

# FM-AM

**Function module, alternative heating appliance**  
**For integration of a heat pump via Modbus RTU**



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# 1 Explanation of symbols and safety instructions

## 1.1 Explanation of symbols


### Warnings

In warnings, signal words at the beginning of a warning are used to indicate the type and seriousness of the ensuing risk if measures for minimising danger are not taken.


The following signal words are defined and can be used in this document:

**DANGER**

**DANGER** indicates that severe or life-threatening personal injury will occur.

**WARNING**

**WARNING** indicates that severe to life-threatening personal injury may occur.


**CAUTION**

**CAUTION** indicates that minor to medium personal injury may occur.

**NOTICE**

**NOTICE** indicates that material damage may occur.

### Important information



The info symbol indicates important information where there is no risk to people or property.

### Additional symbols

Symbol	Meaning
▶	a step in an action sequence
→	a reference to a related part in the document
•	a list entry
–	a list entry (second level)

Table 1

## 1.2 Safety precautions

Failure to observe the safety instructions can result in serious personal injury and a risk to life as well as material losses and damage to the environment.

- ▶ Installation and commissioning as well as service and maintenance must only be carried out by an approved and qualified heating contractor.
- ▶ Read these instructions carefully.
- ▶ Only perform work described for the user group concerned (users, contractors). Other activities can lead to malfunctions, material damage and personal injury.
- ▶ Carry out cleaning and maintenance at least once a year. This involves checking that the entire system is working correctly.
- ▶ Immediately remedy all defects found.

### Safety precautions

- ▶ Observe safety instructions in the documents of the basic controller.

### Danger to life due to current

- ▶ Installation and commissioning as well as maintenance must only be carried out by an approved and qualified heating contractor.
- ▶ Electrical work may only be carried out by an authorised specialist.

# 2 Product Information

## 2.1 Open Source Software

This product contains proprietary software by Bosch (licensed according to the Bosch standard licensing conditions) and Open Source Software (licensed according to the Open Source licensing conditions). The special provisions stated in the license texts apply for LGPL, reverse engineering is permitted for these components in particular.

You can find Open Source information on the DVD supplied with the device/product.

## 2.2 Scope of delivery

Upon delivery:

- ▶ Check that the packaging is intact.
- ▶ Check that all package contents are present.

Included in the scope of delivery:

- Function module FM-AM
- 2 temperature sensors (Ø 6 mm)
- 2 contact sensors (Ø 9 mm)
- Fixing materials for the contact sensor
- Technical documentation

### 2.3 Product description

The purpose of the module is to integrate alternative heat sources (e.g. CHP modules, heat pumps, solid fuel boilers, buffer cylinders) into heating system control systems.

The module can only be installed once in one of the control units of the Logamatic 5000 / Control 8000 control system.

The module supports the following functions and connection options:

- Integration of an alternative heat source with or without buffer cylinder
- Intelligent buffer management by detecting available heat automatically and preventing the heat source from starting
- Requests the operating values of the alternative heat source
- Requests the operating values of an installed buffer cylinder

### 2.4 Intended use

The control unit controls and monitors heating systems in multi-occupancy housing, residential complexes and commercial or industrial buildings.

- Country-specific standards and regulations with regard to installation and operation must be observed!

The FM-AM function module must only be installed in control units of the Logamatic 5000 / Control 8000 control system.

### 2.5 Explanation of the concepts used

Since the FM-AM enables various heat sources to be integrated in one system, the term "heat source" or "boiler" is used in the following for all floor-standing boilers, other boilers, wall mounted condensing boilers, wall-mounted condensing boilers or other heat sources.

#### Qualified person

A qualified person is a person who has extensive, specialist, theoretical and practical knowledge, as well as experience in the specialist area and is familiar with applicable standards.

#### Contractor

A contractor is an organisational unit of the industrial sector with specially trained personnel.

#### Alternative heating appliance (AWE)

Alternative heating appliances (e.g. heat sources fuelled by logs, pellets, woodchips, heat pumps, combined heat and power units or fuel cell heating appliances) are subsequently referred to as alternative heating appliances or AWE.

#### Standard heat source

Unlike alternative heat sources, standard heat sources are boilers or devices operated with fossil fuels, e.g. wall mounted gas condensing boilers or floor standing oil or gas boilers. These are heat generators that cannot be controlled directly via the FM-AM.

### Further explanations

For further explanations of concepts, refer to chapter 12 (e.g. alternative heating appliances (AWE), standard heat sources).

---

## 3 Information for the user

These instructions contain important information for the system user regarding safe operation of the control unit.

- Observe operating instructions of the control unit and the heat source.

Operation of the control unit for the module-specific application is described below.

Depending on the software version, the display and menu items shown in the instructions may differ from those in the control unit.

The terms used are defined in the glossary (→ page 42).

### 3.1 Operation

Operation takes place via the user interface of the control unit in which the module has been installed.

#### Calling up the alternative heating appliance

The menu of the alternative heating appliance is called up from the overview of the heat sources.

- Tap **Heat production**.

The overview of the available heat sources opens.

- Tap **Heat pump**.

#### Overview, hydraulic view of the heat pump

To access the hydraulic view of the heat pump:

- **Control unit > Heat production > Heat pump**

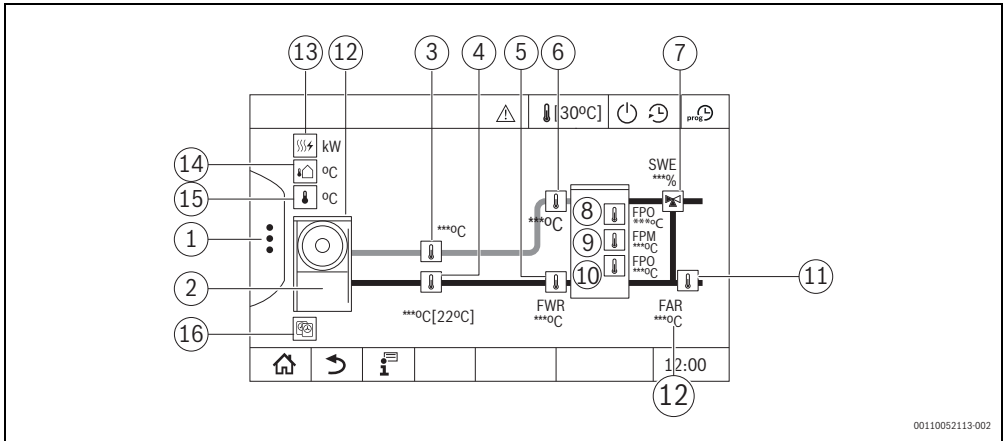


Fig. 1 Hydraulic view of the heat pump

- [1] Advanced functions
- [2] Heat pump (representation depending on the type of heat pump used or heat pump cascade)
- [3] Heat pump flow temperature
- [4] Heat pump return temperature
- [5] Heat pump return temperature, system sensor FWR
- [6] Heat pump flow temperature, system sensor FWW
- [7] **Sensitive return valve/** buffer bypass
- [8] <Buffer cylinder temperature top FPO and heat pump demand
- [9] Buffer cylinder temperature centre FPM
- [10] Buffer cylinder temperature bottom FPU
- [11] System return temperature FAR
- [12] Heat pump status display:  
Green = HMI status OK  
yellow = HMI status Warning  
Red = HMI status Fault  
No display = Modbus communication is not yet established
- [13] Output - Heat | Electric
- [14] **Outside temperature**
- [15] **HP control temperature** And heat pump temperature demand
- [16] **Number of heat pumps in the cascade**

### Activate/deactivate manual operation

To activate manual operation:

- Tap symbol.

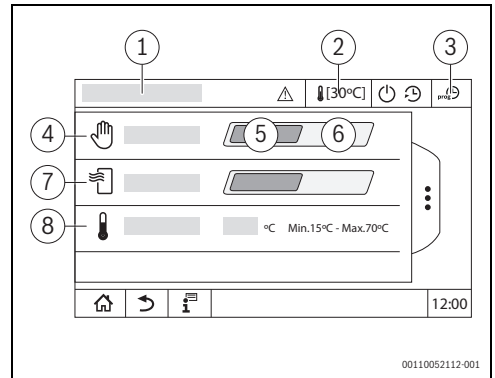


Fig. 2 Advanced functions, Manual operation

- [1] **Heat pump**
- [2] Header
- [3] **Timer**
- [4] Manual operation
- [5] **Off**
- [6] **On**
- [7] **Heating mode**
- [8] **Set temperature**

To deactivate manual operation:

- Tap **Off** (→ Fig. 2, [5], page 5).

Information about the header

The header displays the various states of the heat pump functions to provide information about the current operating status of the heat pump.

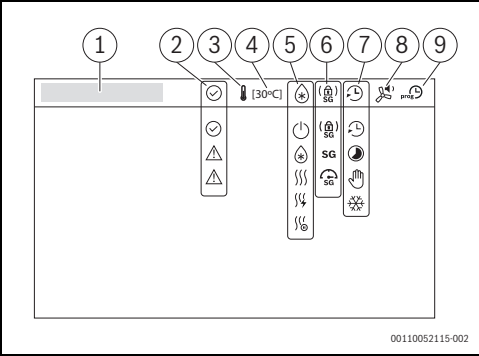


Fig. 3 Header

- [1] Menu path
- [2] Current status of the heat pump
- [3] Heat demand of the heat pump
- [4] Temperature demand
- [5] Current operating mode
- [6] State SG-Ready
- [7] Source of demand
- [8] Silent mode
- [9] Configuration of the time program

Function	Symbol	Status	Note
Current status of the heat pump	(green)	Status OK	
	(yellow)	Status Warning	
	(red)	Status Fault	
Heat demand of the heat pump		Heat demand active	
	–	Heat demand not active	
Temperature demand	[42°C]	Display of required temperature/set temperature	
Current operating mode		Heating mode	
		Standby	
		Heating rod active	The electric heating can also be active during normal heating mode (compressor and electric heating active)
		Deicing heat pump unit	
		Stop the heat pump temporarily	









Function	Symbol	Status	Note
State SG-Ready		Definitive start command	→ Chapter 7.6, page 26
	<b>SG</b>	Boost mode	
	(  ) SG	Energy provider block mode	
	–	Energy-efficient standard	
Source of demand		Timer	
		Manual operation	
		Automatic	Requirement by Calendar, Weekly scheduler or Frost protection
	–	System	Heat demand through system set value
		Frost Protection	Heat pump demand to prevent damage caused by frost
Silent mode		Fan operating mode active	
	–	Fan operating mode not active	
Configuration of the time program		Configuration of the time program	→ Chapter 3.2, page 8

Table 2    Symbols in the header

3.2 Time program

To call up the time program:

► **Control unit > Heat production > Heat pump**

► Tap .

The menu of the time program opens.

In the time program, the settings for the heat supply and the idle mode for heat pumps can be configured.

The heat planner view consists of the following 4 tiles:

- **Timer:** time-controlled heat demands for heat pump units.
- **Calendar:** calendar based settings for annual heat pump units demand
- **Weekly scheduler:** weekly settings for the heat pump demand
- **Silent mode:** weekly settings for the Silent mode (Buderus WLW276 / Bosch CS3000 AW exclusive)

3.2.1 Timer

To call up the timer:

► **Control unit > Heat production > Heat pump > Schedulers > Timer**

The timer can be activated or deactivated.

