

Anti-theft alarm system

E60



Introduction

The anti-theft alarm system (DWA) detects and reports attempts at intrusion and tampering with the vehicle. The vehicle interior is monitored by the ultrasonic interior movement detector (USIS). If an attempt is made to break into the vehicle and to enter the interior, the DWA alarm is triggered. A tilt alarm sensor integrated into the siren monitors the vehicle's position. The tilt alarm sensor detects if the vehicle is raised or towed away. [system overview ...]

The DWA alarm consists of:

- acoustic alarm via siren (intermittent tone for 30 seconds)
- visual alarm via lighting system
(hazard warning lights)

The alarm can be encoded depending on the country concerned.

Brief description of components

The anti-theft alarm system receives input signals from the following components:

- **Ultrasonic interior motion sensor**

The ultrasonic interior motion sensor uses ultrasonic waves to monitor the vehicle interior.

Movement is detected if the reflection (echo) of the ultrasonic waves changes. The sensitivity of the ultrasonic interior

motion sensor can be adapted to different conditions (e.g. sliding/tilt sunroof open). [more ...]

- **Tilt alarm sensor**

The tilt alarm sensor monitors the vehicle's
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ontal position (inclination in longitudinal and lateral directions). The signal from the tilt alarm sensor is evaluated by the microprocessor in the siren. The tilt alarm sensor detects a change in the vehicle position and triggers a DWA alarm. [more ...]

The following control units are involved in the anti-theft alarm system:

- **DWA control unit with ultrasonic interior motion sensor**

The DWA control unit forms a unit with the ultrasonic interior motion sensor.

The DWA control unit activates the siren via a single-wire bus. The DWA control unit is connected to the K-CAN.
[more ...]

- **Car Access System (CAS)**

The Car Access System (CAS) monitors the status of the central locking system. The bonnet contact switch is connected to the CAS. The opening of the bonnet is thus monitored (open or closed). The CAS feeds the signal to the DWA control unit via the K-CAN. The CAS supplies the following signals:

- Boot-lid unlocking via remote control
- Key in ignition starter switch
- Status of convenience opening/closing

- **Door modules, driver (TMFA) and front passenger (TMBF)**

The door modules supply the position of the front power windows. The signal is fed to the DWA control unit via the K-CAN.

- **Body basic module (KBM)**

The body basic module supplies the position of the rear power windows. The signal is fed to the DWA control unit via the K-CAN.

- **Control unit for the sliding/tilt sunroof (SHD control unit)**

The SHD control unit supplies the position of the sliding/tilt sunroof. The signal is fed to the DWA control unit via the K-CAN.

- **Integrated heating and air-conditioning system (IHKA)**

The IHKA controls the independent ventilation function. The IHKA feeds this signal to the DWA control unit via the K-CAN. The signal for the independent ventilation function is needed to calibrate the sensitivity of the ultrasonic interior motion sensor.

- **Control unit for independent heater (SHZH control unit)**

The SHZH control unit controls the independent heating function. The SHZH control unit feeds this signal to the DWA control unit via the K-CAN. The signal for independent heating function is needed to calibrate the sensitivity of the ultrasonic interior motion sensor.

- **Light module (LM)**

The light module actuates the lighting system for the visual DWA alarm. The DWA control unit feeds the triggering signal to the light module via the K-CAN.

The following actuators are actuated for the anti-theft alarm system:

- **Siren with integrated tilt alarm sensor (SINE)**

The siren emits the acoustic DWA alarm. The DWA control unit activates the siren via a single-wire bus. In addition to the DWA alarm, the siren can also emit an acoustic confirmation signal when the system is activated or deactivated (can be set on the Central Information Display (CID) and controller). [more ...]

DWA LED

The DWA LED is located on the underside of the interior mirror.

The DWA LED provides a visual indication of the status of the alarm system. The DWA LED is directly actuated by the DWA control unit via a wire. The following displays are possible:

- DWA LED off: DWA is deactivated.
- DWA LED flashes
(frequency = 0.5 Hz): DWA is activated.
- DWA LED flashes with a frequency of 2 Hz for 10 seconds and then continues with a frequency of 0.5 Hz: DWA is activated but a door or hatch is not closed or a sensor is defective.
- DWA LED flashes with a frequency of 2 Hz for 5 minutes and then continues with a frequency of 0.5 Hz: alarm is triggered.
- DWA LED lights up for 2 seconds and then flashes with a frequency of 0.5 Hz: the ultrasonic interior motion sensor and the tilt alarm sensor are deactivated.

