# Operating manual
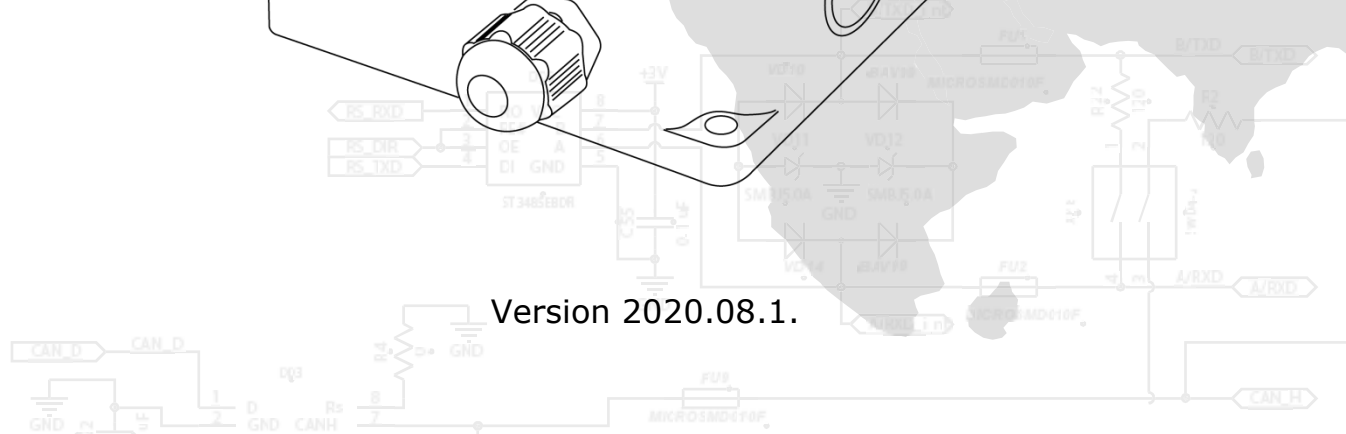
# BLE trailer identifier
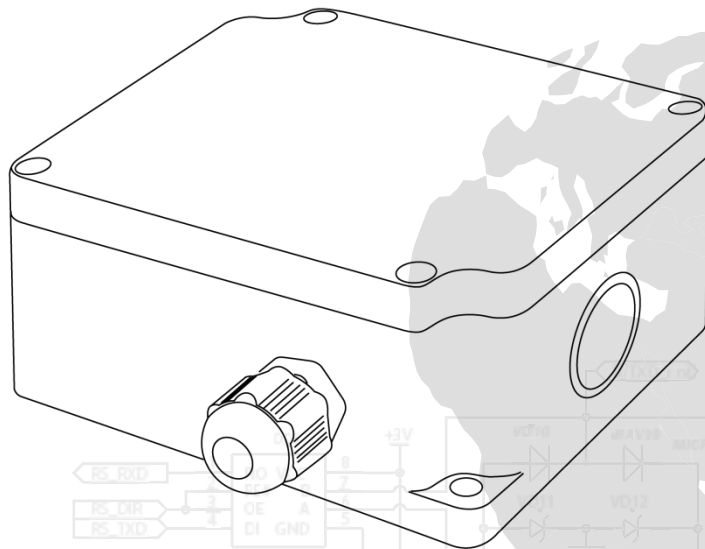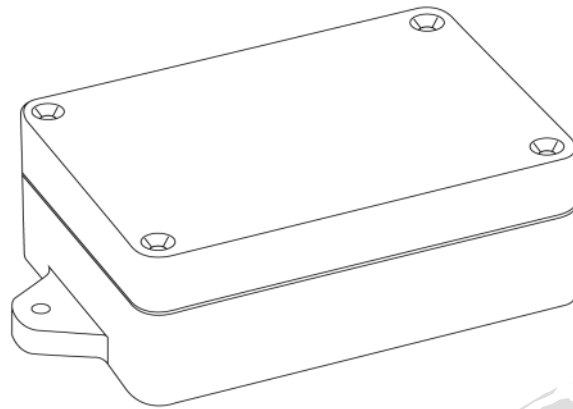
Version 2020.08.1.

# Content

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## Purpose

BLE trailing equipment identifier (hereinafter referred to as the device) is made using Bluetooth Low Energy technology and is designed for wireless identification of various trailing equipment, which can be used with a tractor, traction-type or other equipment.

