

Parking Lot Sensor | PLS

User manual 1.5



User manual

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1 General description and intended use

The Parking Lot Sensor (PLS) with TPS110 sensor core is designed for detecting parked vehicles in parking lots. This user manual is valid for the PLS with TPS110 sensor core by BCDS.

The Parking Lot Sensor with TPS110 sensor core is not designed for use in life-sustaining applications, safety-critical applications or applications for which a malfunction could lead to bodily harm, death or severe property damage. Only use the Parking Lot Sensor with components approved by BCDS.

2 Assembly and commissioning

2.1 Installation requirements

A Warning



Read carefully and keep the user manual for future reference. The Product, as referenced in this manual, is the complete hardware package for the Parking Lot Sensor, including the Cap, Screw, Core and Base.

Follow these instructions and all information.

⇒ The Customer must comply with all applicable laws and regulations for the installation and operation of the Product, and if necessary, obtain necessary approvals. The Customer must take appropriate measures to avoid injury of third parties, for example, by them tripping over the Product. Therefore, the Product should only be installed in a clearly designated parking space and should not, for instance, be installed on the sidewalk.

Before installing the sensors, make sure that the necessary infrastructure is working properly - make sure the gateways are switched on, that a stable Internet connection has been established, and that there is a backend connection. The backend, as well as the associated management software, must be functional. Make sure that all of the required components (see Fig. 1 Parking Lot Sensor with TPS110 sensor core), as well as the tools, are ready.



Figure 1 Parking Lot Sensor with TPS110 sensor core

2.2 Installing the sensor base

Marning



To ensure safe installation:

- ⇒ Install the PLS core (black part) into the PLS base (grey part) only after the final installation of the PLS base.
- ⇒ Do not bring a magnet near the PLS (this would power the device).
- ⇒ Install the PLS core properly into the PLS base.
- ⇒ Avoid uninstalling and reinstalling the PLS core after the initial installation into the PLS base.
- \Rightarrow Do not open the sensor core.

The sensor base is attached to the substrate (e.g., concrete, asphalt). To do this, we recommend a two-component adhesive. We have already had good experience with the following adhesive: DELO®-PUR 9692 (universal 2-component polyurethane adhesive available in 50 ml and 200 ml cartridges). We will be happy to support you with procurement. We recommend installing several sensor bases first and only then inserting the sensor cores.

Required material for installing the parking lot sensor



Figure 2 Material for attachment

- 1 Disposable gloves (protection against contact with adhesive)
- 2 Two-component adhesive
- 3 Adhesive press (these differ, depending on the cartridge size)
- 4 Mixing tube
- 5 Tape rule
- 6 Sensor base
- **7** Sensor core (sensor)
- 8 T20 screw
- 9 Sensor cap (sensor sealing cap)



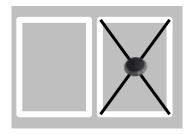
INFORMATION:

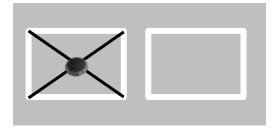
For the bonding procedure, please follow the instructions of the adhesive manufacturer (e.g., temperature, safety information and work instructions).

A parking space cleaning should be clarified in advance with the parking lot operator so that the treatment does not result in removal of existing coatings.

Preparation of the parking space

The parking space must be free of dirt, dust, oil, water and other contaminants. For this purpose, at least one swept area should be prepared. However, it is recommended to clean the surface to remove contamination using a high-pressure cleaner and a burner. The installation must take place in the center of the parking space (intersection of the two diagonals, see Fig. 3) in order to ensure optimum sensor accuracy.





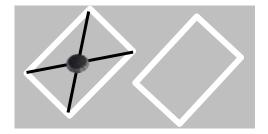


Figure 3 Determination of the center of the parking space

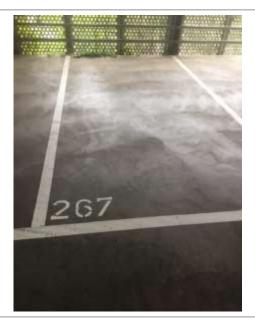


Figure 4 Available parking space for sensor installation

To provide the adhesive with a closed substrate, the surface intended for the installation of the sensor base should be free of any gaps or misalignment (see Figure 4 Available parking space for sensor installation). This is crucial for the contact surface and the adhesive effect of the sensor.