System functions

The anti-theft alarm system incorporates the following functions:

- Activation/deactivation
- DWA alarm triggering (alarm-trigger signal)
- Automatic adaptation of sensitivity of ultrasonic interior motion sensor
- Deactivating interior motion sensor and tilt monitoring
- Emergency function for acoustic DWA alarm
- Combined operation with lock cylinder and remote control

Activation/deactivation

The anti-theft alarm system is activated when the central locking is locked/secured. Locking/securing re
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uires:

Drivers door to be opened and closed after terminal 15 is switched OFF.

The DWA control unit transmits the message "Activate" via the local data bus to the siren with integrated tilt alarm sensor (SINE). The siren is then immediately activated. 3 seconds after being activated, the door and hatch contacts are monitored. This is conditional on the contacts being in their rest position (doors and hatches closed).

The DWA LED starts flashing and the ha

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ard warning lights flash once as a visual confirmation. Depending on the national version, a short acoustic warning tone may also sound from the siren (see national version).

After the DWA has been activated, and after all doors and hatches have been closed, the ultrasonic interior motion sensor starts monitoring the interior with ultrasonic waves. The interior can be monitored after appro
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. 20 seconds.

The monitoring of the interior is interrupted if the side windows and/or the sliding/tilt sunroof are closed using the convenience closing function.

Like the interior monitoring, the tilt monitoring does not start until the doors and hatches are closed. When it is activated, the tilt alarm sensor first conducts a 30 second long reference run. Tilt monitoring does not start until the reference run has been completed.

If the luggage compartment is opened during the reference run, the reference run is interrupted. The reference run is then restarted when the luggage compartment is closed again. The monitoring functions of the ultrasonic interior motion sensor and the tilt alarm sensor have priority. If a faulty door or hatch contact is detected, this will automatically be assumed to be closed.

The anti-theft alarm system is deactivated when the central-locking system is unlocked. The DWA LED stops flashing and the ha
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ard warning lights flash twice as a visual confirmation. Depending on the national version, a short acoustic warning tone (dual tone) may also sound from the siren (see national version).

The luggage compartment can also be unlocked and opened with the remote control without the alarm being triggered, even if the alarm system is activated. When the luggage compartment is opened, the interior monitoring and tilt monitoring are deactivated. The interior monitoring and tilt monitoring are reactivated as soon as the luggage compartment is closed again.

DWA alarm triggering (alarm-trigger signal)

The DWA alarm is triggered if an alarm status is detected while the alarm system is activated. The following will trigger the DWA alarm:

- Forced opening of a door: bus signal from door contact
- Forced opening of luggage compartment: bus signal from boot-lid-contact switch
- Forced opening of bonnet: bus signal from bonnet contact
- Movement in interior: signal from ultrasonic interior motion sensor
- Vehicle in inclined position: signal from tilt alarm sensor
- Open circuit in local data bus (between DWA control unit and siren)
- Monitoring of vehicle battery: drop in on-board supply voltage from 7.5 to 6.5 volts within 40 minutes, battery positive cable cut through, on-board supply voltage > 18 volts

When a DWA alarm is triggered, the DWA control unit activates the siren via the local data bus. At the same time, the DWA control unit transmits an alarm message through the K-CAN. The light module activates the visual alarm via the lighting system.

The siren can trigger an acoustic alarm if it is separated from the vehicle electrical system by manipulation while the DWA is activated.

If the local data bus is separated as this happens, the DWA control unit will also trigger the visual alarm.

A DWA alarm is immediately cancelled when the DWA is deactivated, or if the message "Key is in ignition lock" is received (from the CAS).

Automatic adaptation of sensitivity of ultrasonic interior motion sensor

To prevent false alarms, the sensitivity of the ultrasonic interior motion sensor is adapted to the vehicle's conditions. To do this, the DWA control unit (and thus also the ultrasonic interior motion sensor) receives the following information via the K-CAN:

- Position of front power windows (door module, driver and front passenger)
- Position of rear power windows (body basic module)
- Position of sliding/tilt sunroof (sliding/tilt sunroof control unit)
- Status of comfort functions, e.g. convenience opening (Car Access System)
- Independent ventilation function (integrated automatic heating / air conditioning system)
- Independent heating function (independent heater control unit)

The range (sensitivity) of the ultrasonic signals is adapted. The positions of the side windows and the sliding/tilt sunroof are evaluated by the DWA. If no position value is available, a less sensitive setting is selected.

