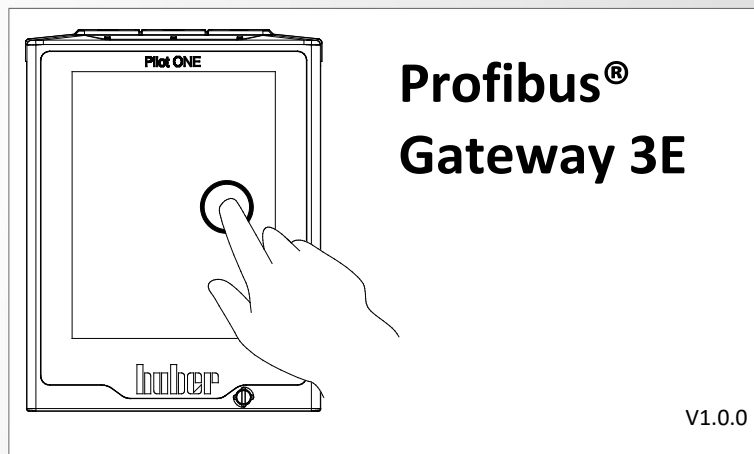




Inspired by temperature



Technical Bulletin

huber

Profibus® Gateway 3E

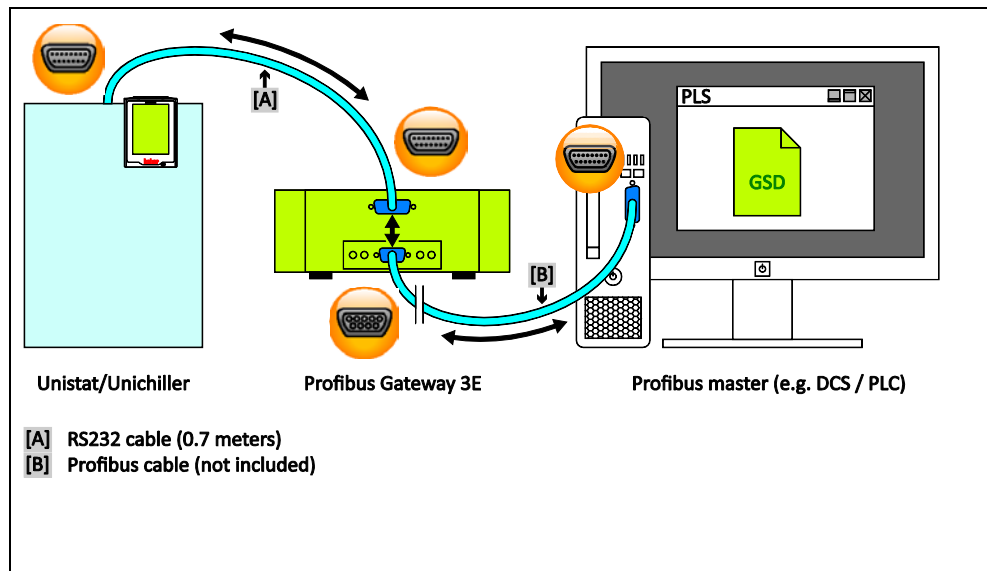
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1 Description

Schematic structure



Profibus DP is used in many industrial applications. The excellent standardization of Profibus DP results in very short start-up times in the field. The Profibus Gateway 3E was built and qualified according to the PROFIBUS User Organization's specifications. The Profibus Gateway SE enables Huber temperature control units to be integrated into automation solutions in a simple, flexible and process-oriented way. The corresponding GSD file is used to integrate the Profibus Gateway 3E with the configuration software.

The responsible body can specify the functionality of Profibus Gateway 3E. The Pilot ONE "PB package" on Huber temperature control units with Pilot ONE can be used to configure the parameters that should be transmitted via Profibus. The number of the desired parameters is then configured in the Profibus Gateway 3E accordingly.

Please note the inherent restrictions of E-grade "Basic" as well as E-grade "Exclusive" and "Professional". For more information, please refer to the data in the Data Transmission Manual at www.huber-online.com.

INFORMATION

The Profibus Gateway 3E can only be used in conjunction with Huber temperature control units with Pilot ONE.

2 Information on the functioning of the Profibus Gateway 3E

2.1 Position of the Profibus Gateway 3E within the data transmission

There are two participants from the viewpoint of the Profibus Gateway 3E: The Profibus master (e.g. PLC, DCS) on the Profibus side and the temperature control unit on the serial side.

The temperature control unit receives the information from the Profibus Gateway 3E. The Profibus Master does not directly access the temperature control unit.

3 Installation instructions

3.1 Installation provided by the customer

The Profibus Gateway 3E is installed in a stainless steel housing with a mains socket for free-standing installation or for hanging it to the side wall of the temperature control unit. The Profibus Gateway 3E is connected via an RS-232 cable to the 15-pin service interface of the temperature control unit.

