Relay PW100 M-Bus Level Converter User Manual

PW100 User Manual
M-Bus Level Converter and Repeater for up to 100 Slaves

Contents

Main Features

- M-Bus Level Converter for 100 devices
- Transparent level converting of several interfaces to M-Bus
- Ethernet 10/100BaseT and USB 2.0 with driver for virtual serial port
- 2 x RS232C with terminals (TXD, RXD, GND)
- 2-wire RS485 interface (not addressable)
- M-Bus Booster with Repeater function for extension of M-Bus networks
- Galvanic isolation of all interfaces from M-Bus
- Intelligent access control of the interfaces by a microcontroller
- External power supply with wide range input for worldwide use
- Housing for rail mounting

Installation

2.1 Functional Principle

level converter and repeater

up to 100 meters

2.2 Mounting

The PW100 housing is mounted on a TS35 top-hat rail. The width of the housing is 6 horizontal pitches (6 HP) on the rail and, due to the low height of 60 mm, not only fits into a control cabinet, but also in a meter cabinet under the covers.

The device requires an external power supply of approx. 42VDC. We strongly recommend using our NT016 power supply. If the PW100 is operated with another power supply, the function of the PW100 may be disturbed. The NT016 also has a height of 60 mm and a width of only two module unit (2 HP).
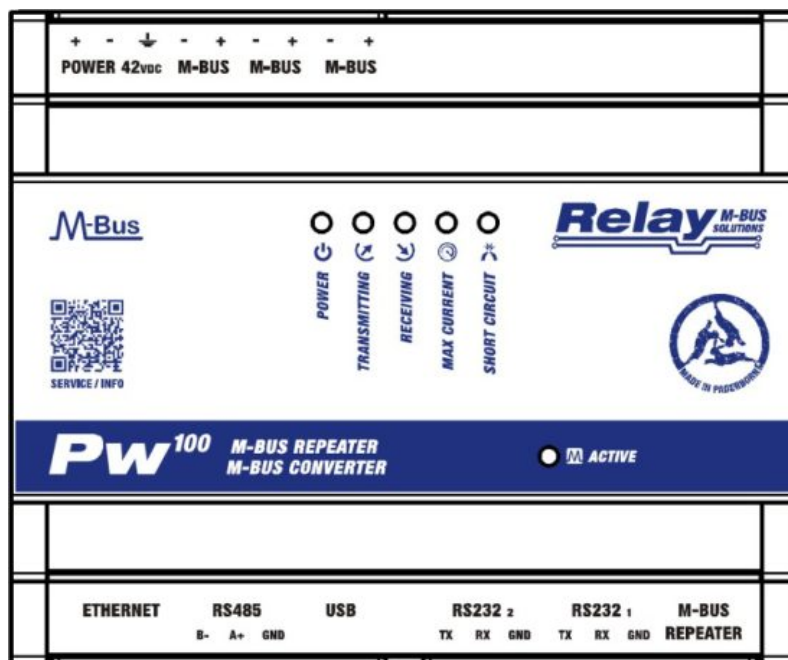
All terminals are pluggable and thus make wiring and replacement of the PW100 easier in the event of a fault.
Attention: Please make sure to put the clamps back in the correct place after removing them. Incorrectly positioned terminals can lead to defects.

Upper terminals (from left to right):

Typ	Signal	Beschreibung
POWER	+ / −	Output voltage of the power supply 42VDC (mind the polarity)
		Protective conductor (earth) for symmetry and protection of the M-Bus
M-BUS	− / +	M-Bus output, wires to the M-Bus meters, 3 pairs of parallel connections

Lower terminals (from left to right):

| Typ	Signal	Beschreibung
ETHERNET		10/100MBit RJ45 Ethernet socket for network connection
RS485	B- / A+ / GND	RS485 Interface, 2-wire, B = − / A = + / GND = ground reference
USB		USB connector of the internal USB-to-RS232 converter (FTDI)
RS232 2	TX / RX / GND	RS232C Interface No. 2, TX = PC transmits, RX = PC receives, GND
RS232 1	TX / RX / GND	RS232C Interface No. 1, TX = PC transmits, RX = PC receives, GND
M-BUS REPEATER		M-Bus Repeater input for network extension