If the DWA is activated and a comfort function is

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ected (e.g. convenience closing using remote control):

- If the position of the side windows or sliding/tilt sunroof is changed, the interior monitoring function is deactivated for as long as the closing procedure runs.
- After the closing movement has been completed, or at most after 25 seconds: the positions of the side windows and sliding/tilt sunroof are re-evaluated and the sensitivity adapted.

The switching-on of the independent ventilation or independent heating system is also monitored to prevent false alarms (movement in vehicle interior caused by airflow).

Deactivating interior motion sensor and tilt monitoring

It may be advisable to deactivate the tilt monitoring and interior motion sensor under the following conditions:

- when the vehicle is being transported (e.g. rail, ferry)
- when the vehicle is parked in a two-level garage
- when persons or animals remain in the vehicle

The tilt monitoring and interior motion sensor are deactivated when the command "lock/secure" is

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ecuted twice within the space of 10 seconds (e.g. with the remote control).

The DWA LED indicates the deactivation by lighting up for 2 seconds.

The ultrasonic interior motion sensor and the tilt alarm sensor can also be permanently deactivated (see Car & Key Memory).

Emergency function for acoustic DWA alarm

If the siren fails during an alarm, or if the local data bus is interrupted, the acoustic alarm is emitted from the fanfare horn. To achieve this, the DWA control unit transmits a message to the steering column switch cluster (SZL).

Combined operation with lock cylinder and remote control

The alarm system can be activated and deactivated by either the door lock or the remote control (= combined operation). In some countries, insurance

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uirements prohibit such combined operation.

In the event of the combined operation failing, the alarm system can still be activated at the door lock, but cannot be deactivated at the door lock. Deactivation is only possible with the remote control. The combined operation function can be encoded in the Car Access System (CAS).

Notes for service staff

Service staff should note the following points:

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

National versions

DWA alarm output on different national versions

Differing registration

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uirements and other individual settings made with the

Car & Key

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emory can mean different alarms:

Function	National versions
Acoustic confirmation from siren when activation and deactivation	US and Canada only
Alarm tone	US and Canada intermittent tone for 30 seconds
Duration of acoustic alarm	Great Britain: 5 minutes
Visual alarm	EU: ha z ard warning lights US and Canada: ha z ard warning lights and main-beam headlights other countries: ha z ard warning lights and dipped-beam headlights (not with x enon headlights)

Panic mode with national versions US and Japan

Panic mode enables the DWA alarm to be triggered to attract attention in the event of a threat from the outside or an accident.

If panic mode is encoded (instead of boot-lid unlocking):

Panic mode is triggered with the remote control. To do this, the special button has to be pressed for 3 seconds (special button = EU boot-lid unlocking button). Panic mode can be triggered regardless of the DWA status (activated/deactivated). Panic mode is ended when any button on the remote control is pressed.

If the siren fails during panic mode, the acoustic alarm is emitted from the fanfare horn (emergency function).

