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F01 Automatic Luggage Compartment Lid Actuating System

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Automatic Luggage Compartment Lid Actuating System (HKL)

Model: F01/F02

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Understand the operation of the HKL system on the F01/F02

Introduction

Features of the Automatic Luggage Compartment Lid Actuating System

The automatic luggage compartment lid actuating system will be available on the F01 as from its launch in 09/08. It will be available to order as an option and only concerns the luggage compartment lid.

Automatic luggage compartment lid operation improves vehicle access in that the luggage compartment lid is opened or closed automatically at the press of a button.

A spindle-driven system is fitted in the F01 for the first time to actuate automatic opening or closing of the luggage compartment lid.

The automatic luggage compartment lid actuating system makes it possible to open and close the luggage compartment lid automatically at the push of a button.

If the vehicle is equipped with Comfort Access, it is even possible to open the luggage compartment lid while the vehicle is locked.

The luggage compartment lid can open automatically when the exterior luggage compartment lid button is pressed. The only requirement being that a vehicle-specific ID transmitter must be present in the immediate vicinity of the rear end of the vehicle.

In connection with Comfort Access, it is now also possible to centrally lock the vehicle doors from the luggage compartment lid. The “central double-lock” button used for this purpose is located in the luggage compartment lid next to the button for automatically closing the luggage compartment lid.

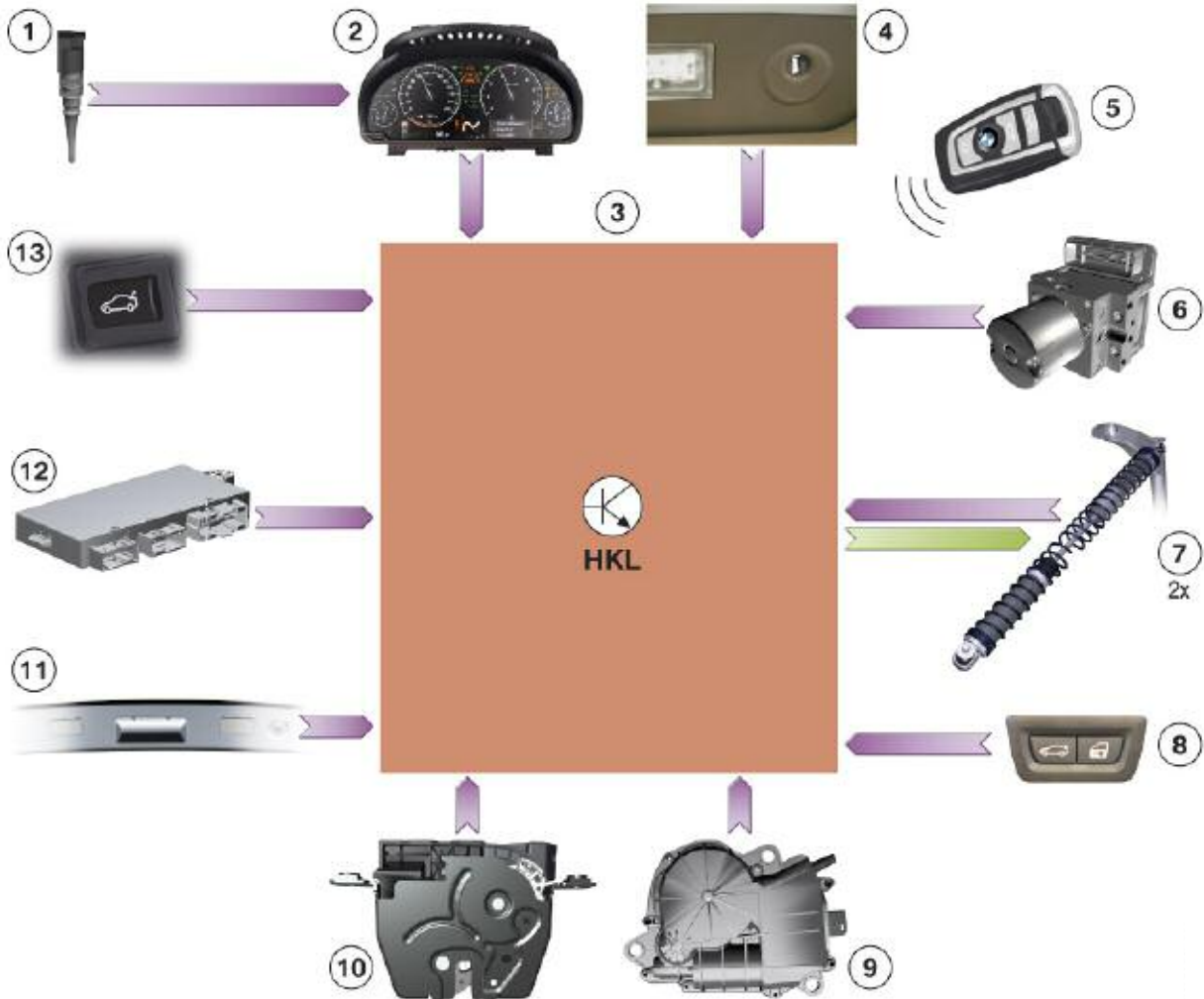


Central double-lock button F01/F02

Closing the luggage compartment lid can also be initiated by pressing the “central double-lock” button.