2.4 LED indicators
There are in total six LEDs in the front part showing the status of the M-Bus. A lighted LED has the following meaning:
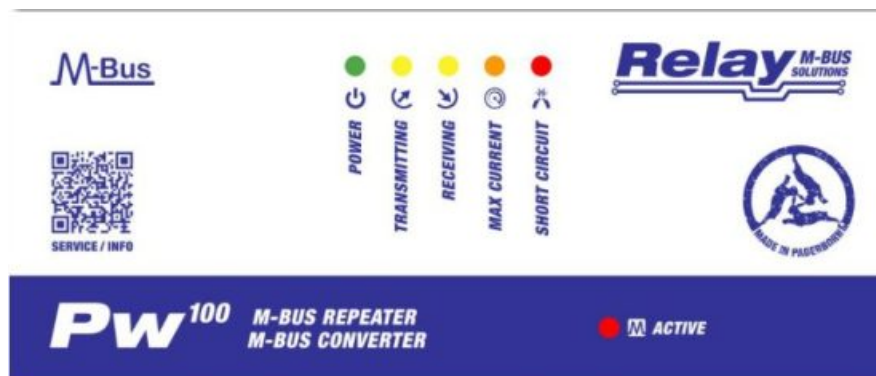
POWER	🟢	The M-Bus output voltage is switched on.
TRANSMITTING	🟡	The Master transmits data.
RECEIVING	🟡	Minimum one meter replies with data.
MAX CURRENT	🟠	The maximum number of connectable meters is exceeded (warning).
SHORT CIRCUIT	🔴	M-Bus over current / short circuit (2 Hz flashing)
M-BUS ACTIVE	🔴	One interface is active and exclusively occupies the M-Bus.

Two LEDs in the RJ45 Ethernet socket show the state of the network and the virtual comport. The LEDs have a reduced intensity of 20% of the normal value without a connected network cable. Once a network is connected, the brightness changes to 100%. The most important flash patterns have the following meaning:
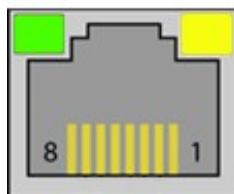
▬▬ ▬▬	No connection established
▬▬▬▬▬▬▬▬	A connection is active
▬▬ ▬▬ ▬▬	A connection is established and a communication is active
▬▬▬ ▬▬▬	Device Server performs a restart

You can find all other patterns in the online help of the DS Manager (F1-button) in the chapter "Firmware Manuals / Device Server Application Firmware / Status LED Signals (Red = Green / Green = Yellow).

Description of functions

The PW100 is a transparent Level Converter from several interfaces to M-Bus for up to 100 meters. The device allows external connected controllers such as a building control, a DDC or a PC to read the connected meters by use of an M-Bus software (not in scope of delivery). The PW100 can also be used as a Repeater for extension of M-Bus networks relating to the cable length and number of meters.

3.1 Interface multiplexer / switch
An internal microcontroller handles the bus control to just give one interface access to the M-Bus even with multiple connected interfaces. This ensures that systems do not interfere with each other during the

communication, when two or more systems are connected, for example a BMS via RS485 and a PC via USB. This automatic switch operates on the principle "first come, first served", i.e. when an interface sends a signal to the M-Bus, this interface takes control of the M-Bus and has exclusive access to communication. The "ACTIVE" labeled LED indicates the activity status of the internal interface switch. While the LED is lit, one of the six possible interfaces is active. The other interfaces are disabled at this time and cannot access the M-Bus. The active interface remains enabled about 3 seconds after the last communication. Another interface can occupy the M-Bus as soon as the LED goes off.