The Profibus cable with D-SUB 9 connector is routed directly to the Profibus Gateway 3E. The user must guarantee compliance with the Profibus parameters and the bus topology in accordance with the requirements of the PROFIBUS User Organization. A bus termination can be enabled on the Profibus Gateway 3E. The customer must comply with the applicable standards for the internal wiring of the device. This applies in particular to an electrically conductive functional earth and the potential equalization.

4 Commissioning of the Profibus Gateway 3E

You must read the operating manual of the temperature control unit, the Profibus gateway and the Profibus master before connecting the gateway. You must observe all instructions in the respective manuals.

No information can be provided on the structure and configuration of the Profibus as it is beyond Huber's control.

There are five controls on the front side of the Profibus Gateway 3E. These have the following functions:

Table 1:
Function of control
elements

Element	Function
S4	Selecting the desired interface
S5	Selecting the communication mode
Termination	Depending on the position of the Profibus Gateway 3E within the bus
ID High	Profibus slave address
ID Low	

The switch position of switches S4 and S5 determines the configuration of the Profibus Gateway 3E. The two switches are described separately. The switch position is read only when the module is turned on. The gateway must be disconnected from the power supply, the switch set accordingly, and the gateway reconnected to the power supply in order to start the gateway with different parameters.

Make the following settings before connecting the gateway to the temperature control unit:

At the Profibus gateway:

- Select the desired protocol using the switch S4. RS232 is the default setting.
- Select the desired baud rate using the switch S5. The default baud rate is 115 kBaud.
- Set the desired Profibus address at the switches ID.

At the temperature control unit:

- In the menu Interfaces → RS interface check the baud rate settings, the LAI address and the RS232 / RS485 switch and adjust if necessary.

Table 2:
Function of
Switch S4

Position S4	Function
0	Communication via RS232 (standard, hard-wired)
1	Communication via RS485 (only possible with the top-hat rail version)*
2	Communication via RS422 (only possible with the top-hat rail version)*
*Set the termination at the gateway according to the bus configuration when operating via RS485 or RS422.	

Table 3:
Function of
Switch S5

Position S5	Function
0	The communication parameters via the above selected connections are 115200,8,N,1
1	The communication parameters via the above selected connections are 9600,8,N,1
2	The communication parameters via the above selected connections are 19200,8,N,1
8	RS test mode with parameters is the same as S5 = 0. The cyclic data exchange with the PB is ignored.
9	RS test mode with parameters is the same as S5 = 1. The cyclic data exchange with the PB is ignored.
A	RS test mode with parameters is the same as S5 = 2. The cyclic data exchange with the PB is ignored.

The Profibus must not be connected in RS test mode!

Important note:

- The settings must be carefully checked and, if necessary, adjusted to each other as the default baud rate of the temperature control unit and the gateway must be different.
- The LAI address must be 1.
- Only the two baud rates 9600 bauds and 19200 bauds are permissible for the RS232 communication via Com.G@te.
- Only 9600 bauds are allowed as baud rate for the communication via RS485.
- By default, the number of parameters in the gateway is set to 0 and the PLC is not write enabled. The temperature control unit is only communicated to after the PLC has transmitted the correct number of parameters to the gateway. Likewise, the parameters can be changed by the PLC only after setting and sending the write enable command.

5 Integration into the process automation system

For process control purposes it is important that the relevant process data are available in the PLC map. The GSD file describes the number of input and output bytes of the Profibus Gateway 3E. The configuration software determines how to integrate the GSD file.

INFORMATION

All provisions of the temperature control unit's operating manual must be complied with.

The data between PLC and gateway is exchanged via the cyclic data exchange. A maximum of 244 bytes - as a parameter is always 2 bytes long - or 122 parameters can be transmitted. Pilot ONE currently only supports a maximum of 61 parameters.

The configuration uses two acyclic DPV1 objects. The first object is one byte long and indicates the number of parameters to be transmitted. This value must be set by the programmer of the PLC and transferred once. Only then does the gateway know how many parameters are to be transferred to the temperature control unit. This number must agree with the number in the temperature control unit:

Slot 0, Index 1, Length 1 → This number of parameters must be transferred in hex format

The second object holds the information that defines, which of these parameters are to be transferred and written to the temperature control unit. This is a 16-byte array. Each bit represents a parameter that is to be transmitted and written. Bit 0 corresponds to byte 0 of the first parameter and bit 4 in byte 8 to the last of the max. 61 parameters. All bits can be set to 1 for write enable. Values that cannot be written to (e.g. actual values) are automatically ignored.

Slot 0, Index 2, Length 16 → Bitwise write enable for transmitted parameters

The sequence and number of parameters are determined by the selection in Pilot ONE. Gateway status messages are exchanged through diagnostic data. The diagnostic data is two bytes in size. Byte 0 contains the status data of the gateway and byte 1 of the temperature control unit.