Figure 5 Substrate example (continuous)

Figure 6 Substrate example (gap)

Installation of the sensor base





The bottom of the base has been processed with a plasma treatment for the adhesion of the glue on the ground:

- ⇒ Take out the base of the sensor only just before putting down the glue there.
- ⇒ Do not touch the bottom side of the base with your hands or anything else.
- \Rightarrow Do not put the base on the ground before gluing, to avoid dust on the sensor base.
- ⇒ Ensure that all parts of the sensor device will be protected and will be kept clean till the installation has been completed, so that these parts will be used only within the described intended use.
- \Rightarrow Check that the glue is compatible with the ground and the base of the sensor.

Insert the adhesive cartridge into the glue gun/adhesive press (Fig. 7 Inserting the adhesive cartridge; in the case of DELO®-PUR 9692, the mixing ratio is 1:1, so you do not have to pay attention to the orientation of the cartridge). Then attach the mixing tube on the cartridge by removing the cartridge cap (Fig. 8 Sealing cap adhesive cartridge) and attaching the mixing tube (Fig. 9 Mixing tube on adhesive cartridge; here, bayonet fitting).







Figure 7 Inserting the cartridge

Figure 8 Sealing cap

Figure 9 Mixing tube

To avoid contamination and to get the maximum use out of the plasma cleaning process, open the sensor base package just before applying the adhesive. In the case of DELO® PUR 9692, you apply about 40 ml of the adhesive in the middle (see Fig. 10 Applying adhesive, and Fig. 11 Amount of adhesive); if you use a 50 ml cartridge, you can empty it completely. Apply the adhesive in the form of a bubble in the center of the sensor base (no screws or even surface).



INFORMATION:

The use of the mixing tube is important for mixing the two components of the adhesive and for the resulting adhesive effect.

Figure 10 Adhesive application

Figure 11 Adhesive amount





Please note that, as soon as the two components are mixed, the adhesive cures within a few minutes.

Now you can mount the sensor in the center of the parking space by applying light pressure on the sensor base (see Fig. 12 Sensor base attachment). Make sure that the sensor is centered in the parking space and that the Bosch logo on the sensor base points towards the access road (see Figure 13 Sensor base installed). Subsequent twisting of the sensor base is not possible.



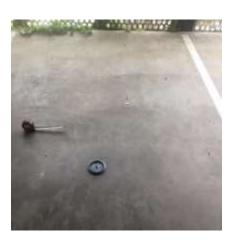
INFORMATION:

Once the adhesive in the mixing tube has cured, it cannot be used again. At room temperature, a typical processing time for the adhesive is about 5 minutes.

Figure 12 Sensor base attachment



Figure 13 Sensor base installed



Allow the two-component adhesive > 12 h to cure (hand-tight at room temperature after 30 min) before you screw in the sensor. Keep the parking space closed off until the sensor is installed to prevent damage (such as breaking the dome) to the sensor base.

2.3 Installing the sensor core

A Warning



Defective seals can cause water to get into the sensor and damage it. The functionality of the parking lot sensor is not guaranteed if it is installed incorrectly.

- ⇒ Make sure that the sealing rings on the cap and sensor are seated correctly!
- \Rightarrow Do not install the sensors when it is raining.
- ⇒ Do not use damaged components!
- ⇒ Do not open the sensor housing!
- ⇒ Only use original replacement parts!

M Warning



Risk of explosion

Extreme heat can damage the battery and the sensor.

- ⇒ Do not expose the sensor to temperatures above 85 °C!
- ⇒ Do not expose the sensor to open flames!

When using a gas burner (for example, when removing weeds), keep a distance of at least 1.50 m between the flame and the sensor!

The sensor can be screwed into the base after the adhesive has cured. To simplify insertion, the arrow on the bottom of the sensor points towards the Bosch logo (see Figure 14 Installing/screwing in the sensor). After inserting the sensor, it will take approx. 2 minutes until the first measurements are carried out. During this time, the sensor should be completely screwed in to ensure optimum teaching of the sensor. To tighten it, use the T20 screw and a T20 screwdriver and tightening torque with at least 1.4 Nm up to a maximum of 1.8 Nm. And then close the opening with the sensor sealing cap.