3.2 RS232C interfaces
The PW100 has two independent RS232C interfaces, both of them as a 9-pin D-SUB as 3-pin screw terminals.
The RS232C pin assignments are:
RX = PC transmits to M-Bus, TX = PC receives from M-Bus, GND = Signal ground
If you want to connect a D-SUB cable, please use the additional, optional cable KA006 with 3 open wires.
To link to a PC (1: 1 connection), connect the 3 wires as follows:
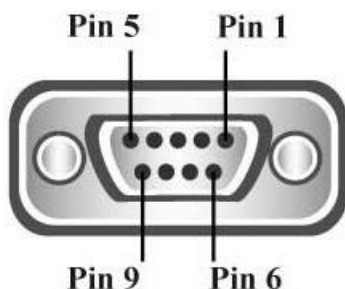
| D-SUB	Signal	Funktion PW100	Farbe (Klemme)
Pin 1	DCD (data carrier detect)	unused	
Pin 2	RXD (PC receives data)	M-Bus sends data to PC	Green (TX)
Pin 3	TXD (PC transmits data)	PC receives data from M-Bus	Yellow (RX)
Pin 4	DTR (data terminal ready)	unused	
Pin 5	GND (signal ground)	GND	Black (GND)
Pin 6	DSR (date set ready)	unused	
Pin 7	RTS (request to send)	unused	
Pin 8	CTS (clear to send)	unused	
Pin 9	RI (ring indicator)	unused	

3.3 RS485 Interface
A 2-wire RS485 interface will be connected to the RS485 terminals (A = + and B = -). Please note that this is a transparent interface without addressing on the RS485 bus. The direction control of the half- duplex 2-wire connection is realized that the PW100 is passive in the idle state (receiver on, transmitter off) and becomes on transmitted data from M-Bus meters (receiver off, transmitter on). The level converter remains active on the RS485 for approximately 50ms after the last transmitted space (0-Bit) of the slave. The master software should not start a new request to the connected meters during this period.
The RS485 bus is not terminated in the PW100. If a termination is required, an appropriately dimensioned external resistor, e.g. 120Ω can be connected between terminals A + and B-.

3.4 Repeater Interface
The PW100 can be used as a so-called Repeater, as a network extension for existing M-Bus systems, if the maximum number of meters or the maximum cable length has been exceeded for the installation. Up to 100 devices and up to 4km cable (1 x 2 x 0.8 JYSTY) at 2400 baud transmission speed can be connected to a repeater.
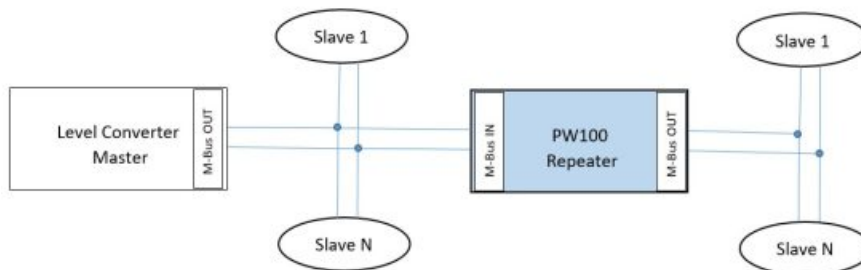
The M-Bus line of the existing master or level converter is connected to the terminals labelled with M-Bus Repeater. The polarity does not matter – as usable and standardized for M-Bus slaves. The signal at the M-Bus output of the PW100 is reconditioned to connect a complete M-Bus network. An almost unlimited number of repeaters can be cascaded or connected in parallel due to the automatic measurement of the maximum transmission speed and the recovery of bit times (bit recovery) by the digital repeater. This allows nearly unlimited M-Bus networks.

