Service Training

Self-study Programme 347

Tyre Pressure Monitoring Systems

Design and Function

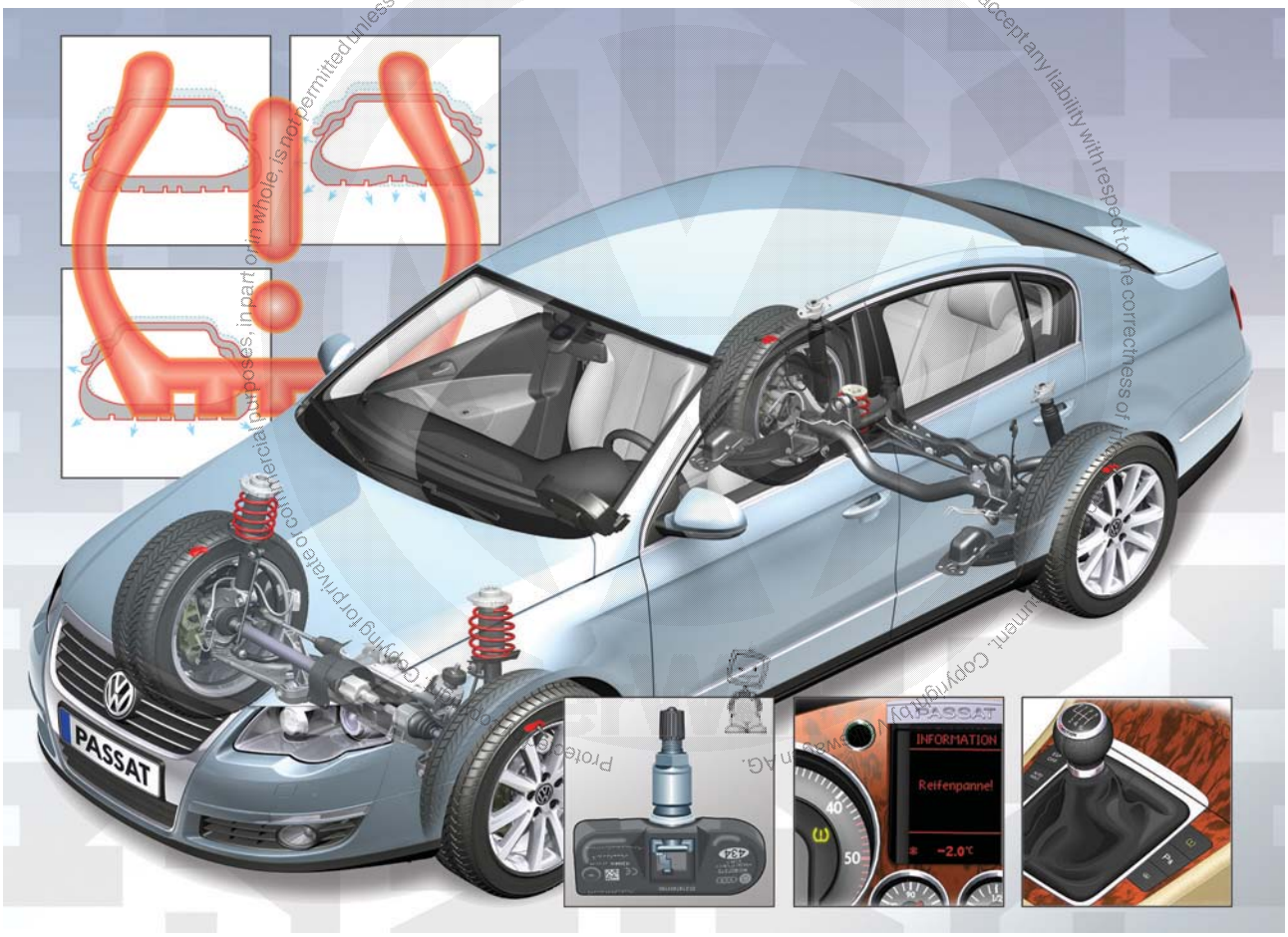
Tyre pressure monitoring systems monitor the inflation pressure of the tyres. They can warn you about dangerous changes in pressure and send a signal when the actual tyre pressure deviates from the specified tyre pressure.

The tyre pressure affects

- road safety,
- comfort,
- the service life of the tyres and
- fuel consumption.

In Volkswagen vehicles, the tyre pressure is monitored using three different systems:

- the tyre pressure monitor display (TPMD), which is purely a software solution,
- the tyre pressure monitor (TPM) with wheel position recognition in the Touareg and Phaeton and
- the TPM without position recognition in the Passat.



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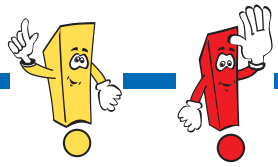


Important Note

The self-study programme shows the design and function of new developments.
The contents will not be updated.

For current testing, adjustment and repair instructions, refer to the relevant service literature.

Contents

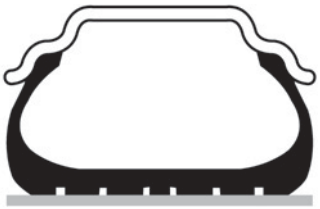
* Not for the North America region (NAR)

Tyre pressure

Correct tyre pressure

A tyre with the correct tyre pressure rolls along the road using the full tread surface. The tread wears evenly and the full amount of grip is provided. This has the following advantages:

- high tyre mileage,
- minimum braking distance,
- optimum cornering stability and
- best ride comfort.



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S347_020

Tyre pressure too high

When the tyre pressure is too high, only the centre of the tread provides optimum power transmission. This has the following disadvantages:

- uneven tread wear,
- reduced tyre life and
- reduced ride comfort.

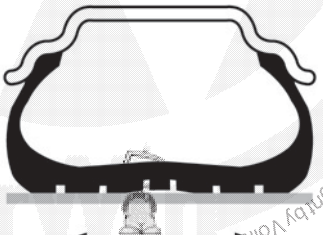
S347_021

S347_022

Tyre pressure too low

If the tyre pressure is too low, the tyre will be slightly concave in the middle so that only the outside surface transfers the power properly to the road surface. This has the following disadvantages:

- considerable heating up of tyres and thus a risk of damage to the tyre structure,
- longer braking distances and
- shortened tyre life.



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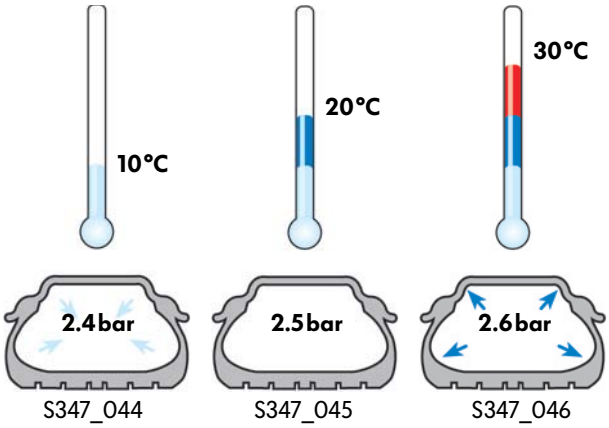
What does the tyre pressure depend on?



The volume remains approximately the same in a tyre. Therefore temperature changes inside the tyre affect the tyre pressure directly.
The tyre pressure is increased or decreased by approx. 0.1bar for every 10 degrees change in the temperature.
The inside temperature of the tyre is subject to various influences:

- the outside temperature or sunlight,
- the heat emitted from the brake discs and
- the flexing of the tyres.

Dangerous low tyre pressure

Low tyre pressure often causes punctures. If the pressure in a tyre is too low over a long period, the temperature inside the tyre increases due to the flexing of the tyres. This causes damage to the tyre structure. If the tyre structure becomes too badly damaged, the tyre will be destroyed.

Introduction

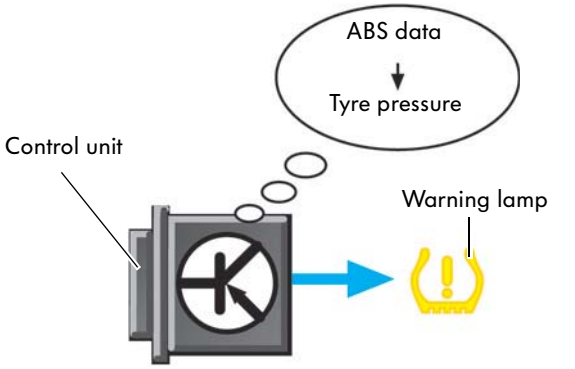
Overview of tyre pressure monitoring systems

The following applies for all tyre pressure monitoring systems:
The tyre pressures are monitored constantly and compared with reference values. All systems issue tyre pressure warnings.

Tyre pressure monitor display*

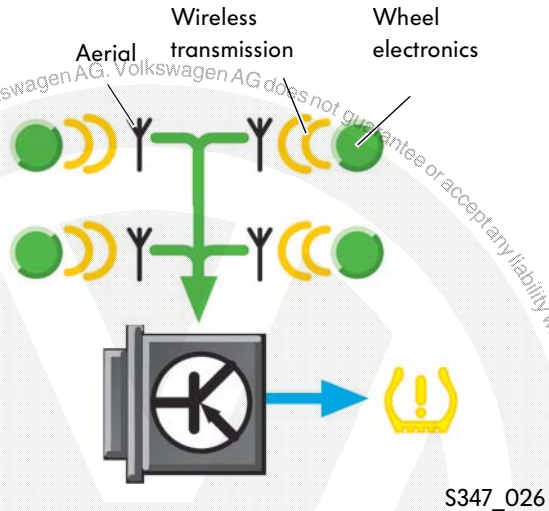
The tyre pressure monitor display (TPMD) is a software module in the ABS control unit. It evaluates ABS data and recognises tyre faults on individual wheels.

The driver himself inflates the correct specified tyre pressures and the system stores them after he presses a button as part of a learning process.



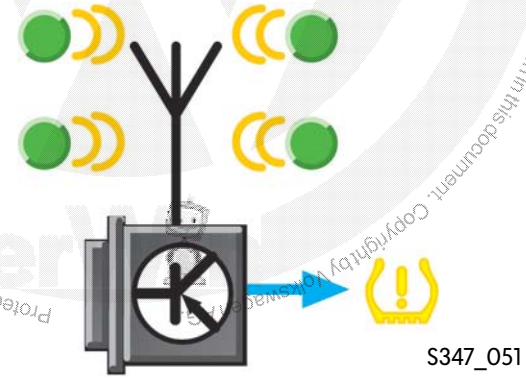
Tyre pressure monitor with position recognition

In the Touareg and Phaeton, the tyre pressure monitoring systems with position recognition comprise wheel electronics, aerials for contact-free transfer of the sensor data from the wheel electronics and a control unit.
The driver inflates the tyres to the correct pressures and stores them in the system.



Tyre pressure monitor without position recognition

The tyre pressure monitor software without position recognition in the Passat is integrated in the convenience system central control unit. The central locking and anti-theft alarm system aerial is used to receive the data from the wheel electronics.
In this system, the specified tyre pressure is preset in the factory.



* Not for the North America region (NAR)

Procedure following tyre pressure warning

If a warning is issued from the tyre pressure monitor systems (except for “soft warning” with TPM systems), you should reduce your speed immediately. Avoid sharp steering and braking. You should stop at the next opportunity and check the tyres and their pressures.

The driver is responsible for ensuring that the tyre pressure is correct. Therefore he should check the tyre pressures on a regular basis.

Main features of systems in comparison

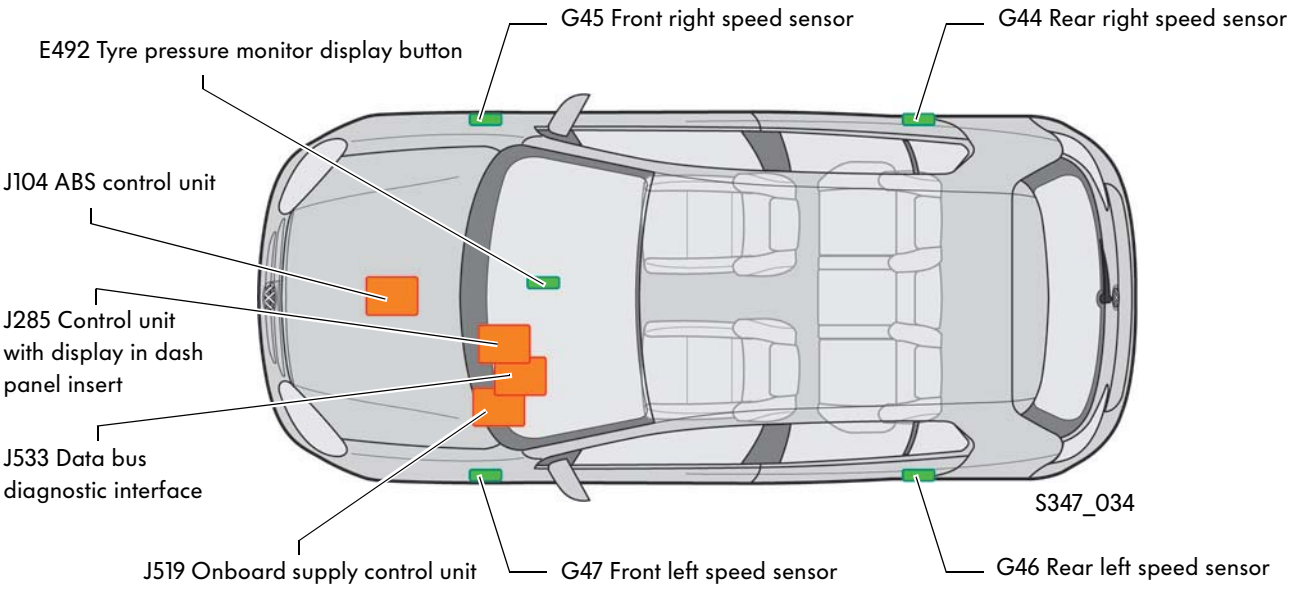
	TPM*	**TPM with position recognition**	**TPM without position recognition**
Software	Module in ABS control unit J104	Separate tyre pressure monitor control unit J502	Tyre pressure monitor control unit module J502 in convenience system central control unit J393
Wheel electronics	Not installed	One per wheel	One per wheel
Aerials	Not installed	One per wheel housing	Not installed, the wheel electronics signals are received by the central locking and anti-theft alarm system aerial
Specified tyre pressures	Need to be inflated by driver and stored in the system by pressing the button	Need to be inflated by driver and stored in the system by pressing the button	Preset in factory
Operating	Using a button. Icon:  S347_052	Via the “Convenience Setup” (Touareg) or the infotainment system (Phaeton).	Using a button. Icon:  * S347_053
Learn process	The system learns the specified tyre pressure in a calibration process.	The learn process needs to be started after the tyres have been inflated to the correct pressure.	New wheel electronics are learnt, the specified tyre pressures remain the same.

