

USB 300 / USB 300U / USB 400J  
USB Gateway for EnOcean Radio

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Observe precautions! Electrostatic sensitive devices!

Patent protected:

WO98/36395, DE 100 25 561, DE 101 50 128,  
WO 2004/051591, DE 103 01 678 A1, DE 10309334,  
WO 04/109236, WO 05/096482, WO 02/095707,  
US 6,747,573, US 7,019,241

**USB 300 / USB 300U / USB 400J**  
**USB Gateway for EnOcean Radio****REVISION HISTORY**

The following major modifications and improvements have been made to this document:

Version	Author	Reviewer	Date	Major Changes
1.7	MK	MKA, CB	01.06.2017	RED and Layout change

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**Important!**

This information describes the type of component and shall not be considered as assured characteristics. No responsibility is assumed for possible omissions or inaccuracies. Circuitry and specifications are subject to change without notice. For the latest product specifications, refer to the EnOcean website: <http://www.enocean.com>.

As far as patents or other rights of third parties are concerned, liability is only assumed for modules, not for the described applications, processes and circuits.

EnOcean does not assume responsibility for use of modules described and limits its liability to the replacement of modules determined to be defective due to workmanship. Devices or systems containing RF components must meet the essential requirements of the local legal authorities.

The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

Components of the modules are considered and should be disposed of as hazardous waste. Local government regulations are to be observed.

Packing: Please use the recycling operators known to you.

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USB Gateway for EnOcean Radio

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## Content

1.	Introduction.....	4
2.	Technical Data & Environmental Conditions .....	5
3.	Block Diagram and Protocol Layers .....	6
4.	Documentation of Protocols and EnOcean Profiles .....	7
5.	Additional Features of USB 300 .....	8
6.	First Steps with USB 300 and DolphinView Basic .....	9
7.	Restrictions and Hints .....	10
8.	Legal issues and approvals .....	11

## USB 300 / USB 300U / USB 400J USB Gateway for EnOcean Radio

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### 1. INTRODUCTION

USB 300 (USB 300U / USB 400J) is a smart USB stick which connects PC's or smart home servers to the world of EnOcean based radio products.



USB 300 is equipped with an EnOcean TCM transceiver module and the gateway controller software. It provides bidirectional EnOcean radio protocol to devices with USB interface. Radio messages are sent and received through a virtual serial interface (FTDI Virtual COM Port). USB 300 provides additional information like signal strength (RSSI).

USB 300 is available for following frequencies:

- 868.300 MHz: USB 300 with RED approval (EU)
- 902.375 MHz: USB 300U with FCC and IC approval (US/CA)
- 928.350 MHz: USB 400J with ARIB approval (Japan)

USB 300 includes a TCM 310 radio module with EnOcean Gateway Controller software. Further information about supported commands and features can be found within the TCM 310 user manual:  
[http://www.enocean.com/en/enocean\\_modules/tcm-310](http://www.enocean.com/en/enocean_modules/tcm-310)

USB 400J includes a TCM 410J radio module with EnOcean Gateway Controller software. Further information about supported commands and features can be found within the TCM 410J user manual:  
[http://www.enocean.com/en/enocean\\_modules\\_928mhz/tcm-410j/](http://www.enocean.com/en/enocean_modules_928mhz/tcm-410j/)