3.5 USB interface

The USB device port of the PW100 is as a USB 2.0 connector type B available on the front of the housing. Please use a USB cable with a type A plug on one end and a type B plug on the other side (not supplied) to connect a PC. You must install the software driver for the virtual COM port before you can use the USB interface. This simulates a serial port that you can use as usual in your M-Bus software. You can find the driver on our CD "Tools & Docs", on our homepage www.relay.de or directly from FTDI Chip, the manufacturer of the used USB chip: https://ftdichip.com/drivers/vcp-drivers (here you will also find drivers for Linux and Mac OS). Please unpack the ZIP file after download. Install the drivers by clicking on the unzipped file in the File Explorer with the right mouse button and select the menu item "Run as administrator" (example file name is: CDM212364_Setup.exe).
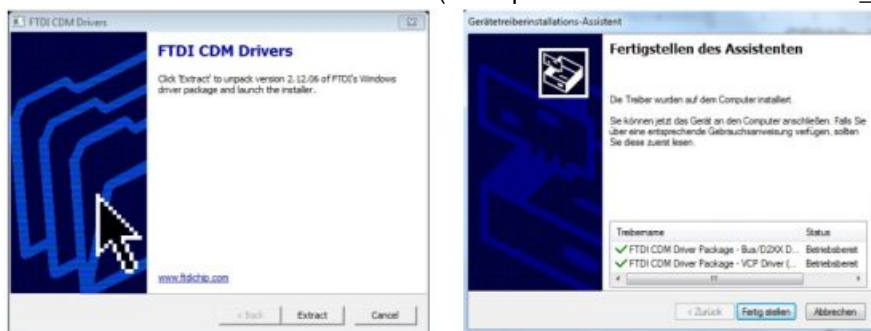
Now you can connect the PC. The USB driver for the PW100 is installed automatically and generates a new, virtual COM port. The new COM port number of the USB serial port is displayed after the installation is finished (here: COM29). You can look up this number at any time in the Device Manager under ports (USB Serial Port) and – if desired – change it in the advanced settings of the driver. Please select the appropriate comport number in your M-Bus software.


3.6 Ethernet interface

The Ethernet interface of the PW100 converts the physical interface Ethernet 10/100BaseT to M-Bus and the TCP / IP protocol to the serial protocol. The Ethernet interface is available in the front panel as an 8-pin RJ45 socket. The PW100 can be integrated into an existing local network and the M-Bus meters can be read from one or more PCs in that network. This requires the so-called "Tibbo Device Server Toolkit" to be installed on that PC. With this software the Ethernet interface is configured in the PW100 and a virtual COM port is set up. This simulated serial interface enables the use of the usual M-Bus software designed for normal serial interfaces. Please perform the following steps of installation:

3.6.1 IT preparations

The IT division of the network containing the PW100 must define the following items:

- Fixed IP address must be identical to the IP range of the reading computer. Only the last number must be different. (e.g. 192.168.1.239)
- You need also the subnet mask and IP address of the gateway if the IP addresses are reassigned by a gateway.
- The converter uses the port 1001 by default for the TCP protocol. This port must not be blocked by any firewall.

You can find your own IP address in your network this way:

Start – Run: cmd <OK>

Input: ipconfig <enter>

Own IP address and subnet mask will be shown
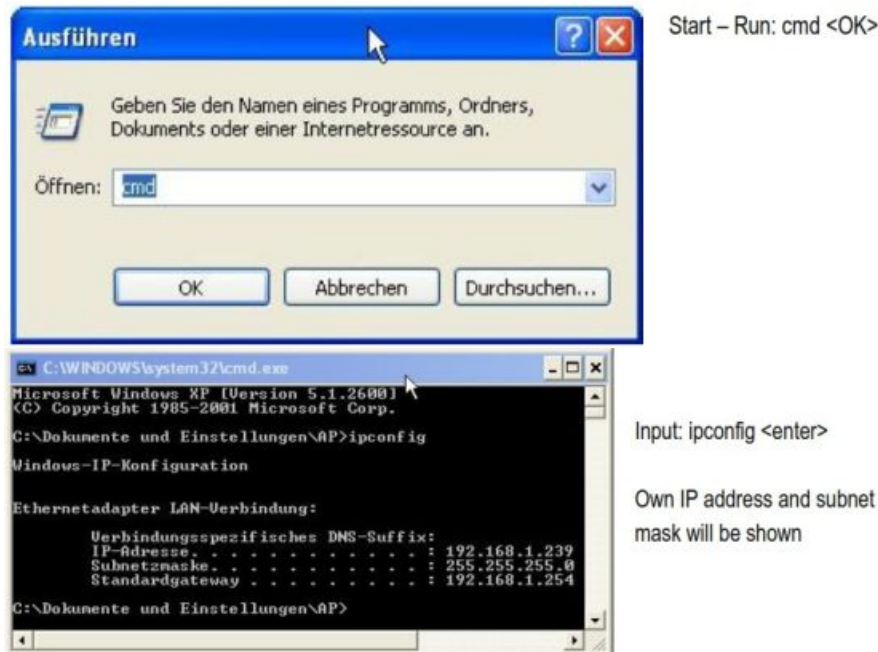
3.6.2 Software installation
You can find the driver software on our CD "Tools&Docs", on our homepage www.relay.de or directly at the manufacturer´s site: https://tibbo.com/support/downloads/tdst.html. Please start depending on your operating system either the 32 bit or 64 bit version of the installation program as an administrator: tdst_5-14-00-x86.exe (32-Bit Windows) or tdst_5-14-00-x64.exe (64-Bit Windows) TDST = Tibbo Device Server Toolkit, 5-14-00 = Version 5.14.00 dated August 2021
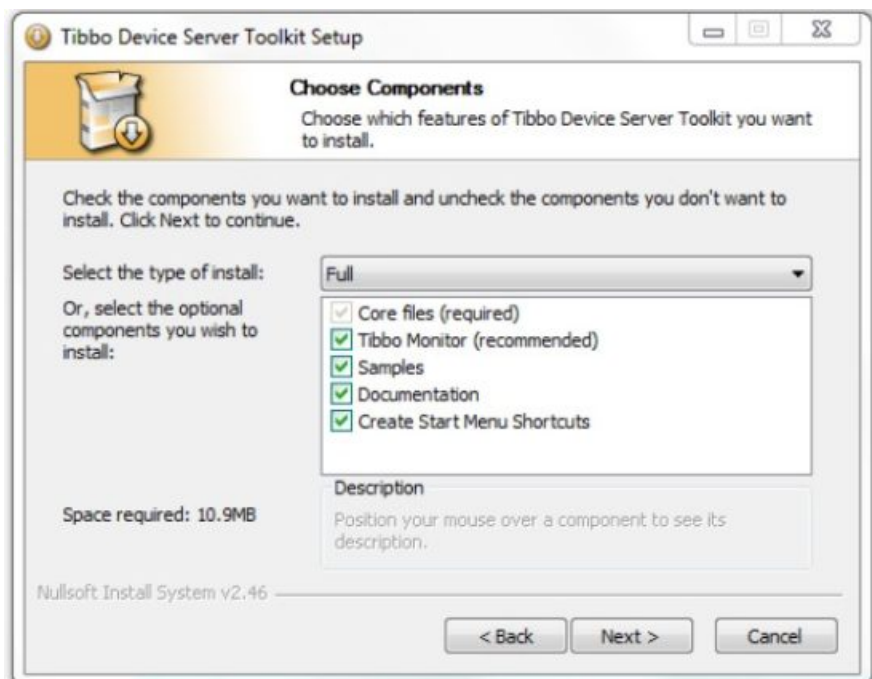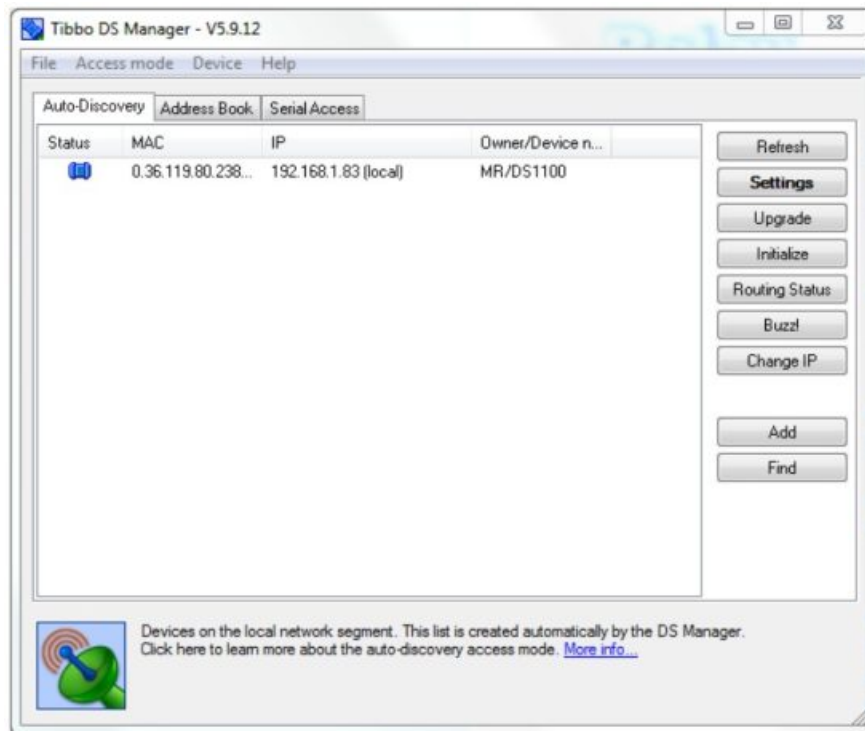

