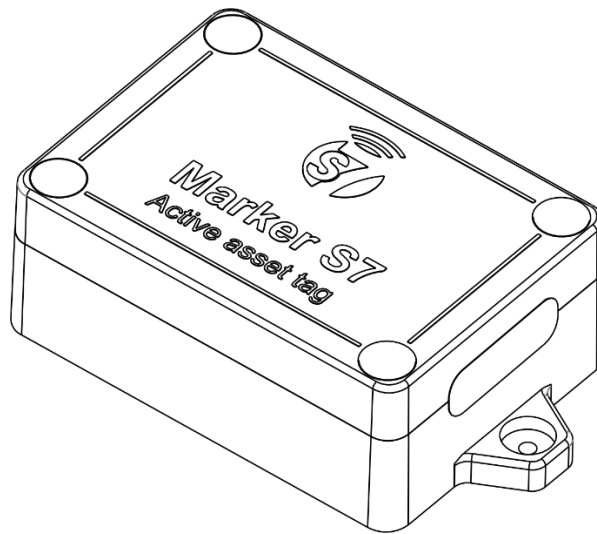




ACTIVE ASSET TAG



Marker S7 OPERATION MANUAL

Version 1.1



TECHNOTON
ADVANCED VEHICLE TELEMATICS

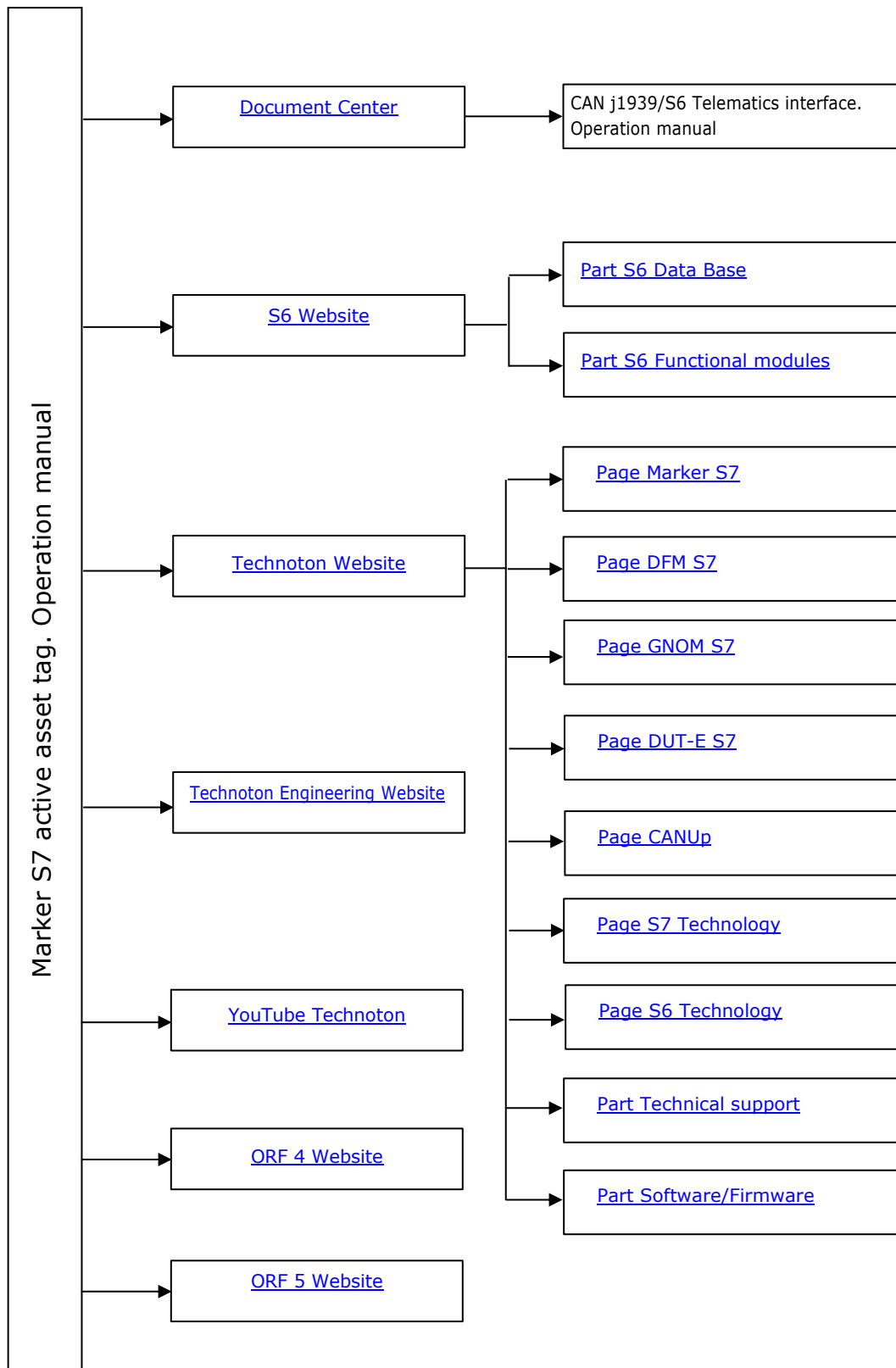
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Revision history

