

Audi open sky sunroof systems

Self-Study Programme 378



Contents

Audi A2 roof

Glass roof panels - explosion drawing	5
Glass roof panel 2 closed.....	6
Glass roof panel 2 opens - tilts up	7
Glass roof panel 2 begins to open.....	8
Glass roof panel 2 opens - glass roof panel 3 is locked	9
Glass roof panel 2 open - glass roof panel 3 opens.....	10
Electrical system	11

Audi A3 Sportback sunroof

Glass roof panel closed	13
Releasing the glass roof panel locking hook	14
Glass roof panel tilted up.....	15
Glass roof panel opens - wind deflector tilts up	16
Glass roof panel open.....	17
Electrical system	18

Audi Q7 sunroof

Glass roof panels - explosion drawing	20
Glass roof panel 1 closed.....	21
Glass roof panel 1 tilted up	22
Front glass roof panel 1 opens - wind deflector tilts up	23
Glass roof panel 1 fully open - over top of roof panel 2	24
Rear glass roof panel 3 tilted up.....	25
Electrical system	26


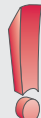
Service

Special tools	30
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The self-study programme teaches the design and function of new vehicle models, new automotive parts or new technologies.

The self-study programme is not a repair manual!
The values specified are intended as a guideline only, and refer to the software version valid at the time of publication of the SSP.

For maintenance and repair work, always refer to the current technical literature.

Reference	Note
	

Introduction

Audi open sky roof systems

The so-called open sky roof system is fitted in the A2, A3 Sportback and Q7.

The open sky roof system has the advantage over a conventional sliding/tilting sunroof in that it allows more daylight to enter the interior of the vehicle. This creates a feeling of space similar to that in a convertible, but with the advantage of less draught in the interior.

The roof system has a variety of functions which enable the occupants to open the sunroof at the front or rear, to open the front roof panel and leave the rear panel closed, or to create a large roof opening by opening both glass roof panels. It is also possible to activate the sun screen when the sunroof is open.

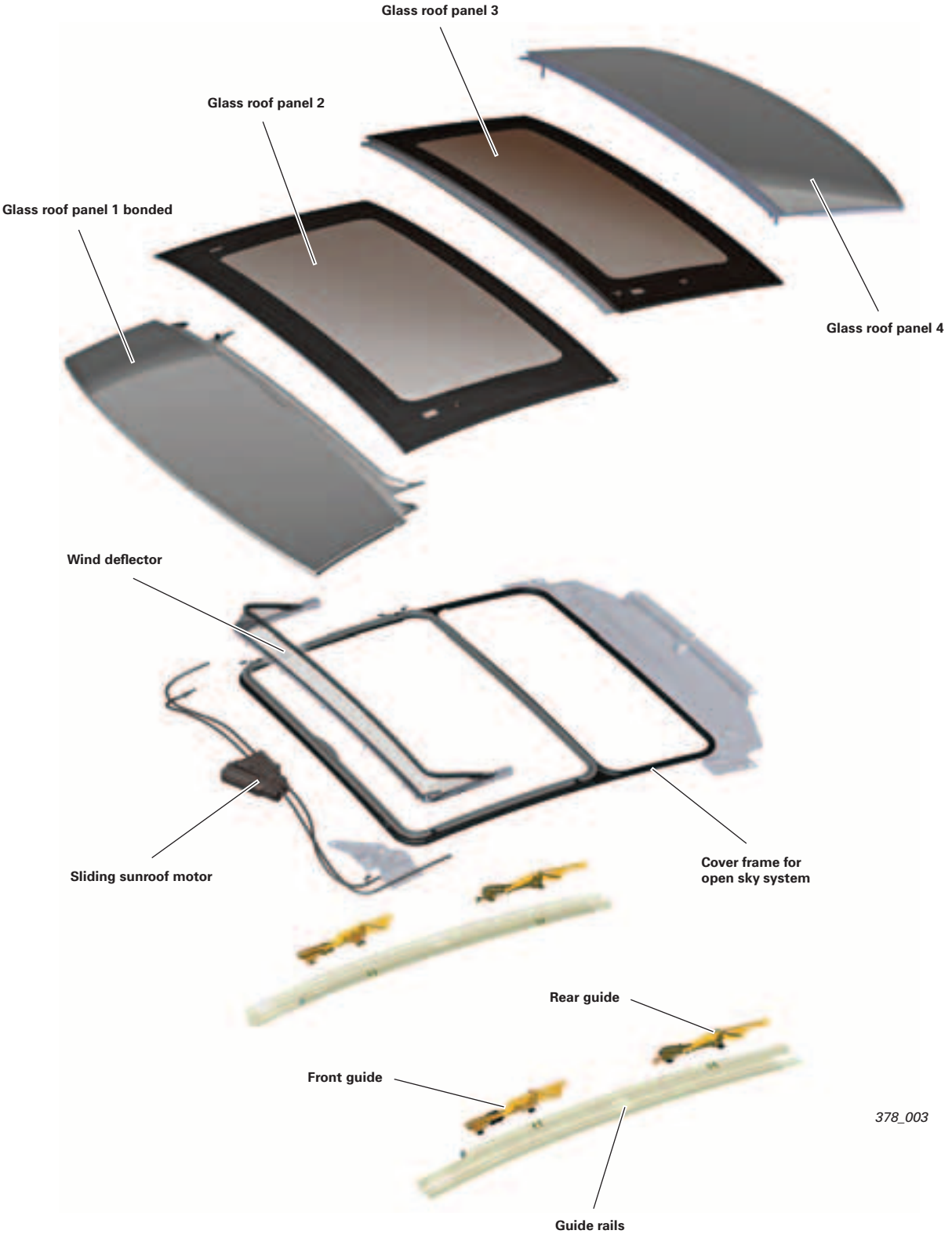
The open sky roof system is, therefore, a multifunctional sliding/tilting sunroof.

The open sky roof system is integrated into the roof structure, and can be removed and installed separately. The open sky roof, which is bonded or bolted depending on type, helps to increase the rigidity and strength of the body structure as a whole.



378_065

Glass roof panels - explosion drawing

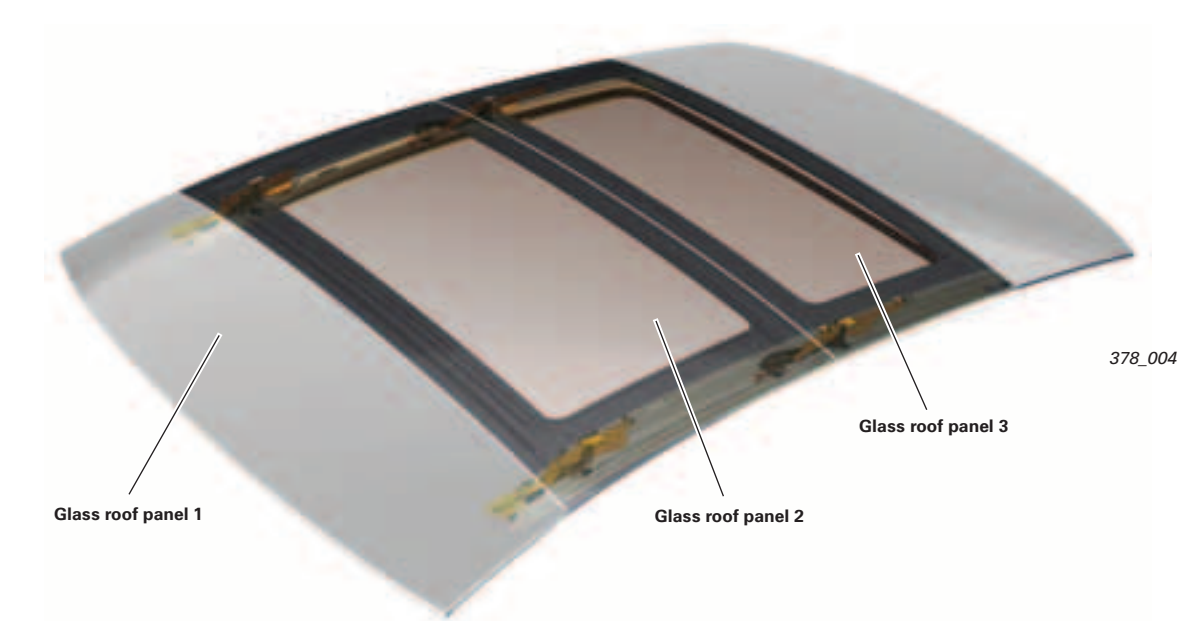


378_003

Audi A2 roof

Glass roof panel 2 closed

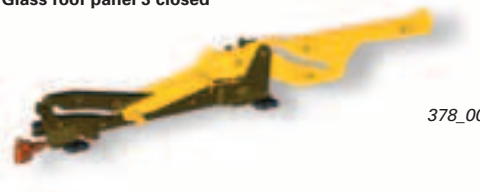
Glass roof panel 2 is closed.
The guides are in the rest position.



Glass roof panel 2 closed

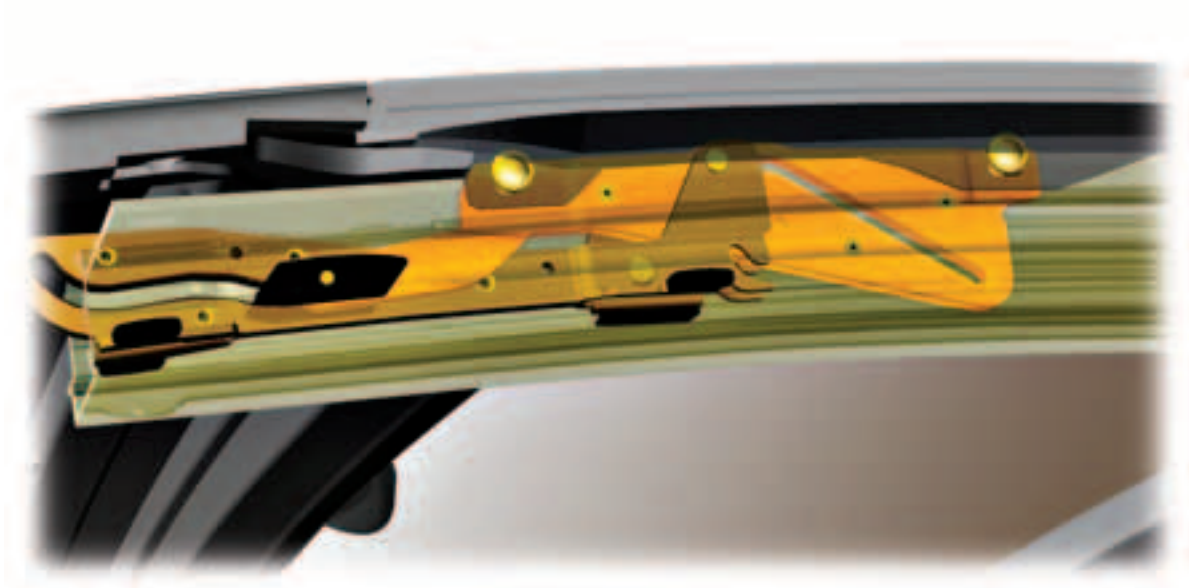


Glass roof panel 3 closed



When the roof is closed, the left and right guides are in their rest position at the front stops on the guide rails.

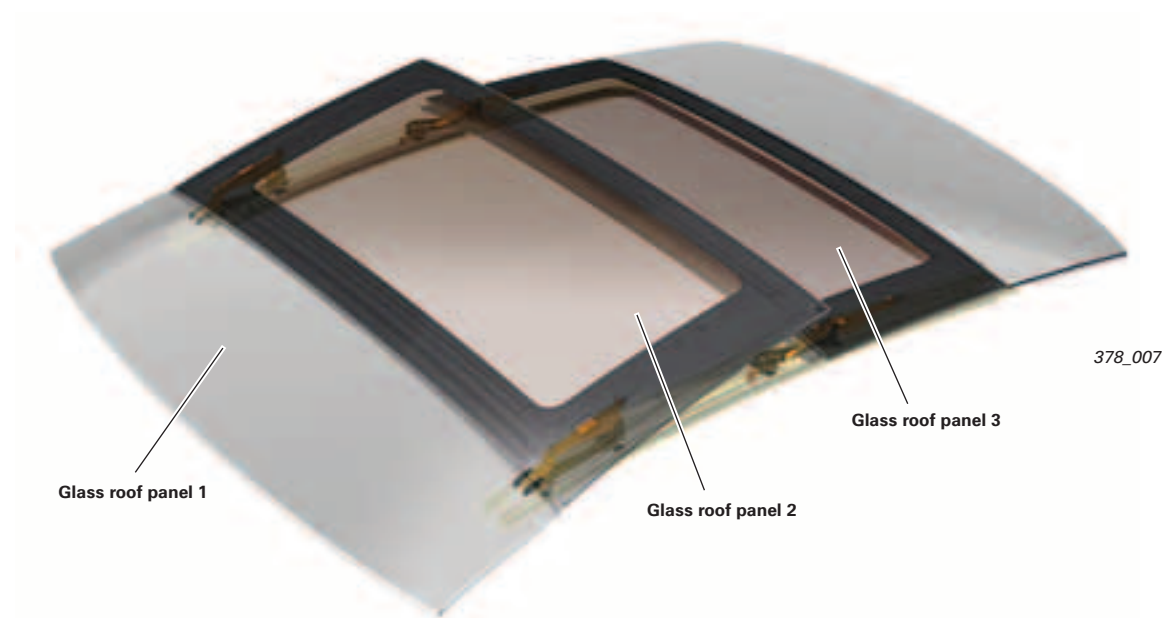
In this position, the guides and glass roof panel 2 are located below roof panel 1 and glass roof panel 3.



Glass roof panel 2 opens - tilts up

The motor-driven cable pulls on the left and right are attached to the front guides.

When the sunroof switch is held in the "open" position, the cable pulls retract along the guide rails together with the guide due to the direction of rotation of the motor.



