Operating instructions
Güntner Motor Management GMMnext
Güntner Solution Controller GSCnext

For management and speed control of EC fans
For management and speed control of AC fans with power unit (phase angle or frequency converter)

guntner.com/uk

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Products associated with the document

Name	ERP number	Type
GMMnext EC Controller IP54 1xM/4xM/ 8xM/16M/24M	5215213, 5215214, 5215215, 5215289, 5215290	Assembly/solution in the GPC
GMMnext EC Controller IP54	5207185, 5207186, 5207187	Individual controller
GMMnext sincon lite	5215498 – 5215503, 5215509 – 5215511	Assembly/solution in the GPC
GMMnext phase cut lite	5215538 – 5215542	Assembly/solution in the GPC
GMMnext Controller IP54	5215405	Assembly/solution in the GPC
GSCnext EC Split Controller	5215594	Assembly/solution in the GPC
GSCnext	5208718	DIN rail controller
GMMnext EC Controller RD 1xM/4xM/8xM/16M/24M	5215348 – 5215352, 5215407, 5215408	Assembly/solution in the GPC
GMMnext Rail/RD		DIN rail controller

Supplementary documents to this document

About the GSCnext:

The description of the Hydro Management on the GSCnext, as well as its settings, can be found in the GHMnext PAD instruction manual.

Information and details of the motor management settings for the GSCnext can be found in this manual.

Version history

This operating manual describes all the features of the GMMnext controller.

Some of the features described in this operating manual depend on the software version of the GMMnext controller.

The table below shows the new features depending on the software version of the GMMnext controller.

Operating manual Version	Amendments/supplements	Associated GMMnext software version(s)
1.0.0	First approved version of the operating manual for GMMnext EC and GMMnext Rail	1.0.1 (only for EC) 1.1.0 (EC + Rail)
1.1.0	New features added: • Automatic switch-off of manual mode after time ("Auto switch back to regular operation after") • Valve manual mode ("Valves") • Locking the regulation system with a signal ("Releasing and locking the coil") • Limiting setpoint displacement with a signal ("Limitation by signal") • Pump alarm ("Pump alarm") • Bypass valve ("Bypass valve") • HRC function and HRC valve ("HRC operation (heat recovery)") • Measurement monitoring ("Measurement monitoring")	1.2.0 (EC + Rail)
1.1.1	Revised commissioning procedure	1.4.0 (EC + Rail)
1.1.2	New features: • Save factory settings after successful commissioning • Load/save configuration; either on the GMM itself or on a USB stick • Optimized fan incident messages	1.7.0
1.1.3	New features (GMMnext Version 1.9.0): • New "Analogue mode" function supports the control of power units via an analogue signal, e.g. 0..10 V.	1.9.0
1.1.4	New features (GMMnext Version 1.8.0): • HRC function expanded to allow constant control of the HRC valve • Measurement monitoring expanded to include new HRC measured quantities • Predefined parameters and overview of the menu structure in the appendix • Updated images • Connecting a GHMspray	1.8.0

Version history

Operating manual Version	Amendments/supplements	Associated GMMnext software version(s)
1.1.5	New features (GMMnext version 1.9.0 – 1.11.0): • Modbus watchdog available • Other IOs on the GMOD 08 UIO available • New controller**GSCnext** • Newly designed GMMnext EC RD	1.11.0

Version history

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 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 the 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 Start-up notes

Prior to start-up the control device, check whether any residual moisture (condensation) has formed in the housing. 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 Motor management function description

The GMMnext EC is preferably used to control EC fans. Alternatively, the drive type for fans can be changed via the GMM software so that power units (e.g. with AC fans) are also controlled via an analogue signal (e.g. 0..10 V). The speed of the connected fans is adjusted depending on the regulation 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. For controlling/regulating AC fans, separate power units (frequency converter or phase angle) can be controlled via a 0 – 10 VDC analogue signal. 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 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.

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

1.5 Scope of performance

The GMMnext's scope of performance varies depending on the system configuration and the fans connected. The following table shows key information which is evaluated to determine the scope of performance. This information can be viewed in the status menu.

Function	Options	Description
Fan drive	Modbus (EC)/Analogue	The drive type for the fans "Modbus (EC)" or "Analogue" is set during commissioning.
Inverse operation available	yes/no	If all connected fans are compatible* "yes" is shown.
Tear-off function available	yes/no	If at least one connected fan is compatible* "yes" is shown.

Properties of fans

*: EC fans controlled via Modbus and supplied later than 2012 (approximate figure, because old stocks may have been being used up) are compatible.