After a reboot of the PC the installation of the drivers and software tools is completed.

3.6.3 Setup of the device server
Please start the Tibbo – DS Manager (Start – Programs – Tibbo – Tibbo Device Server Toolkit – Tibbo DS

Manager.

The DS Manager (DS = Device Server) shows all by broadcast detectable device servers in the sheet „Auto Discovery". Device servers which are not in the same IP address range will not be found and must be manually added into the sheet "Address Book" (button "Add"). Please select the device which you want to configure and click on the button "Settings". Then you see the settings of the device which you shall change according to the following pictures. You can get help for the DS Manager with F1 key.

Recommended settings:

Settings: DS (ds4.33)		
General	Wi-Fi	Channel1	All

General	
Owner name	
Device name	
DHCP	0- Disabled
IP-address	192.168.1.83
Gateway IP-address	192.168.1.254
Subnet mask	255.255.255.0
Wi-Fi	
Wi-Fi Mode	0- Disabled
Access Point Name	(irrelevant)
Security	(irrelevant)
Password	(irrelevant)
DHCP	(irrelevant)
IP-address	(irrelevant)
Gateway IP-address	(irrelevant)
Subnet mask	(irrelevant)
Channel1	
Connection timeout (min)	5
Transport protocol	1- TCP
Broadcast UDP data	(irrelevant)
Inband commands	0- Disabled
Routing Mode	0- Server (Slave)
Accept connection from	0- Any IP-address
Port	1001
Connection mode	(irrelevant)
Destination IP address	(irrelevant)
Destination port	(irrelevant)
Notification destination	0- Last port
Serial interface	0- Full-duplex
RTS/CTS flow control	0- Disabled OR remote
DTR mode	0- Idle or remote
Power-up DTR state	0- LOW
Baudrate	1- 2400bps
Parity	1- Even
Data bits	1- 8 bits
Max intercharacter delay	1
Soft entry into serial programm	0- Disabled
Escape character (ASCII co	(irrelevant)
On-the-Fly commands	1- Enabled
Password for on-the-Fly con	0- Disabled
Notification bitmask	0
Notification destination	0- Last port

Save   Load   Password   OK   Cancel

Change values marked with an arrow

OK:

Stores settings and restarts the device

3.6.4 Setup of the virtual port

The next step is the setup of a virtual, serial port in your PC. You don´t need the virtual port if the used software offers a TCP/IP port instead of serial ports. In this case you must correctly program all settings of the serial interface like baudrate, parity and data bits. You also don´t need a virtual port in the bridge mode (two device servers connected together, i.e. one TCP001 (serial device server) to the PW100.