USB 300 / USB 300U / USB 400J  
 USB Gateway for EnOcean Radio

**2. TECHNICAL DATA & ENVIRONMENTAL CONDITIONS**

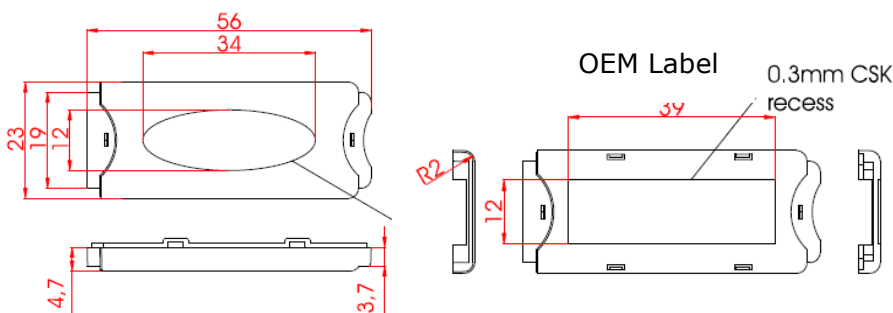
**Features overview**

<b>Frequency/antenna</b>	USB 300: 868.300MHz / chip antenna USB 300U: 902.875MHz / whip antenna USB 400J: 928.350MHz / PCB antenna
<b>Data rate</b>	125kBit/s
<b>Modulation type</b>	USB 300: ASK 868 MHz <sup>1)</sup> USB 300U: FSK 902MHz <sup>1)</sup> USB 400J: FSK 928MHz <sup>1)</sup>
<b>Receiver Sensitivity</b> (at 25°C) <sup>2)</sup>	USB 300: typ. -96dBm USB 300U: typ. -98dBm USB 400J: typ. -95dBm
<b>Receiver Category</b> (RED, EN 300 220)	2 (standard performance)
<b>Conducted Output Power</b> (antenna base)	USB 300: typ. 3dBm USB 300U: typ. 1dBm USB 400J: typ. 0dBm
<b>Dimensions</b> (incl. cap)	70 x 23 x 9mm
<b>OEM label size</b>	39 x 12mm
<b>USB connector</b>	Typ A
<b>Operating temperature</b>	-20°C to +50°C (max. 90% r.h.)
<b>Radio Regulations</b>	USB 300: RED (EU) USB 300U: FCC (US) / ISED (CA) USB 400J: ARIB (Japan)

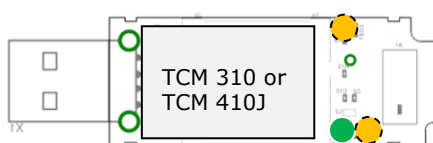
1) According to ISO/IEC 14543-3-1x



2) 0.1% telegram error rate (based on the combination of 3 received sub-telegrams)

**Housing:**



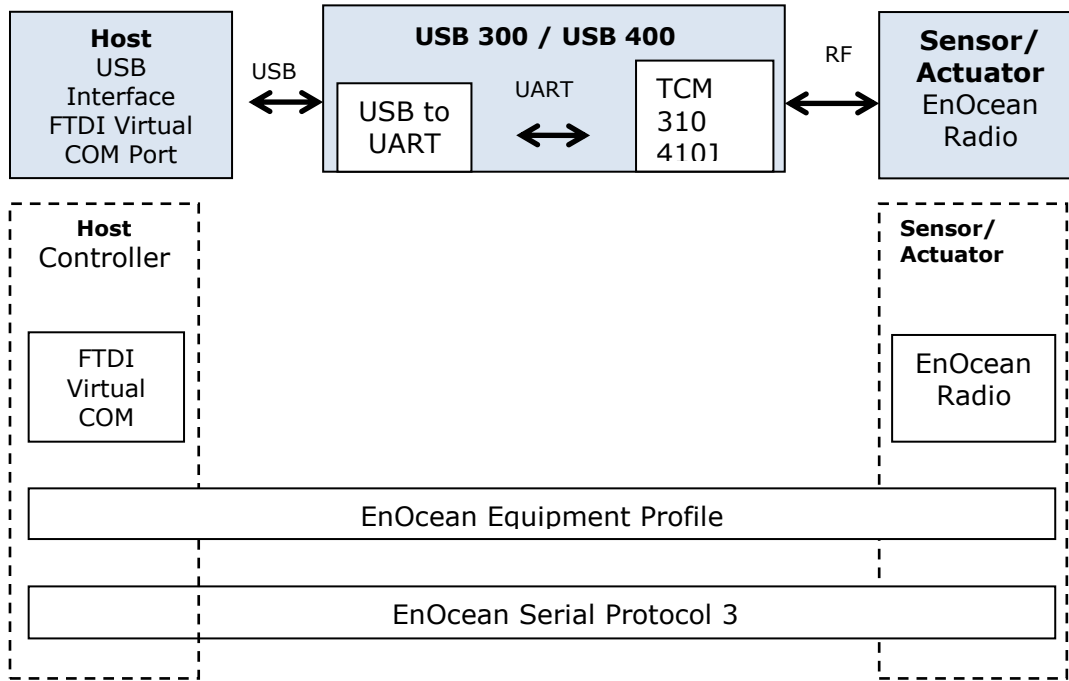
**PCB:**



-  USB activity LED, positions depends on HW variant
-  Power LED

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**3. BLOCK DIAGRAM AND PROTOCOL LAYERS**



USB 300 / USB 300U / USB 400J  
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#### 4. DOCUMENTATION OF PROTOCOLS AND ENOCEAN PROFILES

