# PadPuls M2W
# IM003GW

2-Channel Wireless M-Bus
Pulse Converter For
Wall Mounting


User Manual

**Content**



**This documentation is valid from M-Bus generation: $50**


www.relay.de

# 1 Functional description

The PadPuls M2 adapts consumption measuring instruments, such as, electricity, gas or water meters to the wireless M-Bus system. However, the meters to be adapted must have a floating pulse output. Up to two impulse meters can simultaneous be connected to the inputs of this device. Optionally the user can activate a tariff function, by which energy or volume pulses are accumulated in separate meter readings for primary and secondary tariffs. In this case a floating signal for tariff switch is used at Port 2.


*Picture: Wireless M-Bus System with PadPuls M2W, wM-Bus / M-Bus Gateway RelAir R2M and PW250*

The radio transmission of the meter readings is unidirectional using the Wireless M-Bus system according to the standard EN13757-4 with 868 MHz in mode S1, T1 or C1 and is OMS compatible. The data can be sent unencrypted or AES encrypted in Mode 5 or 7. The transmission interval can be set between 10 seconds and 2 hours.

A built-in, high-capacity battery ensures counting and transmission for many years depending on the selected transmission intervals To keep the battery load as low as possible, only the current meter reading is transmitted in the radio protocol. Further data such as the annual and monthly due-date values can be read out via the converter cable with the MBConf software.

With the PadPuls M2W, both ports (or main and sub-tariff status) have their own application layer address (ALA). The PadPuls M2W behaves like two independent Wireless M-Bus slaves! The user can configure the PadPuls M2W using the free MBCONF software to convert the accumulated pulses into kWh, m3, J or other units.

**Attention: For the configuration of the device a special adapter cable (article mumber KV003) is required as accessory. If you do not own this cable, contact the sales department of Relay GmbH or your local distributor or distributor.**

All configuration data is saved in an EEPROM. In addition, the counter readings are saved daily to the EEPROM. Should there be a battery failure of the PadPuls M2W, the data of the last backup will be available when restarting the PadPuls M2W. It is possible to protect the device data against unauthorized configuration. The PadPuls M2W can be switched to protection mode with a special M-Bus telegram. In this operating state a subsequent change of the device parameters is no longer possible. The protection mode can then only be deactivated by opening the (sealed) housing and pressing the "Unprotect" button.

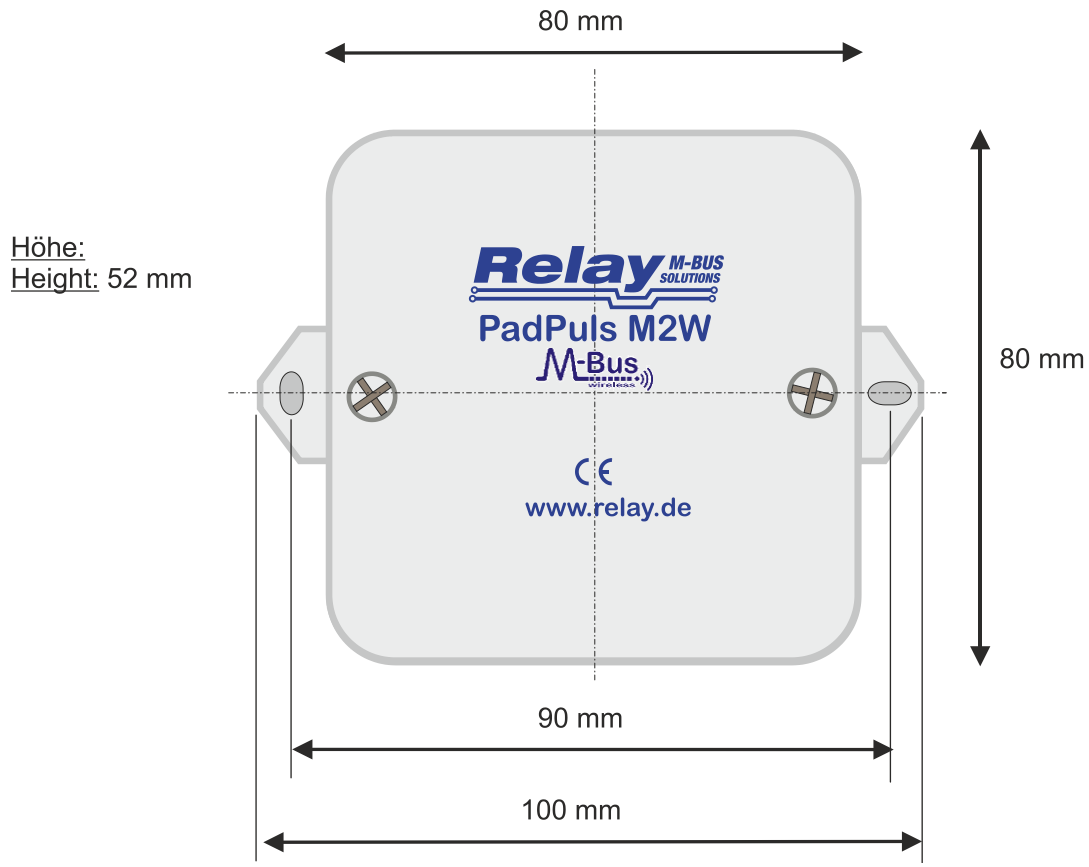
# 2 Installation and Startup

## 2.1 Mounting the case

Die Unterschale des Gehäuses wird mit den Klemmen nach unten an die Wand geschraubt. Zu diesem Zweck befinden sich außen am Gehäuse zwei Wandlaschen.