Please start the Tibbo – DS Manager (Start – Programs – Tibbo – Tibbo Device Server Toolkit – Tibbo VSP Manager.
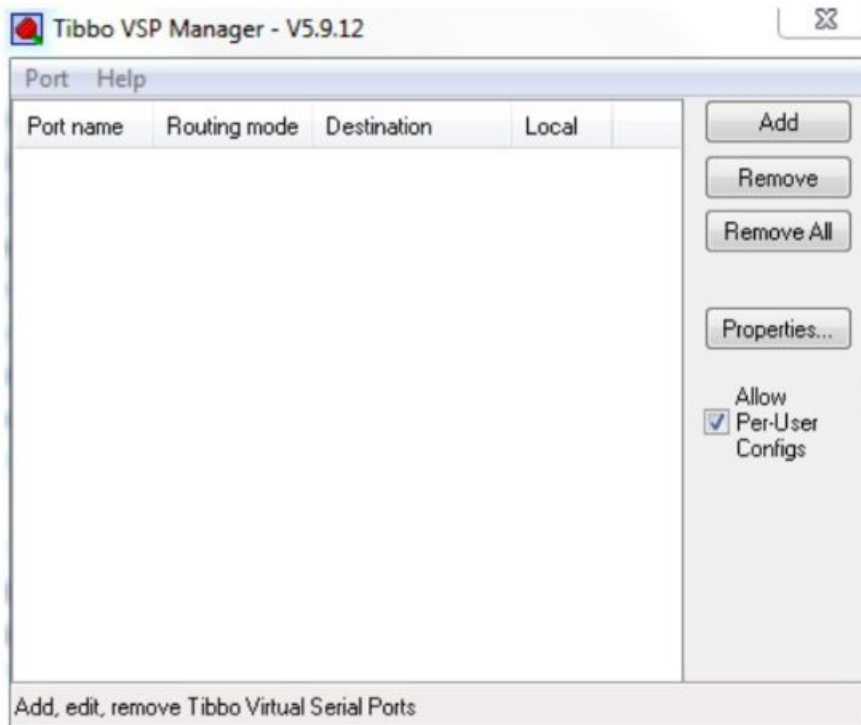
Please add a VSP (virtual serial port) by clicking on the "ADD" button.

Please do the following settings:

Change
marked values

Browse for DS:
Select the de-
vice server
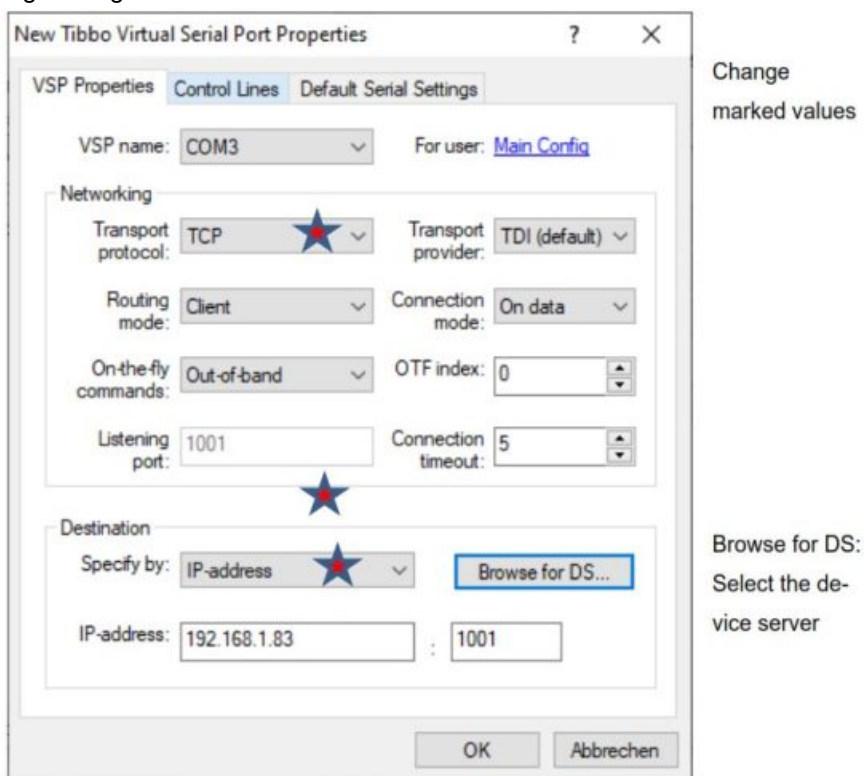
Then you can program the values for the serial communication after startup in the sheet "Default Serial Settings" (baudrate, data bits, parity, flow control). A click at „OK" generates the virtual port and then it can be used in your M-Bus software. Please select the respective port (VSP name) in your software as the communication interface. Now the installation is completed. You can change the settings of the device and the COM port using the DS manager respectively the VSP manager at any time. You can also change the settings of the device server and check its routing state after first setup using a web browser connected to the assigned IP address. The required password for the login is empty on delivery.

