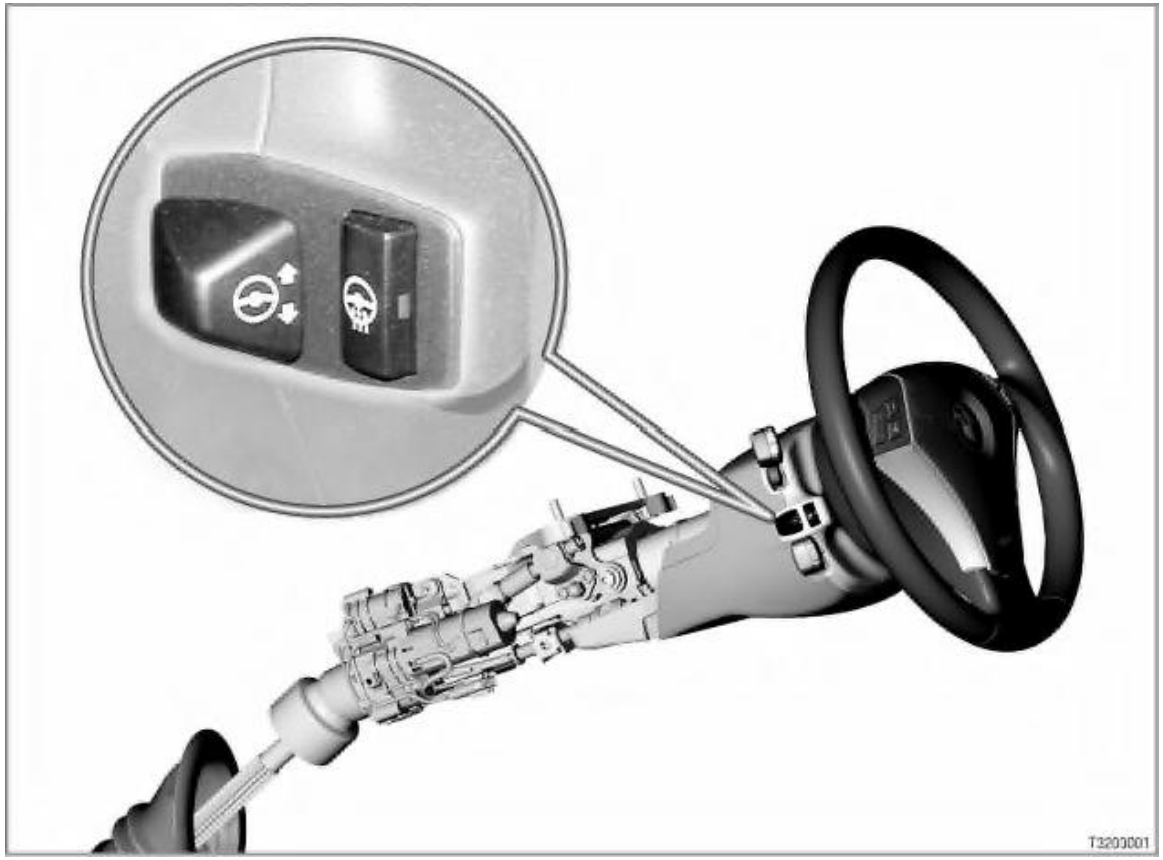
Fully electric steering-column adjustment

E60



Introduction

The fully electric steering-column adjustment allows the driver to set the steering wheel to the best possible position. This is done with a switch on left-hand side of the steering column. The tilt and the fore-and-aft setting of the steering column can be adjusted. [System overview ...]

The steering column adjustment is a constituent component of option 459 "Electric seat adjustment". Options 456 "Comfort seats, front" and 481 "Sports seats" automatically include option 459 "Electric seat adjustment".

Vehicles with electric steering-column adjustment have a steering-column memory (in conjunction with seat memory and mirror memory).

New features on the E60:

- The steering-column adjustment is actuated by the centre console switch cluster
  (SZ
  M
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- 1 motor drives the tilt and fore-and-aft adjustment. A second motor changes the direction of adjustment via the adjustment gears.

Brief description of components

The steering-column adjustment consists of the following components:

- **Switch for steering-column adjustment**

  This switch enables the driver to adjust the tilt and fore-and-aft setting of the steering column. The switch for steering-column adjustment is on the left-hand side of the steering column.

- **Steering-column adjustment drive unit**

  Two motors are integrated in the drive unit. 1 motor drives the tilt and fore-and-aft adjustment of the steering column. The second motor changes the direction of adjustment via the adjustment gears.