Version	Date	Editor	Description of changes
1.0	08.2020	OD	Basic version
1.1	11.2025	OD	Clarifications have been introduced regarding the autonomous operating time of the tag powered by the built-in battery.

Structure of external links



Terms and Definitions

S7 — Technology designed for wireless collection of data from unattended sensors in systems of industrial and automobile Telematics. S7 Technology is recommended for use in facilities where wiring is impossible or hard to install.



S7 Technology implements Bluetooth 4.X Low Energy (BLE) as a communication channel.

S7 Technology provides ultra-low power consumption and a long period of independent operation for smart sensors and other IoT devices.

On the application level, S7 Technology is fully compatible with [S6 Technology](#) which uses cabling.

Advantages of S7 Technology:

- Simple design of data transmission protocol;
- Low power consumption, a potential for fully independent operation of sensors for several years;
- Option of data collection by several data recipients at one time.

[Marker S7](#) active asset tag is implemented based on S7 Technology.

S6 is the Technology of combining smart sensors and other IoT devices within one wire network for monitoring of complex stationary and mobile objects: vehicles, locomotives, smart homes, technological equipment etc. The Technology is based and expands SAE J1939 automotive standards.



Information on cabling system, service adapter and S6 software refer to [CAN j1939/S6 Operation manual](#).

PGN (Parameter Group Number) — is a combined group of S6 parameters, which has common name and number. Functional modules (FM) of the Unit can have input/output PGNs and setup PGNs.

SPN (Suspect Parameter Number) — informational unit of S6. Each SPN has determined name, number, extension, data type and numerical value. The following types of SPN exist: Parameters, Counters, Events. SPN can have a qualifier which allows qualification of parameter's value (e.g. – Onboard power supply limit/Minimum).

GNSS (Global Navigation Satellite System) — System for area positioning of an object through satellite signal processing. GNSS is composed of space, ground and user segments. Currently, there are several GNSSs: GPS, GLONASS, Galileo, BeiDou.

Onboard reports (Reports) — information about vehicle which is returned to a user of Telematics system in accordance with inputted criteria. The Reports are generated by a terminal unit both periodically (Periodic reports) and on Event occurrence (Event report).

Parameter — time-varying or space characteristic of the Vehicle (SPN value). For example, speed, fuel volume in the tank, hourly fuel consumption, coordinates. Parameter is usually displayed in the form of graph, or averaged data.

Server (AVL Server) — hardware-software complex of Telematics service ORF 4, used for processing and storage of Operational data, formation and transmission of Analytical reports through Internet by request of [ORF 4](#) / [ORF 5](#) users.

Event — a relatively rare and sudden change of SPN. For example, the disappearing of a signal from Marker S7 Active asset tag is the Event "Tag Release". An Event can have one or several characteristics. Thus, for the Events "Tag release" and "Tag Attachment" — "Tag ID" is always specified. When the Event occurs, a terminal unit registers the time of occurrence, which is later mentioned in a report on the event. Thus, the Event is always attached to exact time and place of occurrence.

Counter — cumulative numerical characteristic of Parameter. Counter is displayed by a single number and over time its value is increasing. Examples of counters: fuel consumption, trip, engine hours counter etc.

Telematics terminal (Tracking device, Telematics unit) is a unit of Telematics system used for reading the signals of Vehicle standard and additional sensors, getting location data and transmitting the data to the Server.