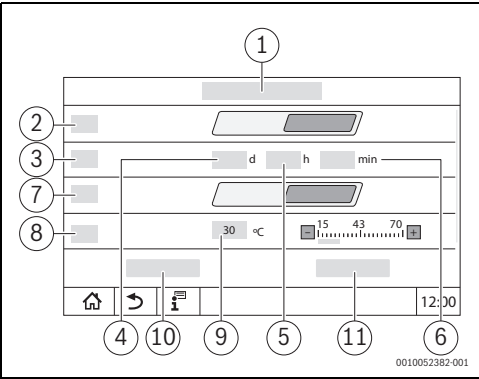


Fig. 4 Timer

- [1] **Schedulers > Timer**
- [2] **Timer**
- [3] **Duration**
- [4] **Days**
- [5] **Hours**
- [6] **Minutes**
- [7] **Heating mode**
- [8] **Set temperature**
- [9] **Temperature**
- [10] **Save**
- [11] **Cancel**

Submenu	Settings/ adjustment range	Explanation	Note
Timer	Off/On		The time has elapsed when this parameter is automatically set to Off.
Duration	0...138 d		Only visible if the parameter Timer is at On.
	0...3...23 h		The duration must be at least 10 minutes.
	0...59 min		
Heating mode	Off/On		Only visible if the parameter Timer is at On.
Set temperature	15...30...70 °C		Only visible if the parameters Timer and Heating mode are at On.

Table 3 Timer menu

3.2.2 Calendar

In the annual calendar, the heat energy demand can be added and configured for up to 8 consecutive periods (entries). The entries are added in ascending order of the start time.

Entries can be added between existing entries as long as they remain in ascending order of start time. The start date can be entered in increments of 1 day.

The period must be between the current date and any date in the future. The default value for the first entry is the current date and the default value for subsequent entries is the value of the end date of the previous entry plus 1 day.

The end date of the heat energy demand can be set in increments of 1 day. The period is between the start date and any date in the future. The default value is the start date.

Time periods that lie in the past are removed from the annual calendar and are no longer displayed.



The following settings cannot be made and will result in warning messages:

- No entry can be inserted between existing entries if there is less than 1 day between the end date of the first entry and the start date of the second entry, as this would result in an overlap.
- No more than 8 entries can be inserted.

To call up the annual calendar:

- ▶ **Control unit > Heat production > Heat pump > Schedulers > Calendar**
- ▶ Enter the first time period with **+**.
- ▶ Enter the time period in the fields.
- ▶ If **Heating mode** is at **On**:
  - Set the temperature using the standard keypad and/or the standard slider with plus and minus keys.
- ▶ If necessary, add further entries with **+**.
- ▶ If necessary, remove entries with **⏏**.
- ▶ Confirm with **Save**.

### 3.2.3 Weekly scheduler

The weekly time program is used to configure the heat energy demand for each day of the week via a planner. Up to 8 entries can be added for each day of the week. Entries are added in ascending order of start time. Entries can be added between existing entries as long as they remain in ascending order of start time.

The following entries are possible:

- The start time of the heat energy demand, with a maximum range of 0:00 to 23:45, adjustable in 15 minute increments.
- Activation of heating mode.
- The temperature setpoint for heating mode, with a setting range of 15 °C to 70 °C and a default setpoint of 30 °C. This set value can be configured using the standard keypad and/or the standard slider with plus and minus keys.


The following settings cannot be made and will result in warning messages:

- No entry can be added after 23:45 as this exceeds the maximum time of day.
- No entry can be inserted between existing entries if there are less than 15 minutes between the end time of the first entry and the start time of the second entry, as this would result in an overlap.
- A maximum of 8 entries can be inserted.

To open the weekly time program menu:

- ▶ **Control unit > Heat production > Heat pump > Schedulers > Weekly scheduler**

### Copy entries from weekdays

Using the function **Copy day** , entries can be transferred from one day of the week to one or more other days of the week.

- ▶ **TapCopy day.**  
The day to be copied from is greyed out.
- ▶ Tap the weekdays where the copied settings are to be transferred to.  
The weekdays are highlighted.
- ▶ Tap **Save**.

### 3.2.4 Silent mode

The function Silent mode can be configured for all days of the week via a scheduler. It is only available for Buderus WLW276 / Bosch CS3000 AW with bus connection.

- Up to 8 entries can be created for each day of the week.
- The entries are added in ascending order of the start time.
- Entries can be added between existing entries as long as they remain in ascending order of the start time.

Each entry contains the following parameters:

- The start time of Silent mode, with a maximum range of 0:00 to 23:45, adjustable in 00:15 minute increments.
- The default value for the first entry is 06:00 and the default value for subsequent entries is the value of the previous entry plus 00:15 minutes.
- The type of Silent mode can be configured via a drop-down menu
  - **Standard mode:** no reduction of the speed
  - **Silent mode:** slight reduction of the speed
  - **Super silent mode:** medium reduction of the speed
  - **Night mode:** high reduction of the speed

The setting from the previous day is retained until the time of the next entry.



#### example:

if an entry is made for Monday, this period is automatically adopted for the following days Tuesday, Wednesday, Thursday, Friday. If a new entry is made for Saturday, it is also automatically adopted for Sunday, provided there is no separate entry for Sunday.

To call up the Silent mode:

- ▶ Call up menu **Control unit > Heat production > Heat pump > Schedulers > Silent mode**.
- ▶ Tap the day of the week.
- ▶ Enter the first time period with **+**.
- ▶ Enter the start time.

- ▶ Select which Silent mode should be used:
  - **Standard mode**
  - **Silent mode**
  - **Super silent mode**
  - **Night mode**

- ▶ If necessary, add further entries with .
- ▶ If necessary, remove entries with .
- ▶ Confirm with **Save**.

The corresponding icon in the header in the display shows which Silent mode is currently active.

**Copy settings Silent mode from weekdays**

Using the function **Copy day**, entries can be transferred from one day of the week to one or more other days of the week.

- ▶ Tap **Copy day**.  
The day to be copied from is greyed out.
- ▶ Tap the weekdays where the copied settings are to be transferred to.  
The weekdays are highlighted.
- ▶ Tap **Save**.

**3.3 Heat pump energy data**


This menu is used to display appliance-specific energy monitoring and efficiency data. It is visible in the module configuration directly after configuration and activation of the FM-AM module. One of the supported heat pumps must also be integrated/configured.



There may be non-negligible deviations between the calculated energy data and real energy consumption. The calculation of the energy data is based on assumptions and not on energy measurements.

The energy data represented here may therefore not be used for invoicing purposes.

To call up the energy data:

- ▶  **Info > Heat production > Heat pump > Energy monitoring**

-or-

- ▶  **Service menu > Monitor data > Heat production > Heat pump > Energy monitoring**

**FM-AM Module - Activate heat pump**

To display the energy data of the heat pump, the heat pump must be activated in the module configuration.

- ▶ Call up **Service > Module configuration** menu.
- ▶ Under **Slot 1...4**, select **FM-AM** at one of the slots.  
The parameter **FM-AM Configuration** appears.

- ▶ Choose **Heat pump**.

**Current values view**


The tile for the current values is displayed if the values are supported by the appliance. If a heat pump is integrated that is not supported, the tile is hidden.

Energy monitoring is supported for the following heat pumps:

- Buderus WLW276 / Bosch CS3000 AW
- Buderus WLW286 / Bosch CS5000 AW

In the event of loosing a connection, the tile continues to be displayed with the last data received.

To display the current values:

- ▶  **Info > Heat production > Heat pump > Energy monitoring > Current values**

-or-

- ▶  **Service menu > Monitor data > Heat production > Heat pump > Energy monitoring > Current values**

Value	Explanation
Heat transfer	Current heat transfer of the heat pump received via Modbus RTU.
Electrical power	Current electrical output of the heat pump received via Modbus RTU.
Efficiency	<ul style="list-style-type: none"><li>• Buderus WLW276 / Bosch CS3000 AW: current efficiency received via Modbus RTU.</li><li>• Buderus WLW286 / Bosch CS5000 AW: current efficiency calculated by the ratio of heat transfer to electrical output.</li></ul>

Table 4 Overview of the current values

**Time periods view**

In the Energy data submenu, up to three tiles are displayed to navigate to the aggregated data for the last three years, if data is available for the respective year.

To display the time periods:

- ▶  **Info > Heat pump > SAFe > Energy monitoring > Year (e.g. 2023)**

-or-

- ▶  **Service menu > Monitor data > Heat pump > SAFe > Energy monitoring > Year (e.g. 2023)**

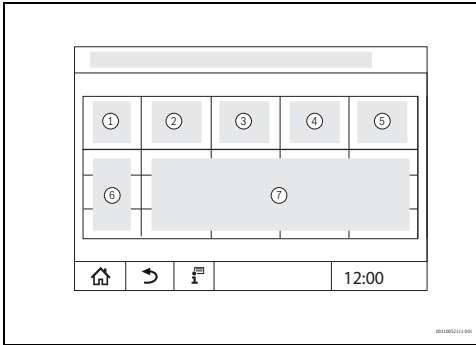


Fig. 5 Time periods view

- [1] **Period**
- [2] **Ø Outside temp. °C**
- [3] **Heat transfer kWh**
- [4] **Electrical power kWh**
- [5] **Efficiency**
- [6] **Time period (Month/year)**
- [7] **Extrapolated measured values over the time period [7]**



If data is shown in *italics*, the calculation was not based on valid data and the values are "estimated". The reason for this can be, for example:

- a change of the time in the current time period
- no data could be determined in the meantime
- energy data influenced by a change of the time settings
- new energy data were loaded
- energy data were reset.

Unavailable data elements for individual entry lines are displayed as -.

### 3.4 Unit troubleshooting



#### WARNING

#### Danger to life due to current!

Touching live parts can result in an electric shock.

- ▶ Do not open the control unit under any circumstances.
- ▶ Switch off the control unit in an emergency (e.g. heating system emergency stop switch) or disconnect the heating system from the power supply via the main circuit breaker.
- ▶ Have faults at the heating system eliminated immediately by an approved and qualified heating contractor.

Fault displays, which refer to heat sources with a control unit in the Logamatic 5000 / Control 8000 series, are described in the instructions for the relevant control unit. They appear on the display of the control unit.

For faults, which refer to a different heat source:

- ▶ The documents for the heat source must be observed.
- ▶ Contact an approved and qualified heating contractor to report faults.
- ▶ Have faults rectified immediately by an approved and qualified heating contractor.



The "Fault" column lists the faults, which can occur with the module and the connected heat sources.

- ▶ In the case of faults that are not listed, refer to the technical documents for the connected components.

#### Call up the message display

To call up the message display:

- ▶ Tap symbol.

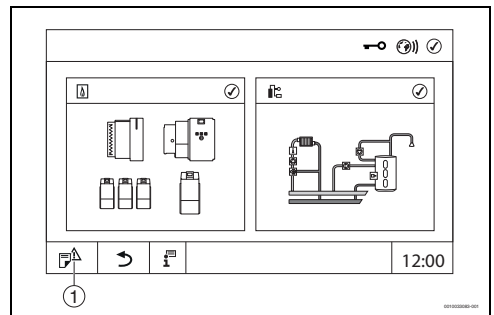


Fig. 6 Call up the message display

- [1] Error display

The **Notifications** menu shows the active faults and service displays of the heating system in plain text. The control unit shows only the faults and service displays of the selected heat source. Collective messages from substations are also displayed in the master control unit.

If more faults and service displays than can be displayed on one page exist, you can scroll through the pages via the arrows in the footer.

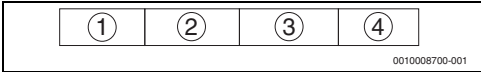


Fig. 7 Message display

- [1] Incident ID
- [2] Occurred (date, time)
- [3] Component (specifies the component where the fault occurred).
- [4] Display text (describes the type of fault).

Active faults and service displays are displayed in plain text (example → Table 5, page 12).

- ▶ Phone an approved and qualified heating contractor to report faults.
- ▶ Have faults rectified immediately by an approved and qualified heating contractor.

Display text/ Observation/ Fault	Cause/Effect	Remedy
Manual boiler locking	No fault. The standard heat source is locked manually.	▶ Enable the standard heat source if required (→ Chapter 3.1, page 4).