System Overview

Automatic Luggage Compartment Lid Actuating System Input/outputs

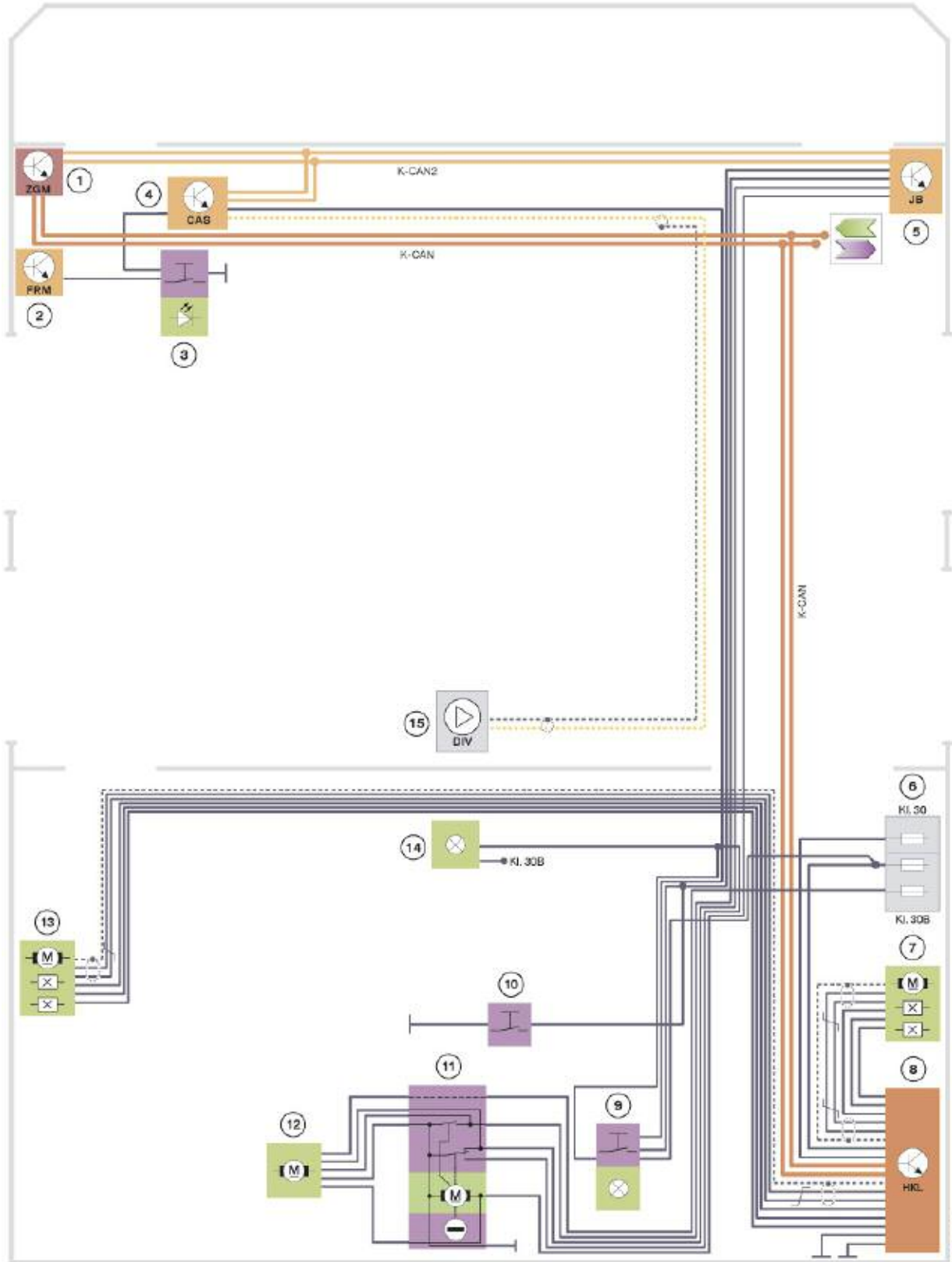


Index	Explanation	Index	Explanation
1	Outside temperature sensor	8	Interior luggage compartment lid button
2	Instrument cluster	9	Drive for automatic soft-close luggage compartment lid lock
3	Control unit for automatic luggage compartment lid actuating system HKL	10	Central locking, luggage compartment lid
4	Lock barrel, luggage compartment lid	11	Luggage compartment lid button, outer luggage compartment lid recessed handle
5	Identification transmitter	12	Car Access System
6	Dynamic Stability Control	13	Luggage compartment lid button, A-pillar drive
7	Luggage compartment lid spindle		