Telematics system — complex solution for vehicle monitoring in real time and trip analysis. The main monitored characteristics of the vehicle: Route, Fuel consumption, Working time, technical integrity, Safety. It includes On-board report, Communication channels, Telematics service [ORF 4](#) / [ORF 5](#).

Vehicle an object controlled within Telematics system. Usually Vehicle means a truck, tractor or bus, sometimes a locomotive or river boat. From Telematics system point of view, stationary objects are also considered to be vehicles: diesel gensets, stationary tanks, boilers/burners.

Function module (FM) unit-embedded component of hardware and software combination, executing a group of special functions. Uses input/output PGNs and settings PGNs.

Unit is an element of vehicle on-board equipment compatible with S6 bus, which uses [S6 Technology](#) or [S7 Technology](#).

Introduction

The Operation manual contains guidelines and rules which refer to **Marker S7 active asset tag** (hereinafter [Marker S7](#)), model code **02** developed by [Technoton](#) company.

The model code of Marker S7 is defined by 3^d and 4th digits of its serial number placed on the name plate in the bottom portion of its casing or on the packaging label (see figure 1):



Figure 1 – Defining the model code of Marker S7

The manual contains information on design, operation principle, specifications and instructions use of Marker S7.

Marker S7 – are wireless devices used within [Telematics systems](#) for monitoring the [Vehicle](#) attached equipment. Based on signals from tags, the Telematics system defines the period of the equipment operation and sends notifications of its attachment/release.

Marker S7 key features:

- Transmission of data using [S7 Technology](#) via **Bluetooth Low Energy** channel to the [Marker S7 Radiobox CAN](#) wireless interface for conversion into [SPN](#) and integration into the Telematics system using [S6 Technology](#).
- Operation in the “advertising” mode (BLE-radio) – continuous signal broadcast with no need of matching with the receiving device.
- Ultra-low power consumption ensures fully autonomous operation of the tag from the built-in battery for up to 5 years, without using any external power sources.
- No signal cable– quick installation without a need of electrical connection.
- No signal cable – explosive and fire safety of the tag is ensured without using additional modules of explosion protection.
- No signal cable – increase resistance to sabotage.
- Simple mounting, a set of mounting elements in the mounting kit.
- Enhanced dust and moisture protection, a wide range of working temperatures.
- High-quality [technical support](#) and [documentation](#).
- Conformity with European and national automotive standards.

The functional test of Marker S7 tags is conducted using a smartphone/tablet based on the Android 6.X and higher platform (further on — Android devices) by means of **Service Marker S7 (Android)** mobile application which displays for each of the available tags:

- ID data (serial number, MAC-address of the BLE module);
- Signal level (RSSI);
- Ambient temperature in the mounting location;
- “Manufacturing” mode of operation (if the tag operates in this mode).

The user may download the Service Marker S7 (Android) application from [Google Play](#) (research request “Technoton”).



ATTENTION: It is strongly recommended to follow strictly the instructions of the present Manual when using, mounting or maintaining Marker S7.

[The Manufacturer](#) guarantees Marker S7 tags compliance with the requirements of technical regulations subject to the conditions of storage, transportation and operation set out in this Manual.



ATTENTION: Manufacturer reserves the right to modify Marker S7 specifications that do not lead to a deterioration of the consumer qualities without prior customer notice.



WARNING: You should mount and run Marker S7 Active asset tags on the [Vehicle](#) together with [Marker S7 Radiobox CAN](#) wireless interface (see [Marker S7 Radiobox CAN Operation Manual](#)).

1 General information and technical specifications

1.1 Purpose of use, operation principle, application area

Marker  is used for:

- Automatic identification of the [Vehicle](#) attached equipment (see figure 2);
- Taking ambient temperature;
- Wireless transfer of data using [S7 Technology](#).



Figure 2 – Purpose of Marker S7 active asset tags

Application area: [Marker S7](#) tags are employed within transport [Telematics systems](#) for monitoring the [Vehicle](#) attached equipment (see figure 3).

Operating principle: Marker S7 tags (up to 2 pcs.) are mounted on the Vehicle active attached equipment. Each tag has a built-in Bluetooth Low Energy module (BLE-module) which due to the special data transfer algorithm enables the tag to operate in the ultra-low power consumption mode.

The BLE-module transmitting device switches on automatically once in 5 s for transmission of the signal containing the identifier (ID) of a particular tag. This operating mode (BLE Radio mode) allows the tag to function autonomously from the built-in battery for up to 5 years, without using any external power sources.