Table 5 Fault displays and troubleshooting, example

## 4 Installation for the qualified person

### 4.1 Notices regarding installation

- ▶ Observe safety instructions (→ Chapter 1.2, page 3).
- ▶ Observe the safety instructions and notes on installation of the basic control unit.

#### ⚠ Notices for the target group

These installation instructions are intended for gas, plumbing, heating and electrical contractors. All instructions must be observed. Failure to comply with instructions may result in material damage and personal injury, including danger to life.

- ▶ Read the installation, service and commissioning instructions (heat source, heating controller, pumps, etc.) before installation.
- ▶ Observe the safety instructions and warnings.
- ▶ Follow national and regional regulations, technical regulations and guidelines.
- ▶ Record all work carried out.

#### ⚠ Notices for the service life

To ensure the long service life of the heat pump:

- ▶ Ensure proper system integration of the heat pump.
- ▶ Do not let the heat pump run close to the maximum temperature for a longer period of time.
  - To ensure this, the maximum demand temperature can be reduced via the parameter **Service > Heat production > Heat pump > Default setting > Reduction of maximum heat pump flow temperature**.

### 4.2 Standards, regulations and directives

- ▶ The following regulations and standards in the documents of the Logamatic 5000 / Control 8000 control unit series must be observed during installation and operation.

## 5 Installation

### NOTICE

#### Faults/material damage due to inductive interference!

- ▶ Make sure all low-voltage cables are routed separately from mains voltage cables (min. clearance: 100 mm).



### CAUTION

#### Danger to life and risk of system damage due to high temperatures.

All parts directly or indirectly exposed to high temperatures must be designed to withstand these temperatures.

- ▶ Keep cables at a safe distance from hot components.
- ▶ Route cables in the cable routings provided, or above the insulation.

### 5.1 Prior to installation



Note the recommended hydraulics for installation (→ Chapter 9, page 30).

Observe the following prior to installation:

- All electrical connections, safety measures and safeguards must only be performed by an approved qualified person, taking into account the relevant standards, guidelines and local regulations.
- The electrical connections must be made in accordance with the wiring diagram for the control unit and the modules.
- When installing the devices, make sure that there is an earth connection.
- Before opening the control unit, disconnect it from all poles of the power supply and secure against unintentional reconnection.
- Incorrect attempts to make connections when live may destroy the control unit and lead to dangerous electric shocks.
- Do not exceed the total current stated on the data plate or the current for each connection.

### 5.2 Installation in the control unit



The module only affects the control unit in which it is fitted. If the module is installed in the master control unit with address 0, it is effective for the connected heat source(s). If the module is fitted in a substation, it will only respond to the heat demand of that substation.

### 5.3 Integrating the module into the control unit

Once the module has been installed in the control unit, the control unit normally detects the module automatically when it is switched on.

If the module is not detected automatically, it will have to be integrated manually once via the control unit (→ installation and operating instructions for the control unit).

### 5.4 Software

These instructions describe the functions of the FM-AM when installed in a control unit with the **SW 3.0.x** software version. The functionality of the FM-AM will be restricted when using control units with older software versions.

#### Checking the software version

All main controllers must have the same software version.

To check the software version of the control unit:

- ▶ The service instructions for the control unit must be observed.

#### Performing a control unit update

The procedure for performing an update with the various versions is described on the control unit manufacturer's homepage.

### 5.5 Connecting temperature sensors

The installation of the temperature sensor depends on the system hydraulics. Examples of system hydraulics are shown in → Chapter 9, page 30.

- ▶ Check whether the selected hydraulic scheme is compatible with the heat source used.
- ▶ Check whether the system components used (e.g. buffer cylinder) are compatible with the heat source used.
- ▶ Make sure that the temperature sensors are connected in the right positions.

The sensor abbreviation and sensor function are explained in → Chapter 9.4, page 39.

5.6 Integrating the heat pump

The FM-AM function module is designed to integrate the heat pumps Buderus WLW276 / Bosch CS3000 AW WLW 276 or Buderus WLW286 / Bosch CS5000 AW hydraulically. The control unit can communicate with heat pump heat via the Modbus RTU.

Connecting the communication cable



The length of the cable between the control unit and heat pump must not exceed 1000 m. A screened cable must be used as the communication cable, e.g. LiYCY 2 x 0.75 (TP) mm<sup>2</sup>.

The communication cable transmits parameters and messages from the heat pump to the control unit.

The parameters and messages from heat pump heat are displayed at the control unit. The start command is also sent to the heat pump via the communication cable.

- Use screened cable as the communication cable.
- Connect communication cable to the Modbus RTU connection.
- Observe the connections at the heat pump.
- Observe the installation instructions for the heat pump.

To avoid stray voltages:

- **Only** connect the cable shield to the control unit or heat pump heat and power unit!

Assignment of Modbus RTU connection (→ Fig. 8, [3], page 14):

- Terminal 1 = GND (cable shield)

Connection	Heat pump Buderus WLW276 / Bosch CS3000 AW	Heat pump Buderus WLW286 / Bosch CS5000 AW
Terminal 2	H1	+
Terminal 3	H2	-

Table 6 Terminals

Caution: the wire assignment must not be swapped round!

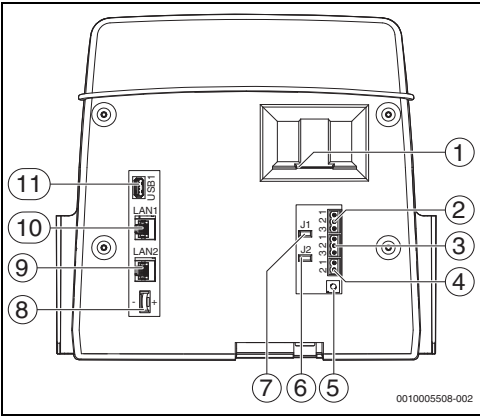


Fig. 8 User interface connections

- [1] Slide type insert for SD card
- [2] CAN-BUS connection (no function, provided for subsequent functions)
- [3] Modbus-RTU connection to heat pump
- [4] EMS connection (connection for EMS heat source with its own basic control (control panel))
- [5] Address setting of control unit
- [6] Jumper (J2) for activating the terminating resistor Modbus RTU
- [7] Jumper (J1) for activating the CAN BUS terminating resistor
- [8] Battery CR2032
- [9] Network connection 2 (CBC-BUS)
- [10] Network connection 1 (Internet, ModBus TCP/IP, CBC-BUS)
- [11] USB connection

The plug-in connector assignment on the back of the control unit depends on what it is used for and the configuration.

Assignment of the CAN-BUS/Modbus RTU/EMS plug:

- Jumper (J2) for activating the terminating resistor Modbus RTU
- Jumper (J1) for activating the CAN BUS terminating resistor

## 6 Settings for the qualified person

### 6.1 Default setting

The settings can be made in the menu:

► **Service > Heat production > Heat pump > Default setting**

Submenu	Settings/ adjustment range	Explanation	Note
Modbus RTU Unit ID	0... <b>1</b> ...255	This parameter must match the setting on the heat pump to enable communication.	In the case of a heat pump cascade, the unit ID of the master of the heat pump cascade must be set.
Heat pump cascade active	<b>No</b> / Yes	Information on whether one heat pump is connected or if several heat pumps are connected in a cascade.	
Number of heat pumps	<b>2</b> ...8	Information of the number of heat pumps that are operated in the cascade.	
Capacity reference heat pump	17 kW	For a cascade: Specify the output of the master heat pump	Only visible with heat pump type Buderus WLW286 / Bosch CS5000 AW
	<b>22 kW</b>		
	38 kW		
Capacity heat pump	17 kW	The operating condition of the heat pump is configured using this parameter.	Only visible with heat pump type Buderus WLW286 / Bosch CS5000 AW.
	<b>22 kW</b>		
	38 kW		
Heat pump temperature spread flow to return temperature	0... <b>10</b> ...20 K	This value is used to convert the desired buffer temperature to a return temperature demand.	Only visible with heat pump type Buderus WLW286 / Bosch CS5000 AW.
Temperature difference heat pump/ buffer storage	-20... <b>0</b> ...20 K	Setting by how many K the set value of the heat pump is to be changed compared to the buffer temperature.	
Supply temperature limitation via	<b>Compressor envelope</b>	Recommended setting: Compressor envelope	
	Custom envelope	When selecting <b>Compressor envelope</b> , the stored curve is used. (Further information → Chapter 7.4, Page 23)	
Reduction of maximum heat pump flow temperature	0... <b>5</b> ...20 K	In order to increase the service life of the heat pumps, it is recommended not to operate them for longer periods of time within the limits of the outside temperature-dependent operating range of the compressor (→ installation instructions for the heat pump).  The demand on the heat pump is reduced to the operating range minus the parameter set here (example → Chapter 7.2, page 22).	

Submenu	Settings/ adjustment range	Explanation	Note
Max. supply temperature	15... <b>50</b> ...70 °C	Specifies the limitation of the maximum flow temperature via a set temperature value.	
Min. supply temperature	<b>15</b> ...70 °C	Specifies the limitation of the minimum flow temperature via a set temperature value.	

Table 7 Default settingMenu

6.2 System Settings

The settings can be made in the menu:

- **Service > Heat production > Heat pump > System Settings**

Submenu	Settings/ adjustment range	Explanation	Note
Source of demand	Weekly scheduler	The set value of the heat demand is determined exclusively by the weekly time program of the heat pump function.	Setting for how the set value for the heat pump control is formed.
	<b>System</b>	The set value of the heat demand is formed exclusively as a max selection by the system ( <b>System</b> ), this means all connected consumers (HK/WW).  Whether an external demand via the building management system is also considered depends on the parameter <b>Strategy &gt; Demand via Bus</b> .	If the Timer function has been activated, the parameter Source of demand has no influence on the set value of the heat pump. The set value settings of the Timer function are adopted instead (→ Chapter 3.2.1, page 8 and Chapter 7.2, page 22).
	Max (System, Weekly scheduler)	The set value is formed from a max. temperature selection of the setpoints <b>System</b> and Weekly scheduler	The time program Silent mode has no influence on the temperature set value of the heat demand. This time program enables a temporary noise-reduced operation, with a corresponding output reduction.
Bivalent operation	Off/On	Setting whether the operating strategy is used or the heat pump and boiler are operated side by side on an equal basis.  On: the following operating strategy is used. If there is a second heat generator or the heat pump cannot guarantee the heating of the system by itself, this operating mode should be selected.  Off: boiler and heat pump are requested independent of the outside temperature. Operation takes place without an operating strategy.	Heat pumps operated bivalent generate the heating energy in combination with another heat generator, which supports or completely takes over the heating of the building at lower outside temperatures.  Dual-fuel mode is defined as a combination with a heater rod, another heat pump, or a combustion heating system using oil or gas.