Luggage compartment lid lift (3) controls and monitors opening or closing of the luggage compartment lid. Opening or closing of the luggage compartment lid can be triggered by luggage compartment lid buttons (8, 11, 13). The luggage compartment lid can be unlocked and opened by purely mechanical means with the lock barrel in the luggage compartment lid (4).

The signals from the outside temperature sensor (1) and vehicle speed (6) are evaluated to determine whether the luggage compartment lid may be opened or closed in response to a press of a button.

Automatic Luggage Compartment Lid Actuating System Circuit Diagram



Index	Explanation	Index	Explanation
1	Central gateway module (ZGM)	11	Luggage compartment lid lock with luggage compartment lid switch/ lock barrel
2	Footwell module (FRM)	12	Automatic soft-close luggage compartment lid
3	Luggage compartment lid button, A-pillar	13	Spindle drive motor, left
4	Car Access System (CAS)	14	Luggage compartment lighting, underside of rear window shelf
5	Junction box electronics (JB)	15	Remote control receiver in diversity module
6	Rear power distribution box	K-CAN	Body CAN
7	Spindle drive motor, right	K-CAN2	Body-CAN2
8	Luggage compartment lid lift (HKL)	Kl. 30	Terminal 30
9	Inner luggage compartment lid button/ central double-lock button	Kl. 30B	Terminal 30, basic operation
10	Outer luggage compartment lid button	LIN-Bus	Local Interconnect Network bus



K-CAN signals at the luggage compartment lid lift

In/out	Information	Source/sink	Function
In	Outside temperature	Outside temperature sensor > instrument cluster	Value for calculating overheating protection for the spindle motors
In	Driving speed	Wheel speed sensors > Dynamic stability control > Integrated chassis management	Permit/deny control functions of the luggage compartment lid

The radio signal from the identification transmitter is received by the rear window antenna. The remote control receiver in diversity module (15) forwards the signal to Car Access System (4). The Car Access System is the master control unit for the central locking function.

Once the signal has been successfully verified, the Car Access System issues a command to control the central locking in the luggage compartment lid.

The junction box electronics (5) execute the command to control the central locking in the luggage compartment lid. The junction box electronics register the status of the luggage compartment lid switch (11) for the "automatic luggage compartment lid actuation" function. The status of the luggage compartment lid switch is sent on the K--CAN to the luggage compartment lid lift (8). The status is one of the triggering criteria for luggage compartment lid operation.

Sensors (13 and 7) in the spindle drives monitor the movement of the luggage compartment lid. The luggage compartment lid lift is therefore able to reverse the closing movement of an obstructed luggage compartment lid, allowing the obstruction to be freed.

An obstruction to luggage compartment lid movement during the opening procedure causes the luggage compartment lid to stop and it is not reversed.

As a backup to the Hall sensors, the luggage compartment lid lift monitors the power consumption of the spindle drive. An increase in current when the luggage compartment lid blocks causes the luggage compartment lid to stop and, if need be, reverse.

NOTES

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Functions

Luggage Compartment Lid Actuating Points

The luggage compartment lid can be unlocked and opened or closed from various operating points. The operating points are the:

- Outer luggage compartment lid button
- Luggage compartment lid button on the interior of the luggage compartment lid (only when the luggage compartment lid is open)
- Central double-lock button on the interior of the luggage compartment lid (only when the luggage compartment lid is open)
- Luggage compartment lid button on the identification transmitter
- Luggage compartment lid button on A-pillar in vehicle interior
- Luggage compartment lid lock barrel (mechanical unlocking).

The automatic luggage compartment lid actuating system cannot be activated when the vehicle is in motion, only when the vehicle is stationary.

Automatic luggage compartment lid actuation is controlled and monitored by a control unit. This control unit is designated luggage compartment lid lift HKL.

The HKL has an integrated “soft-opening” or “soft-closing” function. This means that the closing or opening speed is slowed shortly before the end stops are reached so that the luggage compartment lid moves softly into the respective end stop. The soft end stop is achieved by a change in the pulse width of the control voltage.

The luggage compartment lid moves quietly and smoothly. This gives the impression of a harmonious movement during the luggage compartment lid opening or closing procedure.