Various sectors of industry (mainly in the agricultural sector) need an accurate identification of trailing equipment used at performance of works at the moment with specific tractor/traction-type equipment. This device is used to solve the issue.

Technically, device consists of two functional units: BLE radio module and contactless BLE radio tag. The latter is equipped with an autonomous power supply, which makes it possible to use it together with the trailing equipment that does not have a power source.

Device operates as part of the Bitrek Connect system and is its separate functional module. In addition, the device can work separately from the Bitrek Connect system, but with certain restrictions.

## Supply package

BLE trailer ID is supplied as follows:

- BLE radio module - 1 piece.
- BLE radio tag depends on the number of units of trailed equipment (to be specified when ordering).
- Technical data sheet - 1 piece.
- Warranty card - 1 piece.

## Technical specifications of device

Technical characteristics of the device are presented in Table 1.

Table 1. Technical characteristics of BLE radio module

| № | Parameters | Specifications |
|---|---|---|
| 1 | Supply voltage | from 9 to36 V |
| 2 | Current consumption (12 V) | 17 mA |
| 3 | Output interfaces | CAN, RS485 |
| 4 | The maximum distance between the radio module and the tag | 15 m |
| 5 | Operating temperature range | from -30 °C to +80 °C |
| 6 | Permissible humidity | 80 % ± 15 % |

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| № | Parameters | Specifications |
|---|---|---|
| 7 | Dimensions (WxLxH) | 92 × 91 × 44 mm |
| 8 | Weight | 146 |
| 9 | Housing protection class | IP65 |

Table 2. Technical characteristics of BLE radio tag

| № | Parameters | Specifications |
|---|---|---|
| 1 | Power supply | Built-in battery |
| 2 | Battery life | up to 3 years |
| 3 | Operating temperature range | from -30 °C  to +80 °C |
| 4 | Permissible humidity | 80 % ± 15 % |
| 5 | Dimensions of identification tag housing (WxLxH) | 108×58×33 |
| 6 | Weight | 110 g |
| 7 | Housing protection class | IP65 |

## Appearance and design of device
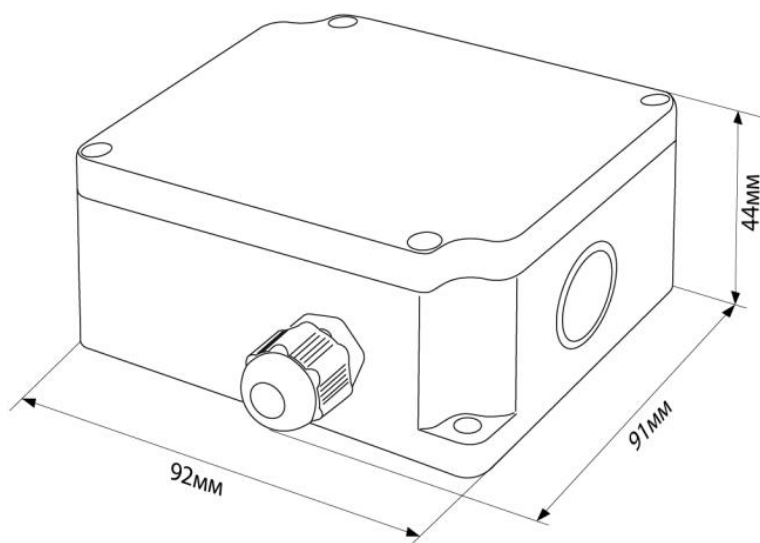


Figure 1 - Appearance and design of BLE radio module.

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Figure 2 - Appearance and design of BLE radio tag.

## Terminal assignment

BLE radio module has a hermetic design. Connection cable is inserted into the module housing through a sealed cable entry and then the cable wires shall be connected to the board using screw terminal blocks.

Contact assignment is marked next to each terminal block on the board (see figure 3).