Table 4:
Status byte of the
gateway

Value	Meaning
0	Everything is fine.
1	Communication with the temperature control unit is not possible
2	Repeated receipt of invalid PB package commands (gateway ↔ Huber)

Error 1: Communication with the temperature control unit is not possible - occurs when restarting after ca. 30 seconds. This relative long time is required to allow the temperature control unit to start. This timeout is reduced to ca. 5 seconds when a successful communication was detected for the first time.

Error 2: Repeated receipt of invalid PB package commands - is detected after five consecutive incorrect commands.

The status byte of the temperature control unit holds the error message returned by Pilot ONE via the PB package command.

Table 5:
Status byte of the
temperature control
unit

Value	Value
0	Everything is fine.
1	Unknown PB package command error
2	Number of parameters sent by the PLC does not match the number in the temperature control unit.
3	Invalid value in the block counter.

Error 1: Unknown PB packet command error - can occur, if new errors have been defined in the temperature control unit, which are not yet known to the gateway.

Error 2: Number of parameters sent by the PLC ... - occurs if the number of parameters transmitted by the PLC to the gateway does not match the number of parameters configured on the temperature control unit.

Error 3: Invalid value in the block counter - occurs if more than 61 parameters are to be transferred. Currently the maximum number of parameters is limited to 61, which is exactly one block.

6 Serial side of the Profibus Gateway 3E

6.1 Basic mode of operation of the Profibus Gateway SE

There is only one variant of the Profibus gateway. The input / output array of the Profibus side is always 244 bytes in size. The content of the unused input / output bytes is not defined!

Use the Pilot ONE to select the individual parameters of interest. The sequence of parameters can be changed. The gateway always transmits the values sent by the Profibus. The write enable command - which can be controlled by the PLC - determines which parameters are changeable by the PLC and which should continue to be changeable by the temperature control unit.

The gateway's behavior is transparent. It does not interpret the data in any way. The cyclic data from the Profibus are inserted directly into the PB packet command and forwarded to the temperature control unit. Naturally, the gateway checks whether the PB packet command is valid and only forwards valid data to the Profibus side.

The Profibus Gateway 3E constantly updates the process variables of the temperature control unit. The actual process parameters are therefore always available when retrieving the process image. The temperature control unit can immediately return the current process values when a Profibus frame is received. On the other hand, the update loop sends the new process values to the temperature control temperature control unit.

6.2 Communication with the controller

At a service interface baud rate of 115 kBaud, the gateway requires ca. 0.2 seconds to transmit a single parameter; ca. 3 seconds to transmit 61 parameters. Longer times can be expected if ComG@te (RS232 or RS485) is used for data transmission. The baud rate via RS232 is 9600 or 19200 bauds and always 9600 bauds via RS485.

The PB packet command is used for the communication between gateway and controller.

For more detailed information on the commands and the individual transferable parameters, please refer to the data in the Data Transmission Manual at www.huber-online.com.

7 Diagnostic functions

7.1 On starting up

The gateway performs an internal self-test after applying the voltage supply. This takes about 2 seconds. It is normal that all LEDs light up briefly.

The software in the gateway controls two display elements. This is the LED labeled 8 and the LED labeled State on the RS side.

LED 8 is used as communication display between gateway and temperature control unit. It will light up after the gateway has sent data to the temperature control unit. The LED goes out when valid data have been received from the gateway.

The LED flashes green at ca. 1 Hz during the initialization phase. It goes out once the first valid data has been received. Valid data must have been received no later than 30 seconds after switching on.

A flashing red-green LED State at 1 Hz indicates a communication error between the gateway and the temperature control unit. The PLC can read the error from the diagnostic data. See Table 4 and Table 5 on page 9 in section »**Integration into the process automation system**«.

All other displays are internal gateway messages that can be looked up in the gateway manual. You can download this manual at www.deutschmann.de for free.

7.2 During operation

When communication is transmitted via the Profibus - recognizable by the green illuminated LEDs Bus and State - LED "8" signals a communication of the Profibus Gateway 3E via the serial interface.

7.3 Troubleshooting

Verify on the Profibus side whether the bus termination is set correctly. A difference between the GSD file and the program in the Profibus Gateway 3E may cause bus errors or incorrect data content. The version is specified in the GSD file. It can be checked with the diagnostics function.

The following information can be used for troubleshooting in case of problems during start-up or operation.

- Are all connectors correctly connected and screwed?
- Is the power supply correctly connected?
- Is the gateway address set correctly in the bus and only once?
- Is the gateway correctly configured?
- Is the temperature control unit correctly configured?
- Do the baud rates match?
- Perform the communication test Table 3 (listed on page 8 in section »**Commissioning of the Profibus Gateway 3E**«) to check the connection between gateway and temperature control unit. LED 8 indicates the communication between gateway and Huber device as described on page 10 in section »**On starting up**«. You can also open a Pilot ONE window under Interfaces → RS Interface → that displays the data sent by the gateway.
- Was the gateway configured by the PLC?
- Were the correct bits set in write enable?

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