To achieve this, the speed of the luggage compartment lid movement is regulated by the HKL. Luggage compartment lid movement depends on whether the luggage compartment lid is covered with hoarfrost or snow. If the weight of the snow is too heavy for the luggage compartment lid, no luggage compartment lid movement will take place.

The HKL receives signals on the K-CAN from the following control units:

- Car Access System
 - Luggage compartment lid button, A-pillar
 - Central double-lock button
 - Enable for operating luggage compartment lid or terminal status
 - Request from identification transmitter
- Integrated Chassis Management Driving speed signal
- Junction box electronics
 - Outer luggage compartment lid button
 - Luggage compartment lid button on interior of luggage compartment lid.

Operation by Luggage Compartment Lid Buttons

The luggage compartment lid can be opened, stopped or closed by pressing one of the luggage compartment lid buttons. It is also possible to stop or resume the movement of the luggage compartment lid from any open position. Tapping a luggage compartment lid button is sufficient input for the luggage compartment lid to continue to the respective end position (luggage compartment lid open or closed). The luggage compartment lid movement stops automatically as soon as the end position is reached.

■ Direction of luggage compartment lid movement

The direction of movement of the luggage compartment lid changes with every second press of the interior or exterior luggage compartment lid button. Initial state of luggage compartment lid closed:

- Button stroke > Open
- Button stroke > Stop
- Button stroke > Close
- Button stroke > Stop
- Button stroke > Open, etc.

■ Luggage compartment lid button, A-pillar

The interior luggage compartment lid button on the A-pillar can only be used to open or stop the luggage compartment lid.

- Button stroke > Open
- Button stroke > Stop
- Button stroke > Open
- Button stroke > Stop, etc.

■ Central double-lock button

In vehicles equipped with Comfort Access, the inner luggage compartment lid button is installed together with the central double-lock button.



**Inner luggage compartment lid button
and central double-lock button F01/F02**

The central double-lock button is connected to the Car Access System. The central double-lock button is used to lock and centrally arrest the vehicle doors. To provide maximum convenience for the customer, closing the luggage compartment lid can be initiated by pressing the central double-lock button.

The central double-lock button can only be used to close and stop the luggage compartment lid.

- Button stroke > Close
- Button stroke > Stop
- Button stroke > Close
- Button stroke > Stop, etc.

Note: A command sent from the central double-lock button can only be executed with the luggage compartment lid open. This is due to the fact that the button has a connection to ground via the luggage compartment lid contact switch only when the luggage compartment lid is open.

■ Outer luggage compartment lid button

The junction box electronics evaluate the status of the luggage compartment lid button.

Evaluation depends on whether or not the vehicle is in sleep mode. If the vehicle is in sleep mode, it will have to be woken first. Only then can the request be sent to the HKL on the K-CAN. The HKL triggers the appropriate request.

When closed, the luggage compartment lid is unlocked by the junction box electronics. The luggage compartment lid lift HKL then opens the luggage compartment lid. The luggage compartment lid is completely opened automatically.

The outer luggage compartment lid button can be used to open, stop or close the luggage compartment lid.

- Button stroke > Open *
- Button stroke > Stop
- Button stroke > Close **
- Button stroke > Stop
- Button stroke > Open
- Button stroke > Stop etc.

* Always in open direction with luggage compartment lid closed

** Always in close direction with luggage compartment lid completely open.

Note: Additional information on luggage compartment lid operation can be found under “Manual opening and closing”.

■ Interior luggage compartment lid button

Parallel to the outer luggage compartment lid button, the inner luggage compartment lid button is connected to the junction box electronics. For this reason, the junction box electronics do not distinguish between the two luggage compartment lid buttons.



Inner luggage compartment lid button F01/F02

Note: A command sent from the inner luggage compartment lid button can only be executed with the luggage compartment lid open. This is due to the fact that the button has a connection to ground via the luggage compartment lid contact switch only when the luggage compartment lid is open.

■ ID transmitter luggage compartment lid button

If the complete vehicle is locked, it is possible to trigger an automatic opening of the luggage compartment lid by pressing the luggage compartment lid button with the luggage compartment lid symbol. Firstly, the luggage compartment lid is unlocked. Then the luggage compartment lid begins to open automatically.

Operation of the luggage compartment lid with the identification transmitter is subject to specific legal requirements. There are differences between the European variant, the US variant and the Canadian variant.

■ European variant

Pressing the luggage compartment lid button with the luggage compartment lid symbol on the identification transmitter:

- Luggage compartment lid closed
 - Short press Luggage compartment lid opens to end position
 - Press and hold Luggage compartment lid opens to end position
- Luggage compartment lid open
 - Pressed and held > Luggage compartment lid closed to end or until button released.