* Not for the North America region (NAR)

TPM tyre pressure monitor display*

Design

The tyre pressure monitor display is a software module without its own diagnosis address in the ABS control unit J104.
It recognises slow pressure loss in a tyre and is available as an optional extra for the Golf, the Passat and the Polo.



If one of these vehicles is equipped with self-supporting tyres, the tyre pressure monitor display will always be installed. When self-supporting tyres are equipped, the driver will hardly notice low tyre pressure therefore a tyre pressure monitoring system is always required.

Warnings are indicated in the dash panel insert by a tyre pressure warning lamp.

A button in the centre console is used to configure the tyre pressure monitor display for the new tyre conditions after the tyre pressure has been adjusted, tyres have been changed or work has been carried out on the chassis (calibration of system).

Customer services must inform customers that the driver is responsible for setting the correct tyre pressure. The tyre pressure monitor display is an information system that issues a warning when pressure is lost at one tyre. It does not, however, relieve the driver of the responsibility to check the tyre pressure himself on a regular basis.

* Not for the North America region (NAR)

Function

Various data from the anti-lock brake system is used to determine the rolling circumference of a tyre. The rolling circumference is compared with reference data.
Pressure loss in the tyre can be detected from slight changes. The reference data is calculated from the current driving data in a system learn process, called calibration.

If the TPM detects the signal from the hand brake (Golf) or the electromechanical parking brake (Passat), it will be deactivated automatically for the duration of the signal.

Spare wheels, temporary spare wheels and trailers are not monitored with the TPM.

The system needs to be calibrated after a wheel is changed.

Operation

S347_039

The calibration is started with the tyre pressure monitor display button, which is built into the centre console in the Golf.

Warning

S347_047

If a pressure loss is detected, the driver will be warned by the tyre pressure monitor warning lamp in the dash panel insert and a single gong. The lamp will be illuminated until the system is calibrated again. Until the system is calibrated, the gong will sound each time the car is started.

TPMD tyre pressure monitor display

Use of button

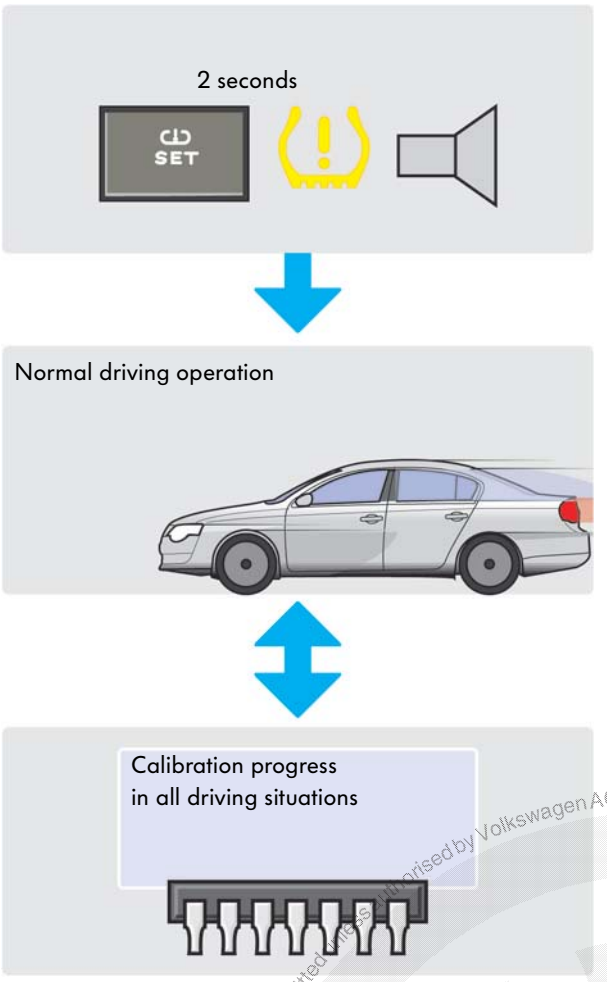
- Hold down the button for 2 seconds:
  - The tyre pressure monitor warning lamp is illuminated for 2 seconds,
  - a gong sounds,
  - the system calibration starts,
  - you can let go of the button.
- Hold down the button for 30 seconds or button sends a signal for 30 seconds:
  - The software recognises that a button is jammed or there is short-circuit,
  - The tyre pressure monitor warning lamp starts to illuminate and
  - An entry is made in the fault memory.
  - If the button contact is opened again, the lamp extinguishes when the ignition is turned on again and the fault memory is set to “sporadic”.

Tyre pressure monitor warning lamp states

State	Optical signals	Acoustic signals
Tyre pressure warning	 S347_005 ... until the system is re-calibrated after the tyre pressure has been adjusted.	Single gong each time ignition is turned on
Ignition on with existing tyre pressure warning	 ... until the system is re-calibrated after the tyre pressure has been adjusted.	Single gong each time ignition is turned on
System error	 ... until the system error is rectified. If you press the button to re-calibrate the system, it will not be accepted.	None

Calibration

As the tyre characteristics change, a calibration procedure needs to be carried out to determine new reference data whenever the inflation pressure has been changed, after any repair work on the chassis and after each time the tyres are changed.



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Starting calibration

To start calibration, you need to hold down the tyre pressure monitor display button for 2 seconds. The warning lamp in the dash panel insert illuminates for approx. 2 seconds. A gong also sounds.

The system calibrates itself in normal driving operation to the tyre pressures inflated by the driver and the tyres fitted. As the calibration progresses, it gradually transfers data to the tyre pressure monitoring system. After just a few minutes, rough monitoring is possible with the speeds and driving situations that the system has already learnt.

TPMD tyre pressure monitor display

Function requirements

Delay of a tyre pressure warning

The rolling circumference of a tyre, which is determined and used by the tyre pressure monitor display, depends on several factors. In addition to the tyre pressure, the following should be named:

- the drive and brake slip,
- the wheel position when cornering,
- the loading of the vehicle and
- the road conditions (the road surface, snow, ice, wet).

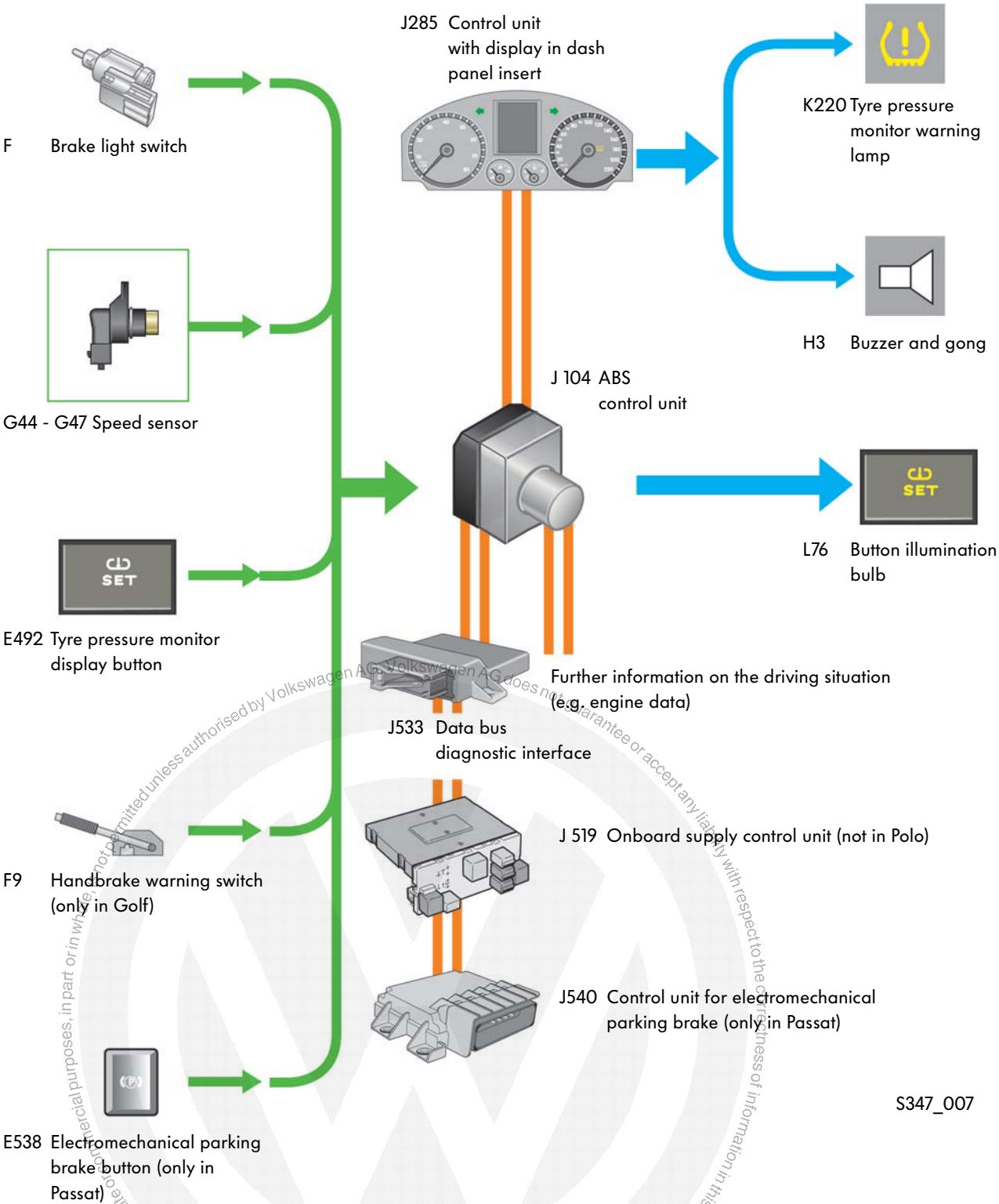
As the rolling circumference is determined for the tyre monitoring display from various operating data, it cannot clearly be based on the tyre pressure in certain situations.
That means: Data evaluation is stopped if the driver has a sporty driving style, the road surface is uneven and loose, when the driver brakes and when travelling uphill or downhill. It is not possible to detect a loss in pressure in these situations. Any tyre pressure warning is delayed until the driving conditions return to normal.

False warnings

False warnings can occur when several unfavourable situations occur in succession.
A false warning can be triggered if several of the following situations occur:

- different road surface conditions (e.g. one side of the road is icy and the other not),
- uneven loading of the vehicle,
- uneven tyres on one axle (e.g. one very worn and one new tyre) and
- uneven heating of the wheels on one side of the car due to direct sunlight.

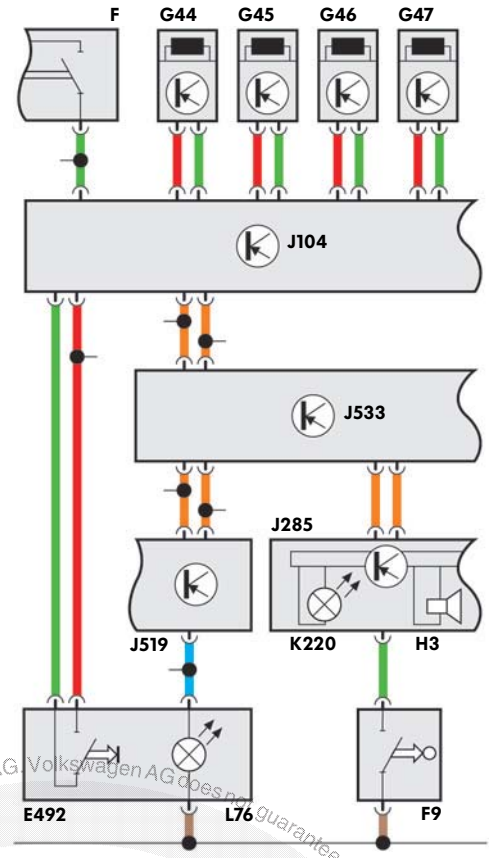
System overview



TPMD tyre pressure monitor display

Functional diagram

Golf functional diagram



S347_032

E492 Tyre pressure monitor display button

F Brake light switch
F9 Handbrake warning switch

G44 Rear right speed sensor
G45 Front right speed sensor
G46 Rear left speed sensor
G47 Front left speed sensor

H3 Buzzer and gong

K220 Tyre pressure monitor warning lamp

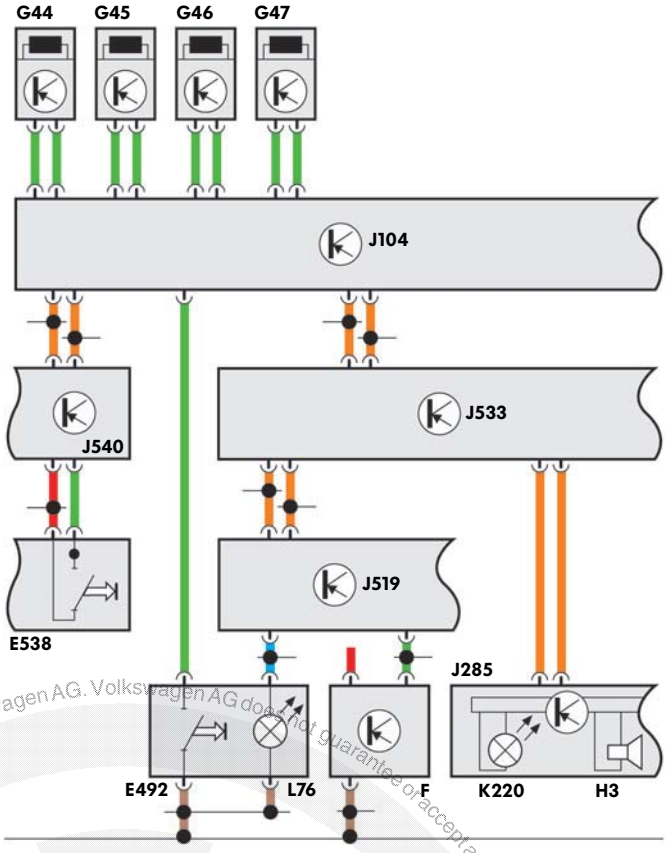
L76 Button illumination bulb

J104 ABS control unit
J285 Control unit with display in dash panel insert
J519 Onboard supply control unit
J533 Data bus diagnostic interface