In combination with Marker S7 tags, the wireless Marker S7 Radiobox CAN interface installed in the driver's cabin is used; it receives signals from all tags located in the area of up to 50 m from it by means of S7 Technology.

In accordance with the user settings, Marker S7 Radiobox CAN automatically identifies the fact of attachment or release of attached equipment, based on the maximum level of a signal from the tags and provides the corresponding data ([SPN](#)) into the [Telematics interface CAN j1939/S6](#).

The [Telematics terminal](#) connected to the [Marker S7 Radiobox CAN](#) by means of [S6 Technology](#) sends [Reports](#) on the Event of the equipment attachment/release to the [ORF 4](#) / [ORF 5](#) Telematics service or directly to the user by SMS or E-mail.

You can also connect CAN j1939 vehicle bus by means of S6 Technology to one CAN input of the Terminal (e.g. of [CANUp 27](#) Telematics gateway) using [FMSCrocodile](#) wireless gateway and up to 16 pcs. [DFM CAN](#) fuel flow meters together with [DUT-E CAN](#) / [DUT-E 2Bio](#) fuel level sensors (up to 16 pcs.).

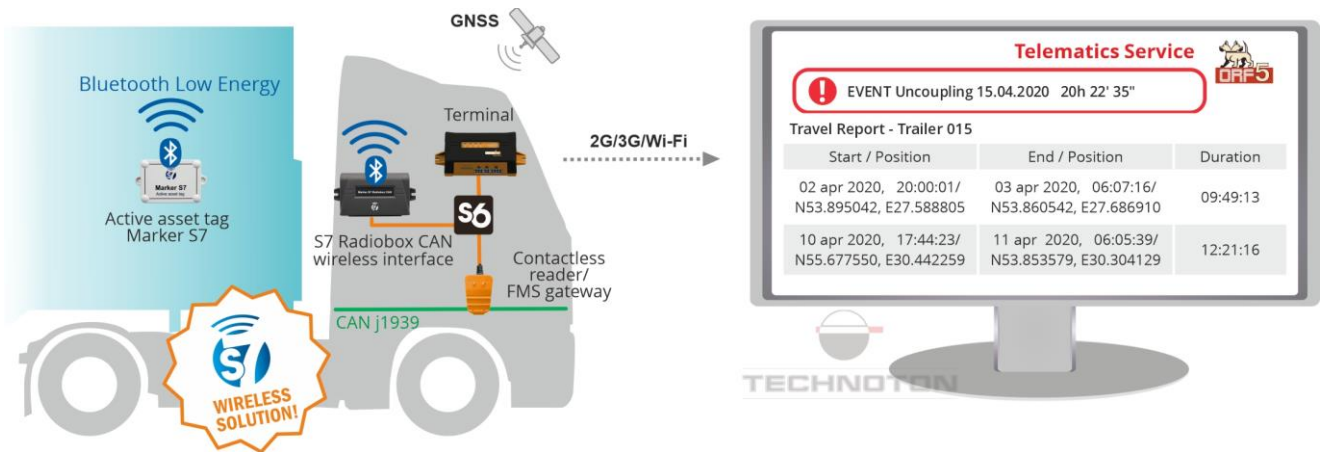


Figure 3 — Example of using Marker S7 tag in the Telematics system for monitoring the Vehicle attached equipment

The employment of Marker S7 tags in the transport [Telematics system](#) enables to monitor:

1) [Parameters](#)

- Time of the equipment attachment/release;
- Equipment attachment/release coordinates;
- Average and maximum speed of the trip with attached equipment;
- Ambient temperature;
- Equipment identifiers.

2) [Counters](#)

- Time of the trip with the active asset;
- Fuel consumption during the trip with attached equipment.

3) [Events](#)

- Equipment attachment;
- Equipment release.

1.2 Exterior view and delivery set



- | | | |
|----------|--|-----------|
| 1 | Marker S7 active asset tag | - 1 pc.; |
| 2 | Specification | - 1 pc.; |
| 3 | Mounting kit (1 pc) including: | |
| | a) Self-tapping screw 2.9x16 | - 2 pcs.; |
| | b) Plug | - 2 pcs.; |
| | c) Magnetic key | - 1 pc. |

Figure 4 — Marker S7 delivery set

1.3 Design



- 1** – casing inside which there is the electronic unit, the temperature sensor, the BLE-module for wireless data transmission by means of [S7 Technology](#) and the autonomous power supply battery;
- 2** – mounting elements.