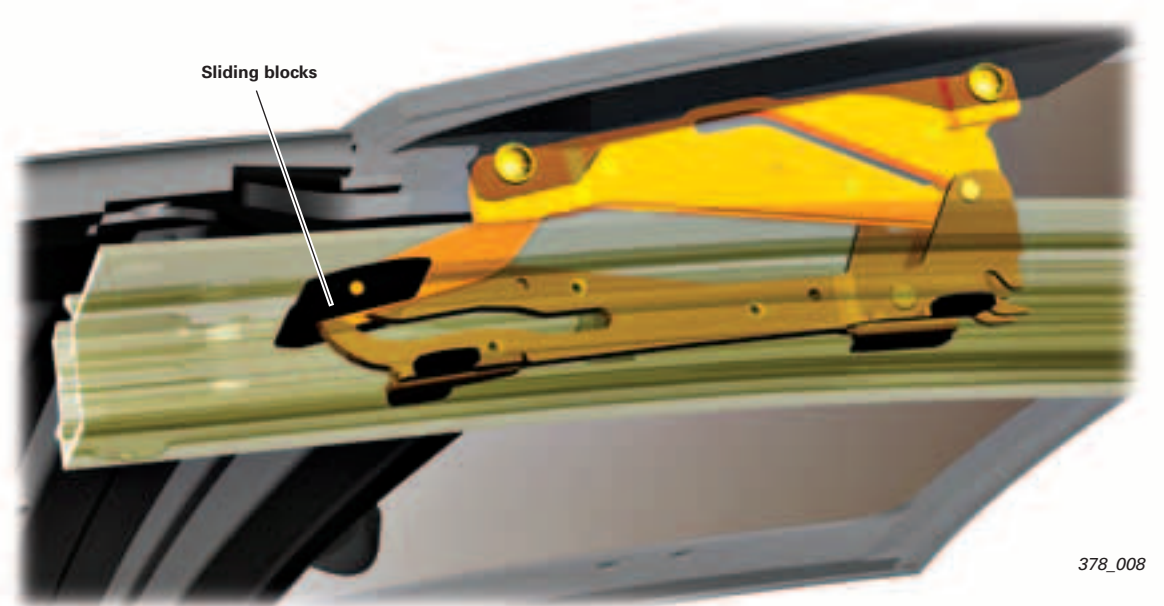
Glass roof panel 2 tilted up



Glass roof panel 3 closed

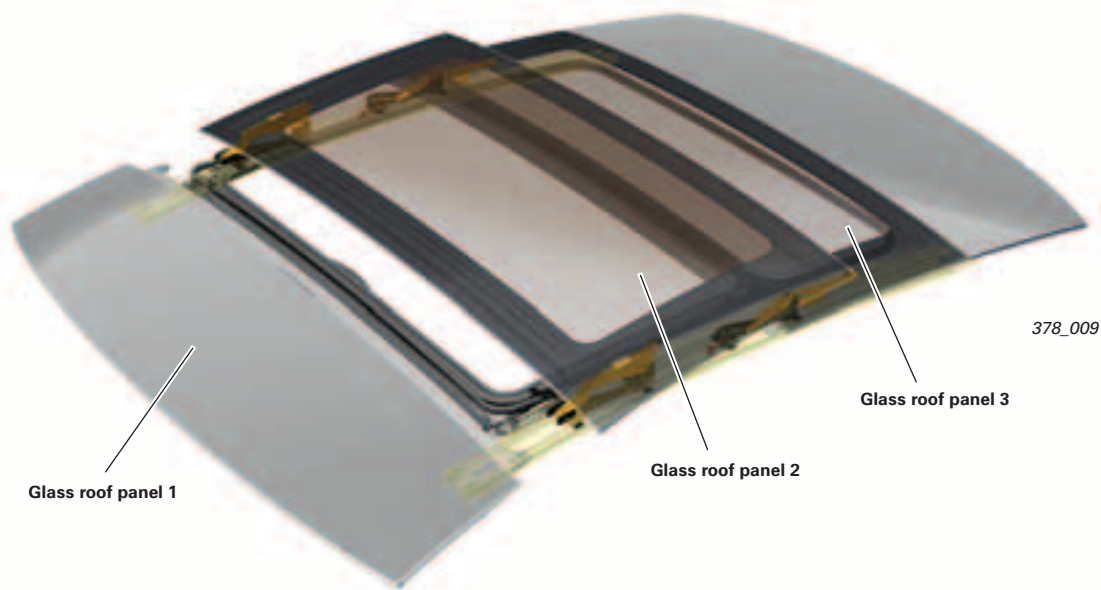


The lower part of the two-part guide moves back along the lifting arm track and lifts the upper part. This is accomplished by means of sliding blocks located at the front end of the guide rails. The wind deflector remains in the closed position.



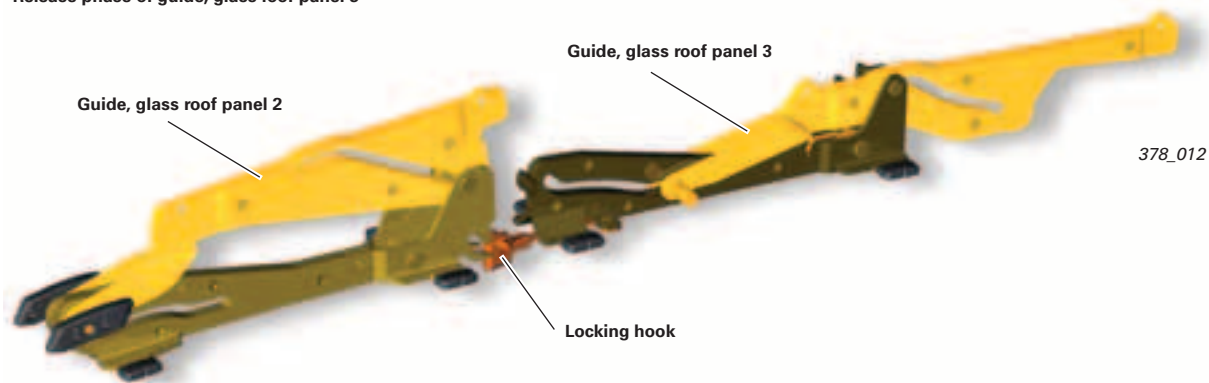
Audi A2 roof

Glass roof panel 2 begins to open



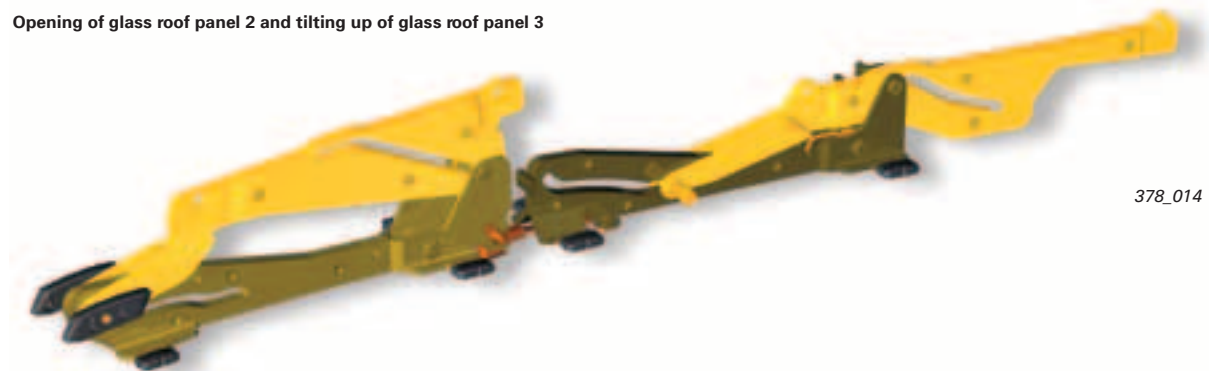
After this, the sliding blocks retract from the front insert and commence the opening phase of the front glass roof panel. The front glass roof panel is now tilted up to the full-open position and simultaneously lifted out at the front edge by the front insert and the front sliding blocks to the extent that it is actually located above the side wall frame. Thus, it is now possible to slide open the glass roof panel. Glass roof panel 2 begins to open. The front edge of the sunroof is raised to the extent that a uniform distance to glass roof panel 3 is maintained.

Release phase of guide, glass roof panel 3



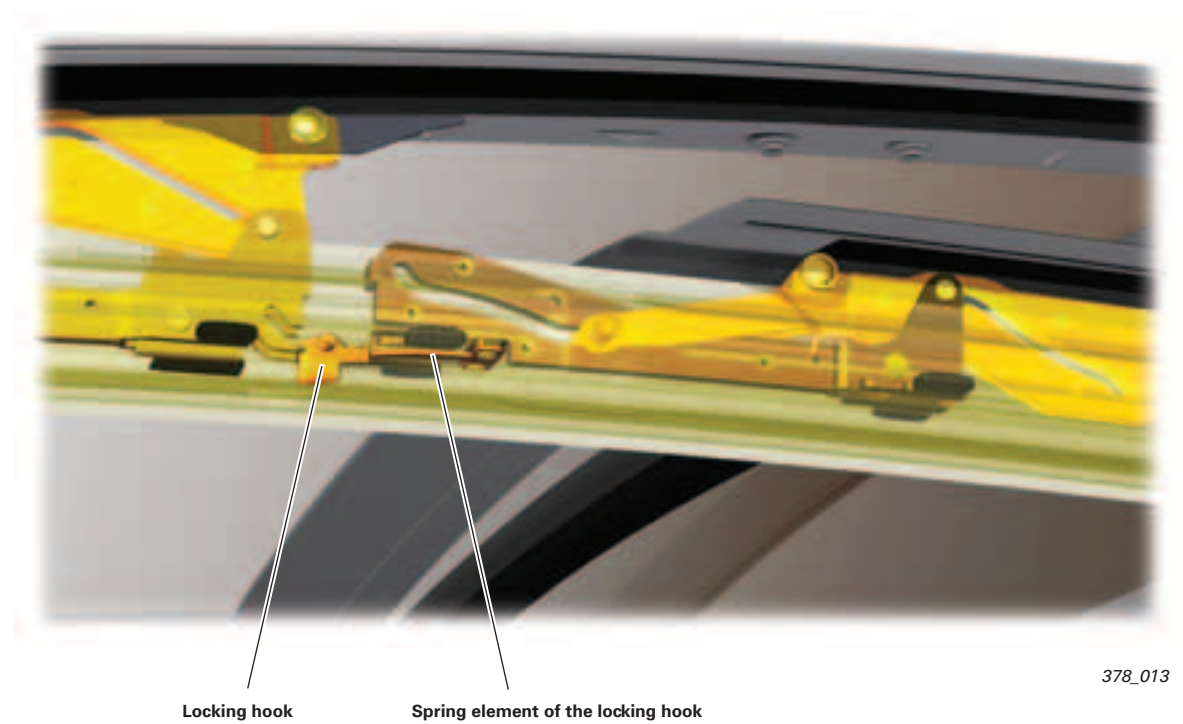
The locking hook on the guide of glass roof panel 3 is lifted out of the locking hook window (guide rail) by the fork of glass roof panel 2.

Opening of glass roof panel 2 and tilting up of glass roof panel 3



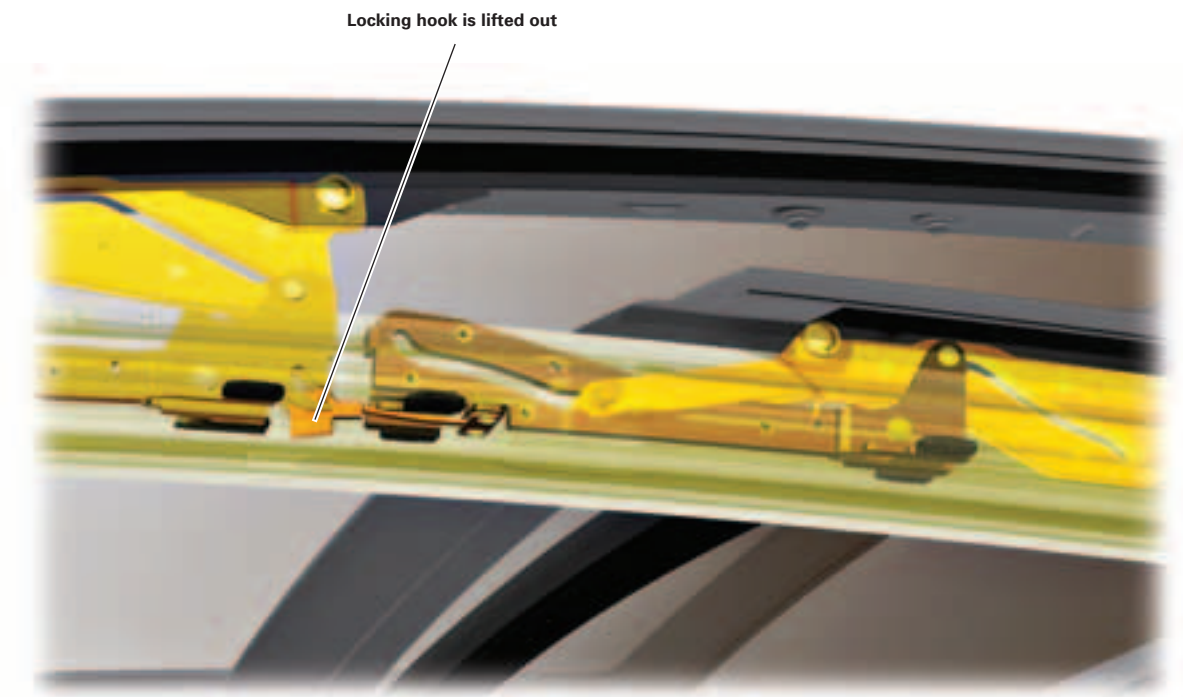
The guide of glass roof panel 3 is released and glass roof panel 3 is tilted up by the lifting arm which runs along the guide of glass panel 3.

**Glass roof panel 2 opens -
Glass roof panel 3 is locked**



After opening approximately halfway, the guide of the front glass roof panel reaches the guide of the rear glass roof panel, which is still closed at this point.

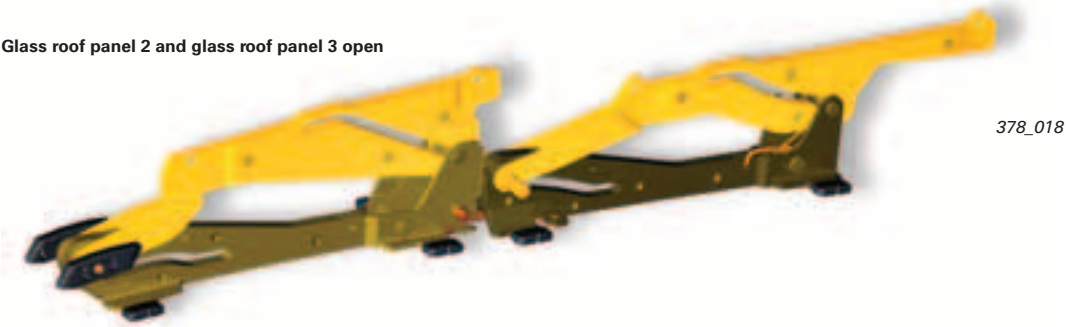
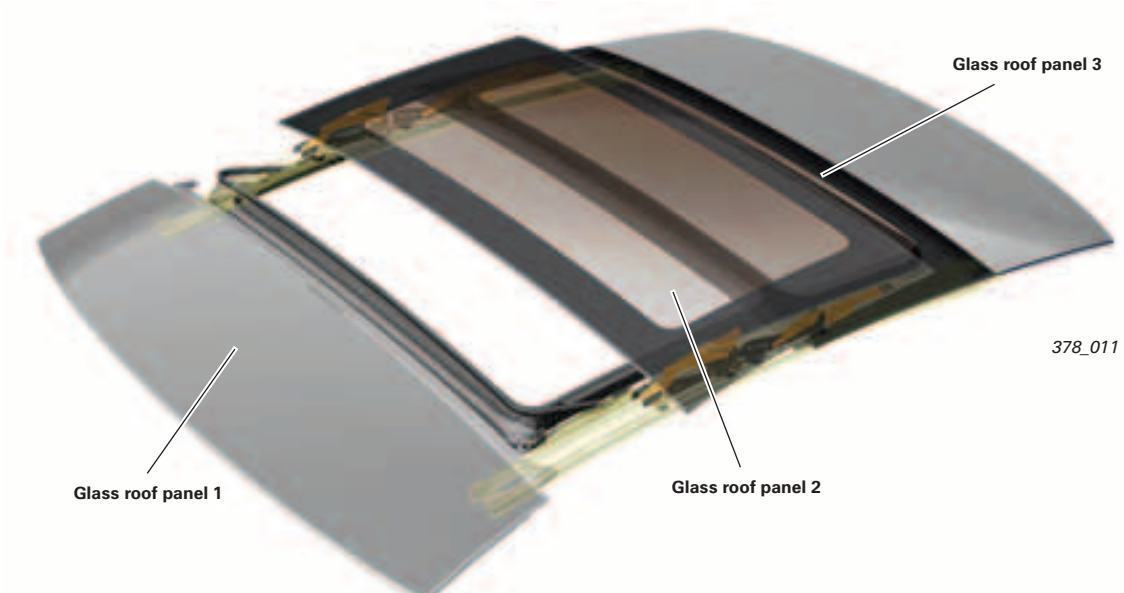
A fork on the front guide engages a spring loaded locking hook on the front part of the rear guide at the rear and lifts the hook out of the locking hook window in the guide rail.



