

## TSS 2. Generation BMW

Tire Safety System TSS 2nd. Generation, BMW

Dept. BEE



<b>Bedienungsanleitung TSS BMW</b> User Manual TSS BMW	Dokument Nr.: Document no.:	Änderungsstand: Status of modification:	Index: Index:
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### Section 15.19: Labelling requirements

This device complies with Part15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

### Section 15.21: Information to the user

The user manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### IC statement according to RSS210

#### 5.11 User Manual

Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device

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	freigegeben am /date of release		8/31/05

### Contents:

<b>1</b>	<b>SYSTEM AND FUNCTIONAL DESCRIPTION .....</b>	<b>4</b>
1.1	SYSTEM DESCRIPTION.....	4
<b>2</b>	<b>FUNCTIONAL DESCRIPTION .....</b>	<b>5</b>
<b>3</b>	<b>WARNING ALGORITHM.....</b>	<b>7</b>
3.1	WARNING LIMIT "MINIMUM PRESSURE" .....	7
3.2	WARNING LIMIT "NOMINAL PRESSURE MINUS RELATIVE DEVIATION" (NOMINAL PRESSURE – X %) .....	7

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Dept. BEE



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## 1 System and functional description

### 1.1 System Description

The Tire Safety System (TSS) controls and monitors tire pressures.  
The system comprises the following components:

- 1 TSS control unit
- 4 sets of wheel electronics including valve
- 1 digital antenna
- 4 trigger transmitters

The wheel electronics mounted inside the tire measures tire pressure and temperature at regular intervals and transfers the values telemetrically via a HF transmission line to a reception antenna. The current pressure and temperature values can be requested specifically via the trigger function. In the receiver antenna, the radio data telegram is decoded and transferred to the control unit as a digital signal. The control unit evaluates the received data and forwards the information to the driver as required. This provides the driver with information on the necessary tire pressure or tire tension adjustments.

The benefits offered by the tire pressure control system are:

- **Safety**  
An early warning in case of fast pressure loss is given.  
"Blow-outs" caused by excessive flexing and driving too fast on inadequate tire pressure are avoided.  
The driver is prompted to adjust the tire pressure where necessary.
- **Comfort**  
Tire handling is made simple. Using the filling equipment at the fuel station and removing the valve cap is only necessary for correcting the tire pressure.
- **New tire developments**  
Tires with limp-home features avoid having to change a wheel immediately and render the spare wheel superfluous. They do, however, require permanent monitoring of the tire pressure.
- **Service life and economy**  
Tire wear is minimized through correct air pressure.

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## 2 Functional description

The wheel electronics are mounted within the tires and measure tire pressure, temperature and wheel electronics. The measured data is sent from the wheel via a send stage in the wheel electronics. A system with relatively seldom measured data transfer is adequate for tire pressure monitoring provided it features the additional option of detecting sudden pressure loss. This enables the electronics in the wheel to be designed for minimum power draw and battery operation.

All wheel electronics have their own code (ID) that is forwarded with the data at each transfer. The HF transfer occurs in the 433 MHz range, referred to as the ISM range. The trigger functionality is achieved by a 125kHz LF channel.

The control unit calls up the wheel electronics via the trigger transmitters every 54 s to send data messages. Tire pressure and wheel electronics temperature are also measured every 3 seconds. When a pressure loss > 0.2 bar on the last sent pressure value is detected, the wheel electronics switch immediately to fast-send mode. In this situation, the wheel electronics measure and send every 0.8 seconds.

The TSS measures and transfers considerably more data than is necessary to ensure reliable basic function. It can therefore use a data transfer path that is not assigned for the error-free transfer of each individual data protocol. Using the trigger function, an implausible and/or non-received data message can be requested again from the corresponding wheel electronics.

The data sent by the wheel electronics is received via the digital antenna and is decoded. The decoded data is transferred onwards to the control unit via a digital interface (LIN interface).

The control unit evaluates the received data and forwards the information to the driver information system as required. This provides the driver with information on the necessary tire pressure or tire tension adjustments.

The main functional characteristics of the control unit are:

- A central warning algorithm and an algorithm for the wheel manager
- The vehicle-specific connection for the power supply system and manufacturer-specific operation and display philosophy

The essential feature of wheel management is the self-learning system with automatic individual wheel detection and the detection of the corresponding installed positions (wheel position detection).