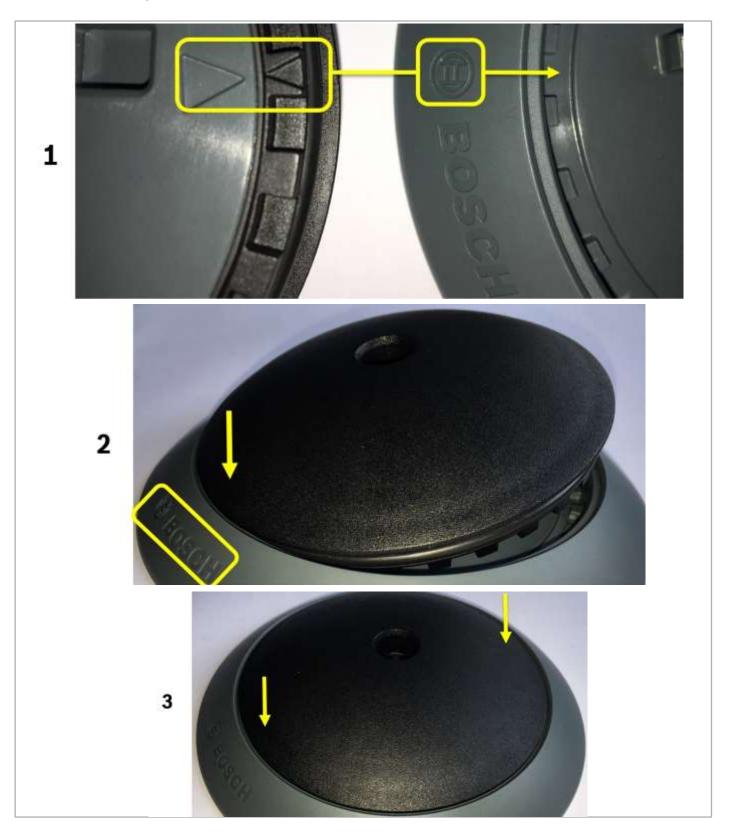


Figure 14 Installing/screwing in the sensor

After the installation of the sensor, the sensor learns about parking changes, which happens in its vicinity. After approx. 10 parking changes, the sensor is in its taught-in state.



INFORMATION:

During operation, a continuous automatic calibration of the parking lot sensor takes place through "parking" and "exiting parking space" events.

2.4 Replacing/removing the sensor

To replace the parking lot sensor, only the sensor needs to be replaced. To do this, remove the sensor cap and loosen the T20 screw; then remove the sensor from the sensor base.



INFORMATION:

A battery replacement is not intended; instead, the sensor must be replaced.

To completely remove the sensor base from the parking space, it is necessary to use a hammer and chisel to destroy the adhesive effect by chiseling the sensor base parallel to the parking space surface. As a result, there is no permanent damage to the parking space.

2.5 Setup and operation of the parking lot sensor in the backend

In order to set up the sensor in the LoRaWAN backend, the following information is required, which will be provided to you:

- ▶ devEUI (for example, FCD6BD0000190001)
- ▶ appKey (for example, 00112233445566778899AABBCCDDEEFF)
- ▶ appEUI (TPS110 EU (FCD6BD0000190000)

TPS110 IN (FCD6BD0000190003)

TPS110 JP (FCD6BD0000190002)

TPS110 US (FCD6BD0000190001)

Additional information on operating the parking lot sensor can be found on our website at https://www.bosch-connectivity.com/parking-lot-sensor/downloads/.