  The adjustment movement and position recognition for both tilt and fore-and-aft adjustment are recorded in the drive unit for the steering-column memory. To achieve this, the drive unit includes 2 Hall sensors and 2 magnetic rings (16-pin). [more ...]

- **Steering column switch cluster (SZL)**

  The switch for steering-column adjustment sends its signal to the steering column switch cluster (SZL). The steering column switch cluster forwards this signal to the centre console switch cluster
  (SZ
  M
).

Signal path: Switch for steering-column adjustment -> Steering column switch cluster (SZL) -> **byteflight**
(SG
M
) -> K-CAN -> Centre console switch cluster
(SZ
M
).

- **Centre console switch cluster (SZM)**

The centre console switch cluster
(SZ
M
) actuates the steering-column adjustment. The centre console switch cluster also stores the positions for the steering-column memory.
[more ...]

- **Door contact in the driver's door**

The centre console switch cluster
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uires the signal from the door contact in conjunction with the terminal status for the easy-entry system.

Signal path: Driver's door contact switch -> Driver's door module
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FA) -> **byteflight** -> Safety and gateway module
(SG
M
) -> K-CAN -> Centre console switch cluster
(SZ
M

).

System functions

The fully electric steering-column adjustment comprises the following functions:

- M
  anual steering-column adjustment
- Steering-column memory
- Overheating protection for steering-column adjustment motors

Manual steering-column adjustment

The driver is able to adjust the steering column with a switch.
W
hen the switch is operated, the signal is transmitted cyclically from terminal 30 (cycle time: 100 milliseconds). The steering-column adjustment is actuated for as long as the signal is being received.

Once the switch is no longer actuated, the message "Stop" is transmitted 3 times.

The steering-column adjustment is stopped when this signal is received, or if the cyclic message is not received twice.

To enable a failure of the steering column switch cluster to be detected, a further a cyclic message is transmitted when the data bus is active (cycle time: 1 second).

W
hen changing the direction of adjustment, the centre console switch cluster first actuates the motor for setting the adjustment gears.

The actuation of this motor is time-dependent. The adjustment motor is not actuated until the direction of adjustment is correctly set. The total adjustment movement is no more than 36 millimetres for tilt adjustment and 40 millimetres for fore-and-aft adjustment.

Steering-column memory

The position of the steering column in each direction of adjustment is recorded by a Hall sensor. This position is stored in the centre console switch cluster

(SZ
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). This allows the Key
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emory to call up the position of the steering column for up to 4 vehicle
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eys.

The tilt adjustment moves to the uppermost position to
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e it easier to get in and out of the vehicle.

For the easy-access facility, the steering-column adjustment is automatically actuated under the following conditions:

- Terminal R OFF
- Terminal R ON and driver's door opened (via door contact)
- Terminal 15 OFF with driver's door open (via door contact)

The steering-column memory is activated under the following conditions:

- One of the two memory buttons for the seat-mirror memory and the steering-column memory on the seat is pressed (from terminal R OFF).
- Another remote control is used (personalisation). Condition: The selection "Last seat position after
  unloc
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  ing" is activated in the "Settings" menu in the Central Information Display (CID) (from 09/2003).

In both cases, the steering-column memory will not move the steering column to the stored position until terminal 15 is switched ON.

Overheating protection for steering-column adjustment motors

To protect the motors against overheating, a temperature model is stored in the centre console switch cluster.

The temperature model

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es allowance for the warming up and cooling down of the motors.
It is possible to move the steering column in either direction through the range of movement at least 6 times before overheating protection is activated.