Submenu	Settings/ adjustment range	Explanation	Note
Heat pump operation strategy	Alternative	Below the bivalence point only the boiler is operated, above it only the heat pump.	Only visible if the parameter Bivalent operation is at On.
	<b>Parallel</b>	The heat pump and the boiler can be operated simultaneously.	Setting the operating mode below the set bivalent temperature.
	Partly-Parallel	Below the bivalent temperature, the heat pump and the boiler are operated in parallel in an adjustable outside temperature range.  Below the temperature set under <b>Shut off point heat pump</b> , only the boiler is operated.	The fulfilment of the system temperature requirement has the highest priority! In case of insufficient supply of the system, the boiler can switch on at any time.  More information → Chapter 7.3, page 22
Bivalence point	-20... <b>3</b> ...20 °C	Setting of the outside temperature up to which the heat pump is to take over the heating alone.  Above the outside temperature set here → The heat pump is operated exclusively/alone.  Below the outside temperature set here → Depending on the setting under Heat pump operation strategy	The current outside temperature of the controller is used.
Hysteresis for bivalence point	0.5... <b>1</b> ...5 K	Setting of the increase of outside temperature at which the heat pump can take over the supply exclusively/alone again.	–
<b>Shut off point heat pump</b>	-30...- <b>5</b> ...10 °C	Setting of the outside temperature up to which the heat pump and the boiler are operated simultaneously in the Partly-Parallel operating strategy.  Above the outside temperature set here → The heat pump and the boiler are operated at the same time.  Above the outside temperature set here → The boiler is operated alone.	Only visible if the parameter Heat pump operation strategy is at Partly-Parallel.  The current outside temperature of the main controller is used.  The parameter must be considered in conjunction with the set Bivalence point.
Hysteresis for bivalence shut off point	0.5... <b>1</b> ...5 K		
Boiler delay due to set point increase	Off/On	If there is a sudden set value change in the system, the lock remains in place for a certain time to give the heat pump time to fulfil this sudden set value change.  Setting whether the boiler should react to a change in the system set value temperature.  On: the boiler is blocked if there is a sudden set value change  Off: the boiler will attempt to meet the new set value	Conditions: <ul style="list-style-type: none"> <li>• The heat pump was capable of supplying the system without a boiler before the sudden set value change.</li> <li>• The temperature set value is within the operating range of the heat pump after the sudden set value change.</li> </ul>
Offset for boiler delay due to set point increase	2... <b>5</b> ...20 K	Setting at which sudden set value change is present in a sudden set value change.	–

## Settings for the qualified person

Submenu	Settings/ adjustment range	Explanation	Note
Boiler delay time due to setpoint increase	10... <b>30</b> ...300 min	Setting for how long the sudden set value change keeps the boiler lock activated. This gives the heat pump time to reach the new set value.	–
Deactivate boiler block due to outside temperature	Off/On	Setting whether the boiler is no longer blocked below certain outside temperatures in the event of a sudden set value change.  On: the boiler is not blocked when there is a sudden set value change below a certain outside temperature.  Off: the boiler is blocked in the event of a sudden set value change, even at low outside temperatures.	–
Outside temperature threshold to deactivate boiler block	–20... <b>10</b> ...40 °C	Setting of the outside temperature up to which the boiler is blocked in the event of a sudden set value change.  Above the outdoor temperature set here → Boiler blocking possible  Below the outside temperature set here → Boiler blocking is not possible The boiler will intervene immediately.	–
Hysteresis to reactivate the boiler block	0.5... <b>1</b> ...5 K	Setting of the increase of outside temperature at which the boiler lock is possible again by a sudden set value change.	–
Enable boiler when setpoint is not reached	No/ <b>Yes</b>	If the boiler is blocked due to the operating strategy for dual-fuel mode, this parameter can be used to release the boiler for support in the event of an insufficient supply of the system demand.  Setting whether the boiler can be enabled although, e.g. the operating strategy of the heat pump blocks the boiler.  <b>Yes:</b> the boiler is to be partially excluded from the operating strategy of the heat pump if the system supply is insufficient.  <b>No:</b> the operating strategy of the heat pump remains the determining function.	<b>Example:</b> <b>Set temperature</b> = 50 °C <b>Maximum acceptable temperature deviation before enabling boiler</b> = – 3 K <b>Hysteresis to deactivate heat demand</b> = 3 K Result: boiler enabled when below 47 °C at FPO. blocked when above 50 °C at FPO.
<b>Maximum acceptable temperature deviation before enabling boiler</b>	–30...– <b>3</b> ...–1 K	Setting for how much the temperature at the FPO may drop below the system set value before the boiler is enabled.	
Hysteresis to reactivate boiler block	1... <b>3</b> ...30 K	Setting of the increase in temperature at the FPO at which the boiler release is ended.	

Table 8 System SettingsMenu

6.3 Defrost settings

The settings can be made in the menu:

- **Service > Heat production > Heat pump > Defrost settings**

**Example:**

All settings = Default

In case one of the sensor values FPO, FPM and FPU < 25 °C or the outdoor temperature (**Heat demand by outside temperature**) < 15 °C:

Then the heat demand for frost at the heat pump = 25 °C (**Heat**

**demand if buffer temperature lower than**) + 3 K (**Hysteresis to deactivate heat demand**) + 2 K (Fix Offset) = 30 °C

heat demand frost back off, in case:  
minimum value from FPO, FPM and FPU > 25 °C (**Heat demand if buffer temperature lower than**) + 3 K (**Hysteresis to deactivate heat demand**) = 28 °C

or:

outside temperature > 15 °C (**Heat demand by outside temperature**) + 1 K (**Hysteresis for heat demand by outside temperature**) = 16 °C

Submenu	Settings/ adjustment range	Explanation	Note
Ensure minimum buffer temperature	No/Yes	To enable defrosting of the evaporator surfaces, energy is taken from the buffer cylinder. This function ensures a temperature level in the buffer below the outside temperature. If the temperature falls below this level, a heat demand is sent to the heat pump.	Depending on the outside temperature and humidity, ice can form on the evaporator surfaces of the heat pump if the temperature at any of the 3 sensors (FPO, FPM, FPU) drops below the set value.
Ensure minimum temperature via system return flow	No/Yes	If the temperature at any of the three sensors (FPO, FPM, FPU) drops below the set value and the system return is warm enough, the sensible return logic is reversed, the valve opens and heats the buffer with warm return water.	

Settings for the qualified person

Submenu	Settings/ adjustment range	Explanation	Note
Heat demand if buffer temperature lower than	5... <b>25</b> ...40 °C	Minimum temperature in the heat pump buffer to be applied to FPO, FPM and FPU.	Only visible if the parameter Ensure minimum buffer temperature is at On.
<b>Hysteresis to deactivate heat demand</b>	1... <b>3</b> ...10 K	If the minimum buffer temperature + the hysteresis set here is reached, the heat demand is cancelled.	
Choice of outside temperature	Heat pump	Outside temperature via bus from the heat pump	
	System	Undamped system outside temperature	
	<b>System and heat pump</b>	Minimum value from undamped system outside temperature and outside temperature of the heat pump via bus	
Heat demand by outside temperature	0... <b>15</b> ...30 °C	When the frost protection is activated, a heat demand is automatically sent when the outside temperature drops below the set value.  Example cases: Very cold outside temperature to prevent pipes from freezing. The outside temperature is warm, but the buffer is cold.	
Hysteresis for heat demand by outside temperature	<b>1</b> ...10 K	Example for value 1 K:  The +/- 1 K value is processed as follows.  Set value for heat request based on outside temperature = 15 °C Assume outside temperature = 15 °C . Set hysteresis value = 1 K.  The request is sent at an outside temperature of 15 °C - 1 K.  The request is ended at an outside temperature of 15 °C + 1 K.	

Table 9 Defrost settingsMenu

### 6.4 Hydraulic integration

The settings can be made in the menu:

- **Service > Heat production > Heat pump > Hydraulic integration**

Submenu	Settings/ adjustment range	Explanation	Note
Type of buffer integration	<b>Direct/without valve (SWE)</b>  Direct/with valve (SWE)	The Type of buffer integration of the heat pump buffer can be selected.	
Buffer reference sensor for sensitive return valve	Bottom buffer cylinder temperature (FPU)  <b>Middle buffer cylinder temperature (FPM)</b>  Top buffer cylinder temperature (FPO)	The sensor for the buffer temperature for comparison with the plant return temperature (FAR) can be selected.	
Switching differential to inject buffer	-20... <b>2</b> ...20 K	If the plant return temperature is colder than the buffer temperature plus this value, the system return flows into the heat pump buffer (SWE = 100%).	If the plant return temperature is lower than the buffer temperature at the selected reference sensor + this value, the plant return flows to the heat pump buffer (SWE = 100%).
Switching hysteresis to bypass buffer	2... <b>4</b> ...20 K	If the plant return temperature is higher than the buffer temperature plus the switching difference for injection into the buffer plus this value, the plant return flows into the heat pump buffer (SWE = 0%).	If the plant return temperature is higher than the buffer temperature at the selected reference sensor + this value + the switching difference for buffer feed, then the plant return is routed past the buffer (SWE = 0%).
Actuator runtime sensitive return	5... <b>120</b> ...600 s	The valve motor running time of the sensible return feed is configurable.	

Table 10 Hydraulic integrationMenu

## 7 Further information for qualified persons



**DANGER**

### Danger to life due to escaping flue gas!

- In addition to the FWG flue gas temperature sensor, also install a flue gas temperature monitor on the flue connector of the alternative heating appliance.
- Integrate the flue gas temperature monitor as shown in the wiring diagram.

### 7.1 Monitor data

The monitor data displayed depends on the settings made. The data displayed by the heat source depends the heat source.

Tap the symbol  in the footer to in the service menu call up the values.

## 7.2 Heat demand

There are the following options for sending a heat demand to the heat pump (sorted by priority):

1. Manual mode: also ignores blocking due to dual-fuel mode
2. Timer
3. Year timer
4. System / weekly timer: depending on the settings under **Service > Heat production > Heat pump > System Settings > Source of demand**

In demand modes 2-4, frost protection and blocking are maintained by dual-fuel mode.

In demand modes 2-4, the demand on the heat pump is limited by the operating limits (operating conditions compressor → installation manual of the heat pump) as well as an additional set back (**Service > Heat productionHeat pumpGeneral dataReduction of maximum heat pump flow temperature**).

### Example:

Heat pump type = WLW276-41 KW

Outside temperature = -16 °C

Heat demand = 50 °C

**Reduction of maximum heat pump flow temperature = 5 K**

Restriction of the heat demand (50 °C) to:

Max. compressor operating condition (45 °C) – **Reduction of maximum heat pump flow temperature (5 K) = 40 °C**

## 7.3 Bivalent operation

Outside temperature dependent (undamped outside temperature system) release of boiler and heat pump.

There are conditions under which the boiler and heat pump are allowed to run through bi-fuel operation despite being blocked (→ Chapter 6.3, page 19).

The following operating strategies are available for dual-fuel mode:

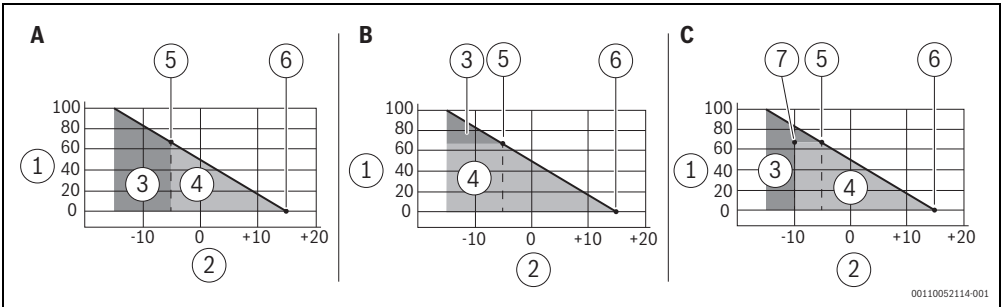


Fig. 9 Operating strategies

- [A] Alternative mode
- [B] Parallel mode
- [C] Partially parallel mode
- [1] Axis: heating demand in %
- [2] Axis: outside temperature in °C
- [3] Additional heating - e.g. covered by oil or gas heater
- [4] Area covered by the heat pump
- [5] dual-fuel switch-over point (**Service > Heat production > Heat pump > System Settings > Bivalence point**)
- [6] Threshold value for heating, heating load of the building
- [7] Heat pump switch-off point (**Service > Heat production > Heat pump > System Settings > Shut off point heat pump**)

### Alternative mode

When outdoor temperatures are below the dual-fuel switch-over point, only the boiler is operated. At outdoor temperatures above the dual-fuel switch-over point, only the heat pump is operated.

### Parallel mode

When outdoor temperatures are below the dual-fuel switch-over point, the heat pump and the boiler are operated in parallel. At outdoor temperatures above the dual-fuel switch-over point, only the heat pump is operated.