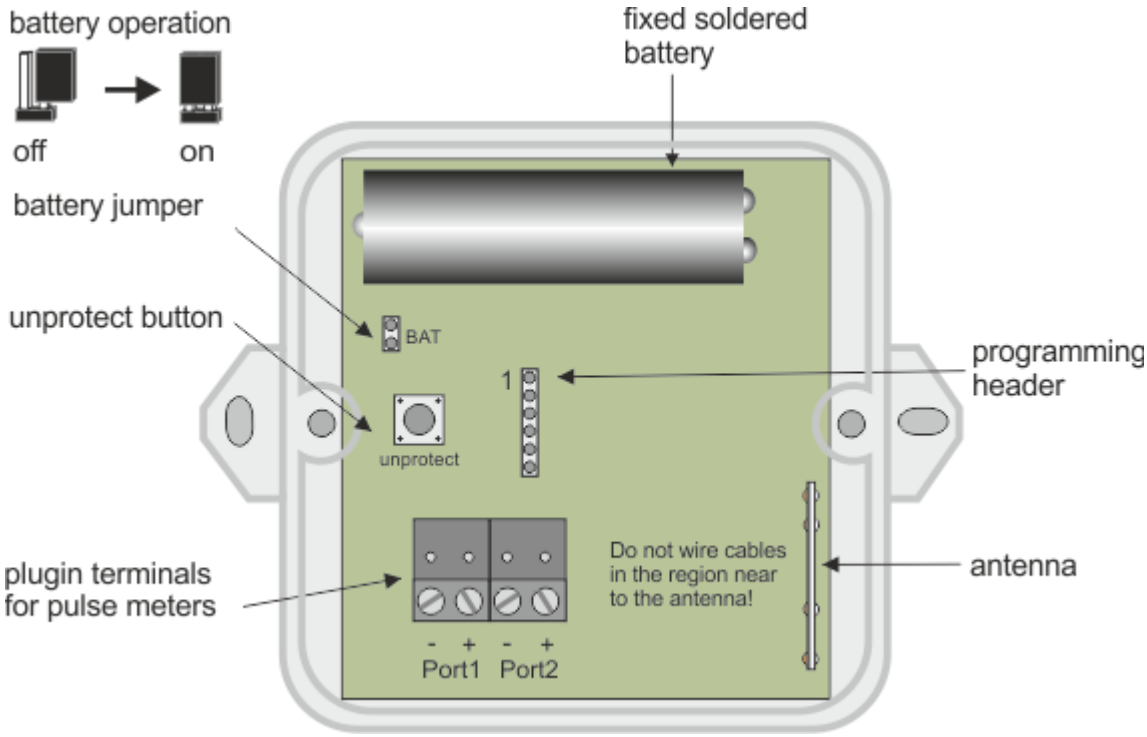
The bottom part of case is first attached to the wall with the terminals arranged downward. Please use 2 screws mounted through the outside drillings at the case.
The cable for pulse generator and M-Bus interface are led through the self sealing cable glands in the housing. You should break the cable glands with a small screw driver if you use flexible cables. To ensure a high protective class of up to IP65 the hole must be much smaller than the outer diameter of the cable. If you lift the terminal connectors and feed the cables far enough through the glands, you can connect the wires comfortably outside of the housing. Afterwards please withdraw the cables again and put the terminals on the appropriate pin rows on the circuit board. The strain relief is given by looping the enclosed cable straps around the cable. If you have completed all assembly and configuration work, you should protect the device against manipulation with one labels on each screw on the cover of the case.

The accompanying drawing defines the dimensions for wall mounting in mm:



## 2.2 Activation

Coming from factory the PadPuls M2W must first be activated. The cover of the housing has to be removed. On the circuit board there is a 2pin row marked with “BAT”. Here the jumper must be put on both pins to allow battery operation and security function in case of M-Bus failure.




- If the device is not used for a longer time, it is advisable to deactivate battery operation by removing the jumper to preserve the battery.

After you have activated the battery jumper, please insert the adapter cable KV003 into the above-mentioned programming pin strip to parameterize the settings of the device. The black wire (pin 1) must match pin 1 of the pin header at the top.

Header of the KV003:
(Pin 1 = black wire)

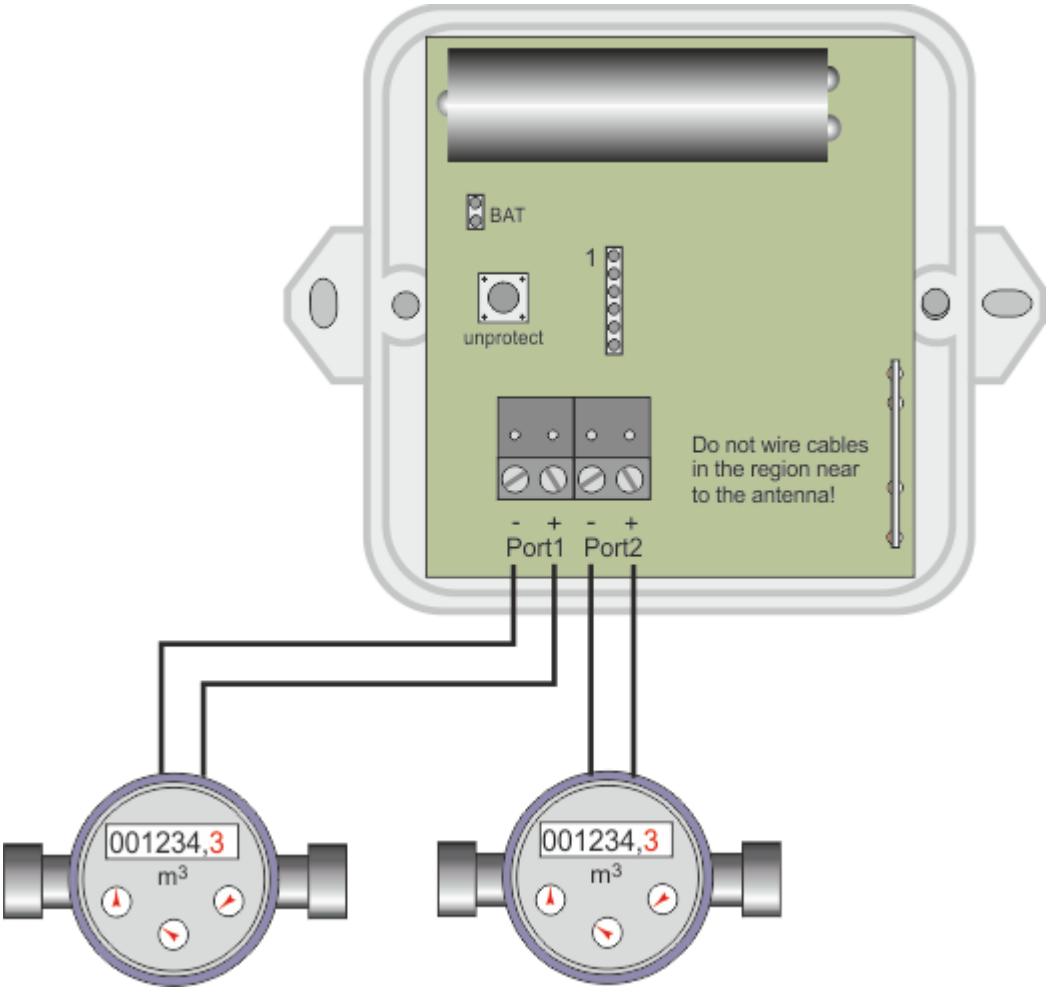

Please refer to chapter 3 (parameterization using MBConf) for details on installing the driver and programming the device.

**Please note that during programming, as long as the converter cable is plugged in, there is no radio transmission!**

## 2.3 Connecting

### 2.3.1 Two channel mode

The following figure shows the link of two counters with impulse outputs to the PadPuls M2W. We recommend to use 2-wire cables (twisted pair, NYM or j-Y(St)Y) with a max. length of 10m. In any case it must be noted that the total capacity of the cable plus impulse generator attached at any port may not exceed 2nF (optional 12nF with activated “long pulse sampling”).

