

DESIGO™ I/O-OPEN

GRUNDFOS interface module

PTM52.16V01

for two electronically controlled GRUNDFOS heating pumps

Interface module for communication between intelligent heating pumps featuring a GRUNDFOS bus connection facility and automation stations with P-bus connection. GRUNDFOS bus segments with two pumps per module or four pumps connected to two interfaced modules.

Use

Integration of communication-capable pumps in process systems in the fields of heat generation, heat distribution and district heat:

- Online communication between GRUNDFOS pumps and the automation stations of Landis & Staefa.
- The interface module can be connected to automation stations with P-bus which support the interface module on the software side. Refer to "Equipment combination".

Functions

	Interface between the GRUNDFOS pump bus and the P-bus (process bus) of Landis & Staefa.
Signal transmission	<p>The following signals are transmitted between the automation station and the pump:</p> <p>From automation station to pump:</p> <ul style="list-style-type: none">• control of operating mode on/off• set value of pump head ¹⁾ 0...100% (of local setting) <p>From pump to automation station</p> <ul style="list-style-type: none">• operating data coded• fault status data coded• pump head [m]• flow rate [m³/h]• output [kW]• pump speed [%] <p>¹⁾ In exceptional cases, the pumps themselves can be set to an operating mode in which the set value refers to the pump's speed.</p>
Access	<p>These data can be accessed:</p> <ul style="list-style-type: none">• locally from the automation station, and• centrally via the PC user interface of the building automation and control system
Note	The value ranges of the operating variables are shown in Table 1 under "Technical design", the content of the codes in Table 2.
Functions relating to application	<p>The interface module maps the data points of the operating variables on existing I/O function blocks of module types PTM11.2Y10 and PTM1.2R1K. This means that existing plants can be upgraded without making changes to the system software. For details, refer to "Technical design".</p> <p>The communication between the pump and the automation station serves for interlinking the heating control and the pump control functions. On the bases of the data and variables transmitted, the following functions can be generated via the automation station, for example:</p> <ul style="list-style-type: none">• adaptation of pump output to the various building occupancy times via time switch programs• visualization of pump parameters and generation of trend charts• adaptation of pump output to the heating boiler's operational status• optimization of heating control through acquisition of the pump's flow rate• control of primary pump in function of the connected heating circuits• energy management aimed at optimizing energy usage and efficiency• matching the pump's output to the flow rate actually required, e.g. with the help of heat allocation by electronic heat meters• central acquisition of operational statuses including archiving and trend indication• central acquisition of faults including instructions for service staff• central maintenance management by means of acquisition of hours run• integration in electric peak load limitation through indication of power consumption• remote signalling and monitoring via modem and radio or Telecom line
Indication on the interface module	LEDs indicate the operational status and errors of the P-bus and the GRUNDFOS bus. For details, refer to Table 3 under "Technical design".
Operational safety	Precautionary measures aimed at ensuring the safety of functions and of the entire system are listed under "Technical design".

Type summary

Interface module

PTM52.16V01

Delivery

Base and electronic module are supplied together, but in separate boxes that are attached to one another.

Accessories

For general accessories that are used in connection with the I/O modules, refer to data sheet N8105. Such accessories must be ordered separately.

Equipment combinations

Automation stations

The interface modules can be connected to automation stations with P-bus which support the I/O functions on the software side. Refer to table 1 of section "Technical design" and to document Z8102, "I/O module system" or data sheet N8100 "I/O module range".

GRUNDFOS heating pumps

For use with communication-capable pumps with GRUNDFOS bus connection facility. The GRUNDFOS bus segment may also include a GRUNDFOS PMU unit. For details, refer to the relevant documentation published by GRUNDFOS.

Technical design

General

The interface module enables data points of GRUNDFOS pumps to be mapped on the P-bus such that the automation station can individually describe or read them via assigned addresses and channels. In the direction of the third party bus, the module acts as a data concentrator so to say and exchanges the data point information with the pumps via serial telegrams. In the other direction, it represents the information on the P-bus such as if it were discretely (individually) linked to the conventional input or output modules.

