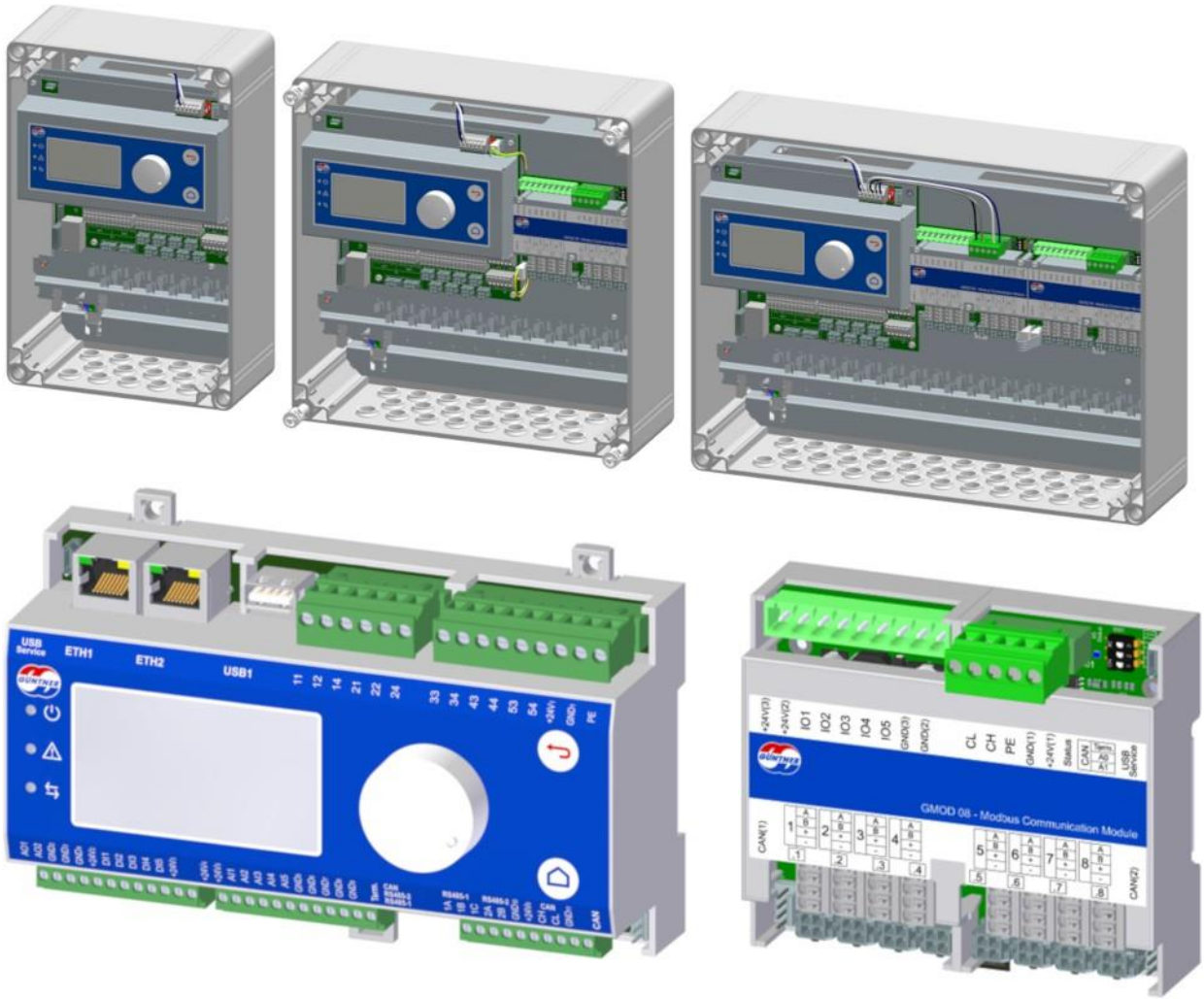
Operating instructions
Güntner Motor Management GMMnext



For management and speed control of EC fans

www.guentner.de

Contents

1 General notes

1.1 Safety information

In order to prevent serious physical injuries or major material damage, work on/with the units may only be performed by authorised persons with the appropriate training and qualifications who are familiar with the set-up, installation, commissioning and operation of speed controllers. These persons must read the operating instructions carefully before installing and commissioning the units. In addition to the instructions and national accident prevention regulations, all recognised technical rules (safety and professional work under UVV, VBG, VDE, etc.) must be followed.

Repairs to the unit may only be made by the manufacturer or a repair centre authorised by the manufacturer.

UNAUTHORISED AND IMPROPER INTERVENTIONS WILL INVALIDATE THE WARRANTY!

While the controller is open, hazardous electrical voltages are exposed; if the unit is open its protection class is IP00! The applicable national accident prevention regulations must be followed when working on controllers under voltage.

1.2 Intended use

Ensure that fuses are always replaced by fuses with the specified rating. Note that fuses should never be repaired or bridged. Only a double-pole circuit tester may be used to check that the unit is free of voltage. The unit is intended only for the purposes agreed in the order confirmation. Any other application or use for any additional purpose, is not a proper intended use. The manufacturer accepts no liability for any injury or damage arising from unintended use. Use according to the intended purpose is also contingent on compliance with the installation, operating and maintenance procedures described in these instructions. The technical data and the details of the connection assignments can be found on the name plate and in the instructions, and must be complied with.

Electronic equipment is not fundamentally failsafe! The user must therefore ensure that his system reverts to a safe condition in the event of failure of the unit. The manufacturer accepts no responsibility for any damage to life and limb or to material goods and assets in the event of failure to comply with this provision and in the event of improper use.

The electrical installation must be performed in accordance with the relevant regulations (e.g. wire cross-sections, fuses, earth conductor connections, etc.). Additional information is included in the documentation. If the controller is used in a particular area of application, the required standards and regulations must be complied with.

1.3 Commissioning notes

Prior to commissioning the controller, check whether any residual moisture (condensation) has formed in the casing. If so, the unit must be dried out. The same applies if the sachet of silica gel (desiccant) has discoloured as this indicates that the sachet of silica gel is no longer providing any protection against moisture. If there are large volumes of condensation (droplets on the interior walls and components), they must be removed manually. Once the unit has been commissioned for the first time, the power supply and the internal control voltage must no longer be switched off for a long period. If this should nevertheless be necessary for operational reasons, suitable moisture protection must be provided.

1.4 Description of functions

The GMMnext EC serves to control EC fans. The speed of the connected fans is adjusted depending on the control deviation between the actual value and the setpoint.

Depending on the model, up to 8, 16 or 24 EC fans can be controlled by the controller via separate bus segments. These fans must be set up for the condenser or dry cooler, depending on the design of the heat exchanger. These settings are necessary on initial commissioning and may need to be repeated when a fan is replaced. This commissioning process determines the performance and noise emissions.

The GMM automatically detects whether commissioning is necessary when it is switched on. If this is the case, it will jump to the commissioning menu and the user will be guided through the commissioning process.

The GMMnext EC has the following inputs and outputs:
- 5 analogue inputs (AI1 to AI5), each one variably configurable
- 2 analogue outputs (AO1 to AO2)
- 5 digital inputs (DI1 to DI5)
- 5 digital relay outputs (DO1+ DO2 changeover contacts, DO3 to DO5 closers).

The input and output profiles and functions can be set via the IO configuration menu and the corresponding functions. The digital inputs are designed for positive voltages of a nominal +24V.

NOTE

Please note that connecting the wrong voltage (e.g. 230V) may seriously damage the controller.

1.5 Classification

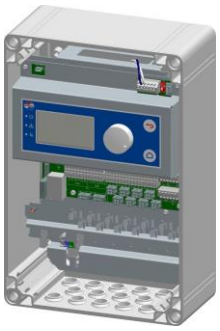
The GMMnext is available in a version for up to 24 fans in a closed IP54 casing. There is also an IP20 version for fixing to a DIN rail. A combination of a GMMnext Rail.1 controller and up to 3 GMOD 08 Rail.1 Modbus expansion modules are required for this.

Classification of the IP54 version

GMMnext EC/xx[.n]	
GMMnext EC	Güntner Motor Management for EC fans
xx	Number of possible connections for EC fans
.n	Hardware version: from .1: first approved hardware version

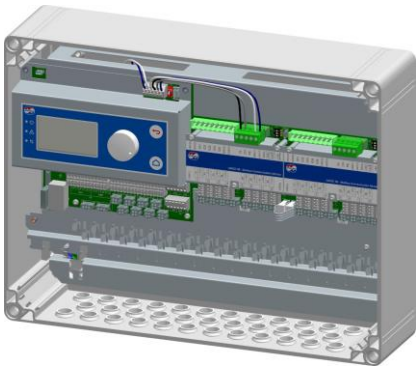
Versions:

GMMnext EC/08.1 = Controller and motor management for 8 EC fans



GMMnext EC/16.1= Controller and motor management for up to 16 EC fans

GMMnext EC/24.1= Controller and motor management for up to 24 EC fans

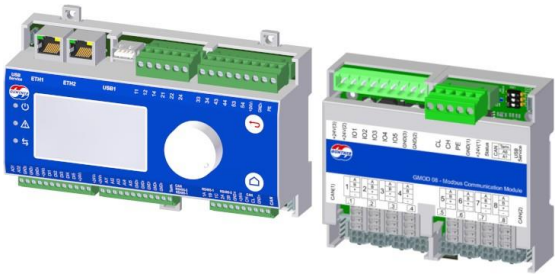


Classification of the IP20 version

GMMnext Rail EC/xx	
GMMnext Rail EC	Güntner Motor Management for EC fans for top-hat rail installation
xx	Number of possible connections for EC fans

Versions:

GMMnext Rail EC/08 + 1x GMOD 08



GMMnext Rail EC/16 + 2x GMOD 08

GMMnext Rail EC/24 + 3x GMOD 08

1.6 Transport and storage, copyright notes

The controllers are packaged appropriately for transport and may only be transported in their original packaging. Avoid any impacts and collisions. Unless otherwise noted on the packaging, the maximum stacking height is 4 packs. When you receive the unit, check for any damage to the packaging or the controller.

Store the unit in its original packaging and protected from the weather and avoid extremes of heat and cold.

Products are subject to technical changes in the interests of further development. Therefore, no claims may be derived from information, images and drawings; errors excepted!

1.7 Warranty and liability

The current General Terms and Conditions of Sales and Delivery of Güntner GmbH & Co. KG apply.

See the homepage at http://www.guentner.com

1.8 Manufacturer and shipping address

Should you have a problem with any of our units, or any questions, suggestions or special requests, simply contact

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1.9 EMC-compliant installation

Controllers in the GMMnext EC/xx series fulfil the requirements of EN 61000-6-2 as regards resistance to EMC interference and those of EN 61000-6-3 as regards emissions.

They also comply with standards IEC 61000-4-4/-5/-6/-11 for grid-bound interference.

In order to guarantee EM compatibility, the following points must be noted:

- The unit must be properly grounded (with at least 1.5 mm²).
- All measurement and signalling lines must be connected via shielded cables.
- A special cable, e.g. HELUKABEL DeviceNet PUR flexible 1x2xAWG24 + 1x2xAWG22 / 81910, must be used for bus wiring to the EC fans.
- The shielding of measuring, signal and bus lines must be earthed *at one end* only.
- Suitable shielding and routing measures must be taken to ensure that mains cables and motor cables do not cause any interference in signal and control lines.

NOTE

If the equipment is installed in a switch cabinet, the temperature inside the switch cabinet **must** be heeded. Sufficiently dimensioned switch cabinet ventilation is provided in Güntner switch cabinets.

2 Brief guide to quick commissioning

These pages contain the main information required for quick commissioning of the GMMnext.

THIS BRIEF GUIDE IS NOT A SUBSTITUTE FOR CAREFUL STUDY OF THE OPERATING INSTRUCTIONS!

Mains connection: *1) **L1** to **terminal** X0 **(grey)**

N to terminal X0 **(blue)**

PE to **terminal** X0 **(green/yellow)**

Fuses: *1) There are **no** exchangeable microfuses built into the GMMnext for semiconductor and motor protection. The unit must be protected by a factory-fitted C 6A automatic circuit breaker for each phase.

Fan connection: on the GMMnext Depending on the version, 1 to 24 bus outputs for the EC fans are provided at the connections X4, X14 and X24 (see Location of connections on the GMMnext EC/16, page 31):

Communication interface:	Terminal **A** and **B**
24V power supply for fan electronics:	Terminal **+** and **-**

*1) Only for the version in the closed IP54 casing

The fans are not powered from the GMMnext – they are wired in an external terminal box, e.g. on the GPD (Güntner Power Distribution).

The GMMnext has the following inputs and outputs:

- 5 analogue inputs (AI1 to AI5), each one variably configurable
- 2 analogue outputs (AO1 to AO2)
- 5 digital inputs (DI1 to DI5)
- 5 digital relay outputs (DO1 + DO2 changeover contacts, DO3 to DO5 closers)

The input and output functions can be set via the IO configuration menu. The digital inputs are designed for positive voltages of a nominal +24V.

Analogue inputs: on the GMMnext	**Pressure sensor** GSW 4003 GSW 4003.1	**1** (brown) on **+24V 2** (green) on **AIx** **2** (blue) on **AIx**
	Temperature sensor	**1** (white) on **AIx** **2** (brown) on **GND**
	Standard signal (0 ... 1V)	**Plus (+)** on **AIx Minus (-) on GND**

Signal outputs For details of signal output connections, see Inputs and outputs (IO interface), Page 35

Enable The default function of the input **DI1** is to enable the controller. The input must be connected to **+24V** for the controller to work and the fans to be able to turn!

Language The default language on delivery is **English**. The display language can be changed in the Language menu option.

Time The date and time must be set using the relevant menu options.

Once the above settings have been made, your GMMnext will normally be ready for use.

"Manual mode" can be selected to check that the GMMnext is functioning.
See Manual mode, Page 57.

When you deactivate manual mode after performing this test, the GMMnext will revert to the set operating mode.

Operating mode The GMMnext operates in different modes depending on the commissioning process.
See also Operating mode, Page 49.

Setback The speed of the fans can be limited, e.g. to limit noise emissions at night. This value is set in the night setback menu option. Night setback is activated either via the input (**DI2** by default) or via the timer which is programmed in the Night setback menu option.

Setpoint changeover It is possible to choose between two setpoints (e.g. for summer and winter operation). The switchover is effected by default via input **DI3** .

The "**Limitation**" and "**Setpoint changeover**" functions normally need to be activated in the Service menu.

3 Commissioning the GMMnext

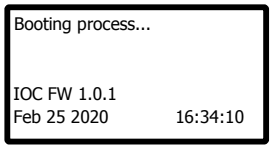
With the GMMnext, the fans are controlled via a bus. These fans must be set up and checked for use with the condenser or dry cooler, depending on the design of the heat exchanger. These settings and checks are necessary on initial commissioning and may need to be repeated when a fan is replaced. This commissioning process determines the performance of the heat exchanger and its noise emissions. The corresponding configurations for the heat exchanger are usually carried out ex works. However, the corresponding parameters may need to be entered again. You will find them in the attached wiring diagram or on a sticker on the heat exchanger itself.

The GMMnext automatically detects whether commissioning has taken place when it is switched on. If it has, the commissioning menu is skipped and normal operation continues.

3.1 Commissioning menu

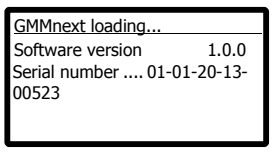
Switch on the power supply for the GMMnext. At the start of the boot process, the Güntner logo will appear for 5 seconds.

As booting progresses, the firmware version of the IO controller will be shown (approx. 25 seconds).



A black start screen with a cursor will then be shown for a short time (approx. 20 seconds).

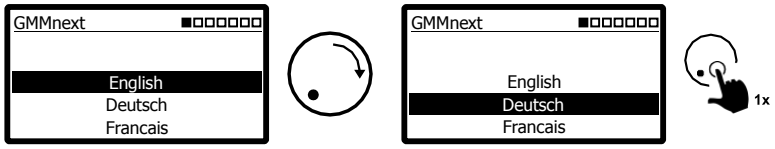
Each time that the system starts, the software version of the application that is starting as well as the serial number of the controller will be shown briefly.



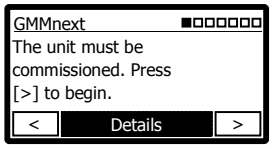
At the start of commissioning, the language for commissioning can be selected. This language setting is not permanent – it is only for commissioning. After commissioning, the default language for the menu is always English. The language can then be selected on a permanent basis in the Language menu.

The progress bar at the top right of the display shows your progress during commissioning.

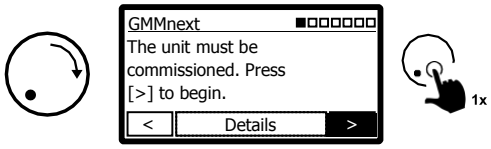
Use the rotary selection knob as well as the Back and Home buttons to navigate in the menu.



A note regarding commissioning will then be shown.

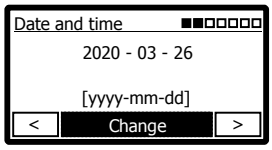


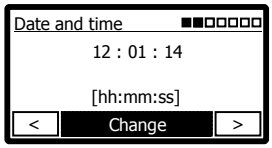
Please follow the instructions in the display. To start commissioning, scroll to the right [>].



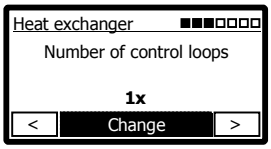
The system date and time are set first.

In the event of a power cut, the system clock will remain set for 4 -7 days depending on the external temperature. The system time may need to be set again (e.g. after the Güntner unit is delivered ex works until it is actually commissioned). Press [Change] or [>] to continue.

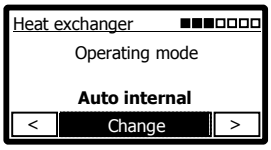




You will then be asked how many control loops are installed on the heat exchanger. Press [Change] or [>] to continue.



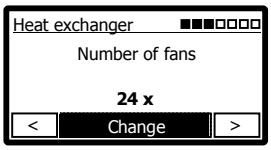
The next step involves setting the operating mode for the controller.



The following options can be selected:

Operating mode	Way of working
Auto internal	The controller records the actual temperature or pressure and adjusts it automatically to a setpoint which can be configured via the menu.
Auto external analogue	The controller records the actual temperature or pressure and adjusts it automatically to a setpoint which is set externally in an analogue fashion.
Auto external bus	The controller records the actual temperature or pressure and adjusts it automatically to a setpoint which is set via the fieldbus interface.
Slave external analogue	The controller obtains the control value for the fans via an analogue signal.
Slave external bus	The controller obtains the control value for the fans via the fieldbus interface.

You can now set the number of fans installed on the heat exchanger.

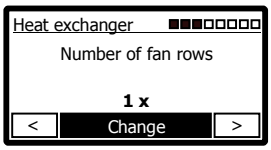


Depending on the unit type (8/16/24), a maximum of 24 fans can be connected to a controller. Set the number of connected fans accordingly.

NOTE

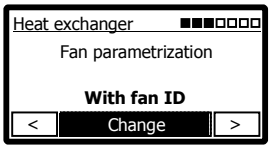
The GMMnext expects the fans to be in ascending order from fan connection 1 to the set number of fans.

If the number of fans is larger than 1, you will now be asked how many fan rows the heat exchanger has. This layout information is important for the controller if for example fan groups are formed or pairs of fans are controlled.
Select “1” for a unit with one row or “2” for a unit with two rows.



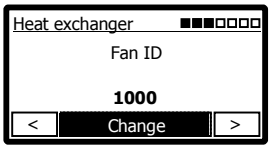
A check will then be carried out to ensure that the communication with these fans is working correctly. Press [>] to continue.

In the steps that follow, the fans’ operating point will be defined. As a result, the maximum heat exchanger power and the maximum sound emissions are defined. By default, this is defined via a so-called **fan ID**. The fan ID determines the maximum speed for a specific fan type (FT number). Generally speaking, this can be found along with the maximum speed and the FT number in the attached diagram or on a separate notice on the heat exchanger. **Configuration with the help of a fan ID is the standard method** and ensures that the heat exchanger is set to the correct operating point.



Alternatively, configuration can be carried out **without a fan ID**. In this case, only the maximum speed needs to be set. If desired, this can be set for each fan too.

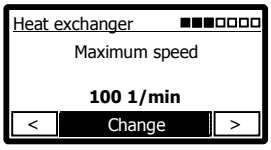
In the next step, the fan ID is entered:



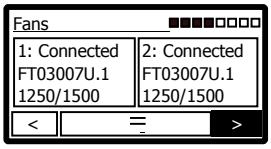
NOTE

When changing a numerical value, you can change the cursor by **pressing and holding (2 s)** the rotary selection knob and then select which digit you would like to change.

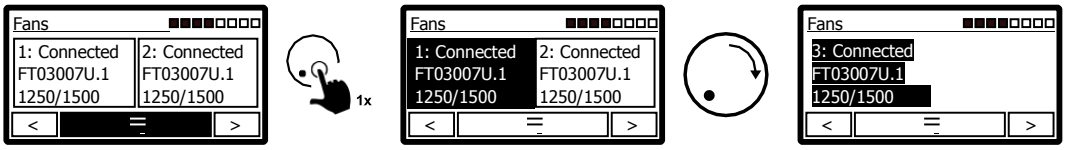
In the next step, you need to enter the maximum speed. If you are commissioning the unit with a fan ID, this step functions as a safety check.



The result of the check is then shown. If the set number of fans matches the number of fans found, the connection status, the fan number (FT number and version), the set operating point speed and the maximum possible speed will be shown for each fan.

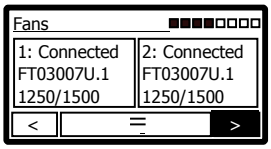


In order to scroll through the list of fans, select [Menu] and scroll through the list with the help of the rotary knob. If necessary, you can view all details for a fan.

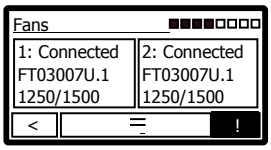


To exit the view, press the “Back” button.

Otherwise, press [>] to continue with the commissioning.



If there is a problem during the search or an incorrect fan was installed, this will be indicated by [!].



Select [!] to see the result of the fan search.

You can go a step back and scroll through the list to find out which fans are connected incorrectly.

Now disconnect the controller and the fans, check the cabling, the bus connection terminals and possibly the fan itself and then start the commissioning process again. The parameters you have entered so far will be retained.

Now select [>] in the search result to continue with the commissioning.

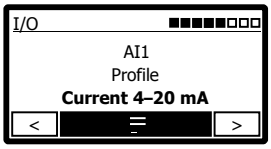
In the next steps, you will be asked about the IO configuration. The inputs and outputs are assigned specific profiles and, in certain cases, specific functions by default.

The settings here should be configured according to the sensors/actuators installed. If necessary, the settings can also be changed in the service menu later on.