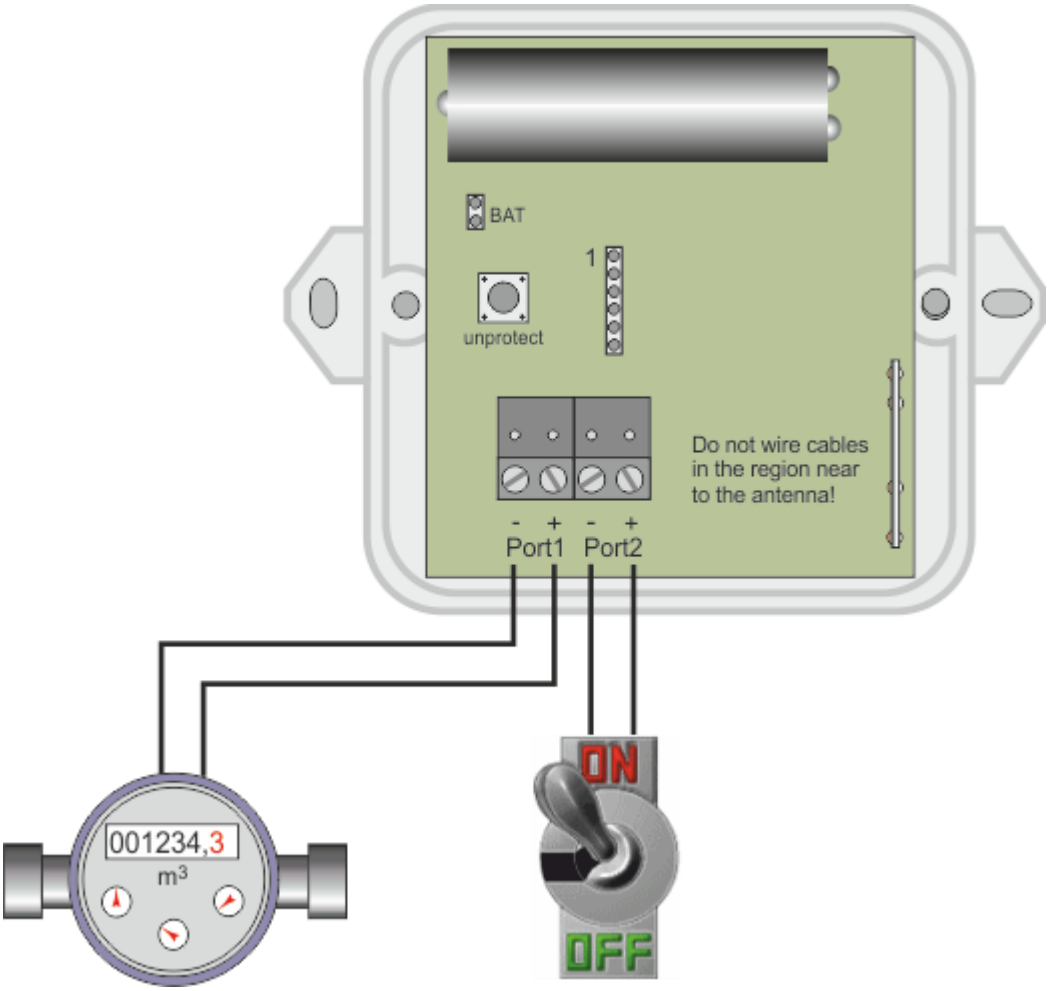



- If not all ports of PadPuls M2W are used, you should not attach a cable to the respective unused port. The capacity of an open-circuited cable reduces the lifetime of the battery. The wireless transmission of unused ports can also be switched off to save battery power.

- If the pulse frequency is over 18 Hz, false counts can occur.

## 2.3.2 Tariff mode

The following graph represents the diagram of connections in the tariff mode with one counter and a tariff signal generator:




The tariff mode can be activated with the configuration software MBCONF. You are using this operating mode to adopt a meter with two tariffs supplying just one joint pulse output and a tariff switch signal to the M-Bus. Port1 is the pulse input and Port2 is the tariff switch. The PadPuls counts the incoming pulses to channel 1 while the input at channel 2 is open and to channel 2 while the input at channel 2 is closed.

The specifications of the impulse and tariff signal generator can be taken from the technical data. The maximum pulse frequency to be counted is 18Hz.

- If the pulse frequency is over 18 Hz, false counts can occur.

# 3 Parameterization using MBCONF

The configuration of the device must be adapted to the respective installation by the customer.

The software MBCONF version 3.8 or higher (download at www.relay.de) and the USB converter cable with the article no. KV003 is required for parameterization of the PadPuls M2W.
**There is no radio transmission as long as the converter cable is plugged in!**

## 3.1 Installation

The software MBCONF for configuration of the pulse adaptor is a 32-bit application, which can be executed on IBM-PC compatible computers under the operating systems Windows 10 / 8.1 / 7 / XP / 2000 / 98 / 95.

Please first install the FTDI driver for the virtual Comport of the KV003 from our homepage www.relay.de, the CD "Tools & Docs" or from the homepage of the chip manufacturer: http://www.ftdichip.com/Drivers/vcp.htm.
Then connect the adapter cable KV003 to a free USB interface of the PC. Now a new virtual serial port should be created in your control panel. Select this new comport number later in the MBConf software.