Figure 5 – [Marker S7](#) design

1.4 Technical specifications

Powered of [Marker S7](#) only by the built-in battery.

1.4.1 Main specifications

Table 1 — Marker S7 main specifications

Parameter, measurement units	Value
Wireless data transmission interface	Bluetooth 4.1
Transmitter power (Tx Power), dBm	+4
Maximum distance between the tag and the receiving device, m	20 (in case there are metal partitions in the mounting location) 50 (when mounted within line-of-sight range)
Data transfer interval, s	5
Tag autonomous operating time from the built-in battery, years	up to 5*
Temperature range, °C	-40...+85
Level of sealing protection from dust and moisture	IP68
Certificates of BLE module electromagnetic compatibility	CE FCC and IC (see annex A), TELEC BQE
Weight, kg, not more than	0.2
Overall dimensions, mm, not more than	see figure 7
<p>* At a constant ambient temperature of +20 °C. Under real operating conditions, when the temperature fluctuates, the tag's autonomous operating time may be reduced, but it is guaranteed to be at least 2 years.</p>	

1.4.2 Data composition of Marker S7 output message

Marker S7 active asset tag transmits data by means of [S7 Technology](#), without integration with receiving device ([Marker S7 Radiobox CAN](#) wireless interface) and without acknowledgement of data reception.

The data in the form of Advertising packets are transmitted automatically with 5 s periodicity in the continuous data transfer mode. The structure of the data packet transmitted by Marker S7 is provided in figure 6.

Service field (AD0) (permanent values)			Data field (AD1) (variable values)					
Data length (AD Length)	Data type (AD Type)	Data (Data)	Data length (AD Length)	Data type (AD Type)	Company identifier (Company ID)	Unit firmware version (Soft Ver)	PGN number (PGN)	PGN data (PGN Data)
(1 byte)	(1 byte)	(1 byte)	(1 byte)	(1 byte)	(2 bytes)	(1 byte)	(2 bytes)	(0...21 bytes)
0x02	0x01	0x06	0xFF	0xFF	0xFFFF	0xFF	0XXXXX	...

Figure 6 – Structure of data packet transmitted by Marker S7 tag

The application layer of the output message protocol of Marker S7 conforms with [S6 Database](#) (see table 2).

Table 2 – Data composition of Marker S7 output message

Field number	Length	Parameter	Name
Ambient Conditions PGN 65269 (0xFE5)			
4	2 bytes	SPN 171	Ambient Air Temperature

[SPN](#) values of the tag output message may be calculated according to the formula (1) using attributes from table 3.

$$\text{Parameter value} = \text{SPN Content} \cdot \text{Factor (Resolution)} + \text{Offset} \quad (1)$$

Table 3 – Attributes for calculating the current value of the Marker S7 output SPN

Parameter	Factor (Resolution)	Offset
SPN 171	0.03125 °C	-273 °C

1.4.3 Receiving device for reception of signals from tags

[Marker S7 Radiobox CAN](#) wireless interface or other compatible devices ([Telematics terminals](#)) are used as receiving devices for reception of signals from Marker S7 tags.

Recommendations for using Marker S7 Radiobox CAN for monitoring the Vehicle attached equipment with Marker S7 tags are provided in the [Marker S7 Radiobox CAN Operation Manual](#).