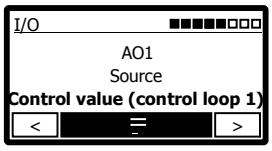
First of all, the profiles for the analogue inputs AI1…AI5 will be queried. If necessary, these can be changed. The analogue inputs are multifunctional, i.e. the inputs can measure current, voltage or resistance.

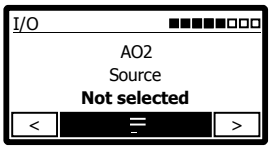
Profile for AI1…AI5	Explanation
Voltage 0–10 V	Voltage measurement at an interval of 0–10 V
Voltage 2–10 V	Voltage measurement at an interval of 2–10 V
Current 0–20 mA	Current measurement at an interval of 0–20 mA
Current 4–20 mA	Current measurement at an interval of 4–20 mA
Resistance thermometer	Resistance measurement for PT1000 (or GTF210)
Voltage (user-defined)	Voltage measurement, the interval can be configured
Current (user-defined)	Current measurement, the interval can be configured
Resistance (user-defined)	Resistance measurement, the interval can be configured

Select [>] to move to the next input.

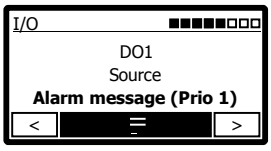


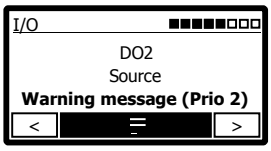
The analogue outputs AO1 and AO2 can be assigned various output functions.

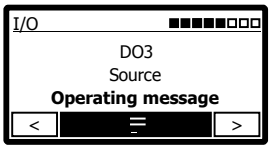


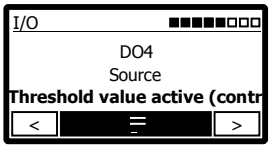


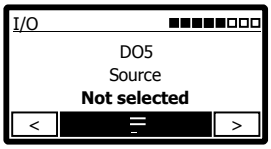
The digital outputs DO1 to DO5 can each be assigned an output function.











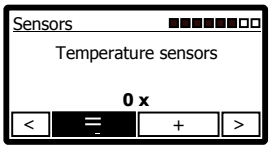
NOTE

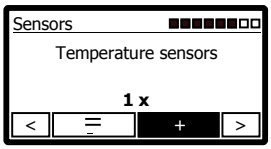
The digital inputs cannot be configured here; the assignment is set by default but can be changed later on in the relevant functions/control loops.

In the next step, the connected sensors must be added and assigned correctly to the corresponding analogue inputs AI1…AI5.

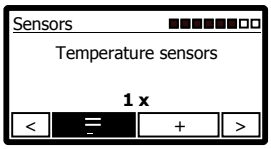
First select the number of sensors before configuring them. A temperature sensor is shown here by way of example.

First of all, determine the number of sensors by selecting and confirming the softkey [+]. The sensors will then be numbered consecutively.

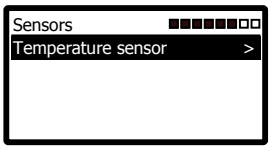




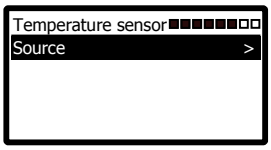
Now select the softkey [Menu] and configure the sensor generated.



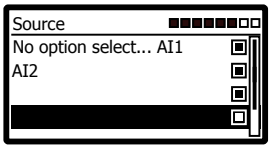
Select the temperature sensor to be configured...



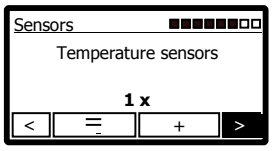
... and then select the source of the analogue input ...



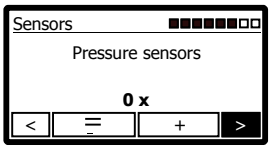
… which you would like to assign to the sensor.



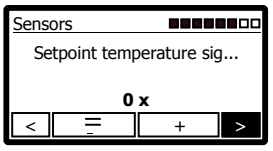
Go back in the menu and proceed with other sensors or signals if necessary.



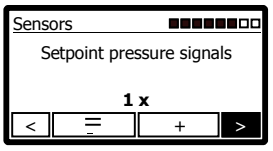
If necessary, configure pressure sensors, e.g. for condensers, or if a brine pressure monitoring system is installed.



If a setpoint temperature is set externally via an analogue signal, configure this here:



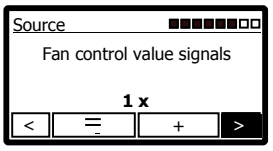
If a setpoint pressure is set externally via an analogue signal, configure this here:



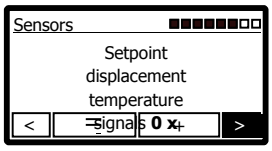
If the controller is operating in Slave external analogue mode and the control value is set in analogue fashion by the higher-level controller, configure this here:

IMPORTANT

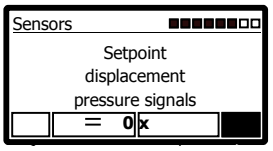
This fan control value signal must be set as the signal source in the corresponding control loop.



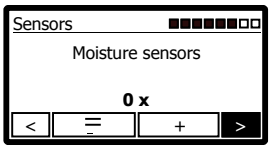
If the setpoint for temperature control is to be displaced externally via a signal, configure this here:



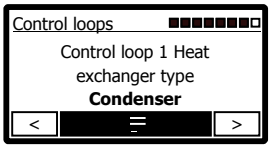
If the setpoint for pressure control is to be displaced externally via a signal, configure this here:



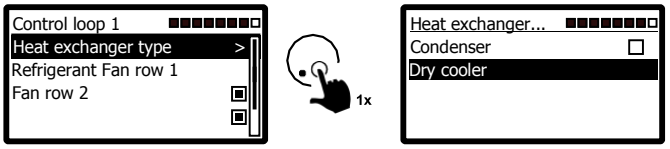
If a moisture sensor is connected, configure this here:



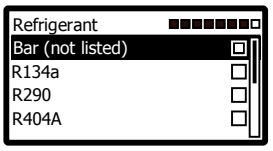
In the next step, configure the control loops for the heat exchanger.



First of all, configure the heat exchanger type.

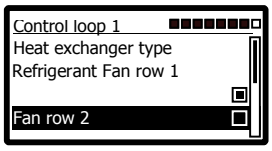


If you have set condenser as the heat exchanger type, you can also select the refrigerant. The controller can then calculate the condensing temperature based on the measured condensing pressure. If the refrigerant is not listed, please use [Bar].



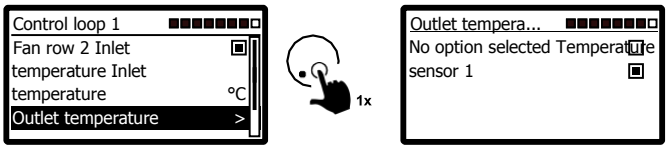
If the heat exchanger has 2 rows of fans next to each other, you can select which of the two rows of fans is influenced by the relevant control loop.

Fan row 1 (left), fan row 2 (right) or both are possible.



With a dry cooler, configure the source of the outlet temperature which is assigned to the PID controller as an actual value.

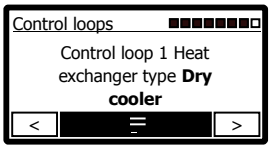
In addition, you can record and display the inlet temperature with a dry cooler.



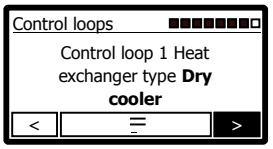
NOTE

With a condenser, configure the source of the fluid pressure in the same way as you would for the outlet temperature sensor for a dry cooler.

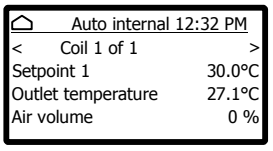
Once you have configured all the settings for the control loop, go back...



... and then press continue [>].



You have now entered all the necessary information for operating the controller and the commissioning process is complete. After commissioning, the menu language once again switches to English. This can be set under “Language” in the menu.



All functions, fan settings, IO configurations and sensors can also be set via the main or service menu.

To get to the main menu, press the rotary selection knob in the home menu.

To get to the service menu, select “Service” in the main menu.

If you would like to carry out commissioning again, you can reset the controller to its delivery state in the service menu.

4 Design of the GMMnext

4.1 Installing the GMMnext

4.1.1 Installing the controller, ventilation

If the unit has been taken from a very cool storage location, leave it at room temperature for 1-2 hours before installation with the lid open to allow any residual moisture to disperse and hence avoid malfunctions during commissioning. The unit may only be commissioned when it is absolutely dry. The sachet of silica gel (desiccant sachet) must be removed.

Once the unit has been commissioned for the first time, the power supply and the internal control voltage must not be switched off for a long period. If this should nevertheless be necessary for operational reasons, suitable moisture protection must be provided.

There are 4 drill holes in the casing for mounting. The equipment may only be fixed at these points, any manipulations of the casing (e.g. drilling new mounting holes) is prohibited.

The cable entries must always be underneath; installation with cable entries at the side or even on top is not permitted!

If moisture problems occur in the casing owing to considerable external heating and cooling, the moisture must be dispersed by means of an air equalisation (cable gland with equalisation opening).

Keep an eye on good accessibility! The unit must be easily accessible for any maintenance work.

Please note:

- If the equipment is installed in a switch cabinet, the temperature inside the switch cabinet **must** be heeded (see Electrical properties, page 110).
- A hood is required if the equipment is installed in the open air.
- Install the GMMnext out of direct sunlight and choose a location with the best possible protection against the elements.

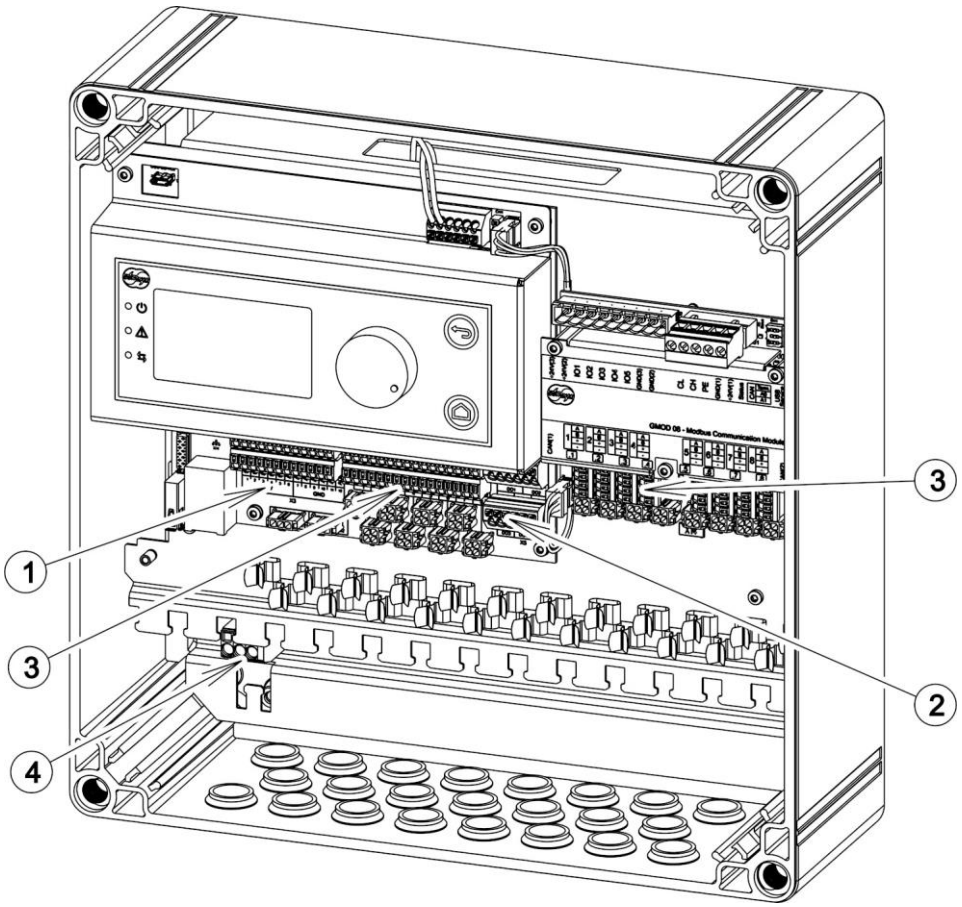
4.2 Connecting the GMMnext

The connecting terminals for the potential-free signal outputs, the control inputs (controller enable etc.), bus lines to the EC fans and sensors can be found on the top main circuit board or on the supplementary circuit boards to the right of it.

The mains connection is on the bottom terminal X0.

The power supply (single-phase 230 V or 3-phase 400 V) for the fans is located in a separate small switch cabinet.

4.2.1 Location of connections on the GMMnext EC/16



Location of connections on the GMMnext EC/16.1

❶ Analogue and digital inputs and outputs (see Inputs and outputs (IO interface), Page 35)

❷ Potential-free signal outputs (see Inputs and outputs (IO interface), Page 35)

❸ EC fan connections 24VDC, RS485 (see Controller fan connection, Page 33)

❹ Mains connection (see Controller mains connection, Page 32)

4.2.2 Controller mains connection

The mains connection for the controller is on terminal X0:

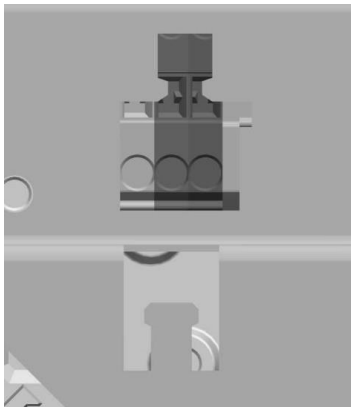
L1 = Phase conductor
N = Neutral conductor
PE = Earth conductor

The connector terminals are designed for a maximum wire cross-section of 2.5 mm².

The supply line must be fused by means of automatic circuit breakers with characteristic "C 6".

NOTE

The heat exchanger fans may not be switched on or off by switching the mains on or off, but only via the switch.



Connection X0

4.2.3 Controller fan connection

The connection for an EC fan consists of the power connection (single-phase 230 V or 3-phase 400 V) and the control connection (bus and DC power supply for the fan electronics).

Power connection:

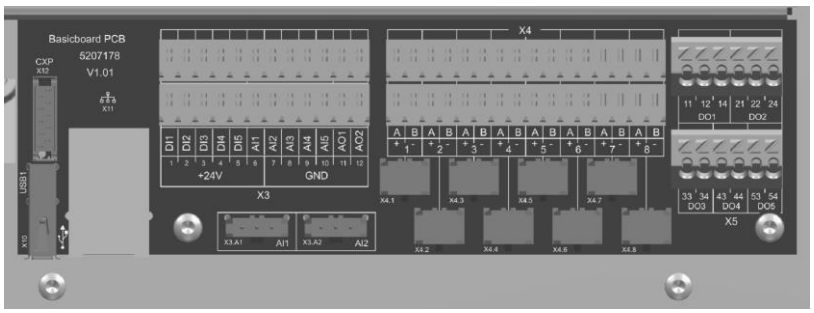
The power connections are located not in the GMMnext but in a separate connection box (e.g. GPD).

Control connection:

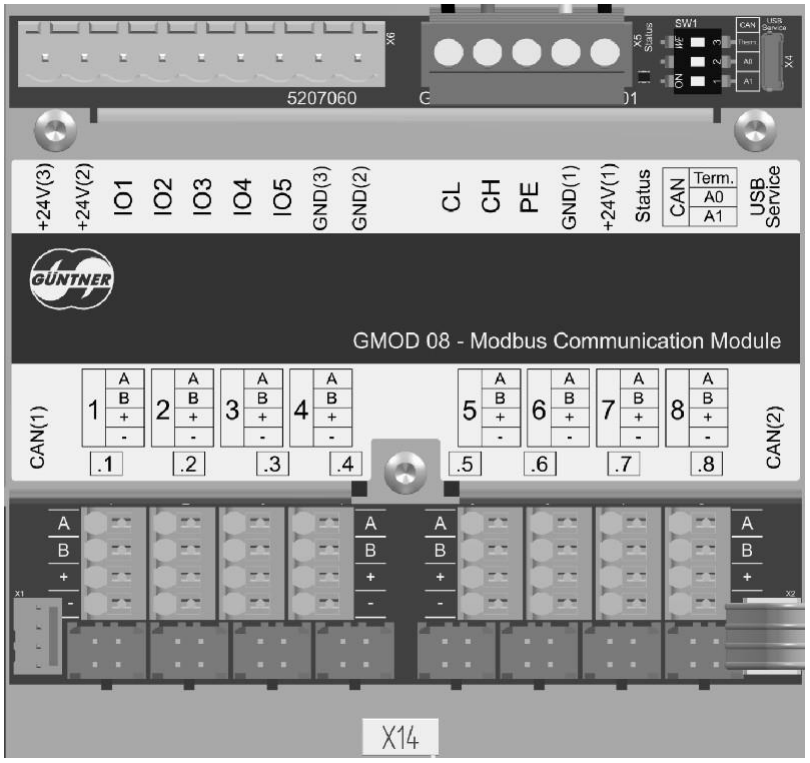
The connection for communication and the DC power supply for the fans is on terminals X4, X14 and X24.

Depending on the version, there are 1 to 24 control connections for the EC fans. Fans 1-8 are connected to terminal X4, fans 9-16 are connected to terminal X14 (only on GMMnext EC/16.1) and fans 17-24 are connected to terminal X24 (only on GMMnext EC/24.1).

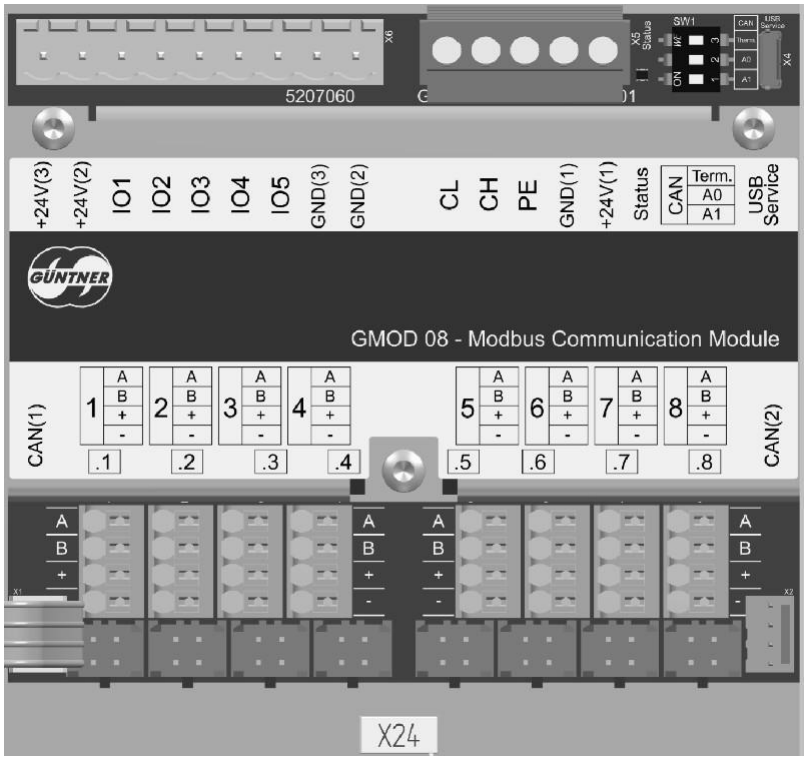
Communication connection	Terminal **A (RS485 A)** and **B (RS485 B)**
24 V power supply:	Terminal **+ (+24V)** and **– (GND)**



Fans 1 to 8 connected to terminal X4



Fans 9 to 16 connected to terminal X14



Fans 17 to 24 connected to terminal X24

5 Inputs and outputs (IO interface)

The GMMnext has the following inputs and outputs:

- 5 analogue inputs (AI1 to AI5), each one variably configurable
- 2 analogue outputs (AO1 to AO2)
- 5 digital inputs (DI1 to DI5)
- 5 digital relay outputs (DO1+ DO2 changeover contacts, DO3 to DO5 closers

The functions (signal source) for the inputs and outputs, a signal inversion and, for analogue signals, the interval (scaling) can all be set flexibly via the IO configuration menu.

NOTE

Please note that connecting the wrong voltage (e.g. 230V) may seriously damage the controller.

5.1 Configuration table

NOTE

The following table shows a "standard configuration" of the controller following commissioning. Details of all possible configurations can be found in the section Function table, page 37.

	I/O	Signal /profile	Function
X3	DI1	24V	Enable
	DI2		No function
	DI3		No function
	DI4		No function
	DI5		No function
	AI1	0…10V 2...10V 0…20mA 4…20mA resistance thermometer	4…20mA pressure sensor (scaling 0-25 bar) *1)
	AI2		0...10V no function
	AI3		PT1000 outlet temperature (-30…100°C) *2)
	AI4		0...10V control value slave (0…100%) *3)
	AI5		0...10V no function
	AO1	0...10V 2...10V	Control value for fan group 1
	AO2		No function
X5	DO1	Potential-free relay	Alarm message Prio 1 (contact 11/12 closed)
	DO2		Warning message Prio 2 (contact 21/22 closed)
	DO3		Operating message
	DO4		Threshold function
	DO5		No function

GMMnext EC/xx.1 configuration table

	I/O	Signal /profile	Function
X1	DI1	24V	Enable
	DI2		No function
	DI3		No function
	DI4		No function
	DI5		No function
X2	AI1	0…10V 2...10V 0…20mA 4…20mA resistance thermometer	4…20 mA pressure sensor (scaling 0-25 bar) *1)
	AI2		0...10V no function
	AI3		PT1000 outlet temperature (-30…100°C) *2)
	AI4		0...10V control value slave (0…100%) *3)
	AI5		0...10V no function
X1	AO1	0...10V 2...10V	Control value for fan group 1
	AO2		No function
X9	DO1	Potential-free relay	Alarm message Prio 1 (contact 11/12 closed)
	DO2		Warning message Prio 2 (contact 21/22 closed)
X10	DO3		Operating message
	DO4		Threshold function
	DO5		No function

GMMnext Rail.1 configuration table

*1) Condition: Heat exchanger = condenser and operating mode = automatic internal
*2) Condition: Heat exchanger = dry cooler and operating mode = automatic internal
*3) Condition: Operating mode = slave external analogue

5.2 Function table

The following table shows the possible functions of the GMMnext. Depending on the wiring of the controller, the functions can be selected individually in the service menu/IO configuration or in the sensor configuration and for the respective functions. Certain functions (e.g. digital inputs) can be assigned to various functions a number of times. Numerous different sensors can be configured and then assigned to the respective analogue inputs. With the analogue inputs, it is possible to switch between measuring the current, voltage and resistance by selecting a profile.