Colour code/legend

- Input signal
- Output signal
- Positive
- Earth
- CAN data bus

Passat functional diagram



S347_072

E492 Tyre pressure monitor display button
E538 Electromechanical parking brake button

F Brake light switch

G44 Rear right speed sensor
G45 Front right speed sensor
G46 Rear left speed sensor
G47 Front left speed sensor

H3 Buzzer and gong

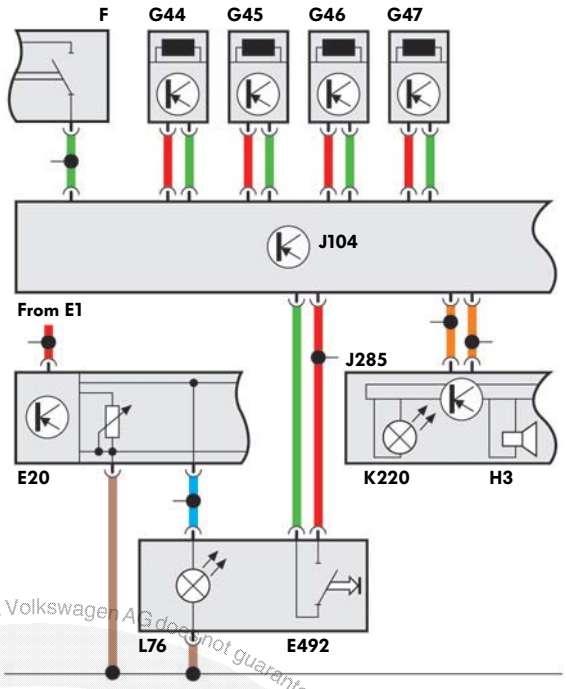
K220 Tyre pressure monitor warning lamp

L76 Button illumination bulb

J104 ABS control unit
J285 Control unit with display in dash panel insert
J519 Onboard supply control unit
J533 Data bus diagnostic interface
J540 Electromechanical parking brake control unit

TPMD tyre pressure monitor display

Polo functional diagram



S347_073

E1 Light switch
E20 Switches and instruments illumination regulator
E492 Tyre pressure monitor display button

F Brake light switch

G44 Rear right speed sensor
G45 Front right speed sensor
G46 Rear left speed sensor
G47 Front left speed sensor

H3 Buzzer and gong

K220 Tyre pressure monitor warning lamp

L76 Button illumination bulb

J104 ABS control unit
J285 Control unit with display in dash panel insert

Colour code/legend

- Input signal
- Output signal
- Positive
- Earth
- CAN data bus

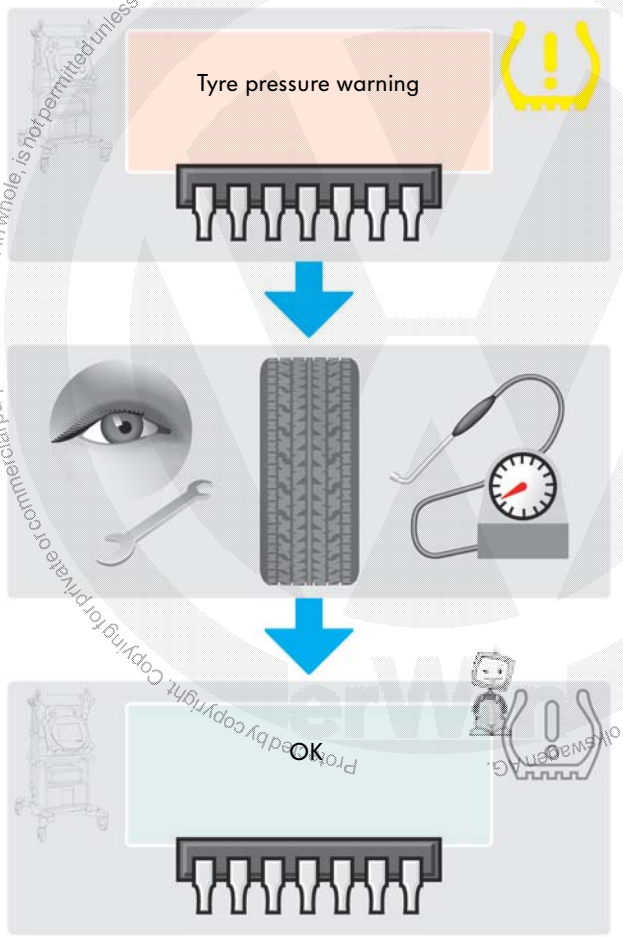
Service

Diagnosis

The fault memory for the tyre pressure monitor display is in the ABS control unit J104.

There are two (Golf) or four (Passat and Polo) different fault tyres:

- “Tyre pressure warning” entry (only Passat and Polo)
- “Tyre pressure warning faulty” entry
- “Tyre pressure warning: button faulty” entry
- “Tyre pressure warning limited function” entry (only Passat and Polo)



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Procedure for “tyre pressure warning”

If a tyre pressure warning is entered in the fault memory and the tyre pressure monitor warning lamp, the tyres should be examined for damage and the tyre pressures checked. Once the fault has been rectified, the calibration needs to be started so that the tyre pressure monitor warning lamp extinguishes.

“Sporadic” may be added at the end of the tyre pressure warning. In this case, a tyre pressure monitor warning was entered, but the warning was removed after the system was calibrated again. The tyre pressure monitor warning lamp does not illuminate. The tyre pressures and the tyres should be checked, however, before this fault memory entry is deleted.

TPMD tyre pressure monitor display

Procedure for “tyre pressure warning faulty”

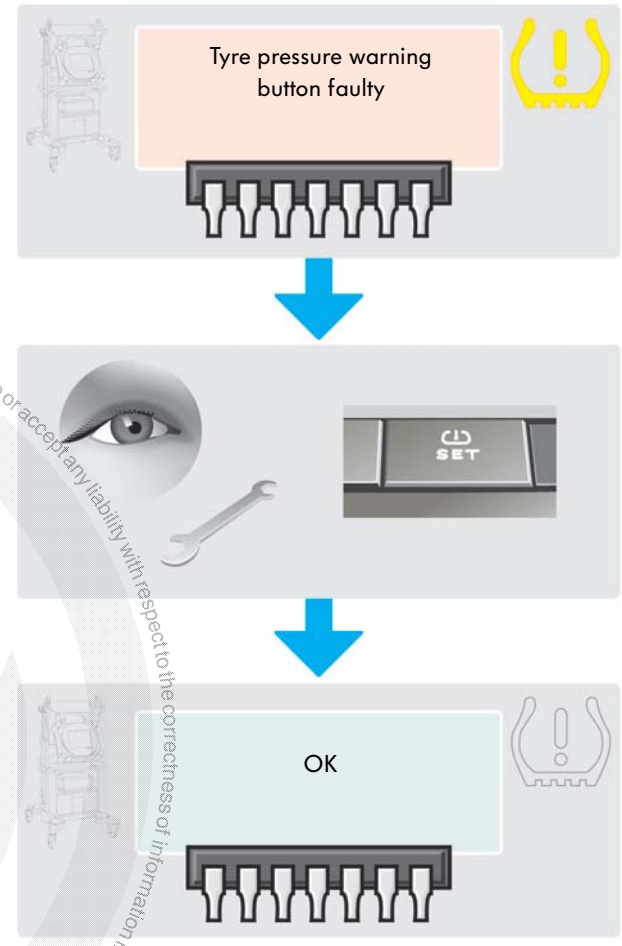
This fault message will be rare in practice. If it occurs in the fault memory, a system reset should be carried out. ELSA provides detailed information on the procedure.

Procedure for “tyre pressure warning button faulty”

If “Tyre pressure warning: Button faulty” is entered in the fault memory, the tyre pressure monitor display button has sent a signal for longer than 30 seconds. The tyre pressure monitor warning lamp illuminates.

“Sporadic” may be entered after the “Tyre pressure warning: Button faulty” if the button contact is no longer closed.

In both cases, the button should be checked (e.g. to see if it is jammed or there is moisture inside) and the system should be checked for a short-circuit before the fault memory is cleared.



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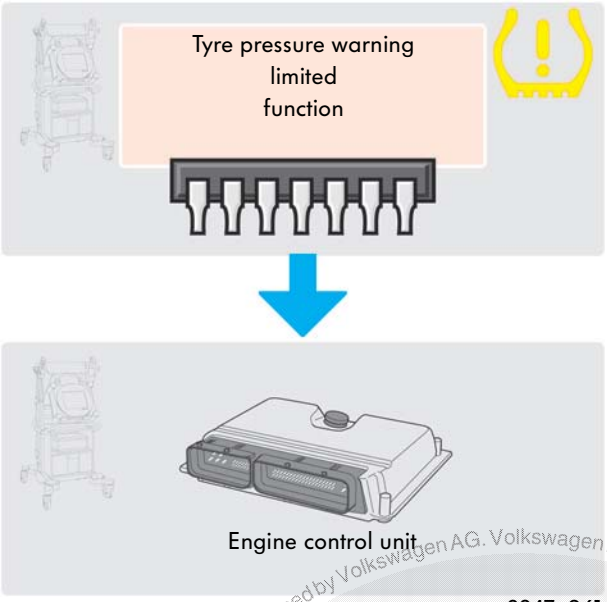
Please press the button to calibrate the system again after each time the tyres are changed and after repair work on the chassis. If you do not do this, the system may work with incorrect data.

Tell your customers if you make changes to the tyre pressure monitor display (e.g. system calibration).



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Procedure for “tyre pressure warning limited function”

If “tyre pressure warning limited function” is entered in the fault memory, the system is receiving insufficient data from the engine control unit. The tyre pressure monitor warning lamp does not illuminate. The system works with limited accuracy.

“Sporadic” may be added after “tyre pressure warning limited function” if the data has been received completely again in the meantime.

In both cases, the engine control unit fault memory should be read out and the cause rectified.

Please use the guided fault finding function and ELSA for diagnosis of the tyre pressure monitor display.

TPMD tyre pressure monitor display

Workshop information

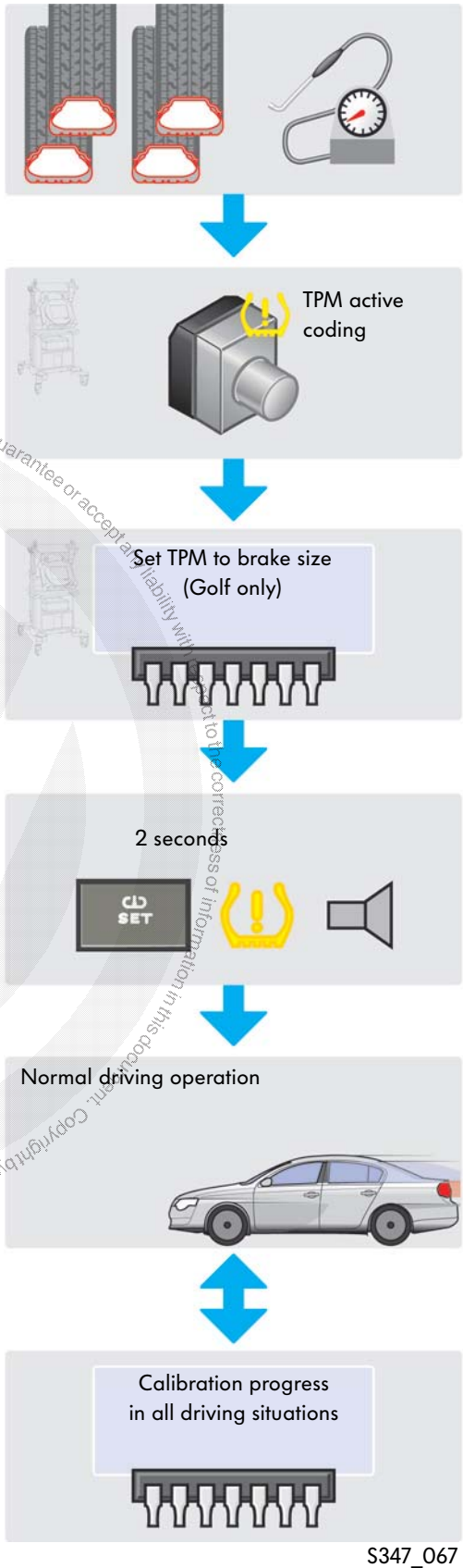
Replacing the ABS control unit J104

When you change the ABS control unit J104, you should observe the following:

- Is the vehicle equipped with the tyre pressure monitor or not?
  If yes, it needs to be coded actively and set to the brake size of the car for the Golf. After active coding, the tyre pressure monitor will automatically start with system calibration.

- The tyre pressures need to be inflated correctly before active coding.

- To test, you should press the tyre pressure monitor display button.
  The tyre pressure monitor warning lamp in the dash panel insert should then illuminate and the system calibration will start again.



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ELSA provides detailed information on the procedure.