Technical data

4.1 General data

Operating voltage	42,0 .. 43,5 VDC
Power consumption	max. 15W
Operating temperature range	0 .. 50°C
M-Bus voltage	42 V (Mark), 28V (Space)
M-Bus basic current	max. 150 mA
Overcurrent threshold	> 220 mA
Internal bus resistance	5 Ohm
Communication speeds	300 .. 38400 Baud
Bit threshold	typ. 7,0 mA
Collision threshold	typ. 48 mA
Maximum cable length for recommended cable type JY STY 1x2x0,8mm	Total (all wires): 1km (9600 baud), 4km (2400 baud), 10km (300 baud) Max. distance to slave (100 slaves at the end of the cable):1000 m Max. distance to slave (100 slaves equally distributed): 2000 m
Galvanic isolation	All interface are isolated from M-Bus and power supply. The Repeater input is additionally isolated from the other interfaces.
Housing	Light-grey and black PC plastic, protective class IP30 H x W x D: 90 x 107 x 60 mm (height without terminals) Mounting on a rail (6 HP)
LED indicators	Power, communication master, slave, warning, short circuit M-Bus, M-Bus activity
Interfaces	10/100 Mbit Ethernet, USB device, 2 x RS232C (terminals), RS485, Repeater
Terminals	3 pairs screw terminals for M-Bus, 3-pin screw terminal for each RS232C, 3-pin screw terminals for RS485, one pair screw terminals for Repeater, 3-pin screw terminals for power supply / protective ground

4.2 Interface data

RS232C	Driver load	Current max. 5mA, resistive: min. 3kΩ, capacity: max. 2,5 nF
	Voltage transmit (at 3kΩ)	Mark: +5V ≤ UT ≤ +15V Space: -15V ≤ UT ≤ -5V
	Voltage receive	Mark: +2,5V ≤ UR ≤ +15V Space: -15V ≤ UR ≤ -2,5V
RS485	Driver load	Current max. 250 mA, resistance min. 54Ω
	Signal voltage TX	Space (0): +1.5V £ Ut £ +5.0V Mark (1): -5.0V £ U £ -1.5V
	Addressing	Not possible (transparent)
	Max. cable length	3,0 m
Repeater	Current M-Bus IN	Basic current < 1,5 mA (1 Unit Load), TX current typ. 15mA
	Capacity	Max. 250 pF
	Galvanic isolation	> 2,5 kV to all interfaces, M-Bus and power supply
USB	Type	USB 2.0 device, socket type B
	USB IC	FTDI Chip: FT232R, Vendor ID = 0403, Product ID = 6001
	Power supply	Bus powered, Low Power (max. 90mA)
	Max. cable length	3,0 m
Ethernet	Network interface	10/100BaseT (RJ45), auto-MDIX, with 2 LEDs
	Protocols / adressing	TCP and UDP / static IP or dynamic IP (DHCP)

4.3 Ordering information

Article number	Description
PW100	M-Bus Level Converter and Repeater for 100 slaves
NT016	Power supply 42VDC, 30W, rail, input range 85 .. 264 VAC, 47 .. 63 Hz
KA USB AB	USB cable A to B plug/plug, length = 1m, grey
KA PATCH.5E RJ45 1M	Network patch cable CAT5E FTP, Length = 1m, grey
KA006	Serial D-SUB-9 female cable with 3 open wires

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Documents / Resources

Relay PW100 M-Bus Level Converter [pdf] User Manual
PW100, PW100 M-Bus Level Converter, M-Bus Level Converter, Level Converter, Converter

References

- **BMETERS UK | Next Day Delivery | Birmingham**
- **Tibbo Device Server Toolkit software for Windows**
- **User Manual**