

# **User manual / Functional description**

for

**Continental - MERCEDES BENZ**

**RF - remote control transmitter**

**FBS 2b**

**315 MHz**

## General Radio Homologation Information

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s) and complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage.
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Changes or modifications made to this equipment not expressly approved by Continental Automotive Technologies GmbH may void the FCC authorization to operate this equipment.

The radiated output power of the device is far below the FCC and ISED radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized.

## Functional description of the RF-transmitter

The transmitter is part of the Mercedes Benz access-control-system FBS2B. In general the following external functions are provided:

- LOCK of the car by RF or infrared (IR)
- UNLOCK of the car by RF or infrared (IR)
- remote control for rear opening hood (ROH)
- panic function (only the 4-button variant)
- comfort LOCK by infrared
- comfort UNLOCK by infrared
- battery protection control by optical red LED
- toggling of the default-unlock-function global- or selective unlock

### **Power supply**

The transmitter is provided with 2 Lithium batteries (CR2025) which means a total power supply of +6V. The voltage of the batteries is checked with every triggered RF-telegram.

If this supply-voltage decrease under 3V (defined threshold), no more RF-telegrams will be transmitted. This low-voltage-detection is made by the components D2, R7 and the integrated A/D-converter of the controller. A reverse-battery-protection is realized with D1.

### **Microcontroller**

uPD754264 from NEC with AD-converter and EEPROM on chip. The clock for the controller is generated by a 2.6 MHz SMD-resonator.

## Buttons

### LOCK (S1):

used to send the LOCK-telegram and change the global/selective-unlock setting.

### UNLOCK (S2):

used to send the UNLOCK-telegram and change the global/selective-unlock setting.

Pressing a button turns the corresponding input-pin via an internal pull-up resistor to ground.

### ROH (S3):

by pressing this button more than 500msec, a IR- / RF-telegram will be sent corresponding to the LOCK / UNLOCK function. The vehicle responds to unlock the rear opening hood (ROH).

### Panic (S4):

the Panic function is defined only for the USA variants (no IR). If the button S4 (Panic) is pressed for at least 1 sec., the function is activated. This timeout period was introduced in order to exclude faulty operations. The alarm can be deactivated on the key only by a further short button press on PANIC.

## Technical description of the RF-transmitter

### Oscillator

The oscillator follows the colpitis oscillation principle stabilized by the SAW. The frequency is fixed to 315 MHz  $\pm$  125 kHz.

The RF-transistor BFR92 is a SMD type. The transit-frequency is amount to 9 Ghz.

### Parallel resonance circuit

The parallel resonance circuit (LC-circuit) is realized by the printed antenna and the combination of C3 and C4.

### Infrared transmitter

The infrared transmitter consists of a npn transistor (FMMT 491), a base input resistor R9, a collector resistor R10 and an infrared transmitting diode D3 (SFH487-2).

### Mechanical design

The mechanical design consists of two parts:

- a) container
- b) printed circuit board (PCB)

The battery-tank is integrated in the container between two metal-sheets on the PCP.

## Transmitter modes

the key works in NORMAL-mode and runs with standard RF-telegrams. The user can determine if in NORMAL-mode by pressing any key for 1 sec to see a short blink of the red LED.

Entry:

First power-up-reset. After that press button LOCK or UNLOCK for a standard RF-telegram.

Exit:

Press the button LOCK again

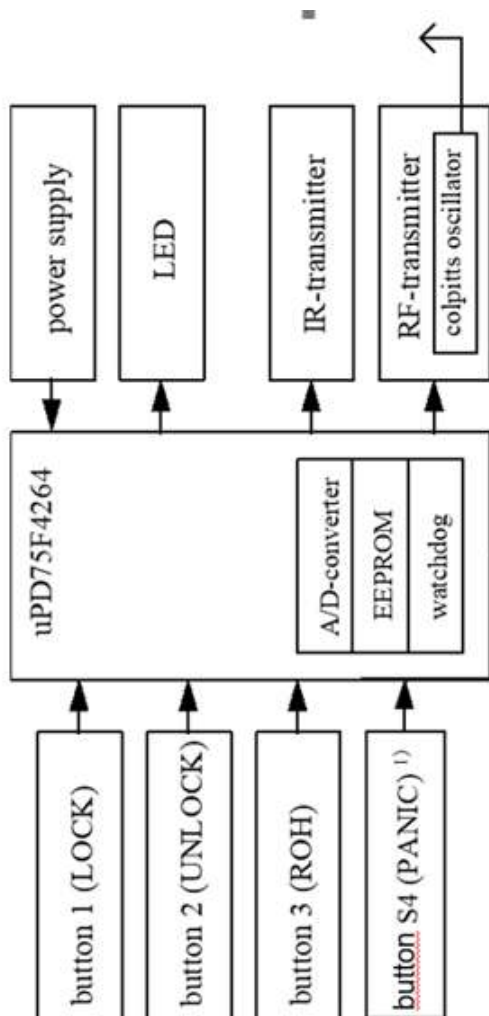
## Electrical data

carrier frequency:	315 MHz $\pm$ 125kHz
output power (carrier frequency):	typ. -24 dBm
modulation:	ASK
duration of telegram:	82 ms
transmission format:	Manchester code
transmission rate:	1 kBaud
current consumption (active):	typ. 5,5 mA
current consumption (stand by):	< 1uA
operating remote-range:	10 - 15 m
power-supply:	2 Li-batteries (CR2025)
operation live:	typical 2 years
operating temperature:	-10°C .....+60°C