The following table shows the conditions for the availability of the individual GMM functions. The relevant function is only available in the GMMnext menu if the corresponding condition is met, i.e. if the connected EC fans support the function.

Function in the menu	Condition
Manual mode > Inverse operation	Inverse operation available = yes
Service > Functions > Inverse operation	Inverse operation available = yes
Service > Functions > NCC	Inverse operation available = yes
Service > Functions > Tear-off function	Tear-off function available = yes
Service > Functions > LCMM	Fan drive = Modbus (EC)
Service > Functions > Bypass	Fan drive = Modbus (EC)
Service > Functions > Analogue mode	Fan drive = Analogue

Availability of functions

Furthermore, certain diagnostic data are only available when operating EC fans controlled via Modbus. These include data for individual fans such as alarms, warnings and operating hours as well as cumulative performance data such as the total power for all fans.

1.6 Classification/versions: GMMnext, GSCnext

Based on one item of hardware, there are various controller versions.

GMMnext EC → Motor Management for EC fans

GMMnext EC RD → Remote Display of the Motor Management for EC fans (DIN rail controller)

GMMnext RAIL → DIN rail controller

GSCnext → combined controller featuring motor and hydro management.

1.6.1 GMMnext EC IP54

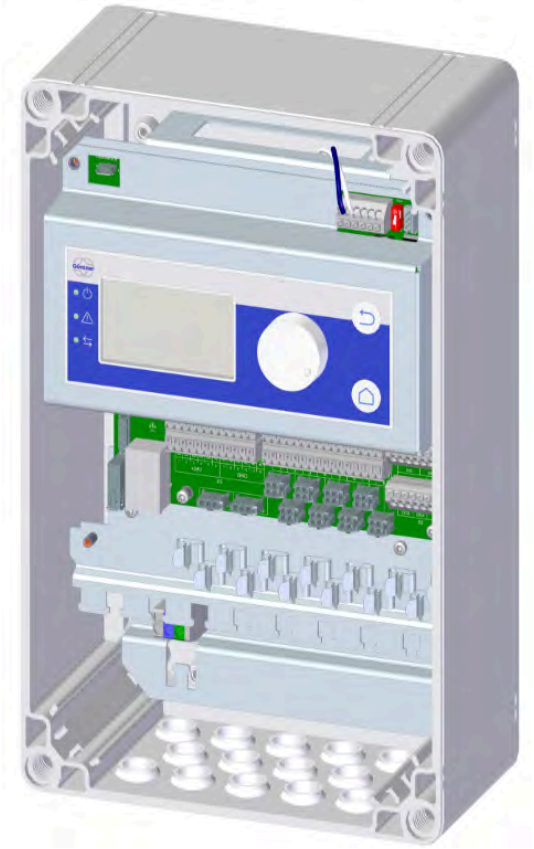
The GMMnext is available in a version for up to 24 fans in a closed IP54 housing. There is also an IP20 version for fixing to a DIN rail. A combination of a GMMnext Rail.1 controller and up to 3 GMOD 08 Rail.1 Modbus expansion modules are required for this.

Classification of the IP54 version

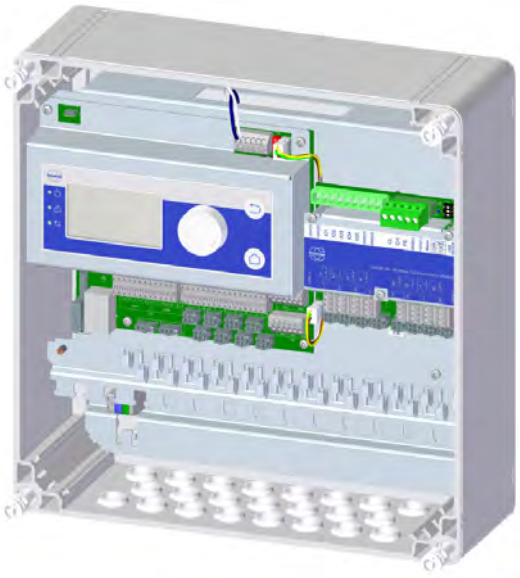
GMMnext EC/xx[.n]	
GMMnext EC	Güntner Motor Management for EC fans
xx	Number of possible connections for EC fans
.n	Hardware version: from .1: first approved hardware version

Versions:

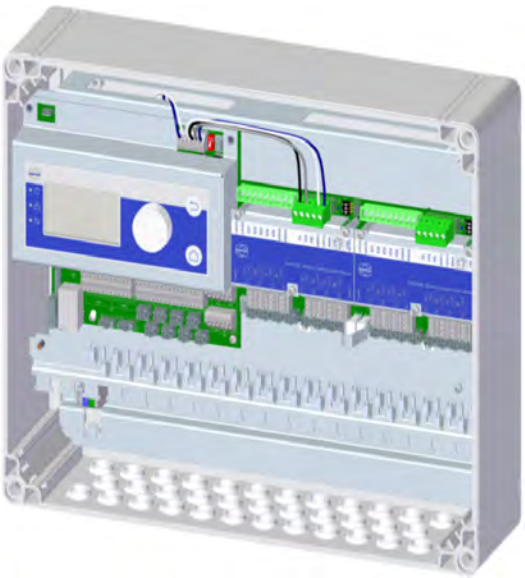
GMMnext EC/08.1 = Controller and motor management for 8 EC fans



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



1.6.2 GMMnext RAIL

Classification of the IP20 version

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

Versions:

GMMnext Rail EC/08 + 1 x GMOD 08

GMMnext Rail EC/16 + 2 x GMOD 08

GMMnext Rail EC/24 + 3 x GMOD 08

GMMnext Sincon lite: GMMnext Rail + frequency converter
GMMnext Phase cut lite: GMMnext Rail + power unit

→ In the Sincon and Phase-cut lite solutions, the GMMnext RAIL is installed in a plastic casing.

1.6.3 GMMnext EC RD (Remote Display)

5215350, GMMnext EC08 Remote Displa

The GMMnext RAIL can be removed here and installed up to a cable length of 100 m away. With longer cables, suitable measures should be taken (e.g. repeater).

5215351, GMMnext EC16 Remote Displa

The GMMnext RAIL can be removed here and installed up to a cable length of 100 m away. With longer cables, suitable measures should be taken (e.g. repeater).

NOTICE
If the controller module has a separate power supply, ensure sufficient potential equalization. Otherwise, galvanic isolation should be provided for the CAN bus.

1.6.4 GSCnext

See document “GSCnext Manual”. This manual only contains details of motor management.

1.7 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!

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Fürstenfeldbruck

1.8 Warranty and liability

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

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

1.9 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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1.10 EMC-compliant installation

Controllers in the GMMnext/GSCnext 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.
- If they are affected, a special cable must be used for bus wiring to the EC fans, e.g. HELUKABEL DeviceNet PUR flexible 1x2xAWG24 + 1x2xAWG22 / 81910
- 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.

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

2 Brief guide to quick commissioning

These pages contain the most important 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 fine-wire fuses 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"):	
	Communication interface:	Terminal **A** and **B**
	24V power supply for fan electronics:	Terminal **+** and **-**
	Analogue connected power units, e.g. with AC fans, are connected to the analogue output terminals of the GMMnext.	
	Communication interface:	Terminal **AO1** and **GND** (0..10 V)

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

Signalling outputs	For connections for signalling outputs, see "Inputs and outputs (IO interface)"
Release	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".
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".
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 “**Setback**” and “**Setpoint changeover**” functions normally need to be activated in the service menu.

3 Start-up 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 start-up and may need to be repeated when a fan is replaced. This start-up 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 start-up has taken place when it is switched on. If it has, the start-up menu is skipped and normal operation continues.

NOTICE

The controller will be in configuration mode until the start-up is complete. In this mode, normal operation is not possible and the fans will be controlled with a 0 % control value. The communication interfaces and protocols are still preconfigured as follows:

- The ETH1 Ethernet interface is configured with the static IPv4 address "169.254.1.1" and the network mask "255.255.0.0".
- The RS485-1 interface is configured with the baud rate "9600 Bd" and "8N1" framing.
- The Modbus RTU and TCP protocols are activated and configured with the unit ID "1" and the TCP port "502".

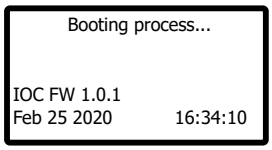
If a number of controllers are commissioned in a network at the same time, conflicts can occur in the network owing to duplicate IP addresses. You can avoid this problem by ensuring that the network cable is not connected or only one controller is actively connected to the network.

Once the start-up has been completed successfully, the controller automatically switches to the set operating mode and the communication interfaces and protocols are configured in accordance with the parametrization, see also "Network settings" and "Fieldbus settings".