Notes for service staff

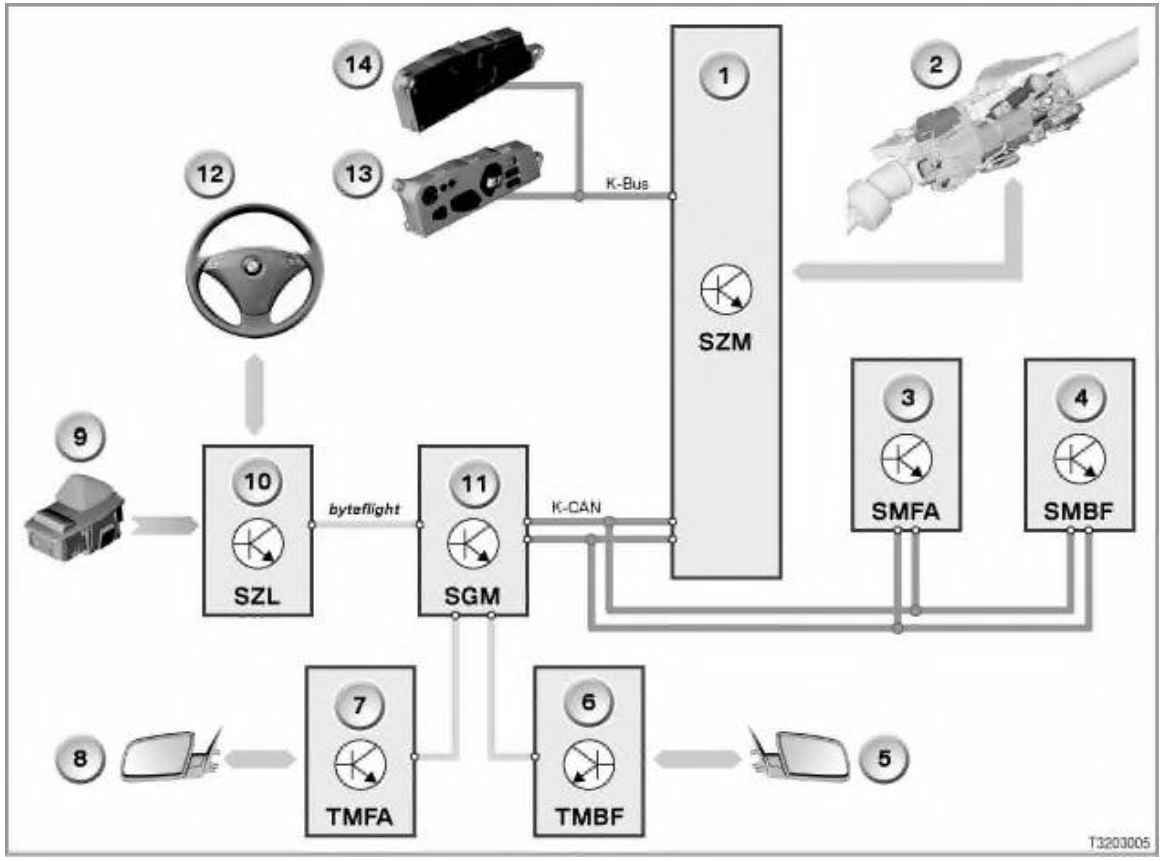
Service staff should note the following points:

- General information: [more ...]
- Diagnosis: ---
- Encoding/programming: ---
- Car and Key
  M
  emory: ---

Subject to change.