It is possible to initiate the opening procedure by means of the luggage compartment lid button while the luggage compartment lid is closed. Releasing the luggage compartment lid button has no effect. The luggage compartment lid is opened until it is completely open. A brief press of the luggage compartment lid button while the luggage compartment lid is opening stops the opening procedure.

A long press of the luggage compartment lid button while the luggage compartment lid is opening triggers the luggage compartment lid closing procedure. The opening procedure stops first to allow the luggage compartment lid to begin closing immediately. The closing procedure ends if the luggage compartment lid button is released or the “CLOSED” position is reached.

Note: The Car Access System evaluates the requests from the identification transmitter. The luggage compartment lid lift receives the requests on the K-CAN. The signal must be routed through various bus systems. These bus systems are:

- **LIN-bus (diversity module > CAS)**
- **K-CAN2 (CAS > ZGM)**
- **K-CAN > (ZGM > HKL).**

■ **US variant**

The luggage compartment lid movement does not begin until the luggage compartment lid button has been released. The identification transmitter sends a message indicating that the luggage compartment lid button has been released. From this message, it is possible for the luggage compartment lid button stroke to be detected. Automatic opening is initiated after the luggage compartment lid has unlocked. The luggage compartment lid is completely opened.

Note: The remote control cannot be used to close the luggage compartment lid on the US variant for legal reasons.

Automatic Opening

The luggage compartment lid is opened or closed automatically when one of the luggage compartment lid buttons is pressed. A basic prerequisite being that there must be no "inhibit condition" present. You will find a description of the inhibit conditions in the "Luggage compartment lid movement inhibit conditions" section of this Product Information.

Automatic Opening Procedure

The following procedure begins with a closed luggage compartment lid.

- Luggage compartment lid button with luggage compartment lid symbol pressed briefly

Note: On the US variant, the luggage compartment lid button on the identification transmitter must be released otherwise the luggage compartment lid will not be opened automatically.

- Power supply switched to luggage compartment lid lift and request to unlock the luggage compartment lid issued by the Car Access System
- The junction box electronics unlock the luggage compartment lid. Initially, the luggage compartment lid lock is actuated.
- The luggage compartment lid contact switch changes from closed to open.
- The HKL controls the spindle drives to open the luggage compartment lid.

The luggage compartment lid is completely opened. If one of the inhibit conditions becomes active during luggage compartment lid movement, this will stop further movement of the luggage compartment lid.

Luggage Compartment Lid Opening with Comfort Access

Vehicles equipped with the Comfort Access option also have a "keyless opening" luggage compartment lid function.

The junction box electronics wake a sleeping vehicle in response to the outer luggage compartment lid button being pressed. The junction box electronics send the request on the K-CAN2. The Car Access System with Comfort Access receives the request and arranges for the identification transmitter to register with the vehicle.

Once the identification transmitter has been successfully verified by the Car Access System, the latter arranges for the luggage compartment lid to be unlocked. The junction box electronics execute the unlocking procedure. As soon as the status of the luggage compartment lid contact switch changes, the junction box electronics issue a notification on the K-CAN2. The central gateway module implements the signal on the K-CAN. In response, the HKL then executes the automatic opening procedure.

Automatic Closing

With the exception of the luggage compartment lid button in the A-pillar, all luggage compartment lid buttons are able to initiate automatic closing.

This luggage compartment lid button cannot be used to start the automatic closing procedure.

Closing Luggage Compartment Lid

The luggage compartment lid can be closed by pressing the inner luggage compartment lid button, outer luggage compartment lid button or central double-lock button.

The junction box electronics wake a sleeping vehicle in response to the inner luggage compartment lid button being pressed. The junction box electronics send the request on the K-CAN2. The Car Access System with Comfort Access receives the request and initiates the automatic closing procedure.

In response, the HKL then executes the automatic closing procedure.

As soon as the status of the luggage compartment lid contact switch changes, the junction box electronics issue a notification on the K-CAN2. The central gateway module implements the signal on the K-CAN. The HKL then knows that the closing process has ended.

Manual Opening and Closing

Moving the Luggage Compartment Lid by Hand

It is possible to open or close an open luggage compartment lid at any time in any vehicle idle mode situation. Three vehicle statuses govern the manual opening and closing procedure. These are:

- Luggage compartment lid lift active
- Luggage compartment lid lift in sleep mode
- Luggage compartment lid lift at terminal 30B OFF.

■ Luggage compartment lid lift active

While terminal 30B is switched on, detection of manual luggage compartment lid movements is straightforward.

The HKL detects luggage compartment lid movement by means of Hall sensors located in the spindle drive motors. The HKL evaluates the pulses of the Hall sensors and stores the current position of the luggage compartment lid.

This position is used as the starting position for subsequent luggage compartment lid movement.