3 Technical specifications

Table 1 Device specifications - Parking Lot Sensor PLS with TPS110 sensor core

Properties	Values
Temperature range	-30 °C to 65 °C
Humidity	0 – 95%
Protection class	IP67/IPx9K
Dimensions	Ø: 145.4 mm H: 30.5 mm
Battery life	Up to 5 years
LoRa frequencies and LoRa Channel Plans (RP002-1.0.0)	TPS110 EU: 863-865/868-868.6/869.4-869.65 MHz (EU868) Transmitting power max. 14 dBm ERP Supported channel frequencies: 864.1 MHz, 864.3 MHz, 864.5 MHz, 868.1 MHz, 868.3 MHz, 868.5 MHz, 869.525 MHz
	Note: For TPS110 EU core used in Rep. of South Africa the K-Band 863-865MHz is deactivated.
	TPS110 IN: 865-867 MHz (IN865) Transmitting power max. 14 dBm ERP
	TPS110 JP: 920-923.4 MHz (AS923) Transmitting power max. 14 dBm ERP
	TPS110 US: 902-928 MHz (US902-928) Transmitting power max. 14 dBm ERP
Radar frequency	2.4-2.4835 GHz Transmission power max28 dBm EIRP
Mass	191 g

Additional information can be found in the datasheet on the website at https://www.bosch-connectivity.com/parking-lot-sensor/downloads/.





Risk of interference to other radio services and malfunction.

Operation of the TPS110 variant out of the Target Markets specified in Chapter 4 can cause disturbance of other services and can be subject of legal prosecution. Regulatory notices for other countries are included in Chapter 4 of the English part of this user manual.

- ⇒ Ensure that TPS110 variants are operated only in the target markets with a valid approval statement.
- ⇒ Ensure that it is connected to LoRa gateways that are certified for operation in the target markets and support the regional channel plans published by the LoRa Alliance.

4 Legal information

4.1 Disposal note



Bosch is committed to environmental protection. Recycling save resources and creates jobs. We encourage you to responsibly recycle your Bosch product when it reaches the end of its service life. The sensor, as well as all the individual parts, must not be disposed of with household waste or industrial waste. You are obliged to dispose of the device in accordance with the requirements of the WEEE Directive 2012/19/EU (in the European Union) or other applicable country regulations in order to protect the environment and to reduce waste through recycling. Please find a local certified recycling facility near you to properly dispose of this product.

For additional information and how to carry out proper disposal, please contact your local certified disposal service providers.

The sensors contain a Li battery, which must be disposed of separately.

4.2 Manufacturer Information

Bosch Connected Devices and Solutions GmbH Ludwig-Erhard-Straße 2 72760 Reutlingen Germany

4.3 European Union: EU Declaration of Conformity

Product type: Parking lot sensor Designation: TPS110 EU



Bosch Connected Devices and Solutions GmbH hereby declares that the "Parking Lot Sensor TPS110 EU" radio equipment is in conformity with Directive 2014/53/EU (Radio Equipment Directive) and Directive 2011/65/EU (RoHS Directive).

The full text of the EU Declaration of Conformity is available at the following web address:

https://www.bosch-connectivity.com/parking-lot-sensor/downloads/.

The following countries are covered by mutual recognition agreements: Turkey, Norway, Iceland, Liechtenstein, Switzerland.

4.4 Japan: Japanese Radio Law (電波法) Notice

Product type: Parking Lot Sensor

Product name: TPS110 JP



This device is granted pursuant to the Japanese Radio Law (電波法) and registered as radio equipment R: 202-SMH007. This device should not be modified, otherwise the granted designation number will become invalid.

4.5 India: Equipment Type Approval
Product type: Parking lot sensor / APLM Sensor

Product name: TPS110 IN

The TPS110 IN has been granted an Equipment Type Approval by the Government of India Ministry of Communications WPC Wing Licensing Office. The following certificates have been granted WPC-ETA-SD-20200100986 (TPS110 IN) and WPC-ETA-SD-20200100984 (APLM Sensor)

4.6 Singapore: Equipment Registration

Product type: Parking lot sensor

Complies with IMDA Standards DB101762 Product name: TPS110 EU

The TPS110 EU has been granted an Equipment Registration by the Info-communications Media

Development Authority of Singapore (IMDA) under registration Number N0234-20.

Product name: TPS110 JP

The TPS110 JP has been granted an Equipment Registration by the Info-communications Media Development Authority of Singapore (IMDA) under registration Number N0235-20.