I/O type	Function	Possible I/Os	Recommendation *1)
DO (relay)	Alarms Prio 1	DO1 + DO2	DO1
DO (relay)	Alarms Prio 2	DO1 + DO2	DO2
DO (relay)	Operating message	DO1 to DO5	DO3
DO (relay)	Threshold function	DO1 to DO5	DO4
DI (24 V)	Enable fans	DI1 to DI5	DI1
DI (24 V)	Switch over to setpoint 2	DI1 to DI5	DI3
DI (24 V)	Heating mode	DI1 to DI5	DI3
DI (24 V)	Switch on manual mode	DI1 to DI5	DI4
DI (24 V)	Switch on night setback	DI1 to DI5	DI2
DI (24 V)	Switch on inverse operation	DI1 to DI5	DI5
DI (24 V)	External fault message	DI1 to DI5	DI5
AI (0…20 mA)	Currently no function	AI1 to AI5	
AI (4…20 mA)	Pressure sensor, e.g. actual value for the control loop (scaling should be configured separately, e.g. 0...25 bar or 0...40 bar)	AI1 to AI5	AI1
AI (4…20 mA)	Active temperature sensor, actual value for the control loop (scaling should be configured separately, e.g. -30….70°C)	AI1 to AI5	AI3
AI (4…20 mA)	Active temperature sensor, external temperature (scaling should be configured separately, e.g. -50….50°C)	AI1 to AI5	AI2
AI (4…20 mA)	Control value 0…100 % for the fans in slave external analogue operating mode	AI1 to AI5	AI4
AI (4…20 mA)	External setpoint (scaling should be configured separately)	AI1 to AI5	
AI (4…20 mA)	Setpoint displacement (scaling should be configured separately)	AI1 to AI5	
AI (0…10 V)	Pressure sensor, e.g. actual value for the control loop (scaling should be configured separately, e.g. 0...25 bar or 0...40 bar)	AI1 to AI5	

GMMnext EC_xxRail.1 function table

I/O type	Function	Possible I/Os	Recommendation *1)
AI (0…10 V)	Active temperature sensor, e.g. actual value for the control loop or external temperature (scaling should be configured separately, e.g. -30….70°C)	AI1 to AI5	
AI (0…10 V)	Active temperature sensor, external temperature (scaling should be configured separately, e.g. -50….50°C)	AI1 to AI5	
AI (0…10 V)	Control value 0…100 % for the fans in slave external analogue operating mode	AI1 to AI5	AI4
AI (0…10 V)	External setpoint (scaling should be configured separately)	AI1 to AI5	
AI (0…10 V)	Setpoint displacement (scaling should be configured separately)	AI1 to AI5	
AI (PT1000)	Recording the outlet temperature	AI1 to AI5	AI3
AI (PT1000)	Recording the inlet temperature	AI1 to AI5	AI2
AI (PT1000)	External temperature	AI1 to AI5	
AO (0…10 V)	Control value 0...100 % of the PID controller (control loop 1...5)	AO1/AO2	
AO (0...10 V)	Control value for fan group 1	AO1/AO2	AO1
AO (0…10 V)	Control signal for the subcooler fan	AO1/AO2	AO2

GMMnext EC_xxRail.1 function table

*1) The recommendation is a suggestion for a consistent system configuration.

5.3 Digital inputs DI1…DI5 (control inputs)

The control inputs are designed as a low-voltage connection and are connected via a potential-free contact (relay, contactor contact, switch etc...).

The potential-free contact must be connected to one of the +24 volt terminals on the GMMnext and the respective control inputs DI1...DI5.

+24 volts at the input corresponds to the signal level “HIGH” or, logically, 1.

An open input or 0 volts corresponds to the signal level “LOW” or, logically, 0.

The specific set function (signal source), a signal inversion and the current status can be viewed in the actual values menu. If necessary, you can change this function in the service menu/IO configuration.

By default, a number of basic functions, e.g. controller enable, are assigned to the inputs.

See Configuration table, Page 35

5.4 Analogue inputs AI1…AI5

The analogue inputs on the GMMnext offer particular flexibility. They can be switched for various input signals via the IO configuration.

In the process, the following analogue input profiles can be assigned to the relevant input:

- Voltage 0… 10 V
- Voltage 2… 10 V
- Current 0… 20 mA
- Current 4… 20 mA
- Resistance thermometer (PT1000)
- Voltage user-defined
- Current user-defined
- Resistance user-defined

As a result, a large number of usable measurement ranges are possible, e.g.:

- 0…10 V, 2…10 V, 0…5 V
- 0…20 mA, 4…20 mA
- PT1000 (and KTY210 compatibility with previous-generation GMM models)

In turn, these input signals can be assigned to various sensors for temperature, pressure, air humidity or other signals for e.g. setpoint setting, setpoint displacements or fan control value. These sensors can likewise be generated and configured freely in the sensor menu.

If a voltage or current profile was selected, the signal can also be inverted.

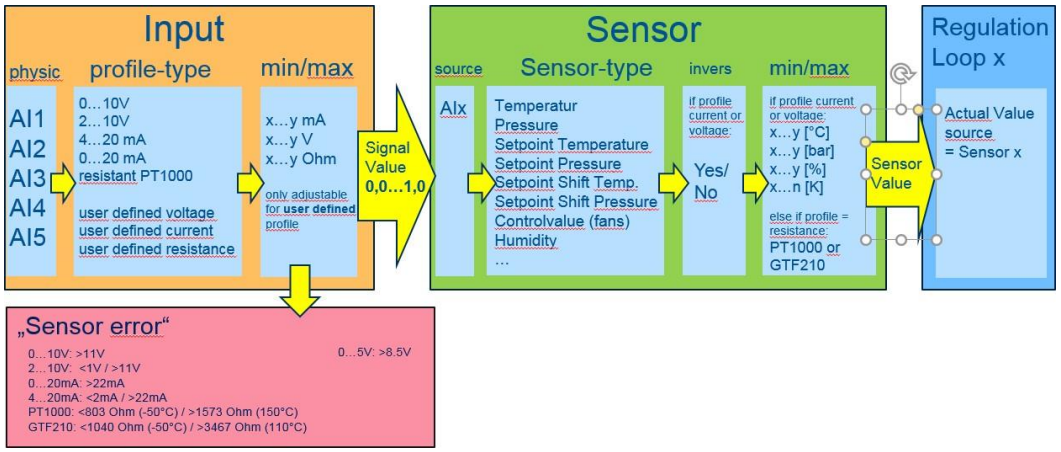
As a result, user-defined sensors/signals such as

- control value signals 0…100 % from 10...2 V or
- a setpoint displacement 0…-2.0 K from 0…10 V or
- a temperature for the actual value of the PID controller -10,0…+60 °C from

4…20 mA can be generated flexibly.

The configuration is carried out in a simplified form during the commissioning procedure or can also be carried out later on in the IO configuration and sensor configuration.

The sensors/signals generated in this way can then be assigned flexibly to 5 control loops.



5.5 Digital outputs DO1…DO5 (potential-free)

The outputs DO1…DO5 are designed as potential-free relay contacts (changeover contacts or closers). The following table gives details of the contacts:

Name	Design	Connection	Description
DO1	Relay 1 changeover contact	11 (COM)	Shared connection
		12 (NC)	Opener contact (normally closed)
		14 (NO)	Closer contact (normally open)
DO2	Relay 2 changeover contact	21 (COM)	Shared connection
		22 (NC)	Opener contact (normally closed)
		24 (NO)	Closer contact (normally open)
DO3	Relay 3 closer contact	31 (COM)	Shared connection
		34 (NO)	Closer contact (normally open)
DO4	Relay 4 closer contact	41 (COM)	Shared connection
		44 (NO)	Closer contact (normally open)
DO5	Relay 5 closer contact	51 (COM)	Shared connection
		54 (NO)	Closer contact (normally open)

Various functions can be assigned to the outputs (see Function table, page 37). You can also configure whether the relay should be energized or deenergized when the respective functional status is reached.

The specific set function (signal source), a signal inversion and the current status can be viewed in the actual values menu. If necessary, you can change this function in the service menu/IO configuration.

By default, a number of basic functions, e.g. alarm message, warning, operating message or threshold value function, are assigned to these outputs.

See Configuration table, page 35.

5.6 Analogue outputs AO1…AO2

The GMMnext has 2 analogue outputs with 0… 10 V output voltage. The

following analogue output profiles can be assigned to these outputs:

- Voltage 0… 10 V
- Voltage 2… 10 V
- Voltage user-defined

In the user-defined profile, the signal minimum and signal maximum can be configured freely.

As a result, a large number of usable measurement ranges are possible, e.g.:

- 0…10 V
- 2…10 V
- 0…5 V

The output signal can be assigned to various sources, e.g. control value control loop 1.

The output signal can also be inverted.

6 Display and operation

Information is shown on the graphic display. Coloured LEDs indicate various operating statuses.

The controller is operated using the multifunctional wheel and the operating buttons.

6.1 Operation

Rotary selection knob

- Left or right movement: allows you to move up or down in the menu or change the parameter you are configuring.
- Short press: for function selection; change to EDIT mode and accept value
- Long press (2 seconds): brings up the relevant context menu/help menu.

Home button

Takes you back to the home menu

Back button

Takes you back to the previous menu

6.1.1 Home menu

Depending on the controller configuration, the most important information regarding the individual control loops is shown in the home menu. Depending on the number of control loops, this information is automatically scrolled through at set times.

To get to the home menu, press the home button at any time  .

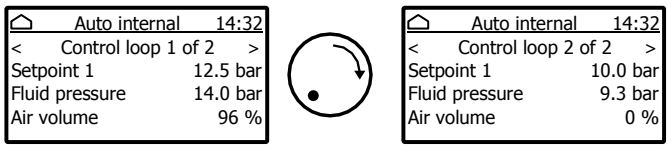
	Auto internal	14:32
<	Control loop 1 of 2	>
Setpoint 1		12.5 bar
Fluid pressure		14.0 bar
Air volume		96 %

NOTE

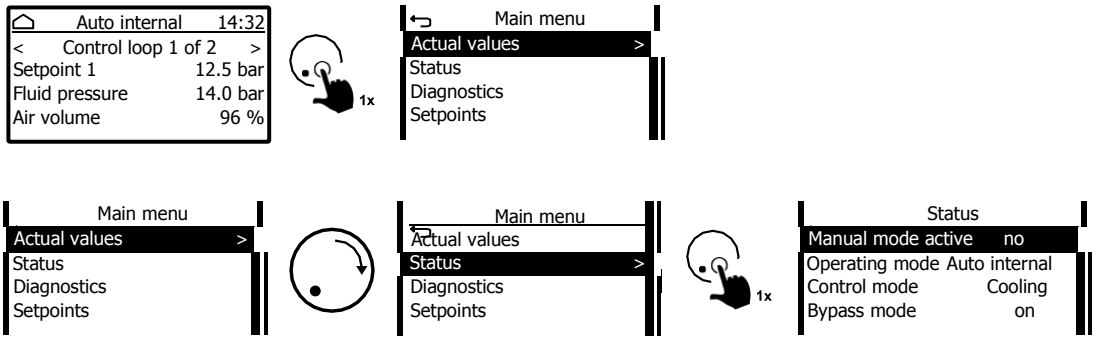
The display's background lighting is switched off after 5 minutes of inactivity. It is switched on again when you press a button or turn the rotary selection knob.

6.1.2 Navigation in the menu

When information is shown in the home menu at set times, you can switch between the individual displays by turning the knob to the left or right.



Pressing the rotary selection knob for a short time in the home menu takes you to the menu navigation level. From here, you can navigate to the individual menu items by turning the knob to the left or right. If you press the knob again for a short time, you can switch to the respective submenu and call up information or configure settings there.

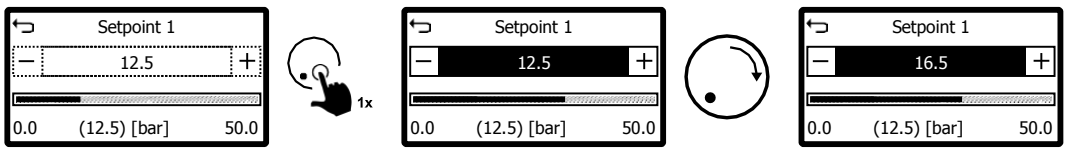


To switch to the previous menu or exit an editing function, simply press the back button  .

6.2 Edit mode

After you select a parameter or a function by pressing the rotary selection knob for a short time, you will enter Edit mode.

Various information will be shown on the display. To change the parameter or function, turn the rotary selection knob to the left or right.



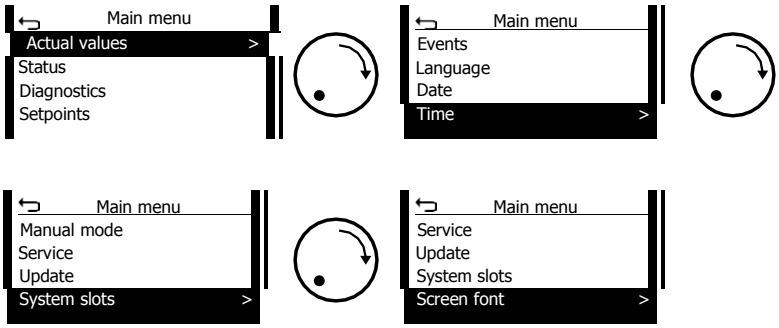
NOTE

When changing a numerical value, you can change the cursor by **pressing and holding (2 s)** the rotary selection knob and then select which digit you would like to change.

6.3 Main menu

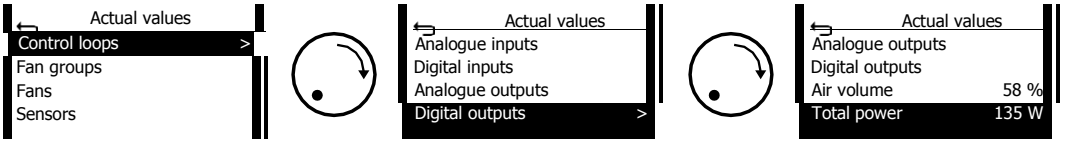
From the top menu, the home menu, you can get to the main menu by pressing the rotary selection knob for a short time. From there, you can navigate to the individual submenu points and the service menu.

The following submenu points can be found in the main menu:



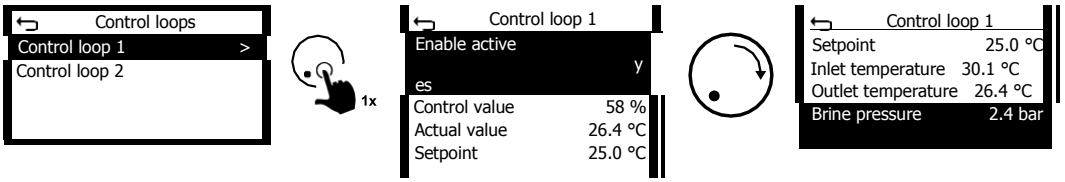
6.3.1 Actual values

In the actual values menu, the current values for the control loops or input signals, fans, sensors, the statuses of digital and analogue inputs and outputs, the current total power and the air volume are shown.



6.3.1.1 Control loops

Specific information is shown for each control loop.

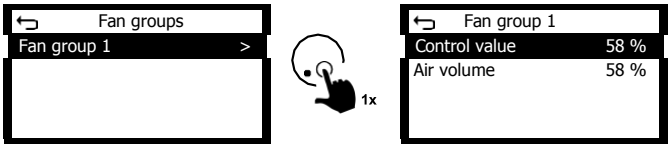


6.3.1.2 Fan groups

Assigning the up to 5 control loops to the fan rows 1 (left) and 2 (right) results in a fan group.

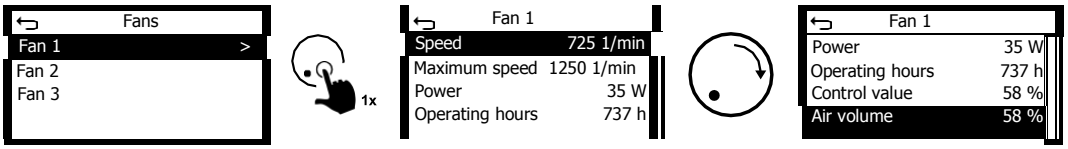
See also LCMM, page 79.

The current control value and the air volume currently generated are shown for each fan group.



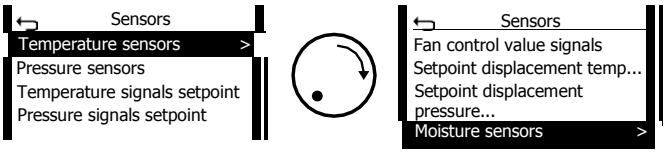
6.3.1.3 Fans

The current values are shown for each fan.

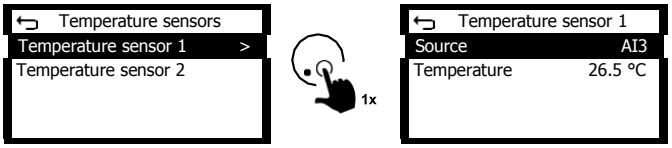


6.3.1.4 Sensors

All sensors, the source of the signals and the current values are shown here.



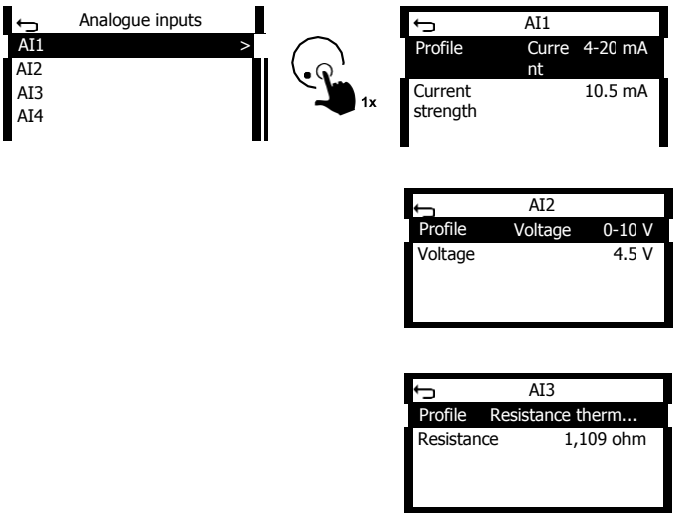
If these sensors are set up, both the signal source and the sensor value currently measured can be displayed here. Here is an example for a temperature sensor.



6.3.1.5 Analogue inputs

The profile and the value currently measured are shown for each of the analogue inputs.

Depending on which profile is set for the relevant input, the current, voltage or resistance value is shown.

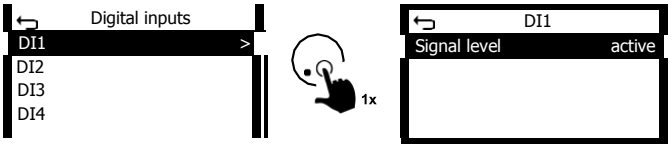


6.3.1.6 Digital inputs

The current signal level is shown for each digital input.

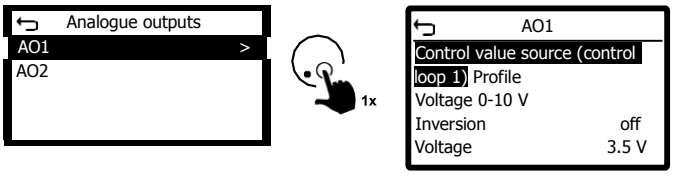
Signal level "active" means that there is a high signal (logically 1, +24 volts) at the input.

Signal level "inactive" means that there is a low signal (logically 0, input open or 0 volts) at the input.



6.3.1.7 Analogue outputs

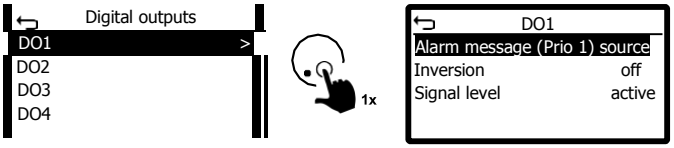
The source of the signal, the selected profile, information as to whether the signal is inverted and the voltage currently output are shown for each analogue output.



6.3.1.8 Digital outputs

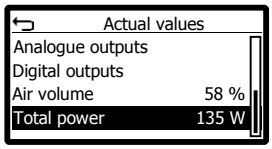
The source of the signal, information as to whether the signal is inverted and the current status are shown for each digital output.

"active" means that the digital output (relay) is energized.



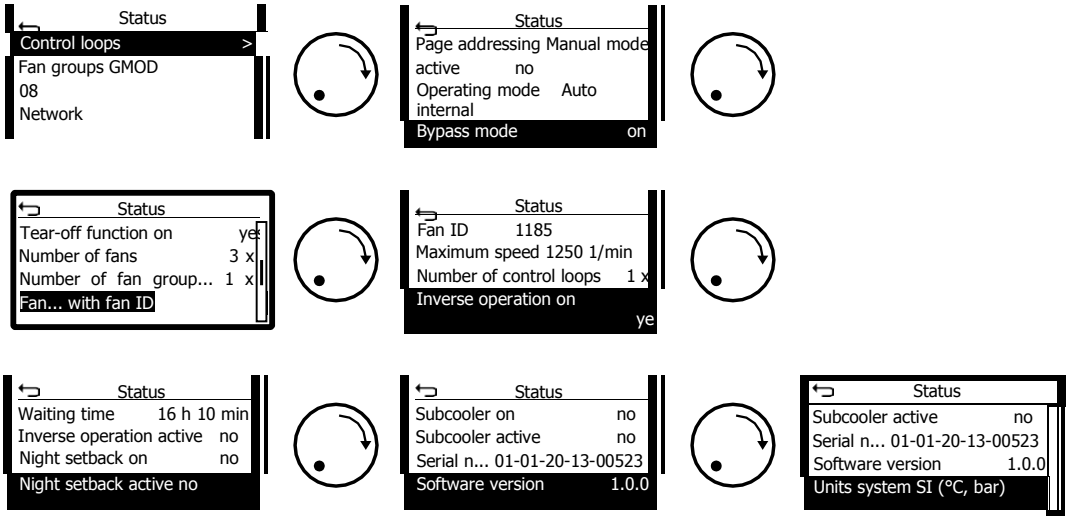
6.3.1.9 Air volume and total power

The total air volume generated by the active fans and the total power are shown. The power is calculated from the intermediate circuit voltage and the intermediate circuit current.



6.3.2 Status menu

The operating statuses, configuration settings as well as the serial and software version number are shown.

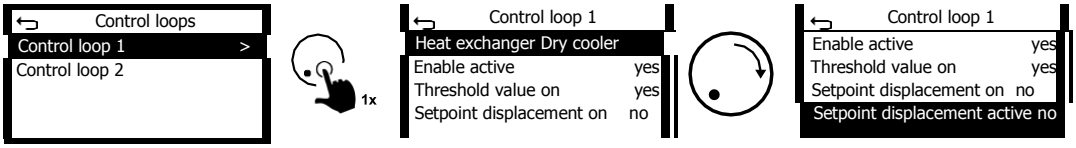


6.3.2.1 Control loops

Specific information is shown for each control loop.

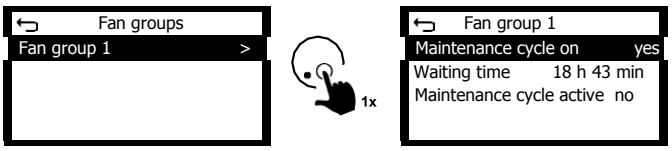
- The set heat exchanger type.
- The enable status for the control loop. Generally speaking, the enable is controlled via a digital input. Alternatively, this can be permanently enabled.