■ Luggage compartment lid lift in sleep mode

The current position of the luggage compartment lid is stored in the HKL before the vehicle enters sleep mode.

Once the vehicle is in sleep mode, the HKL checks the Hall sensors on a cyclical basis. The vehicle is woken if a luggage compartment lid movement is detected. The HKL is then switched on and detects the luggage compartment lid being moved by hand.

■ Terminal 30B OFF

If terminal 30B is switched off, the power supply to the spindle drives is switched off and so too are the Hall sensors. In this situation, therefore, manual luggage compartment lid movements can no longer be detected.

If the position of the luggage compartment lid has been altered manually, the stored value would no longer match the current value.

At the next request, the luggage compartment lid is always closed first. The HKL detects the lower end stop from the status of the luggage compartment lid contact switch. This enables the current position of the luggage compartment lid to be compared with the stored starting position. The position of the luggage compartment lid is, in this way, newly referenced.

Note: If the luggage compartment lid movement is stopped before the lower end stop is reached, the luggage compartment lid will be opened the next time it is operated.

Since the position of the luggage compartment lid has not yet been referenced, the luggage compartment lid is only opened by as much it was previously closed.

Luggage Compartment Lid Movement Inhibit Conditions

The luggage compartment lid is not permitted to be operated in various situations. These situations include engine starting or driving or cases where there may be a risk of vehicle damage.

If luggage compartment lid operation needs to be inhibited while the luggage compartment lid is closing, an attempt is made to complete the movement that has commenced through to the end. For example, an attempt is made to complete luggage compartment lid movement until it closes while the vehicle is driving off. The luggage compartment lid lift will terminate actuation if the luggage compartment lid comes up against a blocking situation.

The inhibit conditions are listed as follows:

Inhibit condition	Explanation/information
Vehicle speed $v_{\max} > 3 \text{ km}$	The speed signal is made available by the integrated chassis management. Note: The luggage compartment lid can be set in motion in the presence of an invalid road speed signal.
Outside temperature < - 30 °C and + 80 °C >	The outside temperature signal is issued by the instrument cluster. Note: The luggage compartment lid can be set in motion in the presence of an invalid temperature signal.
On-board supply voltage < 9 V to 16 V >	In the event of undervoltage < 9 V or overvoltage > 16 V, the luggage compartment lid can no longer be set in motion.
Engine start (status "terminal 50 ON")	The signal is issued on the K-CAN2 by the Car Access System. Cancellation if luggage compartment lid movement in progress, luggage compartment lid operation is inhibited.

If the luggage compartment lid is reversing, the inhibit conditions are ignored and the luggage compartment lid movement is followed through to the end.

Additional Functions of the Luggage Compartment Lid Lift

Position Detection

The spindle drives are each integrated with a motor. The motor contains two Hall sensors. The Hall sensors are arranged with relative offset. This enables detection of the motor’s direction of rotation. In addition, it is possible to draw conclusions as to the remaining path of the luggage compartment lid based on the Hall sensor pulses.

The complete movement range of the luggage compartment lid from “CLOSED” to “OPEN” is recorded during assembly in the works. The HKL therefore knows how many Hall sensor pulses were generated between lower and upper end stop of the luggage compartment lid.

The number of Hall sensor pulses corresponds to the distance covered by the luggage compartment lid. With this information, the HKL is able to determine the opening angle of the luggage compartment lid.

The path of the luggage compartment lid is subdivided into various segments. From the Hall sensor pulses, the HKL knows the segment in which the luggage compartment lid is positioned. If the luggage compartment lid is fully open, it is positioned within the range of the upper segment. From there, the luggage compartment lid is always moved in the closing direction.



Index	Explanation
1	Upper segment
2	Range between the upper and lower segment
3	Lowermost segment

If the luggage compartment lid is in the range of the lower segment, i.e. closed, the luggage compartment lid is always moved in the opening direction.

The current position of the luggage compartment lid is stored by the HKL before it enters sleep mode. When the vehicle wakes up, the most recently stored position is used as the current position.

Luggage compartment lid segments F01

Obstruction Detection

Obstruction detection is active during the luggage compartment lid opening and closing procedure. An obstruction to luggage compartment lid movement during the opening procedure causes the luggage compartment lid to stop moving immediately. If the luggage compartment lid is obstructed in the closing direction, the HKL briefly controls the spindle drives in the opposite direction. If the luggage compartment lid remains obstructed, the HKL stops controlling the spindle drive motors.

There is no reversal of the direction of movement if the luggage compartment lid is obstructed as it opens or closes at the end stop.

■ Obstruction detection principle

The HKL evaluates the Hall sensor pulses in the spindle drive motors. The motor current is also recorded.