4.7 Australia: Declaration of Conformity



Product type: Wireless Parking Space Occupation Sensor

Product name: TPS110 JP

Bosch Connected Devices and Solutions GmbH declares that the TPS110 JP is in conformity with the

requirements of the Australian Communications and Media Authority (acma)

4.8 Hongkong: Declaration of Conformity

Product type: Parking Sensor Product name: TPS110 JP

Hongkong Telecommunication Ordonance C106, C106Z

The TPS110 JP meets the requirements in Telecommunication Ordonance C106, C106Z and related

national standards HKCA 1035, HKCA 1078, HKTA 2001.

The TPS110 JP is exempted from licensing by HK Communication Authority by means of its technical performances proven in this report according to the standards specified by the Communication Authority of Hongkong. It may be sold and operated in connection with a public LoRa network service according section 5(a) and as a standalone device according section 5(b) of ordonance C106Z.

4.9 Republic of South Africa: Equipment Type Approval

Product type: Parking lot sensor

Product name: TPS110 EU (with band 863-865MHz deactivated)



The TPS110 EU has been granted an Equipment Type Approval by the Independent Communications Authority of South Africa (ICASA). Within South Africa the TPS110 EU is not suitable for integration in

systems that operate in the band 863-865MHz.

4.10 Federal Communications Commission (FCC) Notice

Product type: Parking lot sensor Product name: TPS110 US

This device complies with Part 15 of the FCC rules and has been certified. 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. The manufacturer is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications may void the FCC authorization to operate this equipment. NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

4.11 ISED Canada (IC) Notice

Product type: Parking lot sensor Product name: TPS110 US

This device complies with Industry Canada license-exempt RSS standard(s) and has been certified. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference, including interference that may cause undesired operation. This Class B digital apparatus complies with Canadian ICES-003.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

4.12 Note for transport

The TPS110 contains a lithium metal battery and is classified as UN 3091 (lithium metal batteries packed in equipment, including lithium alloy batteries).

The lithium metal battery for the TPS110 complies with the requirements of the UN Manual of Tests and Criteria, Part III, Subsection 38.3. The battery contains less than 2 g of lithium. Packages with up to 2 TPS110 and a maximum of 2 packages per shipment should not be affected by special transport regulations. For your safety, however, check with your transport service provider. Packages with more than 2 TPS110 (for example, also for returns to BCDS) must carry



a lithium battery handling label specified in the appendix.

- * UN 3091
- ** Telephone number

The telephone number on the lithium battery handling label should be that of a person knowledgeable about the shipment but is not intended to be for the purposes of obtaining immediate emergency response guidance, and is therefore not required to be monitored at all times while the package is in transit. It is acceptable for the number to be monitored during the company's normal business hours in order to provide product-specific information relative to the shipment. However, it also is acceptable to use an emergency response, 24-hour phone number on the lithium battery mark. Source: guidelines for Li battery in transport included in p. 7 'IATA 2021 Guidance Document – Battery Powered Cargo Tracking Devices / Data Loggers'

The following requirements must be met:

- The lithium metal batteries are included in the TPS110.
- The TPS110 and the included batteries are not damaged.
- The TPS110 contains the original supplied lithium metal batteries. Replacement of used batteries is not permitted.
- The TPS110 is protected by sturdy packaging.
- No additional separate batteries may be added to the packaging.
- Shipping documents must include a note stating that the shipment contains "Lithium metal batteries in compliance with Section II of Packing Instruction PI 970" for air freight, or "Exempted lithium batteries under Special Provision 188" for road transport.
- Packaging with the TPS110, in accordance with the above-mentioned regulations, may be consolidated in outer packaging that is marked with the lithium battery label and is designated as "outer packaging."

Note that this document cannot contain complete and up-to-date information on all the requirements to be observed. The consignor is responsible for fulfilling all the requirements for the transport of lithium batteries themselves. The International Air Transportation Association (IATA) has issued further regulations on the transport of lithium batteries IATA (International Air Transport Association) Lithium Battery Guidance Document, which must be observed for air transport. The IATA regulations for transport by air freight are the most restrictive and thus also provide assistance for road and sea transport. However, the customer or consignor should inquire about national requirements as well as any requirements from their transport service provider.

4.13 OSS note

The parking lot sensor firmware includes free open source software ("FOSS") components subject to certain FOSS license terms.

The customer must observe the resulting obligations. The detailed FOSS license terms are available at the following web address: https://www.bosch-connectivity.com/parking-lot-sensor/downloads/



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