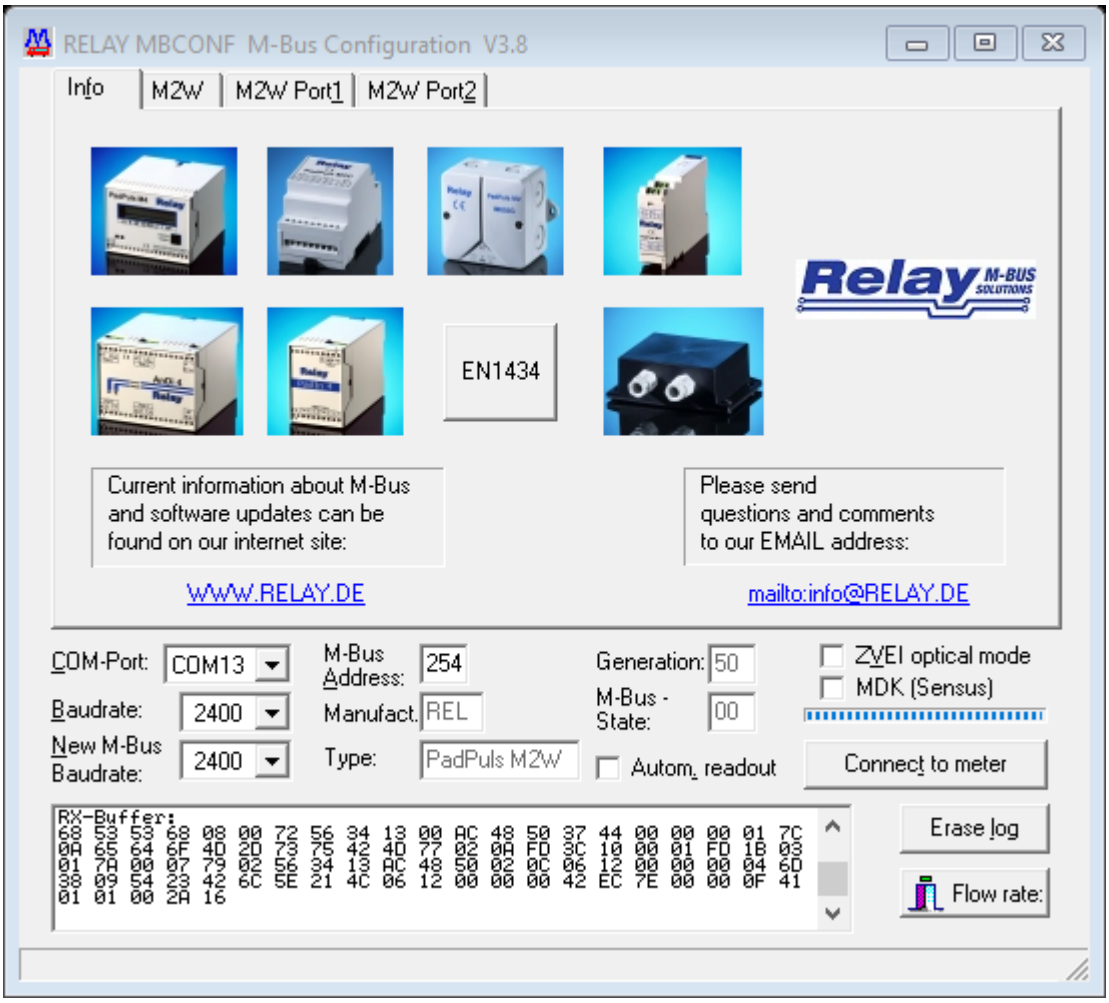
Please run the file “MBCONF_SETUP.EXE” from Windows Explorer or via “Start – Execute” to install the software. Subsequently you select the language of the installation procedure. The setup software can create a program group and a link on the desktop on demand. You can then execute both versions for German and English language either from start menu or desktop.

## 3.2 Operation

After program start the user operates the software according to the Windows conventions with the mouse or the keyboard. If you stay with the mouse on a button or an input field, then a hint to its function appears. Light-grey fields and boxes cannot be edited.
All input fields and buttons have an underlined letter. The function can be activated by simultaneous pressing of the keys [ALT] and the respective letter. Within dialogs the cursor can be moved with the keys [TAB] or [SHIFT] [TAB] forward and backword. [SPACE] activates or deactivates selection boxes. Multiple selection boxes (arrow at the right edge) can be activated with [⇓]. The user then selects an entry with [⇓] and [⇑]. By pressing [RETURN] the selected entry is taken over. With [ESC] the selection box is left without transfer.

The program is arranged as a sheet system. The sheet “Info” contains general options of the communication with the M-Bus device to be configured. In this sheet the user can select the serial port of the PC, the baudrate of the PC, the baudrate of the M-Bus device and the M-Bus primary address which is used for communication. After a successful connection with the M-Bus device, further manufacturer information is shown in the sheet “Info” and additional device-specific sheets are displayed.

## 3.3 Sheet Info




This sheet shows some photos of supported Wired M-Bus devices from the product range of the Relay GmbH, the PadMess GmbH and further manufacturers. Here are also links to our Internet page, from which the current version of the program can be downloaded, and to the email address for criticism and suggestions to the program.
The lower third of this card is likewise visible in every other card. Here the following input fields and buttons are always attainable:

**COM-Port** is the serial port of the PC to which the converter cable KV003 is connected. The selected port will be saved in an INI file and will be restored on start up. Therefore the COM-Port has to be configured only once.

**Baudrate** Specifies the transmission speed of the serial port of the PC used for parameterization. It can be in general 300, 2400 or 9600 baud and corresponds to the currently used M-Bus baud rate. The PadPuls M2W supports only the baud rate 2400 Bd.

| | |
|---|---|
| **New M-Bus Baudrate** | allows reprogramming the baudrate of the M-Bus device. The new baudrate is sent to the M-Bus device after a change in the appropriate selection box. If the M-Bus slave accepts this command, it acknowledges the telegram with the single character „$E5“ ($ for hexadecimal notation) using the old baudrate. Afterwards the device switches to the new baudrate. This button is not needed for the PadPuls M2W, because it only supports 2400 baud for the configuration interface. |
| **M-Bus Address** | is the primary address of the connected M-Bus slave. In a direct connection with only one slave you can use the broadcast address 254. Using this address every M-Bus device must answer regardless of its own address. |
| **Connect to meter** | is used to request data from the slave. The type of device is then automatically recognized. The items “Manufact.”, “Generation”, “Type” and “M-Bus State” will then be refreshed. New sheets are generated depending on manufacturer and type of the M-Bus device. In case of the PadPuls M2W it creates a tab with general settings ("M2W") and a separate tab for each channel (labelled "M2W Port1" for the first channel, "M2W Port2" for the second channel). |
| **Manufact.** | is an item that shows the 3-letter manufacturer code after successful reading (“Connect to meter”). This item is read only. |
| **Generation** | shows the version connected M-Bus device. This item is read only. |
| **Type** | shows the type (here: PadPuls M2W) of the connected device. This item is read only. |
| **M-Bus State** | shows the M-Bus state of the connected device. This item is read only. |
| **ZVEI optical mode** | if this option is activated, devices with an optical interface and M-Bus protocol according to EN 1434-3 can be read and programmed using an optical reading head. |
| **MDK (Sensus)** | This switch activates the readout with an MDK from Sensus. |
| **Autom. readout** | if this option is activated, the software always reads the data after writing (useful for checking the correct programming). |