### Partially parallel mode

When outdoor temperatures are below the switch-off point of the heat pump, only the boiler is operated. At outside temperatures between the switch-off point of the heat pump and the dual-fuel switch-over point, the heat pump and boiler are operated in parallel. At outdoor temperatures above the dual-fuel switch-over point, only the heat pump is operated.

### Example:

Operating strategy = Parallel

Dual-fuel switch-over point = 3 °C

Hysteresis for the dual-fuel switch-over point = 1 K

Boiler and heat pump are enabled as soon as outside temperature system (undamped) is ≤ 3 °C

Boiler is blocked and heat pump enabled as soon as outside temperature system (undamped) is  $\geq 4\text{ }^{\circ}\text{C}$

7.4 Compressor envelope

The **Compressor envelope** indicates the operating range of the compressor. The **Compressor envelope** depends on the **Outside temperature**, or indicates the achievable Flow temperature for each respective **Outside temperature**.

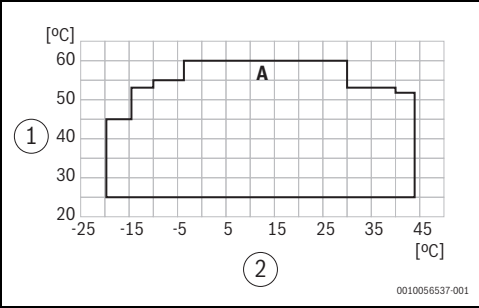


Fig. 10 Compressor envelope Buderus WLW276 / Bosch CS3000 AW Chassis 1, 2 and 3

- [1] Flow temperature
- [2] Outside temperature
- [A] Compressor envelope

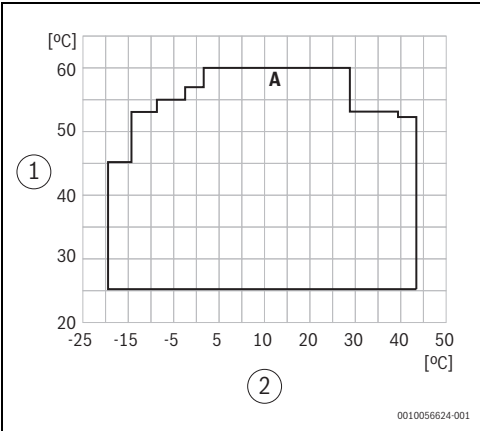


Fig. 11 Compressor envelope Buderus WLW276 / Bosch CS3000 AW Chassis 4

- [1] Flow temperature
- [2] Outside temperature
- [A] Compressor envelope

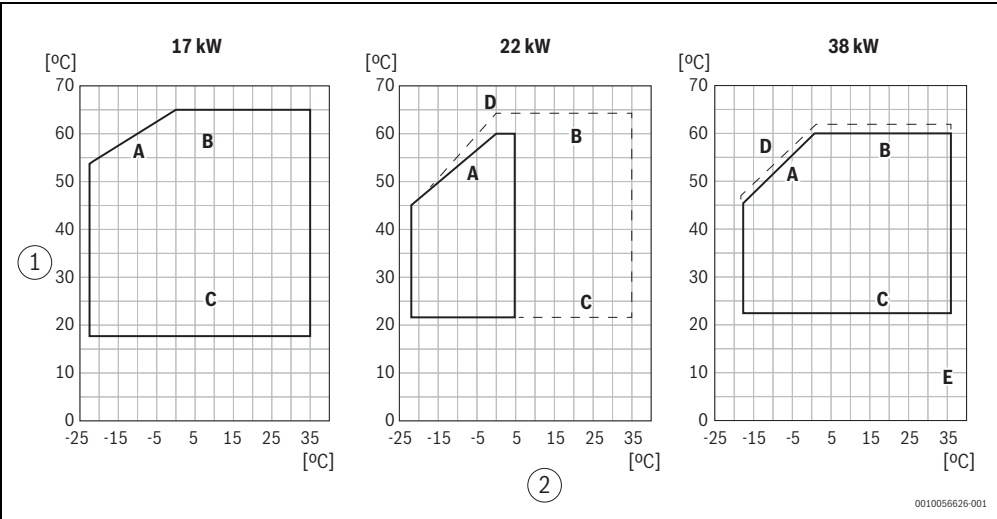


Fig. 12 Compressor envelope Buderus WLW286 / Bosch CS5000 AW 17 kW / 22 kW / 38 kW

- [1] DHW temperature  $^{\circ}\text{C}$
- [2] Heat source inlet temperature  $^{\circ}\text{C}$
- [A] Compressor envelope (output stage 2)
- [B] Leakage (+0/ -2 K)
- [C] Water inlet
- [D] Output stage 1

The Control unit is familiar with the maximum and minimum temperatures of the of the **Compressor envelope** heat pumps. Heat pumps work less efficiently at very low and very high outside temperatures. This means that the maximum Flow temperature cannot be reached (physical limitation). Even at outside temperatures that are better suited for efficient operation, the compressor should not be operated at the maximum possible temperature along the **Compressor envelope**, as this unnecessarily increases wear of theHeat pump. For this reason, the flow temperatures can be limited via the settings in **Control unit**.

7.4.1 Supply temperature limitation via Compressor envelope

The Control unit is familiar with the maximum and minimum temperatures of the **Compressor envelope** of the **Heat pump**. The graphic shows an example of the Buderus WLW276 / Bosch CS3000 AW in which the **Compressor envelope** (→ Fig. 13 [A], page 24), as well as the **Compressor envelope** with **Reduction of maximum heat pump flow temperature** (→ Fig. 13 [B], page 24) with a reduction of 5 K can be seen. The plant control will now only request flow temperatures that are within the range of the reduction.

i

Recommendation: Limit the maximum flow temperature to 48 °C in continuous operation to avoid disproportionate wear and inefficient operation of the heat pump.

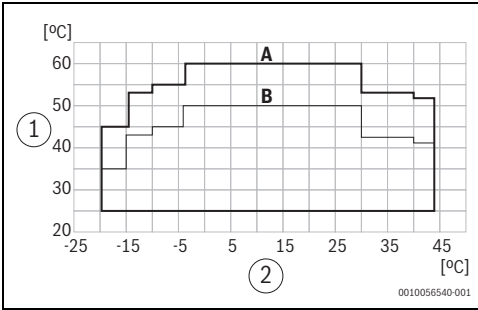


Fig. 13 Reduction of maximum heat pump flow temperature

- [1] Outside temperature
- [2] Flow temperature
- [A] Compressor envelope
- [B] Compressor envelope with Reduction of maximum heat pump flow temperature

7.4.2 Supply temperature limitation via Custom envelope

Max. supply temperature: Specifies the limitation of the maximum flow temperature via a set temperature value.

Min. supply temperature: Specifies the limitation of the minimum flow temperature via a set temperature value. The **Compressor envelope** is not considered in this function. The plant control limits the heat demand temperature to the temperatures configured by the user (grey area in the diagram). The minimum and maximum ambient temperature (vertical lines in the envelope) are also not considered when limiting the required temperature.

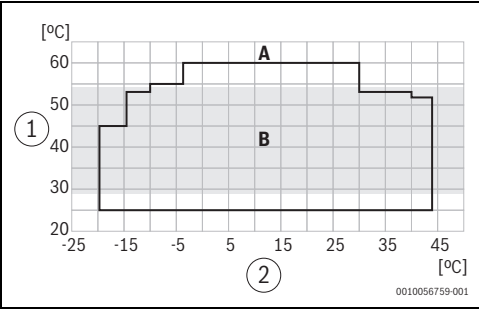


Fig. 14 Supply temperature limitation via Custom envelope

- [1] Outside temperature
- [2] Flow temperature
- [A] Compressor envelope
- [B] defined range (minimum and maximum values)

Example:  
Demand Flow temperature = 60 °C  
Outside temperature = -20 °C

**Compressor envelope [A]:** the heat pump can only reach 45 °C

With this configuration (max. and min. limitation), the heat pump will achieve the flow temperature that it can provide in all areas where the envelope is below the defined maximum value. However, this means that, in contrast to Supply temperature limitation via Custom envelope in the areas an outside temperature -10 °C and an outside temperature higher then 30 °C, it works at the heat pump's output limit.

i

Recommendation: Limit the maximum flow temperature to 48 °C in continuous operation to avoid disproportionate wear and inefficient operation of the heat pump.



## 7.5 Sensitive return valve/ buffer bypass

The valve **SWE** is used to control, based on the water temperature of the system return flow, which is determined by the sensor **FAR**, and the specifications of the parametrisation, where the system return flow should be directed in order to

operate the heat pump/system efficiently. The temperature of the system return **FAR** is compared with the selected buffer value **FPO**, **FPM** or **FPU**. In doing so, the values for hysteresis and offset are taken into account for the measured values in order to prevent the valve from switching too frequently.

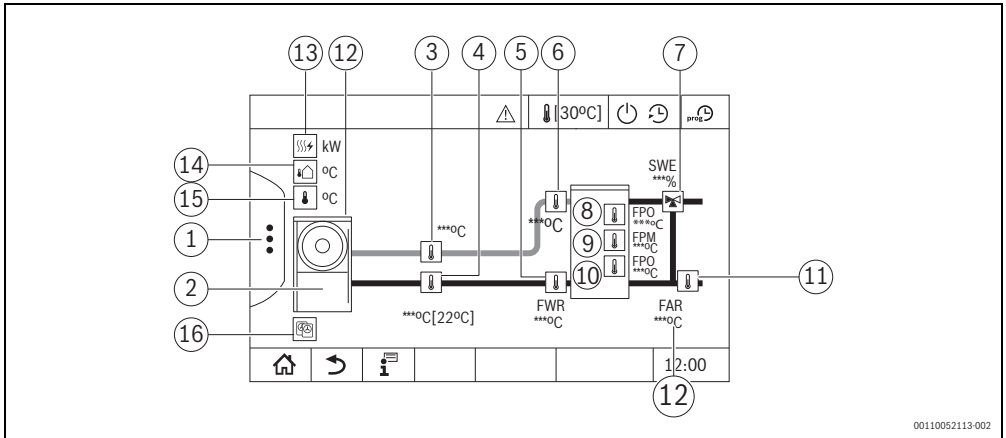


Fig. 15

- [1] Advanced functions
- [2] Heat pump (representation depending on the type of heat pump used or heat pump cascade)
- [3] Heat pump flow temperature
- [4] Heat pump return temperature
- [5] Heat pump return temperature, system sensor FWR
- [6] Heat pump flow temperature, system sensor FWW
- [7] **Sensitive return valve/ buffer bypass**
- [8] <Buffer cylinder temperature top FPO and heat pump demand
- [9] Buffer cylinder temperature centre FPM
- [10] Buffer cylinder temperature bottom FPU
- [11] System return temperature FAR
- [12] Heat pump status display:  
Green = HMI status OK  
yellow = HMI status Warning  
Red = HMI status Fault  
No display = Modbus communication is not yet established
- [13] Output - Heat | Electric
- [14] **Outside temperature**
- [15] **HP control temperature** And heat pump temperature demand
- [16] **Number of heat pumps in the cascade**

The following control characteristic occurs in the 3 possible operating modes:

### Mode Standard mode

The efficiency as well as the share of the heat pump mainly depends on the return and flow temperatures at the heat pump. To increase the efficiency and also the share of the heat pump, the return to the heat pump should be as low as possible within the operating limits of the heat pump. Since the return to the heat pump comes from the buffer cylinder, the temperature in the buffer cylinder should only be increased by the heat pump. Normal operating mode (**SWE** = 100%): The flow from the buffer is routed to the heating circuits and the return from the heating circuits to the buffer

Example:

- Return **FAR** = 30 °C
- Reference sensor selected: **FPU**
- Temperature at selected reference sensor **FPU**: 35 °C
- Switching differential to inject buffer selected: -2K
- Comparison: **FAR** ≤ **FPU** + Switching differential to inject buffer selected

30 °C ≤ 35 °C + (-2 K)? → Yes, **FAR** is smaller, supply and return flow run in normal operating mode.