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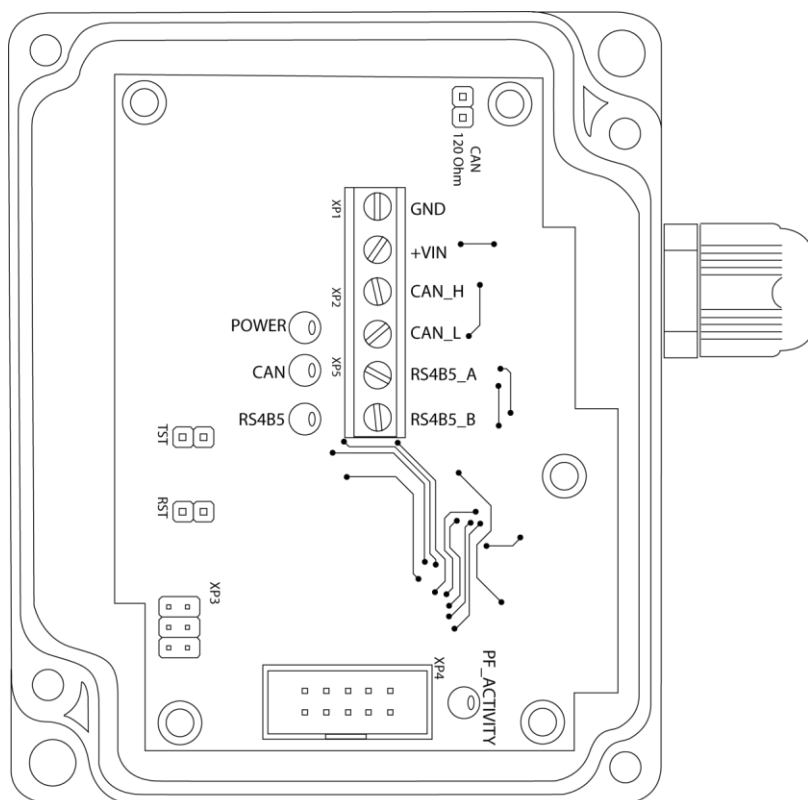
Figure 3 - Terminal blocks on the board and assignment of contacts.

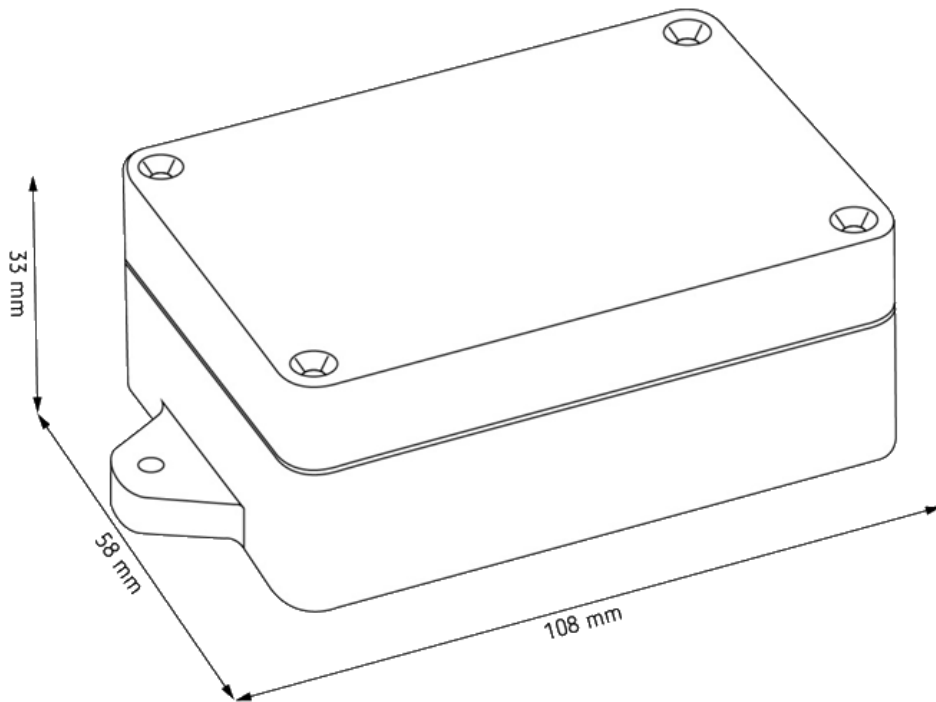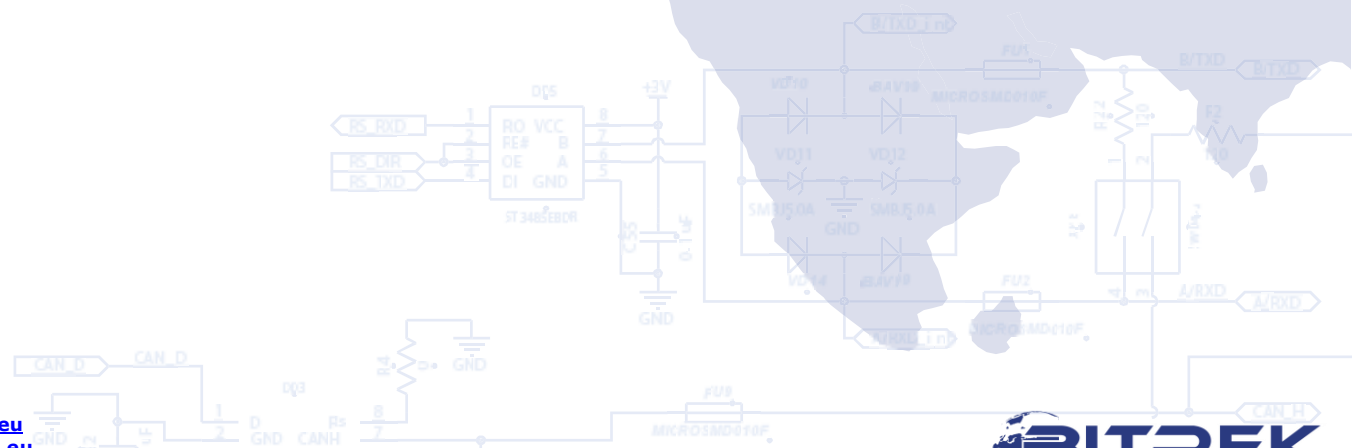Assignment of radio module contacts is indicated in Table 3:

Table 3. Assignment of BLE contacts of the radio module

| № | Name | Purpose |
|---|------|---------|
| **1** | GND | Common wire (ground) |
| **2** | +VIN | "+" supply voltage |
| **3** | CAN_H | CAN_H signal of CAN bus |
| **4** | CAN_L | CAN_L signal of CAN bus |
| **5** | RS485_A | Signal "A" of RS-485 bus |
| **6** | RS485_B | Signal "B" of RS-485 bus |

Device can transmit data using RS485 and CAN (CONNECT-BUS) interfaces, depending on the type of equipment with which it will be used.

In addition, a jumper (bridge) can be installed on the board to connect a matching resistor of 120 Ohm parallel to the signal lines of the CONNECT-BUS. Location of the bridge is shown in Figure 3. Jumper is not installed by default.

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## Operation principles

BLE radio tag is mounted on traction-type equipment and has an internal power source. Once every 5 seconds the tag transmits its unique ID via Bluetooth. BLE radio module mounted on the tractor is constantly in the receiving mode. As soon as the radio module receives ID of tag via Bluetooth, it starts transmitting it to CONNECT-BUS, and can also transmit it via RS485 on request. Communication between the master device and the BLE radio module via RS485 protocol uses SOVA protocol. ID of tag is transmitted for the specified timeout (available for configuration).

Radio module can simultaneously receive signals of 8 tags. ID of the tag and the level of reception of its signal are broadcast to CONNECT-BUS. In this case, PGN 18F701 - 18F708 are used. The first byte in PGN is the tag's validity status (used by RL module to provide relay enable). The second byte is the signal reception level (RSSI, unit of measurement - dBm). Next 6 bytes is tag ID.

Please, keep in mind that when working via RS485, only 5 bytes of the ID tag are transmitted, without the high byte. This is due to a limitation of the SOVA protocol.

Depending on the signal reception level, the tag parameters are translated into the CONNECT-BUS as follows: PGN 18F701 gets the parameters of the tag located next to the radio module (has the maximum signal level). PGN 18F702 gets the tag parameters with a weaker signal etc. PGN 18F708 gets the tag parameters with the weakest signal.

The main variable for determining the current tag is the variable "ID of the priority label". This variable contains the ID of the tag that is closest to the reader. In this case, if another tag is briefly closer to the reader, then the tags will be switched only after the timeout which is specified in the ID0210 parameter - "Timeout for holding the priority tag when changing it". The same variable is broadcast over RS485.

The system has the ability to transmit an arbitrary number of up to two bytes. To implement this function, if necessary, you need to save arbitrary numbers into the labels memory.

## Group configuring

Tags are customizable. You can configure the followed parameters for each tag:
- the group to which it belongs;
- an arbitrary number that the tag will transmit along with its own ID.

The tag ID cannot be changed.

For each tag, it is possible to customize the group to which it belongs. Each tag can belong to only one group while the reader can work with 5 tag groups at the same time.