### Log-Window

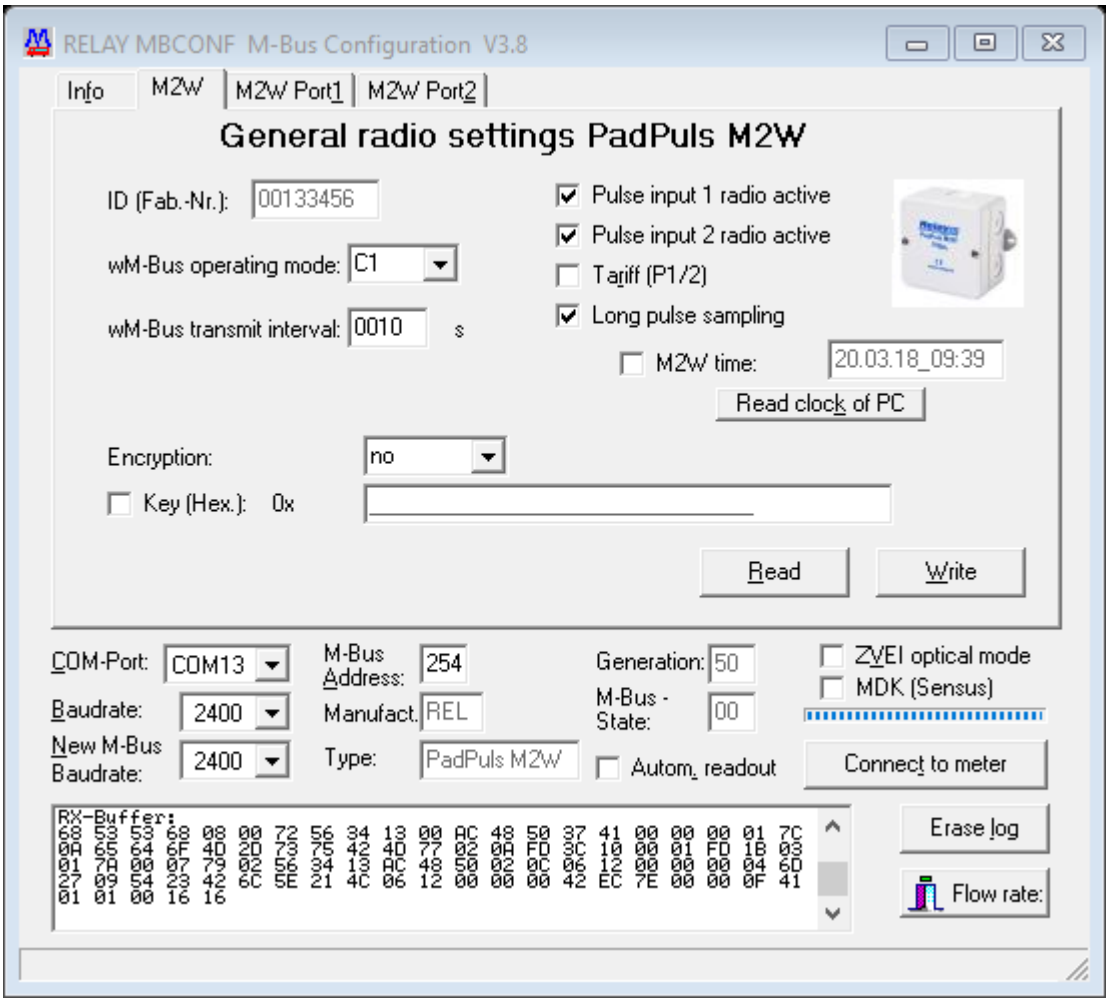
The so-called log window is always visible. All M-Bus communication steps are logged in this window. Data is displayed in hexadecimal notation. It is possible to mark outputs in the log window and copy them with the keys “CTRL-C” to the windows clipboard. The data can then easily be imported to any text editor for documentation. As soon as the maximum storage capacity of the window is achieved, no more data is logged. If you want to keep on logging, you have to delete the logged data.

The following buttons are also always visible:

| | |
|---|---|
| **Erase log** | clears all outputs inside the log window. |
| **Exit** | terminates the program and stores the current setting of serial port (port no.) into the INI file. |

## 3.4 Sheet M2W

The settings in this sheet are valid for both ports.




**ID (Fab.-No.)** is the 8-digit M-Bus ID (= fabrication number), which is transmitted in the Link Layer Address (LLA) of the radio protocol. The item is read only.

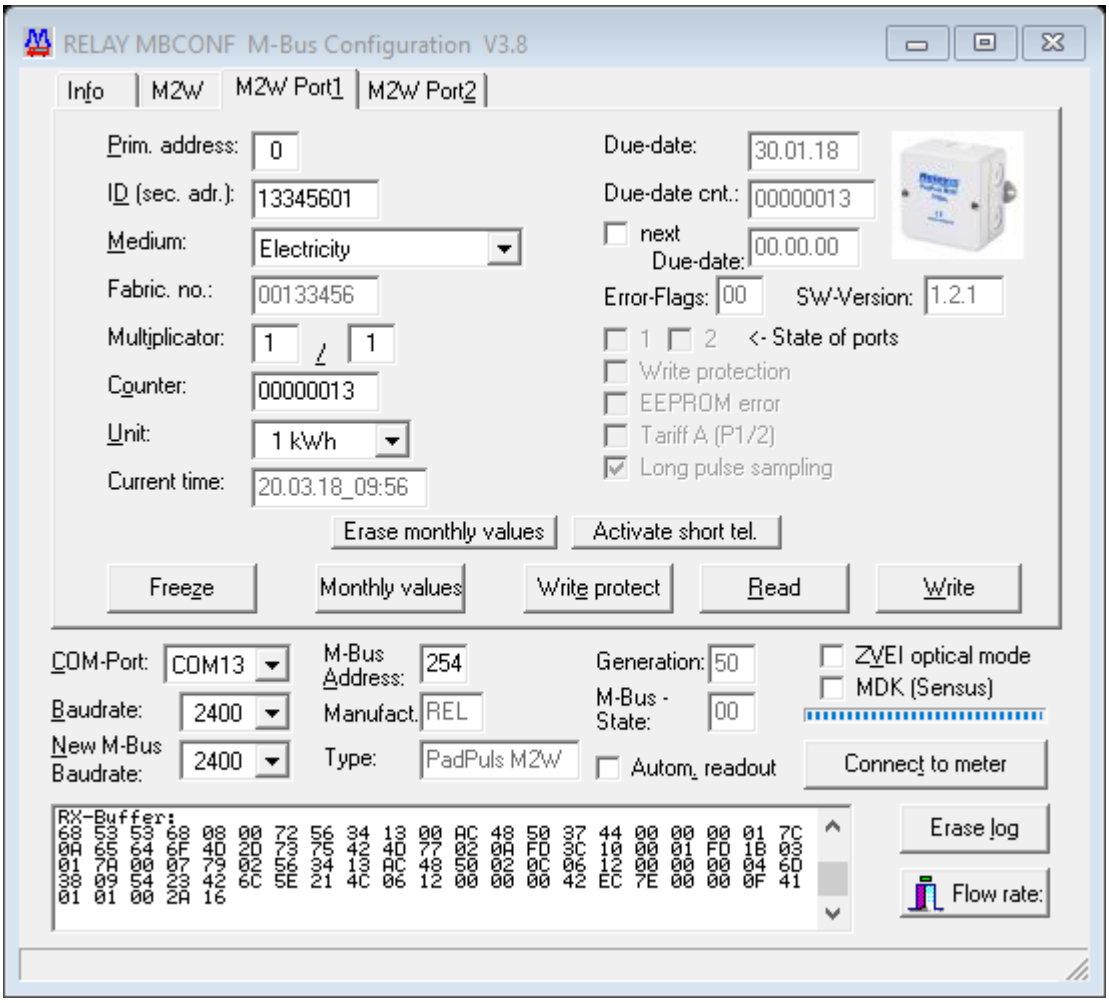
**wM-Bus operating mode** selects the wireless M-Bus operating mode according to EN13757-4:
- S1: stationary mode
- T1: frequent transmit mode
- C1: compact mode

