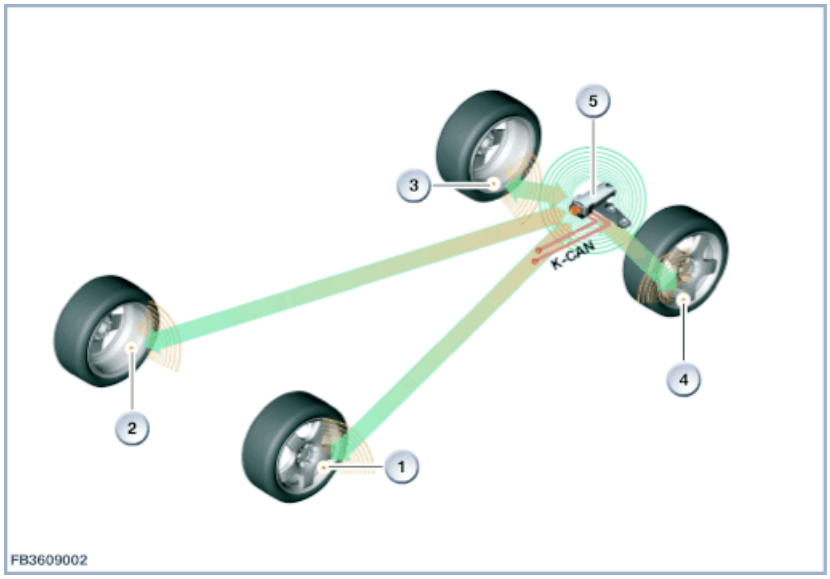
TYRE PRESSURE MONITOR (FUNCTI...

Tyre Pressure Monitor (RDC)

The Tyre Pressure Monitor (RDC) is a system which monitors the tyre pressure while the vehicle is in motion. It is offered exclusively in the USA (legal requirement) and as optional equipment (SA2VB).
The system of the new generation (Generation 3) now consists only of 5 components: the RDC control unit (control unit with integrated reception aerial) and 4 sets of wheel electronics.



Item	Explanation	Item	Explanation
1	Wheel electronics system, front left	2	Wheel electronics system, front right
3	Wheel electronics system, rear right	4	Wheel electronics system, rear left
5	RDC control unit		

Assignment of wheels

Axle assignment and identification of direction of rotation can help to assign the Identification Feature (ID) of the wheel electronics to a defined installation position.
Axle assignment:
The RDC control unit is installed close to the rear axle. For this, the messages on the wheel electronics from front axle and rear axle differ to varying extents. The averaged signal strengths of the wheel electronics systems thus indicate the axle assignment. Since the RDC control unit is installed to the rear of the vehicle, the wheel electronics on the rear axle receive signals at a higher level of receiving power than those on the front axle. Axle assignment runs parallel in time to the idenfication of direction of rotation. In the calculation of signal strengths, only wheels rotating in the same direction (on each side of the vehicle) are taken into account.
Identification of direction of rotation:
The wheel electronics have a combined acceleration sensor to detect swivel motion and direction of rotation. This identification takes place in the starting process or during driving. When swivel motion is detected, a message is sent. In this message, an additional item of information is present via which the direction of rotation is communicated to the RDC control unit. The result of identification for the direction of rotation can assume the following statuses:

- Standstill
- Clockwise direction
- Counterclockwise direction
- unknown

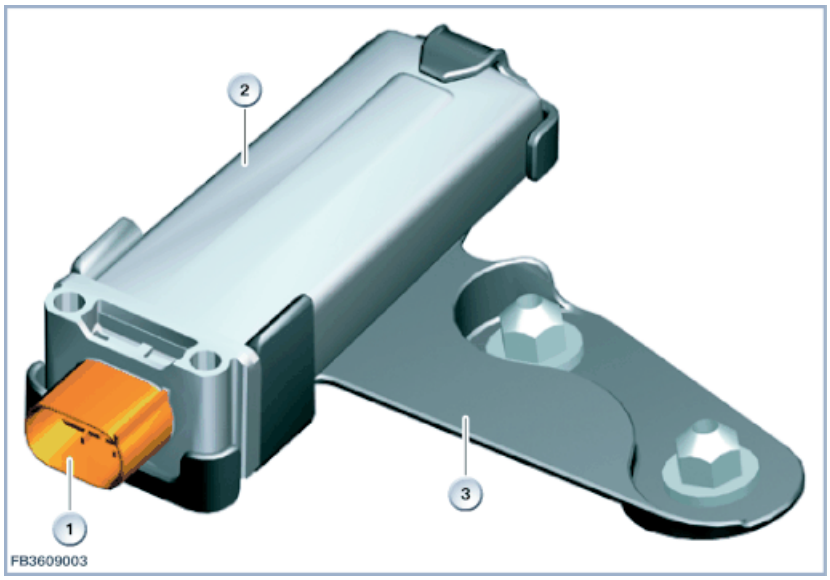
RDC control unit

The RDC control unit processes the messages sent by the wheel electronics. Above a speed of 20 - 30 km/h, the following messages are sent by the electronics on each wheel:

- Tyre pressure
- Tyre air temperature

- Remaining service life of the battery
- Data from the acceleration sensor and Identification Feature (ID) of the wheel electronics

These messages are then transmitted directly to the RDC control unit via a high-frequency transmission path (433 MHz), where they are then evaluated. The measuring cycle of the wheel electronics amounts to 3 second, with transmission to the RDC control unit taking place every 30 seconds. The current status of the messages is sent to the CAN bus (body CAN) and is then rendered visible by the indicating instruments. The installation location for the RDC control unit is in the outer area on the vehicle underbody behind the rear axle.



Item	Explanation	Item	Explanation
1	4â€�pin plug connection	2	RDC control unit
1	Holder		

Structure and inner electrical connection

All 4 pins on the plug connection of the RDC control unit are always assigned.

Item	Explanation	Item	Explanation
1	CAN low	2	Terminal 30B
3	CAN high	4	Terminal 31L

Diagnosis instructions for RDC control unit

If the RDC control unit fails, the following behaviour is to be expected:

- Check Control message
- Indicator and warning light lights up

Wheel electronics

In all wheels, wheel electronics systems are installed in the wheel drop centre. The wheel electronics systems are bolted onto the filling valves (made of metal). All wheel electronics systems are common parts. The valid operating temperature lies between -40 Â°Celsius and +125 Â°Celsius. The wheel electronics monitor the actual temperature in the tyre. If the temperature is greater than approx. 115 Â°Celsius, the RDC switches into a mode with restricted functionality. Under certain circumstances, a hardware shutdown takes place.
When stationary, the wheel electronics perform a cyclical roll identification process in order to identify a starting process. During the starting process, a measuring cycle lasting for 3 seconds is observed. While the vehicle is being driven, a repeated and cyclical roll identification process is performed to confirm and to end driving operations with a measuring cycle lasting for 60 seconds.
At regular intervals (every 3 seconds), the wheel electronics measure the tyre pressure and the temperature in the wheel electronics. These measured data are transmitted to the RDC control unit automatically in a regular transmission (every 30 seconds) from the tyre to the RDC control unit. In the event of a pressure change greater than 0.2 bar within two consecutive pressure measurements or fast tyre pressure loss, the wheel electronics switch immediately into a rapid transmission mode. In this case, the wheel electronics measure and transmit measuring data from the tyres at short intervals (1 second). Every set of wheel electronics is equipped with its

own Identification Feature (ID) to enable it to be identified by the RDC control unit. This Identification Feature is transmitted together with every data transfer.