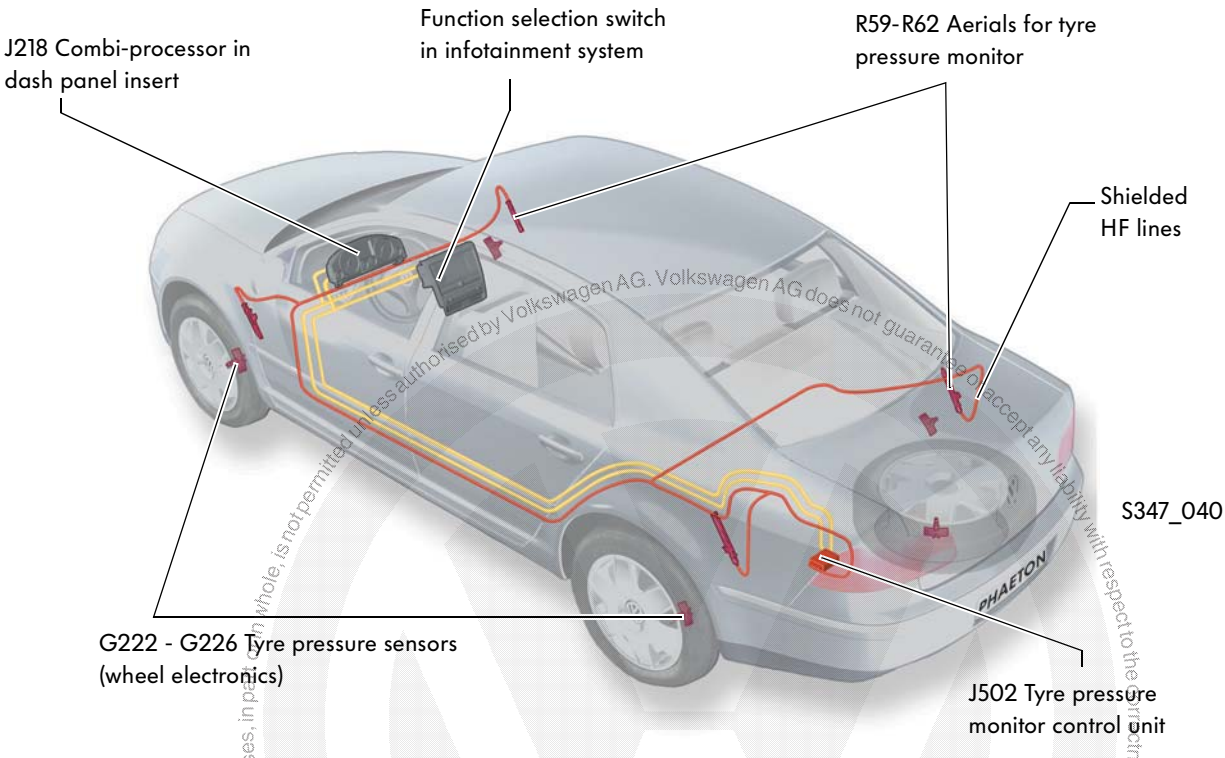
Differences between models

Golf	Passat	Polo
Signal from handbrake switch is evaluated.	Information from the electromechanical parking brake is evaluated.	Neither handbrake nor parking brake signal is evaluated.
No fault memory entry “tyre pressure monitor limited function” and “tyre pressure warning”.	“Tyre pressure monitor limited function” and “tyre pressure warning” fault memory implemented.	“Tyre pressure monitor limited function” and “tyre pressure warning” fault memory implemented.
Manual adaptation to brake size in software module for tyre pressure monitor display.	Automatic adaptation to brake size in software module for tyre pressure monitor display.	No adaptation to brake size in software module for tyre pressure monitor display.

TPM with position recognition

Design

The tyre pressure monitor with position recognition for the wheels is currently used in the Phaeton and Touareg and has the same basic configuration for both vehicles. The diagram below shows the Phaeton.



The tyre pressure monitor with position recognition constantly monitors the tyre pressure while the car is being driven. When the car is stationary, there is also tyre pressure monitoring over a short period.
The wheel electronics mounted on the tyres measure the tyre temperature and tyre pressure. This data is sent from the wheel electronics to the aerials in the wheel housings at regular intervals. The aerials are connected to the tyre pressure monitor control unit via shielded HF lines (high-frequency lines). The data is evaluated in the tyre pressure monitor control unit and forwarded to the control unit in the dash panel insert and also the infotainment system in the Phaeton.

The correct tyre pressures need to be inflated by the driver and accepted as specified tyre pressures by pressing a button.

In the Phaeton, it is operated via the infotainment system and, in the Touareg, via the “Convenience Setup” in the dash panel insert.

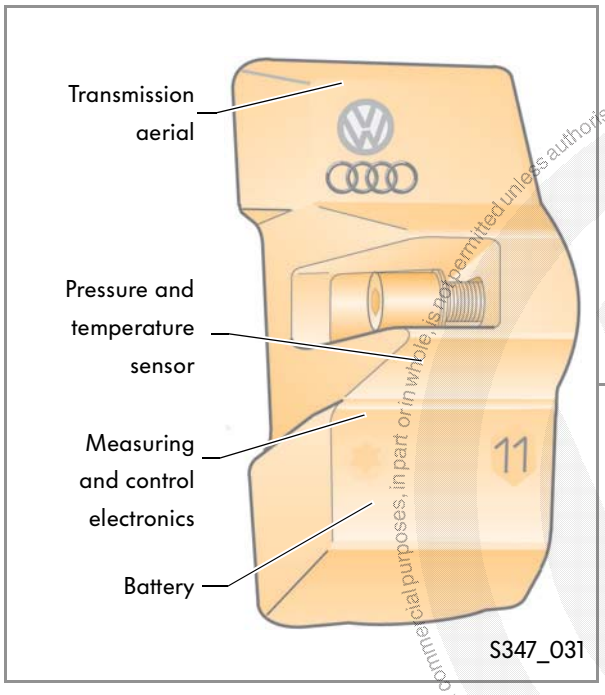
Messages and warnings are indicated by a lamp in the dash panel insert and text appears in the dash panel insert display.

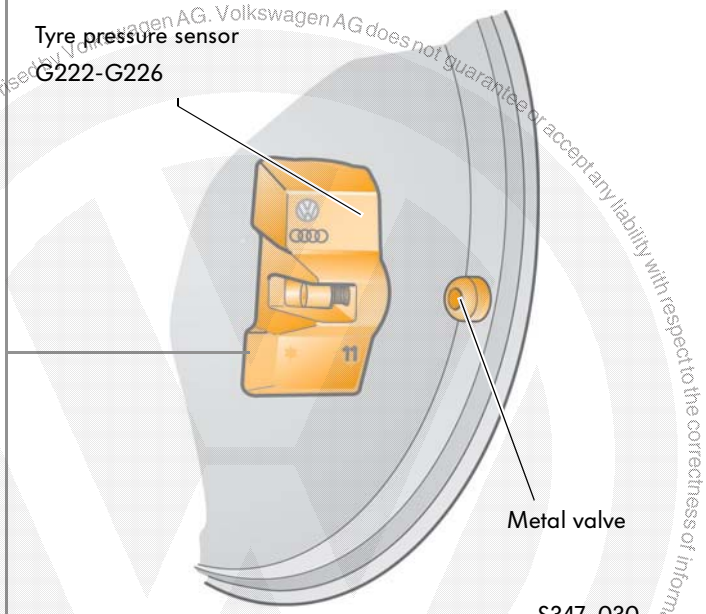
Wheel electronics set-up

The wheel electronics are screwed to the metal valves and can be used again when the wheels or tyres are changed.

The following components are integrated in the wheel electronics:

- are transmission aerial,
- a pressure and temperature sensor,
- the measuring and control electronics and
- a battery.





Transmission intervals

- Transmission interval of wheel electronics in normal operation:
  every 54 seconds.
- Transmission interval of wheel electronics in fast transmission mode (if pressure loss > 0.2bar/min):
  every 850 milliseconds.

To compensate the thicker walls of the Touareg tyres, the transmission power of the tyre pressure sensors has been increased. The Touareg sensors can be recognised by the eight white stars on the top.

Transmission power:

- Phaeton: 10µW–30µW
- Touareg: approx. 100µW

TPM with position recognition

Function

What is detected?

The tyre pressure monitor with position recognition in the Phaeton and Touareg has the following functions:

- Tyre pressure display with wheel position recognition (Phaeton: constantly in infotainment system; Touareg: in “Convenience Setup" when stationary)

- Recognition of slow loss of pressure:
  The driver is informed in good time to check the tyre pressure and correct it if necessary.

- Recognition of sudden loss of pressure:
  The driver is warned immediately as he drives.

- Detection of pressure loss when vehicle is stationary:
  The driver is warned immediately after he turns on the ignition.

Position detection is possible using the four aerials. Changes to the pressure can be assigned immediately to the respective tyre.

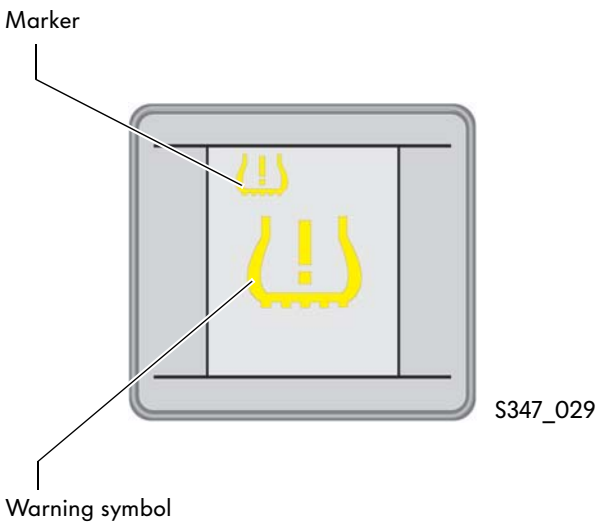
In the Phaeton, a full-size spare wheel is equipped with wheel electronics.
These signals are received by the aerials and assigned to the spare wheel.

When a wheel is changed, the new wheel electronics have to be learnt. This happens after a button is pressed while you drive. The vehicle needs to be travelling at least 25km/h.

The spare wheel and trailer are not monitored.

The externally mounted spare wheel on the Touareg may not be equipped with wheel electronics to avoid system interference.

Operation



Messages and warnings from the tyre pressure monitor with position recognition are indicated by two icons (marker and warning symbol) in the centre display of the dash panel insert.

In the Touareg, you will find the TPM functions in the “Tyre Pressure Monitor” menu in the “Convenience Setup” main menu in the dash panel insert. The “Convenience Setup” menu can only be called up when the car is stationary. You navigate through the “Tyre Pressure Monitor” menu item in the Touareg either using the steering column switch or the multifunction steering wheel.

In the Phaeton, the tyre pressure monitor is operated using the infotainment system in the “Vehicle” menu.

Tyre pressure monitor functions

The following functions can be called up in the “Convenience Setup” (Touareg) or in the Infotainment system (Phaeton):

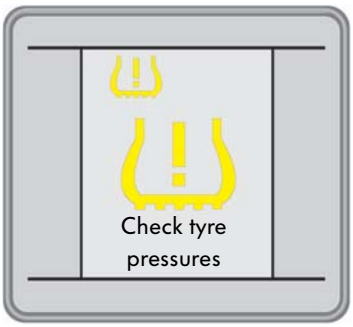
- ON/OFF: Switches the whole tyre pressure monitoring system on and off.
- MON. PRESSURES: The pressures that the driver inflated and stored for the monitoring are displayed. (This function is called “Specified pressures” in the Phaeton.)
- PRESSURE INFO: The specified pressures of the tyres at the current tyre temperature are displayed here. The driver can therefore also correct the tyre pressure when the tyres have warmed up when warnings are issued (add air).
- SAVE: After changing the tyre pressures (e.g. to correct to “fully loaded”) or when new wheel electronics are installed (e.g. in winter tyres), the tyre pressures set by the driver are accepted by the system as specified pressures to be monitored. This starts the vehicle learn process. (This function is called “Accept new specified pressures” in the Phaeton.)
- The Phaeton also has the “spare wheel monitoring” function.

TPM with position recognition

Messages in dash panel insert

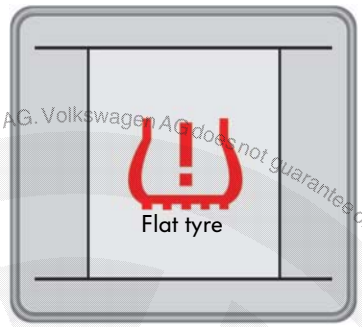
If the system is fully functioning and there are no warning messages, a TPM symbol will not appear in the dash panel insert.

At a pressure reduction from 0.3 to 0.4bar there is a soft warning. The adjacent display appears with a warning tone for 5 seconds and then also each time you turn on the ignition. The large symbol is hidden after 5 seconds. The marker remains until the tyres are inflated to the correct pressure.



S347_043

There is a hard warning at a pressure reduction greater than 0.4bar or a fast pressure loss of at least 0.2bar per minute. This indication cannot be acknowledged, i.e. it will not disappear when you press a button.

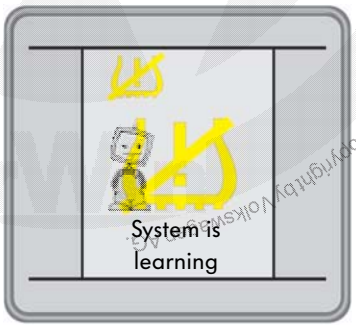


S347_042

If there was a puncture during an ignition procedure, the adjacent message will be displayed when the ignition is turned on.
Within the next 5–7 minutes, the system will check whether the tyre pressures are correct again.
If this is the case, the icons will disappear.

S347_070

When the system is learning, the adjacent display will appear as an indication that the TPM is not working correctly. The large icon will disappear after 5 seconds, the marker remains displayed until the learning process is completed.
The “system fault” and “system off” states are indicated by the same icons.



S347_041

Infotainment system in the Phaeton

In the Phaeton, the tyre pressure monitor is operated with the “Vehicle” function button in the infotainment system.

S347_028

System learn process

After any changes to the tyres on a car, the system learning process needs to be started in the tyre pressure monitor menu using the “SAVE” menu item (Touareg) or “Accept new specified pressures” (Phaeton).

Changes to the tyres can include:

- Correction of the tyre pressure from partial loading to full loading,
- installation of other wheel electronics on one or all wheels (e.g. winter wheels or changing a damaged wheel).

When wheels without wheel electronics are fitted, the system should be switched off.

The learning process only starts when you drive faster than 5 km/h. It takes approx. 7–10 minutes if the data is received without interference. When the learning process is completed, the marker in the dash panel insert disappears.

The learning process involves:

- Detection of the actual tyre pressures.
- Acceptance of the actual tyre pressures as specified tyre pressures.
- Check whether the previous wheel electronics are still installed in the vehicle. If they have been changed, they will be learnt again.
- Check whether the position of the wheel electronics has changed. If this is the case, the new positions will be stored.

You will find more information on tyre pressure monitoring with position recognition in self-study programme 277 “The Phaeton – Chassis” and self-study programme 302 “The Touareg – Chassis and four-wheel drive concept”.
Information on operation of the tyre pressure monitoring system in the Phaeton can also be found in the multimedia training programme “The Phaeton – Infotainment Simulation”.