**wM-Bus transmit interval** Sets the transmission interval and can have values between 10 seconds and 7200 seconds (= 2 hours). Please note that the selection of the transmission interval is decisive for the operating life of the battery.

| | |
|---|---|
| **Encryption** | provides for the method of encryption these options:<br>- Mode 0: no encryption<br>- Mode 5: encryption with AES128-CBC, static, symmetrical<br>- Mode 7: encryption with AES128-CBC, dynamic, symmetrical |
| **Key** | Here you can program the 128 bit (32 nibble) key. To do this, please mark the activation field in front of the key with the mouse and enter the key or copy it from the clipboard to the field using shift paste. The key is a 32-character hex string and can only contain the characters 0 through 9 and A through F. The key can also be pre-programmed if the encryption is turned off.<br>**Attention: The key cannot be read from the PadPuls M2W for privacy reasons. It can only be written.** |
| **Pulse input 1 radio active** | The transmission of the data from radio input 1 can be deactivated here (checkbox not marked) to save battery power if this channel is not needed. The pulse count continues despite deactivation. |
| **Pulse input 2 radio active** | The transmission of the data from radio input 2 can be deactivated here (checkbox not marked) to save battery power if this channel is not needed. The pulse count continues despite deactivation. |
| **Tariff (P1/2)** | is used for activation of the tariff mode on port 1 and 2. The tariff mode will be selected after pressing the “Write” button if the check box is marked. Port 1 is then used as pulse input and port 2 is used for the tariff switch. With an open tariff switch the pulses are accumulated to the counter for port 1 (main tariff). With a closed tariff contact the pulses increment the counter for port 2 (special tariff). When tariff mode is activated, the PadPuls M2W sends both counters in one radio telegram. |
| **Long pulse sampling** | activates a longer charging of the contacts before sampling the inputs. This allows higher capacitors and / or many pulse generators with $S_0$ interface (photocoupler with capacitors) to be connected. On delivery the extended pulse sampling is activated. The lifetime of battery can be slightly increased if this feature is not used. |
| **M2W time** | activating this check box allows to edit and program the internal real time clock of the device. After parameterization with "Write", the switch is deactivated again. |

| | |
|---|---|
| **Read clock of PC** | once gets the current date and time from the clock of the PC and transfers it into the item “M2W time”. |
| **Read** | reads the M-Bus device and refreshes the data on the selected sheet. The non-modifiable data except the unreadable key is also updated. |
| **Write** | sends the current options to the pulse converter, which saves this data into the non-volatile memory. The PadPuls M2W changes the options only if the write protection is deactivated. It is recommended to read and check the data after writing. |

## 3.5 Sheets M2W Port1 and M2W Port2




This sheet shows the current settings and values of the respectively pulse channel (port) of the PadPuls M2W (in this example: Port 1 in the mode “long telegram”). The following input boxes and buttons are used to change the parameters of the pulse adapter. Some fields are not relevant for radio transmission and can only be read or written via the cable.

**Prim. address** is the primary M-Bus address of the selected port. Values between 1 and 250 can be entered in this field for new assignment of the address. After pressing the “Write” button the software programs this primary address and further variable settings on this sheet into the M-Bus device. This field is not relevant for the wM bus!

**ID (sec. adr.)** is the 8-digit wM-Bus ID and is transmitted as a part of the Application Layer Address (ALA) within the radio telegram.
Factory default: ID = 6-dgit fab. no. + channel no. (01 or 02).

**Medium** describes the measured medium of the connected meter and is also part of the ALA. Examples: Oil, Water, Heat, Electricity.

**Fabrik no.** is the fabrication number (serial number) of the device. The preset IDs of the two channels of PadPuls M2W are derived from the fab.no.: ID = last 6 digits of the fabric.no. plus 2 digit channel no. This field is read only and only displayed if the channel is configured to “long telegram” mode.

**Multiplicator** is the pulse increment (multiplicator) of the connected meter. For each registered pulse, the device adds “multiplicator” to the counter. The numerator can take values between 0 (no counting) and 99, the denominator between 1 and 256.

**Unit** is the physical unit of the counter and of the pulse increment. All proper units including variants with power of ten from the DIN EN 13757-3 are offered in the selection list. Examples: kWh, m3, kJ

**Counter** is the accumulated counter. It has to be related to the unit mentioned above. The counter can be programmed equal to the counter of the connected meter in a range of 0 to 99999999.

**Current time** is the current date and time-of-day of the internal clock in the format DD.MM.YY_hh.mm and is displayed here only. The internal clock does not support daylight saving!

**Due-date** is the last due-date (date of the last storage of the due-date counter) in the format DD.MM.YY. This field is read only and not relevant for the wM bus!

**Due-date cnt.** is the counter which was saved at the due-date. This field is read only and not relevant for the wM bus!

**Next Due-date** is the next (future) due-date (date of the next storage of the counter) in the format DD.MM.YY. The counter will be saved at 00:00, e.g. with due-date 01.01 at change from 31$^{st}$ of December 23:59 to 1$^{st}$ of January 00:00. This field can only be edited and programmed if the checkbox in front of this filed is activated. This field is individual for each channel. This field is not relevant for the wM bus!

**Error-Flags** shows 8 Bits for EEPROM errors in due date and monthly values in hexadecimal format. $00 = no error. This field is read only.

**SW-Version** Firmware version, e.g. V1.2.1. This field is read only.

**State of ports** shows the current input state of all ports (a closed contact is marked). This item is read only.

| | |
|---|---|
| **Write protection** | is marked, if the device is protected against programming. Then you cannot configure the adapter. The protection can be removed after opening the sealable housing and pressing the “Unprotect” pushbutton. |
| **EEPROM error** | is marked, if there was an error while reading the non-volatile memory. In this case you must reconfigure the device. |
| **Tariff A (P1/2)** | is only displayed here. See description of the sheet „M2W“. |
| **Long pulse sampling** | is only displayed here. See description of the sheet „M2W“. |
| **Erase monthly values** | erases all existing monthly start values (only in long telegram mode). |
| **Activate long tel.** | transmits a command to the PadPuls M2W to switch to the long telegram mode (incl. monthly values, fabr.no., version and error flags). This field is not relevant for the wM bus! |
| **Activate short tel.** | transmits a command to the PadPuls M2W to switch to the short telegram mode (excl. monthly values, fabr.no., version and error flags). This field is not relevant for the wM bus! |
| **Freeze** | transmits a command to the PadPuls M2W instructing it to freeze the counters. The PadPuls M2 then copies the current counter to the “due-date counter” and the current date to the (last) “due-date”. This field is not relevant for the wM bus! |
| **Monthly values** | shows the 15 monthly start values in ascending order in a window (only in long telegram mode). |
| **Write protect** | transmits a command to the PadPuls M2W to activate write protect. The PadPuls M2W then allows no further configuration. It is protected against unnoticed manipulation. |
| **Read** | reads the M-Bus device and refreshes the data on the selected sheet. The read-only data is also refreshed. |
| **Write** | sends the current options to the pulse converter, which saves this data into the non-volatile memory. The PadPuls M2W changes the options only if the write protection is deactivated. It is recommended to read and check the data after writing. |