Thanks to fast triggering of the wheel electronics when T 15 is ON, the system detects a flat tire well before the start of a journey.

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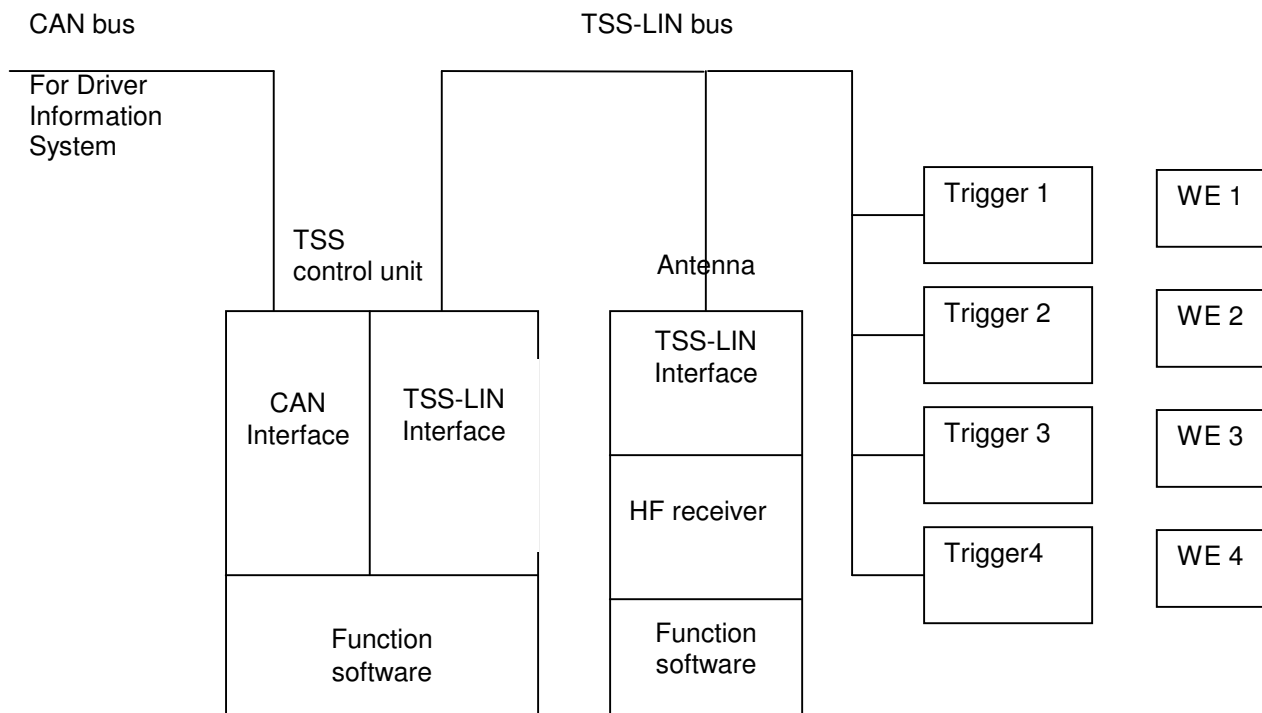
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Index:  
Index:

a

freigegeben am /date of release

8/31/05



**Figure 1: Block diagram, TSS system of the second generation**

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### 3 Warning algorithm

The system monitors a nominal pressure, which is set by the operator, and a fixed set minimum warning pressure. The higher value in each case is used to generate the breakdown warning.

The driver instructs the system to accept the current pressure values as the nominal pressure by using the "Reset". The reset is triggered by pressing a key or selecting a menu item.

#### 3.1 Warning limit "Minimum pressure"

At this warning limit, a check is made against the minimum warning pressure  $P_{\text{Warning\_MinimumPressure}}$ , which is programmed into the system as a fixed value.

The minimum warning pressure for BMW amounts to 2.6bar abs plus an accuracy reserve of 0.1bar.

The corresponding warning bit is set, if the measured pressure lies below this threshold twice in succession.

#### 3.2 Warning limit "Nominal pressure minus relative deviation" (Nominal pressure – x %)

This warning limit is calculated from the nominal pressure less a relative deviation of 25% of the nominal pressure. The nominal pressure is specified by the driver.

Again here an accuracy reserve of 0.1 bar is added to the warning limit.

The corresponding warning bit is set, if the measured pressure lies below this threshold twice in succession.