E60 - Steering-column adjustment, system overview

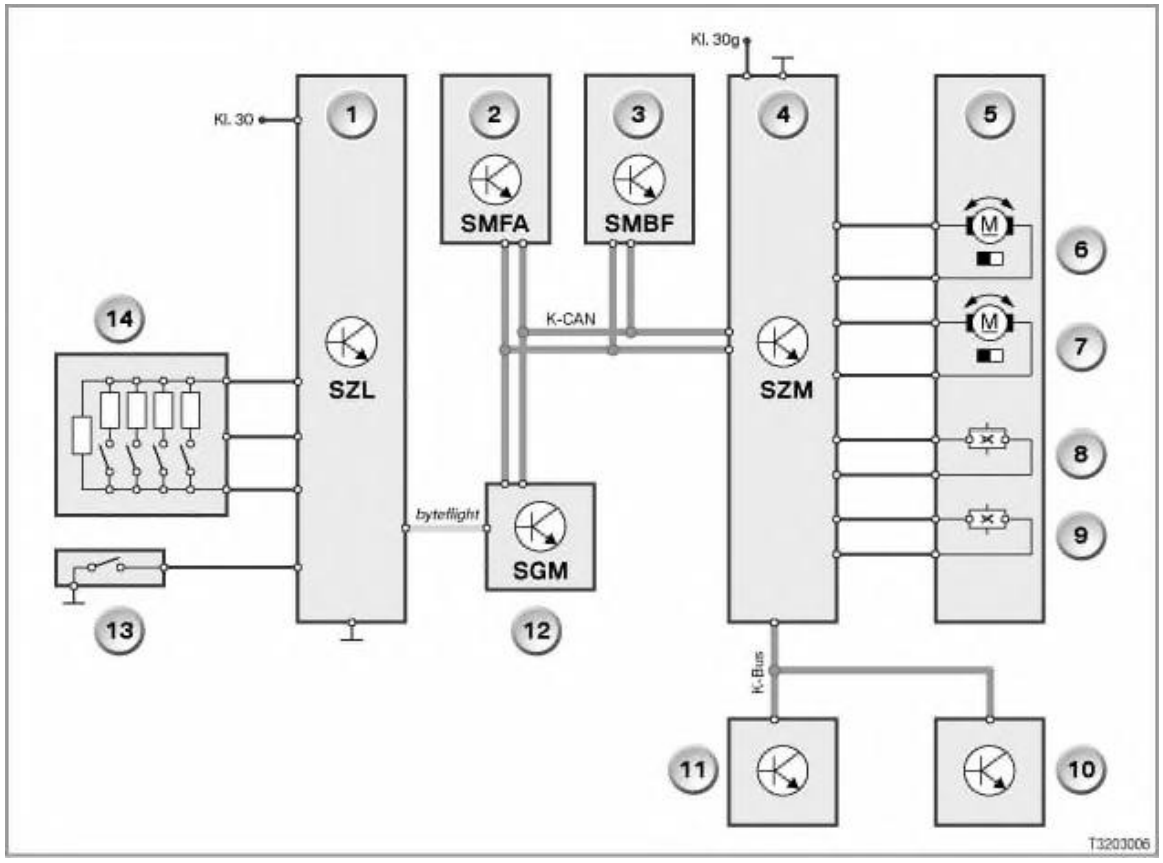
- Input/Output



Key	Explanation	Key	Explanation
1	Centre-console switch cluster (SZM)	2	Drive unit for steering-column adjustment
3	Driver's seat module (for seat memory)	4	Front-passenger seat module (for seat memory)
5	Exterior mirror, passenger-side	6	Front-passenger door module (TMBF) (for mirror memory)

7	Driver's door module (TMFA) (for mirror memory)	8	Exterior mirror, driver-side
9	Switch for steering-column adjustment	10	Steering column switch cluster (SZL)
11	Safety and gateway module (SGM)	12	Steering-wheel electronics on steering column switch cluster
13	Driver's seat control panel with memory button (seat/steering-column memory and mirror memory)	14	Front-passenger's seat control panel with memory button (seat memory)