For example, if at one case this system is used as part of the "friend or foe" system to ensure control of the unloading of the combine and at the same case this system is used to identify trailed units, there is no need for

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the readers installed on the combines to interact with the tags installed on trailed units. For this, the names of the working groups of tags can be different.

The BL reader will only read the data of those tags, the groups of which are specified in the reader settings.

By default, all tags belong to the BITREK group. By default, reader is configured to the same group - BITREK.

The procedure for setting up tag groups for readers is similar to setting up any other reader parameters. The Connect Configurator program is used for configuration. Since the BL reader is a module of the Bitrek Connect system, the principle of configuring this module is similar to other modules in the system. For a description of how to set it up, see the Connect General Manual.

Tags are configured with a special programmer for BLE RFID tags. Below is a step-by-step procedure for setting up labels.

1. Disconnect the tag battery.
2. Connect the programmer to the computer.
3. Start the COM Sender program. Select the COM port to which the programmer is connected. Click the "Close port" button.
4. Enter the following commands into the program:

*setparam 0910 GROUP1;*
*setparam 0210 1234;*
*saveparam;*
 - where,
GROUP1 is the name of the group to which the tag belongs;
1234 - arbitrary number (if necessary)

The *saveparam;* command is required.

5. Connect the programmer to the tag.
6. Click the "Open port" button.
7. Press the "Send" button. Then the commands will be sent to the device.
8. Click the "Close port" button.
9. Disconnect the programmer from the tag.
10.        Connect the battery.

The configuration of the tag is complete.

## Device installation

The device must be installed by qualified technical personnel in conformity with the fire safety regulations in accordance with GOST 12.1.004 and electrical safety in accordance with GOST 12.1.019.

Vehicles at the work area shall comply with the occupational safety and health rules in accordance with the DNAOP (State regulations on labor protection) 0.00-1.28-97.

BLE radio module is mounted outside the tractor in such a way that the cover of the device faces towards the trailing equipment. The hermetic cable

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input shall be located below. Mounting is carried out in a place where it will not interfere with the operation of the standard mechanisms of the tractor. Connection of the cable requires mandatory use of a sealed cable input.

Do not over-tighten the connecting cable, as well as its loose attachment, clamping, etc.

In places where the cable shall pass through metal barriers, use regular places for cable input. If it is impossible, rubber seals shall be used to prevent possible fraying and wearing of a cable.

Mounting of BLE radio tag is performed on trailing equipment so that the top surface of the tag (the top surface is the plane that is on the reverse side of the screws) to be directed towards the tractor where the BLE radio module is installed. Use a metal bracket for mounting.

Mounting of a tag is carried out in a place where it will not interfere with the operation of the standard mechanisms of the traction-type equipment.

## Device setting up

The device has a number of configurable parameters, the list of which is presented in Table 4. To configure the device, use the Bitrek Connect Configurator and the Connect Configurator SW.

The procedure for working with the configurator and software module is described in detail in the document "General guide for Bitrek Connect system organizing and configuring".

Table 4. Device settings

| Name of parameter | ID at setting | Length of parameter | Parameter purpose | Value by default |
|---|---|---|---|---|
| Reset timeout | 0101-0108 | 2 bytes | Data zeroing timeout | 10 sec |
| Send Period | 0201-0208 | 2 bytes | The period of sending data to CONNECT-BUS | 10 sec |
| RS485_addr | 0211 | 1 byte | Address of the device on RS485 bus | 9 |
| Status Period | 0209 | 2 bytes | Retention Tag MAC Address Status Period | 100 ms |
| Timeout MAC | 0210 | 2 bytes | MAC Address Hold Timeout | 5 sec |

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## List of variables transmitted to CONNECT-BUS