TPM with position recognition

Function requirements

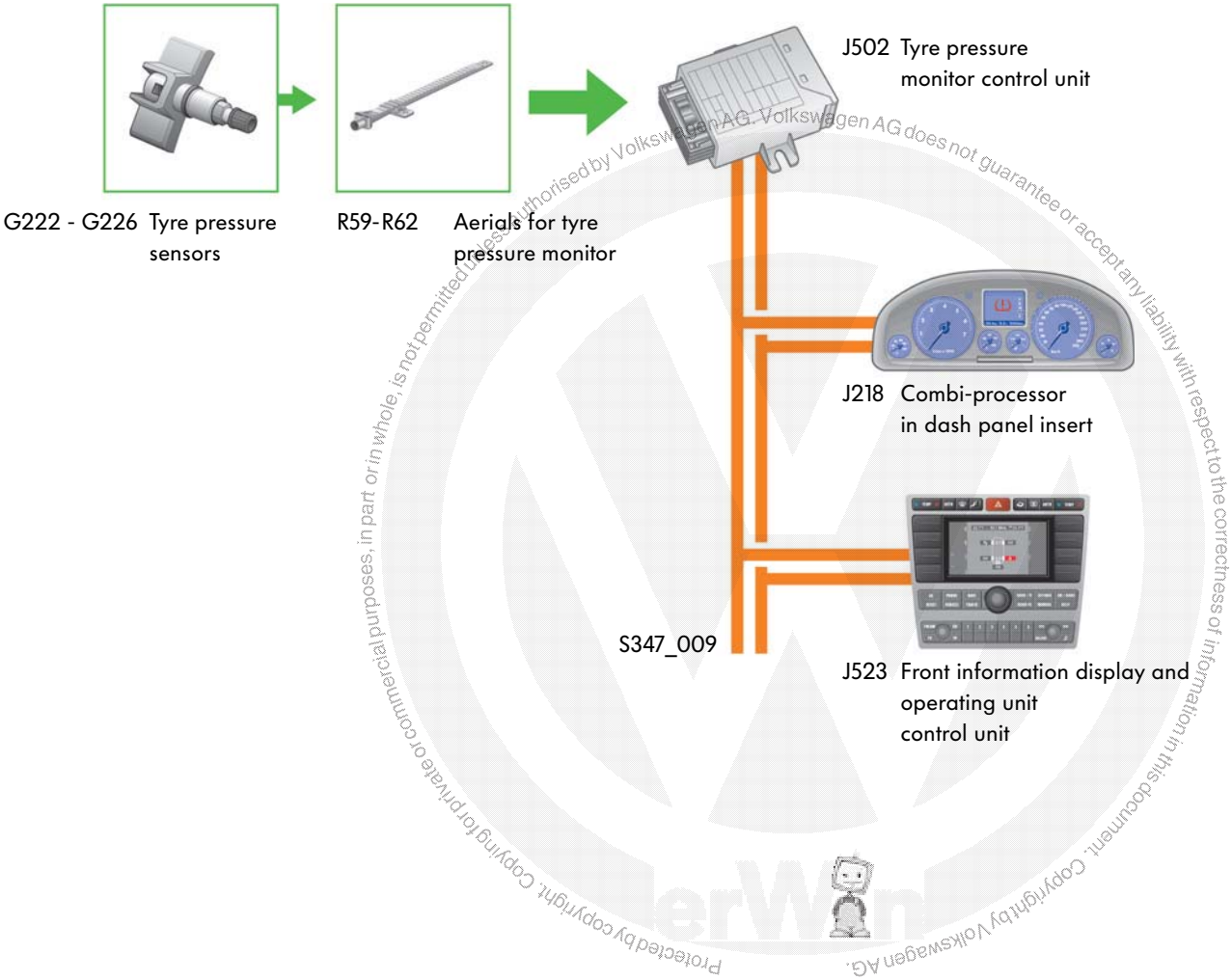
The following conditions need to be met so that the tyre pressure monitor works properly:

1. The driver has to inflate the tyres to the correct pressure also observing the different tyre pressures for full and partial loading.

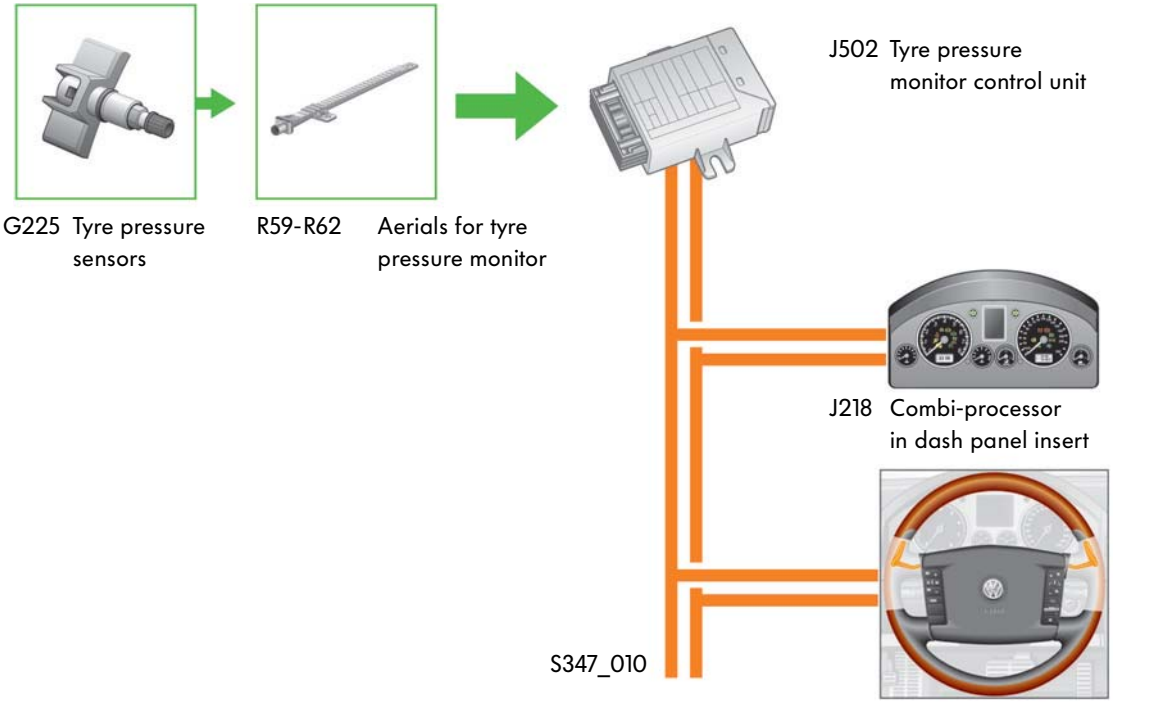
2. External radio interference sources may not interfere with the wireless connection between wheel electronics and aerials.

3. The batteries in the wheel electronics should not have run flat. The life of the batteries is approx. 10 years.

Phaeton system overview



Touareg system overview



Electrical components

Tyre pressure sensors G222-G226

Sent information

The tyre pressure sensors G222-G226 transfer the following data via the individual integrated sensors:

- Tyre pressure and
- tyre temperature,
- the specific identification numbers (ID),
- the state of the integrated battery and
- the status, synchronisation and control information required for safe data transfer.

Signal use

The signals from the tyre pressure sensors contain the current measured tyre pressure with which the tyre pressure monitor control unit can recognise critical tyre situations and can inform the driver.

Sensor failure

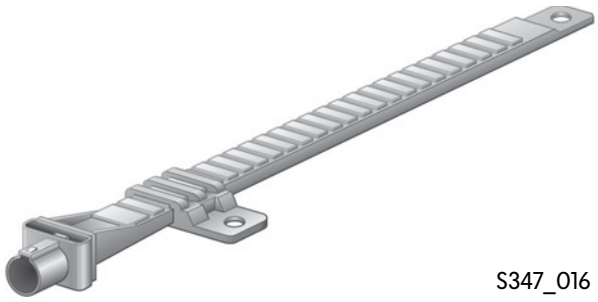
When a sensor fails, a fault message is displayed in the dash panel insert.

TPM with position recognition

Aerials for tyre pressure monitor R59-R62

Function

Each aerial receives the radio signals from all tyre pressure sensors within its range. The power of the received radio signal is decisive for recognition of the nearest wheel electronics.



S347_016

Signal use

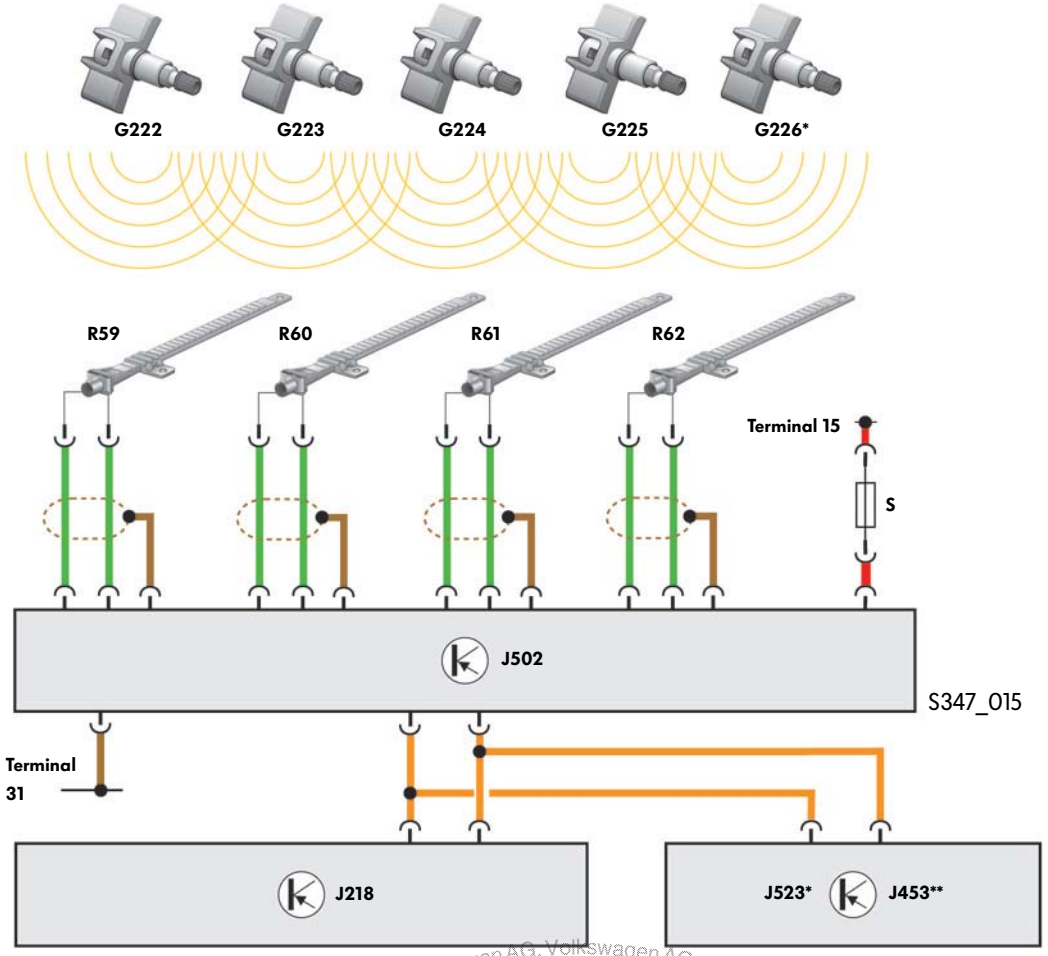
The aerials forward the received signals for further processing to the tyre pressure monitor control unit.

They are connected to the control unit via high-frequency aerial cables and assigned in the control unit according to their location.

Effects upon failure

When one aerial fails, the system still works because the other three aerials receive the signals from the wheel electronics and can assign the positions accordingly.
If two aerials fail at the same time, the system will not be able to perform a learn process and wheel position recognition will no longer be possible. Therefore, when the learn process is started, the "system fault" message will be issued.

Functional diagram



G222	Front left tyre pressure sensor
G223	Front right tyre pressure sensor
G224	Rear left tyre pressure sensor
G225	Rear right tyre pressure sensor
G226	Spare wheel tyre pressure sensor
J218	Combi-processor in dash panel insert
J453	Multifunction steering wheel control unit
J502	Tyre pressure monitor control unit
J523	Front information display and operating unit control unit
*	only in Phaeton
**	only in Touareg

R59	Front left tyre pressure monitor aerial
R60	Front right tyre pressure monitor aerial
R61	Rear left tyre pressure monitor aerial
R62	Rear right tyre pressure monitoring aerial
S	Fuse

Colour code/legend

- Input signal
- Positive
- Earth
- CAN data bus
- Wireless connection

TPM with position recognition

Service

Diagnosis

The tyre pressure monitor control unit J502 can be read with the VAS 5051/VAS 5052 for diagnosis of the tyre pressure monitor with position recognition in the Phaeton and Touareg.

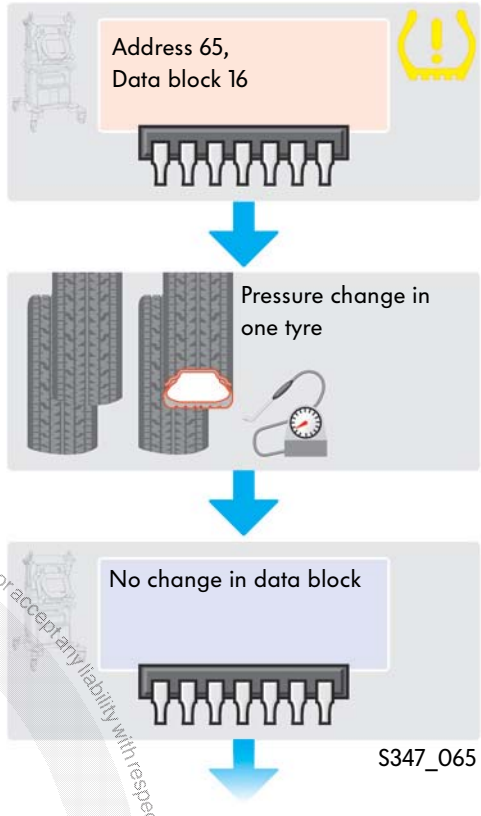
Detecting faulty wheel electronics

If the wheel electronics have been learnt, the faulty wheel electronics unit is indicated with position. If, however, one wheel electronics unit is faulty in a new set, the system will not be able to carry out a learn process. Therefore the position of the faulty wheel electronics unit is not displayed.