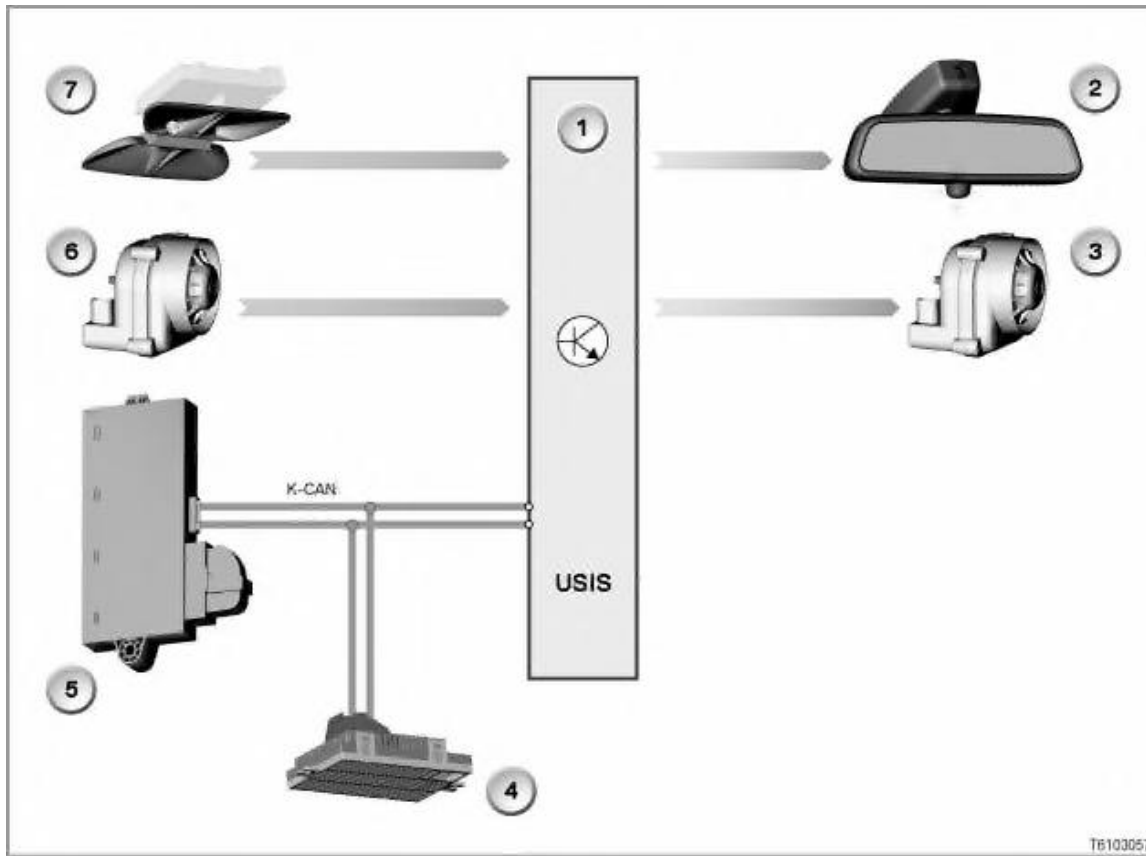
The duration of the alarm in panic mode is unlimited (until the vehicle battery is flat).

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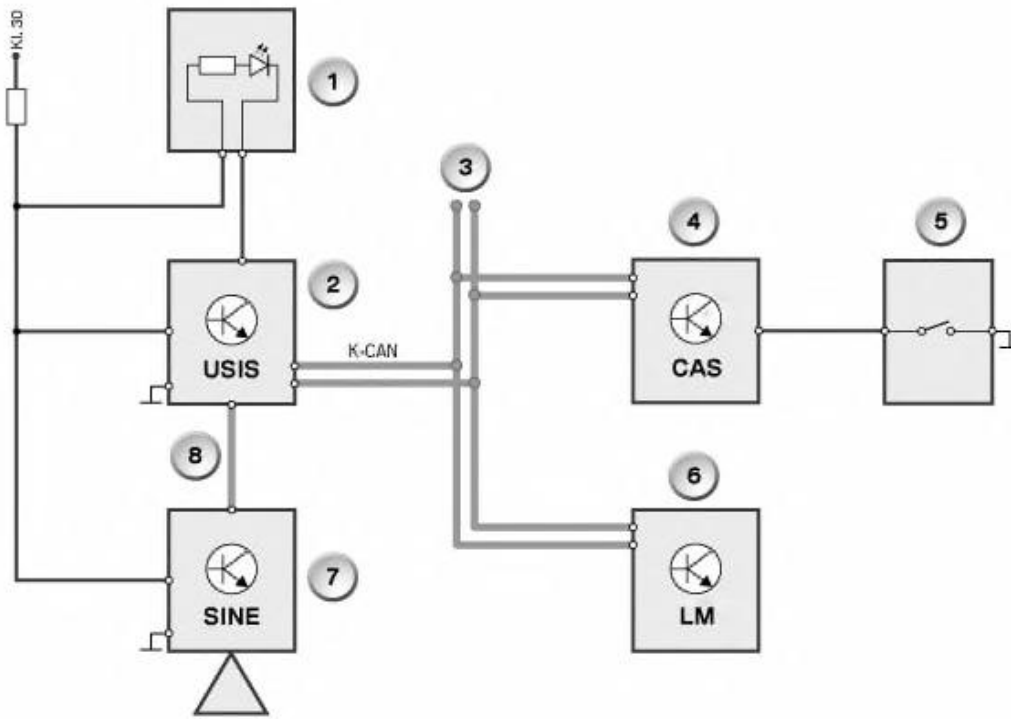
ect to alteration due to misprints, errors and technical modifications.