- The status as to whether the threshold value function for this control loop is on.
- The status as to whether setpoint displacement is configured for this control loop and this is active, i.e. the setpoint is currently being displaced.



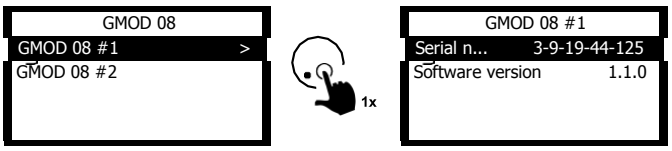
6.3.2.2 Fan groups

The configuration for the maintenance cycle, the waiting time until the start of the maintenance cycle and information as to whether the maintenance cycle is currently under way are shown for each fan group (see also Maintenance cycle, Page 86).



6.3.2.3 GMOD 08

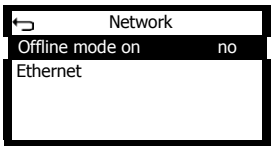
If one or more expansion modules for connecting fans are present, the serial number and software versions for all expansion modules are shown here.



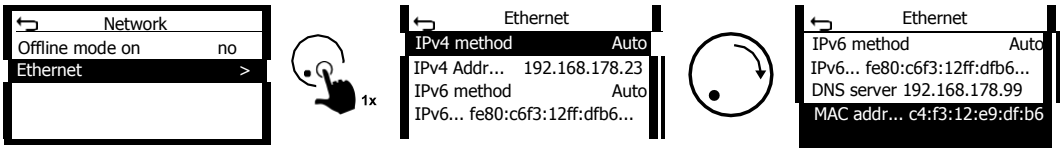
6.3.2.4 Network

Information about the network interface ETH 1 and possibly ETH 2 is shown (see also Network settings, page 97).

If offline mode is on, the network interface is deactivated (offline).



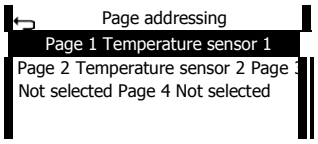
The configuration parameters set, the IP addresses and the MAC address are shown for the Ethernet interface.



6.3.2.5 Page addressing

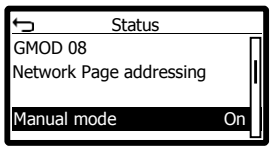
In this submenu, you can see how the so-called "pages" for sensors are configured on the Modbus interface. For more details, see the corresponding Modbus interface specification.

In the example shown here, the information for temperature sensor 1 is shown on page 1 while the information for temperature sensor 2 is shown on page 2. The other pages are empty.



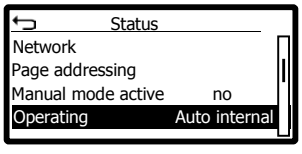
6.3.2.6 Manual mode active

This shows whether manual mode is active (see also Manual mode, Page 57).



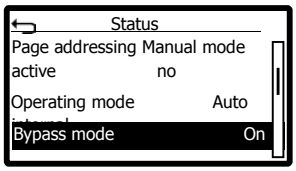
6.3.2.7 Operating mode

The set controller operating mode is shown (see also Operating mode, Page 70).



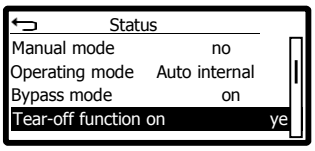
6.3.2.8 Bypass mode

The status of the bypass function is shown (see also Bypass, Page 75).



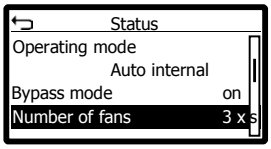
6.3.2.9 Tear-off function on

The status of the fans' tear-off function is shown.



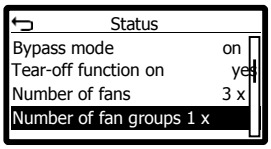
6.3.2.10 Number of fans

The number of fans connected is shown.



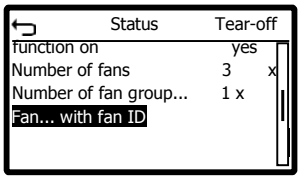
6.3.2.11 Number of fan groups

The number of fan groups is shown.



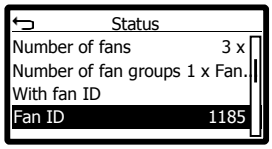
6.3.2.12 Fan parametrization

Information as to whether the fans were parametrized with or without a fan ID during commissioning is shown here (see also Commissioning the GMMnext, page 18).



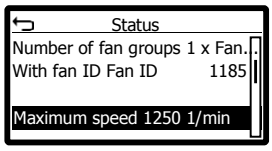
6.3.2.13 Fan ID

If a fan ID was used to parametrize the fans during commissioning, this is shown here.



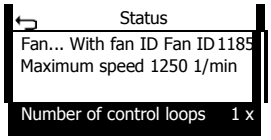
6.3.2.14 Maximum speed

The maximum speed for fans used during commissioning is shown here.



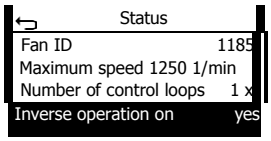
6.3.2.15 Number of control loops

The number of configured control loops is shown.



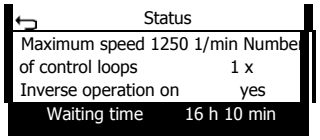
6.3.2.16 Inverse operation on

This shows whether inverse operation is on.



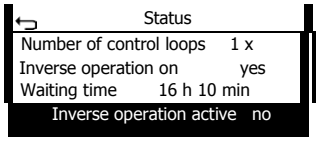
6.3.2.17 Waiting time

This shows the waiting time until the next inverse operation.



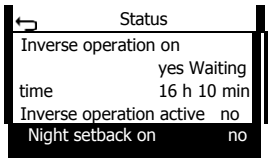
6.3.2.18 Inverse operation active

This shows whether an inverse operation is active.



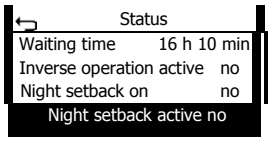
6.3.2.19 Night setback on

This shows whether the “night setback” function is on.



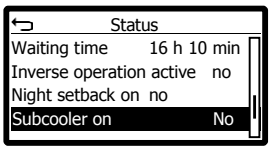
6.3.2.20 Night setback active

This shows whether night setback is currently active.



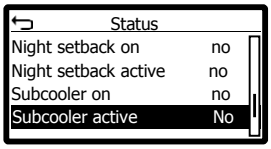
6.3.2.21 Subcooler on

This shows whether the subcooler function is on.



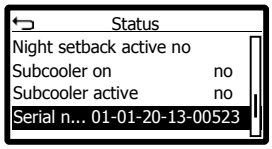
6.3.2.22 Subcooler active

This shows whether the subcooler function is generating an output signal.



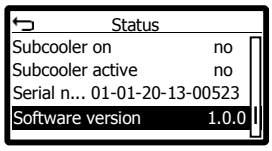
6.3.2.23 Serial number

The serial number of the controller is shown.



6.3.2.24 Software version

The software version in (Major.Minor.Patch) format is shown.



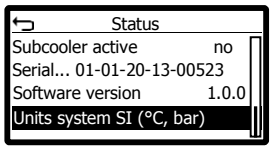
6.3.2.25 Units system

The units system used to show values in the display is shown (see also Units system).

NOTE

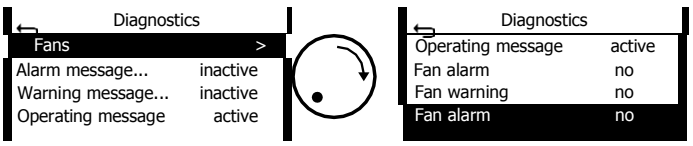
Internally, the controller processes all parameters and process data using the SI system.

You can also select the units system which is used to provide values for the fieldbus interface regardless of how the values are shown in the display (see also Units system, Page 90).



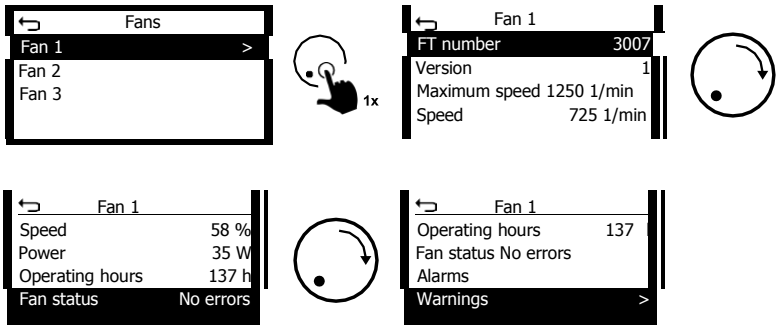
6.3.3 Diagnostics

The diagnostics menu provides a central overview of the controller and fan system status. Parameter and process data for the fans as well as collective messages such as alarm, warning and operating messages are shown.



6.3.3.1 Fans

The parameters, current process data and any current warnings and errors are shown for each fan.



6.3.3.2 Alarm message (Prio 1)

The alarm message (Prio 1) is a collective fault message which indicates a system-critical heat exchanger status. The message is issued if there is a fault with all fans. The alarm message can be output via a digital output.

6.3.3.3 Warning messages (Prio 2)

The warning message (Prio 2) is a collective fault message which is issued if there is a fault but the fans can continue to operate (possibly with restrictions). A warning can be triggered by an alarm, a warning concerning one or more fans or a sensor fault. The warning message can be output via a digital output.

6.3.3.4 Operating message

The operating message feature is active if at least 1 fan is turning. The operating message can be output via a digital output.

6.3.3.5 Fan warning

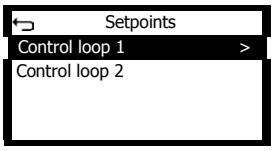
If there is a warning message concerning at least one fan, this is signalled.

6.3.3.6 Fan alarm

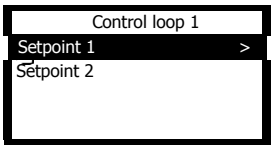
If there is an alarm concerning at least one fan (e.g. fan blocked or overheating), this is signalled.

6.3.4 Setpoints

The setpoints for each configured control loop can be set via the setpoint menu. The number of control loops and their parameters can be configured in the service menu.



Depending on the configuration, up to 2 setpoints can be configured for each control loop.



6.3.5 Events

In the event memory, temporary and one-off events are permanently recorded with a time stamp.

Temporary events are for example fan or sensor faults. Such events are active when the fault occurs and end when the fault is rectified.

One-off events are for example system commissioning points.

You can navigate horizontally (left/right) and vertically (up/down) within the event memory. On the horizontal level, the events are shown in chronological order from left to right.

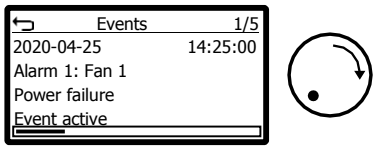
Active events are left-justified. These are then followed by events which have ended.

If you navigate to an event, you can press the rotary selection knob to switch to the event itself. By turning the rotary selection knob, you can scroll through the entire event entry.

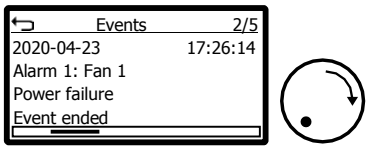
If you press the rotary selection knob again, you will jump back to the horizontal selection level.

The time stamp for the event is the point at which the event became active. Example:

Here, alarm No. 1 concerns fan 1. The fault is a power failure. The event occurred on 25.04.2020 at 14:25. The event is still active.

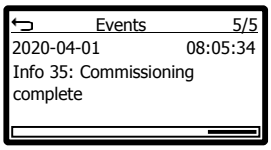


On 23.04.2020, another alarm concerning fan 1 occurred. The event has ended and the alarm is no longer active.



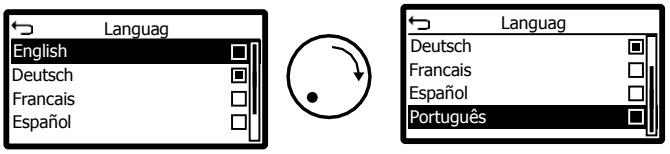
… until the end of the event list.

The controller was commissioned on 01.04.2020 at 08:05.



6.3.6 Language

The display language can be changed by selecting your desired language.



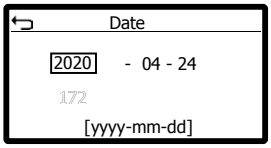
6.3.7 Date/time

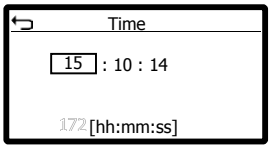
The system time (date and time) can be set here. The time is used to enter the event times in the event memory or for time-controlled functions (e.g. night setback or inverse operation).

The date and time shown are country-specific depending on the set language.

In the event of a power cut, the system clock will remain set for 4 -7 days depending on the ambient temperature.

The date and clock are set in the formats year/month/day and hour/minute/second.





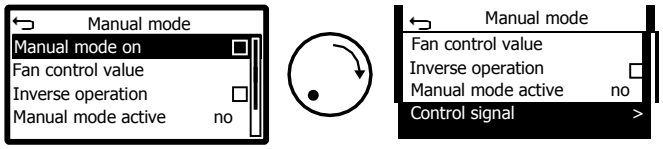
6.3.8 Manual mode

Manual mode is used to start up the heat exchanger fans manually. If it is activated, the fans run with the manual mode control value.

IMPORTA

Manual mode does not depend on an enable signal. It has the highest priority and switches off all other control modes!

Active manual mode is saved permanently, in other words it is active again even after switching the power supply off and on.

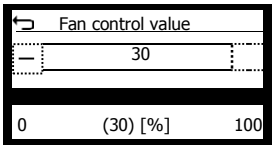


6.3.8.1 Manual mode on

Manual mode can be switched on and off here.

6.3.8.2 Fan control value

Here, you can configure the fan control value which is output to all fans when manual mode is active (switched on manually or with a control signal).



6.3.8.3 Inverse operation

While manual operation is active it is possible to run the fans in the opposite direction to their preferred direction.

To do this, "inverse operation" must be activated.

NOTE

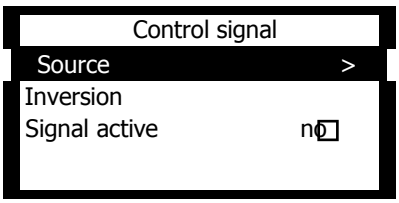
This function is possible only with EC fans supplied later than 2012 (approximate figure, because old stocks may have been being used up).

6.3.8.4 Manual mode active (status)

This shows whether manual mode is active.

6.3.8.5 Control signal

Manual mode can also be activated via a digital input (control signal). If the control signal is present, the previously set manual mode control value will be output to the fans.



6.3.8.5.1 Control signal source

Here, you can freely configure the source of the digital input.

If you do not wish to have a control signal, activate "no option selected".

6.3.8.5.2 Control signal inversion

If necessary, the external control signal can be inverted.

If inversion is selected, a high signal (+24V) at the selected control input will be internally inverted. A low signal (open input or GND) at the selected control input will lead to manual mode being activated.

6.3.8.5.3 Signal active

The status of the internal signal after a possible inversion is shown here.

6.3.9 Service

In the service menu, the central configurations for the controller can be carried out. You will find the individual subfunctions in a separate section Service menu, Page 62.

6.3.10 Update

The GMMnext software can be updated with the help of a USB storage medium with no additional hardware or software. The update procedure is error-resistant because the system is a multi-partition system (system0 and system1). See also System slots, Page 61.

During the update process, the new software will first be installed on the inactive partition and the new partition will only be started at the end of a successful update procedure. If for example there should be a power failure during the update process or the USB stick is pulled out, the previously active partition will remain unharmed and will be started again.

A standard USB storage stick should be used when carrying out an update. This storage stick must be formatted as follows:

- The stick should have a classic DOS partition table.
- There should be exactly one partition on the stick.
- The partition must be FAT32 formatted.
- The size of the assignment units must be 8192 bytes.
- The label for the partition must be **NEXO_RAUC**.

You can do this from Windows-Explorer by selecting the recognized stick, opening the context menu with the right mouse button, selecting the aforementioned points and then starting the formatting process.

You must then copy the update file to the main directory on the USB storage stick. The file name must be as follows:

update-bundle-guentner-image-nexo-guentner-nexo-ec-1.raucb

In the future, the update file will be provided for downloading via the Güntner homepage.

See https://www.guentner.eu/products/controls/.

6.3.10.1 Update procedure

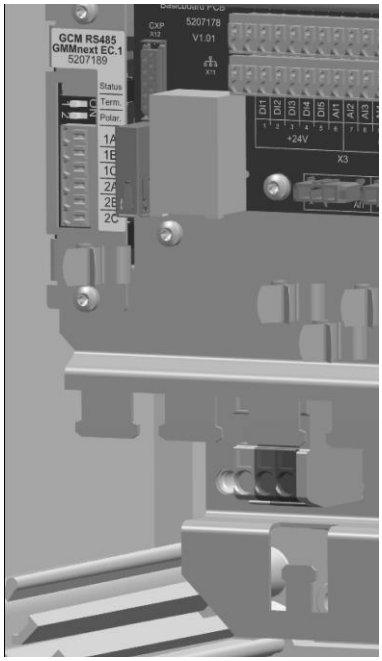
IMPORTANT

First of all, ensure that the date and time are set correctly.

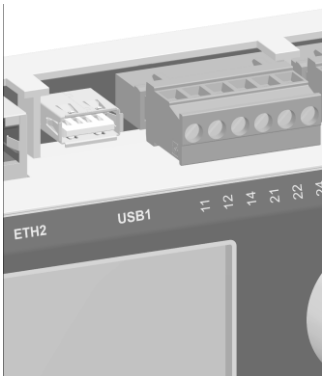
This is essential to ensure that the update certificate can be checked successfully.

See also Date/time, Page 56.

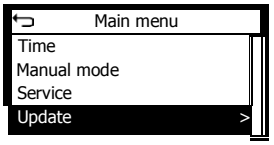
Now switch to the "Update" submenu before you insert the USB storage stick.



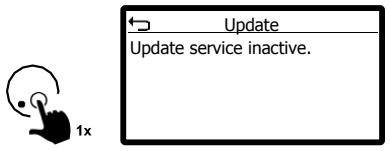
USB1 port on the GMMnext EC



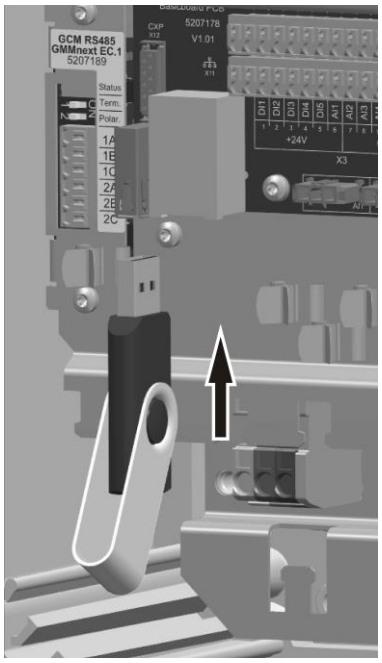
USB1 port on the GMMnext Rail



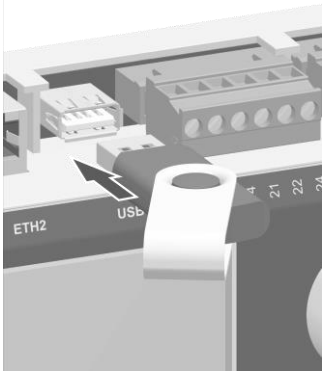
The update service status is then "inactive", which means that no update procedure is currently under way.



Do not insert the prepared USB storage stick into the USB port USB1 until now.

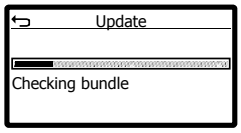


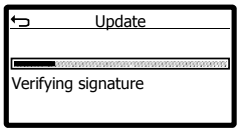
Inserting the USB storage stick into the GMMnext EC

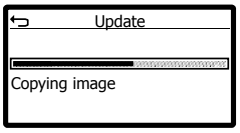


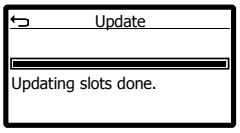
Inserting the USB storage stick into the GMMnext Rail

The update procedure will start automatically. The various stages in the update process will be shown. A progress display will show how far the update process has progressed.

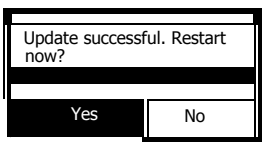






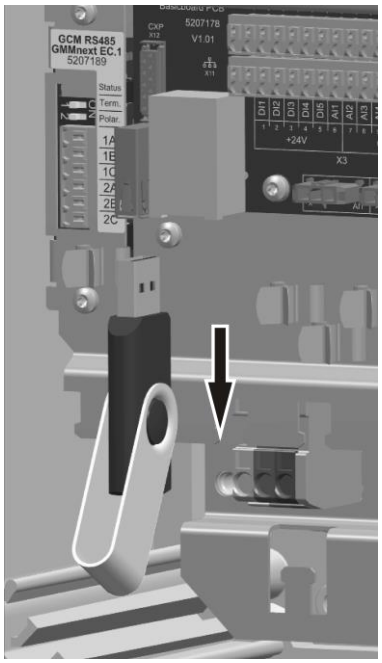


When the update including any data migration is complete, a message will appear:

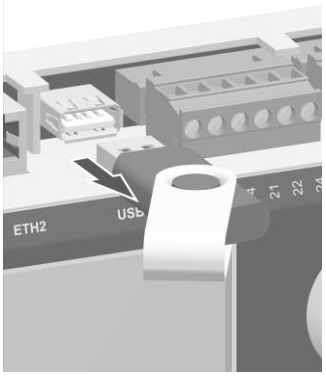


IMPORTANT

Remove the USB stick before restarting the system!

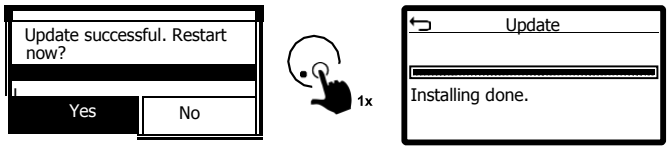


Removing the USB stick from the GMMnext EC



Removing the USB stick from the GMMnext Rail

Now confirm your selection by clicking on "Yes" for "Restart now".

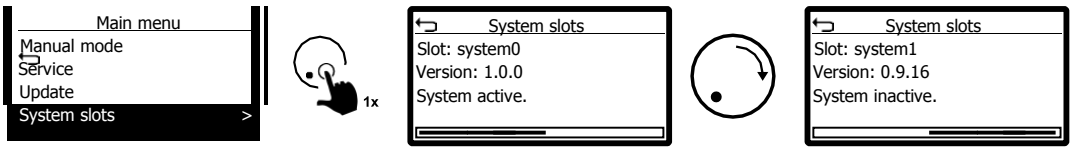


The system will now automatically restart.