In this case, the faulty wheel electronics have to be determined as follows:

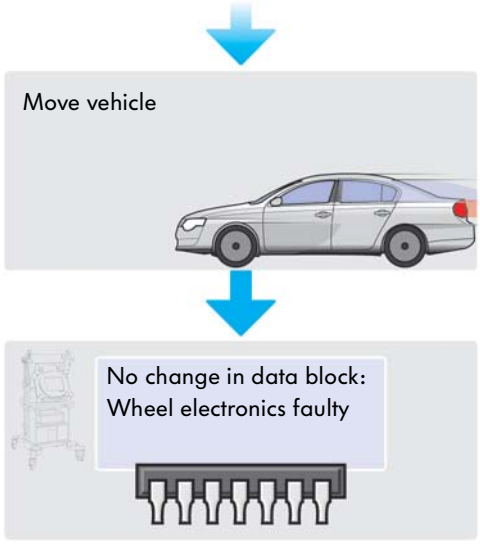
1. Call up the corresponding diagnosis address (address 65, read data block MWB 16). The identification number (ID) of the wheel electronics that last sent a data telegram is entered here.

2. Change pressure on a tyre by at least 0.2 bar per minute (e.g. release pressure).
   If the wheel electronics on the wheel where you changed the pressure are not faulty, it will be now be entered in data block 16 with status 02 (wheel electronics have signals due to a fast pressure change). If this is the case, the wheel electronics are not faulty. The procedure should then be repeated with the next wheel.



S347_065

ELSA provides detailed information on the procedure.



S347_071

3. If the data block entry is not changed despite the change to the pressure of one tyre, you need to rule out that the signal reception from the respective wheel electronics is working properly. Do this by changing the position of the valve slightly by moving the vehicle.

4. If the entry for the last wheel electronics signal received still has not changed, the corresponding wheel electronics are faulty.

Replacing the tyre pressure monitor control unit J502

The following work needs to be carried out after the tyre pressure monitor control unit J502 has been replaced:

- Active coding of system with the VAS 5051/VAS 5052,
- inflating tyres to pressure specified on the tyre pressure label inside the fuel filler flap,
- acceptance of new specified pressures:
  "Vehicle" menu in the Infotainment system in the Phaeton,
  in the "Convenience Setup" in the Touareg.
- Starting the system learn process with a learning drive.

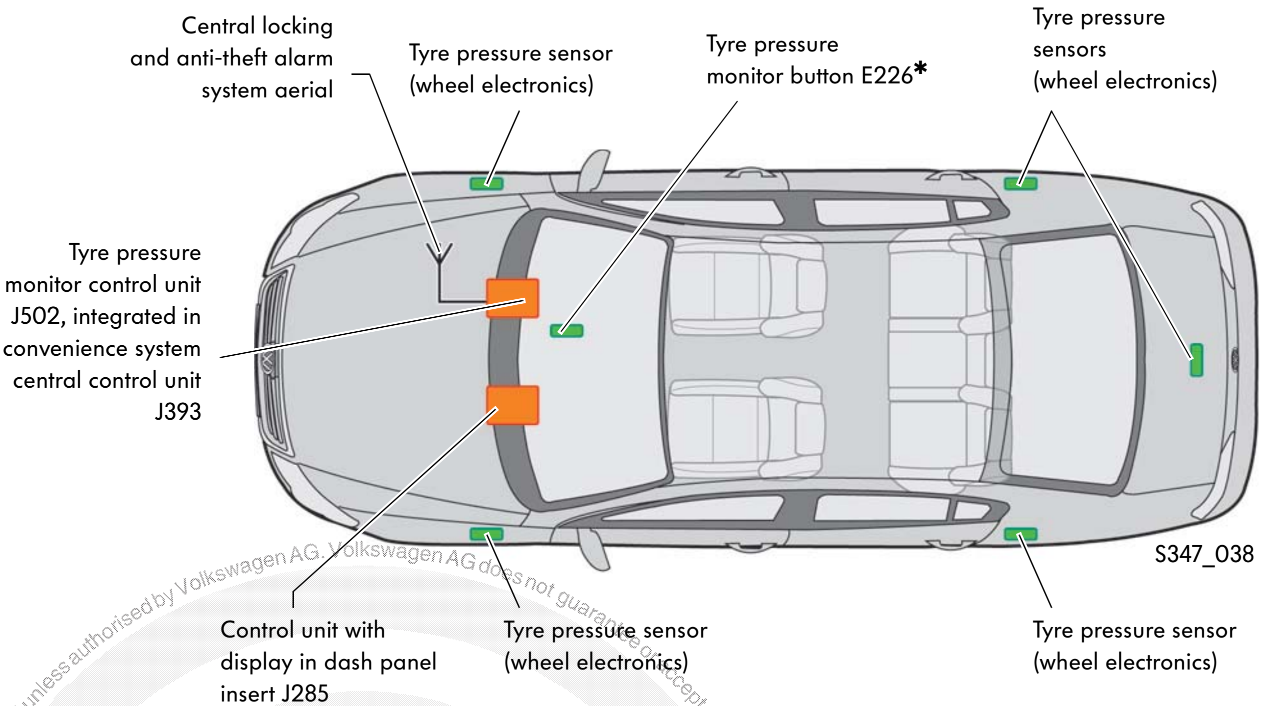
Differences between models

Phaeton	**Touareg**
Operation via "Vehicle" in infotainment system.	Operating via multifunction steering wheel or steering column switch in the "Convenience Setup" menu.
Monitoring the spare wheel if present.	Monitoring of external spare wheel not possible.

TPM without position recognition

Design

Wheel electronics are mounted on each wheel in the tyre pressure monitor system without position recognition used in the Passat.
The wheel electronics send data telegrams at regular intervals, which are received by the central locking and anti-theft alarm system aerial and forwarded to the tyre pressure monitor control unit J502.
The control unit has its own diagnosis address in the convenience system central control unit.



S347_038

The specified tyre pressures (monitoring pressures) are stored in the factory. The pressures are valid for a set of wheels with tyres that are approved by the authorities and Volkswagen as specified on the fuel filler flap. The specified tyre pressures for partial and full loading of the vehicle are preset and may not be changed.

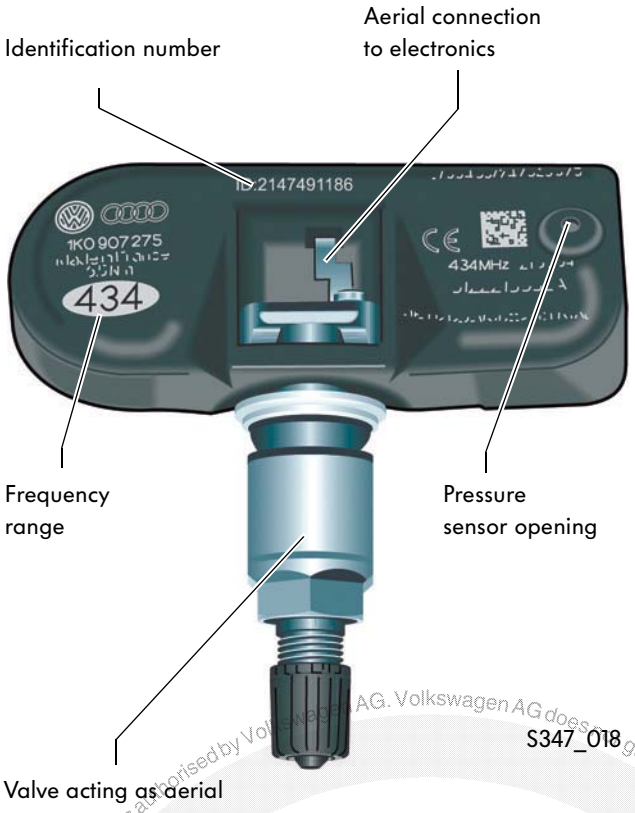
The driver can use the button in the centre console to switch between partial and full loading, to check the status and switch the tyre pressure monitor on and off.*

Messages and warnings are indicated by the lamp in the dash panel insert and text appears in the dash panel insert display.

It is planned to also use the TPM without position recognition in the Golf in the future.

* Not for the North America region (NAR)

Wheel electronics set-up



The wheel electronics of the TPM without position recognition have a different configuration to the TPM with position recognition in the Touareg and Phaeton. They have the following components:

- a pressure sensor,
- a temperature sensor,
- an acceleration sensor,
- a battery,
- measuring and control electronics and
- a transmission aerial.

The valve is used as an aerial so that the signals are not shielded by the tyre materials. The valve is connected to the measuring and control electronics for the wheel electronics.

Technical Data

- Power supplied from high-temperature resistant lithium-ion batteries (life approx. 10 years)
- Transmission frequencies 315 MHz and 434.42 MHz (depending on country, in Germany 434.42 MHz)
- Weight approx. 45 g with valve
- Operating temperature -40 °C to 120 °C

Transmission intervals

- Transmission interval of wheel electronics when driving above 25 km/h:
  At first, 30 data telegrams with a transmission interval of 15 seconds, the subsequent data telegrams with a transmission interval of 60 seconds.

- Transmission interval of wheel electronics in fast transmission mode (if pressure loss > 0.2 bar/min):
  Every 15 seconds.

TPM without position recognition

Function

Not for the North America region (NAR)

The tyre pressure monitor without position recognition in vehicles for the North America region (NAR) is installed without the tyre pressure monitor button. The system without the button works in exactly the same way as the system with button except for the button functions and the lack of “soft warning”.

Wheel electronics

The wheel electronics installed in the wheel constantly measure the internal tyre temperature, the inflation pressure and the centrifugal acceleration of the respective tyre. The data telegrams are sent depending on the state of the vehicle.

When the car is stationary or travelling below 25 km/h, no data telegrams are sent unless the wheel electronics recognise a fast change in pressure of more than 0.2 bar per minute.

If the wheel electronics recognise centrifugal acceleration above 5 g (corresponding with a vehicle speed above approx. 25 km/h), 30 data telegrams will be sent with a transmission interval of 15 seconds. After that, i.e. in normal driving, the wheel electronics send one data telegram per minute.

After any fast pressure change of more than 0.2 bar per minute, the wheel electronics send a data telegram every 15 seconds.

When stationary:
No data telegrams without fast pressure change

S347_055

Above approx. 25 km/h:
30 data telegrams with a transmission interval of 15 sec.

S347_068

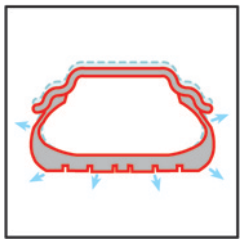
Normal driving operation:
One data telegram per minute

S347_057

What is detected?

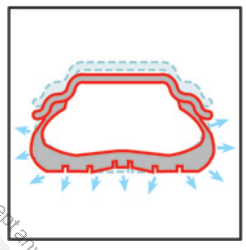
The tyre pressure monitor without position recognition in the Passat recognises three critical tyre conditions, in which warnings for the driver are indicated by the lamps and the display in the dash panel insert:

- the actual tyre pressures deviate slightly under the specified tyre pressures in the range 0.3 to 0.4bar (soft warning without gong)*,



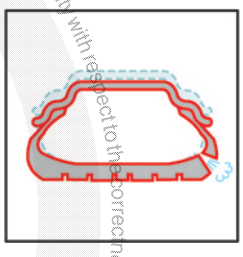
S347_035

- large, but not sudden deviation of the actual tyre pressures from the specified tyre pressures above 0.4bar (hard warning with gong),



S347_036

- sudden great deviation of actual tyre pressures from the specified tyre pressures in the range of more than 0.2bar per minute (hard warning with warning tone).



S347_037

If one component from the tyre pressure monitor without position recognition in the Passat fails or radio interference is detected, the tyre pressure warning lamp in the dash panel insert will inform the driver.

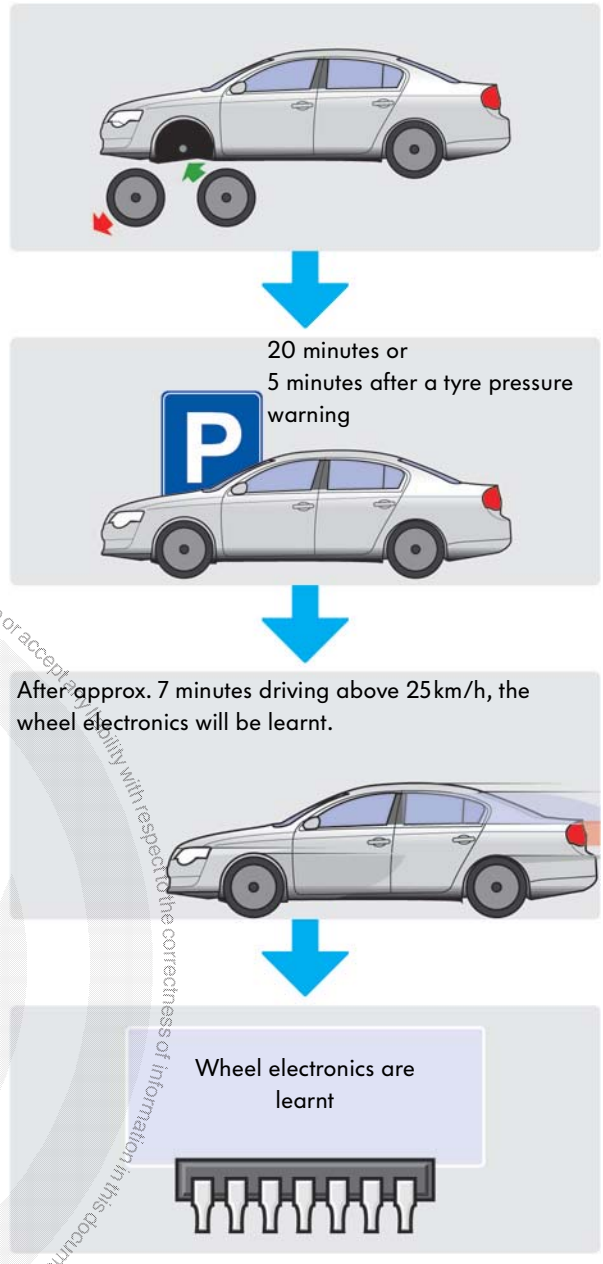
* Not for the North America region (NAR)

TPM without position recognition

Changing wheels

If you change wheels, the wheel electronics will send data as soon as the speed of the new wheels is more than 25km/h. The identification numbers of the new wheel electronics are recognised and read automatically. The acceleration data is also checked with the vehicle speed. This procedure takes approx. 7 min.