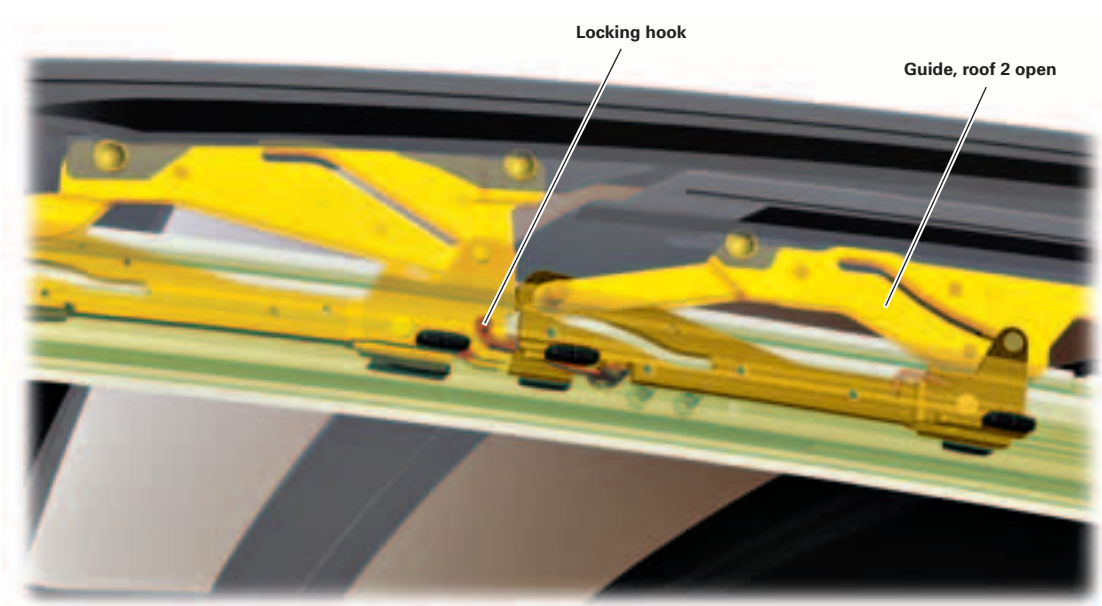
Audi A2 roof

Glass roof panel 2 open - glass roof panel 3 opens

After the locking hooks have been lifted out, the front guide can now raise the rear glass roof panel in a similar manner to the front glass roof panel by pushing the guide back along the lifting arm track. It can then open both roof panels jointly.



Glass roof panel 2 is located above glass roof panel 3 - both glass roof panels are open. The glass roof panel closes in reverse sequence of opening.



Electrical system

The slide/tilt function of the open sky roof on the Audi A2 is implemented by using sliding sunroof motor V1 and sliding sunroof control unit J245.

Both components are located in a common housing. The sliding sunroof control unit J245 receives the control signals from sunroof switch E8. According to the operating logic, these are:

- open roof,
- close roof or button not pressed (hold roof position)

When opening the roof, the glass roof panel is tilted up if the button is pressed; if the button is pressed again, the open sky roof opens fully or for as long as the button is pressed. The roof closes without intermediate stop in the tilted-up position as long as the button is pressed.

The sliding sunroof control unit J245 receives the following information from the convenience system central control unit J393 across two discrete lines:

1. Convenience locking
The roof can be closed completely by activating the convenience locking function on the lock cylinder
2. Run-on enable
After turning off the ignition with the doors closed, a run-on time of 10 minutes is activated; the roof can be opened or closed within this period by pressing the button

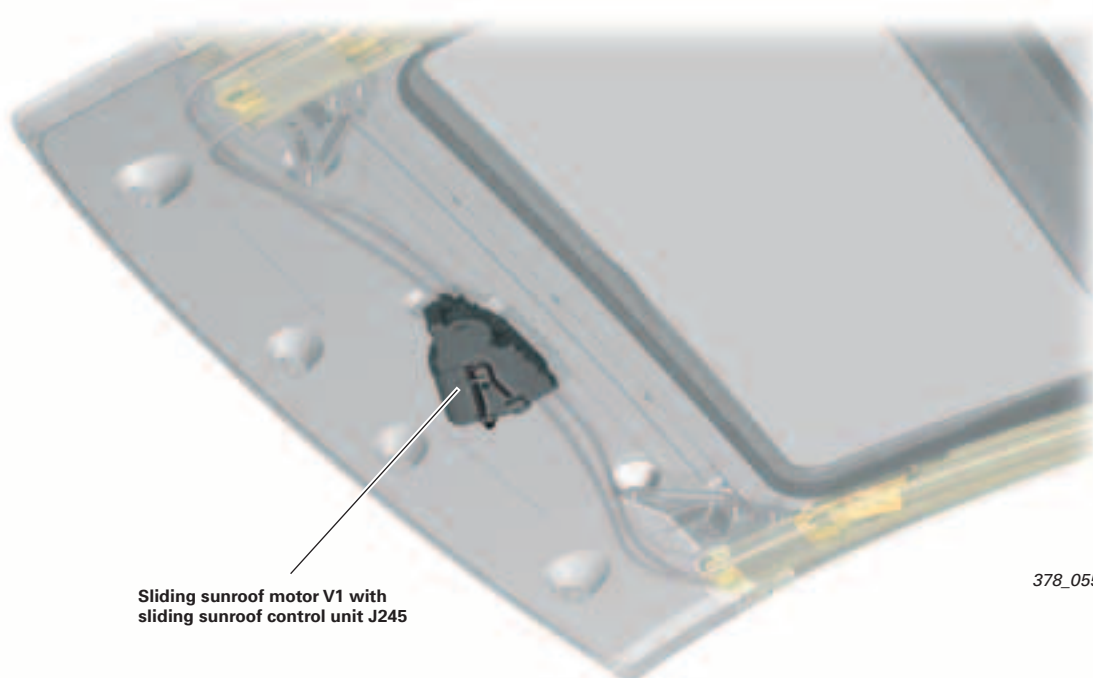
The open sky control unit must be reinitialised after work on the roof or after replacing the drive motor in order to memorise the respective limit positions. The motor can be removed and installed in any position.

The control unit cannot be diagnosed with the workshop tester because the system does not have self-diagnostic capability.

Note



In the case of older Audi A2 open sky systems, there is a version without automatic intermediate stop in the tilted-up position.

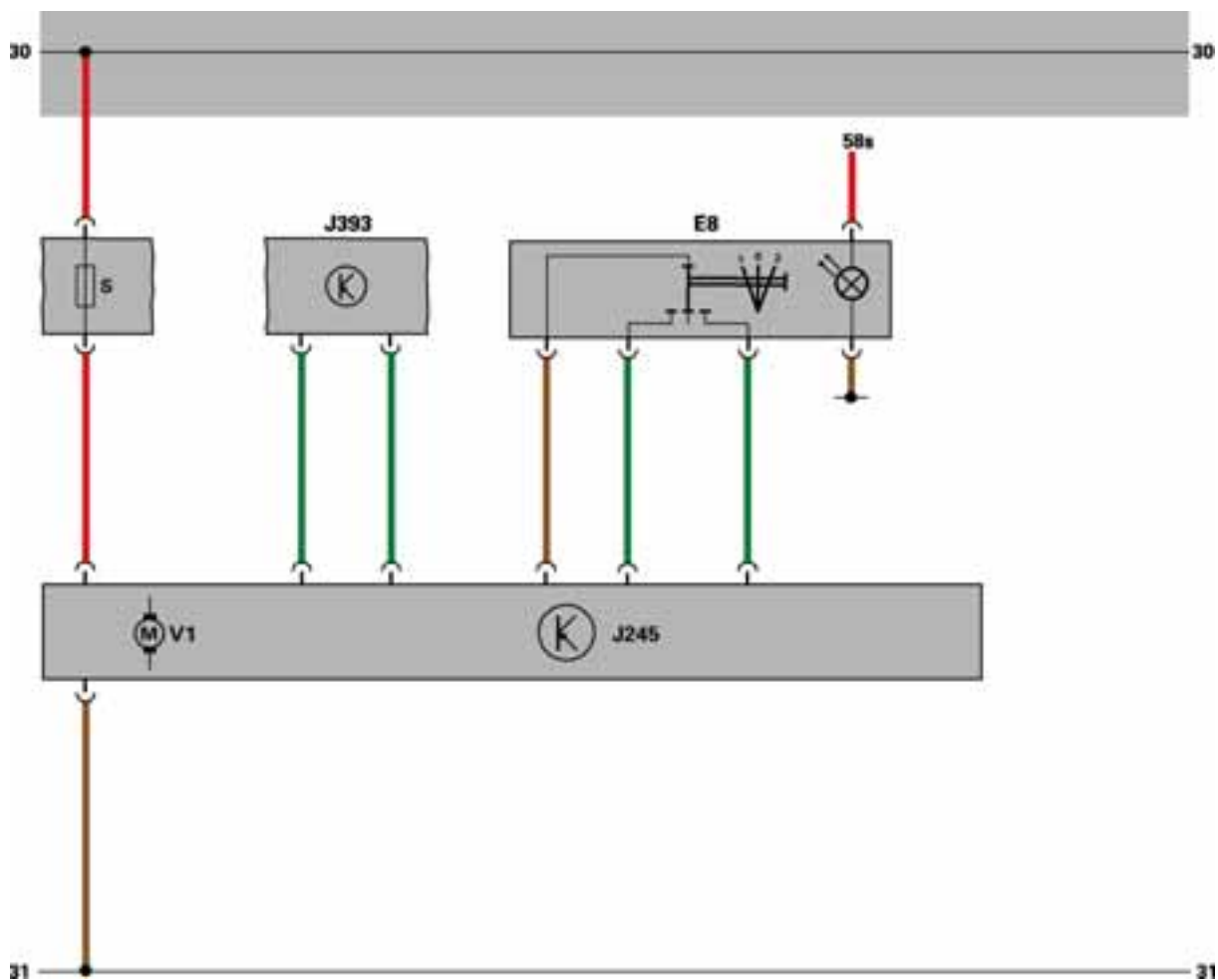


Sliding sunroof motor V1 with sliding sunroof control unit J245

378_055



Audi A2 roof

Function diagram

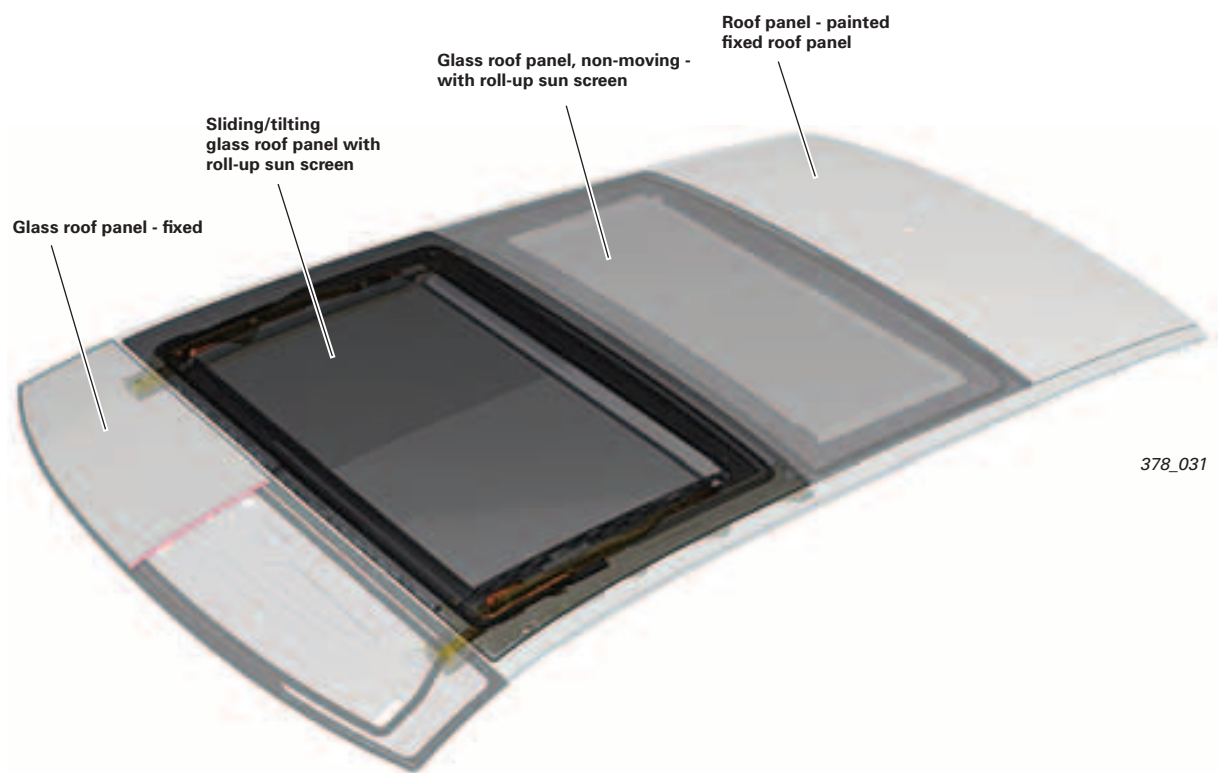


378_001

Legend

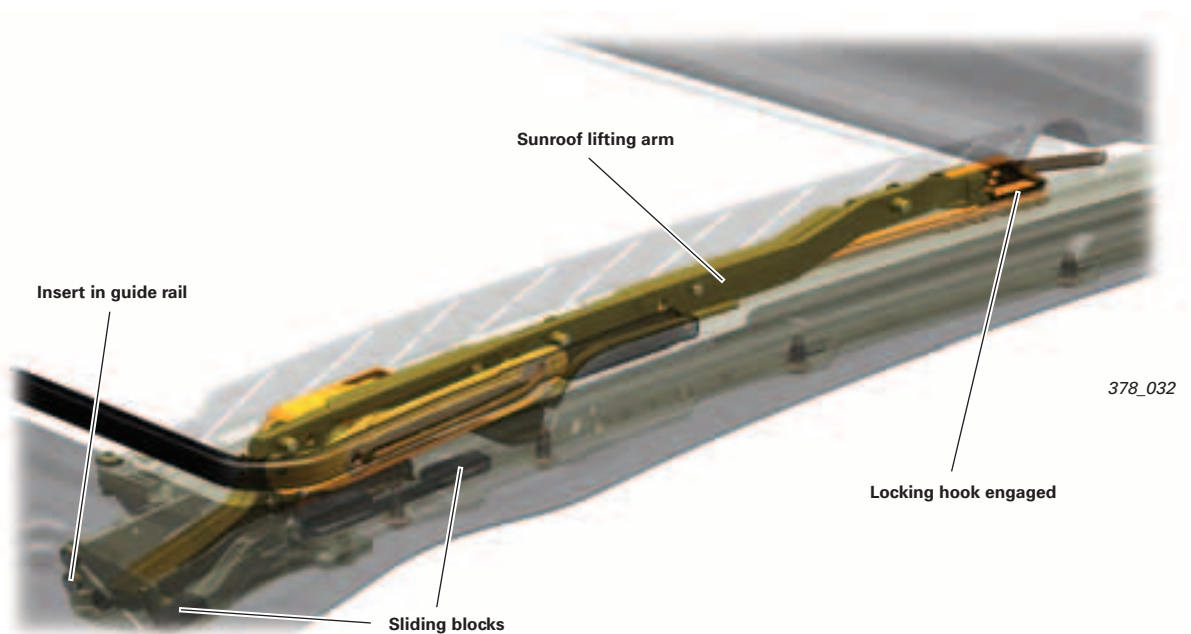
- | | | | |
|------|---|---|--------------|
| E8 | Sunroof switch | | Positive |
| J245 | Sliding sunroof control unit |  | Ground |
| J393 | Convenience system central control unit |  | Input signal |
| V1 | Sliding sunroof motor | | |

