

Electronic Vehicle Immobilization System EWS 2

History of BMW vehicle immobilization systems

On vehicles produced up to late 1994 vehicle immobilization can be activated via the antitheft alarm system (DWA) or the on-board computer (BC) fitted on the assembly line.

On vehicles built in the production period from May 1993 to January 1994 this vehicle immobilization can be additionally activated via the central locking system (ZV).

After deactivation via the key and the lock barrel proved to be more and more a weak point in the antitheft system, the newly developed electronic vehicle immobilization (EWS 1) has been fitted as standard since January 1994 in all BMW vehicles (exception: E30, E32, E36 without ZV). This is documented by SA900. This vehicle immobilization system fulfilled the requirements of fully comprehensive insurance providers at that time

The development of vehicle immobilization systems made further progress resulting in all BMW vehicles worldwide being fitted as standard with an electronically coded vehicle immobilization system (EWS 2) as from January 1995. The EWS 2 prevents the vehicle from being driven under its own engine power as the result of tampering with the ignition lock or doors.

The electronic vehicle immobilization system, stage 2 (EWS 2) fulfilled the more stringent requirements of the European fully comprehensive insurance providers that came into force in January 1995.

Insurance requirements

- The vehicle must be equipped with an electronic vehicle immobilization system that operates independent of the mechanical lock system and which prevents vehicle operation by means of coded intervention in the engine management.
- This immobilization system must be self-arming and must be effective on leaving the vehicle or on locking it at the latest.
- Deactivation must not take place with the mechanical key but rather it must be implemented by electronic means.

Explanation of important terms

Term	Explanation
Transponder	Hybrid term derived from the words trans mitter and responder . The transponder is a special transceiver.
Transponder chip	Electronic module in the key which basically consists of the transceiver, a small antenna coil and a memory.
ISN	Individuelle S teuergerätenummer (= individual control unit number), i.e. a number (production number) allocated individually by the control unit manufacturer to each engine control unit (DME/DDE).

System overview

The EWS 2 system consists of the following components:

- Key with transponder
- Loop antenna (coil) at steering lock
- Transceiver electronics (S/E module)
- EWS control unit
- Engine control unit (DME/DDE) with coded start enable input

Key with transponder

The transponder is a special transceiver in the key which can communicate with the EWS control unit via the transceiver electronics (S/E module). The transponder chip integrated in the key consists of the transceiver, a small antenna coil and a read/write memory.

The transponder chip is powered by the transceiver module via the loop antenna at the steering lock. This means that no battery is necessary in the key for power supply. The power supply and data transfer take place in the same way as a transformer between the loop antenna (coil) at the ignition lock and the antenna coil integrated in the key. The maximum range for writing and reading is 2 cm.

The transponder memory contains:

- Key data
- Service data

Important

Each individual key (with or without remote control) contains a transponder chip with its own key data thus making it unique!

Loop antenna (coil) at steering lock

The coil consists of 75 windings and fitted on the lock barrel of the ignition lock.

Transceiver electronics (S/E module)

The electronic transceiver module (S/E module) serves the purpose of data processing and controlling data transfer to the transponder and also communicates with the EWS control unit. This communication takes place on a serial bi-directional single-wire line.

The transceiver module is installed in the vicinity of the steering column. It receives power as from ignition lock position 1.

EWS control unit

The EWS control unit is the interface to the electronic transceiver module (S/E module), engine control unit and starter.

The main tasks of the EWS control unit are:

- Acquiring the key data from the transponder.
- Coded enabling of the engine management with a valid key.
- Storing the individual control unit number (ISN) of the respective engine control unit for coded data exchange.
- Managing the key data for a total of 10 keys.

Power is supplied via terminal 30.

Engine control unit (DME/DDE) with coded start enable input

The engine control unit (DME/DDE) was designed such that the ignition (terminal 15) and the fuel supply are enabled only when a correct enable signal is received from the EWS control unit.

The basis of this enable signal is the individual control unit number (ISN) of the engine control unit.

The engine control unit (DME/DDE) must identify this enable signal before it then enables the ignition signal (terminal 15) and the fuel supply.