Generation of program

In terms of functions, the interface module incorporates eight existing individual modules (2 x Y10 and 6 x 2R1K). When configuring the plant, the associated I/O function blocks must be called up and instantiated. The required settings in the function blocks and the assignment of values (parameters) are contained in Table 1. For assignment of P-bus address, refer to "Addressing".

Data traffic

P-bus

Data traffic between the interface module and the automation station takes place via the three-wire P-bus. Data sheet N8022, "Process Bus", gives a detailed description.

GRUNDFOS bus

The data of the pump between the interface module and the pumps are exchanged bidirectionally via RS-485 interfaces. For technical data, see further below.

Addressing

Offset address

In the module, each data point type (pump head, required speed) is assigned a specific address (offset address). The channel numbers used for the pump selection make it possible to connect more than one pump per module. Pump 1 is assigned to channel 1, and pump 2 to channel 2. For preselections and special features in connection with addressing, refer to Table 1 in this section.

Basic address

The module itself is assigned a base address with the help of the address plug (hardware address). In the module, fixed offset address are used. In total, a module uses the base address plus 15 subsequent addresses. In the case of several interface modules, the base addresses are to be assigned in increments of 16 (1, 17, 33..., etc.), starting of any number between 1 and 241. See table 1 for limitations with PRV automation stations.

Relative I/O address The complete address (relative I/O address) for an input or output is thus composed as follows (example): base address (9) + offset address (5) and channel number (.1) = relative I/O address (14.1) (also refer to Table 1).

Note With two modules in a GRUNDFOS bus segment, the address plug no. (base address) at one module must be selected < 64, at the other module ≥ 64. This means that the module with the lower base address communicates with pumps 1 and 2, the module with the higher base address with pumps 3 and 4.

Table 1: settings for generating the module functions The table shows the assignment of the data points or module types to the internal offset addresses for defining the relative P-bus address.

Relative P-bus address: base ¹⁾ and offset address	Example (PRV)	Example (PRU) Address		Data point P1=pump 1 P2=pump 2	Value range	Unit	FB type	Module type ³⁾	Offset (COF)	Slope (CS)
Base address	\$000 \$001	1	Channel 1 Channel 2	Switching command P1 ²⁾ Switching command P2 ²⁾	0...100	%	PosO, modl	2Y10	—	—
Base address + 1	\$002 \$003	2	Channel 1 Channel 2	Set value pump head P1 Set value pump head P2	0...100	%	PosO, modl	2Y10	—	—
Base address + 4	\$010 \$011	5	Channel 1 Channel 2	Operating code P1 Operating code P2	0...255	1	Measl	2R1K	-48	1
Base address + 5	\$012 \$013	6	Channel 1 Channel 2	Fault status code P1 Fault status code P2	0...255	1	Measl	2R1K	-48	1
Base address + 8	\$020 \$021	9	Channel 1 Channel 2	Pump head P1 Pump head P2	0...254.0	m	Measl	2R1K	-4.8	0.1
Base address + 9	\$022 \$023	10	Channel 1 Channel 2	Flow rate P1 Flow rate P2	0...254.0	m ³ /h	Measl	2R1K	-4.8	0.1
Base address + 12	\$030 \$031	13	Channel 1 Channel 2	Pump output P1 Pump output P2	0...25.40	kW	Measl	2R1K	-0.48	0.01
Base address + 13	\$032 \$033	14	Channel 1 Channel 2	Pump speed P1 Pump speed P2	0...100	%	Measl	2R1K	-48	1

¹⁾ Permissible numbers for base addresses with automation stations PRV, starting from 1 in increments of 4 (1, 5, 9, 13..., etc.)
With PRU automation stations, all base addresses from 1 to 241 can be used
²⁾ Switching commands: <10 % = OFF / ≥10 % = ON
³⁾ Load units: 8 each with 12.5 mA (independent of the data points used)

Table 2: operational and fault status signals

The table below shows the content of the coded status signals as they appear on the automation station or screen.

Display	Operational status or type of error	Possible preselections or causes of error
Operating code		
00	OFF	Local shutdown or fault
01	OFF	Remote shutdown at the pump
03	Ready	
05	Automatic	
06	operation	Due to remote max. switching via bus
07	Max. operation	Due to remote max. switching at the pump
08	Max. operation	Due to local max. switching at the pump
Fault code		
00	No alarm	
01	Supply error	Undervoltage
02	Supply error	Overvoltage
06	Supply error	Lack of water
07	Supply error	Overpressure, max. limit crossed
08	Supply error	Min. limit crossed
09	Supply error	Other (bus, ...)
10	Pump error	Locked
19	Pump error	
20	Motor error	Overtemperature
39	Electronics error	
40	Detector error	Interruption of cable

Table 3: module LEDs for P-bus and GRUNDFOS bus

The two LEDs for the P-bus and the GRUNDFOS bus indicate the operational status of the module and that of the bus connections. The table below provides the relevant information:

Phase	P-bus LED 1	GRUNDFOS bus LED 2	Meaning
Start phase (approx. 5 s)	Steady light		Normal status
	Off		No P-bus module power supply
	Flash light		Module defective
Operating phase (after 5 s)	Steady light	Steady light	Normal operation
	Flash light	—	Establishing connection to the automation station
	—	Flash light	Transmission error between module and pump
	Off	Off	No P-bus module power supply or no AC 24 V operating voltage
	—	Off	No communication with pumps

Safety of system and functions

Switch-on behaviour	After switching on the power supply (reference voltage BEZ and system potential G), the modules are capable of communicating within 0.5 seconds, that is, they are ready for receiving a telegram.
Reliability of transmission	<ul style="list-style-type: none">• Faulty transmission is detected and not accepted; for this purpose, the ASIC in the module provides the functions "CRC" (cyclic redundancy check) and "Comparison of data on the P-bus line with the required data" (listening in)• The automation station transmits to the interface module at least every four seconds the updated output values in the form of an error-free telegram; if there is no telegram within that period of time, the module's default values are activated in place of the non-transmitted actual values and are then transmitted to the pumps• If the GRUNDFOS bus to the pumps is interrupted or severely disturbed, the pumps continue to operate using the locally set default values: with the exception of the fault code, the pump data in the interface module are set to the default values and transmitted to the automation station in place of the missing actual data; the fault code is still valid and, in that case, contains a "9" (supply error, other, bus fault); the default values for all other data points are "0"
Protection against false wiring	If, by mistake, AC 24 V operating voltage is supplied to the bus lines, the module will not be damaged.
Short-circuit strength	The two bus lines are short-circuit-proof.
Working on the module when voltage is present	Connection of the GRUNDFOS bus and plugging in or removal of the module under voltage will not cause any damage to the module.
Notes	<p>The entire I/O module functionality comprises the module (hardware) as well as signal handling in the module and the automation station (software). To fully understand the module functions, the associated process sequences and configuration options for the user program must be considered.</p> <p>For the technical features common to all I/O modules, refer to document Z8102, "I/O module system".</p>

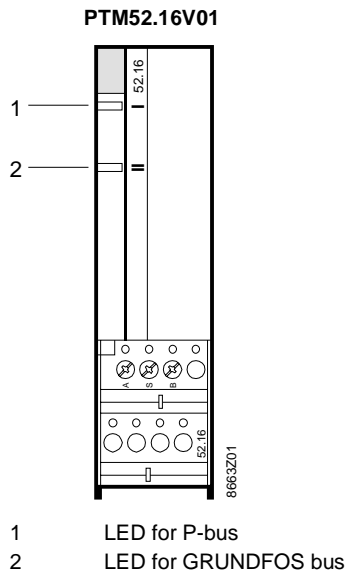
Mechanical design

Modular unit	Modular unit with plastic casing consisting of terminal base and electronic module which are plugged onto the I/O bar. The signals and voltages are picked up from contacts on the I/O bar.
Connecting terminals	The connecting terminals of the I/O modules arranged on the I/O bar are used in place of the block terminals for the external wiring usually installed in the control panel. They comply with the relevant standards and regulations and provide the test terminal function. Also, they can be fitted with plant-specific labels.
Module front	Transparent module front for insertion of the plant-specific module labels. The specifically prepared and perforated labels are marked with the help of the engineering tool for the building automation and control system. The space for the address plug and the two LEDs for the P-bus and the GRUNDFOS bus are also on the front of the module.
Accessories	All I/O modules use the same accessories, which are shown on data sheet N8105.

Note

For a more detailed description of the module's mechanical design, refer to document Z8102, "I/O module system".

Front view



- 1 LED for P-bus
- 2 LED for GRUNDFOS bus

Engineering notes



Document Z8102, "I/O module system", contains system-related engineering know-how. It should be studied before reading the following sections while paying special attention to the information relating to safety.

Correct use

Within the overall system, the I/O modules must always be used on applications as described in document Z8102, "I/O module system". The module-specific characteristics and features given in the brief description on the front page and in the chapters "Use", "Engineering notes" and "Technical data" of the present sheet must also be taken into consideration.



The sections of this chapter identified by a warning triangle contain additional requirements and restrictions relevant to safety. They must be observed to ensure the safety of persons and objects.

Interface coupling

The GRUNDFOS bus is **galvanically separated** from the module's electronics.

Module addresses

For defining the P-bus addresses on the basis of the base address and the offset address, refer to "Technical design".

LEDs

During the startup phase (5 seconds), the two LEDs for the P-bus and the GRUNDFOS bus provide important diagnosis information about the module and the installation of the bus. In case of doubt, the startup phase can be restarted by briefly removing and refitting the module. For details, refer to Table 3 under "Technical design".

Fitting notes

Refer to document M8102, "I/O modules and P-bus".

Instructions for fitting the I/O module on mounting rails and on the I/O bar are printed on the packing.

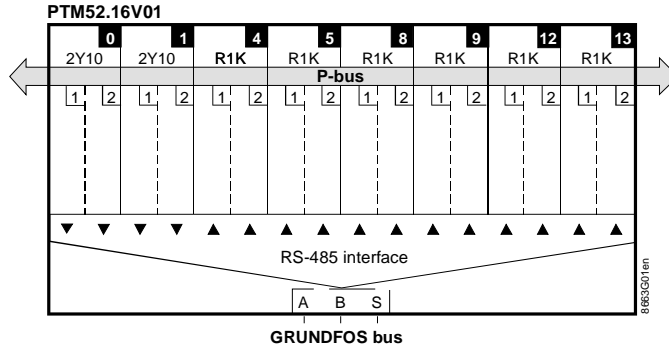
Commissioning notes

Module address	The address plug with the base address must be fitted. Refer to "Technical design" for the respective conditions. The interface module has no other setting or operating elements.
Settings at the pump	<p>The GRUNDFOS pumps with communication capability must be given a pump number and address when commissioning the plant. With P-bus addresses < 64, pump addresses 1 and 2 are supported; with P-bus addresses ≥ 64, pump addresses 3 and 4. After changing the addresses of GRUNDFOS pumps, a pump cold start must be made (switching off/on).</p> <p>The set value of pump head transmitted to the pump always refers to the set value adjusted locally on the pump. In the case of a local value < 100 %, the set value can only be varied within that range. The set value is adjusted with a potentiometer on the pump.</p> <p>With pumps featuring infrared remote operation, the pump number or pump address can be set from a remote location. The maximum set value is adjusted with the +/- buttons on the pump. However, these settings on pumps with remote operation can be made only if the interface module is disconnected (removal of module).</p> <p>For more detailed information on pump settings, refer to the documentation published by the supplier of the pumps.</p>
General	Refer to document Z8102, "I/O module system", for general information on the commissioning of I/O modules.

Technical data

Power supply	Operating voltage	AC 24 V ±20%
	Safety extra low voltage (SELV) to	EN 60 730
	Frequency	50 Hz or 60 Hz
	Power consumption	2 VA
	I/O module power supply via P-bus	DC 24 V (against G0)
	Load units	8 (12.5 mA each)
Module addresses	Number range for base addresses	1...241 (refer to Table 1)
P-bus	Refer to data sheet 8022, "Process Bus"	
GRUNDFOS bus	Type of interface	RS-485 (galvanically separated)
	Rate of transmission (baud rate)	9600 bps
	Type of cable	two-wire (shielded)
	Length of cable (as specified by the supplier)	700...1200 m
CE conformance	In compliance with the directives of the European Union:	
	Electromagnetic compatibility	89/336/EWG
Note	For technical data common to all I/O modules, refer to document Z8102, "I/O module system".	

Internal diagram



Addresses:

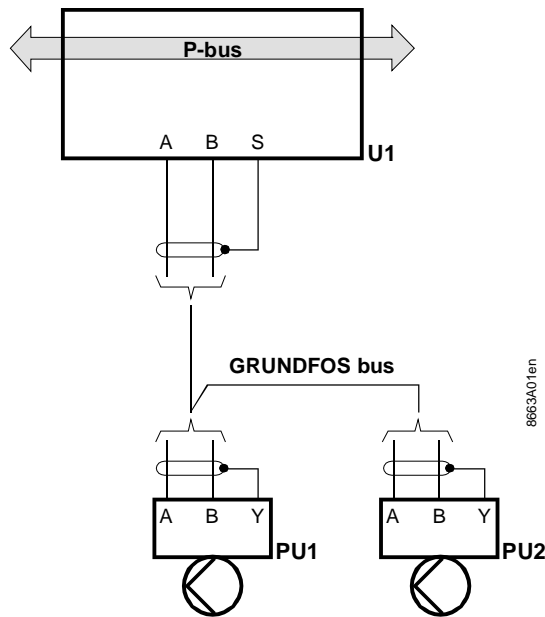
- 0...13 Offset addresses (black squares)
- 1, 2 Channel addresses within offset addresses (white squares)
(for assignment of data points to the module types, refer to Table 1)

RS-485 interface:

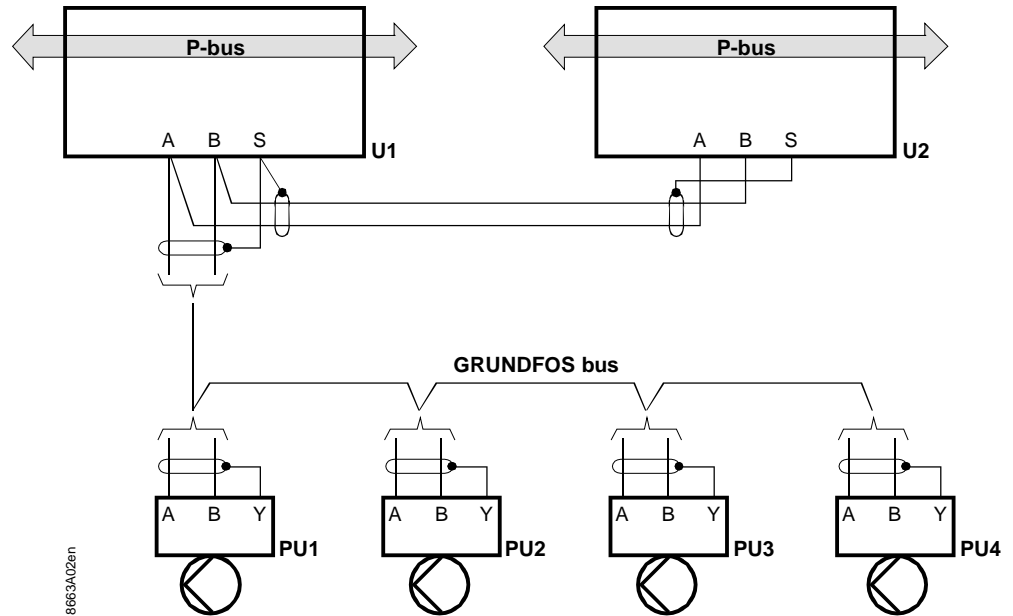
- A Data line, positive
- B Data line, negative
- S Shielding (only auxiliary terminal)

Wiring diagrams

GRUNDFOS bus segment with max. two pumps



GRUNDFOS bus segment with max. four pumps



U1, U2 Interface modules PTM52.16V01
 PU1...PU4 Heating pumps with GRUNDFOS bus

Note

The terminal markings on the pumps may vary, e.g. numbers in place of letters.
 Refer to the technical documentation published by the supplier of the pumps.

Dimensions