- Input/output



Index	Explanation	Index	Explanation
1	DWA control unit (ultrasonic interior movement detector, USIS)	2	DWA LED in middle of lower edge of interior mirror
3	Siren (acoustic alarm)	4	Light module (LM) (visual alarm)
5	Car Access System (CAS)	6	Tilt alarm sensor in siren (SINE)
7	Ultrasonic interior motion sensor		

- System circuit diagram

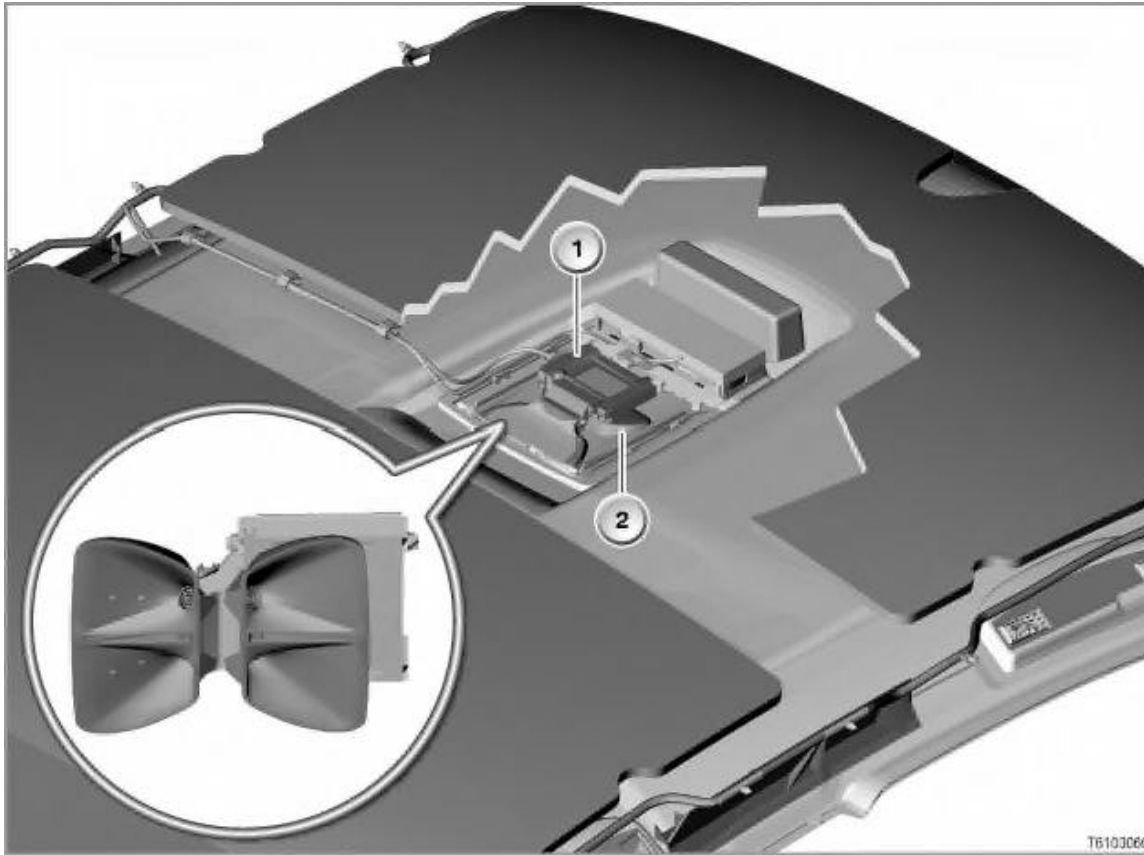


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Index	Explanation	Index	Explanation
1	DWA LED	2	DWA control unit (ultrasonic interior movement detector, USIS)
3	Signal from door contacts (door modules or body basic module), signal from boot-lid-contact switch (body basic module)	4	Car Access System (CAS)
5	Bonnet contact switch	6	Light module (LM)
7	Siren with integrated tilt alarm sensor (SINE)	8	Local data bus

Installation location

The DWA control unit with ultrasonic interior motion sensor is installed in the roof. A grille cover clipped into the headlining allows the ultrasonic waves to be output into the vehicle interior.