For this reason, after replacing the engine control unit (DME/DDE), the individual control unit number (ISN) of the new engine control unit must be transferred by means of coding (DIS tester or MoDiC) into the EWS control unit. The individual serial number is not available from the outside.

Key identification and start procedure

- Ignition lock in position 2 The transponder is powered via the loop antenna and sends the key data to

the EWS control unit.

- The EWS control unit then checks the key data to ensure it is correct and only then sends an enable signal to the engine management system and starter.

On automatic transmission vehicles, the position of the gear selector lever is additionally determined and the starter is enabled only in position P or N.

- After the engine has started, the EWS control unit generates new key data and transfers them to the transponder.
- The starter is switched off when the EWS control unit detects a certain engine speed for a certain period of time. This engine speed variant depends on the type of engine.

CAUTION!

For safety reasons, the EWS control unit features a code-dependent afterrunning time (typically 10 s). The afterrunning time begins as soon as the ignition lock is in position 0 **and** no diagnosis telegrams are sent to the EWS control unit.

Observe the following points when checking keys:

The EWS control unit does **not** acquire any key data from the key during the afterrunning period. For this reason the engine can be started with any mechanically fitting key (also with an electronic defect) during the afterrunning time when changing a key!

To check keys, proceed as described in the following:

- If the service tester DIS or MoDiC is connected: Unplug diagnostic connector from vehicle.
- Switch ignition lock to position 0 and remove the key used for this purpose.
- Wait for afterrunning time to elapse, ignition lock must remain in position 0!
- Insert the key to be checked, turn ignition lock to position 2.
- Attempt to start the engine.

The duration of the afterrunning time can be read out with the diagnostic program of the EWS control unit as the "self-arming time" under "service functions", "read coding data".

Note

For safety reasons, during a start enable, the central locking is opened from a secured status.

Typical procedure

It is necessary to initialize and synchronize the control units and transponder during vehicle production or after replacing individual EWS components. The typical procedure at the production plant as well as at the dealer is described in the following:

First-time initialization at the production plant

The EWS control unit and the 4 vehicle keys are initialized with the key data created in a programming station. The key data for a further 6 replacement keys that have not yet been cut are additionally written in the EWS control unit. All key data (of a total of 10 keys) are stored in a database. The individual control unit number (ISN) is then read out of the engine control unit and entered in the EWS control unit. Initialization is now concluded and the vehicle is ready for operation.

Procuring replacement keys

Replacement keys can be obtained from a sales point only via a BMW dealer where one of the 6 replacement keys fitting the vehicle is programmed. This key is **not** a copy of the lost key, but rather a **new** key.

Important

The sales centre **always** makes a **new key**! A total of not more than 6 replacement keys suitable for the installed EWS control unit can be made and handed over! The key data of delivered replacement keys are deleted from the database!

The order for making a key in the sales centre cannot be further processed before all the necessary customer and dealer data have been submitted in full.

CAUTION!

Every request for a key is documented so that all inquiries from insurance companies and authorities can be followed up.

In view of the more stringent antitheft requirements, the procurement of replacement keys will in future be more involved than it has been in the past.

As from key No. 5 (first replacement key) all replacement keys will feature an 'E' on the key bit for identification purposes.

Disabling keys

With the aid of the DIS tester, a lost key can be disabled on the vehicle and re-enabled if the key is found again. **All** keys still in the customer's possession must be submitted for this purpose.

Replacement of the EWS control unit

A pre-initialized control unit must be obtained from the designated sales centre for the purpose of replacing the EWS control unit. The procedure is similar to that for procuring replacement keys.

The new EWS control unit must then be encoded in the vehicle. During this procedure the individual control unit number (ISN) of the engine control unit (DME/DDE) is transferred to the EWS control unit. The encoding procedure must be carried out as follows:

- Select the defective EWS control unit that is still installed in the vehicle with the coding program. The data are then buffered in the MoDiC or DIS tester.
- Install new EWS control unit.
- Encode new EWS control unit, i.e. transfer the buffered data.
- If diagnosis is no longer possible on the defective EWS control unit, it will be necessary to enter the vehicle identification number and the central encoding code by hand in the new EWS control unit.