Glass roof panel closed



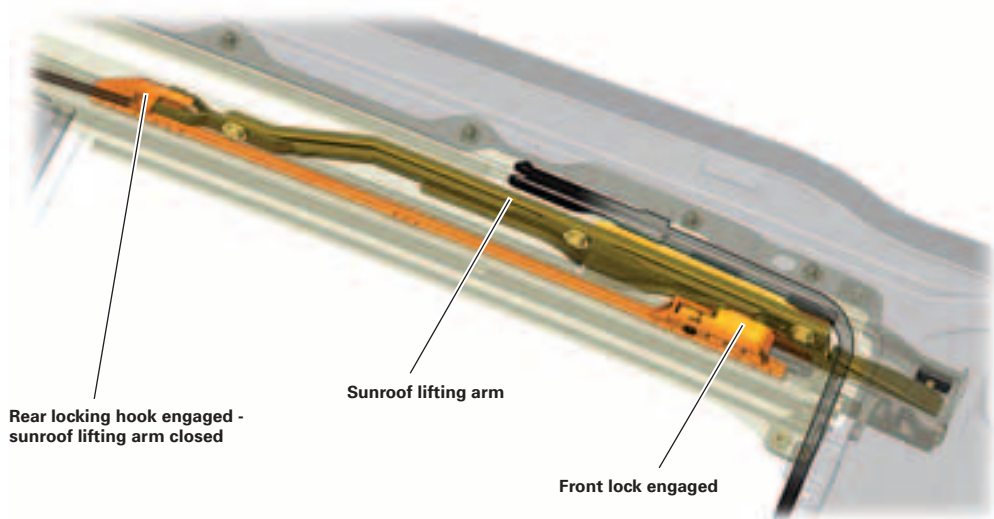
The sliding blocks attached to the lifting arms and guides track along the guide rails of the sliding sunroof frame and enable the sunroof to glide forwards and backwards. The front sliding blocks attached to the upper lifting arm are located in the guide rail insert at the front when the glass roof panel is closed.

In this position, the upper lifting arm is lower at the front end because the guide is routed downward. The lower guide connected to the lifting arm is located at the front at the start of the lifting arm track and simultaneously engages the front lock. The upper rear lifting arm is locked by the rear locking hook.

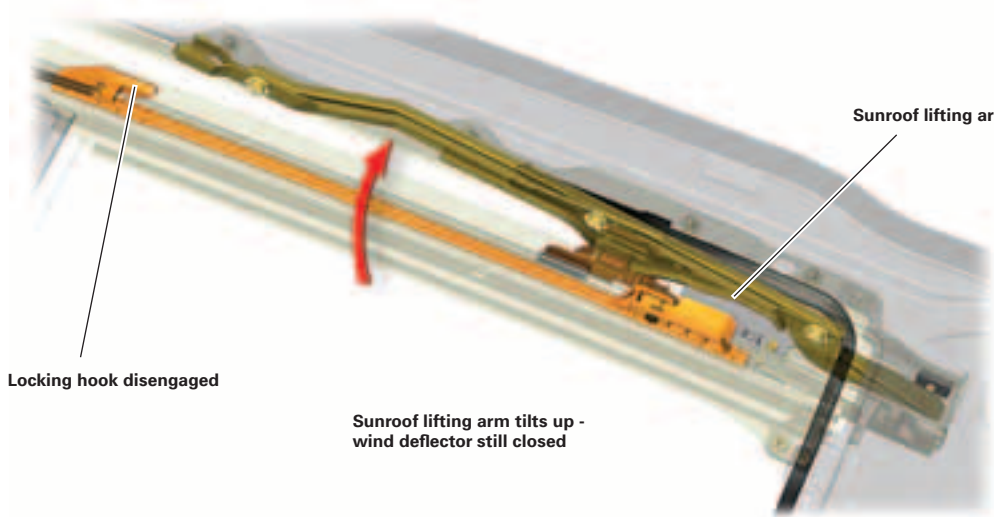


Audi A3 Sportback sunroof

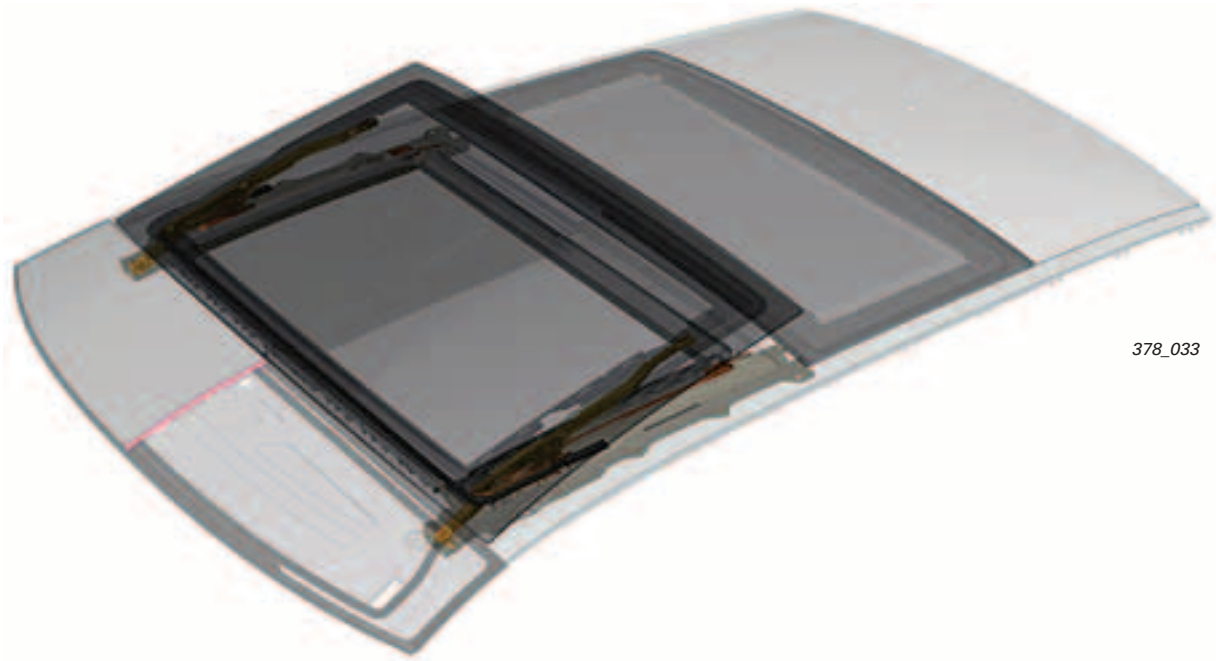
Releasing the glass roof panel locking hook



When the glass roof panel is opened, the guide is retracted. At the same time, bolts attached to the guides lift and retract the front locking mechanism. After approximately 17 mm, the rear locking hook releases the lifting arm. The guide which moves further back raises the lifting arm due to the contour of the lifting arm track and tilts the glass roof panel up.



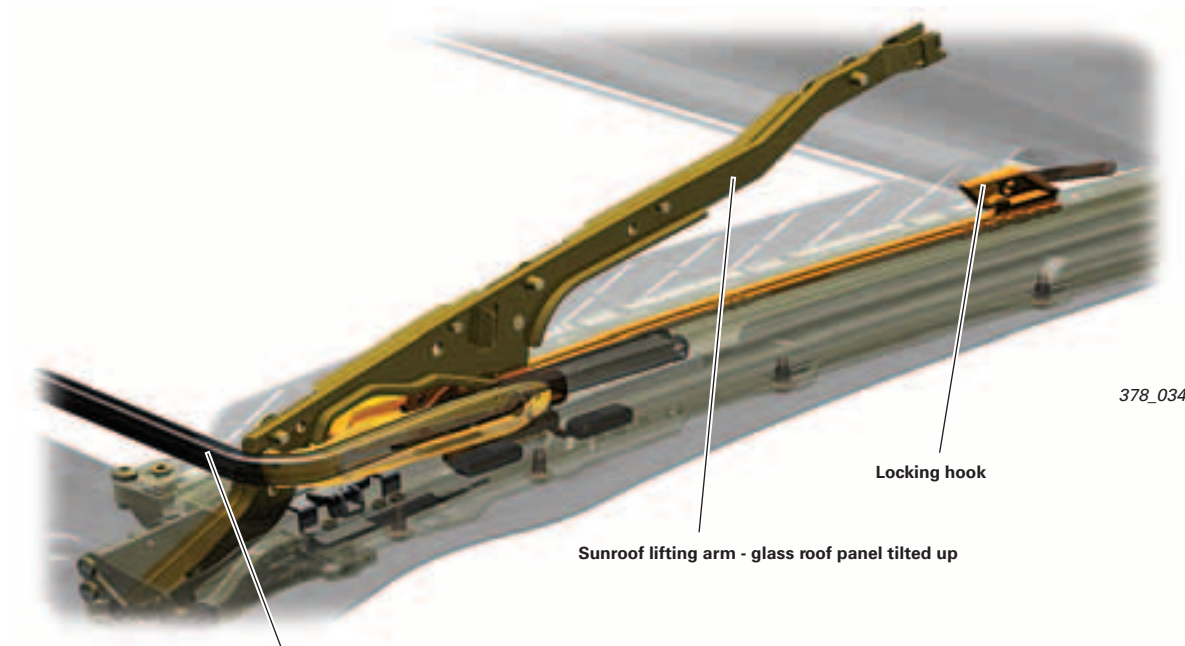
Glass roof panel tilted up



378_033

The roof panel is tilted up and still keeps the spring-loaded wind deflector closed.

The next stage of the roof opening cycle now commences.