### Mode Bypass

In some cases, the temperature of the system return of the heating circuits is higher than the buffer temperature (e.g. fresh water station in circulation mode, DWH during thermal disinfection, etc.). If the system return is now routed into the buffer, it heats up, which is not desired and must be avoided.

The system return must therefore be routed past the buffer cylinder of the heat pump.

For this purpose, the 3-way valve **SWE** is used to divert the system return directly into the flow of the consumer.

Bypass Mode (**SWE** = 0%): The flow from the buffer is routed into the heating circuits and the return from the heating circuits is routed past the buffer and into the flow of the heating circuits.

Example:

- Return **FAR** = 40 °C
- Reference sensor selected: **FPU**
- Temperature at selected reference sensor **FPU**: 35 °C
- Switching differential to inject buffer selected: -2 K
- Switching hysteresis to bypass buffer: 4K
- Comparison: **FAR** ≤ **FPU** + Switching differential to inject buffer + Switching hysteresis to bypass buffer selected

40 °C ≤ 35 °C + (-2 K) + 4 K? → No, the temperature of the return flow **FAR** is higher, so the return flow is routed past the buffer.

### Inverted logic mode

If the parameter Ensure minimum temperature via system return flow= active, a heat request can be triggered (e.g. when the set value **Heat demand if buffer temperature lower than** or the set value **Heat demand by outside temperature** is reached). Now the **SWE** valve is no longer used to bypass the warmer return temperature from the system return to the buffer. The warmer return flow from the system is directed to the buffer to heat it up again (additional protection against freezing of the pipes). If frost protection is active and the mode Inverted logic is in operation, the snowflake appears on the valve in the hydraulic overview of the HMI.

Example:

- Ensure minimum temperature via system return flow= Active
- An antifreeze case has occurred
- Return **FAR** = 30 °C
- Reference sensor selected: **FPU**
- Temperature at selected reference sensor **FPU**: 10 °C
- Switching differential to inject buffer selected: -2K
- Comparison: **FAR** ≤ **FPU** + Switching differential to inject buffer selected

30 °C ≤ 10 °C + (-2 K)? → No, **FAR** is greater. Normally, the system return would now be fed into the buffer, but the inverted logic mode with setting Ensure minimum temperature via system return flow is active

Example:

- Ensure minimum buffer temperature= Active

- Ensure minimum temperature via system return flow= Active
- **Heat demand if buffer temperature lower than 25 °C** (an FPO, FPM or FPU)
- **Outside temperature** < 15 °C

Selected buffer sensors + hysteresis for switching off > 28 °C?  
à The heat demand to **SWE** is taken away.

## 7.6 Smart Grid / Energy supplier contacts



The heat pumps have the option of switching a smart grid/ energy supplier functionality via input contacts on the heat pump. The operating states are read out by the Logamatic 5000 / Control 8000 and displayed graphically in the header and in the monitor data.

The following states are possible:

- **Energy-efficient normal mode:**  
operation of the heat pump is currently not influenced by the smart grid/energy supplier function.
- **Boosted mode:**  
in this operating state, the heat pump runs in boosted mode within the controller. Whether and how high the boost is depends on the heat pump and must be configured on the heat pump control unit. The boost must be selected in such a way that superheating of the heating system is prevented.
- **Definite start command:**  
this is a definitive start-up command, provided it is possible within the scope of the control settings. Whether and how high the boost is depends on the heat pump and must be configured on the heat pump control unit. The boost must be selected in such a way that superheating of the heating system is prevented. In addition, (optional) electric booster heaters are frequently enabled in this operating state.
- **Energy supplier block:**  
operation of the heat pump is blocked for a certain time. For the heat pump Buderus WLW286 / Bosch CS5000 AW, this operating state can also be a reduced operation. In this case, the heat pump continues to operate with a reduced setpoint. For detailed information on the behaviour → Heat pump documentation.

## 8 Fault displays for qualified persons

To call up the Notification history:

- Call up **Service menu**.
- In the **Service menu**, tap the  symbol.
- Tap  symbol.

The **Notification history** menu shows the faults and service displays of the heating system. The user interface shows only the faults and service displays of the selected heat source.

If more faults and service displays than can be displayed on one page exist, you can scroll through the pages via the arrows in the footer.

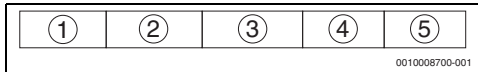


Fig. 16 Notification history

- [1] Incident ID
- [2] Occurred (date, time), specifies when the fault occurred.
- [3] Eliminated (date, time), specifies when the fault ceased to exist.
- [4] Component specifies the component where the fault occurred.
- [5] Display text, describes the type of fault.

Fault	Effect on the control characteristics	Cause	Remedy
Internal fault	Undefined, depends on the fault type.	Internal software fault.	<ul style="list-style-type: none"> <li>► Replace module or control unit.</li> <li>► Contact the Service team.</li> </ul>
Flow temperature sensor heat source (FWV) defective	<ul style="list-style-type: none"> <li>• Emergency cooling is activated with manual heat sources.</li> <li>• An automatic heat source is switched off.</li> </ul>	<ul style="list-style-type: none"> <li>• The temperature sensor is faulty.</li> <li>• The temperature sensor is incorrectly connected.</li> <li>• Module or control unit is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>► Check the FWV sensor electrical connection on the module.</li> <li>► Check the temperature sensor in the alternative heating appliance for damage or incorrect positioning.</li> <li>► Check the device fuse.</li> </ul>

### 8.1 Unit troubleshooting

The fault history depends on the modules used.

Faults caused by the control unit, are automatically deleted once the fault has been rectified.

Faults caused by the burner control unit of the heat source must be reset at the control or the heat source, depending on the type of fault:

- The documents for the heat source must be observed.

Record the following data for those faults, which you can not rectify yourself:

- Control unit type on the data plate
- Software version

## Fault displays for qualified persons

Fault	Effect on the control characteristics	Cause	Remedy
Return temperature sensor heat source (FWR) defective	<ul style="list-style-type: none"> <li>No return temperature control</li> <li>The mixer opens fully.</li> </ul>	<ul style="list-style-type: none"> <li>The temperature sensor is faulty.</li> <li>The temperature sensor is incorrectly connected.</li> <li>Module or control unit is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Check the FWR sensor electrical connection on the module.</li> <li>Check the temperature sensor in the return of the alternative heating appliance for damage or incorrect installation position.</li> <li>Check the device fuse.</li> </ul>
System return temperature sensor (FAR) defective	<ul style="list-style-type: none"> <li>No bypass circuit</li> <li>There is constant flow either through the buffer cylinder or through the heat source.</li> </ul>	<ul style="list-style-type: none"> <li>The temperature sensor is faulty.</li> <li>The temperature sensor is incorrectly connected.</li> <li>Module or control unit is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Check the FAR sensor electrical connection on the module.</li> <li>Check the temperature sensor in the return of the heating system for damage or incorrect positioning.</li> <li>Check the device fuse.</li> </ul>
Temperature sensor buffer top (FPO) defective	<ul style="list-style-type: none"> <li>If the temperature sensor is not installed, the automatic heating appliance will be shut down when it is supposed to heat up a buffer cylinder.</li> <li>The dual-purpose cylinder function is no longer considered for the standard heat source.</li> </ul>	<ul style="list-style-type: none"> <li>The temperature sensor is faulty.</li> <li>The temperature sensor is incorrectly connected.</li> <li>Module or control unit is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Check the FPO sensor electrical connection on the module.</li> <li>Check the temperature sensor in or on the top buffer cylinder for damage or incorrect positioning.</li> <li>Check the device fuse.</li> </ul>
Temperature sensor buffer mid (FPM) defective	<ul style="list-style-type: none"> <li>If the temperature sensor is not installed, the automatic heating appliance will be shut down when it is supposed to heat up a buffer cylinder.</li> </ul>	<ul style="list-style-type: none"> <li>The temperature sensor is faulty.</li> <li>The temperature sensor is incorrectly connected.</li> <li>Module or control unit is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Check the FPM sensor electrical connection on the module.</li> <li>Check the temperature sensor at the centre of the buffer cylinder for damage or incorrect positioning.</li> <li>Check the device fuse.</li> </ul>
Temperature sensor buffer bottom (FPU) defective	<ul style="list-style-type: none"> <li>If the temperature sensor is not installed, the automatic heating appliance will be shut down when it is supposed to heat up a buffer cylinder.</li> <li>The dual-purpose cylinder function is no longer considered for the standard heat source.</li> </ul>	<ul style="list-style-type: none"> <li>The temperature sensor is faulty.</li> <li>The temperature sensor is incorrectly connected.</li> <li>Module or control unit is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Check the FPU sensor electrical connection on the module.</li> <li>Check the temperature sensor on the bottom buffer cylinder for damage or incorrect positioning.</li> <li>Check the device fuse.</li> </ul>

Fault	Effect on the control characteristics	Cause	Remedy
Communication fault	<ul style="list-style-type: none"> <li>The system cannot correctly support the required function.</li> </ul>	<ul style="list-style-type: none"> <li>There is a fault in the communication with the heat source.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check the configuration and wiring.</li> <li>▶ Check the module.</li> <li>▶ Replace the faulty part.</li> </ul>
Manual mode internal	<ul style="list-style-type: none"> <li>The manual mode is active.</li> <li>There is no control behaviour.</li> <li>The system is operated/ controlled according to the user's specifications.</li> </ul>	<ul style="list-style-type: none"> <li>Selected by the user</li> </ul>	
Heat pump ambient temperature sensor defective	<ul style="list-style-type: none"> <li>If the temperature sensors are defective, no value can be determined.</li> <li>Control is no longer possible.</li> </ul>		<ul style="list-style-type: none"> <li>▶ Perform error analysis.</li> <li>▶ Check contacts.</li> <li>▶ Replace sensor.</li> </ul>
Heat pump return temperature sensor defective	<ul style="list-style-type: none"> <li>If the temperature sensors are defective, no value can be determined.</li> <li>Control is no longer possible.</li> </ul>		<ul style="list-style-type: none"> <li>▶ Perform error analysis.</li> <li>▶ Check contacts.</li> <li>▶ Replace sensor.</li> </ul>
Heat pump flow temperature sensor defective	<ul style="list-style-type: none"> <li>If the temperature sensors are defective, no value can be determined.</li> <li>Control is no longer possible.</li> </ul>		<ul style="list-style-type: none"> <li>▶ Perform error analysis.</li> <li>▶ Check contacts.</li> <li>▶ Replace sensor.</li> </ul>
Warning heat pump unit	<ul style="list-style-type: none"> <li>The warning has no effect on the control behaviour.</li> <li>The LED is displayed in yellow.</li> </ul>	<ul style="list-style-type: none"> <li>Manual operation</li> </ul>	
Fault heat pump unit	<ul style="list-style-type: none"> <li>The heat pump is not available.</li> </ul>	<ul style="list-style-type: none"> <li>The sensor is defective.</li> <li>Communication with the heat pump is interrupted.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Analyse error pattern.</li> <li>▶ Tap  in the header. The fault display opens.</li> </ul>
Manual mode Heat pump			
Heat pump control temperature sensor defective			
Manual operation buffer return flow control valve (SWE)			

Table 11 Fault displays at the control unit

## 9 Recommended hydraulic schemes



The recommended hydraulics are schematic representations only and show a selection of the hydraulic systems which are possible with this module. For the sake of clarity, some hydraulic components that may be required (e.g. pressure relief valves or expansion vessels) have deliberately not been included.

---

The hydraulic schemes shown are tailored to the type of heat source.