**Hints:**

1. The PadPuls M2W sends only the current meter reading, the Link Layer Address (LLA) and the Application Layer Address (ALA) In the radio telegram. All other values such as primary address, fabrication number, time, key date, key date value, monthly values, error flags and SW version can only be read using the converter cable in configuration mode.
2. Please first press the button „Connect to meter" after connecting a new M-Bus device. Afterwards all sheets are refreshed.
3. Examples for configuration of pulse increment and unit:
   - Water meter with counter = 45120 l and 1 Pulse = 10 l:
     Choice 1: Unit = 10 l, Multiplicator = 1 / 1, Counter = 4512 ( x 10 l)
     Choice 2: Unit = 1 l, Multiplicator = 10 / 1, Counter = 45120 ( x 1 l)
   - Electricity meter with counter = 78346 kWh and 64 pulses / kWh:
     Choice: Unit = 1kWh, Multiplicator = 1 / 64, Counter = 78346 ( x 1kWh)
   - Electricity meter with counter = 112,345 kWh and 1000 pulses / kWh:
     Choice: Unit = 1Wh, Multiplicator = 1 / 1, Counter = 1123454 ( x 0,001Wh)
4. With activated tariff option the pulses are evaluated with the adjustments of the respective port. Therefore you should take care that both ports have the same pulse increment and unit.

# 4 wM-Bus Telegrams

## 4.1 Unencrypted single channel telegram

| Byte No. | Name | Content | Bytes [hex] | Layer |
|---|---|---|---|---|
| 1 | L-Field | Telegram length (number of following bytes) | 26h | Data Link Layer (DLL) |
| 2 | C-Field | SND_NR (send no reply) | 44h | |
| 3 | M-Field | Manufacturer code = REL | ACh | |
| 4 | M-Field | Manufacturer code | 48h | |
| 5 | LLA ID | Identification number LSB | 56h | |
| 6 | LLA ID | Identification number | 34h | |
| 7 | LLA ID | Identification number (converter ID = 00133456) | 13h | |
| 8 | LLA ID | Identification number MSB | 00h | |
| 9 | LLA Version | Version = 50 hex. = 80 dec. | 50h | |
| 10 | LLA Device Type | Device type = 37h: Radio Converter Meter | 37h | |
| 11 | CI-Feld | 72h (long Header) | 72h | Transport Layer (TPL) |
| 12 | ALA ID-Field | Identification number LSB | 01h | |
| 13 | ALA ID-Field | Identification number | 56h | |
| 14 | ALA ID-Field | Identification number (channel ID = 13345601) | 34h | |
| 15 | ALA ID-Field | Identification number MSB | 12h | |
| 16 | ALA Manufacturer | Manufacturer code LSB (Code = REL) | ACh | |
| 17 | ALA Manufacturer | Manufacturer code MSB | 48h | |
| 18 | ALA Version | Version | 50h | |
| 19 | ALA Device Type | Device type = 02h: Electricity | 02h | |
| 20 | Access No. | Access number | 92h | |
| 21 | State | M-Bus State (e.g. error, alarm) | 00h | |
| 22 | Config. | Configuration field (e.g. encryption) | 00h | |
| 23 | Config. | Configuration field (e.g. encryption) | 00h | |
| 24 | DIF idle | DIF = idle Filler | 2Fh | Application Layer (APL) |
| 25 | DIF idle | DIF = idle Filler | 2Fh | |
| 26 | DIF | DIF = 0Ch: 8-digit BCB value | 0Ch | |
| 27 | VIF | VIF = 06h: energy in 1 kWh | 06h | |
| 28 | Data0 | Value LSB | 13h | |
| 29 | Data1 | | 00h | |
| 30 | Data2 | Value from Data0 to Data3 = 00000013 | 00h | |
| 31 | Data3 | Value MSB | 00h | |
| 32 | DIF idle | DIF = idle Filler | 2Fh | |
| 33 | DIF idle | DIF = idle Filler | 2Fh | |
| 34 | DIF idle | DIF = idle Filler | 2Fh | |
| 35 | DIF idle | DIF = idle Filler | 2Fh | |
| 36 | DIF idle | DIF = idle Filler | 2Fh | |
| 37 | DIF idle | DIF = idle Filler | 2Fh | |
| 38 | DIF idle | DIF = idle Filler | 2Fh | |
| 39 | DIF idle | DIF = idle Filler | 2Fh | |

*Table 1: Unencrypted telegram for channel 1 resp. channel 2*

## 4.2 Encrypted single channel telegram

| Byte No. | Name | Content | Bytes [hex] | Layer |
|---|---|---|---|---|
| **1** | L-Field | Telegram length (number of following bytes) | 26h | Data Link Layer (DLL) |
| **2** | C-Field | SND_NR (send no reply) | 44h | |
| **3** | M-Field | Manufacturer code = REL | ACh | |
| **4** | M-Field | Manufacturer code | 48h | |
| **5** | LLA ID | Identification number LSB | 56h | |
| **6** | LLA ID | Identification number | 34h | |
| **7** | LLA ID | Identification number (converter ID = 00133456) | 13h | |
| **8** | LLA ID | Identification number MSB | 00h | |
| **9** | LLA Version | Version = 50 hex. = 80 dec. | 50h | |
| **10** | LLA Device Type | Device type = 37h: Radio Converter Meter | 37h | |
| **11** | CI-Feld | 72h (long Header) | 72h | Transport Layer (TPL) |
| **12** | ALA ID-Field | Identification number LSB | 01h | |
| **13** | ALA ID-Field | Identification number | 56h | |
| **14** | ALA ID-Field | Identification number (channel ID = 13345601) | 34h | |
| **15** | ALA ID-Field | Identification number MSB | 12h | |
| **16** | ALA Manufacturer | Manufacturer code LSB (Code = REL) | ACh | |
| **17** | ALA Manufacturer | Manufacturer code MSB | 48h | |
| **18** | ALA Version | Version | 50h | |
| **19** | ALA Device Type | Device type = 02h: Electricity | 02h | |
| **20** | Access No. | Access number | 79h | |
| **21** | State | M-Bus State (e.g. error, alarm) | 00h | |
| **22** | Config. | Configuration field: encrypted mode 5, synchronic, | 10h | |
| **23** | Config. | 1 block, 16 Byte are encrypted | 25h | |
| **24** | Data | Encrypted data mode 5 | BCh | Application Layer (APL) |
| **25** | Data | | 07h | |
| **26** | Data | | 59h | |
| **27** | Data | | E9h | |
| **28** | Data | | 5Ch | |
| **29** | Data | | 86h | |
| **30** | Data | | 52h | |
| **31** | Data | | 64h | |
| **32** | Data | | C1h | |
| **33** | Data | | 7Fh | |
| **34** | Data | | DBh | |
| **35** | Data | | D3h | |
| **36** | Data | | F0h | |
| **37** | Data | | 6Eh | |
| **38** | Data | | 44h | |
| **39** | Data | | FAh | |

