

## Sunroof (SHD)

The sunroof is controlled by the sunroof module. The module contains all load circuits and is connected directly to the sunroof drive.

The module is allocated to the vehicle by means of encoding.

### Components

#### Sunroof module

The sunroof module contains the following components:

- DC motor with attached step-down gear mechanism (worm drive)
- Two integrated position sensors (Hall sensors)
- Electronic control

### Switches

The sunroof is operated by means of a switch with five different switch positions.

- Lift (switch pressed)
- Slide OPEN (push back switch)
- Close (push switch forward)
- Slide OPEN - press and hold
- Close - press and hold

The five positions are transferred via three lines to the sunroof (SHD) module (earth signal).

Automatic mode, which opens or closes the sunroof completely, is triggered by pressing and holding the switch in "slide OPEN" and "close" position.

If the switch is moved towards "Lift" when the sunroof is open, the roof moves automatically to the end position "Lift open". The process can be interrupted by pressing the switch again.

### Functions

#### Position detection and anti-trapping protection

Two position sensors (Hall sensors) register the number of motor revolutions and thus determine the position of the sunroof. The drive is switched off on reaching the relevant end position.

The torque of the drive is constantly calculated from the pulses sent by the position sensors and the power consumption of the motor. The torque increasing to above a certain value is interpreted as trapping. The characteristic data (characteristic curve) for the anti-trapping protection are defined in the coding data. They are written into the control unit during the encoding procedure.

The anti-trapping protection is active in the "close" direction when the sunroof is open between > 4 mm and <200 mm. This function is active both during normal closing (switch not over-pressed) as well as during automatic operation and convenience closing of the sunroof. The anti-trapping protection is deactivated in the case of a fault by overpressing the switch in the close and hold direction.

The closing procedure is interrupted if trapping is detected and the sunroof is opened for approx. 1 second.

#### Important

The anti-trapping protection is no longer active when the sunroof is opened by less than 4 mm.

#### Initialization

Initialization of the sunroof involves recording the mechanical end positions (standardization) and learning the characteristic curve for the anti-trapping protection.

On sunroof modules with the **diagnosis index** 01 and 02, the characteristic curve for the anti-trapping protection is specified by the coding data. A separate procedure for learning the characteristic curve is not necessary.

On sunroof modules with the **diagnosis index** 03, the characteristic curve must be learned after

standardization by means of a special process from the module.

## Standardization

Since the position transmitters are integrated in the sunroof module, they do not have a fixed allocation to the sunroof mechanism. In order to achieve this allocation, the module must register the mechanical settings and store them internally. This procedure is termed **standardization**. Only the "close" and "lift" functions can be run with a sunroof that is not standardized.

The standardization is executed when the sunroof is moved into the mechanical stop of the position "closed" or "lift". The stop is detected with an overshoot time of approx. 1 second.

New standardization is necessary after conducting repairs on the sunroof. Set the sunroof in the "lift" end position for standardization purposes.

On reaching this position, press and hold the switch in "lift" for at least 15 seconds. The old data is deleted and new standardization values stored. Brief activation of the sunroof drive indicates that the standardization is being run.

**Note:** if the sunroof stops before reaching the end position, keep the switch pressed and wait for at least 15 seconds (deletion of standardization values). The sunroof then continues to move. Keep the switch pressed for 1 second when the sunroof reaches the end position.

## Anti-trapping protection characteristic curve

On sunroof modules with the **diagnosis index 03**, the characteristic curve for the anti-trapping protection must be learned after standardization.

The following procedure is necessary in order to learn the characteristic curve: after standardization, release the operating switch and, within 5 seconds, press it again to "Lift" and keep it pressed. After approx. 5 seconds, the sunroof is fully opened and fully closed. During the process, the mechanical forces are recorded in the system.

The switch must be pressed during the entire procedure.

When the "sunroof closed" position is reached, the learning of the characteristic curve is finished. The operating switch can now be released.

## Important

So that the anti-trapping protection functions reliably, the standardization and learning of the characteristic curve must be run after all repair work on the sunroof!

## Convenience operation

In the same way as the power windows, the sunroof can also be opened or closed together with locking or unlocking the vehicle.

Convenience opening takes place when the lock cylinder is held in the "unlock" position for longer than 3 seconds or when the appropriate key on the remote control is pressed for the corresponding length of time.

Convenience closing takes place when the lock cylinder is held in the "lock" position for longer than 2 seconds or when the appropriate key on the remote control is pressed for the corresponding length of time.

The functions can be activated or deactivated by encoding.