The tyre pressure monitor control unit needs to switch to learn stand-by before it can automatically start a learn process for the wheel electronics. The vehicle needs to be stationary for 20 minutes for this. After a tyre puncture has been recognised, it will take 5 minutes. If the stationary time is not observed and the control unit is thus not in learn stand-by, the system will recognise radio interference and will only start learning the wheel electronics after a stationary period of 20 minutes.



S347_063

Spare wheel

Wheel electronics can be fitted on a full-size spare wheel. As long as the spare wheel is not fitted, the wheel electronics will not transmit any signals. However, if the wheel electronics recognise centrifugal acceleration above 5g (approx. 25km/h vehicle speed), it will send data telegrams that are received by the tyre pressure monitor control unit. The control unit then stores the data and the identification number of the new wheel electronics integrated in the system.

Temporary spare wheels and trailers are not monitored by the tyre pressure monitor without position recognition in the Passat.

The factory preset specified tyre pressures (for wheel set 1) cannot be changed.

If you use tyres that require other tyre pressures than those specified on the label inside the tank filler flap, it is possible to enter specified tyre pressures for a second wheel set.

Operation*

It is operated using the tyre pressure monitor button E226 on the centre console next to the gearstick. The button sends a signal as long as you hold it down. Depending on the state of the tyre pressure monitor system, the following procedures can be carried out according to how long you hold down the button:

S347_054

- Status query,
- switch between full and partial loading,
- switch on or off.

* Not for the North America region (NAR)

TPM without position recognition

Use of button*

S347_006

Time button held	up to 2 sec.	3-7 sec.	8-10 sec.	11-15 sec.
	Actual state	**Switch**	**Confirm**	**Switch off**
Required functions:	Messages:	Messages:	Messages:	Messages:
Switch from full to partial loading	"Tyre full load monitored" (gong)	"Tyre part load on"	When released: Gong confirms switchover	
Switch from partial to full loading	"Tyre full load monitored" (gong)	"Tyre full load on"	When released: Gong confirms switchover	
Switch on	"Tyre check off" (gong)	"Tyre part load on"	When released: Gong confirms activation	
Switch off	"Tyre full load monitored" or "Tyre full load monitored" (gong)	"Tyre part load on" or "Tyre full load on"		"Tyre check off" (gong)
Status query	For example: "Tyre check off" or "Tyre full load monitored" (gong)	After releasing: "Press ON switch longer" or "Press CHANGE or OFF longer"		

If the button is held for longer than 40 seconds or if it sticks, this will be entered in the fault memory.

* Not for the North America region (NAR)

Tyre pressure warning lamp messages

State	Visual signals	Acoustic signals	Text messages in dash panel insert display
Ignition on	 S347_005 2 seconds	None	None
Soft warning:* Slight deviation from specified tyre pressure (0.3 to 0.4bar)	None*	None*	“Check tyre pressures” * (for approx. 5 seconds after ignition switched on)
Hard warning with gong: Greater deviation from specified tyre pressure (over 0.4bar)	 ... until specified tyre pressure is restored.	Gong once	“Tyre pressures too low” (hide with the multifunction display button)
Hard warning with warning sound: sudden change to the tyre pressure (more than 0.2bar per minute)	 ... until specified tyre pressure is restored.	Warning tone once	“Flat tyre”
System fault or radio interference	 ... until the fault or the interference has been rectified.	None 	None

* Not for the North America region (NAR)

TPM without position recognition

Function requirements

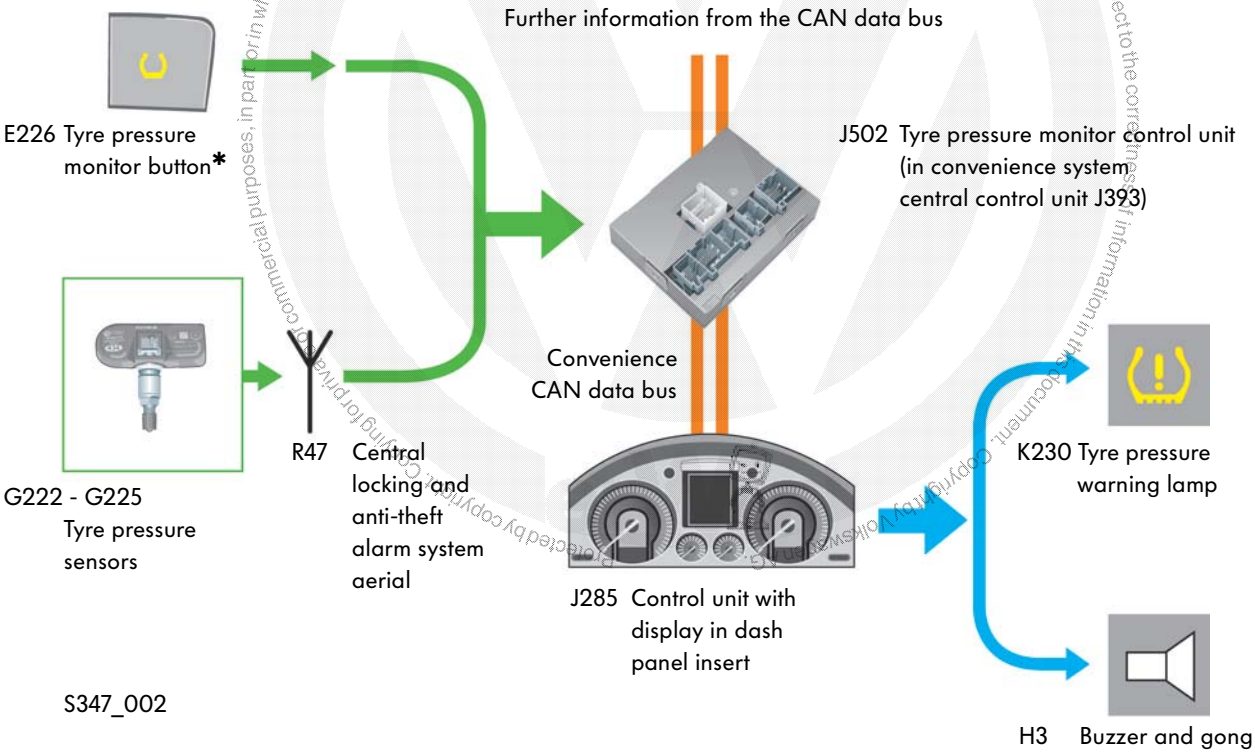
As with the TPM with position recognition in the Phaeton and Touareg, the following requirements need to be met for the system in the Passat to work properly:

1. The driver has to inflate the tyres to the correct pressure also observing the different tyre pressures for full and partial loading.

2. External radio interference sources may not interfere with the wireless connection between wheel electronics and aerials.

3. The batteries in the wheel electronics should not have run flat. The life of the batteries is approx. 10 years.

System overview

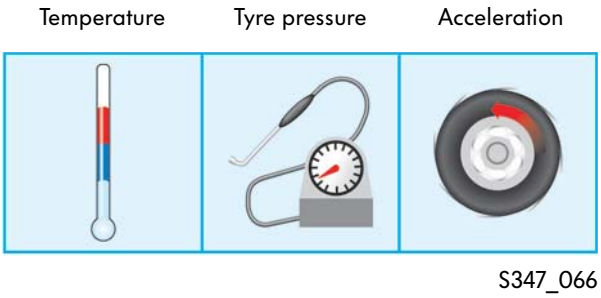


* Not for the North America region (NAR)

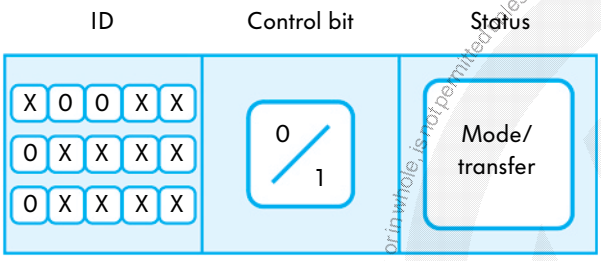
Electrical components

Wheel electronics

The wheel electronics or tyre pressure sensors do not have their own address words as their memories cannot be read separately using the VAS 5051/VAS 5052.



S347_066



S347_074

Sent information

The wheel electronics transfer the following information via the integrated individual sensors:

- Tyre pressure,
- tyre air temperature and
- wheel acceleration.

Furthermore the wheel electronics transfer the following additional information:

- their own identification numbers (ID),
- a control bit and
- their own status.

Signal use

The signals from the wheel electronics are used by the tyre pressure monitor control unit J502 to analyse the tyre pressures and, if necessary, inform or warn the driver.

Sensor failure

Failure of wheel electronics is registered by the control unit. It creates an entry in the fault memory and a message for the driver.

TPM without position recognition

Use of the individual information from the wheel electronics

Tyre pressure

Pressure changes in the tyres are recognised using the tyre pressure data.

Tyre air temperature

The tyre air temperature is used to evaluate the measured tyre pressure.

Wheel acceleration

The wheel acceleration data is compared with the current vehicle speed.

Comparing the acceleration should prevent the tyre pressure monitor control unit J502 recognising wheel electronics from other vehicles as its own.

Control bit

The control bit allows the sensor to signal that it has recognised an internal fault.

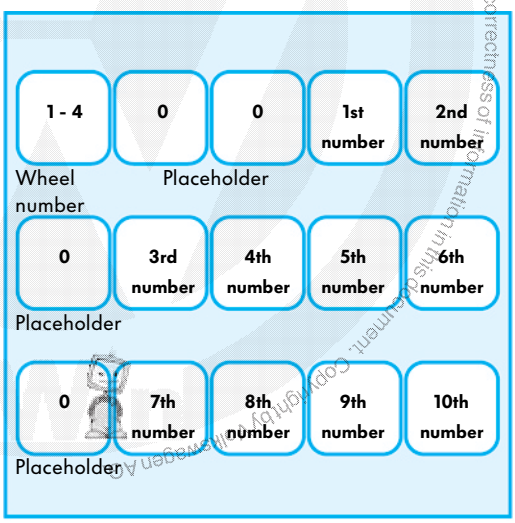
Status information

Information on the wheel electronics mode and the cause of a data telegram transmission.

Identification number

Each wheel electronics unit has a ten-figure identification number (ID). This is included in each data transmission so that the information from the respective wheel electronics can be assigned.

Adjacent you will find a schematic diagram of wheel electronics ID in the corresponding adjustment channels.



S347_069

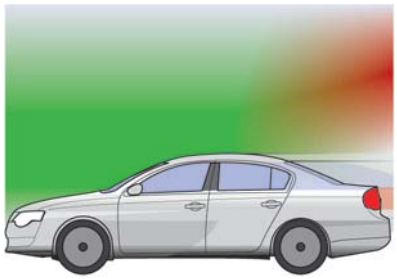
ELSA provides the latest information.

Wheel electronic modes

The wheel electronic have various modes.

There are the following modes:

- Drive mode:
  The wheel electronics are active and send a data telegram every minute.



S347_057

- Sleep mode (also: test mode):
  The delivered state (sleep mode) of the wheel electronics is only active when the vehicle is delivered.
  The wheel electronics do not send any data telegrams. It switches to drive mode when the vehicle is driven faster than 25km/h for at least 4 minutes.

S347_056

- Park mode (energy saving mode):
  No data telegrams are sent, but the wheel electronics measure and are ready.

S347_055

- 30B (30-block mode):
  The wheel electronics are currently in the mode , in which they send 30 data telegrams with a transmission interval of 15 seconds.

S347_075

TPM without position recognition

Tyre pressure monitor button E226*

S347_011

Function

The tyre pressure monitor button E226 is a button with short-circuit to earth. When it is pressed, it will send a signal to the tyre pressure monitor control unit J502 (module convenience system central control unit) via a fixed line.

Signal use

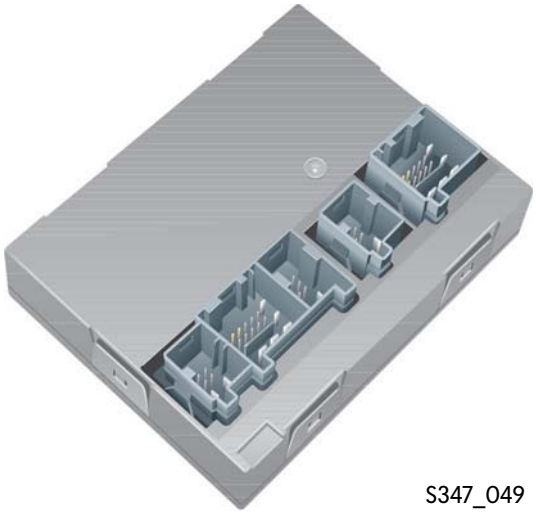
Depending on the length of the signal sent, the driver's requirements (switch on/off, status information, switch between partial/full loading) are recognised by the control unit and carried out.

Effects upon failure

An entry is made in the fault memory when the button fails.

* Not for the North America region (NAR)

Tyre pressure monitor control unit J502



S347_049

The tyre pressure monitor control unit J502 is integrated in the convenience system central control unit and has its own diagnosis address with the address word 65.

If the control unit fails and does not send data to the CAN data bus, the tyre pressure warning lamp K230 will be illuminated.

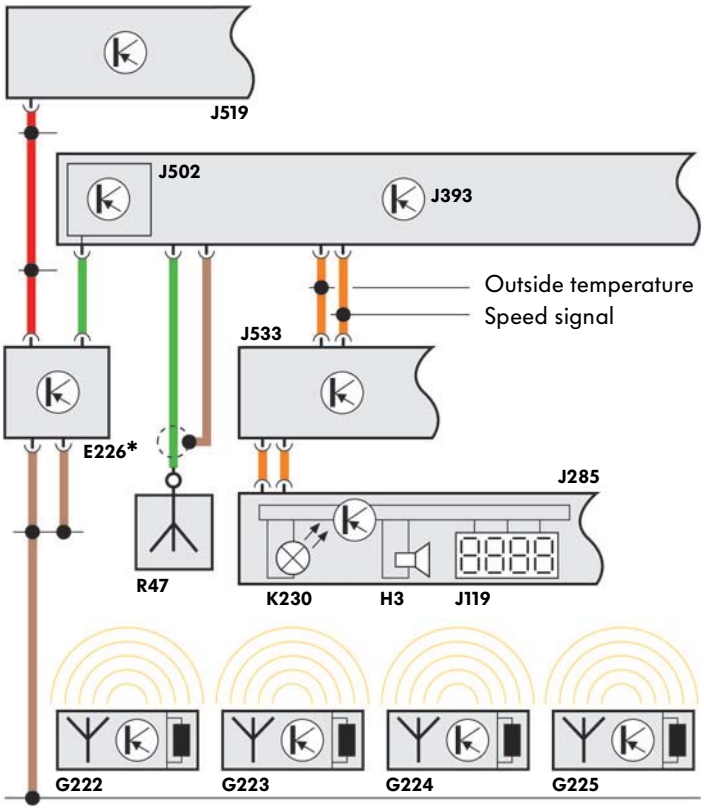
When the convenience system central control unit J393 is updated or replaced (only TPM without position recognition), the following entries need to be made:

- Coding of the system and
- entry of the specified tyre pressures.