If the motor current increases and the Hall sensor pulses drop out, the HKL detects that the luggage compartment lid is being obstructed.

Note: Obstruction detection is deactivated during initialization of the luggage compartment lid lift. This allows the luggage compartment lid drives to be controlled with the maximum current available.

Repeat Interlock

The HKL is equipped with a repeat interlock to prevent the motors from overheating. The motor run-time is cumulated for the repeat interlock.

If the sum exceeds a maximum running time of 2 minutes, a new operation command will be rejected. An action that is already in progress always follows through to the end.

After a cooling phase of 6 minutes, it is possible for the motor to accrue a run-time of 2 minutes again.

The current motor run-time is stored by the HKL before it enters sleep mode.

The motor run-time of the repeat interlock is halved when the control unit is woken from sleep mode.

The repeat interlock is cleared in the event of a terminal 30B reset. This means that a motor run-time of 2 minutes is immediately available.

System Components

Control Units, Control Elements and Spindle Drives

Luggage Compartment Lid Lift

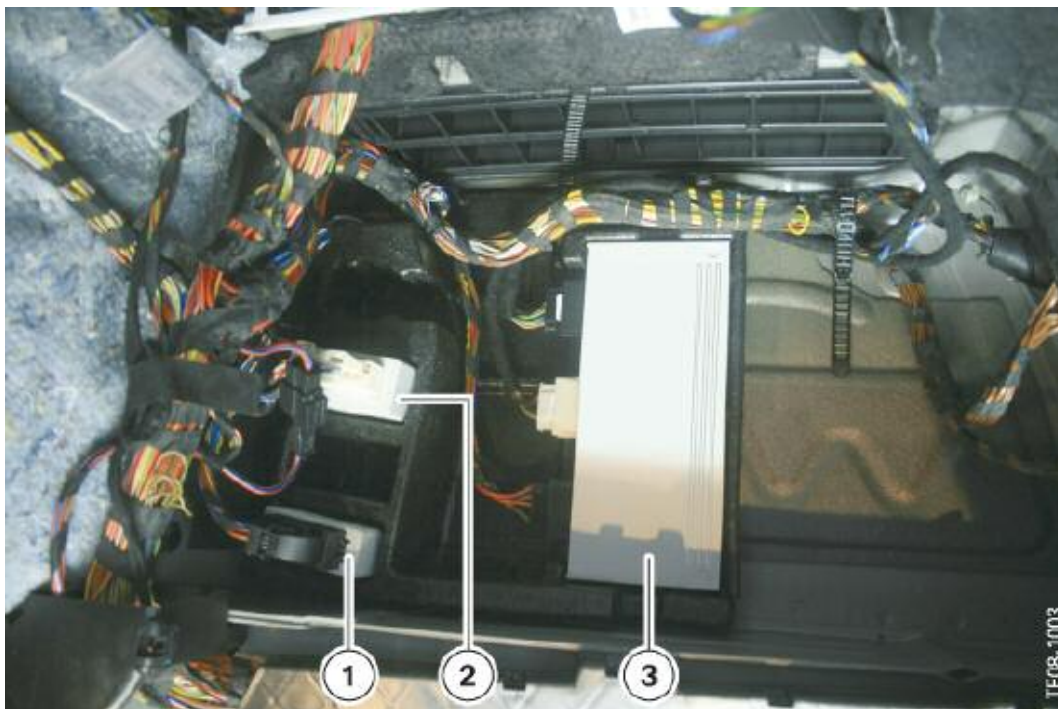
The luggage compartment lid lift is fitted on the right-hand side in the luggage compartment floor. The HKL controls and monitors the operation of the automatic luggage compartment lid actuating system.

The control logic module is connected to terminal 30B. The HKL is also connected to terminal 30 for the load current through the spindle drives.

In sleep mode, the HKL requires a certain amount of closed-circuit current. With terminal 30B OFF, the HKL is no longer supplied with off-load current.

Note: Terminal 30B is switched off with a delay.

The luggage compartment lid lift operates at a voltage of between 9 V and 16 V. Outside this range, the functions may no longer be supported.



Index	Explanation	Index	Explanation
1	Not for US market	3	HKL control module
2	Not for US market		

Car Access System

The Car Access System is fitted next to the steering column. It is the master control unit for the central locking. It is therefore also responsible for having the luggage compartment lid unlocked.

Junction Box Electronics

The junction box electronics are connected to the front power distribution box.

Note: The power distribution box and the junction box electronics are two separate components. This is an important point for the Service to note.

The central locking of the luggage compartment lid is controlled by a power output stage in the junction box electronics. The automatic soft-close drive is supplied by a relay in the distribution box at the rear. The junction box electronics control the relay.