- Check whether the selected hydraulics is compatible with the heat source used.
- Check whether the system components used (e.g. buffer cylinder) are compatible with the heat source used.

Corresponding parameters are listed for each hydraulic scheme.

Further hydraulic examples (without parameters) than those shown here can be found at the following web address:  
<https://buderus-de-de.boschtt-documents.com/hdb/>



**Please note:** the numbers in the No. column are only provided in order to explain the hydraulic schemes shown. They have no reference to parameters in the software.

---



The following parameters applies exclusively to the hydraulics represented. Individual hydraulics and systems planned in-house require an adapted parameters.

---



The abbreviations used in the hydraulic schemes are defined in → Chapter 9.4, page 39.

---

### Heat source settings

The settings of the heat source and system are made in the service menu under **Heat production > Alternative heat source (AHS)**

### Settings of schedules

The settings for the schedules are made in the main menu under **Main menu > Heat production > 2nd/primary/alternative heat source > Program > Custom.**

## 9.1 Bivalent hydraulics with Buderus WLW276 / Bosch CS3000 AW high and low temperature buffer cylinder, LOAD plus and Hybrid Injection Technology

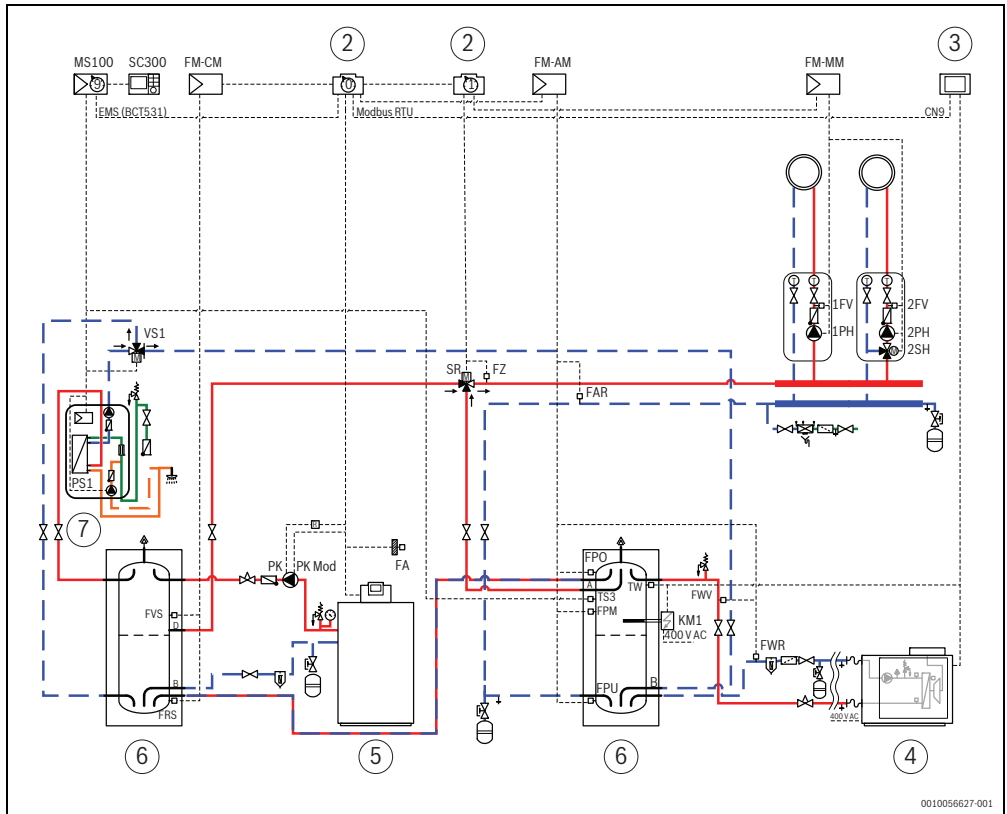


Fig. 17 Bivalent hydraulics with Buderus WLW276 / Bosch CS3000 AW

- [2] Control unit 5313/8313
- [3] HMI of the heat pump
- [4] Heat pump Buderus WLW276 / Bosch CS3000 AW
- [5] Floor standing condensing heating appliance
- [6] System buffer cylinder
- [7] Fresh water station
- [8] E156/TH3500
- [9] Heat pump Buderus WLW286 / Bosch CS5000 AW
- [10] EKR module
- [11] Control unit of the E156/ TH3500 (on the appliance)

## Recommended hydraulic schemes

No.	Settings in the service menu	Parameters	Adjustment	Description
1	Default setting	Modbus unit ID	1	
2		Heat pump cascade active	No	
3		Number of heat pumps	–	Not relevant, hidden
4		Capacity reference heat pump	–	Not relevant, hidden
5		Capacity heat pump	–	Not relevant, hidden
6		Heat pump temperature spread flow to return temperature	–	Not relevant, hidden
7		Temperature difference heat pump/ buffer storage	0 K	
8		Supply temperature limitation via	<b>Compressor envelope</b>	
9		Reduction of maximum heat pump flow temperature	5 K	Reduction of the curve
10		Max. supply temperature	–	Not relevant, hidden
11		Min. supply temperature	–	Not relevant, hidden
12	System Settings	Source of demand	Weekly scheduler	
13		Bivalent operation	On	
14		Heat pump operation strategy	<b>Parallel</b>	
15		Bivalence point	3 °C	
16		Hysteresis for bivalence point	1 K	
17		<b>Shut off point heat pump</b>	–	Not relevant, hidden
18		Hysteresis for bivalence shut off point	–	Not relevant, hidden
19		Boiler block due to setpoint jump	Off	
20		Boiler block due to setpoint jump	–	Not relevant, hidden
21		Boiler delay time due to setpoint increase	–	Not relevant, hidden
22		Deactivate boiler block due to outside temperature	Off	
23		Outside temperature threshold to deactivate boiler block	–	Not relevant, hidden
24		Hysteresis to reactivate the boiler block	–	Not relevant, hidden
25		Enable boiler when setpoint is not reached	–	Not relevant, hidden
26		<b>Maximum acceptable temperature deviation before enabling boiler</b>	–	Not relevant, hidden
27		Hysteresis to reactivate boiler block	–	Not relevant, hidden



No.	Settings in the service menu	Parameters	Adjustment	Description
28	Defrost settings	Ensure minimum buffer temperature	<b>Yes</b>	
29		Ensure minimum temperature via system return flow	–	Not relevant, hidden
30		Heat demand if buffer temperature lower than	25 °C	
31		<b>Hysteresis to deactivate heat demand</b>	3 K	
32		Choice of outside temperature	System	
33		Heat demand by outside temperature	15 °C	
34		Hysteresis for heat demand by outside temperature	2 K	
35	Hydraulic integration	Type of buffer integration	<b>Direct/without valve (SWE)</b>	Realisation via HIT function
36		Buffer reference sensor for sensitive return valve	–	Not relevant, hidden
37		Switching differential to inject buffer	–	Not relevant, hidden
38		Switching hysteresis to bypass buffer	–	Not relevant, hidden
39		Actuator runtime sensitive return	–	Not relevant, hidden

Table 12 Settings in the main menu

[illegible]

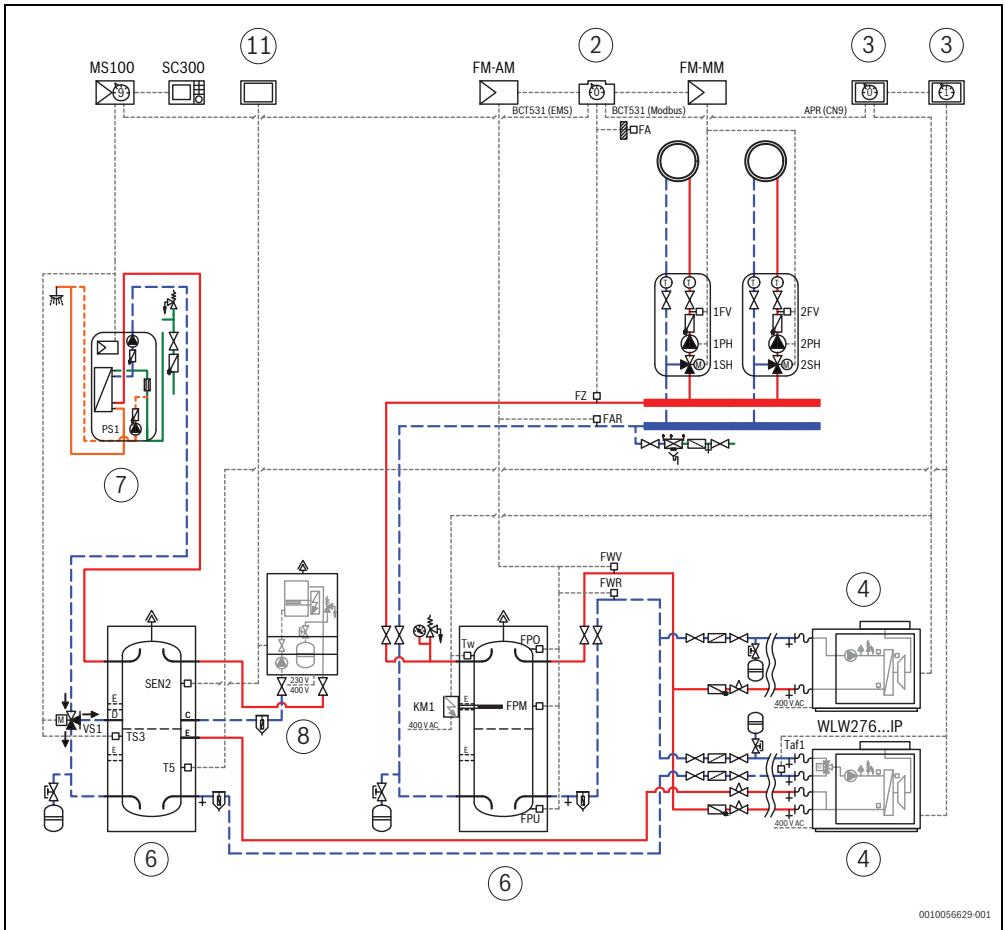
No.	Settings in the service menu	Parameters	Adjustment	Description
1	Default setting	Modbus unit ID	1	
2		Heat pump cascade active	No	
3		Number of heat pumps	–	Not relevant, hidden
4		Capacity reference heat pump	–	Not relevant, hidden
5		Capacity heat pump	17 kW <b>22 kW</b> 38 kW	according to the size of the heat pump used
6		Heat pump temperature spread flow to return temperature	5 K	
7		Temperature difference heat pump/ buffer storage	0 K	
8		Supply temperature limitation via	<b>Compressor envelope</b>	
9		Reduction of maximum heat pump flow temperature	5 K	Reduction of the curve
10		Max. supply temperature	–	Not relevant, hidden
11		Min. supply temperature	–	Not relevant, hidden
12	System Settings	Source of demand	Weekly scheduler	
13		Bivalent operation	On	
14		Heat pump operation strategy	<b>Parallel</b>	
15		Bivalence point	3 °C	Depending on the size of the heat pump design
16		Hysteresis for bivalence point	1 K	
17		<b>Shut off point heat pump</b>	–	Not relevant, hidden
18		Hysteresis for bivalence shut off point	–	Not relevant, hidden
19		Boiler block due to setpoint jump	Off	
20		Boiler block due to setpoint jump	–	Not relevant, hidden
21		Boiler delay time due to setpoint increase	–	Not relevant, hidden
22		Deactivate boiler block due to outside temperature	Off	
23		Outside temperature threshold to deactivate boiler block	–	Not relevant, hidden
24		Hysteresis to reactivate the boiler block	–	Not relevant, hidden
25		Enable boiler when setpoint is not reached	–	Not relevant, hidden
26		<b>Maximum acceptable temperature deviation before enabling boiler</b>	–	Not relevant, hidden
27		Hysteresis to reactivate boiler block	–	Not relevant, hidden