- System circuit diagram



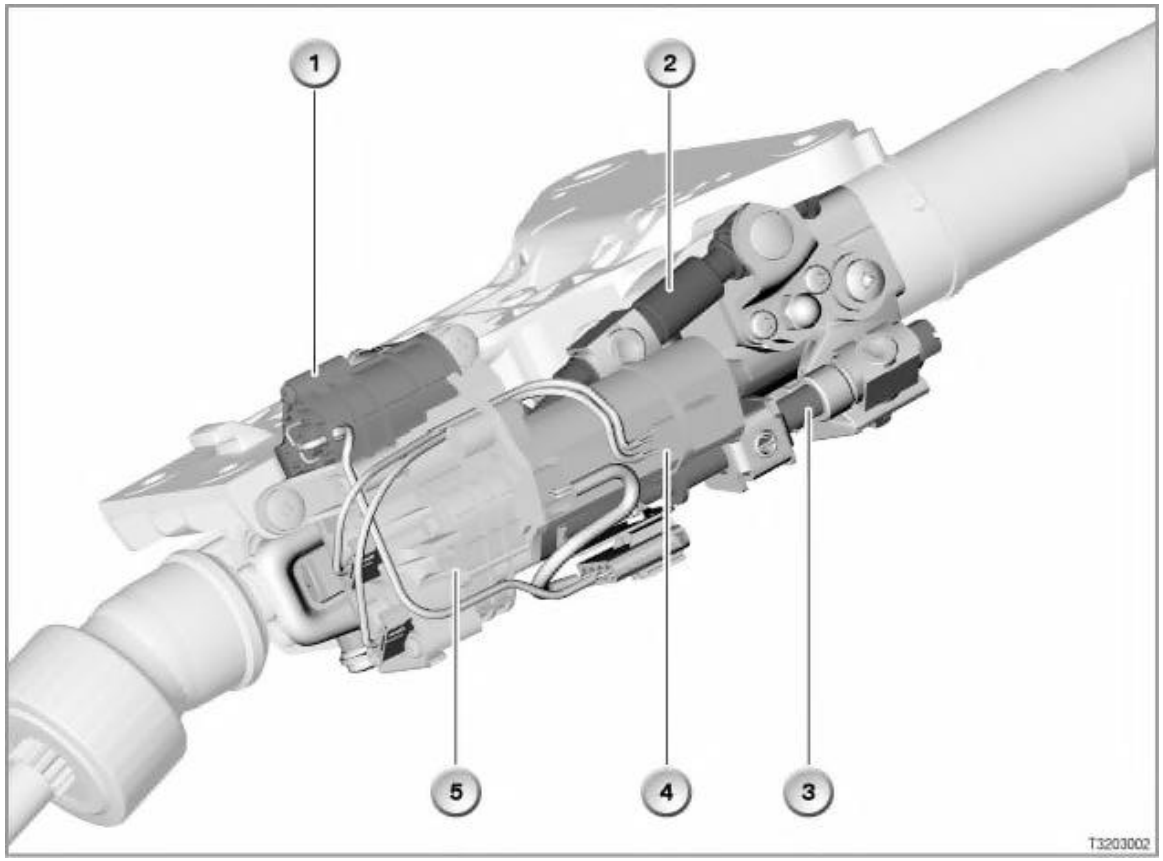
Key	Explanation	Key	Explanation

1	Steering column switch cluster SZL	2	Seat module, driver
3	Seat module, front-passenger	4	Centre-console switch cluster (SZM)
5	Drive unit for steering-column adjustment	6	Motor for setting adjustment gear
7	Adjusting motor	8	Hall sensor for tilt adjustment
9	Hall sensor for fore-and-aft adjustment	10	Driver's seat control panel with memory button (seat-steering column memory and mirror memory)
11	Front-passenger seat control panel with memory button (seat memory)	12	Safety and gateway module (SGM)
13	Button for heated steering wheel	14	Switch for steering-column adjustment
byteflight	**byteflight** fibre optics	K-bus	Body bus
K-CAN	Body CAN	Kl. 30g	Terminal 30g active

E60 - Steering-column adjustment drive unit

Installation location

The steering-column adjustment drive unit is affixed to the upper steering spindle.



Key	Explanation	Key	Explanation
1	Motor for setting adjustment gear	2	Flexible drive shaft for tilt adjustment
3	Flexible drive shaft for fore-and-aft adjustment	4	Motor for steering-column adjustment
5	Adjustment gears		

Construction

2 motors are integrated in the steering-column adjustment drive unit

In contrast to the E65, 1 motor is responsible for adjustment in both directions.
The second, smaller motor is affixed to the adjustment gears. This motor only changes the direction of adjustment (tilt adjustment or fore-and-aft adjustment) at the adjustment gears.