378_034

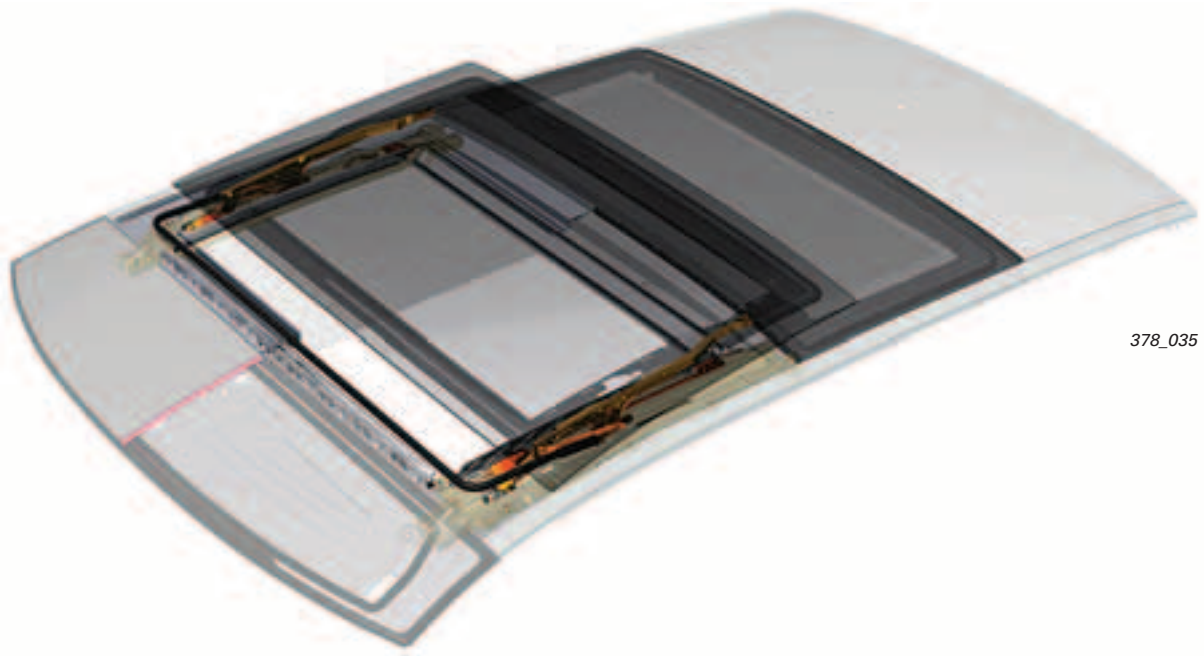
Wind deflector closed

Sunroof lifting arm - glass roof panel tilted up

Locking hook

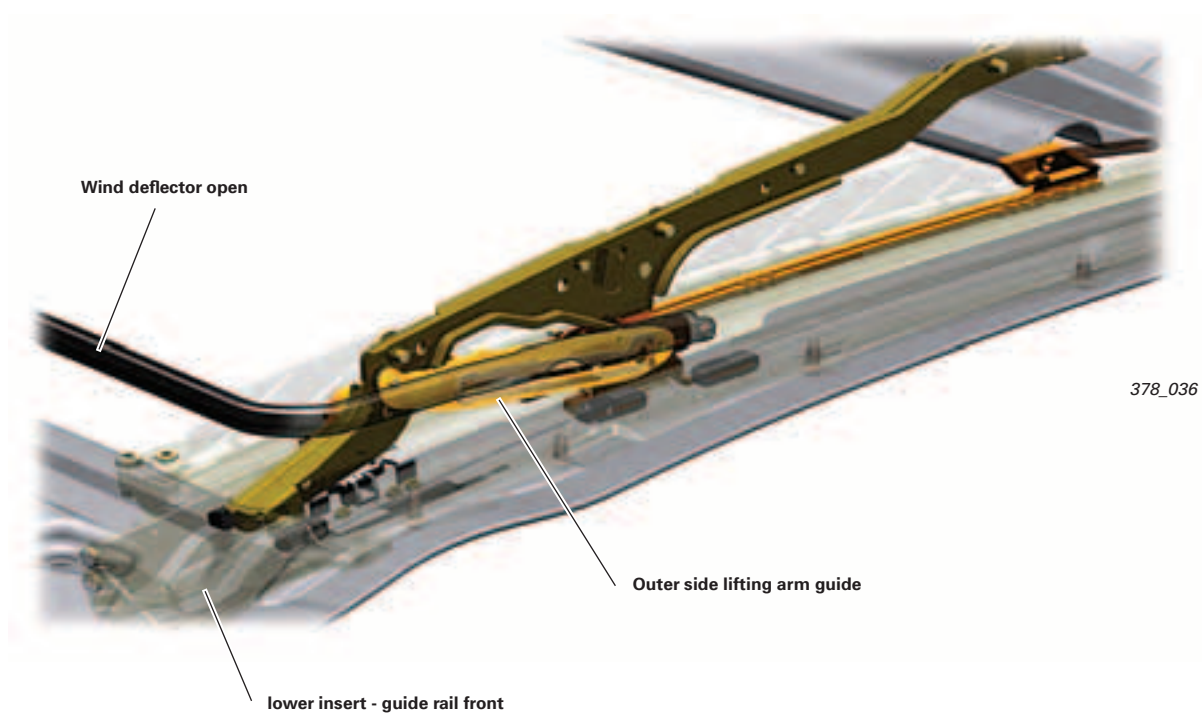
Audi A3 Sportback sunroof

Glass roof panel opens -
wind deflector tilts up

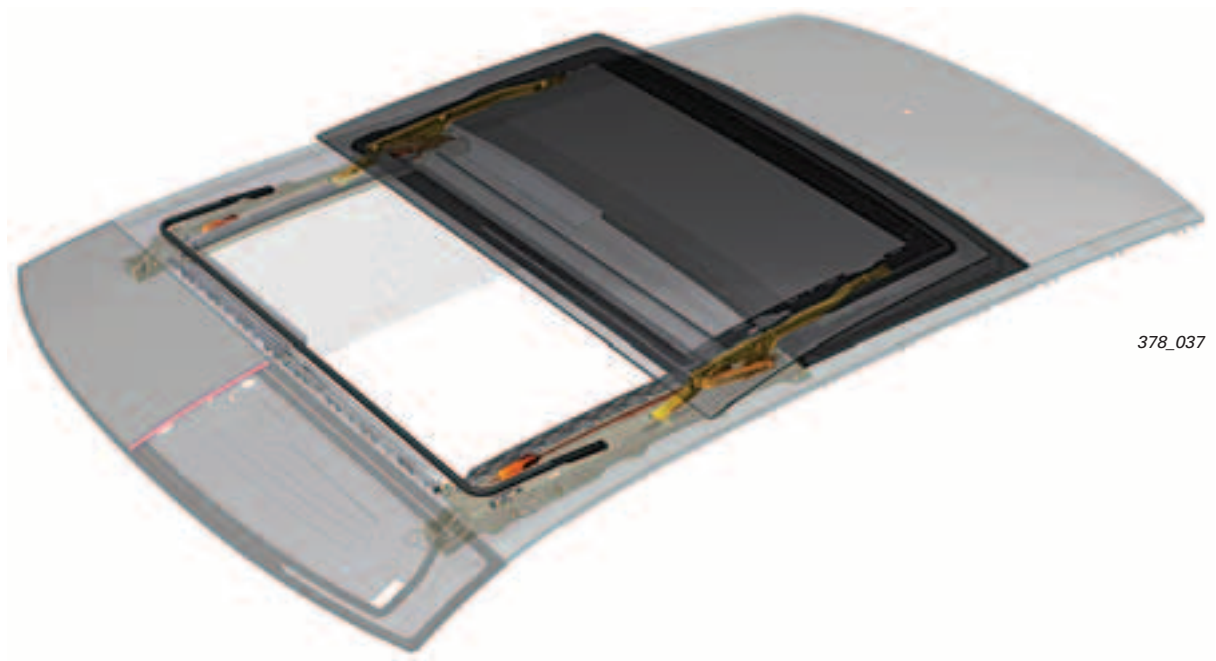


To open the glass roof panel from the "roof tilted up" position, the upper lifting arm is retracted by the outer lifting arm guide connected to the lower guide.

The upper lifting arm is retracted from the lower insert in the guide rail and moved into a horizontal position at the front. The guide together with the lifting arm are moved in the opening direction of the sunroof.

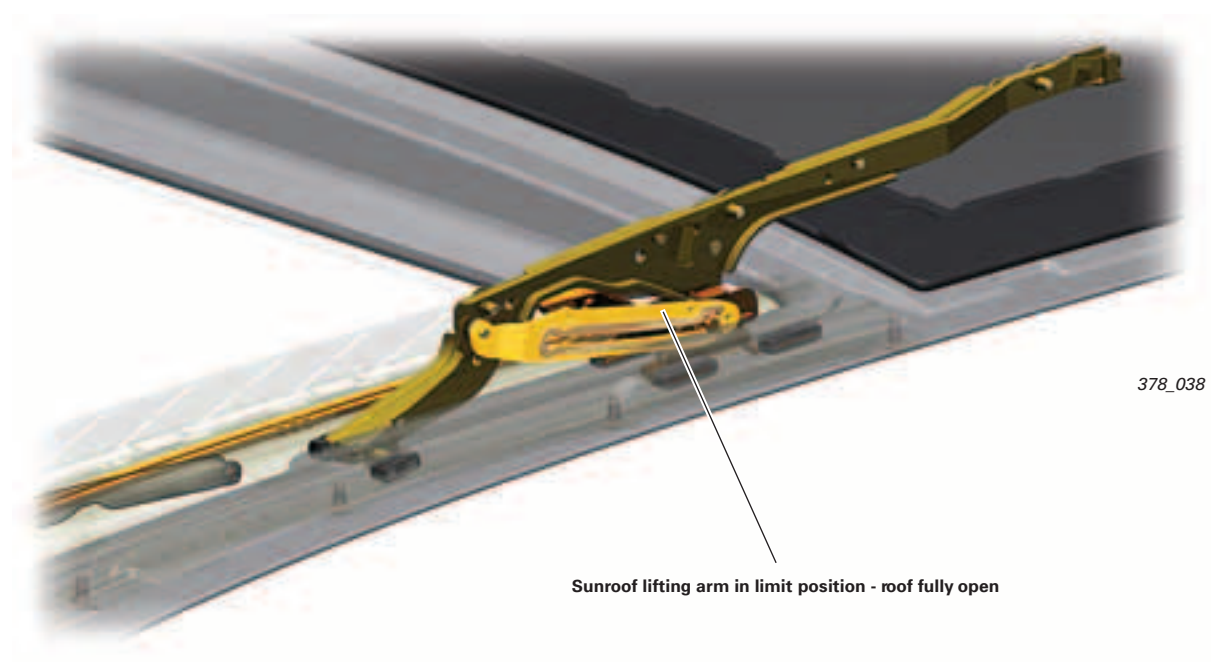


Glass roof panel open



To completely open the glass roof panel, the guide is now pushed back to the limit position, in which the drive motor is turned off.

The glass roof panel closes in reverse sequence of opening.



Audi A3 Sportback sunroof

Electrical system

The tilt-open/slide function of the open sky roof of the Audi A3 Sportback is, like in the Audi A2, realised by using the sliding sunroof motor V1 and sliding sunroof control unit J245.

Both components are located in a common housing. The sliding sunroof control unit J245 receives the operating signals from the sunroof button E325.

These are:

- open roof,
- close roof or button not pressed (hold roof position)

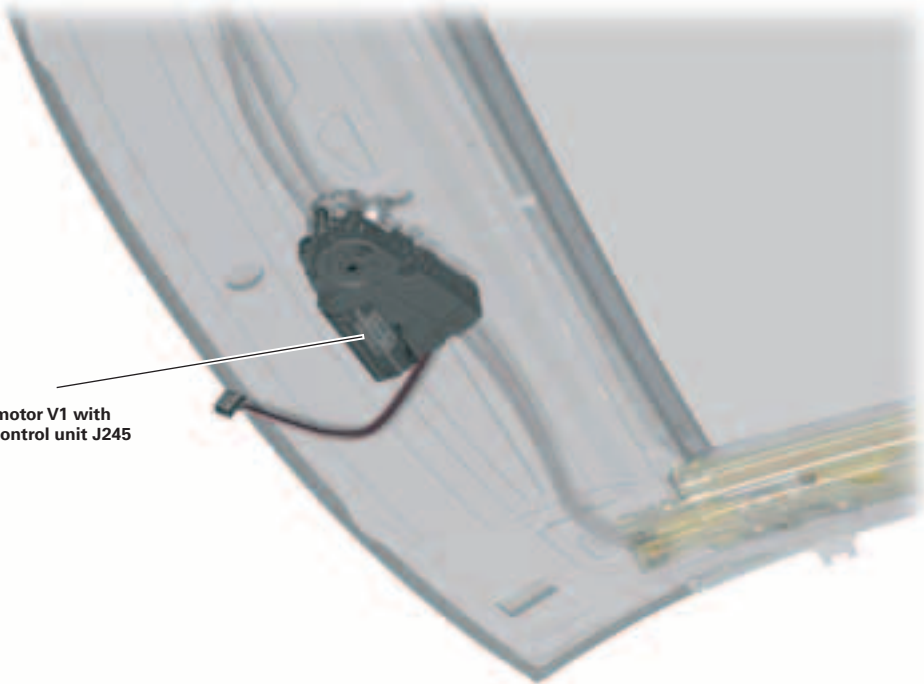
When opening the roof, the glass roof panel is tilted up if the button is pressed; pressing the button opens the open sky roof automatically, or manually for as long as the button is pressed. The roof closes without intermediate stop in the tilted-up position as long as the button is pressed.

The sliding sunroof control unit J245 receives the following information from the convenience system central control unit J393 over three discrete lines:

1. Convenience locking
The roof can be closed completely by activating the convenience closing function at the lock cylinder or the IR remote control
2. Run-on enable
After turning off the ignition while the doors are closed, a run-on time of 10 minutes is activated; the roof can be opened or closed within this period by pressing the button
3. Road speed signal
At present, the road speed signal is not evaluated by the control unit

The drive motor of the open sky system of the Audi A3 Sportback may only be removed and installed in the "roof closed" position, because the system uses internally an absolute encoder for each roof position. This is why initialisation is not possible.

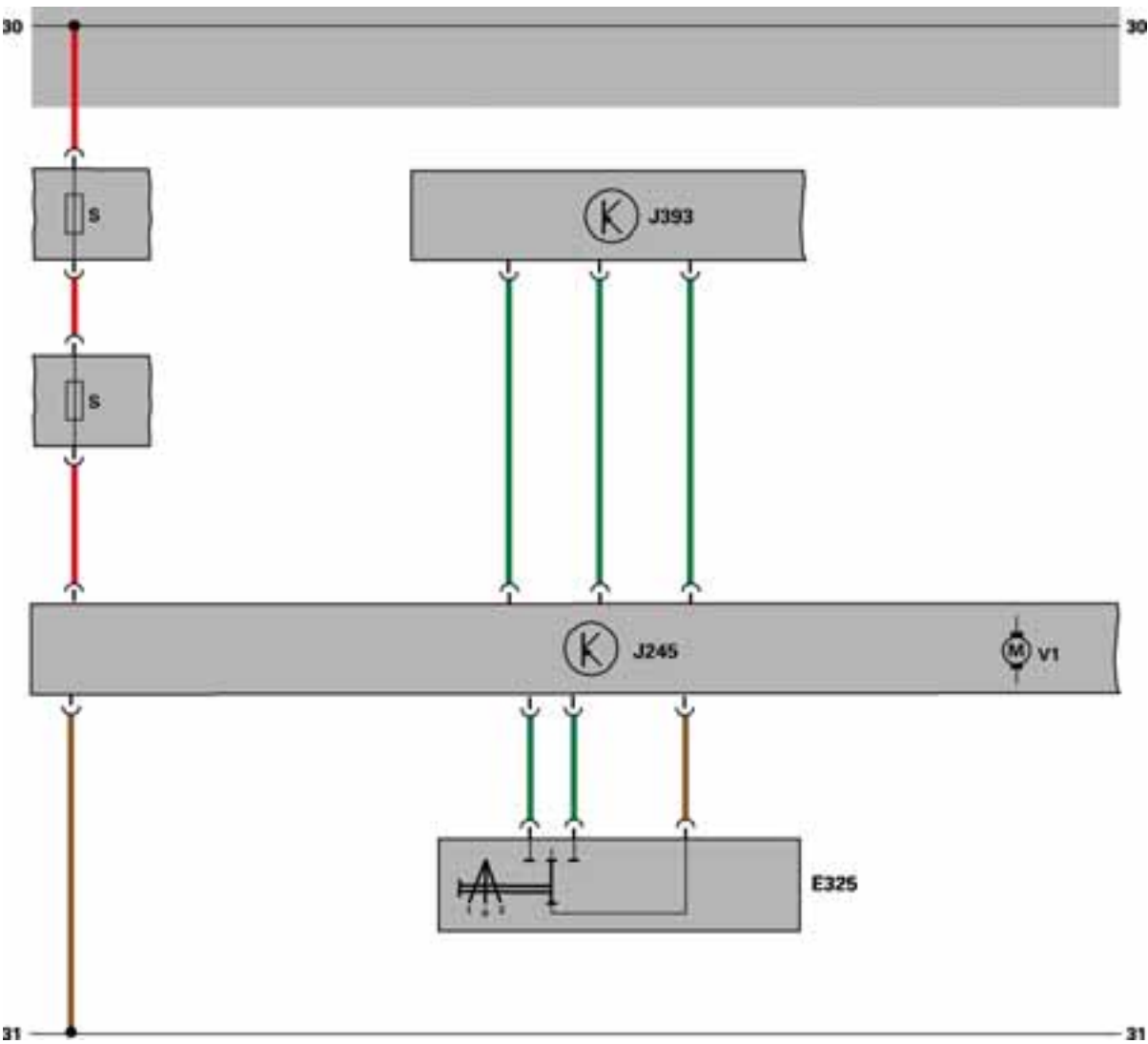
The control unit cannot be diagnosed with the workshop tester because the system does not have self-diagnostic capability.