Index	Explanation	Index	Explanation
1	DWA control unit	2	Ultrasonic interior motion sensor with bell pieces

Construction

The DWA control unit and the ultrasonic interior motion sensor form a single unit.

The ultrasonic interior motion sensor consists of 4 ultrasonic wave transceiver units.

The 2 bell pieces each ensure the ultrasonic waves to be dispersed in 2 directions, front and rear.

The DWA control unit with ultrasonic interior motion sensor is connected to the vehicle electrical system with an 8-pin connector.

Pin assignment X1582, 8-pin (black)

Pin	Type	Explanation
1	V	Power supply for DWA control unit from rear power distributor
2	E/A	K-CAN (Low)
3	E/A	K-CAN (High)
4	---	---
5	A	DWA LED actuation

6	---	---
7	E/A	Local data bus between DWA control unit and siren
8	M	Earth for DWA control unit
	A = Output E/A = Input and output M = Earth V = Supply Please refer to the BMW diagnosis system for current information regarding pin assignment	

How it works

The ultrasonic interior motion sensor is a movement detector. The ultrasonic interior motion sensor detects movement in the entire vehicle interior. The DWA control unit evaluates the signal from the ultrasonic interior motion sensor and triggers the alarm.

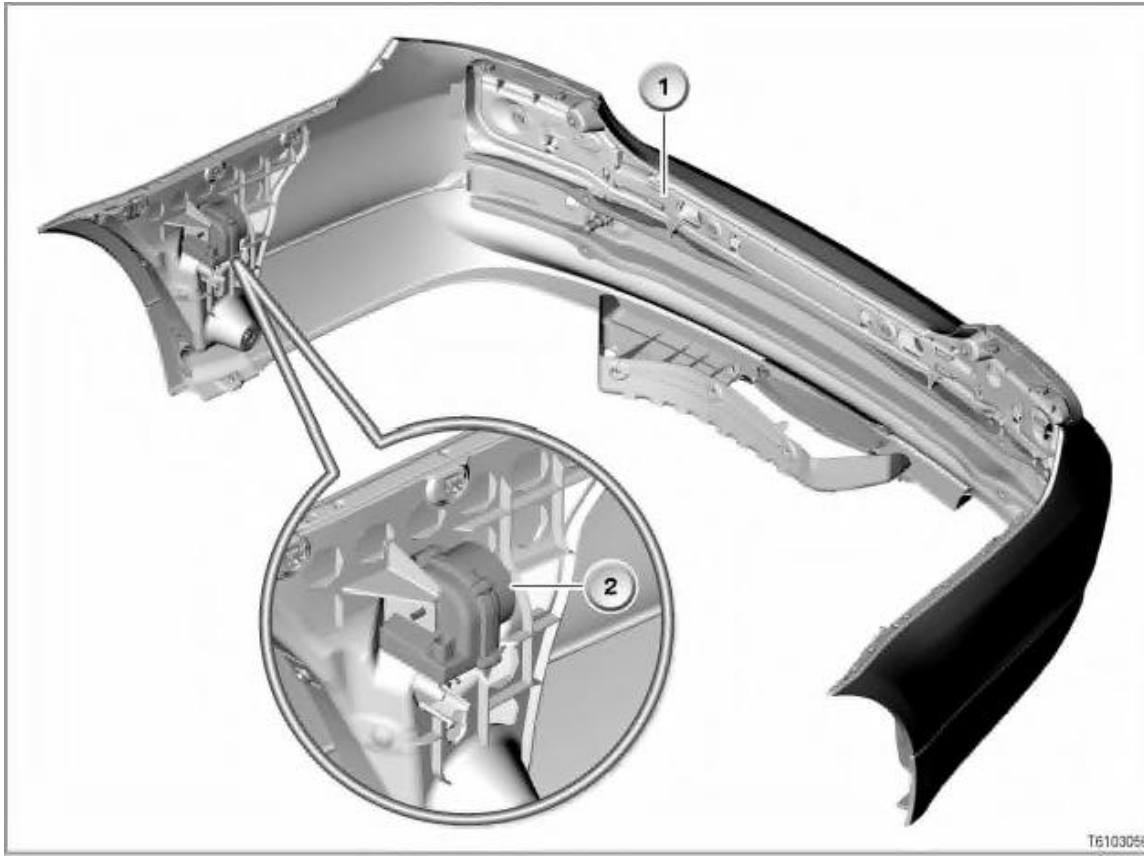
3 seconds after the last door or hatch is closed, the ultrasonic interior motion sensor starts its reference run. During the reference run, the vehicle interior is "scanned". This allows any changes in the vehicle interior (e.g. objects left on the rear seat) to be recognised. The correct function of the ultrasonic interior motion sensor is monitored by a self-test. The ultrasonic interior motion sensor is operational 20 seconds after the start of the reference run.