Recommended hydraulic schemes

No.	Settings in the service menu	Parameters	Adjustment	Description
28	Defrost settings	Ensure minimum buffer temperature	<b>Yes</b>	
29		Ensure minimum temperature via system return flow	–	Not relevant, hidden
30		Heat demand if buffer temperature lower than	25 °C	
31		<b>Hysteresis to deactivate heat demand</b>	3 K	
32		Choice of outside temperature	System	
33		Heat demand by outside temperature	15 °C	
34		Hysteresis for heat demand by outside temperature	2 K	
35	Hydraulic integration	Type of buffer integration	<b>Direct/without valve (SWE)</b>	Realisation via HIT function
36		Buffer reference sensor for sensitive return valve	–	Not relevant, hidden
37		Switching differential to inject buffer	–	Not relevant, hidden
38		Switching hysteresis to bypass buffer	–	Not relevant, hidden
39		Actuator runtime sensitive return	–	Not relevant, hidden

Table 13 Settings in the main menu

### 9.3 Monoenergetic hydraulics with cascade Buderus WLW276 / Bosch CS3000 AW, high and low temperature buffer cylinder



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Fig. 19 Monoenergetic hydraulics with Cascade Buderus WLW276 / Bosch CS3000 AW

- [2] Control unit 53138313
- [3] HMI of the heat pump
- [4] Heat pump Buderus WLW276 / Bosch CS3000 AW
- [6] System buffer cylinder
- [7] Fresh water station
- [8] E156/TH3500
- [11] Control unit of the E156/ TH3500 (on the appliance)

## Recommended hydraulic schemes

No.	Settings in the service menu	Parameters	Adjustment	Description
1	Default setting	Modbus unit ID	1	
2		Heat pump cascade active	<b>Yes</b>	
3		Number of heat pumps	2	
4		Capacity reference heat pump	–	Not relevant, hidden
5		Capacity heat pump	–	Not relevant, hidden
6		Heat pump temperature spread flow to return temperature	–	Not relevant, hidden
7		Temperature difference heat pump/ buffer storage	0 K	
8		Supply temperature limitation via	<b>Compressor envelope</b>	
9		Reduction of maximum heat pump flow temperature	5 K	Reduction of the curve
10		Max. supply temperature	–	Not relevant, hidden
11		Min. supply temperature	–	Not relevant, hidden
12	System Settings	Source of demand	System	
13		Bivalent operation	Off	
14		Heat pump operation strategy	–	Not relevant, hidden
15		Bivalence point	–	Not relevant, hidden
16		Hysteresis for bivalence point	–	Not relevant, hidden
17		<b>Shut off point heat pump</b>	–	Not relevant, hidden
18		Hysteresis for bivalence shut off point	–	Not relevant, hidden
19		Boiler block due to setpoint jump	Off	
20		Boiler block due to setpoint jump	–	Not relevant, hidden
21		Boiler delay time due to setpoint increase	–	Not relevant, hidden
22		Deactivate boiler block due to outside temperature	–	Not relevant, hidden
23		Outside temperature threshold to deactivate boiler block	–	Not relevant, hidden
24		Hysteresis to reactivate the boiler block	–	Not relevant, hidden
25		Enable boiler when setpoint is not reached	No	Not relevant, hidden
26		<b>Maximum acceptable temperature deviation before enabling boiler</b>	–	Not relevant, hidden
27		Hysteresis to reactivate boiler block	–	Not relevant, hidden

No.	Settings in the service menu	Parameters	Adjustment	Description
28	Defrost settings	Ensure minimum buffer temperature	<b>Yes</b>	
29		Ensure minimum temperature via system return flow	No	
30		Heat demand if buffer temperature lower than	25 °C	
31		<b>Hysteresis to deactivate heat demand</b>	3 K	
32		Choice of outside temperature	System	
33		Heat demand by outside temperature	15 °C	
34		Hysteresis for heat demand by outside temperature	2 K	
35	Hydraulic integration	Type of buffer integration	<b>Direct/without valve (SWE)</b>	Realisation via HIT function
36		Buffer reference sensor for sensitive return valve	–	Not relevant, hidden
37		Switching differential to inject buffer	–	Not relevant, hidden
38		Switching hysteresis to bypass buffer	–	Not relevant, hidden
39		Actuator runtime sensitive return	–	Not relevant, hidden

Table 14 Settings in the main menu

## 9.4 Abbreviations

Abbreviation	Designation	Function
APR (CN9)	Terminal for connecting Modbus RTU	
EMS	EMS- terminal on the BCT 531 in the	
FA	Outside temperature sensor	
FAR	System return temperature sensor	Reference sensor for serial or buffer bypass circuits. Controls whether flow is through the alternative heating appliance or the buffer cylinder based on the buffer differential temperature.
FM-AM	Function module, alternative heating appliance	
FM-CM	Function module, cascade module	
FM-MM	Function module, heating circuit module	
FPM	Buffer cylinder centre temperature sensor	This sensor is used to start an automatic , alternative heating appliance during buffer cylinder heating.
FPO	Buffer cylinder top temperature sensor	Controls whether flow is through the buffer cylinder (if buffer cylinder is installed) based on temperatures.
FPU	Buffer cylinder bottom temperature sensor	Switches off buffer cylinder heating in combination with automatic , alternative heating appliances. Temperature-differential controlled actuation of the PWE buffer cylinder heating pump in combination with manual alternative heating appliances (together with the FWV temperature sensor).

Recommended hydraulic schemes

Abbreviation	Designation	Function
FRS	Return temperature sensor strategy	Controls the operating conditions of a system containing several heat sources. Definition of the point of heat transfer from heating system to heat source (system return).
FV	Flow temperature sensor for heating circuit	
FVS	Flow temperature sensor strategy	Controls the operating conditions of a system containing several heat sources. Definition of the point of heat transfer from heat source to heating system (system flow).
FWR	Return temperature sensor on heat source	Safeguarding operating conditions of the alternative heating appliance in case of return temperature control of the alternative heating appliance.
FWV	Heat source flow temperature sensor	Temperature detection of the alternative heating appliance Detection is required if parameters have been set for a heat source.
FZ	Additional sensor	
KM1	Heater rod connection	
LWPM410	Extension module for the heat pump manager	For data transmission via Modbus RTU interface protocol to higher-level control systems.
Modbus RTU	Communication protocol	
PH	Heat carrier pump	
PK	Boiler circulation pump	
PK Mod	Modulation connection of the boiler circulation pump	
PS	Cylinder primary pump	
R1	External sensor heat pump	
SEN2	Additional sensor on terminal B9/B10 of E156/TH3500	
SH	Heating circuit actuator	
SR	Actuator return HIT valve (Hybrid Injection Technology), connected to the SR terminal	
SWE	Actuator integration of the alternative heating appliance	
SWR	Actuator return of the alternative heating appliance	
T5	Heat pump DHW sensor	
TS3	Fresh water station sensor	For temperature-sensitive return feed-in
TW	Heat pump sensor	
VS1	Diverter valve for temperature-sensitive return feed of fresh water station	
WPM100	Heat pump manager	

Table 15 Abbreviations



# 10 Environmental protection and disposal

Environmental protection is a fundamental corporate strategy of the Bosch Group.

The quality of our products, their economy and environmental safety are all of equal importance to us and all environmental protection legislation and regulations are strictly observed. We use the best possible technology and materials for protecting the environment taking account of economic considerations.

## Packaging

Where packaging is concerned, we participate in country-specific recycling processes that ensure optimum recycling. All of our packaging materials are environmentally compatible and can be recycled.

## Old electrical and electronic appliances



This symbol means that the product must not be disposed of with other waste, and instead must be taken to the waste collection points for treatment, collection, recycling and disposal.

The symbol is valid in countries where waste electrical and electronic equipment regulations apply, e.g. "(UK) Waste Electrical and Electronic Equipment Regulations 2013 (as amended)". These regulations define the framework for the return and recycling of old electronic appliances that apply in each country.

As electronic devices may contain hazardous substances, it needs to be recycled responsibly in order to minimize any potential harm to the environment and human health. Furthermore, recycling of electronic scrap helps preserve natural resources.

For additional information on the environmentally compatible disposal of old electrical and electronic appliances, please contact the relevant local authorities, your household waste disposal service or the retailer where you purchased the product.

You can find more information here:

[www.bosch-homecomfortgroup.com/en/company/legal-topics/weee/](http://www.bosch-homecomfortgroup.com/en/company/legal-topics/weee/)

# 11 Appendix

## 11.1 Specifications for FM-AM

	Unit	Value
Operating voltage (at 50 Hz $\pm$ 4 %)	V AC	230 (+10 %/-15 %)
Power consumption	W	1
Mixing valves (SWE, SWR) <ul style="list-style-type: none"> <li>Max. switching current</li> <li>Activation</li> <li>Recommended servomotor running time</li> </ul>	A V s	5 230 three-point stepper controller (PID characteristics) 120 (adjustable 6...600)
Maximum switching current <ul style="list-style-type: none"> <li>Pump output, automatic heating appliance</li> <li>Output WE-ON</li> </ul>	A A	5 5
Temperature sensors <ul style="list-style-type: none"> <li>NTC sensor O</li> </ul>	mm	9
Low voltage <ul style="list-style-type: none"> <li>Output WE-ON<sup>1)</sup></li> </ul>	V DC mA	5 10
Ambient temperatures <ul style="list-style-type: none"> <li>Operating</li> <li>Transport and storage</li> </ul>	°C °C	+5...+50 -20...+60
Max. humidity	%	75

1) If the WE-ON output is used for a low voltage circuit, a 230 V circuit must not be switched by this output beforehand.

Table 16 Specifications for FM-AM

11.2 Sensor curves

**DANGER**

**Danger to life due to electric shock!**

Before opening the device:

- ▶ Isolate the mains voltage.
- ▶ Secure against unintentional reconnection.

Checking fault:

- ▶ Remove sensor terminals.
- ▶ Check the resistance at the temperature sensor cable ends using an ohmmeter.
- ▶ Check the temperature at the temperature sensor with a thermometer.

The following tables show whether the temperature and electrical resistance value correspond.



The sensor tolerance for all curves is  $\pm 3\%$  at  $25\text{ }^{\circ}\text{C}$ .

**Resistance values for buffer temperature sensors FPO, FPM, FPU, system temperature sensor FAR, system sensor FWV, FWR**

Temperature [ $^{\circ}\text{C}$ ]	Resistance [ $\Omega$ ]
-40	332100
-35	240000
-30	175200
-25	129300
-20	95893
-15	72228
-10	54889
-5	42069
0	32506
5	25313
10	19860
15	15693
20	12486
25	10000
30	8060
35	6536
40	5331
45	4372
50	3605
55	2989

Temperature [ $^{\circ}\text{C}$ ]	Resistance [ $\Omega$ ]
60	2490
65	2084
70	1753
75	1480
80	1258
85	1070
90	915
95	786
100	677
110	508
115	443
120	387

Table 17 Pressure drop values of 53xx temperature sensor

12 Glossary

**Floor standing heat source with / control 53xx/83xx**

Heat source whose burner is connected with the standardised 7-pole plug for stage 1 and the 4-pole plug for stage 2 or for modulation to the Logamatic 5000 / Control 8000 control unit series.

**Operation in series**

If the alternative heat source, or the buffer cylinder heated by the alternative heat source, is hotter than the system return, that heat source will be integrated as a means of return temperature increase for the standard heat source during operation in series.

**Standard heat source**

Unlike alternative heat sources, standard heat sources are boilers or devices operated with fossil fuels, e.g. wall mounted gas condensing boilers or floor standing oil or gas boilers. These are heat generators that cannot be controlled directly via the FM-AM.





Original Quality by  
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