**Variants USA / Canada**

<b>Part number</b>	<b>Component</b>	<b>Type</b>	<b>Variation description</b>
5WK4 795	remote-control key with transponder	315MHz	4-button-RF-sender (with panic button)
5WK4 698	remote-control key with transponder	315MHz	technical variant: reduced assembly 2-button-RF-sender
5WK4 7950A	remote-control key with transponder	315MHz	3-button-RF-sender

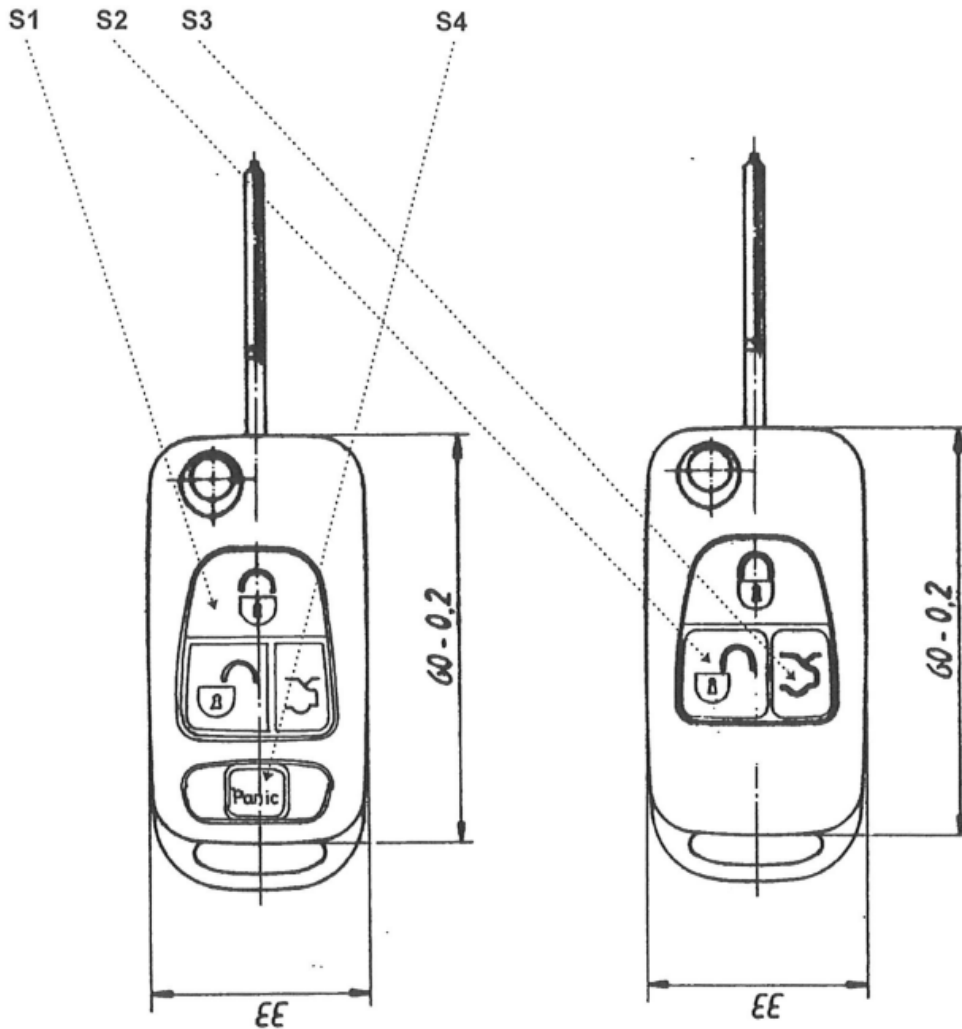
## Block-diagram



Legend for the figure above:

German	English
Taste S1 (LOCK)	Button S1 (LOCK)
Taste S2 (UNLOCK)	Button S2 (UNLOCK)
Taste S3 (HDF)	Button S3 (HDF)
Taste S4 (PANIC)	Button S4 (PANIC)
A/D-Wandler	A/D converter
Batteriespannung	Battery voltage
IR-Sendestufe	IR-transmitter stage
RF-Sendestufe	RF-transmitter stage
nur alle USA-Varianten	1) only all USA variants

## Mechanical Design



- S1 LOCK
- S2 UNLOCK
- S3 HFE
- S4 Panic