2 ultrasonic signals are emitted at intervals of 65 milliseconds. After transmission, the echoes of each ultrasonic signal from the vehicle interior are stored separately in a measured value field. The echo is then split into several subintervals. Within each subinterval, the echo value of the two measurements are compared.

If an alarm condition is detected, the DWA control unit will trigger the alarm. The siren for the acoustic alarm is actuated via the local data bus. The signal for the visual alarm is fed to the light module through the K-CAN.

Installation location

The siren with tilt alarm sensor is affixed to the inside of the rear bumper.



Index	Explanation	Index	Explanation
1	Bumper	2	Siren with tilt alarm sensor

Construction

The siren and the tilt alarm sensor together comprise a single unit. This is linked to the DWA control unit via a local data bus.

To ensure that the siren works regardless of the vehicle battery, it has its own batteries (emergency-current horn). The batteries are not rechargeable (service life: minimum approx. 10 years or 300 self-sufficient alarm activations).

The siren has a loudspeaker with a frequency range of 1900 to 2800 Hz.

How it works

A built-in microprocessor controls the functions of the siren and the tilt alarm sensor.

The siren has its own power supply and also monitors the power supply from the vehicle battery. This means that it is still possible for an acoustic alarm to be emitted if the power cable to the siren has been tampered with.

In addition, the siren monitors the earth lead and the local data bus. The siren will also trigger the alarm if these wires are cut through.

If the vehicle is parked up for a lengthy period of time:

The siren will not emit an alarm if the battery is continually discharged and the on-board supply voltage drops at a rate of 0.5 volts/hour to 3 volts.

If the siren is deactivated and there is no external power supply, the internal batteries are set to minimum current consumption. Current consumption is then no greater than 25 microampères. When the vehicle battery is reconnected, the siren is reset to normal current consumption.

The siren detects a polarity reversal when an external start is performed and stores this in its info-memory. Like the alarm memory, the info-memory can be read with the BMW diagnostic system.

The tilt alarm sensor monitors the vehicle's position. This means that it detects if the vehicle is raised so that the wheels can be removed (stolen), or so that the vehicle can be towed away.

The parked position of the vehicle is stored as the current longitudinal and transverse angles. The tilt angle sensor measures the longitudinal and transverse angles every 90 milliseconds. If the alarm threshold is exceeded, a message is sent to the DWA control unit. After an initial alarm, the threshold is lowered, which means a second alarm will be triggered more quickly.

If the vehicle is rocked, an internal counter is set to 0 as soon as a certain measured value is detected in the direction opposite to the first measurement. This prevents a false alarm, even if the vehicle is rocked heavily.

Reading off alarm memory

The last 10 DWA alarms are stored in the alarm memory of the DWA control unit. The alarm memory is read off together with the fault memory. For each alarm, the following additional information is stored:

- Alarm trigger signal with history
- Date and time
- Outside temperature
- Position of power windows and sliding/tilt sunroof
- Status of independent ventilation and independent heating functions

The last 5 alarms triggered by the siren are stored in the siren alarm memory. For each alarm, the following additional information is stored:

- Alarm trigger signal (overvoltage, undervoltage, open circuit, short circuit)
- Outside temperature

Settings for visual and acoustic confirmation

The visual and acoustic confirmation for activation and deactivation is not a function of the Car & Key Memory. The type of confirmation can be set by the customer using the Central Information Display and the Controller (menu "Settings" under "Vehicle settings").

E60 - Car & Key Memory, anti-theft alarm system (DWA)

The following functions can be encoded in the Car Memory for the anti-theft alarm system:

Function	Option
Ultrasonic interior movement detector	active or not active
Tilt sensor	active or not active
Activation/deactivation	Activation via door lock on driver's side and deactivation only via remote control or Activation and deactivation via door lock on driver's side and via remote control