Sliding sunroof motor V1 with sliding sunroof control unit J245

378_056

Function diagram



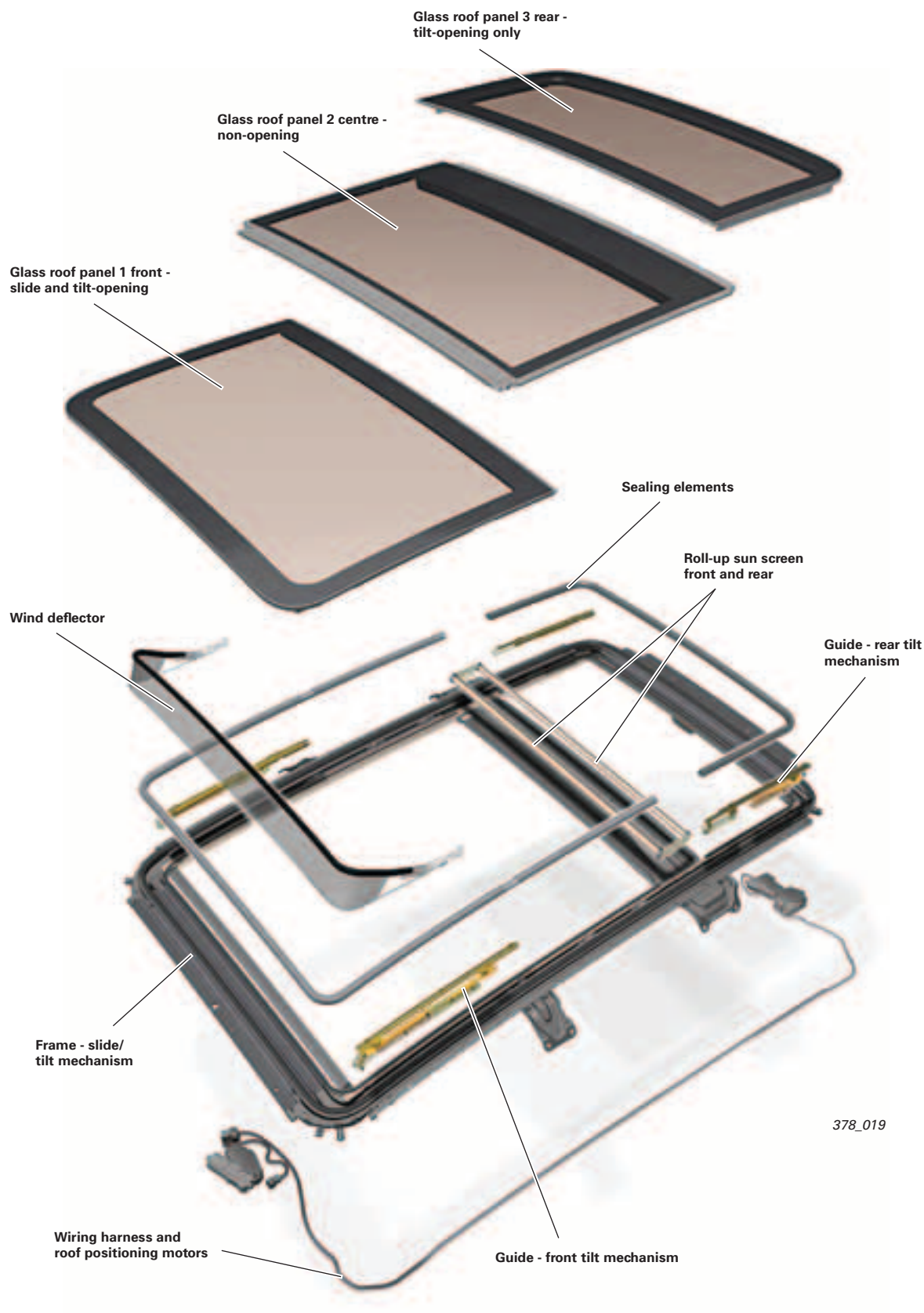
378_002

Legend

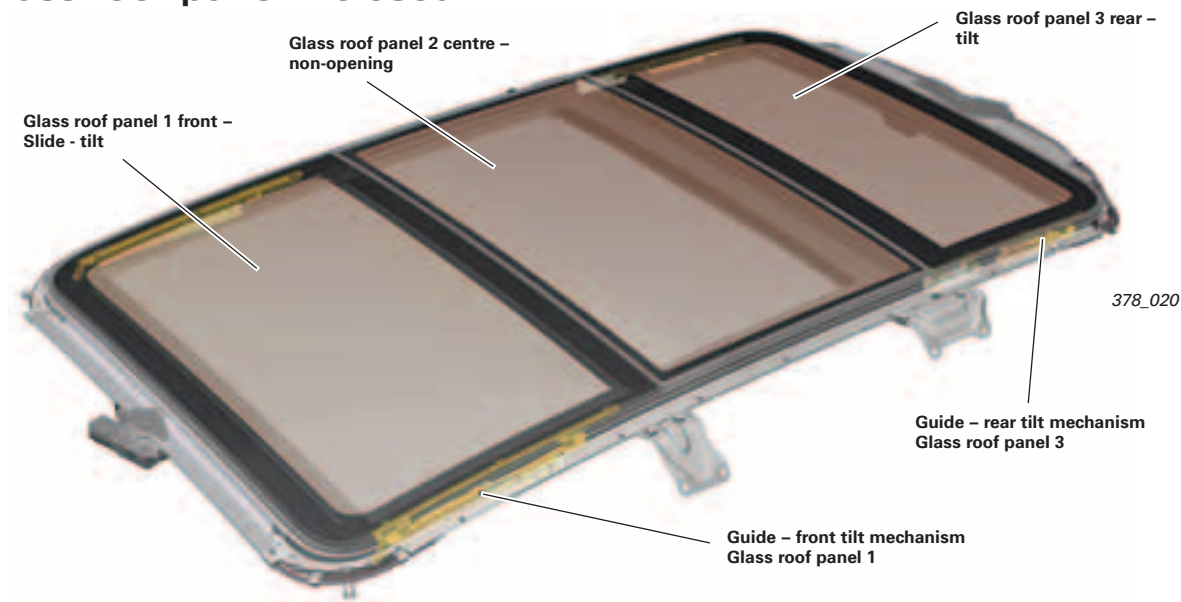
- | | | | |
|------|---|--------------------------------------|--------------|
| E325 | Sunroof button | — | Positive |
| J245 | Sliding sunroof control unit | — | Ground |
| J393 | Convenience system central control unit | — | Input signal |
| V1 | Sliding sunroof motor | | |

Audi Q7 sunroof

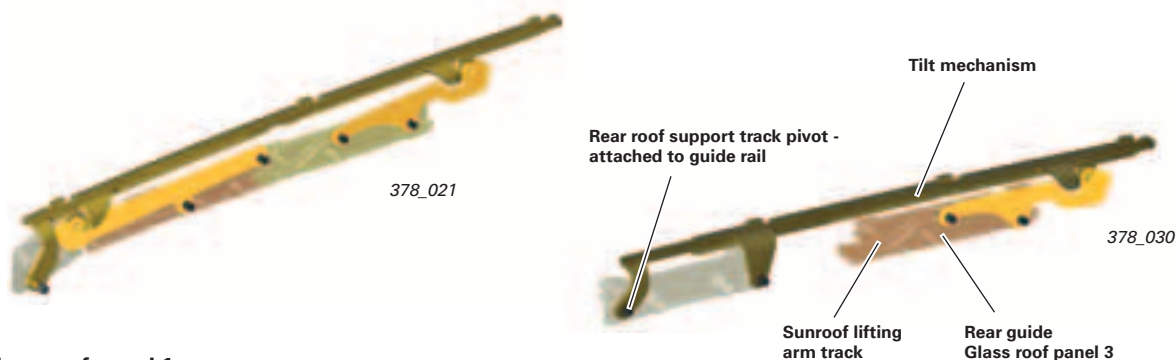
Glass roof panels - explosion drawing



Glass roof panel 1 closed

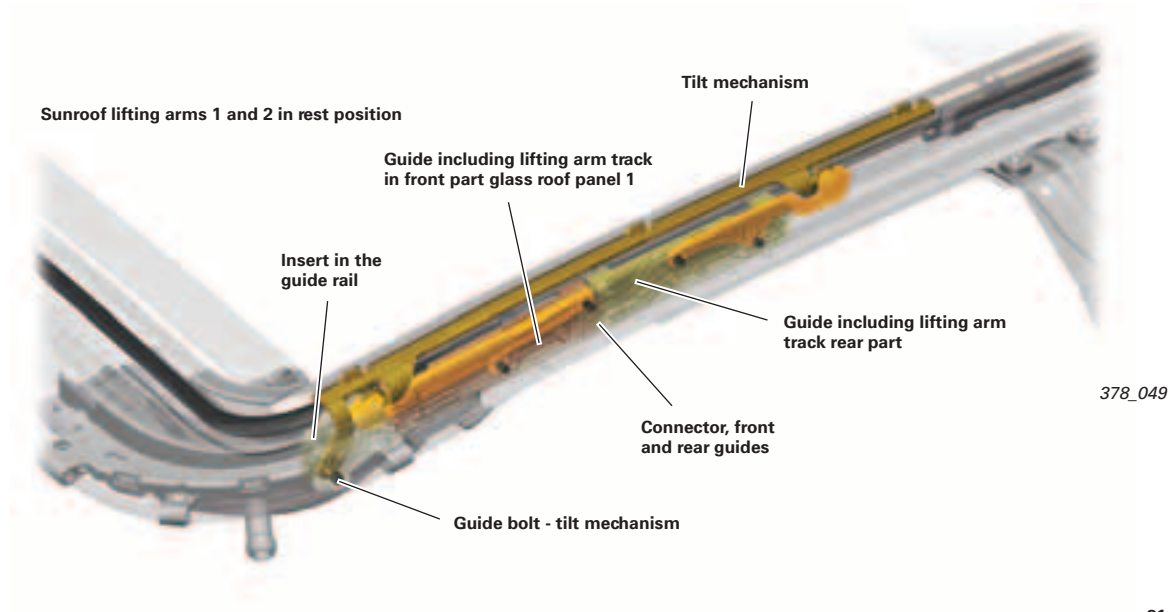


The front glass roof panel mechanism comprises guides at the bottom and a tilt mechanism at the top. The guides - consisting of interconnected front and rear parts - are half-shell shaped. The lifting arm tracks, along which the tilt mechanisms run, are integrated in the guides.



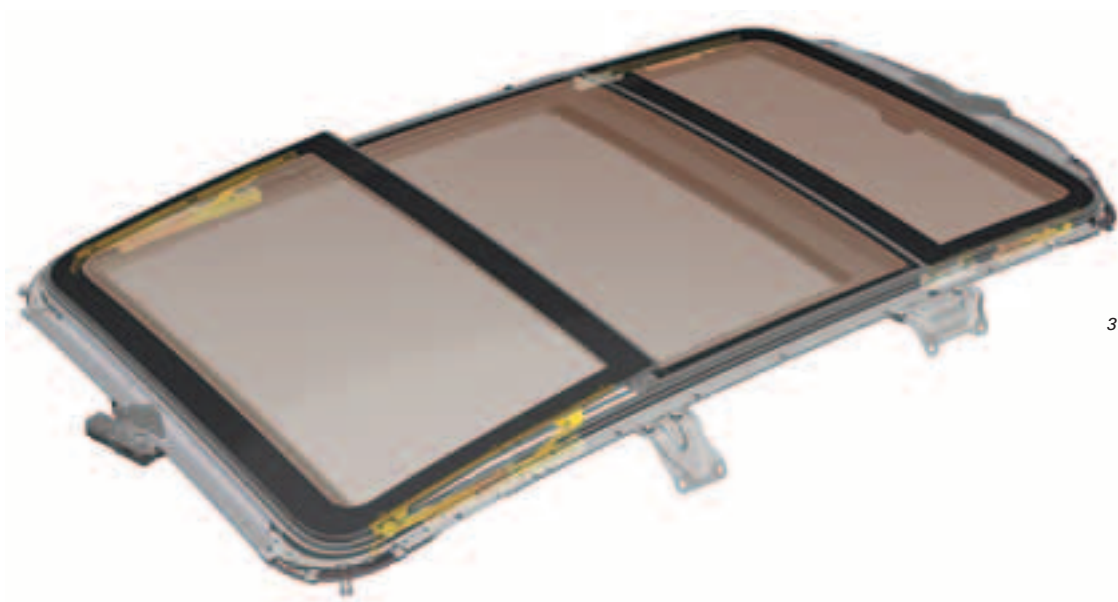
Glass roof panel 1

When the roof is closed, the left and right guides in the guide rails are located in their rest position at the front stops. The tilt mechanism is aligned horizontally and the front guide bolts are in a lowered position.



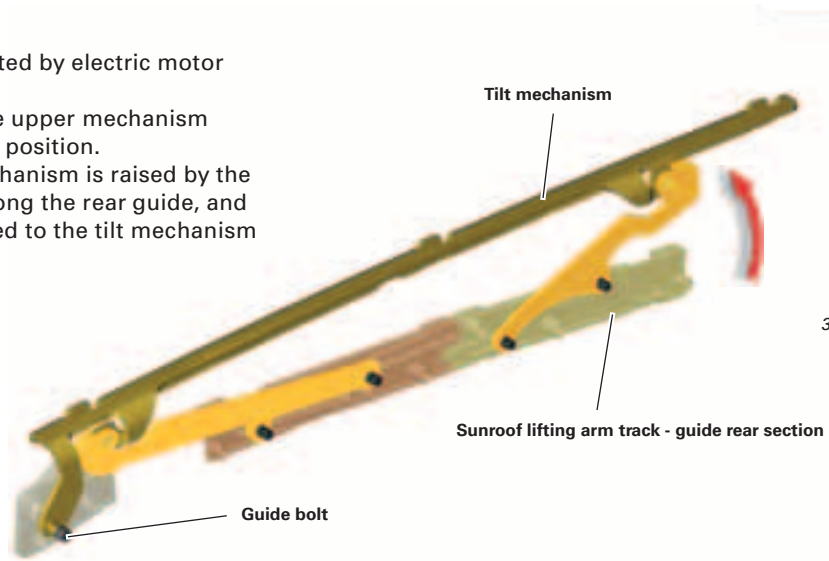
Audi Q7 sunroof

Glass roof panel 1 tilted up



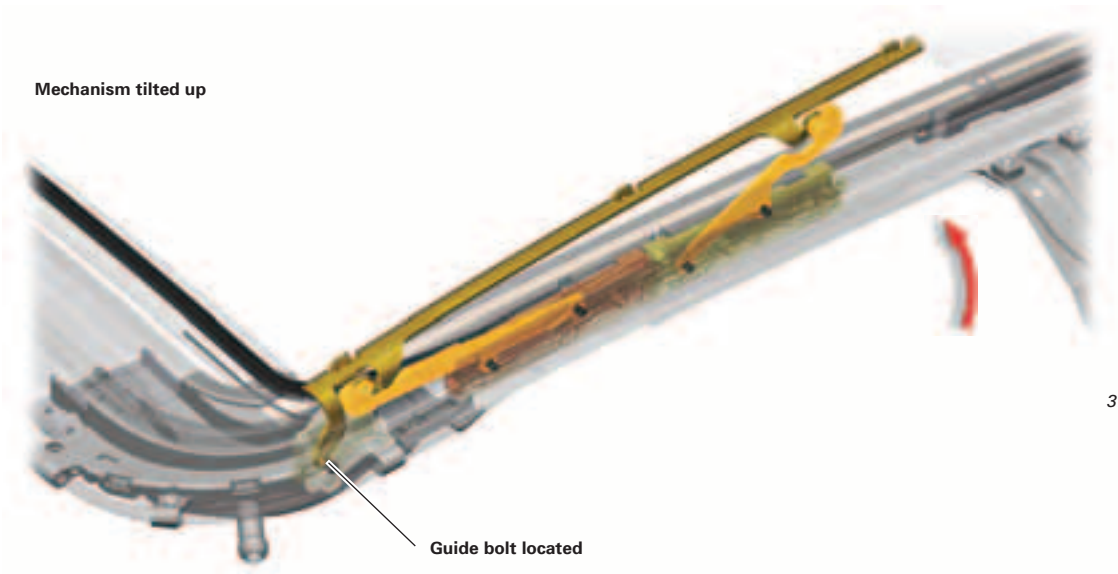
378_022

The lower guides are retracted by electric motor driven linkages.
The front guide bolts on the upper mechanism remain fixed in the lowered position.
The rear part of the tilt mechanism is raised by the lifting arm track running along the rear guide, and the glass roof panel attached to the tilt mechanism is tilted up.