Replacement of engine control unit (DME/DDE)

After replacement, the new engine control unit must be encoded by means of the DIS tester or MoDiC. During this procedure the individual control unit number (ISN) stored in the engine control unit (DME/DDE) is transferred to the EWS control unit.

Replacement of the transceiver module (S/E module)

Initialization is not necessary.

Obtaining spare parts

In addition to the production plants, the following sales centres are currently equipped with programming stations for the purpose of initializing EWS components:

- For Europe: Dingolfing (Central Parts Distribution Depot)
- 2 centres in the USA for North, Central, South America and Canada
- For East Asia, Australia and Oceania: Japan
- For Southern Africa: South Africa

The following EWS 2 components are available as spare parts through the sales centres:

- Pre-initialized transponder key
- Pre-initialized EWS 2 control unit
- Pre-encoded/non-coded DME/DDE
- Steering lock barrel
- Lock barrel for doors and lids/flaps
- Lock barrel with key without transponder
- Pre-initialized uniform lock system with EWS 2 control unit
- Electronic transceiver module (S/E module)
- Loop antenna (coil)

Procedure for loss of all 10 keys

By providing all the necessary data, the authorized customer is able to obtain from the sales centre a new

EWS control unit and new initialized transponder keys with the previous mechanical key code via a BMW dealer.

If all 10 keys **and** all acquired data (also in the database centre) are lost it will be necessary to replace both the EWS control unit as well as all the keys. Since, in this case, the parts are not standard stock, the parts are supplied only by the Central Parts Distribution Depot (ZKA).

Diagnosis

The diagnosis capabilities of the EWS system are supported by the use of the 'electronic vehicle immobilization EWS' diagnostic program (available on DIS tester).

Troubleshooting is greatly facilitated by the selection of fault symptoms and working through corresponding test modules.

In addition, functions are provided for the purpose of determining the validity of existing keys ('key test') and checking correct data matching between the DME/DDE and EWS control unit ('EWS DME/DDE data comparison').

Proceed as follows in the case of complaint:

- Connect DIS tester to diagnosis socket in the vehicle.
- Switch ignition lock to position 2.
- Select model series

Model series E31/34/36:

- On page 'Diagnosis CONTROL UNITS' select the EWS control unit under '16 ELECTRONIC VEHICLE IMMOBILIZATION EWS'.
- Schematic circuit diagrams are available in paper document form.

Model series E38:

- Identify vehicle. The page 'Diagnosis vehicle identification' follows
- Press 'function selection' button. Select 'EWS system' in the 'Diagnosis function and component selection' page for the drive or body.
- Continue in the diagnosis program by pressing the 'testing schedule' button.
- The corresponding functional description, schematic circuit diagrams, pin assignments and installation locations of the EWS components are provided under 'Documents'.

Encoding

Encoding is of decisive importance in the EWS system. After replacing the EWS control unit or the engine control unit (DME/DDE) the EWS control unit must always be correctly adapted by means of encoding otherwise it will not be possible to start the engine.

Procedure:

- Connect DIS tester or MoDiC.
- Switch ignition lock to position 2.

If replacing EWS control unit:

- Select 'Replacement coding'.
- Select the EWS control unit under 'control unit selection'.

The encoding procedure begins with reading out the data from the old, defective EWS control unit still fitted in the vehicle.

The data entered in the defective EWS control unit are buffered in the DIS tester or MoDiC. After replacement the buffered data are entered in the newly installed EWS control unit.

Important

This procedure (read data from defective component - install new part - transfer data to new part) must always be carried out in this order when replacing an EWS control unit!

If the EWS control unit to be replaced no longer has communication capabilities it will be necessary to enter the vehicle identification number and the central encoding code (ZCS) by hand. All other service data can no longer be read out of the old EWS control unit and are therefore lost.

If replacing engine control unit (DME/DDE):

The encoding procedure is carried out after replacing the engine control unit.

- Select programming
- Select the engine control unit under 'control unit selection'.

Matching with the EWS control unit takes place automatically during the programming procedure.