1.4.4 Overall dimensions

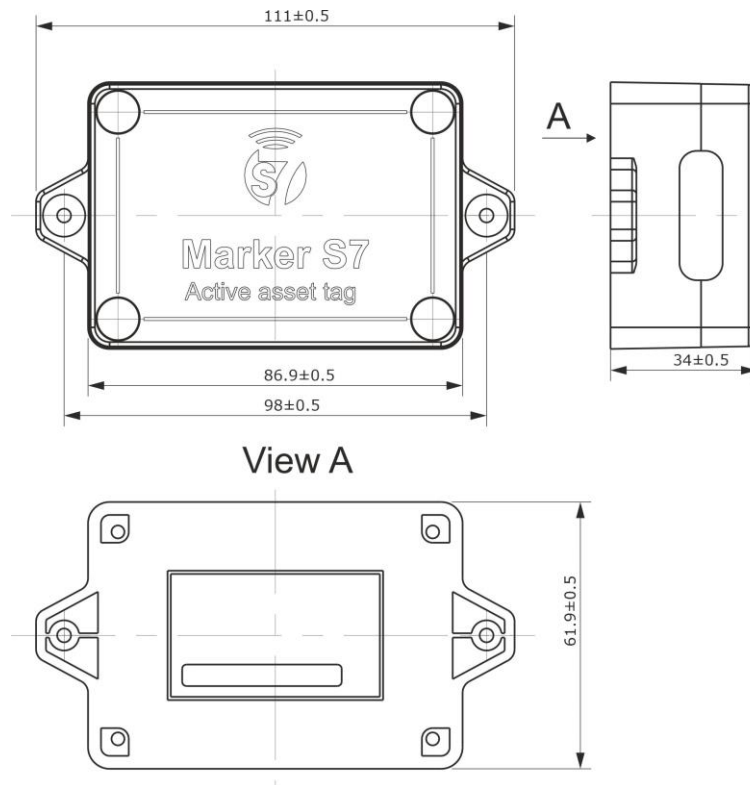


Figure 7 — [Marker S7](#) overall dimensions

2 Installation

For Marker S7 correct operation its mounting and configuration should be carried out by certified specialists who have passed [corporate technical training](#).



ATTENTION: When mounting Marker S7, strictly follow safety rules of car repair works as well as local safety rules of the customer' company.

2.1 Exterior inspection prior to starting works

It is required to conduct Marker S7 exterior inspection for the presence of the possible defects of body or connectors arisen during transportation, storage or careless use.

Contact the supplier if any defects are detected.

2.2 Mounting



IMPORTANT: We do not recommend to mount [Marker S7](#) tags:

- 1) Close to the Vehicle heating and cooling components, power electric circuits.
- 2) Closer than 10 cm to the [Vehicle](#) rotating mechanisms and surfaces.
- 3) Close to radiotelephones, video signal transmitting devices and other wireless devices operating within 2.4 or 5.0 GHz ranges.
- 4) In closed metal boxes that might prevent the radio signal travel.

You may select any suitable location on the Vehicle attached equipment for mounting Marker S7, with respect to the above-mentioned limitations.

Please, use the mounting elements from the [delivery set](#) for mounting Marker S7.

For uninterrupted data transmission in conditions of the Vehicle, we do not recommend that the distance between the Marker S7 tags and the receiving device — Marker S7 Radiobox CAN should exceed **20 m** (see figure 8).

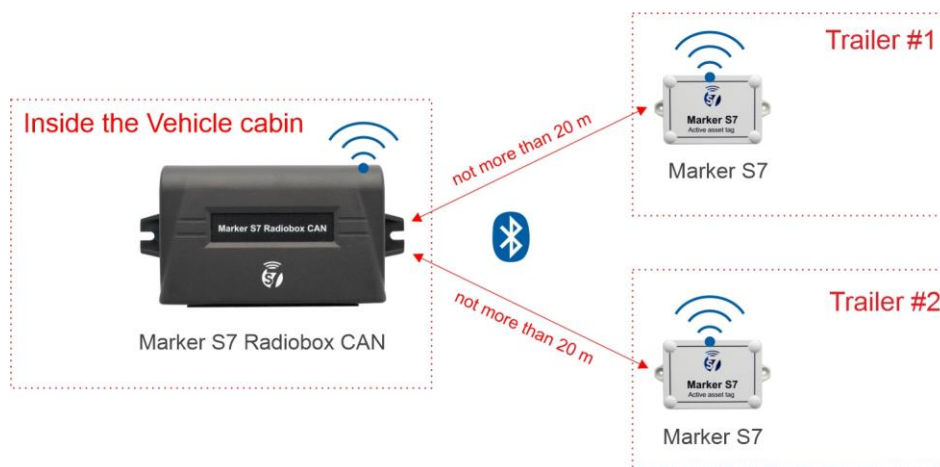


Figure 8 — Location of Marker S7 tags and the receiving device

2.4 Preparation of Marker S7 tags for operation

2.4.1 Basic provisions

To test the data transfer by [Marker S7](#) tags using [S7 Technology](#), first, install the Service Marker S7 (Android) mobile application on your smartphone/tablet based on Android 6.X or higher platform from [Google Play](#) (search request "Technoton") (see figure 9).