*Table 2: Encrypted telegram for channel 1 resp. channel 2*

## 4.3 Unencrypted tariff telegram

| Byte N0. | Name | Content | Bytes [hex] | Layer |
|---|---|---|---|---|
| **1** | L-Field | Telegram length (number of following bytes) | 26h | Data Link Layer (DLL) |
| **2** | C-Field | SND_NR (send no reply) | 44h | |
| **3** | M-Field | Manufacturer code = REL | ACh | |
| **4** | M-Field | Manufacturer code | 48h | |
| **5** | LLA ID | Identification number LSB | 56h | |
| **6** | LLA ID | Identification number | 34h | |
| **7** | LLA ID | Identification number (converter ID = 00133456) | 13h | |
| **8** | LLA ID | Identification number MSB | 00h | |
| **9** | LLA Version | Version = 50 hex. = 80 dec. | 50h | |
| **10** | LLA Device Type | Device type = 37h: Radio Converter Meter | 37h | |
| **11** | CI-Feld | 72h (long Header) | 72h | Transport Layer (TPL) |
| **12** | ALA ID-Field | Identification number LSB | 01h | |
| **13** | ALA ID-Field | Identification number | 56h | |
| **14** | ALA ID-Field | Identification number (channel ID = 13345601) | 34h | |
| **15** | ALA ID-Field | Identification number MSB | 12h | |
| **16** | ALA Manufacturer | Manufacturer code LSB (Code = REL) | ACh | |
| **17** | ALA Manufacturer | Manufacturer code MSB | 48h | |
| **18** | ALA Version | Version | 50h | |
| **19** | ALA Device Type | Device type = 02h: Electricity | 02h | |
| **20** | Access No. | Access number | 92h | |
| **21** | State | M-Bus State (e.g. error, alarm) | 00h | |
| **22** | Config. | Configuration field (e.g. encryption) | 00h | |
| **23** | Config. | Configuration field (e.g. encryption) | 00h | |
| **24** | DIF idle | DIF = idle Filler | 2Fh | Application Layer (APL) |
| **25** | DIF idle | DIF = idle Filler | 2Fh | |
| **26** | DIF1 | DIF = 8Ch: 8-digit BCB value | 8Ch | |
| **27** | DIFE1 | DIFE = 10h: tariff 1 | 10h | |
| **28** | VIF1 | VIF = 06h: energy in 1 kWh | 06h | |
| **29** | Data1_0 | Value channel 1 LSB | 13h | |
| **30** | Data1_1 | | 00h | |
| **31** | Data1_2 | Value channel 1 from Data0 to Data3 = 00000013 | 00h | |
| **32** | Data1_3 | Value channel 1 MSB | 00h | |
| **33** | DIF2 | DIF = 8Ch: 8-digit BCB value | 8Ch | |
| **34** | DIFE2 | DIFE = 20h: Tarif 1 | 20h | |
| **35** | VIF2 | VIF = 06h: energy in 1 kWh | 06h | |
| **36** | Data2_0 | Value channel 2 LSB | 12h | |
| **37** | Data2_1 | | 00h | |
| **38** | Data2_2 | Value channel 2 from Data0 to Data3 = 00000012 | 00h | |
| **39** | Data2_3 | Value channel MSB | 00h | |

*Table 3: Unencrypted telegram in tariff mode (both channels in one telegram)*

# 5 Technical Data

## 5.1 General

| | |
|---|---|
| Mounting | Wall mounting |
| Material | polystyrene, light-grey |
| W x L x H | (80 x 80 x 52) mm |
| Protective class | IP54, IP65 is possible if the cable entry is done carefully |
| Operating temperature | 0 to 40 °C |
| Storage temperature | -20 to 70°C |
| Humidity | 10% to 70% (non condensing) |
| Terminals cable Ø | Fixed wire: 0,14 to 1,5 $mm^2$ / Flexible wire: 0,14 to 1,0 $mm^2$ |
| Accuracy RTC | 25 ppm at 25°C |

## 5.2 Wireless M-Bus Interface

| | |
|---|---|
| Standard | EN13757-4 and EN13757-3, compatible to OMS |
| Transmit mode | S1, T1, C1 (unidirectional) / Frame Format A |
| Encryption | Mode 0 (not encrypted), Mode 5 or Mode 7 |
| Transmit interval | Programmable: 10 Sec. to 2 hrs.. |
| Addresses | Link Layer Address with fabrication no. |
| | Application Layer Address (ALA) with own ID and device type per channel |
| | Pre-programmed ID = 6-digit fabrication no. + 2-digit channel no.,<br>e.g. fab.-No. = 123456: ID channel 1 = 12345601, ID channel 2 = 12345602 |

## 5.3 Power Supply

| | |
|---|---|
| Battery | Lithium 3.6V, size AA, capacity 2400 mAh, soldered fixed, not replaceable |
| Battery current | Typical 10µA (contacts open) |
| Batterie lifetime | Transmit interval 15 Min. / 2 channels / T-Mode: app. 14 years (contacts open) |
| | Transmit interval 1 Min. / 2 channels / T-Mode: app. 10 years (contacts open) |

## 5.4 Inputs

| | |
|---|---|
| Contact voltage | 2.5V to 3.6V (dynamic sampling) |
| Contact current | 30 µA |
| Guaranteed debouncing | 5.0 ms |
| Connection cable | Maximal 10m |

## 5.5 Requirements to contacts of pulse generators

| | |
|---|---|
| Potential | Floating, Isolation to ground > 1 MΩ |
| Resistance | Contact open1 MΩ, contact open < 2kΩ |
| Maximum capacity | Incl. cable: 2nF (short pulse sampling), 12nF (long pulse sampling) |
| Contact duration | >= 30 ms |
| Contact pause | >= 30 ms |
| Pulse frequency | <= 18 Hz |

## 5.6 Requirements to tariff signal

| | |
|---|---|
| Potential | Floating, Isolation to ground > 1 MΩ |
| Resistance | Contact open1 MΩ, contact open < 2kΩ |
| Maximum capacity | Incl. cable: 2nF (short pulse sampling), 12nF (long pulse sampling) |
| Signal shape | Static signal |

## 5.7 Ordering Information

| Ordering number | Description |
|---|---|
| IM003GW | PadPuls M2W, 2-channel Wireless M-Bus pulse converter for wall mounting |
| KV003 | USB-to-TTL-RS232C converter cable |