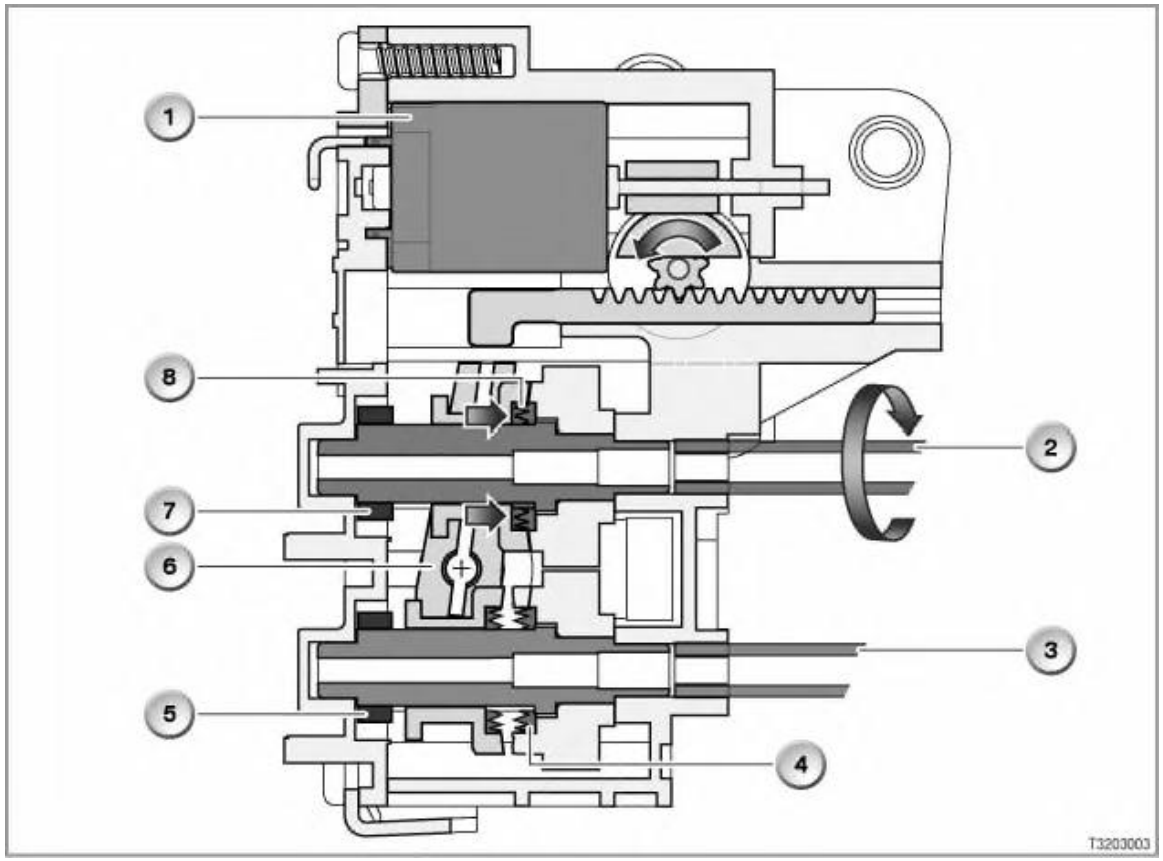
How it works

The actuation of the motor for setting the adjustment gear is time-dependent.
If the direction of adjustment has to be changed in order to execute a movement, current is first applied to the selector motor for approx. 900 milliseconds. After this, current is applied in the direction required to the steering-column adjustment motor. As this happens, current remains applied to the selector motor for a further approx. 400 milliseconds (at room temperature). This ensures that the direction of adjustment is completely changed.

The time for which current is applied to the motor for setting the adjustment gear depends on the onboard system voltage.
A map (time and vehicle electrical system voltage) is stored in the centre console switch cluster (SZM). The changeover procedure is actuated according to this map.

2 Hall sensors record the position of the tilt adjustment and of the height adjustment. 2 magnetic rings (16-pin) on the two drive shafts in the adjustment gears record the position in respective direction of adjustment.

Tilt adjustment



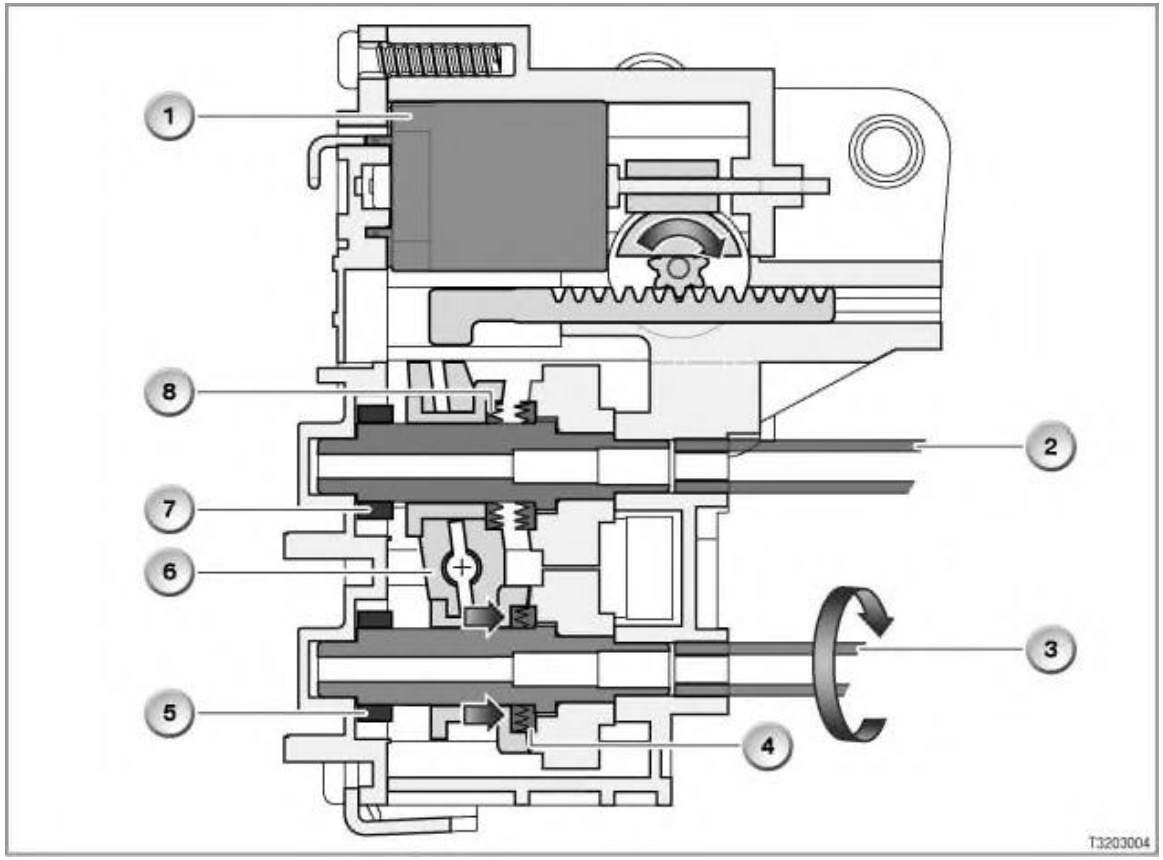
Key	Explanation	Key	Explanation
1	Motor for setting adjustment gear	2	Flexible drive shaft for tilt adjustment
3	Flexible drive shaft for fore-and-aft adjustment	4	End gearing on the drive shaft for fore-and-aft adjustment
5	Ring magnet for the Hall sensor for fore-and-aft adjustment	6	Clutch
7	Ring magnet for the Hall sensor for tilt adjustment	8	End gearing on the drive shaft for tilt adjustment