IMPORTANT:



1) During your work with Service Marker S7 (Android), to eliminate any communication disruption between Marker S7 tags and the Android device, you need to make sure that there are no sources of electromagnetic interference close to the workplace (radiotelephones, video signal transmitting devices and other wireless devices operating within 2.4 or 5.0 GHz ranges, powerful transformers and switching equipment, welding equipment, high-voltage power lines and so on).

2) The maximum allowed distance between the Marker S7 tags and the Android device depends on the quality of the Bluetooth module of the Android device. To ensure the uninterrupted data transfer, we do not recommend that this distance should exceed **20 m**.



Figure 9 — Testing the Marker S7 tags operation by means of S7 Technology using the Android-based device

2.4.1 Activation of the BLE-module of the tag



WARNING: Data transfer by the Marker S7 tag is possible only after the activation of its BLE-module.

Marker S7 has the following modes of operation determined by the status of its BLE-module:

- **“Storage”** — the active asset tag is in this mode from the moment it is manufactured. The BLE-module of [Marker S7](#) is disabled, no data transmission at all.
- **“Manufacturing”** — in this mode, the BLE-module of the Marker S7 tag is activated for data transfer only for the period of the tag operability check using Service Marker S7 (Android) application.
To activate this mode, you need to apply the magnetic key (see the [delivery set](#)) for **(5...8) s** to the bottom portion of the tag casing (see figure 10). After **4 h** period or after another touching the same place by the magnetic key, the BLE-module of Marker S7 returns to the inactive state.
- **“Operating”** — this mode is enabled, when the tag is mounted on the [Vehicle](#) active attached equipment. In this mode, the BLE-module is fully enabled, without the possibility to return to the inactive state. After that, the Marker S7 tag is ready to transfer data by means of S7 Technology throughout its service life.
To enable the “Operating” mode, apply the magnetic key to the bottom portion of the tag casing (see figure 10) for **(30...40) s**.

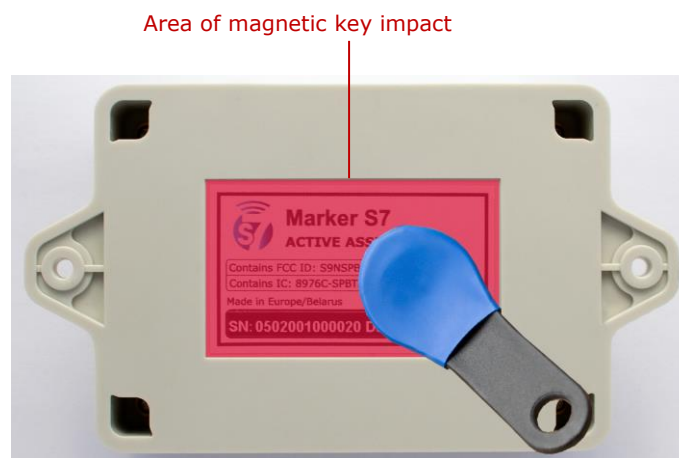



Figure 10 — Activation of Marker S7 tag BLE-module

2.4.3 Testing operability



Launch the Service Marker S7 (Android) mobile application with  icon from the main menu of the Android device.

Each [Marker S7](#) tag is ready for operation with the Service Marker S7 (Android) application from the moment its BLE-module is activated (enabling "Operating"/"Manufacturing" modes).

Immediately after starting the Service Marker S7 (Android) application will offer to allow to enable the Bluetooth of the Android device (see figure 11 a).

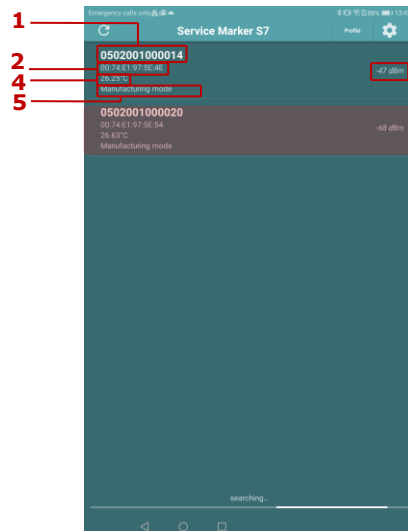
After its activation, the Bluetooth application will search and detect active Marker S7 tags. Each detected tag will be automatically included into the list of accessible devices; the following information will be displayed (see figure 11 b):

- [Unit](#) name (serial number) **(1)**;
- MAC-address of the BLE-module **(2)**;
- Received signal strength indicator (RSSI) **(3)**;
- Ambient temperature in the location the tag is mounted **(4)**;
- "Manufacturing" mode (if the tag operates in this mode) **(5)**.