| No | Name of parameter | Length | PGN | Start Bit | Bit Total | Time out |
|----|-------------------|--------|-----|-----------|-----------|----------|
| 1 | Device model | 4 | 18F713 | 0 | 32 | 10 |
| 2 | SW version | 4 | 18F713 | 32 | 32 | 10 |
| 3 | Operation time of module | 4 | 18F712 | 0 | 32 | 10 |
| 4 | Number of module restarts | 4 | 18F712 | 32 | 32 | 10 |
| 5 | Tag ID No.1 | 8 | 18F701 | 16 | 48 | 10 |
| 6 | Tag ID No.2 | 8 | 18F702 | 16 | 48 | 10 |
| 7 | Tag ID No.3 | 8 | 18F703 | 16 | 48 | 10 |
| 8 | Tag ID No.4 | 8 | 18F704 | 16 | 48 | 10 |
| 9 | Tag ID No.5 | 8 | 18F705 | 16 | 48 | 10 |
| 10 | Tag ID No.6 | 8 | 18F706 | 16 | 48 | 10 |
| 11 | Tag ID No.7 | 8 | 18F707 | 16 | 48 | 10 |
| 12 | Tag ID No.8 | 8 | 18F708 | 16 | 48 | 10 |
| 13 | Priority tag ID | 8 | 18F714 | 16 | 48 | 15 |
| 14 | Tag signal level No.1 | 2 | 18F701 | 0 | 16 | 10 |
| 15 | Tag signal level No.2 | 2 | 18F702 | 0 | 16 | 10 |
| 16 | Tag signal level No.3 | 2 | 18F703 | 0 | 16 | 10 |
| 17 | Tag signal level No.4 | 2 | 18F704 | 0 | 16 | 10 |
| 18 | Tag signal level No.5 | 2 | 18F705 | 0 | 16 | 10 |
| 19 | Tag signal level No.6 | 2 | 18F706 | 0 | 16 | 10 |
| 20 | Tag signal level No.7 | 2 | 18F707 | 0 | 16 | 10 |
| 21 | Tag signal level No.8 | 2 | 18F708 | 0 | 16 | 10 |
| 22 | Priority tag signal level | 1 | 18F714 | 8 | 8 | 15 |
| 23 | Arbitrary number No.1 | 2 | 18F709 | 8 | 16 | 15 |
| 24 | Arbitrary number No.2 | 2 | 18F70A | 8 | 16 | 15 |
| 25 | Arbitrary number No.3 | 2 | 18F70B | 8 | 16 | 15 |
| 26 | Arbitrary number No.4 | 2 | 18F70C | 8 | 16 | 15 |

| No | Name of parameter | Length | PGN | Start Bit | Bit Total | Time out |
|----|-------------------|--------|-----|-----------|-----------|----------|
| 27 | Arbitrary number No.5 | 2 | 18F70D | 8 | 16 | 15 |
| 28 | Arbitrary number No.6 | 2 | 18F70E | 8 | 16 | 15 |
| 29 | Arbitrary number No.7 | 2 | 18F70F | 8 | 16 | 15 |
| 30 | Arbitrary number No.8 | 2 | 18F710 | 8 | 16 | 15 |
| 31 | Priority tag arbitrary number | 2 | 18F715 | 8 | 16 | 15 |

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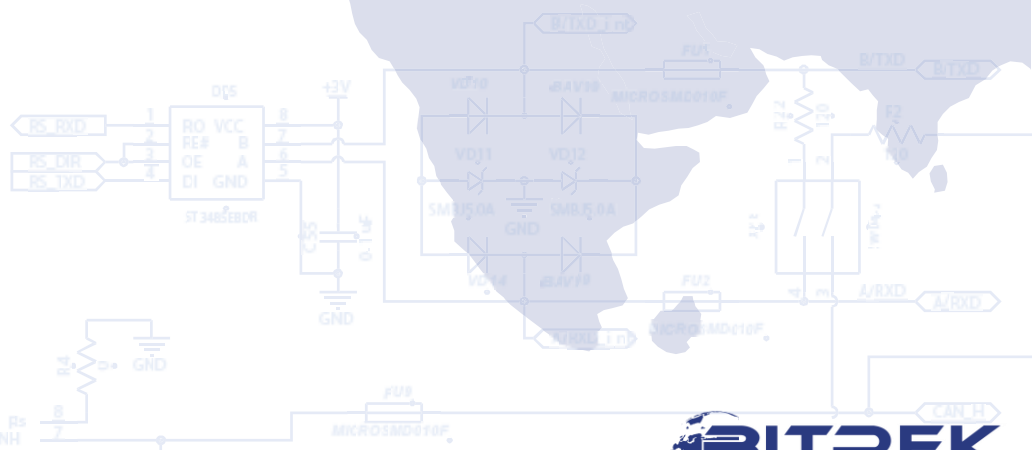
Document version

| Date | Version | Note |
|------|---------|------|
| 10.02.2017 | 2017.10.1 | Basic document |
| 01.07.2020 | 2020.07.1 | Figures are replaced, new parameters for configurating added and new variables are added to the list |
| 01.08.2020 | 2020.08.1 | Added a section describing the tag settings |

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