ELSA provides detailed information on the procedure.

TPM without position recognition

Functional diagram



S347_004

E226 Tyre pressure monitor button*

G222 Front left tyre pressure sensor
G223 Front right tyre pressure sensor
G224 Rear left tyre pressure sensor
G225 Rear right tyre pressure sensor

H3 Buzzer and gong

J119 Multifunction display
(only on vehicles with multifunction display)
J285 Control unit with display in dash panel insert
J393 Convenience system central control unit
J502 Tyre pressure monitor control unit
J519 Onboard supply control unit
J533 Data bus diagnostic interface

K230 Tyre pressure warning lamp

R47 Central locking and anti-theft alarm system aerial

Colour code/legend

- Input signal
- Output signal
- Positive
- Earth
- CAN data bus

* Not for the North America region (NAR)

Service

Sets of tyres with other specified tyre pressures

If a vehicle is fitted with tyres which require different specified tyre pressures to those specified inside the fuel filler flap, these tyres can also be monitored with the tyre pressure monitor (wheel set 2). Tyre pressures for a second set of tyre need to be set in the system using the VAS 5051/VAS 5052. The wheel electronics in the second set of wheels will not be recognised and learnt automatically by the tyre pressure monitor (like wheel electronics on the set of wheels with regular tyres).

To switch to wheel set 2, you need to carry out the following work:

- Read identification numbers (IDs) of wheel electronics (tyre pressure sensors) before fitting.
- Switch the TPM to wheel set 2.
- Enter the necessary specified tyre pressures and the IDs of the wheel electronics in the system.

Adjustment channels

- Adjustment channel 2:
  Switch monitoring from wheel set 1 to 2 and back
- Adjustment channels 10 - 12:
  Enter wheel electronics IDs for wheel set 2
- Adjustment channel 5:
  Specified pressure full load axle 1
- Adjustment channel 6:
  Specified pressure partial load axle 1*
- Adjustment channel 7:
  Specified pressure full load axle 2
- Adjustment channel 8:
  Specified pressure partial load axle 2*

Data blocks

- Data block 25:
  Entry for which wheel set is being monitored.
- Data block 23:
  Specified pressures wheel set 1
- Data block 24:
  Specified pressures wheel set 2

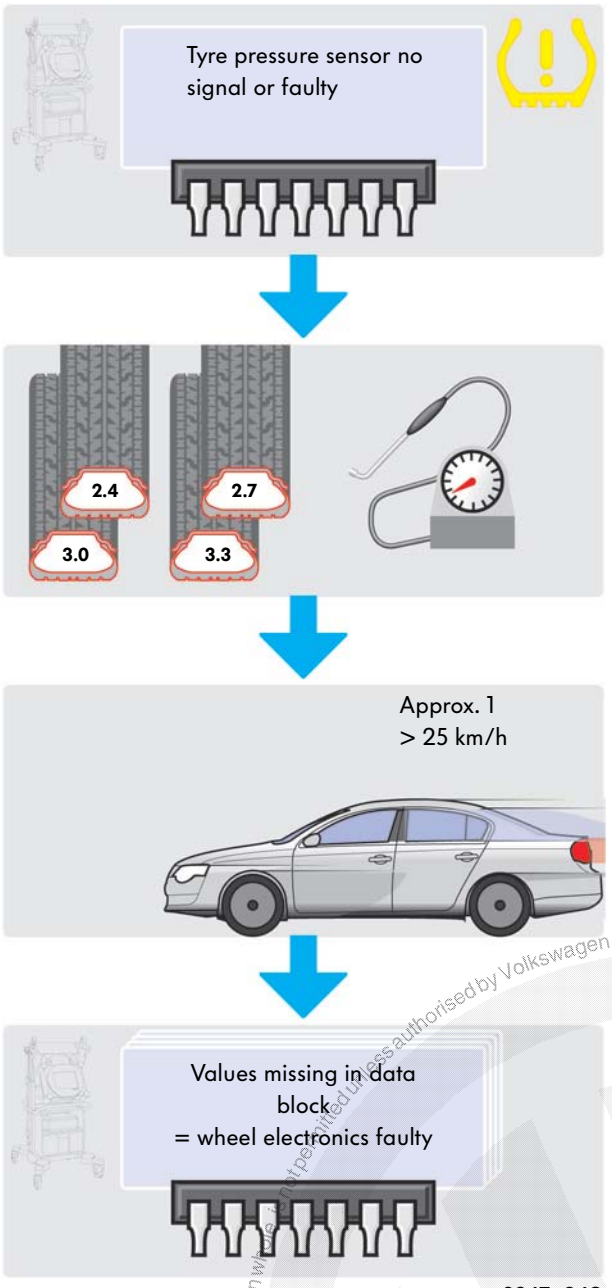
* Only the full load specified pressure is used for the North America region (NAR).

If you go back to using wheels with the tyre pressures specified inside the fuel filler flap, this will have to be set again with the VAS 5051/VAS 5052 (wheel set 1). The wheels with wheel electronics are learnt automatically. The identification numbers do not have to be entered.

ELSA provides detailed information on the procedure.

TPM without position recognition

Detecting faulty wheel electronics



S347_062

In the tyre pressure monitor system without position recognition, the signals from the wheel electronics are received centrally from the central locking and anti-theft alarm system aerial. Position assignment of the wheel electronics is therefore not possible.

The following signs indicate a faulty wheel electronics unit:

- A tyre pressure monitor system fault is displayed.
- “No signal/communication tyre pressure sensor” or “Tyre pressure sensor faulty” is read from the fault memory.

To test one wheel electronics unit, you can proceed as follows:

- Inflating the four tyres to four different pressures and noting the respective tyre pressures with the wheel position.
- Moving the car for approx. one minute at more than 25km/h.
- Read data blocks.
  If no tyre inside temperature and no current inflation pressure is included in the data block, the wheel electronics are faulty.

ELSA provides detailed information on the procedure.

Handling the wheel electronics (TPM with/without position recognition)

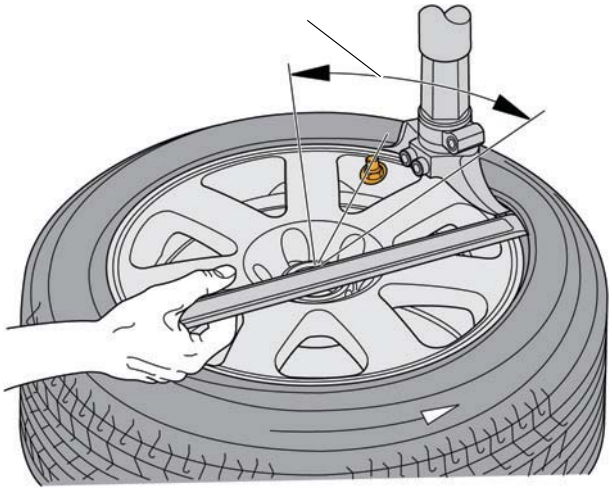
Fitting wheel electronics

The wheel electronics are inserted from the inside through the wheel valve hole and screwed secure.

Tyre changes with wheel electronics

When changing tyres, make sure that the removal levers are not placed near the valves to avoid damage to the wheel electronics.

Do not use removal levers in this area



S347_027

Changing the wheel electronics

The wheel electronics need to be replaced in the following situations:

- Battery is flat.
- The wheel electronics are faulty.
- The valves are faulty
  (TPM without position recognition)

If you use a tyre sealing fluid (Tirefit), we recommend changing the wheel electronics because the fluid can block the pressure sensor opening.

Please use only approved valve inserts and original valve caps (no special caps) for the wheel electronics.
The wheels may not be cleaned in cleaning machines that use ultrasound.
Ultrasound can damage the wheel electronics.
The valves are made from a specially coated aluminium for corrosion protection and can break off if you use too much force. The whole wheel electronics need to be replaced in this case.

Test Yourself

Which answers are correct?

One, several or all answers could be correct.

1. What should you do first if a tyre problem occurs or the message "tyre pressure too low" is issued?

☐ a) Press the tyre pressure monitor button and start calibration or learning of the respective system.

☐ b) Drive slowly, avoid sharp steering movements and, at the next opportunity, stop and check the tyre pressure.

☐ c) Deactivate the tyre pressure monitor in the "Convenience Setup".

2. Which system does not need aerials in the wheel housings?

☐ a) Tyre pressure monitor with position recognition. The wheel electronics are connected to the tyre pressure monitor control unit via cables.

☐ b) Tyre pressure monitor display. The system is made up of a software module in the ABS control unit. No aerials are needed.

☐ c) Tyre pressure monitor system without position recognition. The signals from the wheel electronics are received centrally from the central locking and anti-theft alarm system aerial and forwarded.

3. How can you tell whether a vehicle is equipped with a tyre pressure monitor system without position recognition?

☐ a) The tyre pressure monitor warning lamp in the dash panel insert illuminates for two seconds when you turn the ignition on.

☐ b) No rubber valves are installed in the wheels.

☐ c) The tool set does not include a jack.

4. What do you have to observe when changing a wheel on a car with a tyre pressure monitor without position recognition to ensure that the system learns the new wheel electronics?

☐ a) The vehicle needs to be stationary for 3 minutes.

☐ b) The vehicle needs to be stationary for 20 minutes.

☐ c) The vehicle immediately needs to travel at a speed above 25km/h.

5. When does the tyre pressure monitor button need to be pressed?*

☐ a) After one tyre has been inflated to the correct pressure.

☐ b) After more than one tyre has been inflated to the correct pressure.

☐ c) After each time the tyres are changed.

☐ d) After repair work on the chassis.

* Not for the North America region (NAR)

Test Yourself

Answers

1. b)

2. b, c)

3. a)

4. b)

5. a, b, c, d)

Notes

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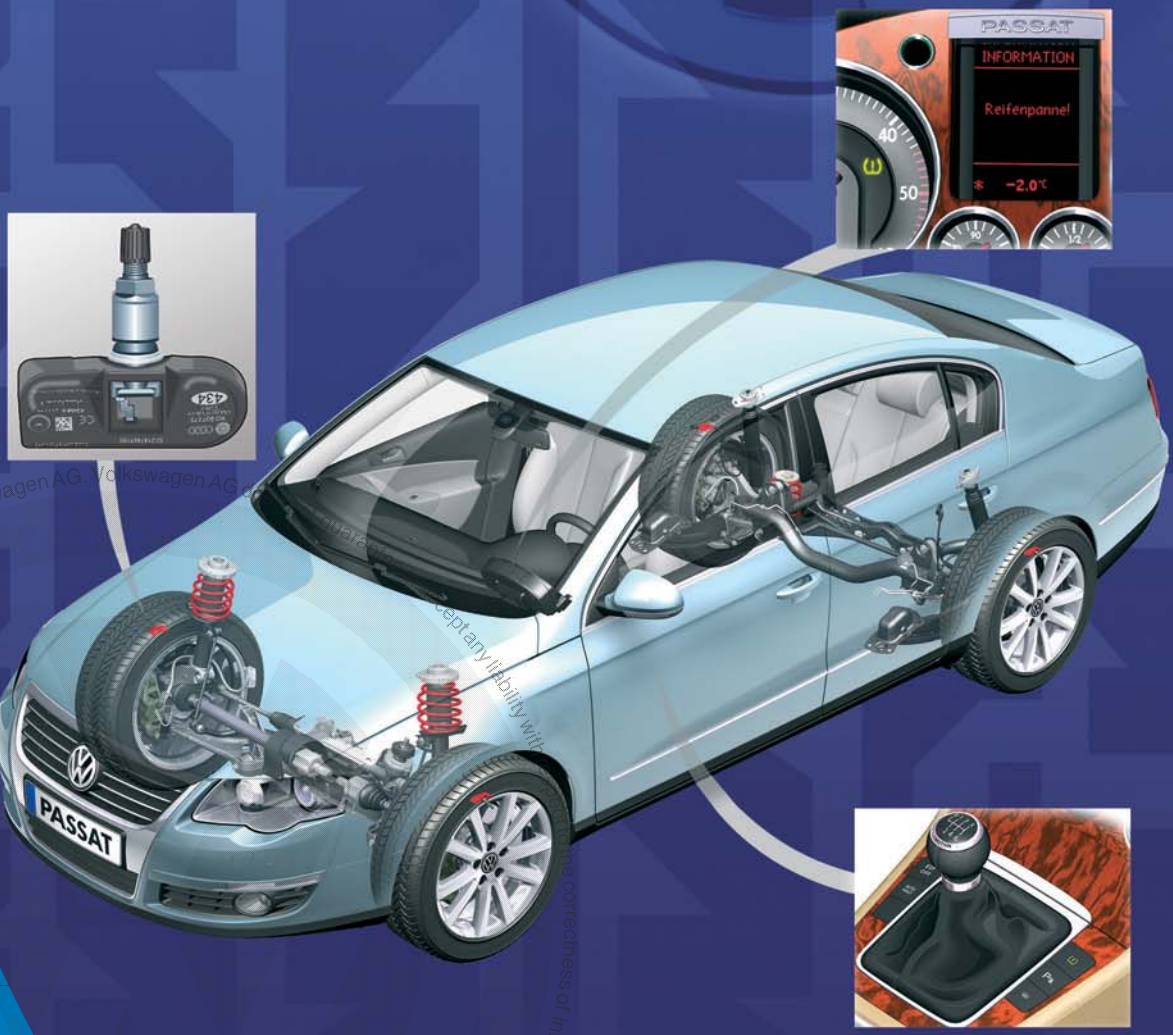

000.2811.61.20 Technical status 08/2005

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