6.3.11 System slots

The software architecture of the GMMnext features 2 system slots (system0 and system1) which are independent of each other. These are 2 separate areas where the system and application software as well as the database are installed. Only one of these system slots is ever active – the other one is inactive. This architecture allows an error-resistant software update and data migration.

This menu shows the statuses of the system slots and the software versions of the system slots.



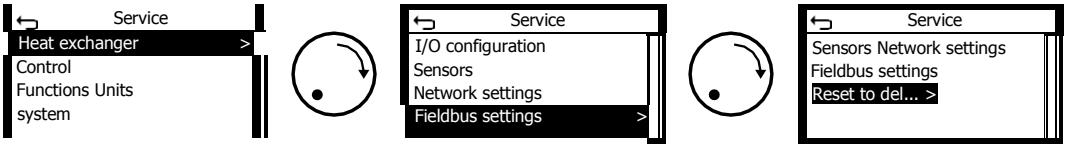
6.3.12 Screen font

You can temporarily change the screen font and the font size if necessary. The standard font is Helvetica size 11.

6.4 Service menu

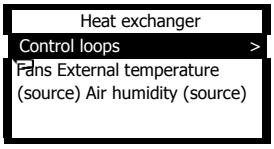
Via the service menu, you can configure all settings for the controller and the connected fans.

The following main categories can be found in the menu and are described in subsequent sections.



6.4.1 Heat exchanger

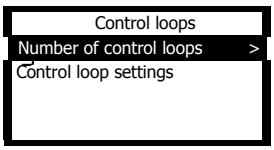
All settings which have an effect on the entire heat exchanger can be configured here.



Note: If an external temperature or air humidity sensor is configured and connected, the current measured values will also be shown here.

6.4.1.1 Control loops

Here, you can configure all basic settings for the control loops which relate to the heat exchanger itself. These include the number of individual heat exchangers which are installed, what type these heat exchangers are (i.e. what fluid is used), what sensors are installed and used and, possibly, the fan row which the control loop is to be assigned to.



NOTE

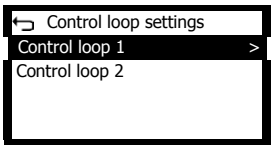
The associated internal control loop is configured separately in the menu, see Control, page 68.

6.4.1.1.1 Number of control loops

Up to 5 independent control loops can be configured. Set the number here according to the number of heat exchanger loops.

6.4.1.1.2 Control loop settings

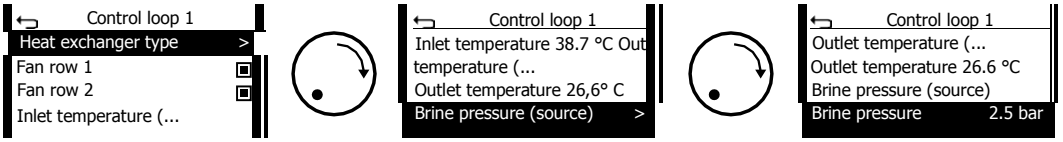
You can configure the settings for each control loop here.



IMPORTANT

The parameters available depend on the selected heat exchanger type.

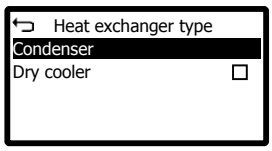
The following parameters are shown for a **dry cooler**:



The following parameters are shown for a **condenser**:

6.4.1.1.2.1 Heat exchanger type

The type of heat exchanger for this control loop can be set here.



6.4.1.1.2.2 Refrigerant

This menu point is only shown if the heat exchanger type is set to condenser. Here, you can specify whether a refrigerant is defined so that the setpoints and actual values with a temperature conversion are shown accordingly.

If no refrigerant is defined, only the pressure will be shown.

Using the condensing pressure and the refrigerant set, the GMMnext can calculate the condensing temperature, display this and use it for control purposes.

The following refrigerants are currently supported by the GMMnext:

- R134a
- R290
- R404A
- R407C
- R410A
- R507
- R717
- R723
- R744
- R22
- R1234yf
- R1234ze
- R1270
- R32
- R407A
- R407F
- R417A
- R427A
- R448A
- R449A
- R450A
- R452A
- R513A
- R600
- R600a

6.4.1.1.2.3 Fan row 1

For heat exchangers with 2 fan rows, you can specify whether fan row 1 (left-hand row, viewed from the inlet side) will be influenced by this control loop.

6.4.1.1.2.4 Fan row 2

For heat exchangers with 2 fan rows, you can specify whether fan row 2 (right-hand row, viewed from the inlet side) will be influenced by this control loop.

6.4.1.1.2.5 With condenser

6.4.1.1.2.5.1 Fluid pressure (source)

Here, you can set the source of the pressure sensor which is used as the actual value for the PID controller in this control loop.

6.4.1.1.2.5.2 Fluid pressure (current value)

The current measured fluid pressure is shown.

6.4.1.1.2.6 With dry cooler

6.4.1.1.2.6.1 Inlet temperature (source)

The source of the inlet temperature sensor for this control loop can be set here. This temperature is not used to control the control loop. It is used for recording/display purposes, for provision on the fieldbus and, possibly, to calculate a difference temperature, e.g. compared to the outlet temperature.

6.4.1.1.2.6.2 Inlet temperature (current value)

The measured inlet temperature is shown if this sensor is configured and measuring valid values.

6.4.1.1.2.6.3 Outlet temperature (source)

The source of the outlet temperature sensor for this control loop can be set here. This temperature is used as the actual value for the PID controller in this control loop.

6.4.1.1.2.6.4 Outlet temperature (current value)

The measured outlet temperature is shown if this sensor is configured and measuring valid values.

6.4.1.1.2.6.5 Brine pressure (source)

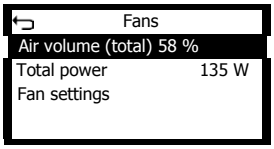
The source of any brine pressure sensor can be configured here.

6.4.1.1.2.6.6 Brine pressure (current value)

The measured brine pressure is shown if this sensor is configured and measuring valid values.

6.4.1.1.3 Fans

In this menu, you will find information regarding the connected fans and, if necessary, you can change the settings for each fan.



6.4.1.1.3.1 Air volume

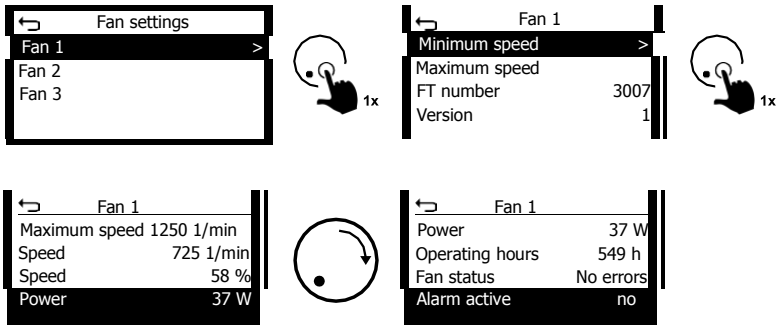
The cumulated total air volume for all fans is shown in %.

6.4.1.1.3.2 Total power

The current total power for all fans is shown.

6.4.1.1.3.3 Fan settings

In this menu, the current process data, warnings and alarms are shown for each fan. Manual changes to the parameters can also be made.



6.4.1.1.3.3.1 Minimum speed

If necessary, the minimum speed of the fan can be configured here.

IMPORTANT

This parameter should only be changed by a person with specialist knowledge because it affects the fan's minimum air volume.

If you would like a base value for a control loop for example, configure this in the relevant control loop instead.

6.4.1.1.3.3.2 Maximum speed

If necessary, the maximum speed (working point speed) of the fan can be configured here.

IMPORTANT

This parameter should only be changed by a person with specialist knowledge because it affects the fan's working point and, if configured incorrectly, will lead to the maximum noise limit being exceeded.

6.4.1.1.3.3.3 FT number

The fan type number (without version number) is shown. It is part of the Güntner item number for the fan.

6.4.1.1.3.3.4 Version number

The hardware version number of the fan is shown. It is part of the Güntner item number for the fan.

6.4.1.1.3.3.5 Maximum speed

The fan's current configured maximum speed is shown here. This speed is also referred to as the working point speed.

6.4.1.1.3.3.6 Current speed

The fan's current speed is shown.

6.4.1.1.3.3.7 Speed in %

The current speed in percent in relation to the fan's maximum speed is shown.

6.4.1.1.3.3.8 Power

The current fan power, calculated from the intermediate circuit voltage and the intermediate circuit current, is shown.

6.4.1.1.3.3.9 Operating hours

The fan's operating hours are shown.

6.4.1.1.3.3.10 Fan status

This shows whether the fan is currently error free or has an error.

6.4.1.1.3.3.11 Alarm active

This shows whether an alarm is currently active for this fan.

6.4.1.1.4 External temperature (source)

Here, you can configure the source of an external temperature sensor. Select a temperature sensor which you set up previously here.

6.4.1.1.5 External temperature (current value)

The measured external temperature is shown if this sensor is configured and measuring valid values.

6.4.1.1.6 Air humidity (source)

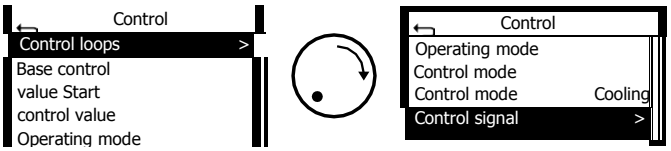
Here, you can configure the source of an air humidity sensor. Select an air humidity sensor which you set up previously here.

6.4.1.1.7 Air humidity (current value)

The measured air humidity is shown if this sensor is configured and measuring valid values.

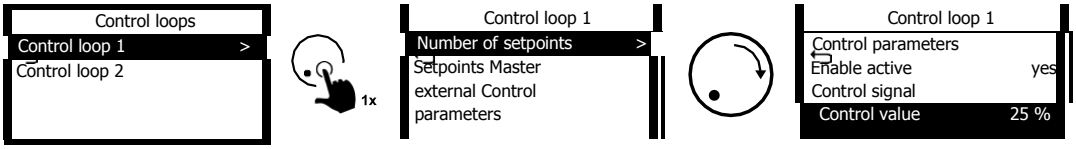
6.4.2 Control

Here, you can configure settings which apply either to each control loop or to all control loops.



6.4.2.1 Control loops

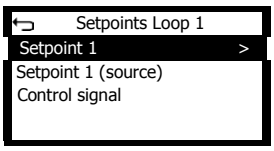
Here, you can configure settings which apply exclusively to the selected control loop.



6.4.2.1.1 Number of setpoints

Up to 2 setpoints can be configured for each control loop. The switchover from setpoint 1 to setpoint 2 is effected by a control signal which can be configured freely. If setpoint 2 (source and value) is to be displayed later on, the number of setpoints must be set to 2.

6.4.2.1.2 Setpoints



Here, you can configure the setpoints for the internal PID controller, possibly the setpoint sources and the control signal for switching from setpoint 1 to setpoint 2.

6.4.2.1.2.1 Setpoint 1/2

Here, you can set the parameter setpoints 1 or 2 for this control loop.

6.4.2.1.2.2 Setpoint 1/2 (source)

If the setpoint will not come from the internal parameter setpoint 1 or 2, you can select the source, e.g. an external analogue setpoint signal, here.

See also Temperature signals setpoint/pressure signals setpoint, Page 96.

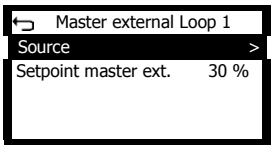
6.4.2.1.2.3 Control signal

If necessary, you can configure the source of a control signal (digital input) which switches the selected control loop from setpoint 1 to setpoint 2.

6.4.2.1.3 Master external

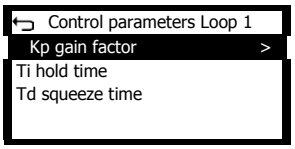
In the "Slave external analogue" operating mode, the control value for the fans is given via an analogue signal. Here, you can configure the source of the previously configured fan control value signal.

See also Fan control value signals, Page 96.



6.4.2.1.4 Control parameters

Here, you can set the control parameters for the PID controller in the respective control loop.



6.4.2.1.4.1 Kp gain factor

The Kp factor specifies the control gain. It is the proportion of the control path following the input signal.

6.4.2.1.4.2 Ti hold time

The I part of the control constantly changes the degree of regulation until the actual value reaches the setpoint.

6.4.2.1.4.3 Td squeeze time

The D part of the control reacts not to the control deviation but to the speed of change.

6.4.2.1.5 Enable active

This shows whether the control loop is enabled (either through a control signal or permanently).

6.4.2.1.6 Control signal (control loop enable)

Here, you can configure a control signal which enables the selected control loop. If necessary, the signal can also be inverted.

IMPORTANT

If no control signal is configured, the control loop is always enabled.

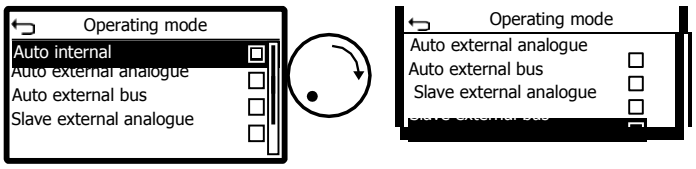
6.4.2.2 Base control value and start control value

The base control value function is used to set a minimum speed. The start control value function is used to define a start point for issuing the control value.

Here are some setting examples:

Base control value	Start control value	Function
0%	0%	Functions off, normal control 0%...100% with enable
10%	0%	At least 10% control value is issued, when the enable is active
10%	5%	At least 10% control value is only then issued when the control has reached 5% and the enable is due
10%	10%	The 10%...100% control value is only issued when the control reaches 10%
0%	5%	The control value is 0% when the general value is under 5%. The control value is issued (5%...100%) from 5% control with given enable.

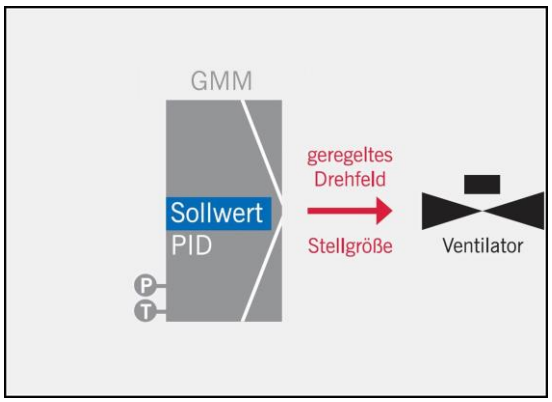
6.4.2.3 Operating mode



The operating mode can be set in this menu. The setting then applies to all control loops.

6.4.2.4 Auto internal

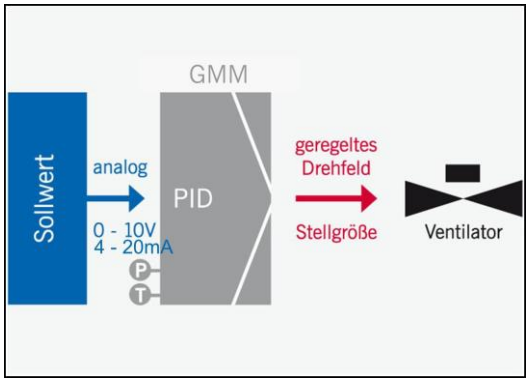
In this mode, the system is regulated automatically to the setpoint set internally. The setpoint 1 and possibly a setpoint 2 can be set individually for each control loop under "Setpoints" in the menu.



Sollwert: setpoint; geregeltes Drehfeld: controlled rotating field; Stellgröße: correcting variable; Ventilator: fan

6.4.2.5 Auto external analogue

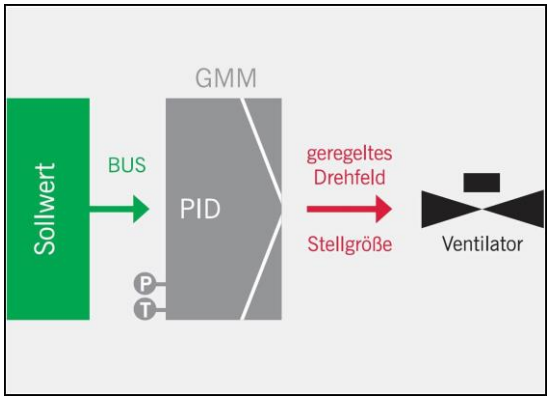
In this mode, the system is regulated automatically to a setpoint defined externally in an analogue fashion. In order for this to be possible, a corresponding "Temperature setpoint" or "Pressure setpoint" sensor signal (see Temperature signals setpoint/pressure signals setpoint, page 96) must be configured beforehand and assigned to an analogue input.



Sollwert: setpoint; analog: analogue; geregeltes Drehfeld: controlled rotating field; Stellgröße: correcting variable; Ventilator: fan

6.4.2.6 Auto external bus

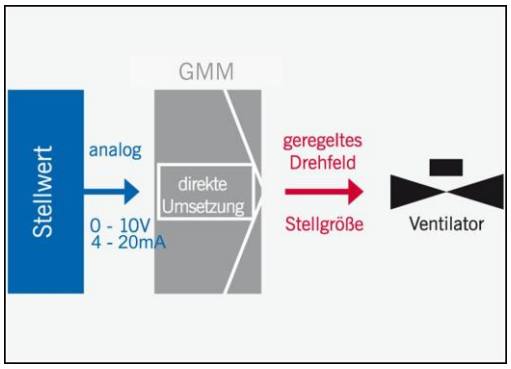
In this mode, the setpoint is given via one of the possible fieldbus interfaces/protocols. In order to operate the fieldbus interface, another communication module may be required, see also Options, page 117 in order to configure the fieldbus interface, see Fieldbus settings.



Sollwert: setpoint; geregeltes Drehfeld: controlled rotating field; Stellgröße: correcting variable; Ventilator: fan

6.4.2.7 Slave external analogue

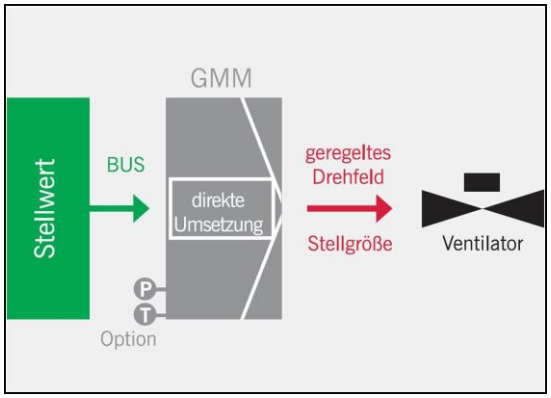
In this mode, there is no internal control. Instead the fan control value signal which is given externally in an analogue fashion is passed directly to the fans. In order for this to be possible, a corresponding fan control value signal must be set up beforehand, assigned to an analogue input and assigned to the control loop as a master control value, see also Fan control value signals, page 96.



Sollwert: setpoint; analog: analogue; direkte Umsetzung: direct application; geregeltes Drehfeld: controlled rotating field; Stellgröße: correcting variable; Ventilator: fan

6.4.2.8 Slave external bus

In this mode, the control value is given via one of the possible fieldbus interfaces/protocols. In order to operate the fieldbus interface, another communication module may be required and the fieldbus interface may need to be configured, see Fieldbus settings, Page 99.

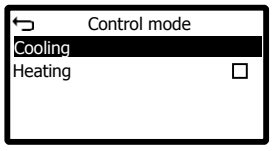


Sollwert: setpoint; analog: analogue; direkte Umsetzung: direct application; geregeltes Drehfeld: controlled rotating field; Stellgröße: correcting variable; Ventilator: fan

6.4.2.9 Control mode

Normally, the GMMnext is used to cool liquids and refrigerants. With some applications, a reversal of the function is required, i.e. liquids are warmed (e.g. with heat pumps). With the "Control mode" parameter, you can set the control logic globally to Heating for all control loops.

As an alternative to setting a fixed control mode, the switchover can be effected via a freely configurable control signal, see Control signal.



6.4.2.10 Control mode (current)

The current control mode is shown.

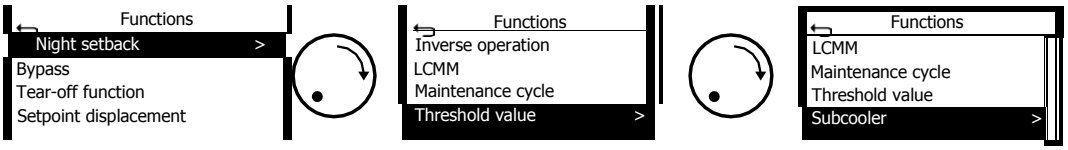
6.4.2.11 Control signal

With the help of a control signal, the control mode can be switched from Cooling to Heating. If you wish, you can configure the source of the digital signal here. You can also configure the inversion of the control signal if necessary.

Switching from Cooling to Heating will then affect all control loops.

6.4.3 Functions

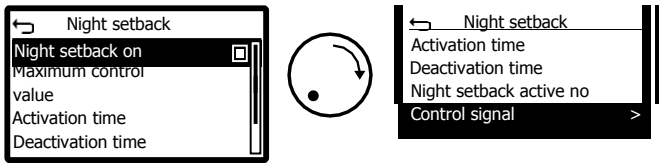
With this item in the service menu, you can activate and configure special functions if necessary.



6.4.3.1 Night setback

With this item in the service menu, you can configure night setback. Night setback limits the fans to a maximum control value (speed).

In order for time-dependent night setback to work, the activation and deactivation times must be different. Please also ensure that the system time is set correctly, see also Date/time, page 56. You should also bear in mind that the system time may need to be set correctly if the controller was switched off for a long period. This is because the real-time clock only remains set for a few days without power.



6.4.3.1.1 Night setback on

The function can be switched on or off here. Night setback will only work if the function is switched on, e.g. by an external control signal or independently of time.

6.4.3.1.2 Maximum control value

The maximum control value to which the output signals for the fans are limited can be set here.

6.4.3.1.3 Activation time

The activation time for night setback can be set here. Night setback will then be switched on depending on the system time.

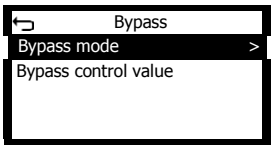
6.4.3.1.4 Deactivation time

The deactivation time for night setback can be set here. The limiting of fan control values will then be deactivated again.

6.4.3.1.5 Control signal

If necessary, the source of a control signal (digital input) for activating night setback can be configured here.

6.4.3.2 Bypass



With this item in the service menu, the bypass function can be switched on or off. If the function was activated, the control value for bypass operation can be set. This function is used to maintain operation in the event of a fault in a GMMnext component.

The bypass function has the effect that if there is a fault in the GMMnext the fans will run at the speed specified here. The bypass speed is activated automatically 10 s after the connection to the GMMnext is lost or there is a sensor fault.

The following options can be set:

Bypass operation ON

Control value 0 %

... if the GMMnext is defective or the connection to the fans has been interrupted:

=> all the fans stop

Control value 100 %

... if the GMMnext is defective or the connection to the fans has been interrupted:

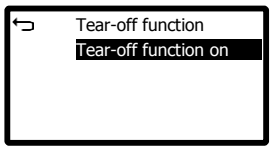
=> all fans run at a speed of 100 %

Bypass operation OFF

... if the GMMnext is defective or the connection to the fans has been interrupted:

=> all fans run at their last speed before the GMMnext failed

6.4.3.3 Tear-off function



The tear-off function prevents the fans from being blocked by snow during the winter.

The GMMnext menu offers this function only if it is possible for all the EC fans.

NOTE

This function is possible only with EC fans supplied later than 2012 (approximate figure, because old stocks may have been being used up).

If the tear-off function is **deactivated**, the EC fan will signal a fault if, when started up, it is found to be not rotating. The EC fan will then continue to make regular low-starting-current attempts to start up in the preferred direction.

If, while the tear-off function is **activated**, the EC fan attempts to start up and finds that it is blocked, it will automatically make a number of further attempts, with increasing drive current and in alternating directions. The GMMnext does not issue a fault report during this time. If the fan does succeed in rotating it then changes automatically to its preferred direction and goes into normal operation.

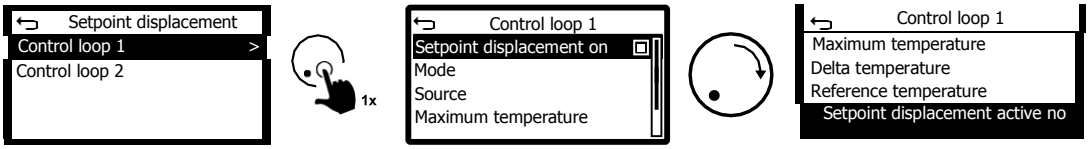
If this also fails to start rotation the fan will then report this in the form of a Blocked report and will then use its minimum starting current to continue attempting to start up, in alternating directions.

6.4.3.4 Setpoint displacement

Setpoint displacement results in the setpoint which is currently used being raised or lowered depending on another signal value.

2 setpoint displacement modes are supported. In the "reference displacement" mode, the displacement takes place depending on the external temperature or wet bulb temperature for example. In the "direct displacement" mode, the displacement takes place depending on a setpoint displacement signal which can come from any analogue input. This setpoint displacement signal should be set up in the sensor menu beforehand.

Setpoint displacement can be configured separately for each control loop.



6.4.3.4.1 Setpoint displacement on

Setpoint displacement for the relevant control loop can be switched on and off here.

6.4.3.4.2 Mode

Select the setpoint displacement mode here.

Select "**reference displacement**" if setpoint displacement is to take place depending on the external temperature or wet bulb temperature. Please note that reference displacement depending on the aforementioned reference temperatures only makes sense and is only available if the actual control takes place on the basis of a temperature.

Select "**direct displacement**" if the setpoint is to be displaced depending on an analogue signal.

6.4.3.4.3 Source

In the "direct displacement" mode, the source can be selected here. In order to do this, you must first set up a temperature setpoint displacement sensor or a pressure setpoint displacement sensor.

See also Temperature setpoint displacement/pressure setpoint displacement, Page 96.

You can also configure the scaling of the setpoint displacement for the relevant signal source. As a result, any positive and negative displacement signals are possible depending on an analogue input.

6.4.3.4.4 Maximum temperature

You can set the maximum temperature up until which the displacement signal influences the displacement here.

6.4.3.4.5 Delta temperature

You can set the delta temperature, i.e. the difference between the setpoint and the displacement signal, here.

6.4.3.4.6 Reference temperature

You can select the temperature which will be used as a reference here.

External temperature-dependent setpoint displacement

In order to ensure the optimum operation from an energy point of view, it is beneficial to displace the setpoint under certain circumstances, depending on the external temperature. Setting the min. condensation temperature can cause rising external temperatures, so that the external temperature is above the setpoint. If the system is now only to be operated at partial load, raising the setpoint can save energy on the fans. Without a displacement these fans would always be controlled with 100 %, as the high external temperature (above the setpoint) means this setpoint cannot be reached.

Example:

Setpoint = 25 °C

ΔT = 5 K

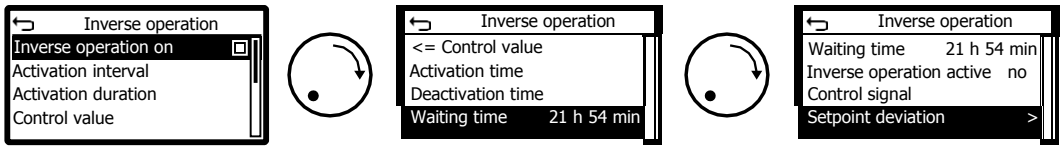
T_{max}= 40 °C

In this example, the setpoint must always be 5 K above the external temperature. As soon as the external temperature reaches 20.1 °C, the setpoint is displaced to 25.1 °C. The limit Tmax marks the area up until which the displacement works. In this example, the setpoint is displaced from 20 °C. The max. value where the setpoint can be displaced to is at 45 °C in this example.

6.4.3.4.7 Setpoint displacement active

This shows whether setpoint displacement is currently active.

6.4.3.5 Inverse operation



Activation of inverse operation depends on the fan having been in operation for a certain time. It is carried out with a configurable control value in the opposite direction.

Inverse operation can be used to delay contamination of the fins in the heat exchanger.

This function is carried out if the following conditions are met:

- Manual mode is deactivated
- Control value for all PID controllers in the control loops ≤ configurable control value
- Night setback off
- No unit fault
- Possibly for a configured time window
- The delta between the actual value and the setpoint for the relevant control loops is not greater than the configured Δ max value

Inverse operation is performed independently of the enabling of the controller.

If in inverse operation one of the above conditions is not met, inverse operation will be aborted and the controller will return to normal controlled operation. In this case, inverse operation will be deemed not to have taken place and it will only be started again if all of the conditions above are met. Aborting inverse operation always resets the counter for the inverse operation duration.

Inverse operation is not considered to be complete until a full cycle has been carried out at one time. Inverse operation can also be activated via a control signal.

IMPORTANT

This function is possible only with EC fans supplied later than 2012 (approximate figure, because old stocks may have been being used up).

6.4.3.5.1 Inverse operation on

This is used to turn the function on or off.

6.4.3.5.2 Activation interval

When the fans have been in operation for this length of time, inverse operation is scheduled. Only actual operating time in seconds is counted. Time during which the fans are at rest is not included.

6.4.3.5.3 Activation duration

This is used to specify the duration of inverse operation.

6.4.3.5.4 Control value

This control value allows inverse operation. This control value is also used if inverse operation is activated via a control signal.

6.4.3.5.5 <= Control value

Condition for inverse operation. Inverse operation will only be enabled if the current control value for all PID controllers in the control loop <= this configured control value.

6.4.3.5.6 Activation time/Deactivation time

If necessary, a time window in which inverse operation can take place can be configured. In order for this to be possible, all other conditions must be met. If the two times are the same, no time window will be active.

6.4.3.5.7 Waiting time

This shows the remaining required waiting time before the next inverse operation.

6.4.3.5.8 Inverse operation active

This shows whether inverse operation is currently taking place.

6.4.3.5.9 Control signal

If necessary, you can configure an external control signal and, possibly, a desired inversion.

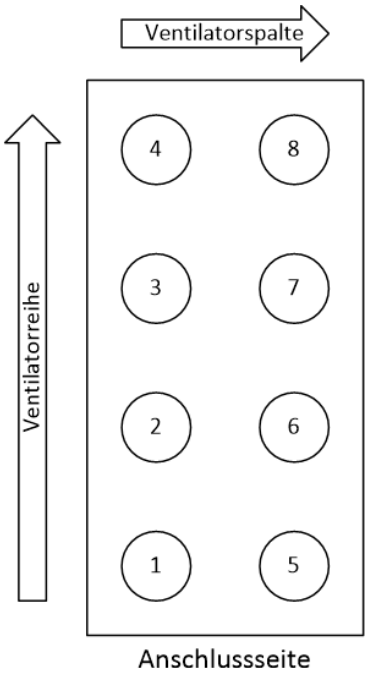
6.4.3.5.10 Setpoint deviation

Inverse operation will only be enabled or aborted if the deviation between the setpoint and the actual value is smaller than the Δ max value. Monitoring can be turned on and off for each control loop and the maximum Δ max deviation can be configured. This function only makes sense in auto internal or auto external mode.

6.4.3.6 LCMM

In order to gain a better understanding of the individual functions and parameters, a number of explanations regarding the nomenclature are given below:

- **Fan row**
  This refers to a row of fans which stretches one-dimensionally from the connection side of the heat exchanger to its rear side.
- **Fan column**
  This refers to a number of fans running orthogonally to a row of fans. Generally speaking, this term is used for two-row units.
- **Fan group**
  This refers to a number of fan rows which are assigned to a number of control loops and can be controlled independently of other fan rows.
- **Increment**
  The number of fans within a fan group which shall be switched on or switched off at the same time.

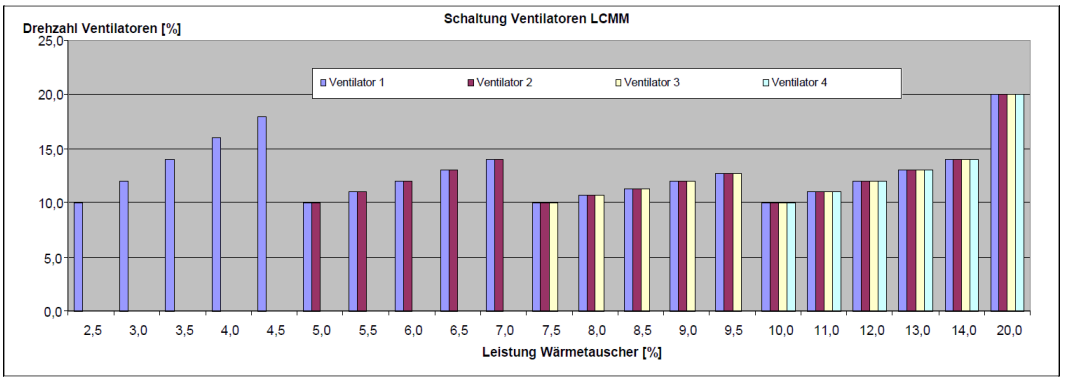


Ventilatorspalte: fan column; Ventilatorreihe: fan row;
Anschlussseite: connection side

EC fans have a minimum speed which lies somewhere between 5 and15 % of the maximum speed. With systems with one fan this is simultaneously the smallest possible control value of the controller for the overall system.

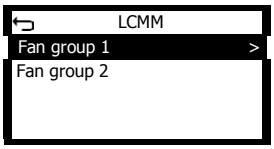
With systems with several fans, the controller's LCMM function allows a control value that is lower than the minimum control value of an individual fan by switching fans off and on (min. control value = min. fan speed / number of fans). With control values that are above the minimum speed of an individual fan (therefore from approx. 5-15 %), all fans run regularly, and the control is now only via the fans' speed. The advantage of this control is the ability, even with low heat exchanger power, to use the continuous control via the fan speed instead of running a pure 2-point control.

A system with 4 individually controlled fans serves as an example. With an assumed minimum fan speed of 10 % of the maximum speed, a control value of 2.5 % can be set for the heat exchanger (10 % / 4). At this setting one fan runs with the required minimum speed and all other fans are switched off. If the control value is increased, the activated fan increases its speed. As soon as the overall system reaches a control value of 5 % the 2nd fan is activated; from 7.5 % the third and from 10 % all fans run. The figure below illustrates the process. Without LCMM only heat exchanger powers > 10 % are possible (all fans run).

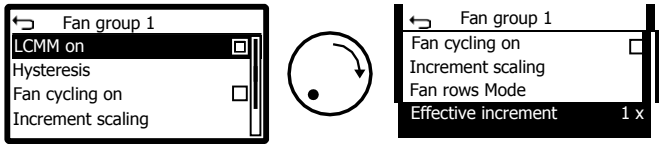


Drehzahl Ventilatoren [%]: Fan speed [%]; Schaltung Ventilatoren LCMM: LCMM fan switching Ventilator: Fan; Leistung Wärmetauscher [%]: Heat exchanger power [%]

The LCMM function is configured for each fan group.



The following functions can then be configured for each fan group:



6.4.3.6.1 LCMM on

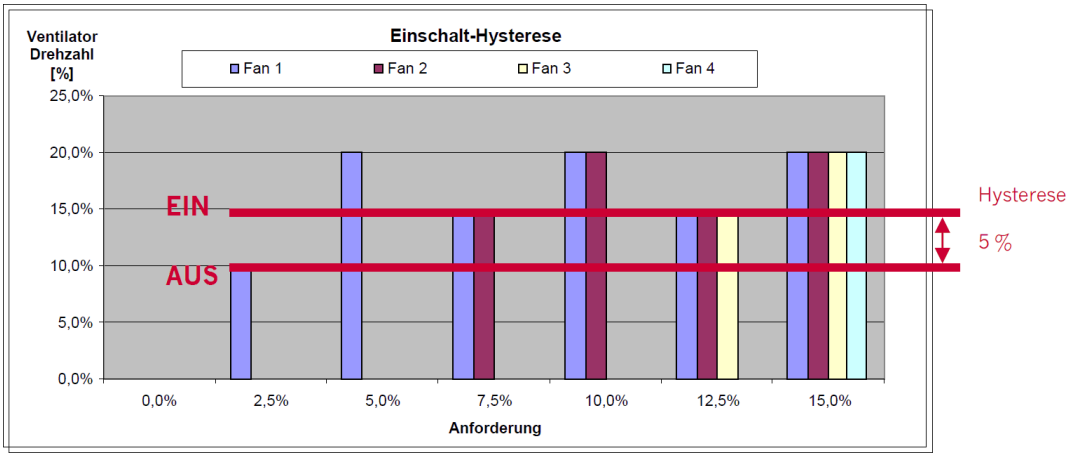
Here, you can switch the LCMM function on and off for this fan group.

6.4.3.6.2 Hysteresis

To avoid a constant switching on and off of the fans depending on the calculated control value, a hysteresis factor between 1.0 and 2.5 can be defined. This factor is multiplied with the minimum speed of the respective fan and the control value from which the first/next fan will be activated is therefore determined. (A hysteresis factor > 1.0 means no hysteresis.)

Within the hysteresis curve the GMMnext control continues to run regularly via the speed of the fans, as described in the above section. The control values, with which individual fans are activated or deactivated, have changed.

In the example shown below the minimum speed of a fan is at 10 %, the hysteresis factor is at 1.5 and therefore the speed at which the first fan is activated is at 15 % (this is equal in our example with 4 fans to a heat exchanger power of 3.75 %). The first fan is deactivated at a heat exchanger power of 2.5 % or less, i.e. when the minimum speed of the individual fan is reached. The second fan is activated in our example at a system control value of 7.5 % (2 of 4 fans run at a control value of 15 %), the third fan at 11.25 % and the fourth at 15 %.



Ventilator Drehzahl [%]: Fan speed [%]; Einschalt-Hysterese: Activation hysteresis; EIN: ON; AUS: OFF; Hysterese: Anforderung: Requirement

6.4.3.6.3 Fan cycling on

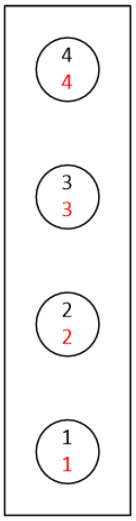
Via the fan cycling, LCMM offers the possibility of keeping the fans' operating times more or less the same. When this feature is activated the fans at low control values are switched on in an alternating sequence, so that the units with the least operating hours are switched on first. This should increase the EC fans' overall service life.

6.4.3.6.4 Increment scaling

The increment is used to determine how many fans within a group are switched on or off at the same time. The bigger the increment, the smaller the granularity with which the overall control value for all fans in a system is implemented. The following parameters are taken into account when calculating the increment:

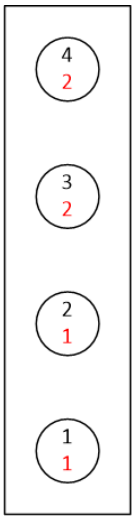
- **Atomic increment**
  If all fans within a column are to be controlled synchronously, the smallest increment with which the fans can be switched on and off is calculated from the number of fan rows within the particular fan group.
- **Increment scaling**
  Using an integral factor, the granularity of the atomic increment can be further reduced. The result is the **effective increment**.

The increment scaling is 1 by default. With large heat exchangers, a higher increment can be used in order to prevent individual fans being switched on and off all the time. The following illustration shows a single-row unit with an effective increment of 1. This corresponds to the “1 row individual” option for the old GMM EC.

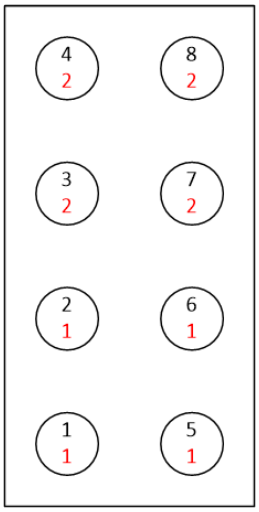


The fans are switched on and off individually.

The effects of an increment greater than 1 are shown in the following illustrations. The first corresponds to the “1 row in pairs” option for the old GMM EC.



An effective increment of 2 for a single-row heat exchanger



An effective increment of 4 for a multi-row heat exchanger

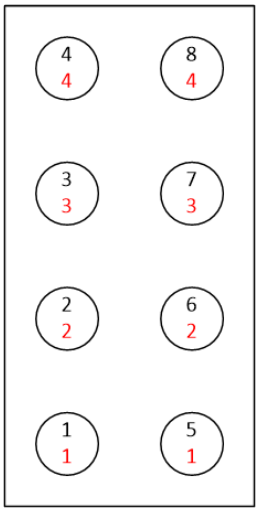
6.4.3.6.5 Fan row mode

Here, you can specify how the fans in a fan row are controlled in relation to a neighbouring fan row. A distinction is made between synchronous and asynchronous control.

Synchronous control

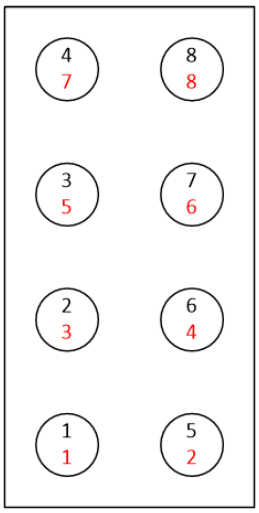
With a number of multi-row heat exchangers, the fans within a fan column must also be controlled as synchronously as possible. In this case, two options are available:

- Fan row mode = **uniform**
  All fans within a column (i.e. with respect to the neighbouring row) are controlled with the same control value. The increment corresponds to the number of fan rows, in this case 2. This is a generalization of the "2 rows in pairs" option for the old GMM EC.



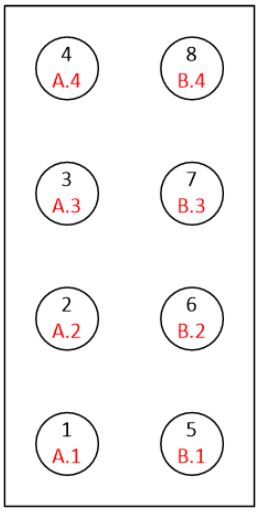
The fans within a column receive the same control value

- Fan row mode = **balanced**
  Fan control differs in no more than one column. In this case, the atomic increment is 1. This is a generalization of the "2 rows individual" option for the GMM EC, which in theory could also be operated with fan cycling.



The control value for the fans differs in no more than one column

- Fan row mode = **independent**
  If a heat exchanger with a number of control loops is operated, there are generally different cooling requirements for the individual fan rows. In such a case, the fan rows can be controlled independently and there is no synchronization within a column. This case is shown in the following illustration.



All fan rows are controlled independently of each other.

6.4.3.6.6 Effective increment

The effective increment is shown.

6.4.3.7 Maintenance cycle

A maintenance cycle is activated in response to the length of time the fans have been stationary. Its purpose is to prevent them from becoming jammed.

Activation of a maintenance cycle after the configured standstill period depends on all the following conditions being fulfilled:

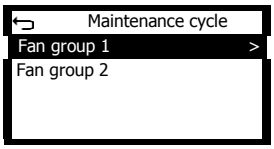
- Manual mode is deactivated
- Control value for all PID controllers in the control loop = 0, i.e. no speed requirement
- No unit fault

The controller does not need to be enabled, because the speed controller is often enabled only when cooling has been requested. Otherwise the maintenance cycle would effectively be disabled and a maintenance cycle would never happen.

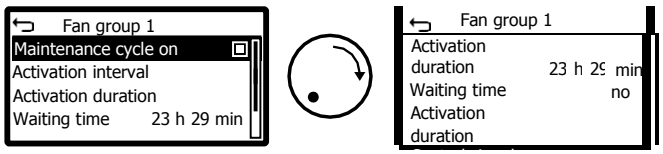
If a speed request is made during a maintenance cycle, the maintenance process will be aborted and the system will return to control mode. In such cases, maintenance is considered to have been performed, because the fans have been in operation.

A maintenance cycle is carried out at full speed, but this will be reduced by an active night setback.

The maintenance cycle can be set for each fan group.



The following functions can then be configured for each fan group:



6.4.3.7.1 Maintenance cycle on/off

This is used to turn the function on or off.

6.4.3.7.2 Activation interval

If the fans have not been in operation at all during this configured period then a maintenance cycle will be started.

6.4.3.7.3 Activation duration

This is used to specify the duration of a maintenance cycle.

6.4.3.7.4 Waiting time

This shows the current waiting time until the next maintenance cycle.

6.4.3.7.5 Maintenance cycle active

This shows whether a maintenance cycle is currently taking place.

6.4.3.7.6 Control signal

The maintenance cycle can also be activated via an external control signal. This can be configured here.

6.4.3.8 Threshold value

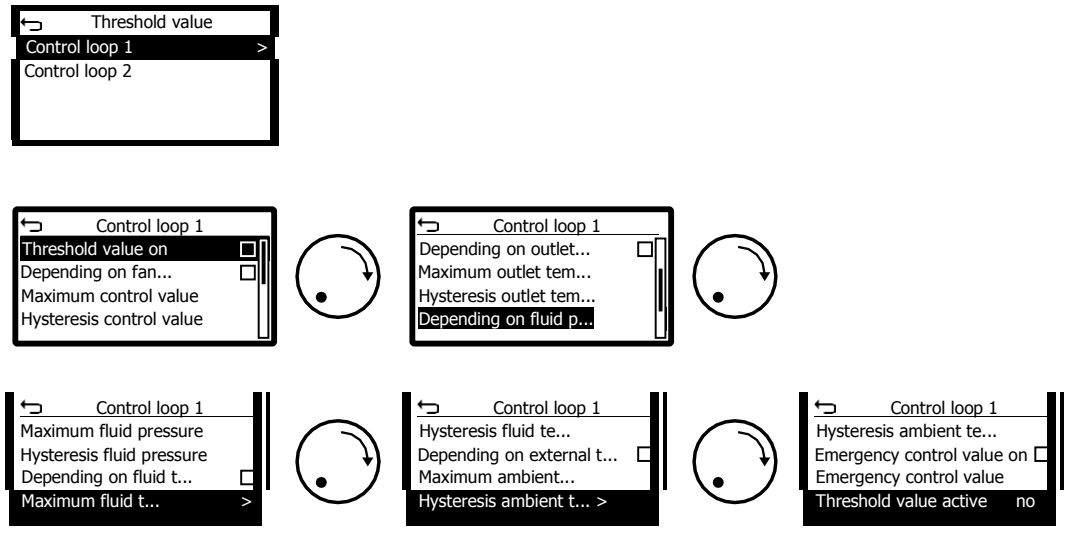
With the help of the threshold value function, you can switch any relays (digital output) depending on various parameters separately for each control loop.

IMPORTANT

You can select a number of dependencies. The results of the dependencies come together in an **AND function**. This means that the threshold function is only fulfilled if all activated dependencies are fulfilled.

A **maximum value** and a **hysteresis** can be set for each dependency.

The threshold value output signals are assigned to any digital output separately in the I/O configuration -> Digital outputs.



The following dependencies can be activated and parametrized separately:

6.4.3.8.1 Depending on the fan control value

The threshold value condition is fulfilled if the fan control value is greater than the configured maximum value.

6.4.3.8.2 Depending on the outlet temperature

The threshold value condition is fulfilled if the outlet temperature is greater than the configured maximum value. This dependency makes sense only if the control loop is of the dry cooler type.

6.4.3.8.3 Depending on the fluid pressure

The threshold value condition is fulfilled if the fluid pressure is greater than the configured maximum value. This dependency makes sense only if the control loop is of the condenser type.

6.4.3.8.4 Depending on the fluid temperature

The threshold value condition is fulfilled if the fluid temperature is greater than the configured maximum value. This dependency makes sense only if the control loop is of the condenser type and an appropriate refrigerant is configured.

6.4.3.8.5 Depending on the external temperature

The threshold value condition is fulfilled if the external temperature is greater than the configured maximum value.

6.4.3.8.6 Maximum value

If the relevant maximum value is exceeded, the threshold condition is fulfilled.

6.4.3.8.7 Hysteresis

In order to prevent the threshold value signal switching back and forth, a hysteresis can be configured for each condition. If a threshold value condition was fulfilled, it will only be deemed to be not fulfilled again if the dependent value is smaller than the maximum minus the hysteresis.

The threshold value function can be configured separately for each control loop.

6.4.3.8.8 Emergency control value on

The emergency control value is issued as the control value for the relevant control loop if the following conditions are fulfilled:

- Threshold value function is active
- Threshold value condition(s) exceeded
- Emergency control value function is active
- Emergency control value is greater than the calculated fan control value (e.g. during controlled operation or bypass value with sensor fault)
- Manual mode is not active
- Control loop is enabled

The emergency control value can be reduced to active night setback if necessary.

6.4.3.8.9 Emergency control value

The relevant emergency control value can be set here.

6.4.3.8.10 Threshold value active

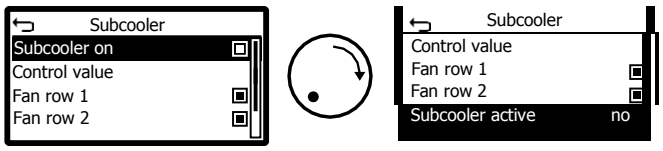
This shows whether a threshold value signal is active for this control loop.

6.4.3.9 Subcooler

This function allows a separate subcooler fan to be operated. The control value for the subcooler fan is output via a freely selectable analogue output (e.g. 0...10 V = 0...100 %) and can then be used to control this fan.

The subcooler function is independent of the remaining fan controls. The subcooler is controlled when the fans in the relevant fan group(s) are turning (or when the current actual value for the fan group is sufficiently high). The subcooler function is independent of the manual mode.

Any active night setback will be taken into account for the subcooler.



6.4.3.9.1 Subcooler on

The subcooler function can be switched on here.

6.4.3.9.2 Control value

The control value which is output when the subcooler function provides an active signal can be configured here. Downstream scaling then takes place in the configuration of the analogue output.

6.4.3.9.3 Fan row 1

Here, you can select whether the fans in fan row 1 (left) turning should be used as a criterion for activating the subcooler.

6.4.3.9.4 Fan row 2

Here, you can select whether the fans in fan row 2 (right) turning should be used as a criterion for activating the subcooler.

6.4.3.9.5 Subcooler active

This shows whether the subcooler function is providing an active signal.

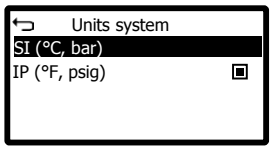
The subcooler function was originally developed for separately attached subcooler units. With the GMMnext, this control can also be achieved by configuring a separate control loop if the relevant subcooler loop is fully integrated into the heat exchanger.

For details of backwards compatibility, see the control values to be set for the fans/fan IDs used to date in the following table.

Fan ID	FT No.	Speed [rpm]	Control value
1398	FT03039U	1220	10.0
1399	FT03039U	1150	8.0
1400	FT03039U	920	6.5
1401	FT03039U	770	5.3
1402	FT03039U	500	3.6
1403	FT03039U	310	2.2
1404	FT03040U	1540	10.0
1405	FT03040U	1130	6.8
1406	FT03040U	880	5.3
1407	FT03040U	610	3.7
1408	FT03040U	374	2.2

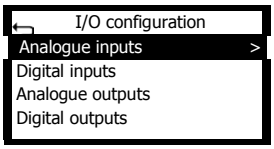
6.4.4 Units system

Here, you can set the units system which is used to show the values in the display.



6.4.5 I/O configuration

In this menu, the analogue and digital inputs/outputs can be configured.



6.4.5.1 Analogue inputs

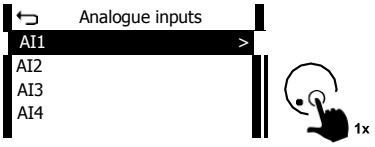
The analogue inputs are multifunctional inputs which can measure either current, voltage or resistance.

See also Analogue inputs AI1…AI5, page 39.

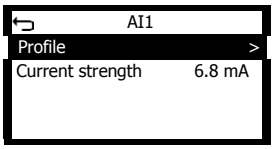
A so-called profile can be assigned freely to each of the analogue inputs. Select the relevant input and set your desired profile.

Standard profiles such as those used in typical control and regulation systems and user-defined profiles are available. As a result, there is a very wide range of signal processing options.

Select an analogue input…



… and assign your desired profile to the input:



The following profiles can be selected:

- Voltage 0… 10 V
- Voltage 2… 10 V
- Current 0… 20 mA
- Current 4… 20 mA
- Resistance thermometer
- Voltage user-defined
- Current user-defined
- Resistance user-defined

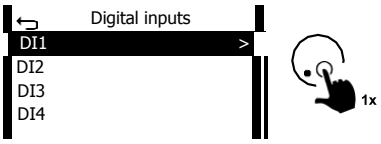
With the user-defined profiles, you can also configure the minimum and maximum values with which the input signal is then converted to the internal signal values 0.0 to 1.0.

Depending on the selected profile, the currently measured value is shown in the corresponding unit.

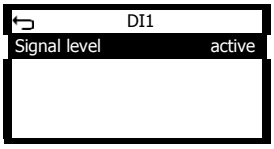
6.4.5.2 Digital inputs

Only the statuses of the digital inputs can be shown here. See also Digital inputs DI1…DI5 (control inputs), Page 39.

The control inputs are always assigned for the relevant functions. Select a digital input…



... and the current signal level will then be shown:



Active means that a "high level=logically 1" is present.

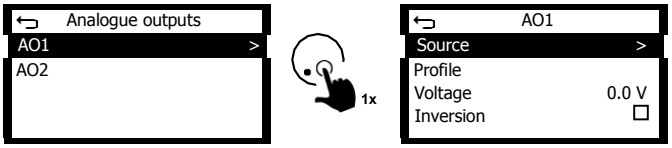
Inactive means that a "low level=logically 0" is present.

6.4.5.3 Analogue outputs

You can configure the profiles, the signal sources and, if desired, an inversion of the analogue outputs here. The current signal value for the output is also shown here.

See also Analogue outputs AO1…AO2.

Select an analogue output…



...and then select the source which is to be output at this output and, possibly, your desired profile.

The following signal sources can be selected:

- None
- AI1…AI5
- Control value for the fan groups
- Control value for the PID controller for the relevant control loop
- Control value for a fan
- Control value for the subcooler

function The following profiles can be set:

- Voltage 0–10 V
- Voltage 2–10 V
- Voltage (user-defined)

Activate "Inversion" if the output signal is to be output inverted with respect to the input signal.

6.4.5.4 Digital outputs

Here, you can configure the source for controlling the digital outputs and, possibly, a desired inversion of the control signal.

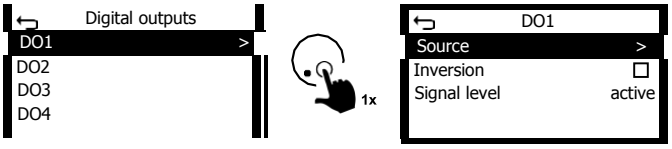
In addition, the current signal level is shown here.

Active means that the digital output is being controlled.

Inactive means that the digital output is not being controlled.

See also Digital outputs DO1…DO5 (potential-free), Page 40.

Select a digital output…



…and define for this output the signal source which this output is to react to. The

following signal sources can be selected:

- No assignment
- Status of the digital inputs
- Threshold values for the relevant control loops
- Alarm message Prio 1
- Warning message Prio 2
- Operating message
- ...

If you would like to invert the status of the digital output, then activate “Inversion”.

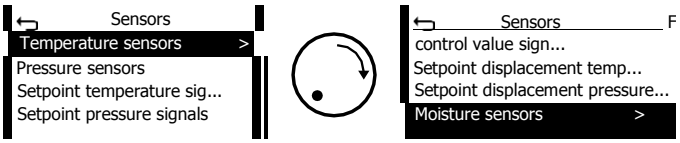
This can also be used to manually switch the status of the digital output on and off for test purposes.

6.4.6 Sensors

In this menu, you can add or configure sensors. With the exception of the resistance thermometers PT1000 and GTF210 (KTY), all sensors can be freely scaled and the signals can be inverted if necessary. This results in a large number of possible uses.

The sensors set up here can then be selected for control loops or other functions as signal sources. See also Analogue inputs AI1…AI5.

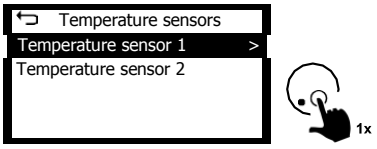
Selecting the correct profile for the analogue input is important in order to ensure that the sensors function correctly. See also Analogue inputs.



Sensors can be added here during commissioning or later on.

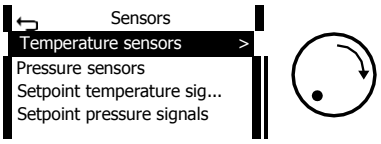
To configure an existing sensor, select the sensor and then change its settings.

If you would like to change the settings for a temperature sensor for example, navigate to the sensor, select it…



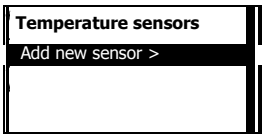
…and then make your desired changes.

To add a new sensor, select a sensor type in the sensor menu...



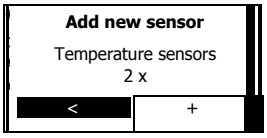
...and then press and hold (for at least 2 seconds) the rotary selection knob.

The context menu will now open.

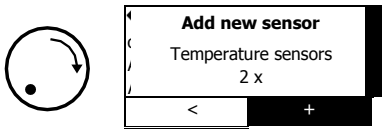


Press the rotary selection knob briefly to continue adding the sensors.

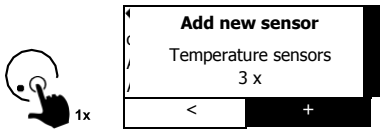
You will also see how many temperature sensors have already been set up.



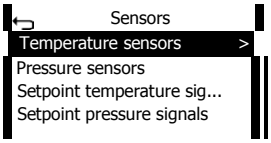
Now select the "+" field by turning the selection knob.



Each time that you press the rotary selection knob briefly, you can add another sensor. The total number of each sensor type will increase and will be shown here.

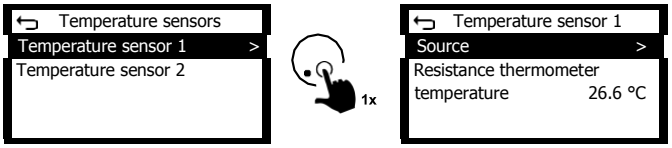


You can exit the context menu by pressing the "Back" button twice.



You can then configure these newly created sensors, e.g. assign the signal source for the analogue input to the sensor.

Select the relevant sensor.



6.4.6.1 Temperature sensors

Temperature sensors serve to record temperatures. These temperatures can be processed by various functions, e.g. as an input signal. This signal can be the actual values for the PID controller, external temperatures for threshold values or setpoint displacement, inlet temperatures for delta monitoring etc.

If the temperature sensors are assigned to an analogue input with the profile type resistance thermometer, the type PT1000 or GTF219 (KTY) can be selected if necessary. In this case, scaling is not possible. Scaling is fixed in both cases.

If temperature sensors are assigned to an analogue input with the profile type current, voltage or resistance (user-defined), the interval (minimum and maximum temperature) and an inversion of the signal can be configured.

6.4.6.2 Pressure sensors

Pressure sensors serve to record pressures within various systems. These pressures can be processed by various functions, e.g. as an input signal. These include actual values for the PID controller, input values for calculating the condensing temperature on the basis of the condensing pressure or the pressure of the brine in the refrigerant circuit.

Generally speaking, pressure sensors are connected via the standard signals 4…20 mA or 0…10 V. Here too, you should ensure that the correct profile is assigned to the selected analogue input.

In order to rule out incorrect configurations, the system prevents pressure sensors being assigned to an analogue resistance thermometer input profile.

You can configure the interval (minimum and maximum pressure) as well as an inversion for the pressure sensors.

6.4.6.3 Temperature signals setpoint/pressure signals setpoint

In the "Auto external analogue" operating mode, the setpoints (1 or 2) can be specified via an external analogue signal. The source of the relevant setpoint signal should be selected in the relevant control loop.

Use "Temperature signals setpoint" if control relates to the temperature. Use "Pressure signals setpoint" if control relates to the pressure.

Any analogue input can be selected as the signal source. You can also configure the minimum and maximum figure for the setpoint – this is calculated on the basis of the specified analogue source signal. This allows flexible scaling with respect to the input signal.

It is also possible to invert the setpoint signal.

6.4.6.4 Fan control value signals

In the "Slave external analogue" operating mode, the control values for the control loop which is to be regulated can be given externally via an analogue signal. The source of the relevant fan control value signal should be set in the relevant control loop.

Any analogue input can be selected as the signal source. You can also configure the minimum and maximum figure for the control value – this is calculated on the basis of the specified analogue source signal. This allows flexible scaling with respect to the input signal.

It is also possible to invert the control value signal.

6.4.6.5 Temperature setpoint displacement/pressure setpoint displacement

In the "Automatic" operating mode, the setpoint can also be displaced in a positive or negative direction depending on an analogue signal.

Depending on whether the control reacts to temperature or pressure, you can add a displacement signal.

Use "Temperature setpoint displacement" if control relates to the temperature.

Use "Pressure setpoint displacement" if control relates to the pressure.

Any analogue input can be selected as the signal source. You can also configure the minimum and maximum figure for the setpoint displacement – this is calculated on the basis of the specified analogue source signal. The setpoint displacement can be configured in a positive or negative direction.

This allows flexible reactions and scaling with respect to the input signal. It is also possible to invert the displacement signal.

6.4.6.6 Moisture sensors

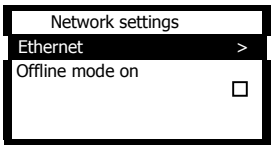
You can add moisture sensors here. If necessary, this sensor can be used for displaying, for provision on the field bus or for control, just like the ambient temperature.

Any analogue input can be selected as the signal source. You can also configure the minimum and maximum figure for the air humidity – this is calculated on the basis of the specified analogue source signal.

It is also possible to invert the air humidity signal.

6.4.7 Network settings

In this menu, you can configure all network settings.
In addition to the Ethernet-based settings, you will also find configuration points such as WLAN or Cellular in the future.



6.4.7.1 Offline mode on

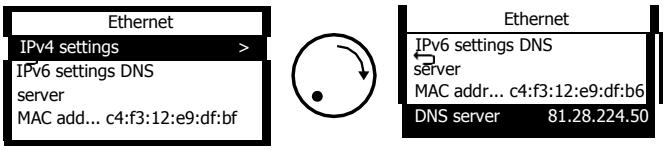
Activate "Offline mode on" if you want to fully deactivate **all** network connections.

6.4.7.2 Ethernet

Here, you can configure all settings for the relevant Ethernet connection. The GMMnext has one Ethernet connection (ETH1).

The GMMnext Rail has two Ethernet connections (ETH1 and ETH2).

The Ethernet menu therefore depends on the unit type, the available network components and implemented protocols and can thus differ from the following illustration.



6.4.7.2.1 IPv4 settings

Here, you can configure the settings which apply to the IPv4 protocol.

6.4.7.2.1.1 IPv4 method

Here, you can set the method for obtaining an IPv4 address. Select **Off** if

you do **not** wish to use the IPv4 protocol.

Select **Auto** if an IPv4 address is to be obtained automatically from a DHCP server when the system starts.

Select **Manual** if you wish to configure an IPv4 address manually.

6.4.7.2.1.2 IPv4 address (manual)

The IPv4 address set here will be used if you have set the IPv4 method to Manual.

6.4.7.2.1.3 IPv4 prefix length

Here, you can set an IPv4 gateway. Queries whose IP addresses are outside the configured network will be sent to this gateway.

6.4.7.2.1.4 IPv4 gateway

Here, you can set an IPv4 gateway. Queries whose IP addresses are outside the configured network will be sent to this gateway.

6.4.7.2.1.5 IPv4 address (current)

Here, the current IPv4 for the Ethernet connection is shown.

6.4.7.2.2 IPv6 settings

Here, you can configure the settings which apply to the IPv6 protocol.

6.4.7.2.2.1 IPv6 method

Here, you can set the method for obtaining an IPv6 address. Select **Off** if

you do not wish to use the IPv6 protocol.

Select **Auto** if an IPv6 address is to be obtained automatically from a DHCP server when the system starts.

Select **Manual** if you wish to configure an IPv6 address manually.

6.4.7.2.2.2 IPv6 address (manual)

The IPv6 address set here will be used if you have set the IPv6 method to Manual.

6.4.7.2.2.3 IPv6 prefix length

Here, you can set an IPv6 prefix length. This value is also referred to as the so-called “mask”.

6.4.7.2.2.4 IPv6 gateway

Here, you can set an IPv6 gateway. Queries whose IP addresses are outside the configured network will be sent to this gateway.

6.4.7.2.2.5 IPv6 address (current)

Here, the current IPv6 for the Ethernet connection is shown.

6.4.7.3 DNS server

Here, you can configure a DNS server (domain name server).

6.4.7.4 MAC address

Here, the MAC address for the Ethernet connection is shown. This address is needed if for example this Ethernet connection is to be integrated into a customer system.

6.4.7.5 DNS server (current)

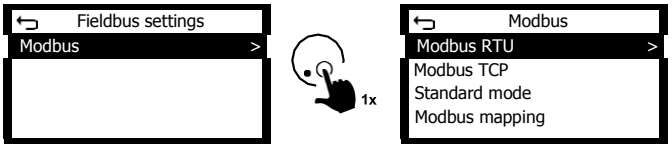
The current IP address for the DNS server is shown here.

6.4.8 Fieldbus settings

Here, you can configure the available fieldbuses. The fieldbuses are shown in this menu depending on which ones are available.

6.4.8.1 Modbus

The parameters for the fieldbus protocol Modbus can be configured here.



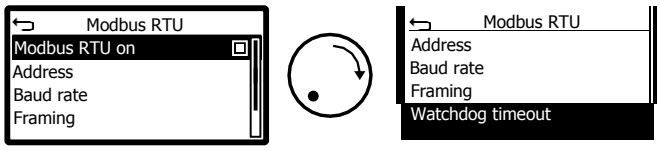
6.4.8.1.1 Modbus RTU

Modbus RTU is a fieldbus protocol which is offered via the serial RS485 interface.

The GMMnext works here as a Modbus RTU slave (Modbus server) which means that the data for the GMMnext can be read out and parameters written by a higher-level Modbus RTU master.

With the GMMnext EC/xx, an additional module (GCM RS485 GMMnext EC.1) is needed in order to offer this protocol.

With the GMMnext Rail.1, Modbus RTU is offered via the RS485-1 interface which is available as standard.



6.4.8.1.1.1 Modbus RTU on

The Modbus RTU protocol can be activated or deactivated here. The Modbus RTU protocol is always switched on when the unit is delivered.

6.4.8.1.1.2 Address

The fieldbus address for the Modbus RTU slave can be set here.

6.4.8.1.1.3 Baud rate

The baud rate can be set here.

6.4.8.1.1.4 Framing

The framing (number of data bits, stop bits, parity) for the fieldbus interface can be set here.

6.4.8.1.1.5 Watchdog timeout

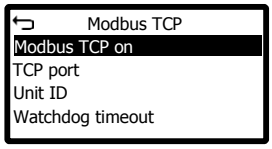
Here, you can configure a watchdog timeout which can be reacted to downstream if no messages are received for the timeout set here.

6.4.8.1.2 Modbus TCP

Modbus TCP is a fieldbus protocol which is offered via the Ethernet interface.

The GMMnext works here as a Modbus RTU slave (Modbus server) which means that the data for the GMMnext can be read out and parameters written by a higher-level Modbus RTU master.

The Modbus TCP server on the GMMnext can be reached via the ETH1 IPv4 address in conjunction with the TCP port and the unit ID configured here.



6.4.8.1.2.1 Modbus TCP on

The Modbus TCP protocol can be activated or deactivated here.

6.4.8.1.2.2 TCP port

The TCP port via which the Modbus TCP server is reached can be set here. The standard TCP port is **502**.

6.4.8.1.2.3 Unit ID

The unit ID via which the GMMnext can be reached via Modbus TCP can be set here.

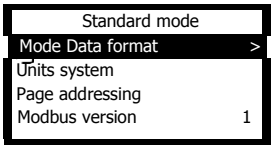
6.4.8.1.2.4 Watchdog timeout (TCP)

Here, you can configure a watchdog timeout which can be reacted to downstream if no messages are received for the timeout set here.

6.4.8.1.3 Standard mode

The GMMnext offers 2 modes in which data points are offered on the Modbus interface. See also Modbus mapping, Page 102. In the standard mode, you can also conveniently set how data are provided for the Modbus interface.

When doing this, bear in mind the information in the corresponding interface specification.

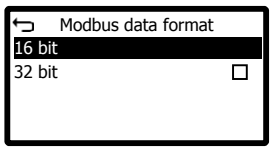


6.4.8.1.3.1 Modbus data format

Here, you can specify how numerical parameters and process data which, in principle, can have decimal places are provided on the Modbus interface. In the "16 bit" data format, a compact fixed point notation which requires only one data word (2 bytes) per value is used.

With the "32 bit" data format, a floating point notation in accordance with the IEEE 754 standard is used. This offers greater accuracy but requires 2 data words (4 bytes) per value.

For further information, see the Modbus interface specification.

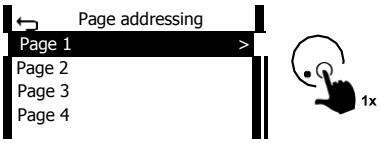


6.4.8.1.3.2 Units system

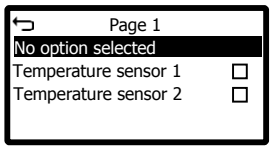
Here, you can specify the units system used when transferring parameters and process data on the Modbus interface. This setting is independent of the units system for the display.

6.4.8.1.3.3 Page addressing

Here, you can specify which sensors are shown on the relevant pages in the Modbus interface.



To do this, select a page and assign the desired sensor to it.



For further information, see the Modbus interface specification.

6.4.8.1.3.4 Modbus version

The internal Modbus version is shown here. It is designed exclusively for internal diagnostic purposes.

6.4.8.1.4 Modbus mapping

The new GMMnext provides a much wider range of functions, which is why the Modbus interface had to be reworked.

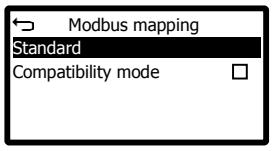
It now allows more IOs, more interfaces, more fans and more functions.

The new interface comes under the term Modbus mapping = "Standard".

There is a separate interface specification for this.

In order to offer the greatest possible backwards compatibility, the so-called "**Compatibility mode**" was also created. This means that you should select Compatibility mode if you install the GMMnext EC as a replacement unit or you would like to expand your existing infrastructure without changing the interface programming.

Switching is possible via this menu.



Standard mode is switched on by default.

With the previous version of the GMMnext (GMM EC), only part of the parameters and process data were available via the Modbus interface.

With the GMMnext generation, all parameters and process data are available via Modbus, both via Modbus RTU and Modbus TCP/IP. For this reason, only one interface description is needed for Modbus RTU + TCP/IP.

6.4.9 Resetting the unit to its delivery state

Via this menu item, you can reset the unit to its delivery state.

In this case, all parameters will be deleted and the unit will need to be commissioned again.

IMPORTANT

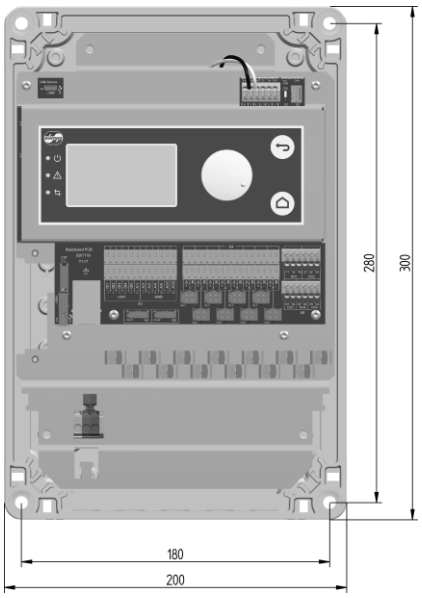
Select this menu item only if you understand the implications and have all parameters for this step.

7 Technical data

7.1 Dimension drawing of GMMnext EC/08.1

The dimensions of the casing and fixings are shown below. All dimensions are given in millimetres.

Fixing drill holes max. Ø 7.5 mm.

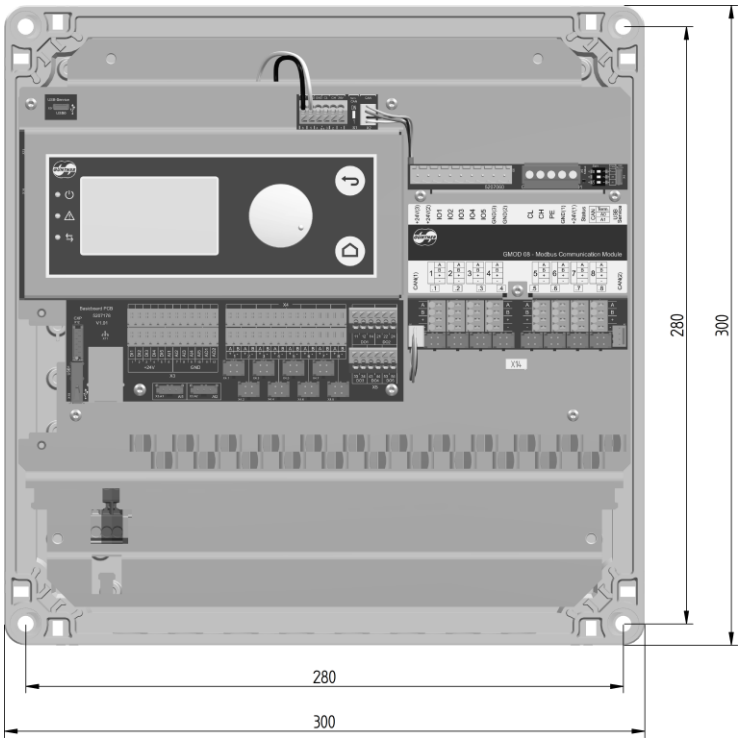


Dimension drawing of GMMnext EC / 08.1 casing

7.2 Dimension drawing of GMMnext EC/16.1

The dimensions of the casing and fixings are shown below. All dimensions are given in millimetres.

Fixing drill holes max. Ø 7.5 mm.

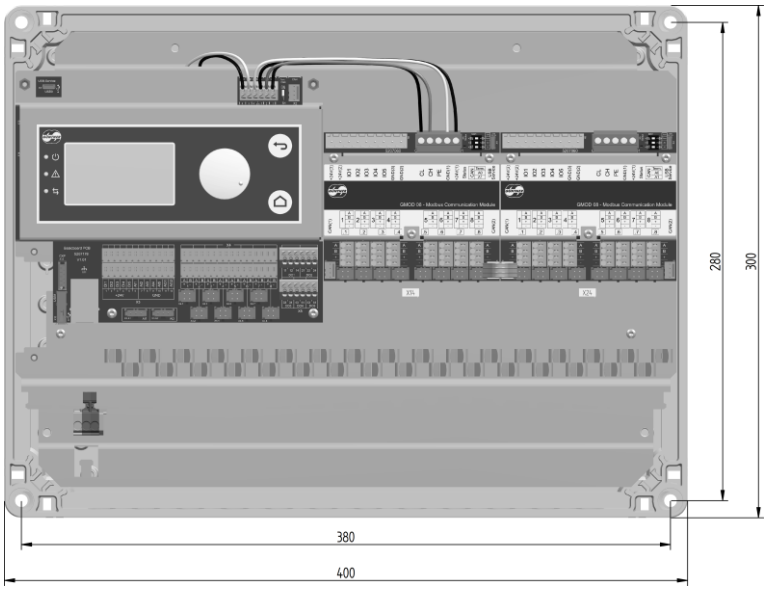


Dimension drawing of GMMnext EC / 16.1 casing

7.3 Dimension drawing of GMMnext EC/24.1

The dimensions of the casing and fixings are shown below. All dimensions are given in millimetres.

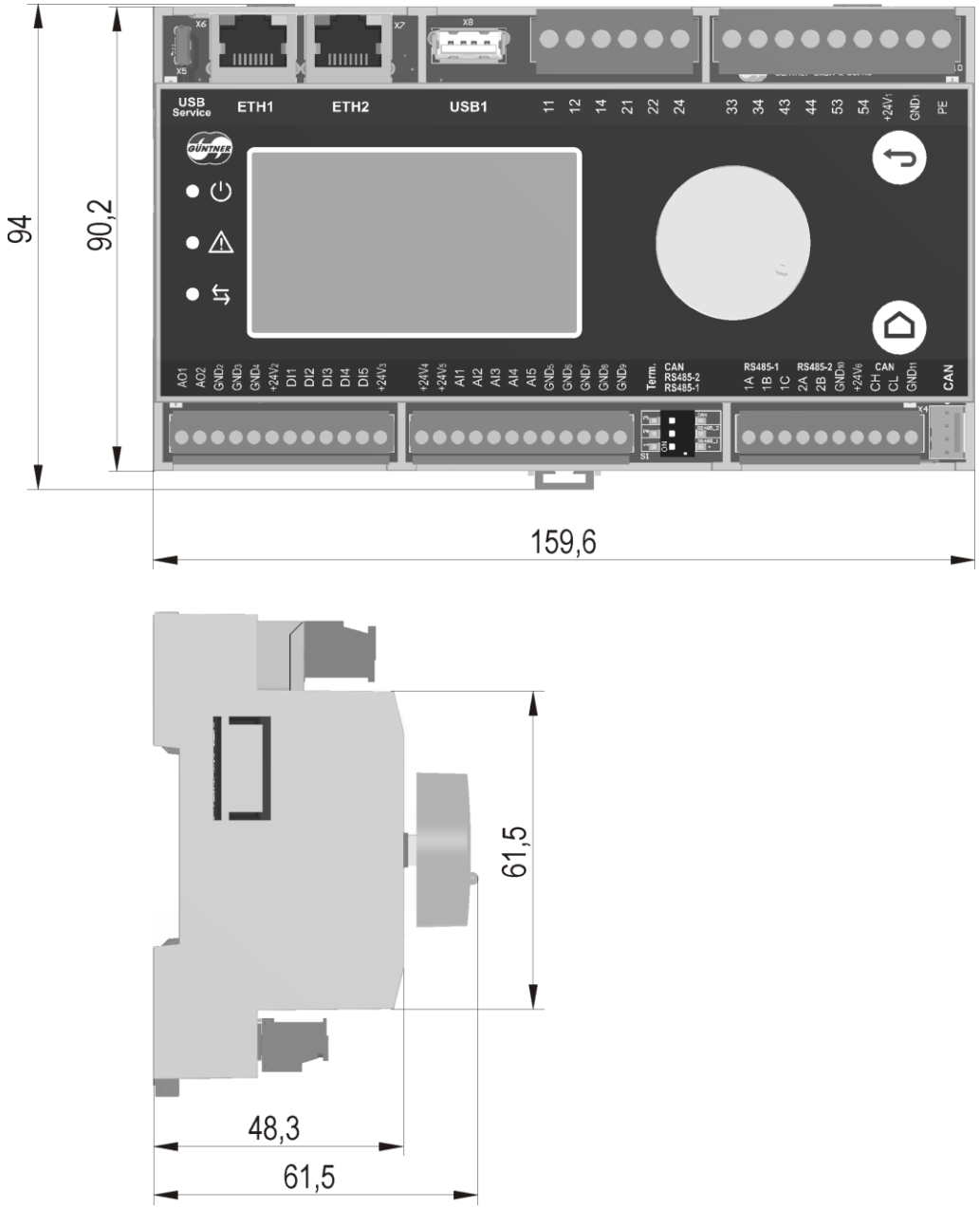
Fixing drill holes max. Ø 7.5 mm.



Dimension drawing of GMMnext EC / 24.1 casing

7.4 Dimension drawing of GMMnext Rail.1

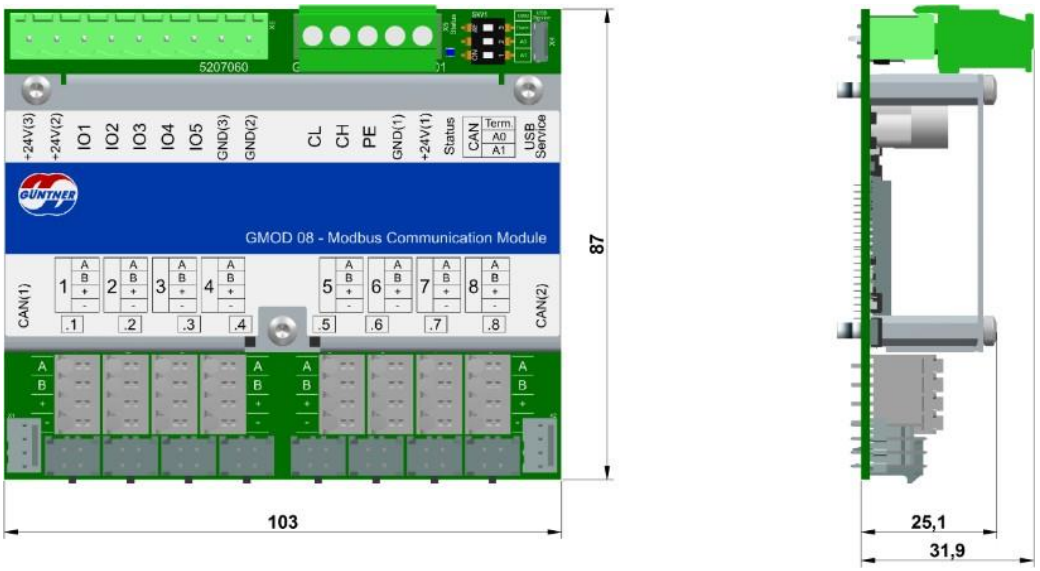
The dimensions of the casing and fixings are shown below. All dimensions are given in millimetres.



Dimension drawing of GMMnext Rail.1

7.5 Dimension drawing of GMOD 08 GMMnext EC.1

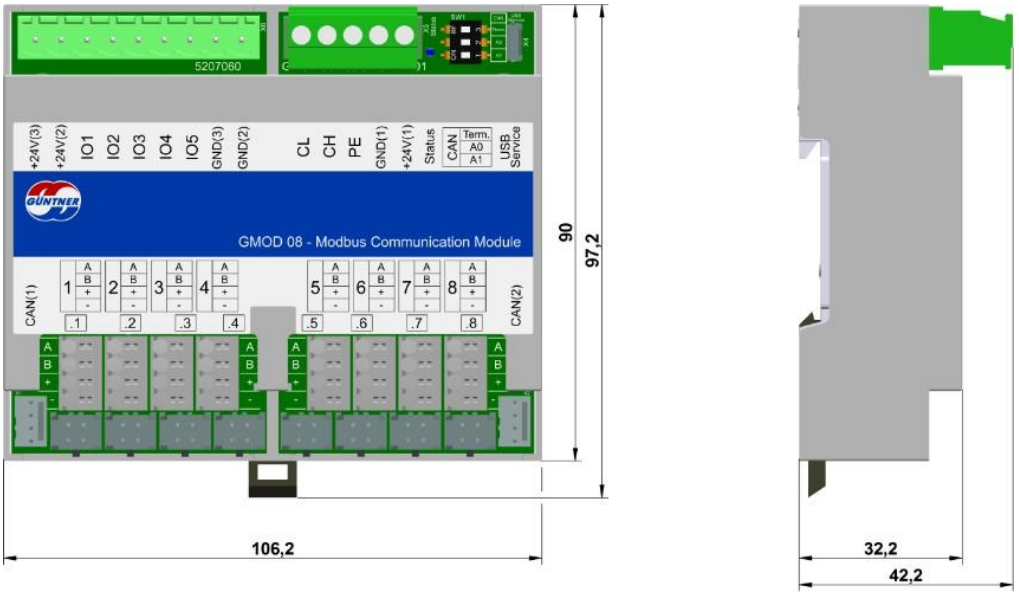
The dimensions of the casing and fixings are shown below. All dimensions are given in millimetres.



Dimension drawing of GMOD 08 GMMnext EC.1

7.6 Dimension drawing of GMOD 08 Rail.1

The dimensions of the casing and fixings are shown below. All dimensions are given in millimetres.



Dimension drawing of GMOD 08 Rail.1

8 Electrical properties

	Min	Type	Max	Unit
Power supply	4.75	5.0	5.25	V
Current consumption		80	120	mA
Power consumption		0.4	0.65	W
Modbus				
Termination (can be switched in)		120		Ω
Transmission rate	1200	9600	115200	bit/s
Galvanic separation			1000	V (rms)
Dielectric strength A/B	-8		+15	V

Electrical properties

	Min	Type	Max	Unit
Power supply DC	18	24	28	V
Current consumption (without supplying the fans)		150	300	mA
Current consumption (with 8 fans connected)		500	900	mA
CAN bus				
Dielectric strength	-24		24	V
Transmission rate		125	1000	kBit/s

Description	Min	Type	Max	Unit
Power supply				
Input voltage range (AC)	85		264	VAC
Input voltage (DC) (alternative)	120		373	VDC
Input voltage frequency	47		63	Hz
Current consumption of GMMnext EC/08.1 (115 VAC)			510	mA
Current consumption of GMMnext EC/08.1 (230 VAC)			305	mA
Current consumption of GMMnext EC/16.1 (115 VAC)			910	mA
Current consumption of GMMnext EC/16.1 (230 VAC)			540	mA
Current consumption of GMMnext EC/24.1 (115 VAC)			1360	mA
Current consumption of GMMnext EC/24.1 (230 VAC)			830	mA
Digital inputs				
Potential separation	No			
High level (digital mode) *2)	15	24	28	V
Low level (digital mode) *2)	-1	0	5	V
Frequency (digital mode) *2)			20	kHz
Input resistor	35			kΩ
Relay outputs				
Potential separation	Yes			
Voltage DC		24	30	V
Voltage AC			250	V
Current resistive load (30 VDC)			1.0	A
Current inductive load (30 VDC)			0.45	A
Current resistive load (250 VAC)			1.5	A
Current inductive load (250 VAC)			0.6	A
Switch cycles, mechanical	$1*10_5$			switch cycles
Switch cycles, electrical	$1*10_5$			switch cycles

*1) The maximum current consumption includes supplying 2 connected pressure transmitters and 1 connected temperature sensor.

*2) Digital inputs can be operated in analogue or digital mode. The switching levels in analogue mode are configured via software parameters.

Description	Min	Type	Max	Unit
Analogue input general				
Potential separation		No		
Dielectric strength	-5		30	V
Resolution			12	Bit
Analogue input voltage mode 0...10V				
Measuring range	0		12	V
Error		0.25	0.5	% *3)
Input resistor	100			kΩ
Analogue input current mode 0..25mA				
Measuring range	0		25	mA
Error		0.25	0.5	% *3)
Input resistor in the measuring range(without protective circuit)		110	150	Ω
Analogue input PT1000 mode				
Measurement range (resistance)	800		1500	Ω
Error (resistance)		1.5	2.0	Ω
Measuring range (temperature)	-50		130	°C
Error (temperature)		0.4	0.6	K
Measured current		1	1.4	mA

*3) Error relating to measuring range end value

Description	Min	Type	Max	Unit
Voltage output 0..10V				
Potential separation		No		
Voltage range	0		10	V
Load resistance		>=5		kΩ
Resolution			12	Bit
Error (I_{out} <= 1mA)			1	%*4)
Short circuit protection		Yes		
Short circuit current (I_{out_max})			5	mA
Ethernet interface 1 / 2				
Dielectric strength			2	kV
Transmission rate	10		100	MBit
Autonegotiation		Yes		
Auto MDI-X		Yes		
Galvanic separation		Yes		

Electrical properties

Description	Min	Type	Max	Unit
USB service interface				
OTG capability		Yes		
Voltage supply U_{out} (host mode)	4.5	5		V
Voltage supply I_{out} (host mode)			500	mA
Transmission rate	1.5		480	Mbit/s
USB1 interface				
OTG capability		No		
Voltage supply U_{out} (host mode)	4.5	5		V
Voltage supply I_{out} (host mode)			500	mA
Transmission rate	1.5		480	Mbit/s
CXP interface				
Plug and play recognition of expansion module		Yes		

Electrical properties

*4) Error relating to range end value

Description	Min	Type	Max	Unit
Power supply				
Supply voltage	20	24	28	V
Current consumption (24 VDC) *1)		200	400	mA
Power consumption *1)		4.8	9.6	W
Digital inputs				
Potential separation		No		
High level (digital mode) *2)	16	24	28	V
Low level (digital mode) *2)	-1	0	5	V
Frequency (digital mode) *2)			20	kHz
Input resistor	35			kΩ
Relay outputs				
Potential separation		Yes		
Voltage DC		24	30	V
Voltage AC			250	V
Current resistive load (30 VDC)			1.0	A
Current inductive load (30 VDC)			0.45	A
Current resistive load (250 VAC)			1.5	A
Current inductive load (250 VAC)			0.6	A

Description	Min	Type	Max	Unit
Switch cycles, mechanical	$1*10_5$			switch cycles
Switch cycles, electrical	$1*10_5$			switch cycles

*1) The maximum current consumption includes supplying 2 connected pressure transmitters and 1 connected temperature sensor.

*2) Digital inputs can be operated in analogue or digital mode. The switching levels in analogue mode are configured via software parameters.

Description	Min	Type	Max	Unit
Analogue input general				
Potential separation		No		
Dielectric strength	-5		30	V
Resolution			12	Bit
Analogue input voltage mode 0..10V				
Measuring range	0		12	V
Error		0.25	0.5	% *3)
Input resistor	100			kΩ
Analogue input current mode 0..25mA				
Measuring range	0		25	mA
Error		0.25	0.5	% *3)
Input resistor in the measuring range(without protective circuit)		110	150	Ω
Analogue input PT1000 mode				
Measurement range (resistance)	800		1500	Ω
Error (resistance)		1.5	2.0	Ω
Measuring range (temperature)	-50		130	°C
Error (temperature)		0.4	0.6	K
Measured current		1	1.4	mA
Voltage output 0..10V				
Potential separation		No		
Voltage range	0		10	V
Load resistance		>=5		kΩ
Resolution			12	Bit
Error (I_{out} <= 1mA)			1	% *4)
Short circuit protection		Yes		
Short circuit current (I_{out_max})			5	mA
Ethernet interface 1 / 2				
Dielectric strength			2	kV
Transmission rate	10		100	MBit
Autonegotiation		Yes		
Auto MDI-X		Yes		
Galvanic separation		Yes		

*3) Error relating to measuring range end value

*4) Error relating to range end value

Description	Min	Type	Max	Unit
USB service interface				
OTG capability		Yes		
Voltage supply U_{out} (host mode)	4.5	5		V
Voltage supply I_{out} (host mode)			500	mA
Transmission rate	1.5		480	Mbit/s
USB1 interface				
OTG capability		No		
Voltage supply U_{out} (host mode)	4.5	5		V
Voltage supply I_{out} (host mode)			500	mA
Transmission rate	1.5		480	Mbit/s
CXP interface				
Plug and play recognition of expansion module		Yes		

Electrical properties

9 Options

The GMMnext EC/xx.1 can also be expanded with an interface module. This module can be installed in a slot provided for this purpose.

For technical details, please see the relevant data sheets or interface specifications.

These can be downloaded from the “Controls” area of the Güntner homepage (www.guentner.eu).

RS485 module:
GCM RS485 GMMnext EC.1
ERP No. 5207189

The GMMnext Rail.1 can be expanded with an interface module.

The module is placed on the left side of the controller and uses the controller’s Communication Expansion Port (CXP). This port is located behind the removable cover on the left side panel.

For technical details, please see the relevant data sheets or interface specifications.

These can be downloaded from the “Controls” area of the Güntner homepage (www.guentner.eu).

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