The motor for setting the adjustment gear turns anti-clockwise. This moves the clutch to the right.

The clutch closes the end gearing on the drive shaft for tilt adjustment.

The flexible drive shaft for tilt adjustment is driven.

Fore-and-aft adjustment



Key	Explanation	Key	Explanation
1	Motor for setting adjustment gear	2	Flexible drive shaft for tilt adjustment
3	Flexible drive shaft for fore-and-aft adjustment	4	End gearing on the drive shaft for fore-and-aft adjustment

5

	Ring magnet for the Hall sensor for fore-and-aft adjustment	6	Clutch
7	Ring magnet for the Hall sensor for tilt adjustment	8	End gearing on the drive shaft for tilt adjustment

The motor for setting the adjustment gear turns clockwise. This moves the clutch to the left.

The clutch closes the end gearing on the drive shaft for fore-and-aft adjustment.

The flexible drive shaft for fore-and-aft adjustment is driven.

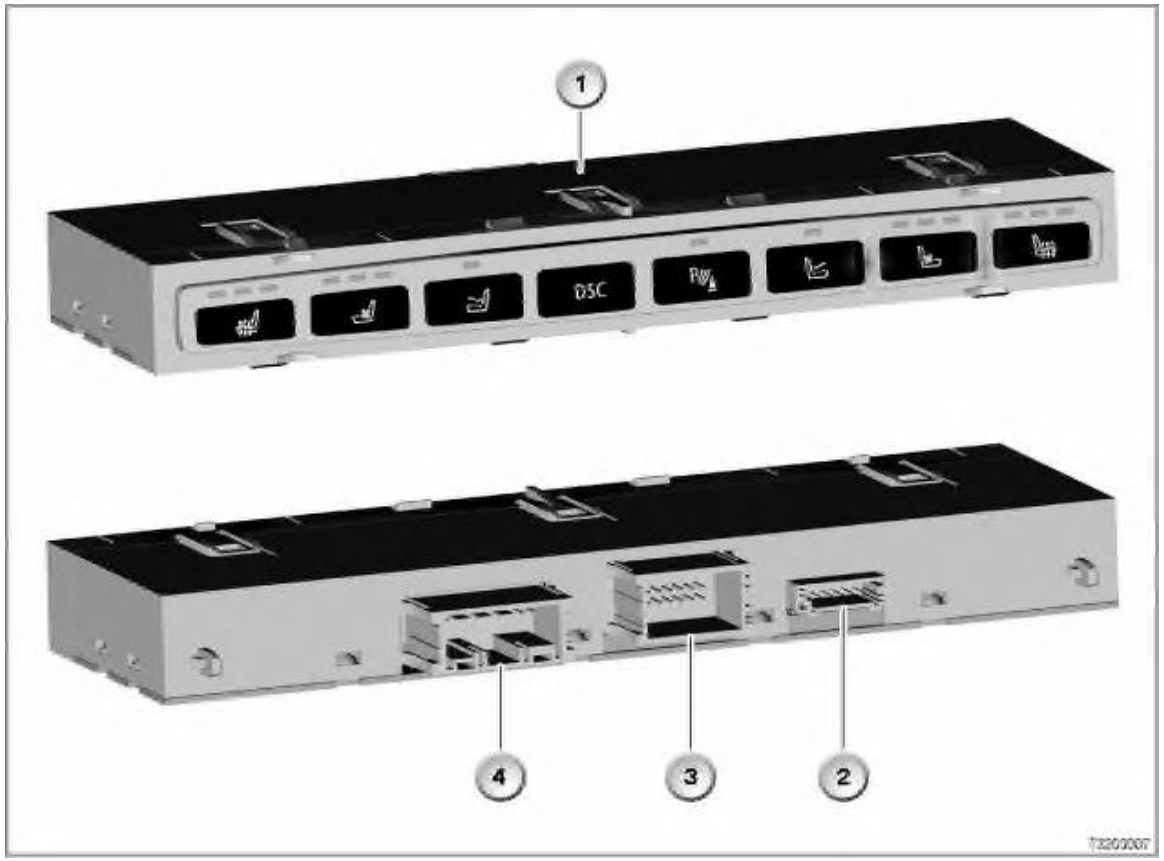
E60 - Centre console switch cluster (SZM)

Installation location

The centre console switch cluster is installed in the centre console under the multi-audio system controller.

Design

Depending on the equipment fitted (heated seats, active seats or Park Distance Control, etc.) there are currently 12 different versions of the centre console switch cluster, each with a different combination of buttons.



Key	Explanation	Key	Explanation

1	Centre console switch cluster (SZM) (with full equipment)	2	Connector X14057
3	Connector X14056	4	Connector X14058

With full equipment, the centre console switch cluster (SZM) is connected to the rest of the vehicle electrical system by three plug connectors.

Pin assignment X14056, 12-pin (black)

Pin	Type	Description
1	---	---
2	---	---
3	E/A	K bus for driver's seat control panel and font-passenger's seat control panel
4	A	Power supply for Hall sensor for tilt adjustment
5	A	Earth for Hall sensor for tilt adjustment
6	A	Power supply for Hall sensor for fore-and-aft adjustment
7	A	Earth for Hall sensor for tilt adjustment
8	E	Signal from SPORT button for Dynamic Driving Control (FDC)
9	A	Power supply for function LED in SPORT button
10	A	Earth for SPORT button
11	E/A	K-CAN High
12	E/A	K-CAN Low

A = Output

E = Input

E/A = Input and output

	For current specifications regarding pin assignment, please refer to BMW diagnosis system

Pin assignment X14057, 6-pin (black)

Pin	Type	Description
1	V	Power supply for centre console switch cluster (SZM) and DSC button, terminal 30g (active)
2	M	Earth for centre console switch cluster (SZM)
3	A	Signal from DSC button to DSC control unit
4	E	Locating lamp, terminal 58g
5	---	---
6	---	---
	A = Output E = Input M = Earth V = Supply For current specifications regarding pin assignment, please refer to BMW diagnosis system	

Pin assignment X14058, 8-pin (black)

Pin	Type	Description
1	M	Earth for steering-column adjustment
2	V	Power supply for steering-column adjustment
3	A	Actuation of steering-column adjustment motor (up/to front)

6	A	Actuation of motor for setting adjustment gear (fore-and-aft adjustment)
7	A	Actuation of roller sunblind motor (up)
8	A	Actuation of roller sunblind motor (down)
	A = Output M = Earth V = Supply For current specifications regarding pin assignment, please refer to BMW diagnosis system	

How it works

Note: Several functions in centre console switch cluster (SZM)

Besides the steering-column adjustment, the centre console switch cluster also includes the actuation of the roller sunblind.

The SPORT button for Dynamic Driving Control is also connected to the centre console switch cluster (SZM).

E60 - Steering-column adjustment, general information

Note: No special tools are needed

No special tools are needed for replacing the steering column.

Steering-column adjustment soft stop

The soft stop prevents the steering-column adjustment motor from continually moving to the mechanical stop.
When the steering-column adjustment reaches a mechanical stop, this position is stored in the non-volatile memory of the centre console switch cluster (SZM).
For subsequent adjustments, movement is made as far as the soft stop, without the mechanical stop being reached.

Initialisation after replacing the steering column or open circuit in vehicle electrical system

If a mechanical stop is reached, the system will automatically be initialised.
During initialisation, the steering-column adjustment is moved to the mechanical stops. For tilt adjustment, the upper stop is the reference point. For fore-and-aft adjustment, the front stop is the reference point. The mechanical stops are recognised as follows:

- Increased current draw from steering-column adjustment motor
- Failure of signals from Hall sensors

Initialisation can also be activated by the BMW diagnostic system.

Note: Initialisation by the BMW diagnostic system

Before initialisation, manually move the steering column approximately to the centre position.
Make sure that the steering column is free to move throughout the range of adjustment (no obstructions).

Note: Hall sensor failure

In the event of a failure of one of the Hall sensors, the steering-column adjustment will no longer recognise its position. The steering column can then only be adjusted manually.
The soft stop is deactivated. The response time of the overload protection circuit is shortened. This protects the steering-column adjustment motor against overheating.

Note: System state due to cold

If the steering-column adjustment should lock because of very low temperatures, this could be recognised as a mechanical stop. In such cases, adjustment may be restricted in one direction of movement.