Press the button, to enable Bluetooth

a) offer to allow the Bluetooth connection



To change the tag name, press its line

b) displaying tags in the list of accessible devices

Figure 11 – Establishment of connection between Marker S7 tags and the Android device with Service Marker S7 (Android) application

3 Packaging

[Marker S7](#) active asset tag delivery set come in cardboard box of the following shape (see figure 12).



Figure 12 — Marker S7 packaging

Label sticker with information on the product name, certificates, used technologies, serial number, firmware version, manufacture date, weight as well as Quality Control seal and QR code is stuck on two sides of the Marker S7 box (see figure 13).



Figure 13 — Marker S7 packaging label

Note — label design and contents can be modified by the [Manufacturer](#).

4 Storage

[Marker S7](#) is recommended to be stored in dry enclosed areas.

Marker S7 storage is allowed only in original packaging at temperature range from +10 to +30 °C and relative humidity from 45 to 75 % at 25 °C.

Do not store Marker S7 in the same room with substances that cause metal corrosion and/or contain aggressive impurities.

Marker S7 shelf life must not exceed 24 months.

5 Transportation

Transportation of [Marker S7](#) is recommended in closed transport that provides protection for Marker S7 from mechanical damage and precipitation.

When transporting by air, Marker S7 must be stored in heated pressurized compartments.

Air environment in transportation compartments should not contain acid, alkaline and other aggressive impurities.

Shipping containers with packed Marker S7 tags should be sealed.

6 Utilization/re-cycling

[Marker S7](#) does not contain precious metals in amount that should be recorded.

The inbuilt lithium-thionyl chloride battery of Marker S7 contains harmful substances and components that are hazardous to human health and environment.

Battery must not be disposed of together with general domestic waste.

The Buyer is responsible for the disposal of battery by means of its delivery to the hazardous waste collecting center; this will ensure safety for human health and environment.

[Technoton](#) bears no responsibility for any non-compliance with the above disposal and recycling requirements for battery.

Contacts

Distribution, technical support and service



sales@jv-technoton.com

support@jv-technoton.com



Annex A

Electromagnetic compatibility of BLE-module

BLE-module installed in [Marker S7](#) tags is certified and found to comply with:

- FCC Rules Part 15 (marking — Contains FCC ID: S9NSPBTLERF);
- IC Rules, RSS-210 (marking — Contains IC: 8976C-SPBTLERF).



WARNING: Any changes or modifications of BLE-module, which are not approved by the [party](#) responsible for compliance with FCC and IC certificates, may deprive the user of the tag of the right to operate it.

1) BLE-module complies with the restrictions for Class B digital device in accordance with Part 15 of the FCC Rules and RSS-210 of the IC Rules.

These restrictions are used for providing protection from harmful interference when operating in residential premises. BLE-module generates and can transmit/receive radio frequency energy. If it is not installed and is not used in accordance with the [instructions](#), it may cause harmful interference to radio communication. There is no guarantee that interference will not occur in a particular installation. If BLE-module creates harmful interference to the reception of radio or television signals, what can be determined by turning BLE-module on and off, it is recommend for a user to try to eliminate the interference in one or more of the following ways:

- change the direction or location of the receiving antenna;
- increase the distance between the equipment and the receiver;
- plug the equipment into an outlet on a circuit different from that to which receiver is connected;
- contact the dealer or an experienced radio / television technician for a help.

2) BLE-module complies with the restrictions for Class A digital device in accordance with Part 15 of the FCC Rules and RSS-210 of the IC Rules.

These restrictions are designed to provide reasonable protection against harmful interference when the BLE-module is operated in a commercial environment. BLE-module generates and can transmit / receive radio frequency energy. If it is not installed and is not used in accordance with the [instructions](#), it may cause harmful interference to radio communication. Operation of BLE-module in a residential area may cause harmful interference in which case the user will be required to correct the interference at his own expense.

Annex B

Videography

Technoton videos are on the YouTube channel which is regularly updated:

 <https://www.youtube.com/channel/UCq7EF3DHrgl7fOWB2ynsR-A>