- Plug'n play device drivers are available from USB chip manufacturer FTDI Limited for the operating systems Microsoft Windows, Linux and Apple Mac OS:  
<http://www.ftdichip.com/FTDrivers.htm>
- If you want to develop for other host platforms, you can use or adapt available C-source code for Linux OS from FTDI Website:  
<http://www.ftdichip.com/Drivers/VCP.htm>
- Smart Home Server with Raspberry Pi and USB 300/400:  
[http://www.enocean.com/fileadmin/redaktion/pdf/white\\_paper/wp\\_Raspberry\\_talks\\_EnOcean.pdf](http://www.enocean.com/fileadmin/redaktion/pdf/white_paper/wp_Raspberry_talks_EnOcean.pdf)
- USB 300 uses EnOcean Serial Protocol 3 for control commands and data communication. A description of ESP 3 is available at:  
<http://www.enocean.com/en/knowledge-base/>
- The content of EnOcean radio telegrams is standardized by the EnOcean Alliance. You will find the latest definition of EnOcean Equipment Profiles (EEP) at:  
<http://www.enocean-alliance.org/>
- **Attention: USB 300 has been designed for gateway applications, some radio telegrams (e.g. Smart Acknowledge) will be internally processed only. For protocol tracing it is strongly recommended to use DolphinSniffer from the EnOcean Developer Kit.**

## USB 300 / USB 300U / USB 400J USB Gateway for EnOcean Radio

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### 5. ADDITIONAL FEATURES OF USB 300

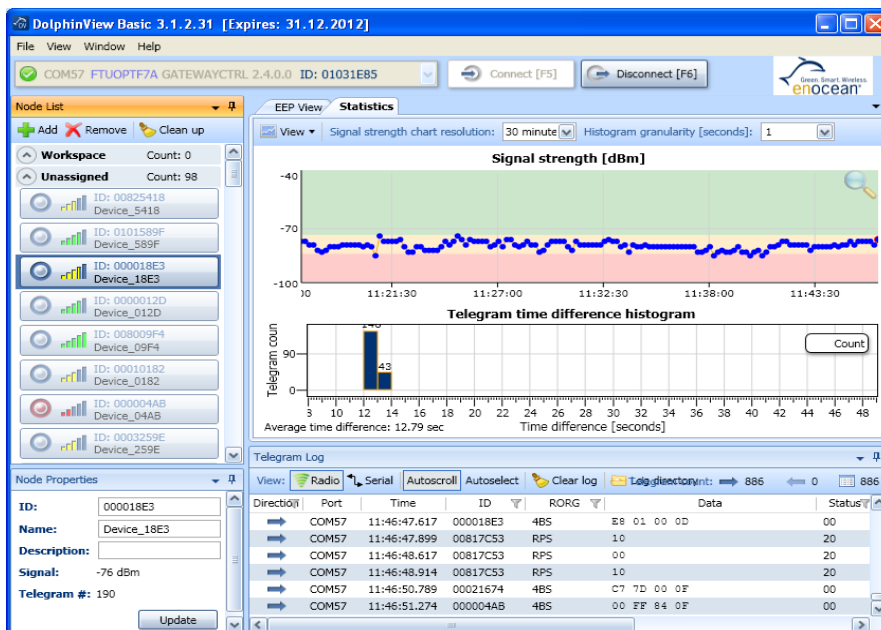
- USB 300 can be used as repeater of EnOcean telegrams; this will expand the range of radio devices. Repeater command has to be sent after every power up. For details see ESP3 command description of CO\_WR\_REPEATER within the ESP3 description:
- USB 300 can filter EnOcean telegrams; this can avoid heavy data load for the host system. For details see ESP3 command description of CO\_WR\_FILTER\_ADD within the ESP3 description.
- USB 300 supports remote management of self-powered radio nodes. For details see TCM 310 and ESP3 command description of REMOTE\_MAN command within the ESP3 description.
- USB 300 supports smart acknowledge of self-powered radio nodes internally. This feature enables bidirectional communication for self-powered radio nodes.
- USB 300 commands are defined within TCM 310 Gateway Controller and ESP3 documentation is available at:  
<http://www.enocean.com/en/knowledge-base/>
- For advanced analysis and protocol debugging we recommend EnOcean Developer Kit EDK with DolphinView Advanced and DolphinSniffer.