Control Elements

Outer Luggage Compartment Lid Button

The outer luggage compartment lid pushbutton switches to ground. The signal from the outer luggage compartment lid button is sent to the junction box electronics. The junction box electronics signal the status of the outer luggage compartment lid button to the luggage compartment lid lift.

Interior Luggage Compartment Lid Button

The luggage compartment lid button switches to ground. The signal from the luggage compartment lid button is sent to the junction box electronics. The junction box electronics signal the status of the luggage compartment lid button to the luggage compartment lid lift.

The lighting of the luggage compartment lid button is only supplied with power under the following conditions:

- Luggage compartment lid open and
- Terminal 30B ON.

Note: A command sent from the inner luggage compartment lid button can only be executed with the luggage compartment lid open. This is due to the fact that the button has a connection to ground via the luggage compartment lid contact switch only when the luggage compartment lid is open.

Central Double-lock Button

The central double-lock button is connected to the Car Access System and switches to ground. The Car Access System makes the button status available on the K-CAN2.

Note: A command sent from the central double-lock button can only be executed with the luggage compartment lid open. This is due to the fact that the button has a connection to ground via the luggage compartment lid contact switch only when the luggage compartment lid is open.

■ ID transmitter luggage compartment lid button

The status of the luggage compartment lid button on the identification transmitter is evaluated by the electronics in the identification transmitter.

The identification transmitter sends an encrypted message to the vehicle by radio wave. The message reaches the remote control receiver via the antenna in the rear window. From there, the message is made available to the Car Access System.

The Car Access System verifies the message. Once the message has been successfully verified, the Car Access System sends out the request on the K-CAN2.

■ Luggage compartment lid button, A-pillar

The luggage compartment lid button is resistance-coded. The status of the luggage compartment lid button is evaluated by the Car Access System. The Car Access System issues the status on the K-CAN2.

■ Lock barrel, luggage compartment lid

The lock barrel in the luggage compartment lid is connected to the luggage compartment lid locking mechanism by means of a bowden cable. When the bowden cable is operated with the mechanical key, the luggage compartment lid lock releases and the luggage compartment lid can be opened.

Note: Opening the luggage compartment lid with the mechanical key can trigger an alarm in the antitheft system.

Spindle Drives

Each spindle drive comprises the following components:

- Spindle drive
- Drive motor
- Drive motor Hall sensor
- Spring
- Fixture of the spindle drive to the luggage compartment lid
- Fixture of the spindle drive to the body
- Ball bearing for the spindle drive.

Note: A defective spindle drive must be replaced as a complete unit.

Luggage Compartment Lid Contact Switch

The luggage compartment lid contact switch is switched to ground while the luggage compartment lid is not open. The status of the luggage compartment lid contact switch is evaluated and made available by the junction box electronics.

Service Information

Control Unit Replacement

Teaching in the Luggage Compartment Lid End Stops

If the luggage compartment lid lift control unit has been replaced, a new teach-in procedure will be necessary for the upper end stop. To do this, the luggage compartment lid has to be moved until obstructed by the upper stop.

The obstruction of the luggage compartment lid, and thus the drop-out of the Hall sensor pulses, marks the point at which the luggage compartment lid has reached its maximum opening angle. From this point, a value of approximately 5 % of the total opening angle is deducted. This will be the future opening angle of the luggage compartment lid. This point is also named the soft stop.

The soft stop prevents the luggage compartment lid from opening as far as the end stop and being damaged.

Note: The lower end stop is determined by the change in status in the contact switch of the luggage compartment lid lock from open to closed. The junction box electronics send out the status of the luggage compartment lid contact switch on the K-CAN2.

Spindle Drive Replacement

It is necessary to disconnect the plug connections when replacing the spindle drives. To protect the control unit or the spindle drives, terminal 30B should be switched off beforehand.

If the HKL is woken in this situation, it checks whether the spindle drives are connected. If the spindle drives are in fact not connected, a fault code memory entry will be generated. In response to the fault code memory entry, the HKL prevents control of the spindle drives. The automatic luggage compartment lid actuating system does not work, even if the spindle drives are connected now.

The HKL control unit must be allowed to enter sleep mode once more and terminal 30B switched off. The spindle drives are checked again the next time the control unit is woken. If the check is successful, the automatic luggage compartment lid actuating system is switched to active again.

After replacing the spindle drives, closing and opening of the luggage compartment lid must be adapted to given vehicle conditions. The luggage compartment lid lift does not recognize the position of the luggage compartment lid after installing the new spindle drives.

The spindle drives must be taught-in at the vehicle to enable the luggage compartment lid to recognize the position. The corresponding diagnosis order must be carried out for this purpose. This will ensure smooth opening and closing of the luggage compartment lid.

Note: The service information does not replace the current information available to Service, nor does it replace repair instructions.