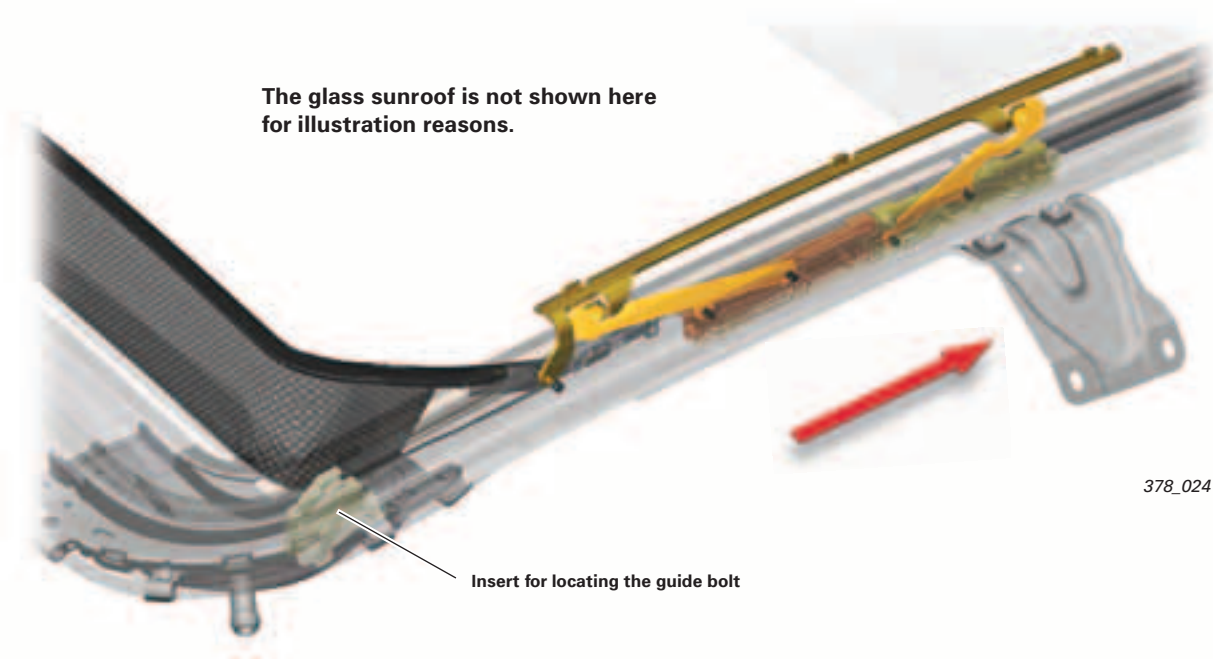
378_023

Mechanism tilted up



378_050

**Glass roof panel 1 front opens -
wind deflector tilts up**



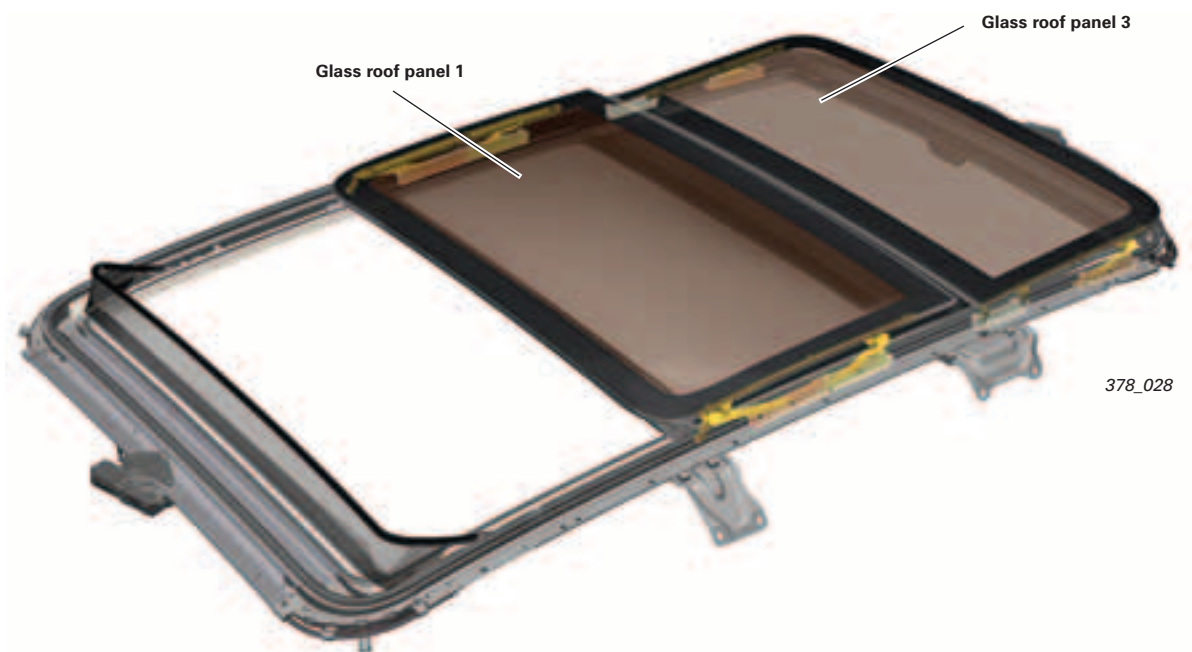
To open the glass roof panel from the - roof tilted up - position, the upper mechanism is retracted from the lower insert of the guide rail through the release of the upper guide bolt and moved into a horizontal position. In this position, the guide together with the tilt mechanism are retracted in the opening direction of the sunroof. The spring-loaded wind deflector is released and tilts up.



To illustrate the lifting arm movements more clearly, only the inner lifting arm tracks of the front and rear guides are shown together with the tilt mechanism.

Audi Q7 sunroof

Glass roof panel 1 fully open -
above glass roof panel 2



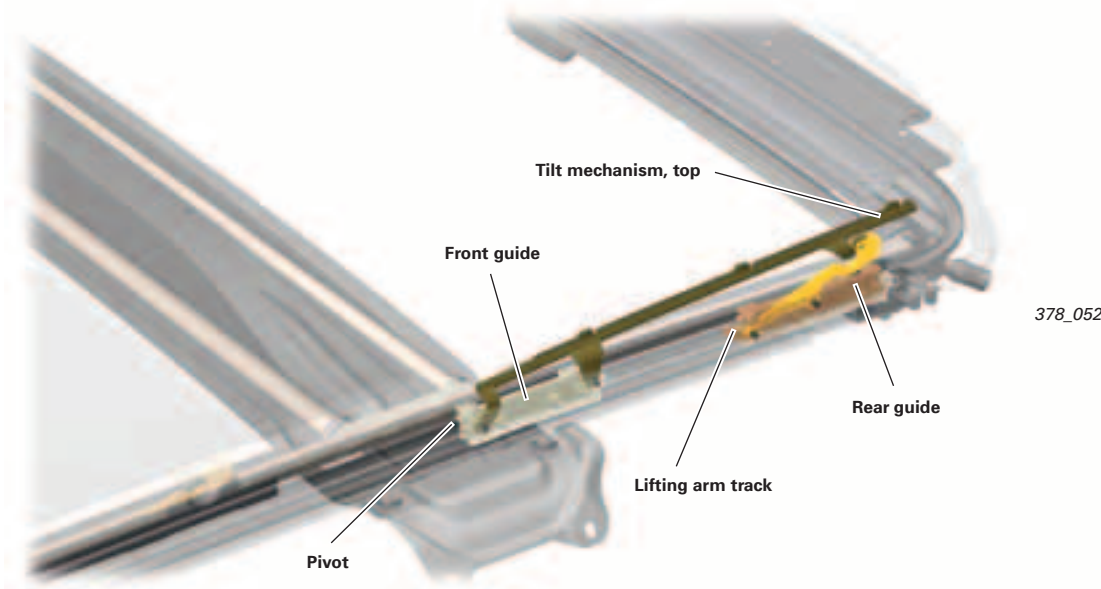
To fully open glass roof panel 1, the left and right outer guides are moved back past glass roof panel 2. The glass roof panel closes in reverse sequence of opening.



Glass roof panel 3 rear tilted up



Glass roof panel 3 is designed as a tilt sunroof. Roof panel 3 and roof panel 1 have different lower guides and upper tilt mechanisms. The front guide is bolted to the guide rail. The upper tilt mechanism is inserted in the pivot at the front and in the lifting arm track at the rear. The tilting distance is defined fixed pivot and the reduced travel in the lifting arm track. Opening and tilting of glass roof panel 3 are initiated by the retraction of the guide. When the guide moves, the tilt mechanism opens (tilts up) the glass roof panel as it travels along lifting arm track. The roof panel closes in reverse sequence of opening.



Audi Q7 sunroof

Electrical system

The system used on the Audi Q7 is very different to the open sky systems of the Audi A2 and the Audi A3 Sportback.

Three drive motors are required to implement the various functions of the roof. Each drive motor accommodated in a housing together with the control unit and configured as a LIN slave. The sliding sunroof control unit J245, in conjunction with the sliding sunroof motor V1, which drives glass roof panel 1, also serves a central control function.

All information from the controls of the open sky system is read in by the sliding sunroof control unit J245 and transferred to the LIN data bus whereby the convenience system central control unit 2 J773 acts as the LIN master.

E139 sliding sunroof adjustment regulator with potentiometer (settings 0-7) for glass roof panel 1 and the integrated button (setting 8) for full opening

E8 with tilt sunroof button 1 E582 and sunroof roller sun blind button 1 E584

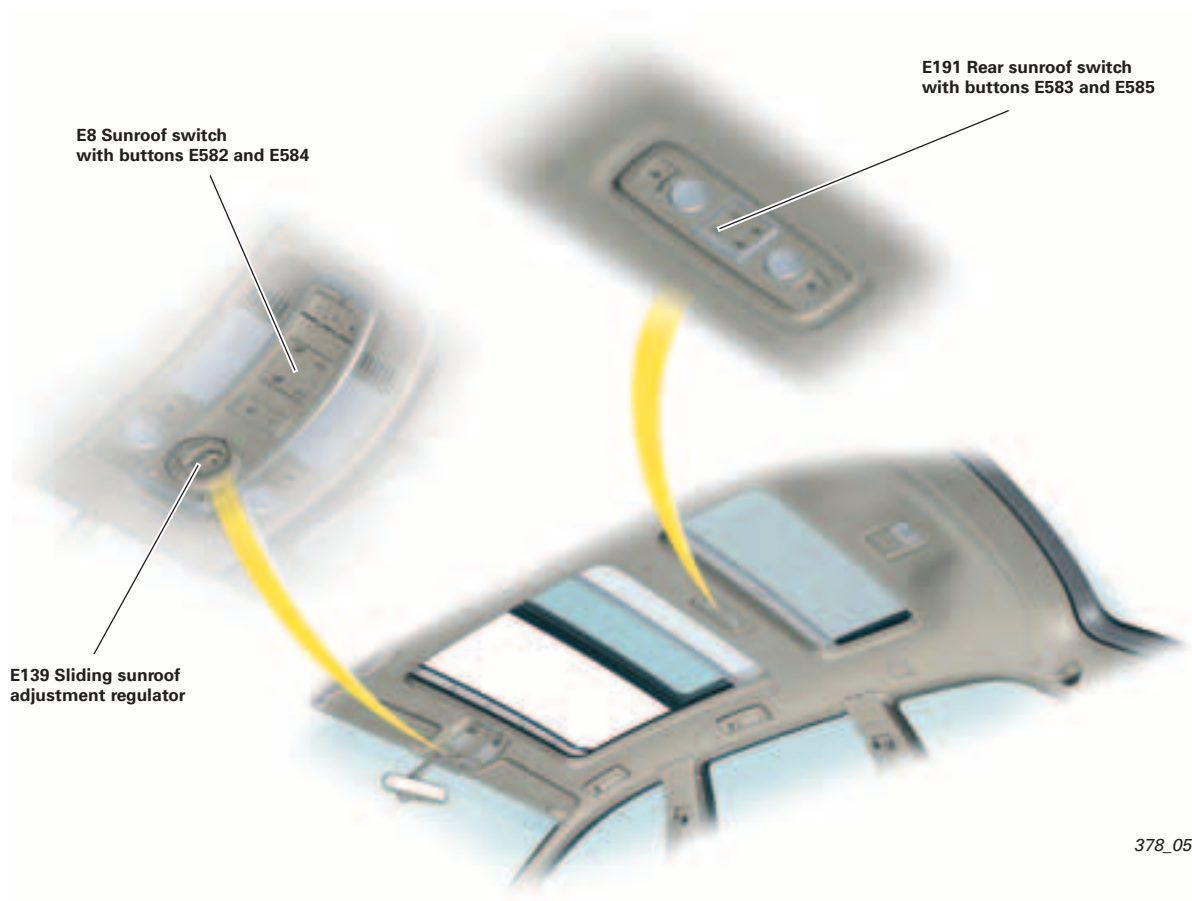
E191 with tilt sunroof button 2 E583 and sunroof roller sun blind button 2 E585

Modules E139 and E8 are integrated in the front operating unit and module E191 is integrated in the rear operating unit. Warning lamp K96, which is activated when the sunroof is tilted up, is also integrated in tilt sunroof button 1.

Note

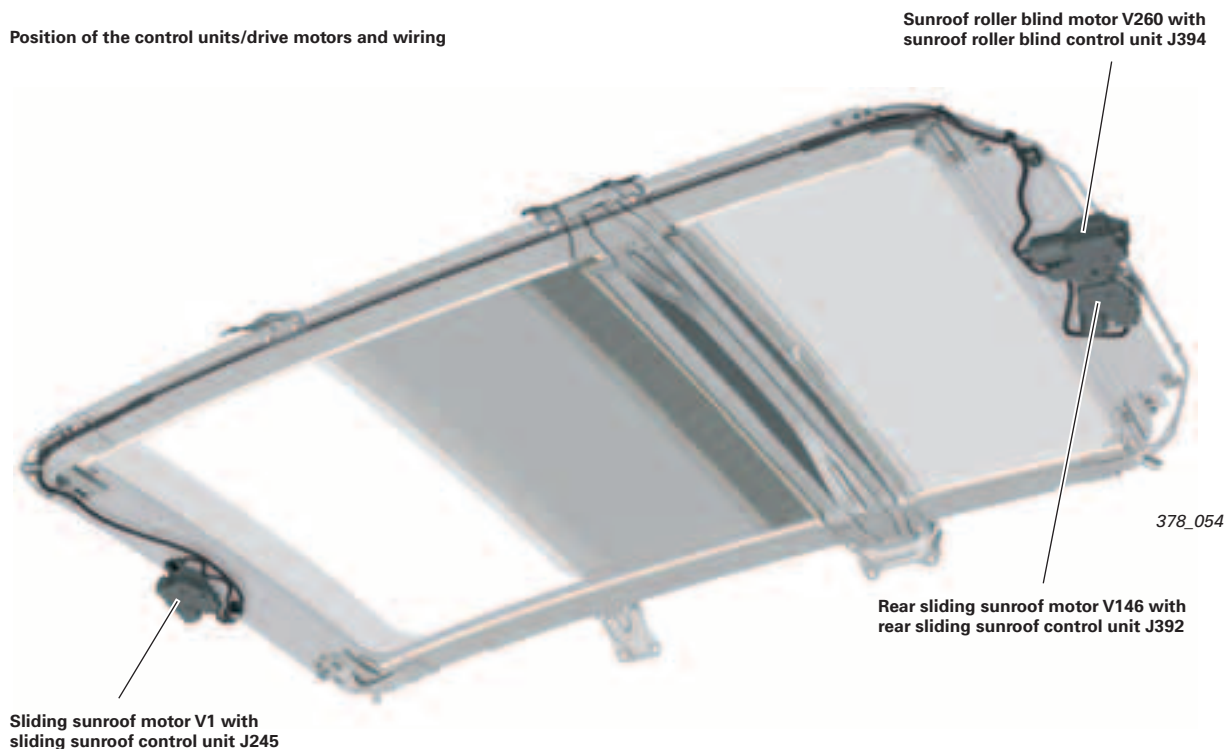


For further information on the operation, function and initialisation of the open sky system of the Audi Q7, please refer to SSP364 "Audi Q7 - Electrical System", the operating manual and the workshop literature.



378_053

Position of the control units/drive motors and wiring



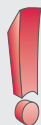
The convenience system central control unit 2 J773 is connected via the LIN data bus to the control units of the open sky system of the Audi Q7. For this reason, this system, unlike the open sky systems of the Audi A2 and Audi A3 Sportback, is diagnosable.

In addition to finding faults with the guided fault finding function,

- fault memory entries and data blocks can be read,
- final control tests performed
- and codings can be configured.

All drive motors have an anti-pinch protection feature whereby the force required to initiate the anti-pinch protection feature and reverse the drive motor is dependent on the speed at which the vehicle is travelling. When driving at high speeds, the effects of wind load are largely compensated.

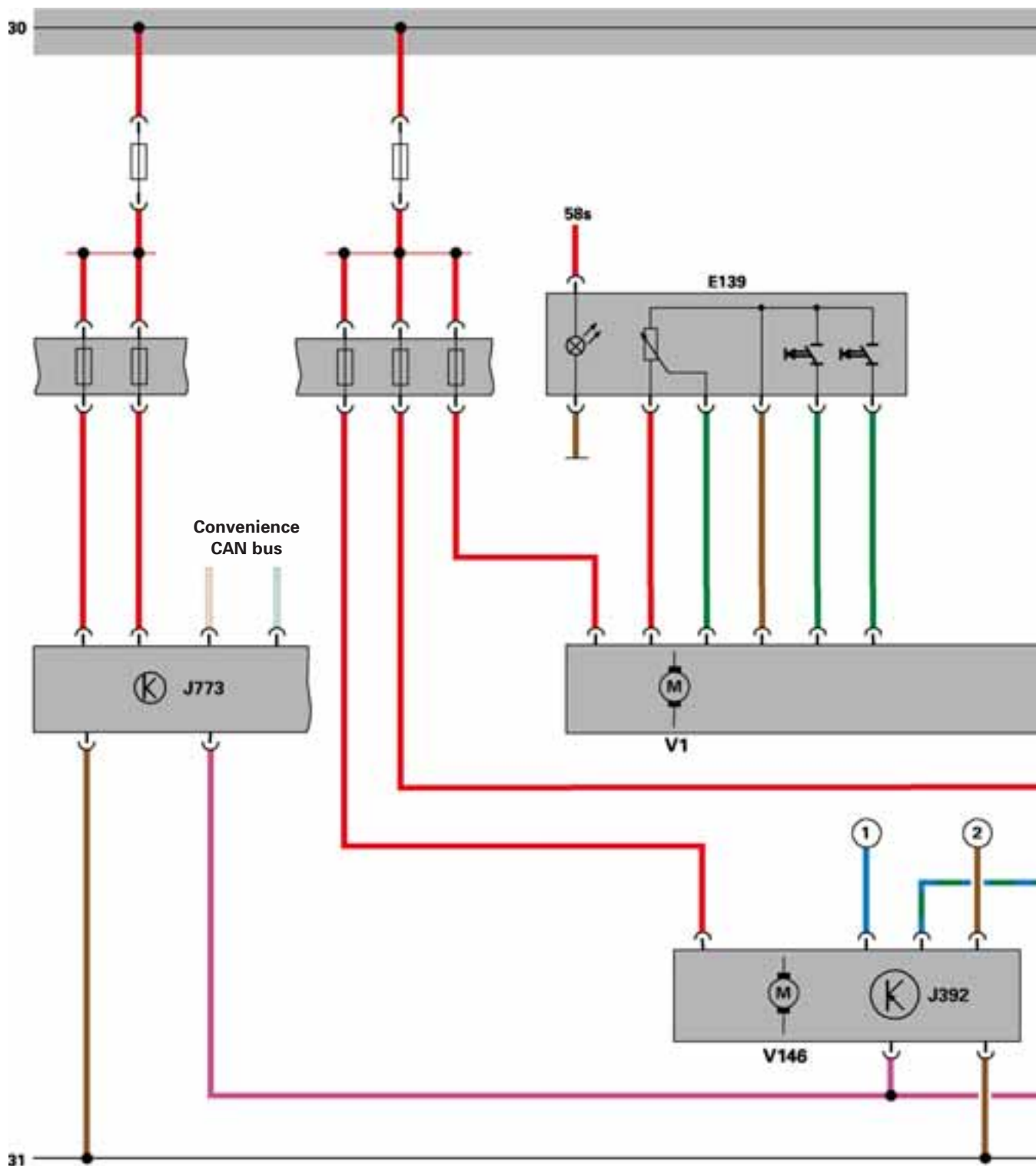
Note



After working on the electrical system of the open sky system of the Audi Q7 or after removing and assembling a glass roof panel, the associated drive motor and/or the control unit must be adapted.

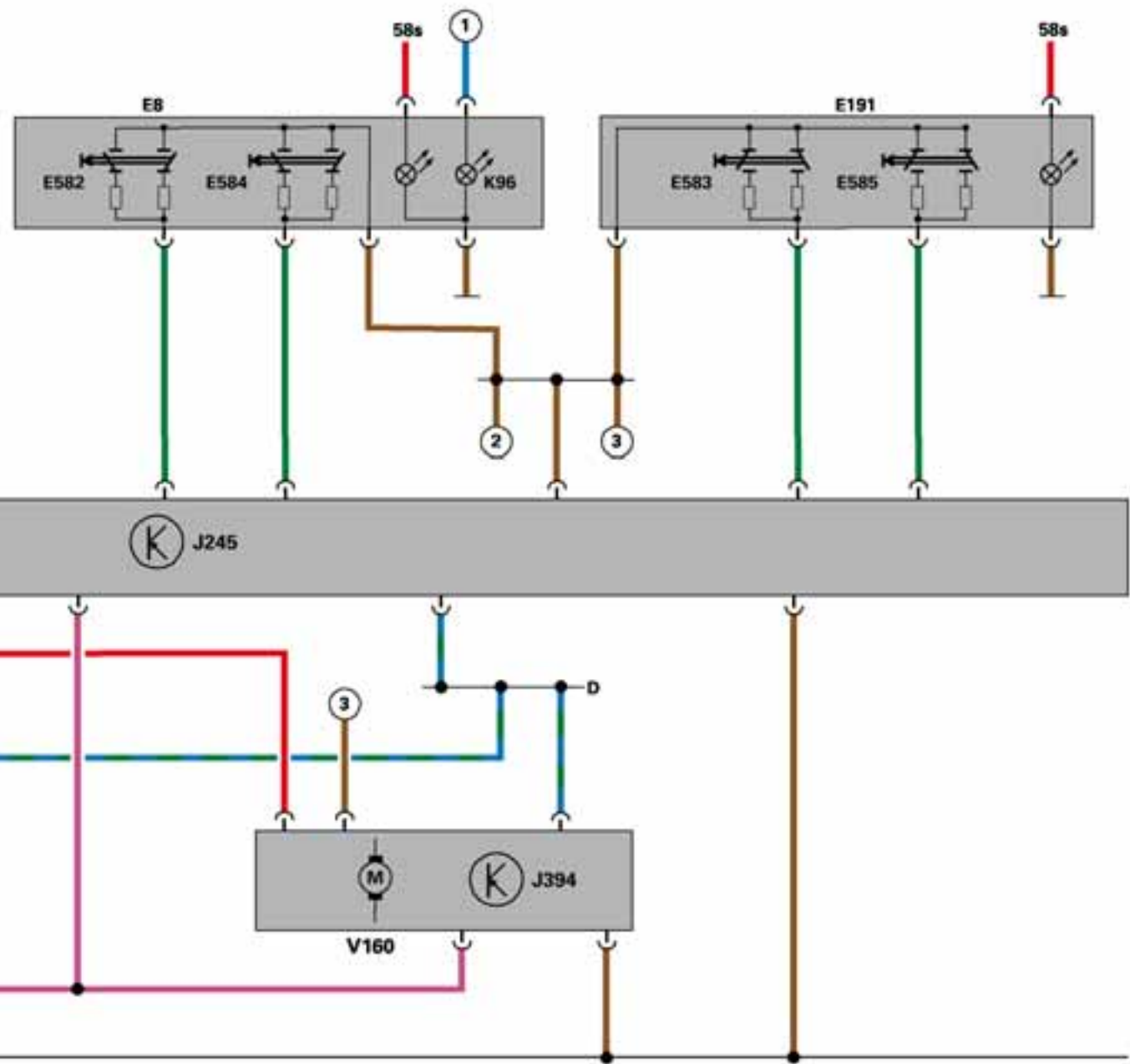
Audi Q7 sunroof

Function diagram



Legend

- | | | | |
|------|--------------------------------------|------|---|
| E8 | Sunroof switch | J245 | Sliding sunroof control unit |
| E139 | Sliding sunroof adjustment regulator | J392 | Rear sliding sunroof control unit |
| E191 | Rear sunroof switch | J394 | Sunroof roller blind control unit |
| E582 | Tilt sunroof button 1 | J773 | Convenience system central control unit 2 |
| E583 | Tilt sunroof button 2 | | |
| E584 | Sunroof roller sun blind button 1 | K96 | Warning lamp "rear tilt sunroof opened" |
| E585 | Sunroof roller sun blind button 2 | V1 | Sliding sunroof motor |



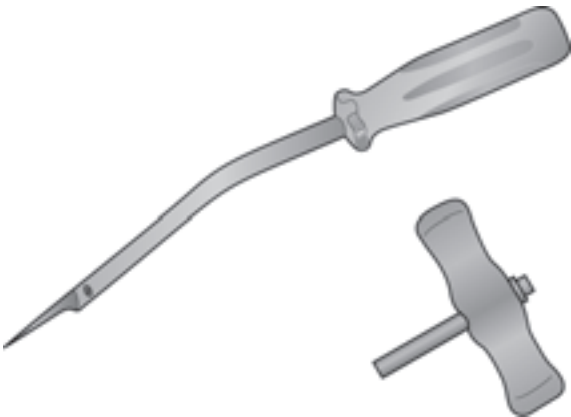
- V146 Rear sliding sunroof motor
- V260 Sunroof roller blind motor
- D Connection for motor diagnostics by manufacturer
- ① from control unit J392
- ② earth in sunroof wiring harness
- ③ Earth in sliding sunroof wiring harness

- Positive
- Ground
- Input signal
- Output signal
- Communication interface
- LIN data bus
- Convenience CAN data bus (CAN-high)
- Convenience CAN data bus (CAN-low)

Special tools



Here you can see the special tools
for open sky sunroofs.



V.A.G 1351

378_058



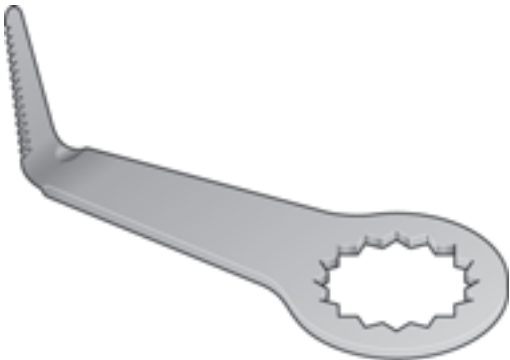
V.A.G 1561/2

378_064



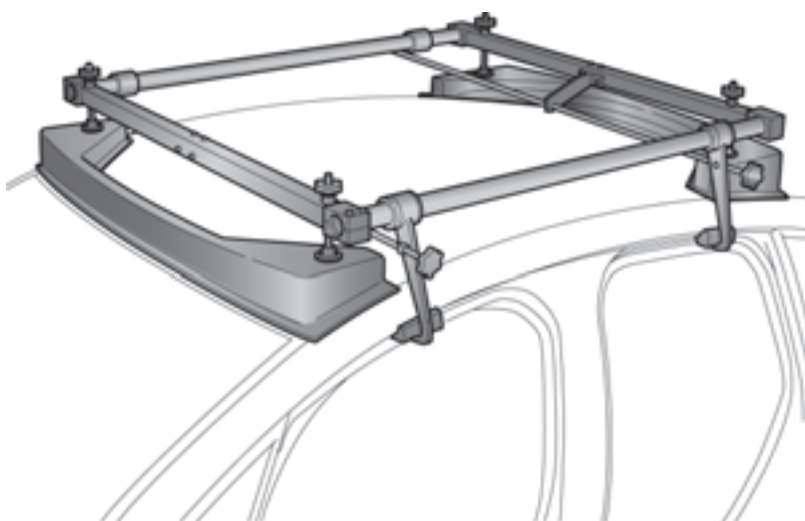
V.A.G 1561/11

378_060



V.A.G 1561/22

378_061



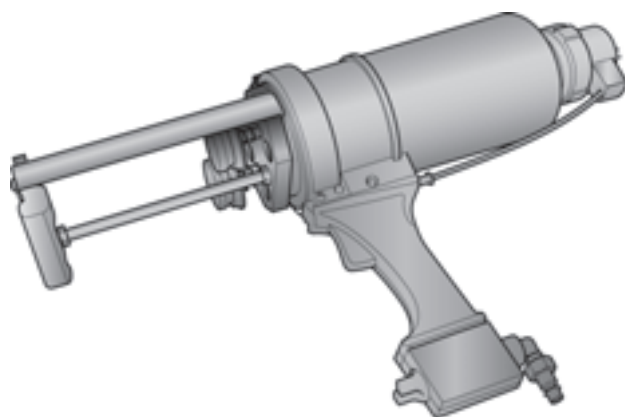
378_062

VAS 6010
Can be obtained on loan through your sales centre or your importer



378_063

V.A.G 1561 A



378_059

VAS 5237

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