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### 6. FIRST STEPS WITH USB 300 AND DOLPHINVIEW BASIC

1. Register download and install DolphinView Basic:  
<http://www.enocean.com/en/download/>
2. Plug USB into free USB 300 to an USB port of the PC.
3. Start DolphinView Basic and connect to COM port
4. Press self-powered switch or learn button of sensor, DolphinView Basic will display telegram



## USB 300 / USB 300U / USB 400J USB Gateway for EnOcean Radio

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### 7. RESTRICTIONS AND HINTS

- USB 300 should not be exposed to rapid temperature changes shortly before or during operation. Condensation of moisture might damage the device.
- USB 300 is not intended to be used in rough environment with heavy vibrations or mechanical shocks.
- The USB 300 front cap is used as handling protection during delivery.
- USB 300U:  
In order to optimize radio performance you have to stretch out whip antenna. Please do not cut of, coil up, brake or bend frequently.
- Installation location of radio nodes should be carefully planned.  
Application note AN001 at <http://www.enocean.com/en/application-notes/> will explain basic rules.
- Any USB 300 configurations done by ESP3 commands (e.g. repeater on, filter, maturity time) will be lost in case of power off. If you need these configurations permanent, make sure USB 300 has continues power or re-send commands after power down.
- USB 300 has been designed for usage with DolphinView Basic. For advanced protocol analysis and debugging we recommend the usage of EnOcean Developer Kit with DolphinView Advanced and DolphinSniffer.
- USB 300 has been optimized for cyclic sending/receiving status values and not for continuous data communication; therefore the radio interface is limited to receive approx. 90 telegrams per second. Higher traffic can lead to telegram loss.
- Microsoft Windows increases the COM port number for every installed USB 300/400 (FTDI virtual COM port device). If the number reaches 255, you have to reset the device driver and follow the instructions from the company FTDI.

## USB 300 / USB 300U / USB 400J USB Gateway for EnOcean Radio

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### 8. LEGAL ISSUES AND APPROVALS

USB gateways have been tested to fulfil the requirements of RED (USB 300), FCC/ISED (USB 300U) and ARIB (USB 400J) based on the radio module hardware and the built-in firmware.

#### **Radio Equipment Directive (RED) for the European Union**

The Radio Equipment Directive (2014/53/EU, typically referred to as RED) replaces the old R&TTE directive from 1999 as regulatory framework for radio products in the European Union. All products sold to final customers after 12th of June, 2017 have to be compliant to RED. At the time of writing, the text of the RED legislation was available from this link: <http://eur-lex.europa.eu/eli/dir/2014/53/oj>

TCM 300 is delivered to OEM manufacturers for their use as final (branded) product. OEM manufacturers or distributors have to take care about legal issues of selling products to the European market. At least following issues have to be considered

- Product labeling and documentation containing full postal address of the manufacturer as well as radio frequency band and max. transmitting power
- User manual, safety information and a declaration of conformity for the final product in local language
- Provide product development and test documentation upon request
- Fulfillment of country specific registration and recycling regulations of electronic waste and packaging material (WEEE)

#### **Duty cycle lock for 868.3 MHz**

In order to ensure the 1% duty cycle is not exceeded a watcher is implemented in firmware. This watcher limits the transmission of telegrams beyond the defined 1 % boundary. The EnOcean Duty cycle watcher implementation works as follows: the 60 minute regulatory interval is divided into 10 rolling time slots of equal length. For each of these time slots, the total transmission time is recorded. In addition to that, the transmission time in the current time slot is recorded. New telegrams will only be transmitted if the total transmission time in the previous 10 time slots (representing a full 60 minute interval), the transmission time in the current time slot, and the transmission time of the current telegram combined do not exceed the regulatory limit. The time slots are rotating, freeing always the last slot.

## USB 300 / USB 300U / USB 400J USB Gateway for EnOcean Radio

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### **FCC (US)**

USB 300U (902MHz) is based on the EnOcean STM 300U radio module (HW for TCM 310). This hardware has a limited modular approval according to FCC. The conformity has been proven and the according documentation has been deposited at EnOcean.

*Contains FCC ID: SZV-STM300U*

*The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:*

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

### **ISED (former Industry Canada)**

USB 300U (902MHz) is based on the EnOcean STM 300U radio module (HW for TCM 310). This hardware has a limited modular approval according to FCC. The conformity has been proven and the according documentation has been deposited at EnOcean.

*Contains IC: 5713A-STM300U*

*The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:*

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

### **ARIB (Japan)**

USB 400J (928MHz) is based on the EnOcean TCM 410J radio module. This hardware has an approval according to ARIB STD-T108. The conformity has been proven and the according documentation has been deposited at EnOcean.

When the product is placed on the Japanese market, it must carry the Specified Radio Equipment marking as shown below:

