

**Panasonic**  
Aquaarea

**Heat pump manager**  
PAW-HPM 1  
PAW-HPM 2

**Manual, part 1**  
**Installation and commissioning**

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Revision A, February 2013

Software revision: 1.0-0-00



### **NOTICE:**

**Before removing the controller from the terminal block, be sure to switch off the supply voltage!**

# *Part I* **Installation and startup**

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# Chapter 1 General information

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This operating manual consists of a detailed description of the installation and commissioning of the HPM controller. The manual describes the individual parts of the controller as well as its operation, how to connect sensors, pumps and valves, selecting the system diagram and how to make additional adjustments to adapt the controller to the construction of a individual system and its installed heat pump(s).

The appendix of the manual contains the most common system diagrams along with the complete menu structure, an overview of the available types of heat pumps (type of communication), an overview of the possible heating curves, a description of cascade control (i.e. using more than one heat pump with communication) and information for configuring web communication (Ethernet/network interface).

To simplify controller operation, its display will show only such parameters and menu items that are currently relevant. I.e., if a boiler has been selected as the heat source, menus pertaining to the operation of district heating and heat pumps will not be visible. Or, supposing there is no return temperature sensor assigned to a terminal, no entry will be visible in the menu "Current values" pertaining to a return temperature.

The selected and loaded system diagram, along with any additional manual adjustments made, decide what will be displayed in the menu system of the controller.

# 1.1 HPM tool: Selecting the system diagram

To select the system diagram, Panasonic offers a web-based tool called “HPM tool”.

HPM tool is a web-based software accessible via the address [www.hpmtool.eu](http://www.hpmtool.eu) by using a standard Internet browser

HPM tool permits quick and easy selection of the right system diagram for your heating system.

The screenshot shows the Panasonic HPM tool interface. At the top, there is a navigation menu with options: Heat Pump, Dom. Hot Water, Buffer Tank, Heating Circuit 1, and Heating Circuit 2. Below the menu is a system diagram with five modules: '1 heat pump, communication', 'changeover valve (com), solar system', 'installed', 'continuous actuator', and 'unmixed'. The diagram shows a network of pipes and electrical connections between these components. Below the diagram, the system number 'SD-Nr. 58112' is displayed. At the bottom, there is a 'Wiring diagram' section with a table of terminal configurations and options to 'Print-Preview', 'Save to excel', and 'Save as pdf'.

	17	temp.sensor	N	16	
	18	temp.sensor	L	15	
	19	temp.sensor	ground for 13	14	
	20	temp.sensor	relay	13	HC1 pump
	21	temp.sensor	not used	12	
Solar collector temperature	22	temp.sensor	relay	11	
Heat Pump / Strategy Buffer tank temperature	23	temp.sensor	ground for 9+11	10	
	24	temp.sensor	relay	9	
	25	counter	not used	8	
	26	contact	relay	7	Solar pump
	27	0...10V	ground for 5+7	6	
HC1 valve continuous	28	0...10V	relay	5	HC2 pump
	29	sensor/contact ground	not used	4	
	30	not used	relay	3	
	31	not used	ground for 1+3	2	
	32	not used	relay	1	

Fig 1.1: Different modules are combined into a system diagram. HPM tool then provides a system diagram number which is entered into the controller and the corresponding terminal configuration

By making selections from the menu system near the top of the screen, the modules can be combined into a system diagram corresponding to the actual heating system in use. HPM tool then generates a system diagram number. This has to be entered during initial startup of the controller.

The terminal configuration displayed in HPM-tool shows to which input and output terminals the sensors, pumps and valves must be connected. The terminal configuration can either be printed out or saved as a Microsoft Excel file.

## 1.2 Model overview and Accessories

The product range of the PAW-HPM consists of the HPM controller (with or without display), the adapter cable (enabling communication with a split- or mono-block heat pump) and miscellaneous sensors:

Controller type	Display and Keys	BUS *	Web
PAW-HPM1	X	X	X
PAW-HPM2		X	X

\* Communication with a heat pump requires additional adapter cable of model INT-X

Table 1.1: Controller types

The HPM1 is a standardized controller for systems including a heat pump. Control of the heat pump can take place either via a contact or via communication. A HPM controller can be used for cascade control of up to 3 heat pumps. For demand via contact, only one HPM1 is required. When utilising cascade control via a communication port, one HPM1 is required as a master controller and up to 2 HPM2 as slave controllers (for communication with heat pumps 2 and 3). In addition, the HPM controllers must be connected via an Ethernet port.

Accessories	Description	Usage
<b>Adapter cable:</b>		
PAW-HPMINT-U	Adapter cable, HPM-split HP, 5V, 3m	Communication with a split-heat pump
PAW-HPMINT-M	Adapter cable, HPM-mono-block HP, 12V, 30m	Communication with a MONO-block-heat pump
<b>Sensors:</b>		
PAW-HPMUH	Outdoor sensor, -30...+70°C	For weather-dependant setpoint calculation
PAW-HPMAH1	Clamp-on sensor, -20...+120°C	Flow temperature for the heating circuit
PAW-HPMB1	Universal cable temperature sensor, -30...+100°C	Domestic hot water, buffer tank
PAW-HPMSOL1	Cable temperature sensor, -50 - +250°C	Solar collector, domestic hot water, buffer tank (high temp.)
PAW-HPMDHW	Immersion temperature sensor, -20 - +120°C, with pocket, R1/2", L=90mm, stainless steel	Flow temperatur for heating circuit, domestic hot water, buffer tank
PAW-HPMR4	Room temperature sensor with setpoint adjustment, 5 – 30°C	Room temperature and remote setpoint potentiometer for heating circuit

Table 1.2: Accessories

## 1.3 The HPM-Package

The HPM Package consists of the following components

- Controller
- Socket
- Installation instruction

# 1.4 The controller

## 1.4.1 The control elements

HPM is available with or without a built-in display.

Models without a display have no control elements. In this case, the controller is operated via the communication port (RS-485).

Models featuring a display offering a front panel that is highly intuitive and simple to use, containing a backlit text display and a control element with 5 keys.



Fig. 1.2: The control elements

## 1.4.2 The default display

The display of HPM is a backlit text display of 4 x 20 characters. When the controller is in “sleep mode” the “default display” will be shown, containing the following information:

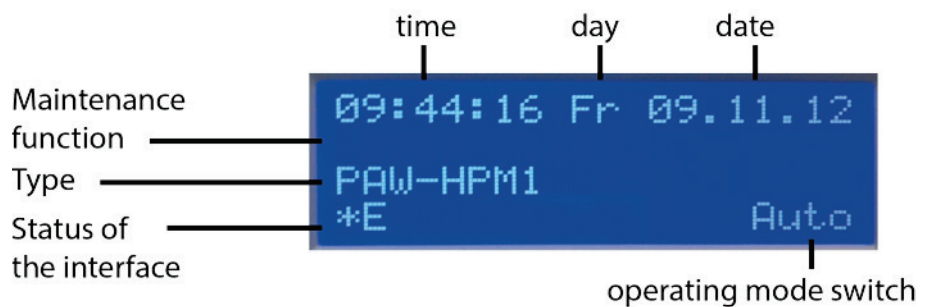


Fig. 1.3: The default display

The menu “global – service – display” permits adjusting the default display to the individual needs of the user. The 4 rows of the display is capable of displaying current sensor values, output signals and/or plain text.



### 1.4.3 The main operating mode switch

The menu for the main operating switch can be accessed by pressing “+” while in the default display. The menu contains the operating mode switch for the controller and the main switch for the heat pump.

The position of the switch can then be selected by using “+” and “-”. The selected position can be entered by pressing “OK”.

The main operating switch has the following effects on the module library:

		Heating circuits	Domestic hot water circuits	Heat pump
Switch position	Off	Off: Valve stays in current position, pump off	Off: Valve stays in current position, pump off	Off
	Auto	Automatic operation: Automatic setpoint switching depending on timer program (day/night)		Automatic operation: Setpoint according to demand
	Summer	Switch-off operation: Valve closed, Pump off, Frost protection remains active	Automatic operation: Automatic setpoint switch depending on timer program	
	Holiday	Reduced operation/support operation: Setpoints of non-operating time NO (night) apply		
	Duration	Nominal operation: Setpoints of operating time 1 OT1 day apply		
	Manual	Manual operation: Valve and pump function as defined in the “Manual operation” menu		

Table 1.4: Operating mode switch



**NOTE:**

**In the “Off“ switch position, the frost protection and pump prerun/extended running functions are not active!**

You can find further information in the menu “configuration – switch – operating mode switch“. When the controller is communicating via communication port with the heat pump(s) you will find in this menu also the main switch of the heat pump MS-HPx. These parameters substitute the ON/OFF keys of the heat pump and the FORCE key in the operating unit in the heat pump.

		MS-Px
Switch- position	Off	Heat pump is switched off
	Auto	Heat pump is controlled by the controller HPMx
	Force	Heat pump is switched on in emergency operation (E-heater inside is active).

Table 1.5: Main switch of heat pump

For more information please refer to the menu “Configuration – switch – heat pump main switch”

## 1.4.4 System overview

To provide the user or technical personnel with a quick overview of the current heating system, it is possible to enter a menu which will display the most relevant parameters. These include operating and error status, setpoints, current values and signals transmitted via the output terminals, as well as the option to adjust the occupation time 1 and non-occupation time setpoints.

To enter the system overview menu, press “-“ while in the default display. The list of parameters can then be scrolled through by pressing “DOWN”. For more information, refer to the chapter “System overview”.

## 1.4.5 Overtime

It is possible to easily prolong the current occupation time without changing the basic timer parameters, or to spontaneously initiate a new occupation time. This can be performed simply by pressing “DOWN”. In the overtime menu, the overtime for each consumer circuit (heating circuit 1, heating circuit 2 and the domestic hot water circuit) can then be activated separately, depending on the current configuration of the controller.

For more information, refer to the chapter “Configuration – keys”.

## 1.4.6 Maintenance / acknowledgment

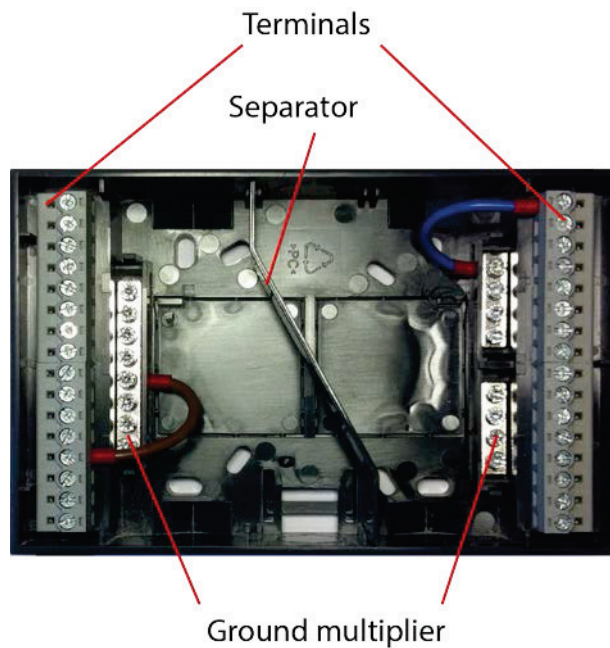
To acknowledge errors of the heat pump(s) and to give a service technician the possibility to service the pump(s) in question, this menu provides the possibility to start the maintenance function (signalling demand to the heat pump for 15 minutes) or to acknowledge/reset errors.

Pressing “UP” will bring up the Acknowledge/maintenance menu. The “DOWN” key then permits selecting the desired parameter. The keys “+” and “-“you enables adjusting the parameter to “ON” or “OFF”. The “OK” key is used to enter the parameter setting.

For more information, refer to the chapter “Configuration – keys”.

## 1.5 The socket

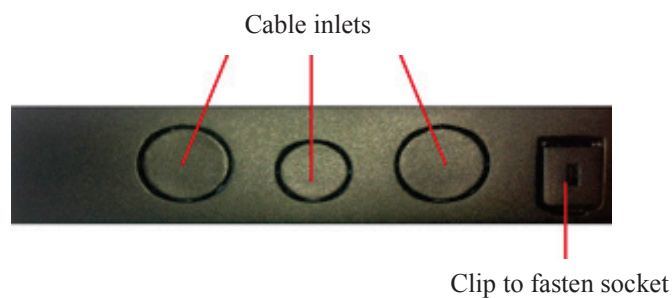
The socket of the HPM constitutes a separate component in which the terminals are contained and the wires connected. The socket is divided by a separator into 2 parts. The left-hand side contains low voltage connections, such as for sensors and 0...10 V terminals, and the right-hand side contains high voltage connections (230 V) for actuators and pumps.



*Fig. 1.7: The socket*

Each section of the socket contains ground multipliers, which are situated immediately next to the terminals. Low voltage and high voltage use separate grounds to prevent electromagnetic influence.

To fasten the socket to the controller, simply slide the controller onto the socket and push the two clips on each side of the socket. A screwdriver is required in order to open the clips again.



*Fig. 1.8: Cable knockouts and clip to fasten the socket*

The cable inlets must be pressed out where needed. The holes are prepared for standard M-cable glands.

## 1.6 The interfaces

Depending on the type of controller, a number of interfaces are available:

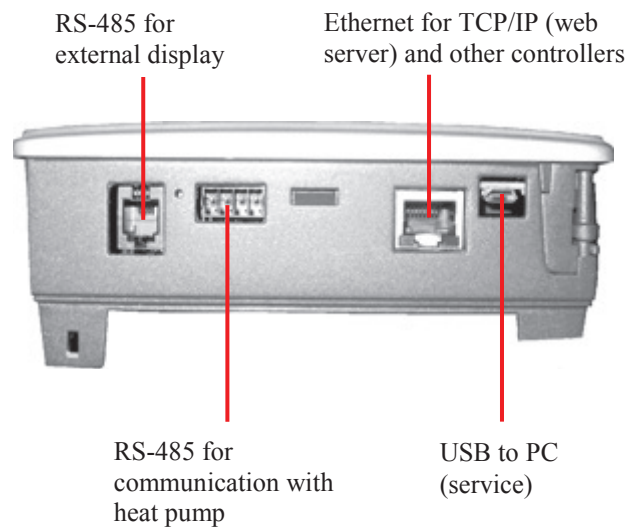


Fig. 1.9: The interfaces

### USB

Each controller is equipped with an USB interface. The USB interface can be used to:

- Make adjustments.
- Create a backup of the configuration.
- Upload backups or new firmware.

The only equipment necessary is a normal USB-to-Micro-USB interface cable and the necessary COM-port driver as required by the computer's operating system.

### External display (RS-485)

This interface enables connecting a remote control unit (e.g. an external touch panel).

### Communication with the heat pump (RS-485)

This interface is used to communicate with the heat pump. To connect the heat pump, a PAW-HPMINT-X model adapter cable is needed. The "X" stands here for either "–U" (a 3 m adapter cable to communicate with the internal unit of a split-heat pump) or "–M" (a 30 m adapter cable to communicate with a MONO-block-heat pump). In this case, the HPM functions as a substitute for the operating unit of the heat pump.

### Network (Ethernet)

If the controller is equipped with an Ethernet interface, it can be connected to a communications network which can in turn be connected to the Internet. The interface can be used to:

- a) Communicate with the controller.
- b) Connect master and slave controllers when using more than one heat pump in the system.

## 1.7 Technical data

Power supply .....	85...265 V AC, 50/60 Hz
Power consumption .....	Max. 8 VA (depending on model)
Dimensions.....	146.7 x 97.6 x 76.0 (WxHxD)
Ambient temperature .....	0...50°C
Storage temperature .....	-40...+50°C
Ambient humidity .....	Max. 90 % RH
Protection class .....	IP20 (mounted on the wall)
.....	IP40 (mounted in cabinet)
Connection .....	Terminals in a socket
Memory backup .....	Long life battery (>8 years).
.....	All settings are stored in the event of power failure.
Display .....	Backlit, LCD, four rows of 20 characters

### EMC emissions & immunity standards

This product conforms to the requirements of the EMC Directive 2004/108/EC through product standards EN 61000-6-1:2001 and 61000-6-3:2001.

### RoHS

This product conforms to the Directive 2011/65/EU of the European Parliament and of the Council.

### Inputs

Analogue inputs ....	8 x For Pt1000, NI1000 or NI1000LG sensors (accuracy $\pm 0.4^\circ\text{C}$ ).
.....	Can also be used as digital inputs.
.....	2 x 0...10 V DC (accuracy $\pm 0.15\%$ of full output signal).
Digital inputs .....	2 x contact input for potential free contacts

### Outputs

Analogue outputs .....	2 x 0...10 V DC, 1 mA, short-circuit proof
Digital outputs .....	7 x relay, 230 V AC, 1 A inductive. Totally max. 7 A.

Collective alarm .....	The output can be configured
------------------------	------------------------------

### Interface

USB .....	Service interface with micro USB connector
Web .....	TCP/IP (with fixed IP, DHCP can be activated)
.....	Web graphic + WebRemote
Bus .....	Communication with a heat pump via adapter cable:
For Split- heat pumps .....	PAW-HPMINT-U (3 m long)
For MONO-block heat pumps.....	PAW-HPMINT-M (30 m long)
External display.....	RS-485 for the connection of a Touch-Display
.....	as remote control unit, with room temperature
.....	sensor and setpoint adjustment

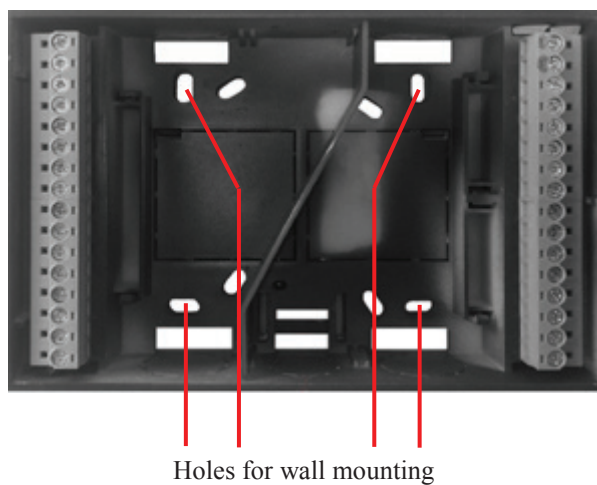
# Chapter 2 Installation and wiring

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## 2.1 Installation

HPM comes prepared for 3 different kinds of mounting.

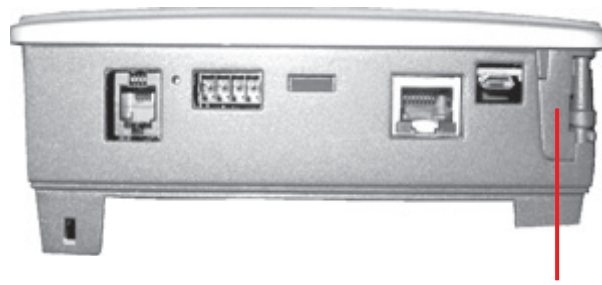
### 2.1.1 Wall mounting



*Fig. 2.1 Wall mounting*

Because the HPM is a stand-alone controller, it is highly suitable for direct wall mounting. The socket comes equipped with specially located holes that enables it to be screwed directly onto the wall.

## 2.1.2 Mounting in a control cabinet door

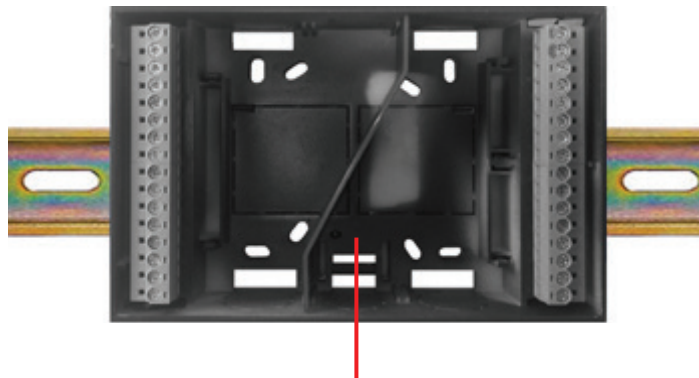


Flaps for fastening  
controller in cabinet door

*Fig. 2.2 Control cabinet door mounting*

The HPM can be installed in a cabinet door or in a panel of a boiler or a heat pump. The controller is designed to fit into a standard hole of 138 x 192 mm. Simply slide the controller through the hole in the cabinet door or the boiler (heat pump) panel and turn the flaps until the controller is secured. No screwdriver or additional tools are needed.

## 2.1.3 Mounting in control cabinet on DIN-rail



Lock for DIN-rail

*Fig. 2.3 Mounting on DIN-rail*

The socket of the HPM is also ready for direct mounting onto a DIN-rail, either inside of a cabinet or in any other housing in which a DIN-rail is available. Simply clip the socket onto the DIN-rail and the mounting process is completed.

## 2.2 Wiring

### 2.2.1 General

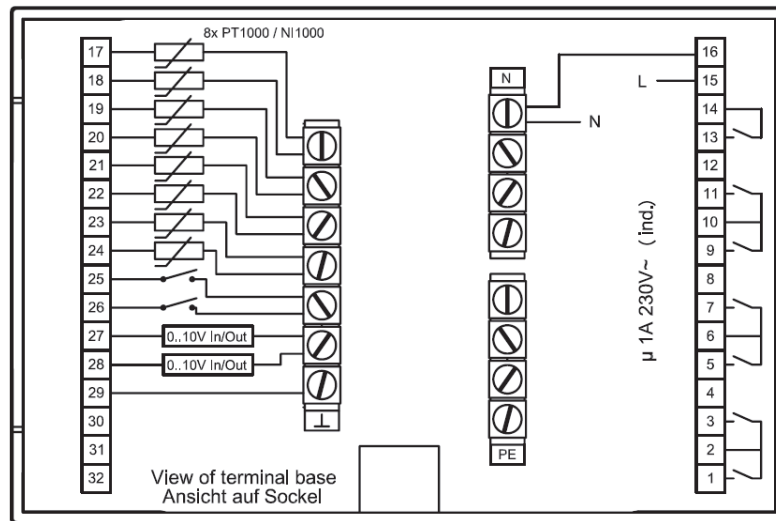


Fig. 2.4: Connection of power supply, relay outputs, sensor and contact inputs.

The HPM is equipped with 7 potential-free relay outputs, 8 sensor inputs (which can also be used as contact inputs), 2 contact/pulse counter inputs and 2 continuous (0...10 V) universal inputs/outputs.

The following chapters explain the use of the terminals more thoroughly.

### 2.2.2 Main voltage

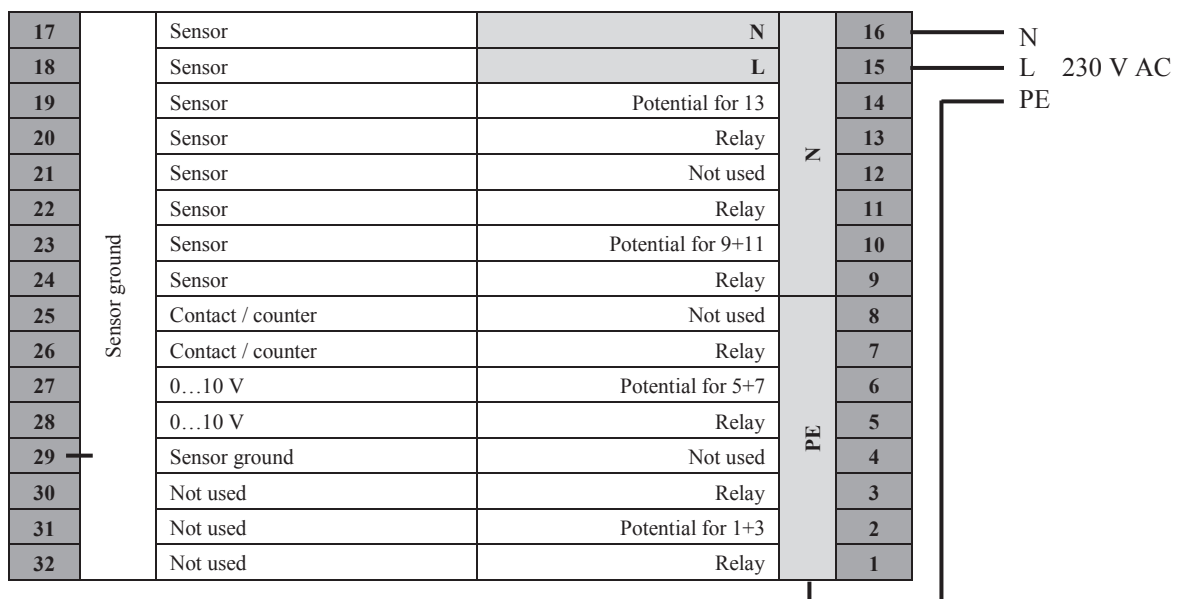


Fig. 2.5: Connection of the power supply

The HPM is a stand-alone controller with a 230V power supply. The power supply also feeds the components, which in turn are connected to the relays.



## 2.2.3 Input terminals

The HPM has the following input terminals:

- Sensor input (PT1000, Nickel1000 or Nickel1000 LG): Only one type of sensor can be used at any one time and has to be specified during the initial installation (see chapter “The start-up sequence”).
- Contact input or counter input (for reading a pulse from a meter).
- 0..10V input for sensors with 0..10V output or for a heat demand via signal (0..10V=0..150°C). These inputs can also be used as 0..10V outputs (see the operating manual for more information).

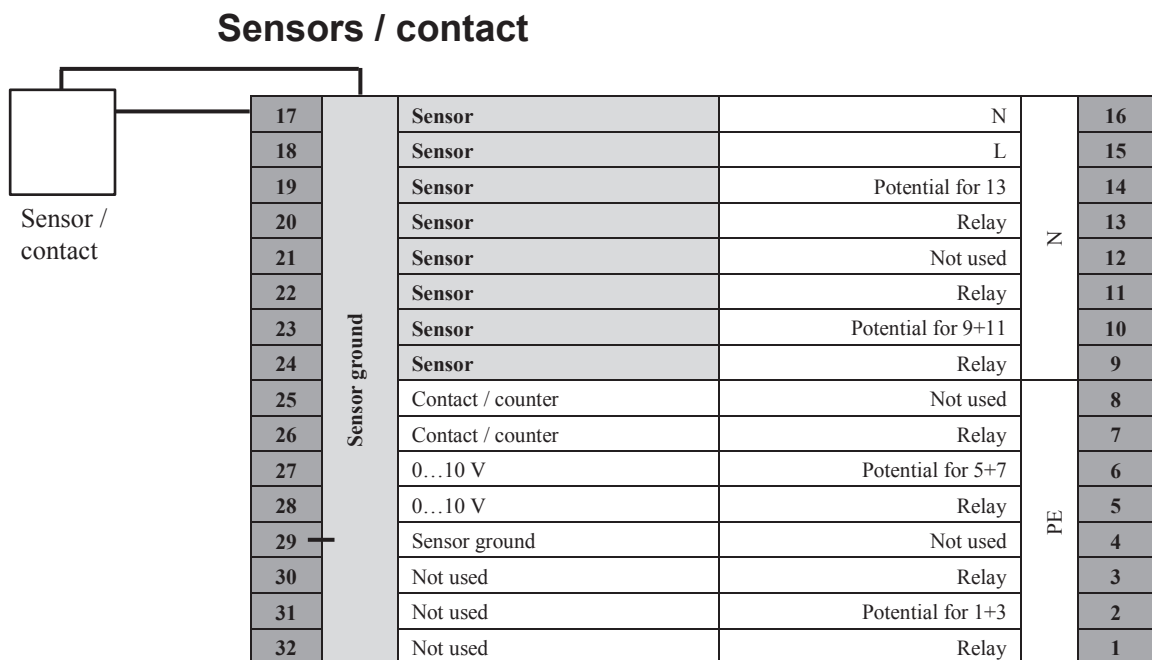


Fig. 2.6: Connection of sensors or contact inputs

A sensor is connected to the assigned terminal and to the sensor ground. Exigo supports connection of up to 8 sensors. PT1000, Ni1000 and Ni1000LG sensors are not poled, and it is therefore not necessary to differentiate between which wire should be connected to the ground and which should be connected to the terminal.

The sensor inputs can also be used as contact inputs.

### Room sensor with remote setpoint adjustment

To connect a room temperature sensor with a remote setpoint potentiometer (PAW-HPMR4), all sensor inputs can be used that are still free and which have no function once the system diagram has been loaded. The sensor ground and the chosen input terminals must be connected to the sensor and the setpoint potentiometer in the PAW-HPMR4 (the sensor ground will probably have to be bridged).

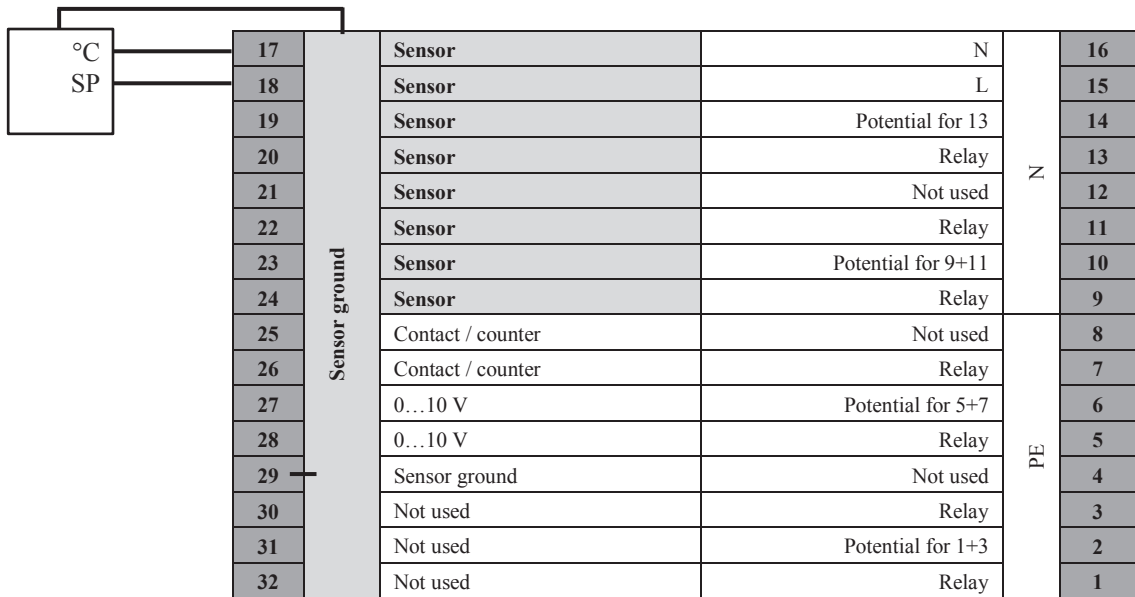


Fig. 2.7: Connection of a room sensor with remote setpoint potentiometer

The function of the input terminals must be manually assigned during initial installation (to the module(s) **Heating circuit 1** and/or **2**) as “**room**” sensor and “**SW-Poti**”. The influence of current room temperature on calculation of the flow temperature setpoint can be adjusted in the menu “Heating circuit – function – room influence”.

## Contacts / counter

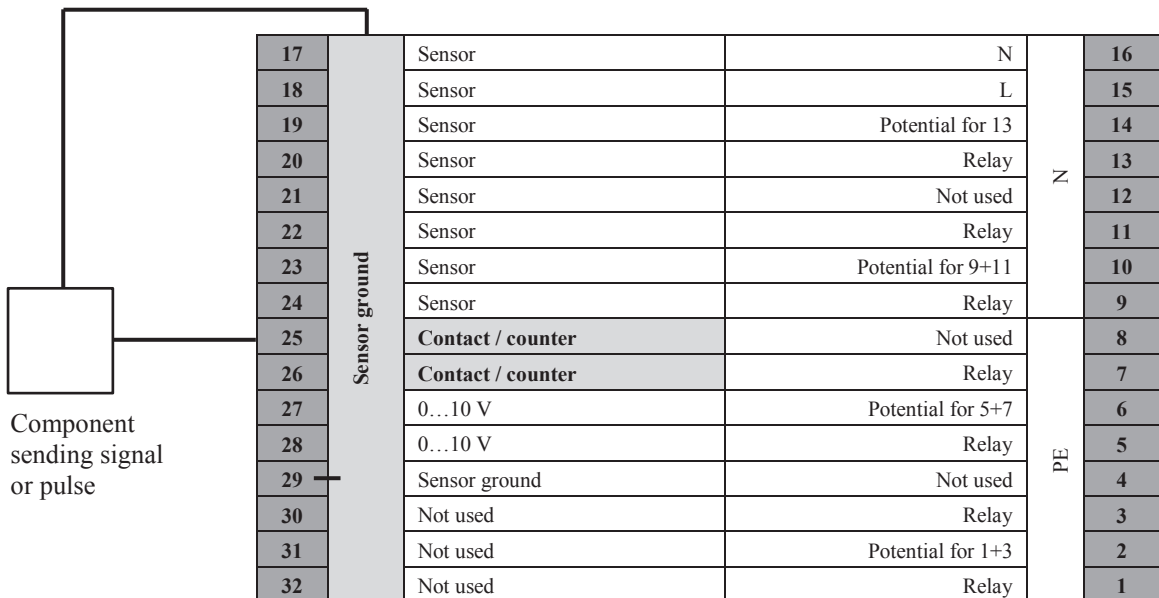


Fig. 2.8: Connection of counters, contact inputs

A signal can consist of a feedback signal from a pump or a ventilator. The wires have to be connected to the assigned terminal and the sensor ground. Terminal 25 or 26 may be used either as a signal input or a counter input.

## Room thermostat (for switch-off of heating circuits)

If a room thermostat, used to switch off the heating, should be connected, a switching contact must be placed between the sensor ground and a free input terminal (17-26). When assigning the terminal (called “system” main switch in the heating circuit), this input terminal is configured automatically as a contact signal input. As long as the contact is closed (room is still too cold), the heating program will remain in automatic operation. When the contact opens, the heating circuit changes to switch-off operation. In this case no temperature demand is calculated; only the frost protection function is active.

### 2.2.4 0...10V (Universal terminals)

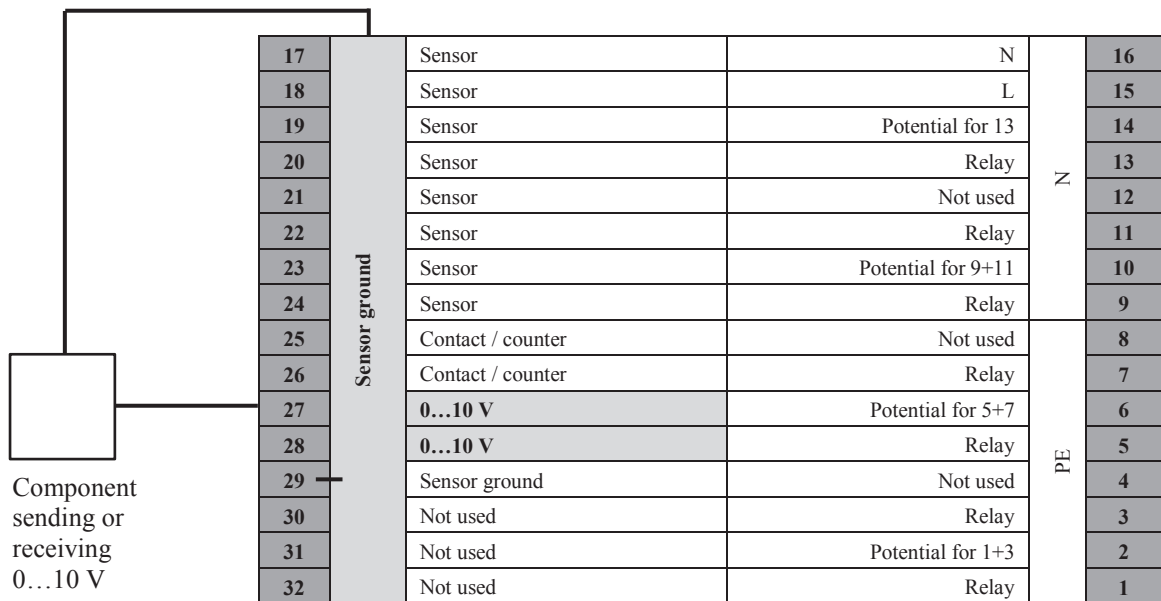


Fig. 2.9: Connection of 0...10V inputs or outputs

The HPM has two 0...10 V universal terminals. These can be used as inputs or outputs, individually. Please refer to the operating manual for further information.

# External heat demand

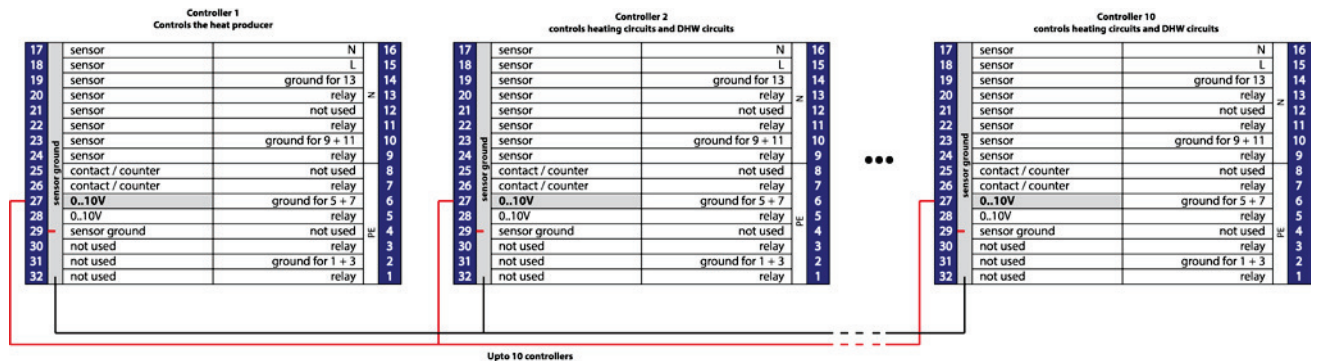


Fig. 2.10: controlling external heat demand with up to 10 controllers

The 0...10 V inputs/outputs can be used to transfer a heat demand from one controller to another. If one controller is used to control the heat source, the 0...10 V inputs can be used to connect up to 9 other controllers for control of heating circuits or domestic hot water circuits. The highest demand (highest voltage) is used for controlling the heat source. Please refer to the operating manual for further information.

## 2.2.5 Output terminals

### Valves

#### Valve + actuator with 2-point control (thermal actuator or spring return)

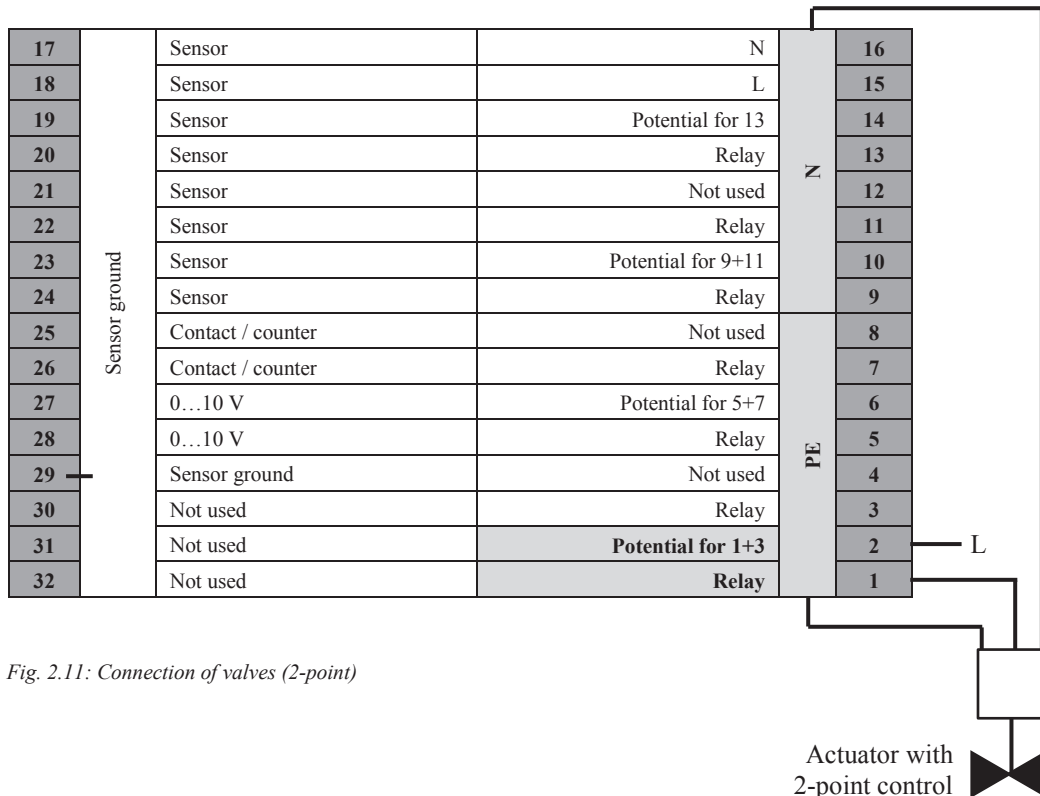


Fig. 2.11: Connection of valves (2-point)

### Valve + actuator with 3-point control

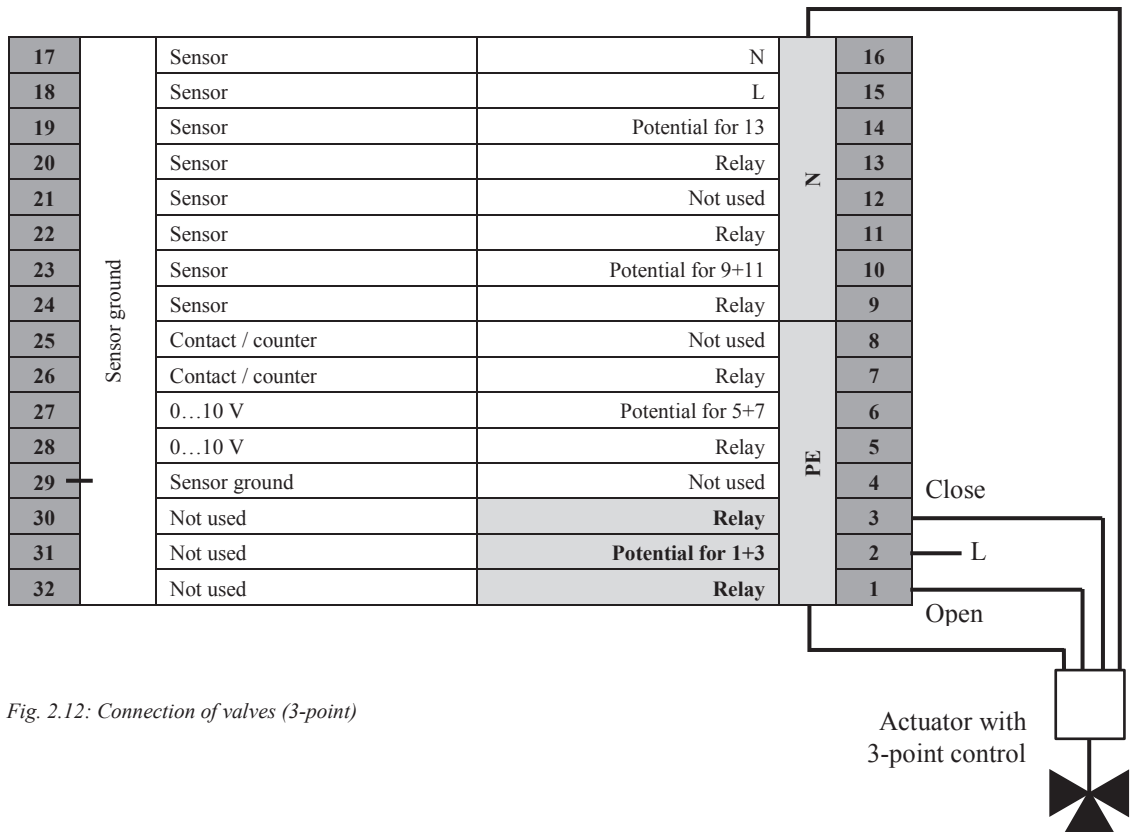


Fig. 2.12: Connection of valves (3-point)

### Valve + actuator with continuous control (0...10 V)

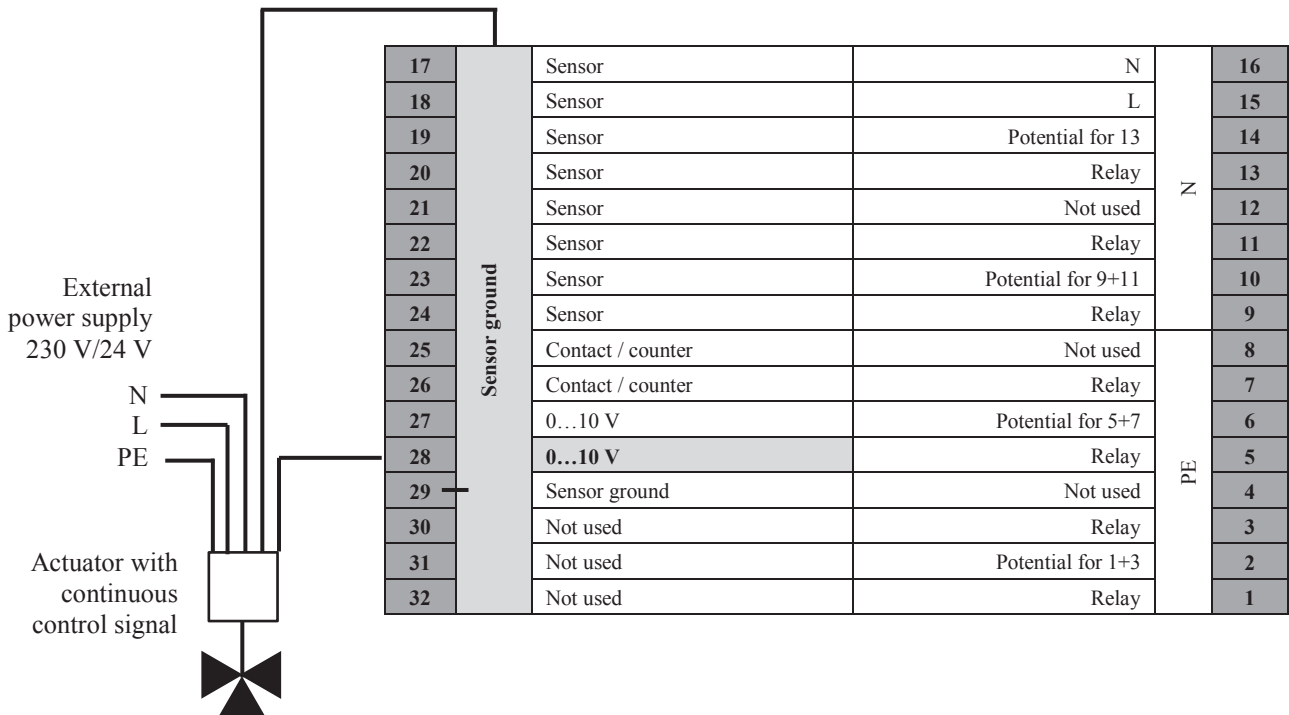
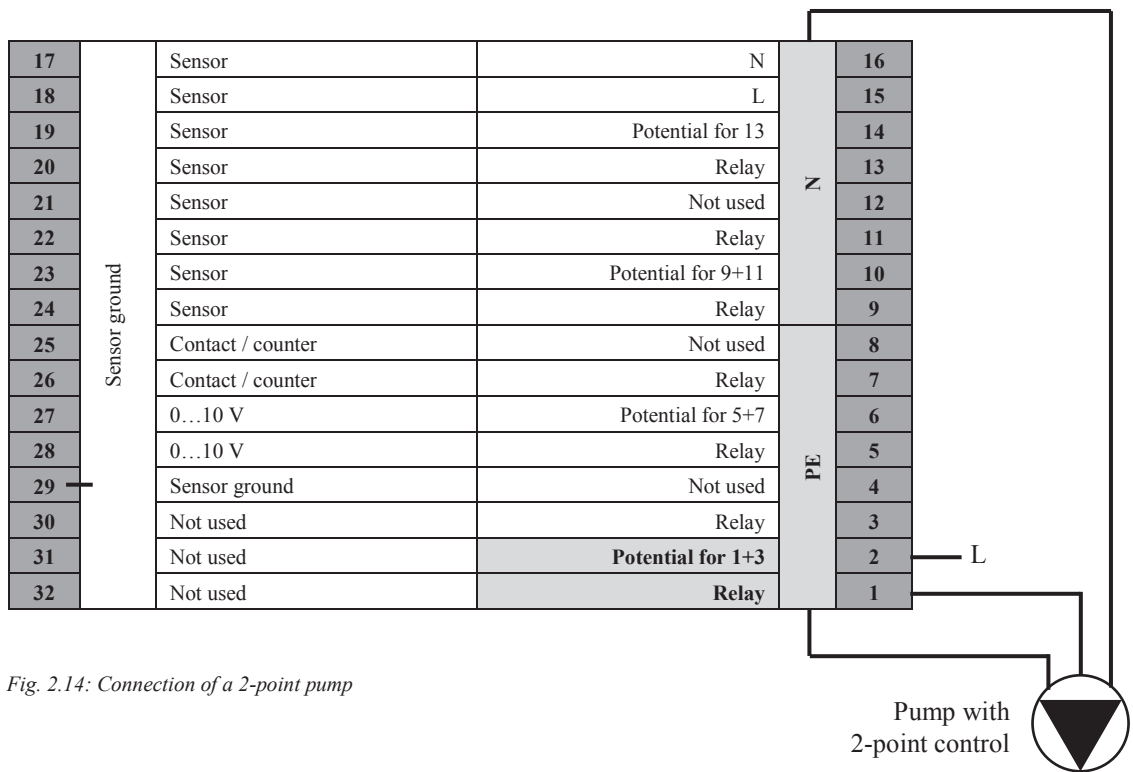


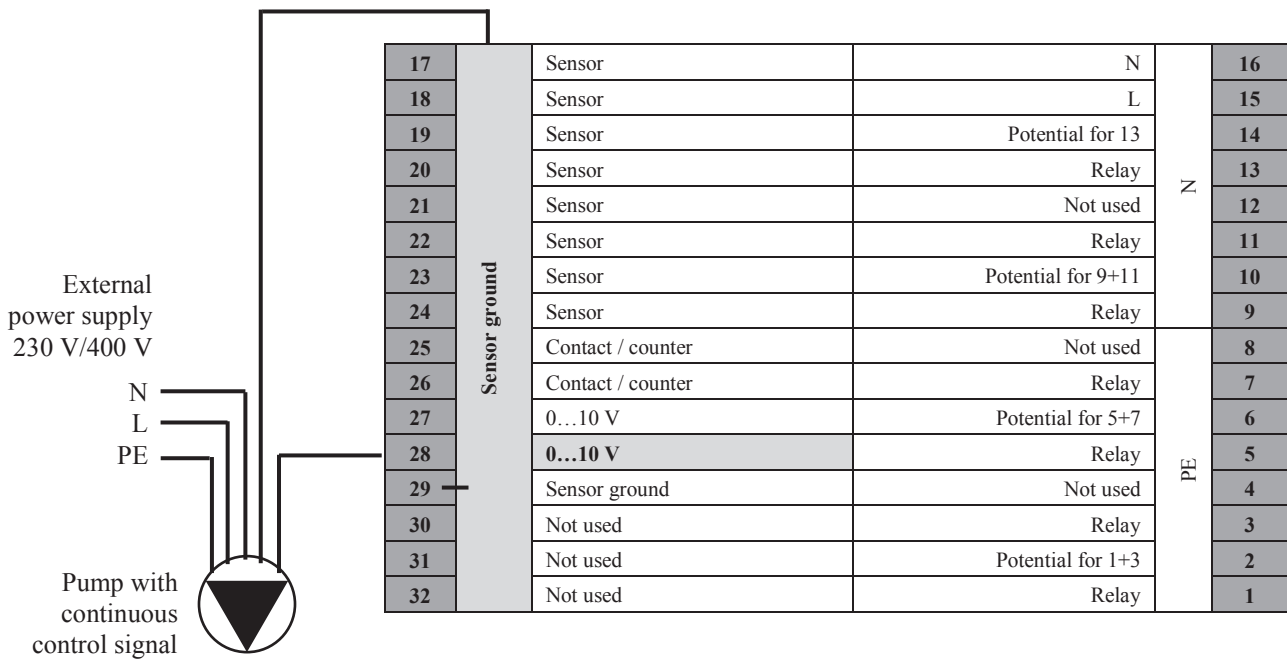
Fig. 2.13: Connection of valves with continuous control (0...10 V)

# Pumps

## Pumps with 2-point control



## Pumps with continuous control



## 2.2.6 Connection with the heat pump

The HPM controller is capable of controlling the Panasonic heat pump via a contact (demand) signal. Communication via contact signal only offers the possibility to send a demand for the heating circuits through the signal.

Direct communication with the heat pump via a communications port provides the controller with the advantage of being able to send the current flow temperature setpoints for heating or cooling, as well as for domestic hot water. Cascade control of up to 3 heat pumps via HPM controllers is also possible. An additional HPM(2) controller is needed for control of the second and third heat pump in a cascade.

### Activation via contact

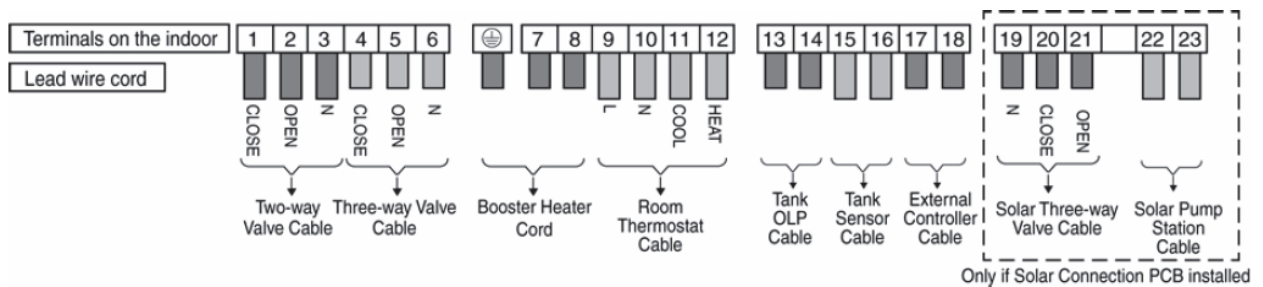


Fig. 2.16: External connections at a Panasonic Aquarea heat pump

The HPM controller can send a heat demand to the heat pump via an activation (release) signal. A heat demand will cause the contact to close. The heat pump then provides a flow temperature generated from its own internal heating curve (which is stored in the operating unit of the heat pump). The HPM controller cannot make any adjustments to this flow temperature via the contact signal. In systems with domestic hot water control, the loading process of the domestic hot water tank is not controlled by the HPM controller but by the internal control strategy of the heat pump.

Depending on the desired system (heat production for domestic hot water + heating, or heating only), the activation signal of the HPM must be connected to the following external connections of the heat pump:

**For heating and DHW:** Function “Room thermostat” – Terminal 9 + 12

**For heating only:** Function “External control signal/remote switch” – Terminal 17+18

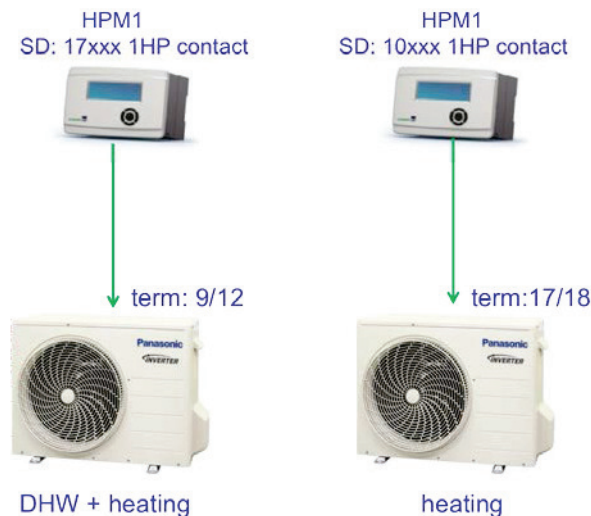


Fig. 2.17: Heat pump activation via contact

In systems for heating and domestic hot water production with only one heat pump, as well as in cascade systems in which HP1 is taking care of heating and DHW, the function “**Room thermostat**” (terminals 9 and 12) must be used. In this case, the heat pump can decide when the DHW tank should be loaded using its own domestic hot water management (controlling the switch-over valve and calculating the needed flow temperature).

The function “**External control signal / remote switch**” (terminals 17 and 18) is always used when the heat pump is used only to produce heat for heating. In this case, or if the heat pump is in a cascade system with other heat pumps (HP2 and HP3), the heat pump is not responsible for loading a DHW tank.

In a system where the heat pump is controlled via contact, system diagrams that include domestic hot water circuits cannot be loaded into the HPM controller since the controller has no way to control loading of a DHW tank. As a result, it is not possible to visualize the current temperature in the DHW tank or to change setpoints for the DHW temperatures in the web graphic of the HPM controller.

## Communication port

The full functionality of the HPM controller can only be used if the heat pump is connected to the controller via the communication port. In this operating mode, the HPM controller serves as a substitute for the operating unit in the heat pump. The adapter cable has to be connected to the main PCB inside the heat pump instead of to the operating unit. All basic configurations for initial startup of the heat pump must be performed via the menu of the HPM controller.

During communication between the HPM controller and the heat pump, the HPM controller transfers the calculated flow temperature setpoint to the heat pump. The heat pump controls its own actuators (pump, compressor, fan, electric heating) to provide the desired temperature at the heat pump’s flow outlet.

If needed, the HPM switches the operating mode of the heat pump to “tank” (DHW tank loading) and provides the desired flow temperature. The switch-over valve is controlled by the heat pump.

Depending on the type of heat pump, it can also be switched to cooling operation. The flow temperature setpoint and the criteria for switching to cooling operation can be adjusted in the menu for the heating circuits in the HPM controller.

The following pictures display the connection of the operating unit on the main PCB to which the adapter cable must be connected.

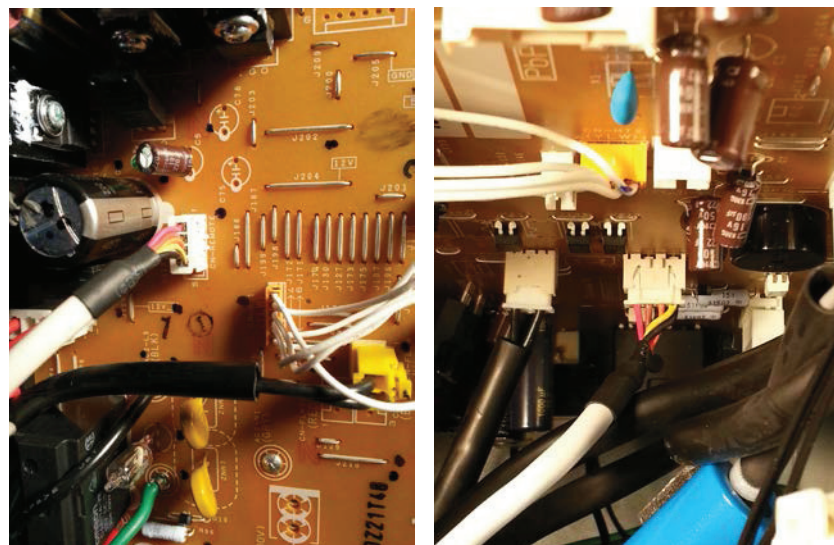


Fig. 2.18: Split: above - left - pos. of connection - MONO: middle - right



In split- or MONO-block heat pumps, the connectors for the adapter cable are in different places on the main PCB. On the main PCB, the connectors are labelled with “CN-REMOTE” for a split-heat pump and “CN-REMOTE2” for a MONO-block heat pump. When replacing the cables, the power to the heat pump and the controller must be switched off.

When the basic parameters in the HPM have been adjusted, the other end of the adapter cable must be connected to the BUS interface of the HPM. The heat pump will emit a beep if the connection was successful.

As an accessory there are 2 different adapter cables available for the connection between HPM and the heat pump. They have been developed especially for the communication with Panasonic split- and MONO-block heat pumps and only work in the right combination.

PAW-HPMINT-U	for all Split- heat pumps	3m long
PAW-HPMINT-M	for all MONO- block- heat pumps	30m long

### Cascade via contact activation

Controlling the heat pump(s) via a contact signal permits control of up to 3 heat pumps in a cascade. This requires using the right external connections for the heat pump. Depending on the system in question, either terminal 9/12 or terminal 17/18 must be used.

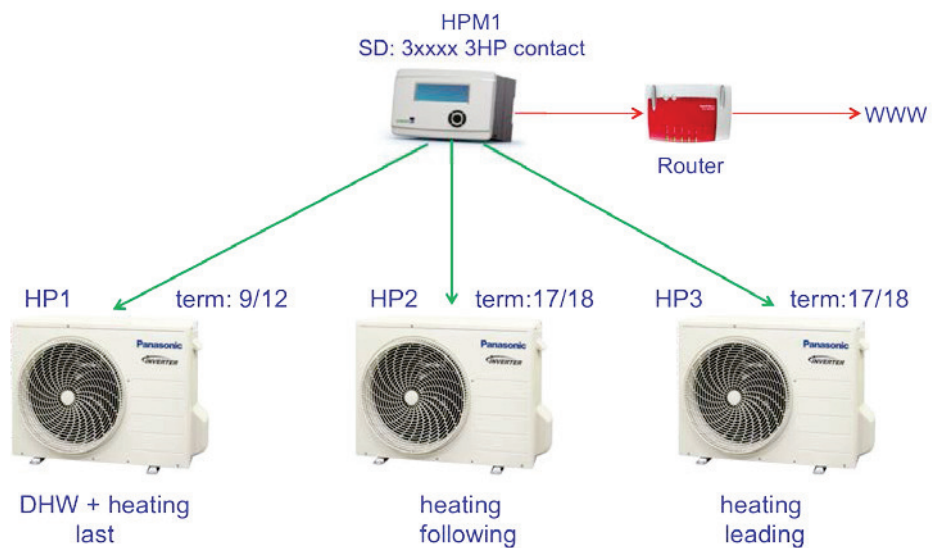


Fig. 2.19: A cascade system using release via contact

## Cascade via communication

Systems in which more than one heat pump is controlled via the communications port require both additional HPM(2) controllers as well as the proper adapter cable for the additional second and third heat pumps. The HPM controllers must be connected via an Ethernet/LAN switch (see figure, below). When loading the appropriate system diagrams, the functions will be automatically adapted in each controller and fixed IP-addresses will be issued.

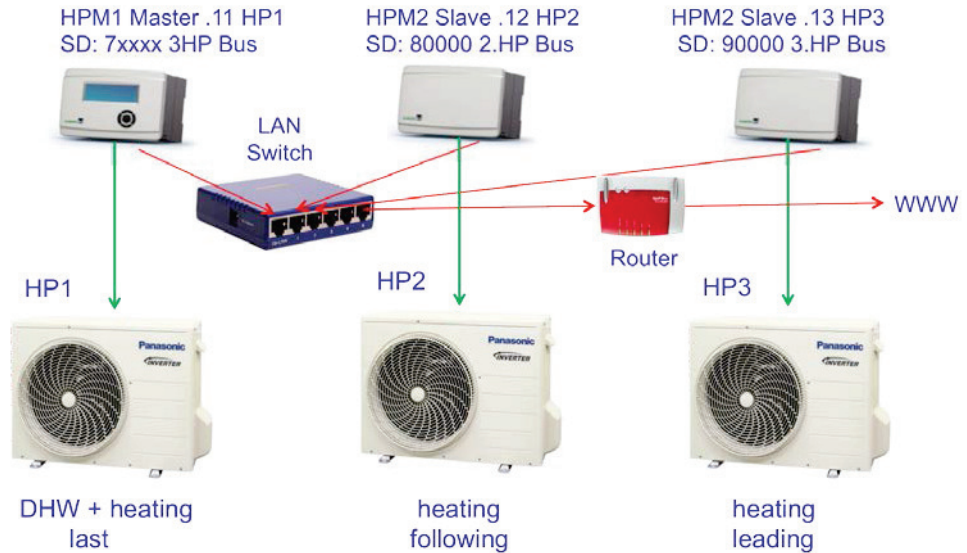


Fig. 2.20: cascade system with communication via BUS

	System diagram	IP after loading the diagram
HPM1 master controller HP1	6xxxx = 2WP 7xxxx = 3WP	192.168.178.11 (as default setting)
HPM2 slave controller HP2	80000	192.168.178.12
HPM2 slave controller HP3	90000	192.168.178.13

Table 2.1: Diagram / IP address in cascade system

As the IP-address will be changed in the slave controllers, loading of the system diagram should take place before the controller is connected to the LAN switch.

# Chapter 3 Initial installation

## 3.1 Selecting a system diagram - HPM tool

HPM tool is a web-based software accessible via the address [www.hpmtool.eu](http://www.hpmtool.eu) by using a standard Internet browser

HPM tool permits quick and easy selection of the right system diagram for your heating system.

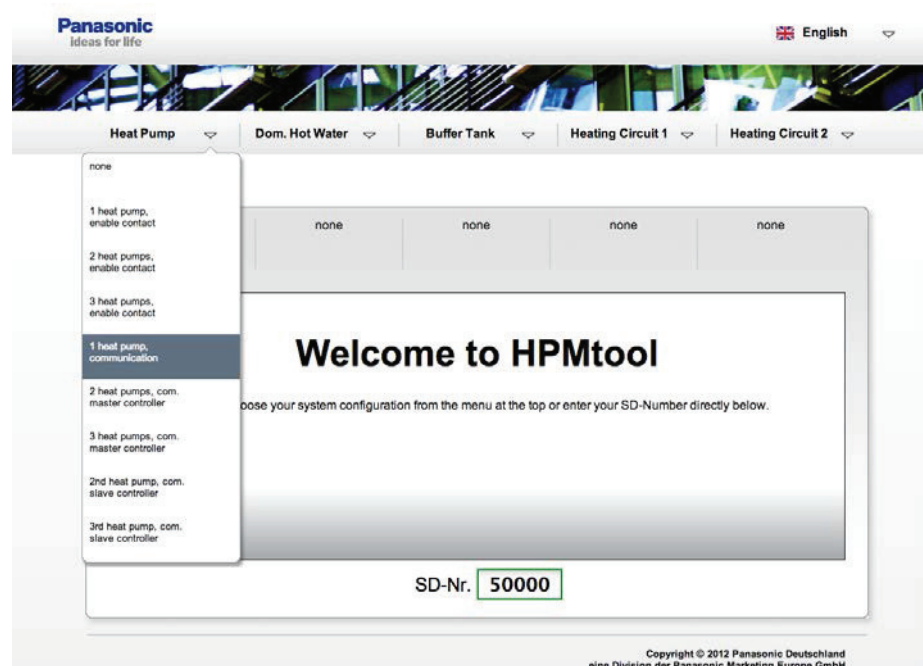


Fig. 3.1: Selection of the heat producer – heat pump(s)

It is necessary to select the corresponding modules for the main parts of the system (heat producer – heat pump(s), domestic hot water, heating circuit 1+2). The selected modules are combined into a system diagram. HPM tool then generates a system diagram number, which has to be entered into the HPM during the startup phase.

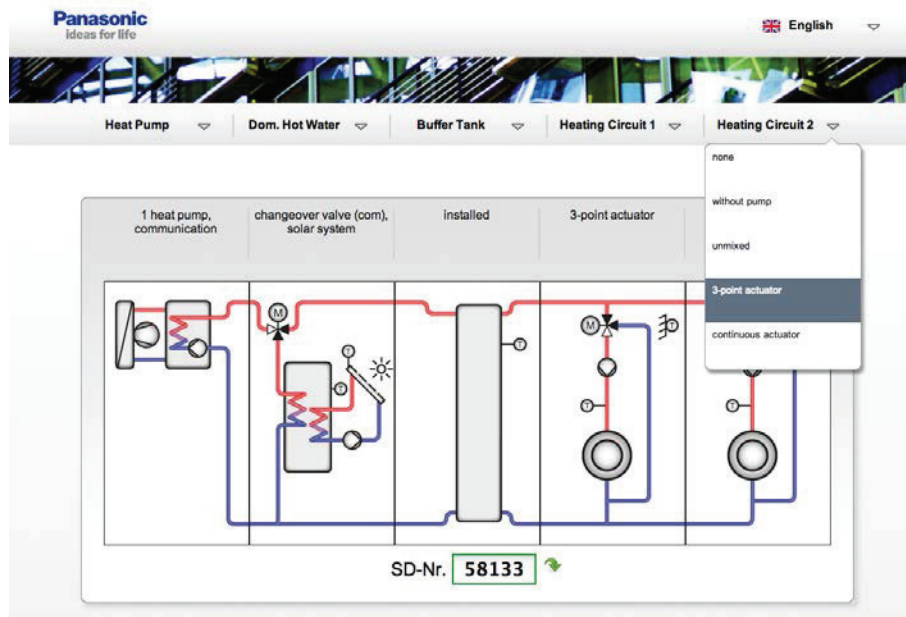


Fig. 3.2: Selecting heating circuit 2 – the system structure is now completed

If a selected system diagram is available, this is shown by a symbol located to the right of the number:



Fig. 3.3: System diagram NOT available

System diagram available

If the desired system diagram is not available, simply choose the closest available solution and then make the needed adjustments manually during initial installation in order to adjust the controller to your heating system.

When selection is finished, HPM tool will offer the option to print or download the proper documentation in PDF or Excel-format.



Fig. 3.4: Options for exporting the documentation

The documentation includes the graphical presentation of the system diagram, the corresponding system diagram number and the designation of the input and output terminals.

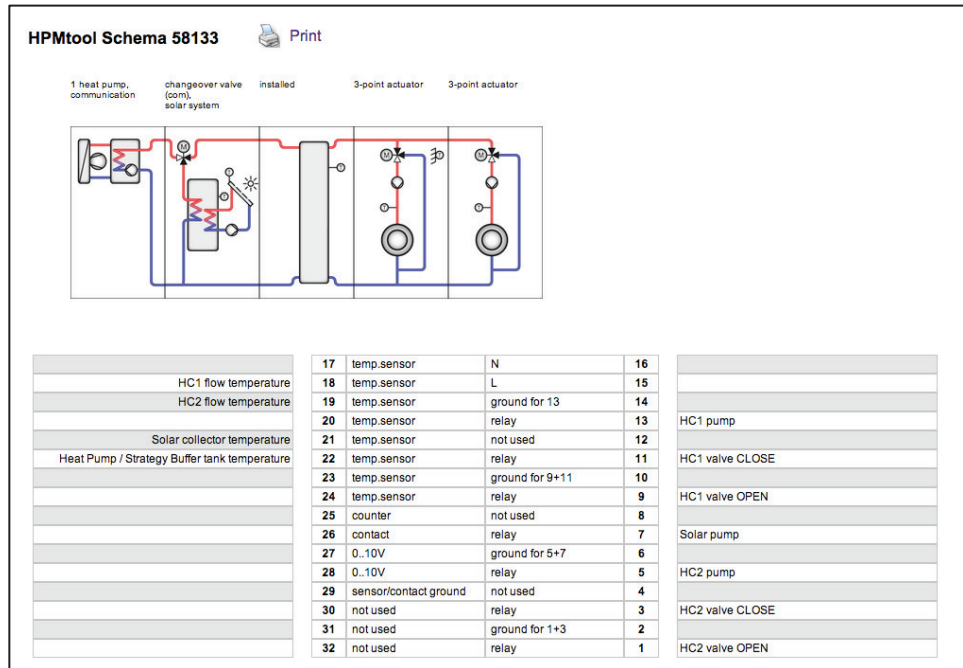


Fig. 3.5: Print preview

When entering the system diagram number (e.g. “58133” in the above example) into the HPM during its initial start-up phase, the controller will automatically configure its input and output terminals and parameters in accordance with the documentation offered by the HPM tool.

The appendix of this manual contains a selection of the most frequently used system diagrams (in case no Internet connection is available).

The graphical display of the web server integrated in the HPM unit is automatically adjusted to the selected system diagram. The overview picture in the web server corresponds to that of the selected diagram in HPM tool.

## 3.2 Loading the system diagram

When the system diagram is being loaded, the HPM will perform an automatic configuration of its parameters according to the selected system diagram:

- All input and output terminals will be assigned and configured according to the system diagram.
- All important functions are activated and their parameters are adjusted.

**Afterwards, the controller is ready to operate!**

**NOTE: The operating mode switches in the HPM and in the heat pump will be put in the “OFF” position. These have to be moved into the “AUTO” position for the system to start working.**

Naturally, the automatically generated parameter configuration may later be manually adjusted or changed. This means it is also possible to control systems which are not entirely covered by the pre-configured system diagrams. Upon delivery of the controller, there is normally no system diagram assigned and the control programs are inactive.



**CAUTION:**

**When the system diagram is being loaded, the power supply should not be disconnected. Doing so will cause the configuration not to finish completely, in which case the automatic configuration must be performed again (see chapter “Manual configuration“).**

### 3.2.1 Initial loading of the system diagram

If the HPM controller notices that no system diagram has been loaded, the user is automatically asked to select a language and to enter the system diagram number.

1. Switch the controller on and follow the steps shown in the display.
2. The controller will ask what language should be shown in the display. The default language is "German". If this language is wanted, simply press "OK". Otherwise, use "+" and "-" to select a language and press "OK" to select it. Changing the language is possible any time in the menu "global / service / software"
3. The message "Please configure all system data, then load diagram with coldstart=1 [OK]" will be displayed. Press "OK".
4. The display will now jump automatically into the menu "system diagram".
5. Change the **sysDiagram** parameter to your selected system diagram number using "+", "-" and "OK".
6. Press "DOWN" to select the parameter **type sensor**. Changing the default setting ("0") is only necessary if a foreign sensor (1=Ni1000, 2=NI1000LG) will be used. Choose the desired sensor type for the system by using "+", "-" and "OK".
7. When selecting a system diagram which includes communication with the heat pump(s) (4xxxx; 5xxxx, 6xxxx, 7xxxx), the type(s) of heat pumps must be entered in the parameters **type-HP1**, **type-HP2** and **type-HP3**. Here, the identification "-1" (according to the type label on the heat pump) must be entered (e.g. "SXC12D90E8-1"). "+", "-" and "OK" enables adjusting each character in the line.
8. If the type entered is not accepted when pressing "OK", then communication with a heat pump of this type is not possible. An overview of all compatible heat pumps is contained in the appendix.
9. Use "DOWN" to select the parameter **cold start**. Change the parameter to "1" by using "+". Press "OK".
10. When the display shows "SYSTEM XXXXX LOADED", you are done. The controller is now ready for operation.



**CAUTION:**

**When performing a cold start, all previously performed adjustments are lost and all parameters are reset to their default values!**

### 3.2.2 Reloading the system diagram

The system diagram can be reloaded at any time, e.g. if the automatic configuration was incomplete due to a power failure or if you want to select a different system diagram. The following steps must then be performed:

1. Press and hold “OK” until the controller asks for an access code. Using “+”, “-“ and “OK”, enter the access code “4444”.
2. Press “OK” and the controller will switch to the “MCR/BMS” menu. Pressing “UP” will navigate to the main menu.
3. Using “DOWN”, select the “System diagram“ menu item. Press “OK” to enter the “System diagram” menu.
4. Change the parameter **sysDiagram** to your selected system diagram number by using “+”, “-“ and “OK”.
5. Press “DOWN“ to select the parameter **type sensor**. Changing the default setting (“0”) is only necessary if a foreign sensor (1=Ni1000, 2=NI1000LG) will be used. Choose the desired sensor type for the system by using “+”, “-“ and “OK”.
6. When selecting a system diagram which includes communication with the heat pump(s) (4xxxx; 5xxxx, 6xxxx, 7xxxx), the type(s) of heat pumps must be entered in the parameters **type-HP1**, **type-HP2** and **type-HP3**. Here, the identification “-1” (according to the type label on the heat pump) must be entered (e.g. “SXC12D90E8-1”). “+”, “-“ and “OK” enables adjusting each character in the line.
7. If the type entered is not accepted when pressing “OK”, then communication with a heat pump of this type is not possible. An overview of all compatible heat pumps is contained in the appendix.
8. Use “DOWN” to select the parameter **cold start**. Change the parameter to “1” by using “+”. Press “OK”.
9. When the display shows “SYSTEM XXXXX LOADED”, the process is complete. The controller is now ready for operation.



#### CAUTION!

**When performing a cold start, all previously performed adjustments are lost and all parameters are reset to their default values!**

### 3.2.3 Manual configuration (loading of diagram “99999”)

If the HPM tool is not offering a system diagram number that fits the current system, the system diagram “99999” can be selected and the entire controller then configured manually.

After setting the type of heat pump to “1= release via contact” or to the actual product type (e.g. “SXC12D90E8-1”) or to “” (no type) = HP not existing“, the selection for the other control circuits (buffer tank, DHW circuit and heating circuits) should also be set to a value (0,1,2). When performing a cold start, the controller will be freshly initialized.

After the cold start, all input and output terminals of the control circuits must be assigned according to the system specifications.

The following steps must be performed for a manual configuration:

1. Press and hold “OK” until the controller asks for an access code. Using “+”, “-“ and “OK”, enter the access code “4444”.
2. Press “OK” and the controller will switch to the “MCR/BMS” menu. Pressing “UP” will navigate to the main menu.
3. Using “DOWN”, select the “System diagram“ menu item. Press “OK” to enter the “System diagram” menu.
4. Change the parameter **sysDiagram** to “99999” using “+”, “-“ and “OK”.
5. Press “DOWN“ to select the parameter **type sensor**. Changing the default setting (“0”) is only necessary if a foreign sensor (1=Ni1000, 2=NI1000LG) will be used. Choose the desired sensor type for the system by using “+”, “-“ and “OK”.
6. To select the number of heat pumps, and whether the connection between heat pump and controller is via contact switch or communication port, the following **type-HPx** parameters must be configured as follows:
  - If the connection between HPM and the heat pump is via contact switch, **type-HPx=1** must be set.
  - If the connection between HPM and the heat pump is via communication port, the appropriate type must be entered into parameters **type-HP1**, **type-HP2** and **type-HP3**. Here the identification “-1” (according to the type label on the heat pump) must be included (e.g. “SXC12D90E8-1”).

If no change is performed to the parameters **type-HPx**, a heat pump program will not be included into the structure.

  - The buttons “+”, “-“ and “OK” enables adjusting each character in the line. If the type entered is not accepted when pressing “OK”, then communication with a heat pump of this type is not possible. An overview of all compatible heat pumps is contained in the appendix.

Adjustments must now be made to the other control circuits:

7. Use “DOWN” to select the parameter **buffer**. Adjust the parameter to suit system needs (0=no buffer tank included, 1=buffer tank included).
8. Use “DOWN” to select the parameter **numDHW**. Adjust the parameter to suit system needs (0=no DHW circuit included, 1=DHW circuit included)
9. Use “DOWN” to select the parameter **numHC**. Adjust the parameter to suit system needs (0=no heating circuit included, 1=one heating circuit included, 2=two heating circuits included)
10. Use “DOWN” to select the parameter **cold start**. Change the parameter to “1” by using “+”. Press “OK”.
11. When the display shows “SYSTEM 99999 LOADED”, the process is complete. The controller has been structured.
12. When conducting this kind of initial installation, it is important to remember that the assignment of input and output terminals and the adjustment of the control circuits must be performed manually.



#### CAUTION!

**When performing a cold start, all previously performed adjustments are lost and all parameters are reset to their default values!**



When the configuration is performed, it can be saved to memory. To do so, the controller must be connected to a PC or notebook and the appropriate software must be used (e.g. **gpm-read**...reading parameter settings, **hpm-write**...writing parameter settings back into the controller, **hpm-control**...remote control via PC)

## 3.3 Additional adjustments

After the system diagram is loaded, additional adjustments can be made. These adjustments concern necessary adjustments like the adaption of the communication port to the settings in the heat pump(s) (basic configuration) and the parameters to adapt the controller to the heating system (heating curve, setpoints, temperature limitations)

The following chapters will explain the menu structure of the HPM controller and the release via the access code.

### 3.3.1 The menu structure

From the default display, the menu can be reached by pressing the “OK” key. The menu structure is entered via the menu “**MCR-BMS**” (standing for “Measuring, Controlling, Regulation – Building Management System”). Here, all modules are listed. From here, simply select the module in which it is desirable to look at or change a parameter.

The sections “**Global**”, “**Interfaces**”, “**Configuration**”, “**System diagram**” and “**System overview**” are intended primarily for technical personnel. All parameters in these sections should be handled with care.

The menu utilises the following structure:

Configuration level	Module library level	
Global		
MCR-BMS → Press “OK“ →	Timer	
	Heat producer	Heat pump 1
		Heat pump 2
		Heat pump 3
		Strategy circuit
	Buffer tank	
	Domestic hot water circuit	
	Heating circuits	Heating circuit 1
		Heating circuit 2
	Trend	Trend 1
		...
		Trend 2
Interfaces		
Configuration		
System Diagram		
System Overview → Press “-“ →	Overview of each controller and module	

Table 1: The Menu Structure

The shaded menus can be used by any user of the system. The other menus should be accessed only by technical personnel. They can only be accessed, after the code for the access level 4 has been entered (finished by pressing “OK”) and by moving out of the menu “MCR-BMS” with the “UP” key.

Every module (except for the timer) uses the following structure:

Module library level	Parameter level
E.g. district heating circuit	Current values
	Setpoints
	Additional functions
	Status
	Manual operation
	Service functions

Table 3.2: menu structure in a library module

The appendix contains a detailed description of the menu structure of the HPM controller.

### 3.3.2 Access codes

If no access code has been entered, the controller will display only a limited amount of information (parameters).

To display more information or to make adjustments, it is necessary to first enter an access code:

1. If the default display is not currently shown, press "UP" until it is.
2. Press and hold "OK". You will be asked to enter the access code digit by digit.
3. Use "-" and "+" to select the digit.
4. Press "OK" to enter the digit. The display will automatically jump to the next digit.
5. When the access code has been correctly entered, it will be shown by the controller in the display.

There are 5 different access levels:

Access Level	Area of access	Default Access Code
Base Level	Look at all parameters in the MCS-BMS menu	No code needed
Level 1	Changes in setpoints, timer, system clock	1111
Level 2	Changes in additional functions, manual operation	2222
Level 3	Changes in service functions	3333
Level 4	Changes in global menu, access codes, etc.	4444

Table 3.3: Access codes

The access codes can be adjusted in the menu "Global – service – access code".

### 3.3.3 Aquarea basic configuration (only needed for connection via Bus)

The HPM controller serves as a substitute for the Aquarea operating unit. Therefore, all parameter adjustments needed for initial installation of the heat pump must be performed via the menu structure of the HPM. This includes necessary basic configuration and parameters as these are described in the operating and service manuals of the Panasonic heat pump(s).

To do this, press “OK” in the default menu and open the “MCR/BMS” menu. Select the item “**heat producer**” using “DOWN” and enter the menu using “OK”. Depending on the system diagram loaded (one or more heat pumps) the menu structure of the heat pump module will either be automatically displayed, or it will be necessary to select heat pump 1-3 by using “UP”, “DOWN” and “OK”.

- In the menu for the heat pump, select the menu “**function**” using “DOWN” and “OK”.
- In the “**function**” menu, select the menu item “**Aquarea**” using “DOWN” and “OK”.
- In the “**Aquarea**” menu, select the menu “**settings**” using “DOWN” and “OK”.

This menu contains the most important parameters, displayed in the table below with their default values. Some of the parameters will already have been automatically adjusted when the system diagram was selected (e.g. DHW tank included or not):

Name	Info text	Range / default value
Thermos	Room thermostat	0:no, 1:yes
Tank	Tank Connection	0:no, 1:yes
SolarPrio	Solar Priority	0:no, 1:yes
HeatPrio	Heating Priority	0:no, 1:yes
Steril.	Sterilization	0:no, 1:yes
basPanH	bas pan heater	0:no, 1:yes
CoolPrio	Cooling Priority	0:no, 1:yes
AntiFr	Antifreezing	0:no, 1:yes
OpInt	Operation Interval	range: 30-600 min, default: 180 min
TankInt	Tank heat Interval	range: 5-95 min, default: 30 min
BoostDel	Booster Delay	range: 20-95 min, default: 60 min
SterTemp	Sterilisation boiling temperature	range: 40-75 °C, default: 70 °C
SterTime	Sterilization continuing time	range: 5-60 min, default: 10 min
HeaterC	Heater Capacity	range: 0, 3, 6 ,9 KW, default: 0 kW
OutTOon	Outdoor temp heater on	range: -15-20 °C, default: 0 °C

Table 3.4: Aquarea setting parameters

After adjusting the parameters, the power supply for the heat pump must be switched off in order to connect the adapter cable PAW-HPINT-x to the main PCB inside the heat pump (instead of the cable coming from the operating unit) The other side of the adapter cable must be connected to the BUS interface of the HPM controller. The heat pump will emit a beep if the connection was successful.

### 3.3.4 Domestic hot water – Setpoints

If setpoints differing from the basic values (45°C) should exist for the domestic hot water tank, these can be adjusted. Different values for occupation times 1...4 can be selected, as well as non-occupation time and special non-occupation time (holiday).

To reach the menu for making these adjustments starting from the default display, press “OK” and select “**domestic hot water (DHW)**” using “DOWN”. Enter the menu using “OK” and then select “**setpoints**” and press “OK”. This menu contains all parameters required for the occupation (SP-OTx) and non-occupation times.

### 3.3.5 Heating Circuits – Setpoints, heating curve, setpoint limitation

After loading the system diagram, the HPM will automatically configure the parameters in the heating circuit for weather-dependent flow temperature calculation for underfloor heating systems. Therefore, a flat **heating curve** has been chosen (Slope: **hCu-slope** = 0.5), along with a small **exponent** (radiator exponent: **hCu-exp** = 1.10) and a comfortable **base point** (**basepOTx** = 22°C). These parameters can be found in the menu “heating circuits / heating circuit x / setpoints”.

To reach the menu in order to make adjustments, press “OK” (starting from the default display) select “**heating circuits**” with “DOWN” and enter the menu using “OK”. In the next menu, the heating circuit will likely have to be selected. Select “**setpoints**” with “DOWN” and enter the menu using “OK”. This menu contains all parameters needed for the heating curve.

For alternative heating systems, the following adjustments must be made:

Heating system	Heating curve slope	Radiator exponent
underfloor heating (up to 35°C)	0.2 (flow 29°C for outd.temp -10°C) 0.3 (flow 32°C for outd.temp -10°C) 0.4 (flow 35°C for outd.temp -10°C)	1.10
low temperature radiators (up to 45°C)	0.5 (flow 38°C for outd.temp -10°C) 0.6 (flow 41°C for outd.temp -10°C) 0.7 (flow 44°C for outd.temp -10°C)	1.20
radiators and plate radiators (up to 55°C)	0.8 (flow 48°C for outd.temp -10°C) 0.9 (flow 51°C for outd.temp -10°C) 1.0 (flow 55°C for outd.temp -10°C)	1.20 – 1.40 DIN: 1.33
convectors (up to 65°C)	1.1 (flow 58°C for outd.temp -10°C) 1.2 (flow 61°C for outd.temp -10°C) 1.3 (flow 65°C for outd.temp -10°C)	1.40 – 1.66

Table 3.3: Overview heating systems / heating curve

When selecting a heating curve >0.5, the function “**summer shutdown**” will be automatically set to type=2 (3-day caretaker). This means that the outdoor temperature has to be above the set threshold for 3 days in a row before the heating goes into “summer shutdown” mode. The same applies if the outdoor temperature falls below the switch-on threshold. The parameter “**type**” can be manually set to “1=comfort caretaker”, in the menu “**heating circuits / heating circuit x / functions / summer shutdown**”, if it is desirable that the summer shut-down should react immediately.

A graph of the most commonly used heating circuits is contained in the appendix of this manual.

Depending on the design of the heating system and the materials used in it, it might be necessary to set a setpoint limitation. This function ensures the flow temperature will not exceed a set maximum temperature (limitation), regardless of the selected heat curve. The parameters for this function can be activated and set in the menu “**heating circuits, heating circuit x / functions / setpoint limitation**”. The parameters “**maxFl**” and “**maxDemFl-T**” affect the setpoint limitation (maximum calculated flow temperature) and the demand limitation (maximum demanded flow temperature).

### 3.3.6 System – time and date

In the menu “**timers/timer service**”, the system clock of the HPM controller can be set. To set the clock, press “OK” starting from the default menu. Press “OK” again to enter the menu “**timers**”. Use “DOWN” to select “**timer service**” and enter this menu by pressing “OK”. This menu contains the menu items “**time**” and “**date**”.

In these menus the parameters “**curTime**” (current time) and “**curDate**” (current date) are available for selection and modification. The values can be adjusted using “+”, “-”, “.” and a new value entered with “OK”.

To ensure that the occupation times for domestic hot water and the heating circuits will function correctly, entering the correct values for the system clock is essential. If the system clock uses an incorrect value, wrong temperature reductions may occur during the night or during holidays.

### 3.3.7 Occupation times

Each consumer circuit (domestic hot water, heating circuit 1, heating circuit 2) and the “whisper (i.e. quiet) mode” of the heat pump (only usable when communicating via bus) has an assigned timer. After the system diagram has been loaded, all timers are set to the occupation time “mon-sun: 00:00 – 24:00 o'clock”. Using this setting, no temperature reduction will take place for the domestic hot water and heating circuits during the night. The heat pump will also not automatically switch to “whisper mode”.

If temperature reductions are to be used during the night, these settings can be changed in the menus “DHM”, “heatc.1”, “heatc.2”, “quiet”, after selecting the timer channel in the menu “timers / timer chan.select”. Up to 4 occupation times can be set per day, with an option to use occupation times for a group of days in the same week.

In the weekly timer programs, the beginning and end time of the occupation times are not permitted to overlap. Occupation times that exceed the end of a day must be programmed using 2 occupation times (numOT=2; 1:18-24 o'clock; 2:0-6 o'clock)

The annual programs for the timers permit setting special non-occupation times (max. 15) and special occupation times (max. 10). Depending on the date, it is possible to set operating times that differ from the normal non-occupation times (e.g. holiday in a private house) and normal occupation times (e.g. a normal weekday in a school). For annually recurring special days, the year may be set to “--” (e.g. 01.01.--).

The timer menu is opened by pressing “OK” twice before the display shows the default display. Use “DOWN” to select the channel selection “timer chan.selec.” and press “OK”. Select the desired timer using “DOWN” and press “OK” to enter. From here, the menu items “weekly program”, “special non-occupation time” or “special occupation time”, can be selected as desired, containing the aforementioned parameters.

### 3.3.8 Operating mode switch

The operating mode switch for the controller and heat pump are set to the “OFF”-position after the system diagram has been loaded. In this position, no temperature setpoints are calculated and no control outputs activated. To place the system into automatic operation, the operating mode switches for the controller and the heat pump must be set to “AUTO”. The switches can be located by pressing “+” while in the default display. Select the required operating mode switch using “DOWN”. Use “+” or “-“ to set the switch to the desired position and press “OK”.

### 3.3.9 Testing the functionality

Testing the connected sensors and the correct functionality of the outputs is an important step during initial installation.

#### Sensors

The value measured at each connected sensor can be seen in the menu “Current value” in each module. If a sensor is missing, or if its cable has broken or suffered a short, it will be shown in the default display (e.g. as the error message: “TI-input, trouble indication Term: xx”). The “status” menu of each module will detail which error was recognized on which sensor (e.g.: outdoor sensor too high – cable broken, outdoor sensor too low – short in cable or in the sensor).

What to do:

- Solve any eventual wiring problems.
- Measure the signal/resistance of the disconnected sensor. If necessary, replace the sensor. A table of sensor measuring values is contained in the appendix of this manual.
- Sensors which have been assigned by loading the system diagram, but which are not needed or not connected, must be deleted in the menu “System – terminal assignment” in the associated module.

#### Outputs

To check the functionality of the connected valves and pumps, the following steps must be followed:

1. Set the operating mode switch to “manual”.
2. The menu “manual” of each module permits manual control of the connected component. Parameter value “3” sets the pumps and the 3-point actuators to “automatic”. “101” will do the same for actuators with continuous control (0...10 V).
3. Changing the parameter to “0” will cause the HPM controller to issue a “CLOSE” signal to 3-point actuators, an “OFF” signal to pumps and a 0% control signal to actuators with continuous (0...10 V) control.
4. Changing the parameter to “1” will cause the HPM controller to issue an “OPEN” signal to 3-point actuators and an “ON” signal to 2-point-controlled components. Entering a value between 0...10 enables testing of the complete continuous control signal (0...10 V).
5. After all testing has been performed, all values must be reset to their original state and the operating mode switch set back to “AUTO”.

### 3.3.10 Screed drying

The “screed drying” function enables the initiation of a special heating-up program for a composition floor layer. Depending on the screed material used and its composition, it is possible to adjust the parameters for starting time and heat-up, holding and cool-down steps, before the function is activated.

The HPM controller offers the “screed drying” function only if a flow temperature sensor is assigned to the heating circuit, or if the system diagram “50090” (heat pump with communication + HC1: unmixed without a pump) has been loaded. After this system diagram has been loaded, the “screed drying” function will appear in the display automatically. If a different system diagram was loaded, or if it is desirable to start the function from normal operation, the following steps must be performed:

Press “OK” in the default display. Select “heating circuits” using “DOWN” and enter the menu by pressing “OK” (in system diagrams using more than one heating circuit, select heating circuit x and enter by pressing “OK”). Select “functions” using “DOWN” and press “OK” to enter the menu. The following parameters will be displayed:

Name	Info text	Range / default values
active	activate the function	0 - 1; default: 0
InitTemp	initial temperature	2 - 50 °C; default: 25 °C
dwelInitTime	dwel time initial temperature	0 - 10 days; default: 1 day
rateTmp+	rate of heat-up	1 - 50 K per day; default: 5 K per day
rateTmp-	rate of cool-down	1 - 50 K per day; default: 5 K per day
maxTemp	maximum temperature	2 - 65 °C; default: 45 °C
dwelMaxTemp	dwel time maximum temperature	0 - 10 days; default: 3 days

Table 3.4: Parameters to adjust and activate

When screed drying is active, the flow temperature setpoint of the current step is controlled through control of the valve in the heating circuit and demand to the heat pump, respectively.

If the difference between the setpoint and current value exceed a certain limit for a given time, an error message is generated. The reaction to a power failure will consist of a step being repeated, or of the function being started again or cancelled. The monitoring to be used can be set using the additional parameters in this menu.

In the “status” menu of the heating circuit, and in the menu “service / screed drying”, it is possible to view further information about the current step when the function is activated (e.g.: Setpoint temperature 35°C, step status: heating-up).

At the end of the screed drying function, the operating mode of the heating circuit switches to weather-dependent setpoint calculation if an outdoor sensor is assigned. If system diagram “50090” was chosen, no outdoor sensor is assigned and the heating circuit goes into the operating mode “not active/OFF” (no demand to heat pump).

Additional functions can be found in Part II of the manual; “Parameter description”.

# Chapter 4 Appendix

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## 4.1 The displaying of error messages

HPM recognises a number of trouble indications and errors. You will see them when the error message alternates with the default display. The following short text can be seen:

<b>FP-system</b>	Frost protection for the system, flow temperature below frost limit
<b>FP-stor</b>	Frost protection for storage tank, storage tank temperature below frost limit
<b>BP-frRoom</b>	Building protection, room temperature below frost limit
<b>BP-heRoom</b>	Building protection, room temperature above heat limit
<b>uLiColl</b>	Solar collector above upper limit
<b>uLiStor</b>	Storage tank temperature above upper limit
<b>uLiFlow</b>	Flow temperature above upper limit
<b>TI-system</b>	Trouble indication, system: error message input active
<b>TI-input</b>	Trouble indication input (short or broken cable)
<b>thermDes</b>	Thermal disinfection could not be finished
<b>Xw-loadFl</b>	Loading flow temperature difference between current value and setpoint is above max. control deviation
<b>Xw-room</b>	Loading flow temperature difference between current value and setpoint is above max. control deviation
<b>Xw-buffer</b>	Storage tank temperature difference between current value and setpoint is above max. control deviation
<b>Xw-bufferVL</b>	Storage tank flow temperature difference between current value and setpoint is above max. control deviation
<b>Xw-flow</b>	Flow temperature difference between current value and setpoint is above max. control deviation
<b>Xw-contr</b>	Temperature difference of control sensor between current value and setpoint is above max. control deviation

These error messages do not have to be acknowledged; the error message will disappear automatically as soon as the problem has been solved.

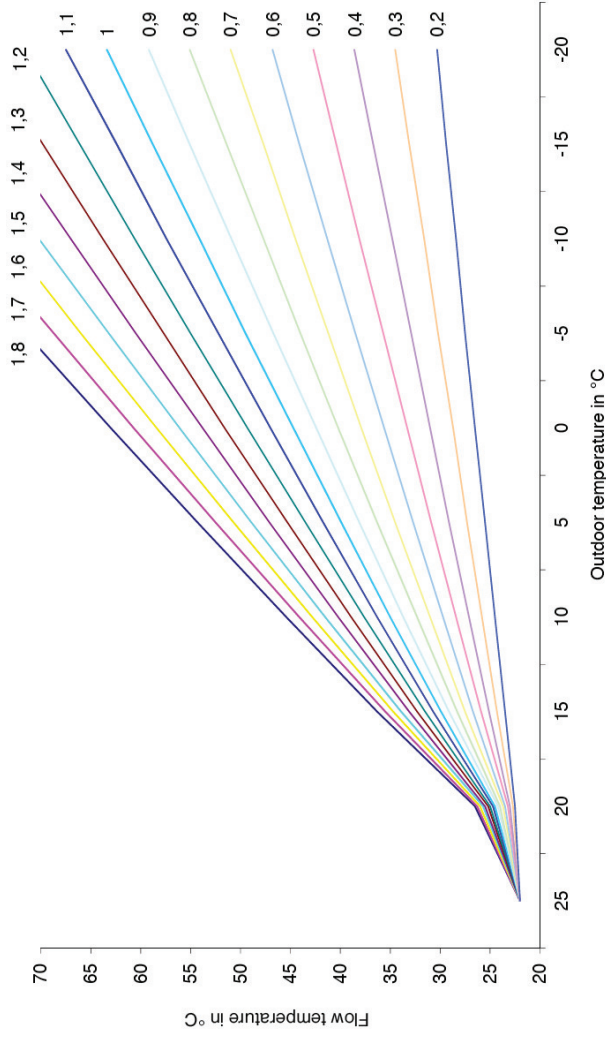
Furthermore, the error code sent to the HPM when it is connected via Bus will be shown in the display of the controller. Some of these errors must be acknowledged. A list of all possible error messages of the heat pump are described in the operating and service manual of the pump.





## 4.2 Heating curves

The heating curve (slope), the radiator exponent (exponent) and the base point (parallel gliding) can be used to adapt the weather-dependent calculation of the flow temperature setpoint in the menu “heating circuits / heating circuit x / setpoints”. The values in the table, representing the heating curves, can be found in the HPM controller in the menu “heating circuits / heating circuit x / service / HCU Adaption”. This menu contains the correlation between flow- and outdoor temperature in steps of 5°C.



Flow temp. in °C	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2
25	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
20	26.5	26.3	26	25.7	25.5	25.2	25	24.7	24.5	24.2	24	23.7	23.5	23.2	23	22.7	22.5
15	36.3	35.5	34.7	33.9	33.1	32.3	31.5	30.7	29.9	29.1	28.3	27.5	26.7	25.9	25.1	24.3	23.5
10	45.4	44.1	42.8	41.5	40.2	38.9	37.6	36.3	35	33.7	32.3	31	29.7	28.4	27.1	25.8	24.5
5	54.3	52.5	50.7	48.9	47.1	45.3	43.5	41.7	39.9	38.1	36.3	34.5	32.7	30.9	29.1	27.3	25.5
0	63	60.7	58.4	56.1	53.8	51.6	49.3	47	44.7	42.4	40.2	37.9	35.6	33.3	31	28.7	26.5
-5	71.5	68.7	66	63.2	60.5	57.7	55	52.2	49.5	46.7	44	41.2	38.5	35.7	32.9	30.2	27.5
-10	79.9	76.7	73.4	70.2	67	63.8	60.6	57.4	54.1	50.9	47.7	44.5	41.3	38.1	34.8	31.6	28.4
-15	88.2	84.5	80.8	77.1	73.5	69.8	66.1	62.4	58.8	55.1	51.4	47.7	44.1	40.4	36.7	33.1	29.4
-20	96.4	92.2	88.1	84	79.9	75.7	71.6	67.5	63.4	59.2	55.1	51	46.8	42.7	38.6	34.5	30.3

hCu-exp (radiator-exponent) - bending = 1,10 (for underfloor heating)  
basepOT1 (setpoint OT1) - basepoint of the heating curve = 22°C

## 4.3 Table of measuring values of the sensors

The HPM controller primarily works with standard PT1000 resistor sensors. In order to test the sensor, both wires of the connection cable must be disconnected from the HPM controller, after which a temperature-dependent resistor value can then be measured with a multimeter. The measured value must correspond with the raw value of the terminal to which the sensor will be connected again. The raw value can be found in the menu “configuration / inputs / term.xx”. To reach the configuration menu, it is necessary to enter the highest access code for service technicians.

Temp. (°C)	Raw value (kOhm)	Temp. (°C)	Raw value (kOhm)	Temp. (°C)	Raw value (kOhm)	Temp. (°C)	Raw value (kOhm)
-28	0.890	2	1.008	32	1.125	62	1.240
-26	0.898	4	1.016	34	1.132	64	1.248
-24	0.906	6	1.023	36	1.140	66	1.255
-22	0.914	8	1.031	38	1.148	68	1.263
-20	0.922	10	1.039	40	1.155	70	1.271
-18	0.929	12	1.047	42	1.163	72	1.278
-16	0.937	14	1.055	44	1.171	74	1.286
-14	0.945	16	1.062	46	1.179	76	1.294
-12	0.953	18	1.070	48	1.186	78	1.301
-10	0.961	20	1.078	50	1.194	80	1.309
-8	0.969	22	1.086	52	1.202	82	1.317
-6	0.976	24	1.093	54	1.209	84	1.324
-4	0.984	26	1.101	56	1.217	86	1.332
-2	0.992	28	1.109	58	1.225	88	1.340
0	1.000	30	1.117	60	1.232	90	1.347

## 4.4 Menu structure

<b>global</b>	signal				
	error				
<b>MCR-BMS</b>	service	hardware			
		software			
		cold- warm start			
		access codes			
		project management			
	system clock				
	structure	display			
		WEB			
	timers	timer curVal	timer chan.select.	"control circuit" DHW/HC1/HC2/quiet	week program special-non-occup. special-occup. priority
			timer status	"control circuit"	operating status 0=NO; 1=OT1; 2=OT2;
timer manual contr.		timer service	time date mode terminal ass.	"control circuit"	3=OT3; 4=OT4; 5-10 SNO; 11=AUTO
					current time current date su/wi - switch "control circuit"
heat source		heat pump x	(see following pages: menu structure of the module "heat pump circuit")		
		strategy circuit	(see following pages: menu structure of the module "strategy circuit")		
buffer tank		(see following pages: menu structure of the module "buffer tank")			
domHotWater		(see following pages: menu structure of the module "domestic hot water")			
heating circuits		heating circuit x	(see following pages: menu structure of the module "heating circuit")		
trend		trend "n"	current value		trend
	function			record controller	
	status				
	service			record terminal assignment	
				reference/delete	

<b>interfaces</b>	Ethernet external display heat pumps general char. values heat pump x
<b>configuration</b>	inputs outputs keys switch
<b>diagrams</b>	adjustment of system diagram and type of heat pump(s), initiate cold start
<b>system survey</b>	controller, heating circuit x, DHW, bufer tank, heat pump x

## Module “heat pump”

<b>heat pump</b>	<b>current values</b>	:	HPOutdoor HPOutletTemp HPInletTemp etc.
	setpoints	setpointHC	heating circuit heating/cooling
		setp.DHW	demand of domestic hot water
	functions	setpoint limitation boost maintenance signal external demand controller bivalenz <b>Aquarea</b>	<b>settings</b> service modus busstatus
	status	operating status, error status, SP-source, outputs, show help status, <b>Aquarea return signal(s) OP-..</b>	
	manual operation	HP release	0=OFF; 1=ON; 3=AUTO
		HP Bivalenz	0=OFF; 1=ON; 3=AUTO
	service	General values maintenance signal external demand bus status Amount of heat sensor correction terminal assignment	operating hours/ starts    heat. energy, COP correction value +/- 10K

## Module “strategy circuit”

strategy circuit	current value	flowHC flowDHW outdoor etc.	
	setpoints	SP-flowHC	heating circuit heating/cooling
		SP-flowDHW	demand of DHW
	function	leading	
		<b>following</b>	
		boost	
		signal	
		frost protection	
pump			
additional heat producer			
status	external demand		
	controller		
manual operation	setpoint limitation		
	pump/valve exercise		
service	operating status, error status, SP-source, outputs, show help status		
	0=OFF; 1=ON; 3=AUTO		
service	General values		
	0=OFF; 1=ON; 3=AUTO		
	leading		
	<b>releaseHC</b>		
	<b>releaseDHW</b>		
	signal		
	pump		
	additional heat producer		
	external demand		
	sensor correction	correction value +/- 10K	
terminal assignment			

## Module “buffer tank”

<b>buffer tank</b>	current value	:	
		tank	
		solar	
		additional heat producer	
		etc.	
	setpoints	SP-zone1	Setpoint heating/cooling
		<b>boostzZ1</b>	boost until switch-off limit.
function	boost		
	external demand		
	signal		
	buffer tank		
	additional heat producer		
	solar		
status	operating status, error status, SP-source, outputs, show help status		
manual operation	additional heat producer	0=OFF; 1=ON; 3=AUTO	
	solar pump	0=OFF; 1=ON; 3=AUTO	
	etc.		
service	General values		
	external demand		
	sensor correction	correction value +/- 10K	
	terminal assignment		

## Module “domestic hot water”

domestic hot water	current values	DHWtank DHWtank2 DHWflow usw.	
	Sollwerte	SPDHWta : <b>SP-OT1</b> SP-OT2 etc.	
	function	priority controller release return limitation remote control signal frost protection setpoint limitation controller forced load thermal disinfection circulation pump pump/valve exercise output limitation solar statistic	
	status	operating status, error status, SP-source, outputs, show help status	
	manual operation	valve	3Pnt.:0=CLOSE;1=OPEN; 2=STOP; 3=AUTO; cont.: 0 - 100%; 101=AUTO
		pump. / empty tank	0=OFF; 1=ON; 3=AUTO
	service	general value priority return limitation signal controller DWH tank DWH tank flow load flow solar circuit thermal disinfection output limitation switch-on delay switch-off delay solar statistic sensor correction terminal assignment	correction value +/- 10K



## Module “heating circuit”

heating circuit	current value	room outdoor flow etc.	(only with room temp. control)
	setpoints	SP-room SP-flow <b>heating curve slope</b> <b>heating curve exponent</b> <b>base point OT1</b> : SP-cooling	(only with room temp. control)      setpoint cooling
	function	summer switch-off heating curve adaption <b>setpoint limitation</b> universal limitation room compensation delayed outdoor temperature design temperature remote control signal frost protection pump controller pump/valve exercise output limitation support operation screed drying cooling	(only with room temp. control)
	status	operating status, error status, SP-source, outputs, show help status	
manual operation	valve		3pnt.: 0=CLOSE; 1=OPEN; 2=STOP; 3=AUTO; cont.: 0 - 100%; 101=AUTO
	pump		0=OFF; 1=ON; 3=AUTO
	pump reduction		0=NORMAL; 1=MINIMAL; 3=AUTO

service	General value	
	summer switch-off	
	heating curve adaptation	
	setpoint limitation	
	universal limitation	
	room compensation	(only with room temp. control)
	delayed outdoor temperature	
	remote control.	
	signal	
	controller	
	output limitation	
	screed drying	
	sensor correction	correction value +/- 10K
	terminal assignment	

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