Item	Explanation
1	Wheel electronics

The wheel electronics are supplied with power by a lithium ion battery. The service life is designed for approx. 10 years. To avoid any unnecessary load on the state of charge of the battery, the wheel electronics operate in 5 different operating conditions. In which operating condition (mode) a set of wheel electronics perform a measurement or transmit a radio signal depends upon:

- Tyre pressure
- Tyre air temperature

mode	Explanation
0	Bearing
1	Normal transmission mode for stationary mode and driving
2	Fast transmission mode after identification of a fast pressure change
3	Fast transmission mode prior to a shutdown due to excess temperature
4	Detection of direction of rotation in the starting process

Structure and inner electrical connection

The wheel electronics system consists of a plastic housing. The plastic housing contains a printed circuit board and the following components:

- Pressure sensor
- Temperature sensor
- Acceleration sensor
- Transmission and receiving equipment
- Evaluation electronics
- Battery

Diagnosis instructions for the wheel electronics

If the wheel electronics system fails, the following behaviour is to be expected:

- Fault entry in the RDC control unit
- Check Control message
- Indicator and warning light lights up

The battery of the wheel electronics system cannot be renewed.

Diagnosis instructions for service

Notice! Checking the wheel electronics!

The only external way to establish if a set of wheel electronics has been installed is to examine the aluminium screw valve. The only way to check if the correct set of wheel electronics has been installed is by first dismantling the tyre. Regrettably, for technical reasons, it is not possible to submit a query via the diagnosis system.

Notice! Deactivation of an active wheel electronics system

It is not possible to deactivate a wheel electronics system that has already been activated. If ever the vehicle is at a standstill for extended periods (> 5 minutes), the wheel electronics transmits no radio signal. The only way to switch the wheel electronics into a transmit mode is to drive at a speed in excess of 30 km/h.

Notice! Preconditions for initialisation!

An initialisation of the tyre pressure control must be performed in the following cases:

- The tyre pressure is changed.
- A wheel exchange is carried out. The exchanged wheels must be equipped with the correct wheel electronics systems.
- Axle-wise wheel exchange on the vehicle.
- Diagnosis instruction

During the initialisation process, the existing inflation pressure is transferred as a specification for the nominal pressure.
The driver is personally responsible for setting the correct inflation pressures on cold tyres in accordance with the operating instructions. Depending on the series,various operating points are possible for the initialisation process:

- operation of the central information display (CID)
- operation of the instrument panel via the drop arm
- operation of the radio
- operation by button

This must be done with the vehicle at a standstill and with terminal 15 ON. The RDC acknowledges the initialisation process with a display on the instrument panel, radio or CID. These Check Control messages remain visible until the initialisation process has terminated. At the end of the initialisation process, all warning lights go out.
The RDC control unit checks the plausibility of the nominal value before adopting it (minimum pressure). Any initialisation is only possible if the inflation pressure in all wheels is at least 1.6 bar. If the tyre pressure of one wheel falls below this limit, a Check Control message is issued immediately.
Remedy: Set inflation pressures to correct values then repeat the initialisation process. If the initialisation process is forgotten after wheel exchange or after replacing the wheel electronics, the driver is asked to perform the initialisation process on vehicles equipped with an iDrive ('intelligent Drive') control centre.
Internal procedure after an initialisation has been triggered (reset):

1. Recognition of the fitted wheel electronics systems
2. Identifying the position of the wheel electronics systems
3. Plausibility check by checking the nominal pressures against the minimum pressures
4. Adoption of the specified pressures as nominal pressures

The tyre pressure increases by 0.1 bar per 10 Â°C increase in temperature. If the temperature-evaluated limit values are not reached, the Tyre Pressure Monitor issues a Check Control message.
In the initialisation there are substitute values up until the complete allocation of the wheels (e.g. 6.4 bar; 127 Â°Celsius).

To finalise the assignment of wheels successfully, the vehicle must be driven for at least 12 minutes at a speed in excess of 30 km/h.

National-market versions

USA, Canada, Europe

Transmission frequency of the system: 433 MHz
Reception frequency of the system: 125 kHz (only for Development and the manufacturing plants)
We can assume no liability for printing errors or inaccuracies in this document and reserve the right to introduce technical modifications at any time.