3.1 Start-up menu

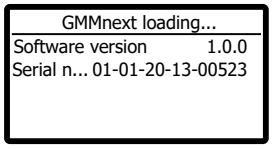
Switch on the power supply for the GMMnext. At the start of the boot process, the Güntner logo will appear for 5 seconds.

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).

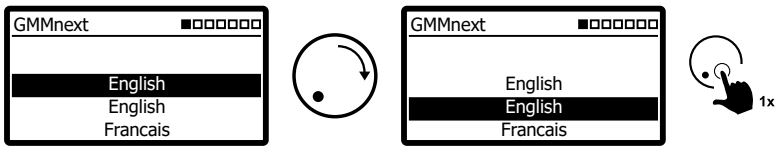
Each time that the system starts, the software version of the application that is starting as well as the serial number of the controller will be shown briefly.



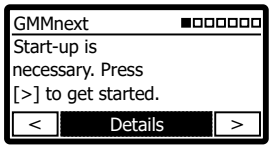
At the beginning of start-up, the language for start-up can be selected. This language setting is not permanent – it is only for start-up. After start-up, the default language for the menu is always English. The language can then be selected on a permanent basis in the Language menu.

The progress bar at the top right of the display shows your progress during start-up.

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



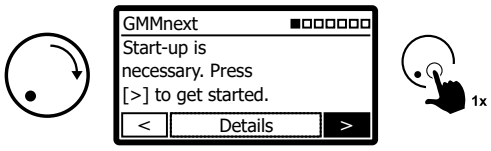
A note regarding start-up will then be shown.



In standard start-up, a heat exchanger can be parametrized with up to two coils. During start-up, the analogue and digital inputs and outputs are automatically configured and assigned standard functions. An overview of the I/O configuration after start-up is available in the "Annex".

An extended start-up with up to five coils can be carried out after the standard start-up via the service menu.

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



3.1.1 General commissioning procedure

The following is a systematic list of the commissioning steps:

Section	Parameter	Description
GMMnext	Language	Selection of the language for commissioning.
Introduction	-	Note that a new commissioning is required.
Date and time	Date	Setting the system date.
	Time	Setting the system time.
Fans	Fan drive	Fan drive type selection. A selection is made between EC fans controlled via Modbus and analogue controlled power units, e.g. with AC fans. *This selection is available only for the GMMnext Rail controller variant.*
	Control value limitation	An optional limitation of the control value output can be configured here. This allows partial load operation of fans which are connected via an analogue controlled power unit. In the process, the calculated control value in the interval [0..100] % is rescaled into the output interval [0...Control value limitation] %. *This selection is available only for the GMMnext Rail controller variant.*
	Number of fans	Setting the number of fans on the heat exchanger. *This selection is available only for EC fans.*
	Fan row count	Setting the number of fan rows on the heat exchanger. Query only occurs if the number of fans is greater than one.
	Fan parametrization	Selection of the parametrization of the fans with or without fan ID. *This selection is available only for EC fans.*

Commissioning procedure

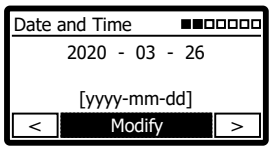
Section	Parameter	Description
	Maximum speed	Setting the maximum fan speed (working point). *This selection is available only for EC fans.*
Fan scan	-	Display of the result of the fan search. If the fan parametrization without fan ID has been selected, the maximum speed per fan can be adjusted at this point. *This overview is available only for EC fans.*
Heat exchanger	Coil count	Setting the number of coils within a heat exchanger. Selection is made between 1 or 2 control cycles. The service menu can be used for extended parametrization of up to 5 coils.
	Operating mode	Setting the operating mode of the regulation.
	Heat exchanger type	Setting the type of heat exchanger. Selection is made between condenser or dry cooler and applies to all coils.
	Refrigerant	Setting the type of refrigerant. Selection is made per coil. Query only occurs if condenser has been selected.
	Pressure sensor	Setting the type of pressure sensor for recording the actual pressure of a coil (refrigerant pressure). Selection is made between 25 or 40 bar. Query only occurs if condenser with unknown refrigerant has been selected.
Completion	-	Indication that commissioning has been carried out successfully.

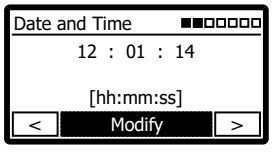
Commissioning procedure

3.1.2 Detailed start-up procedure with EC fans

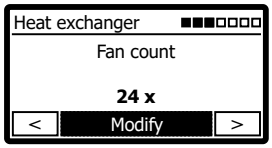
The system date and time are set first.

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 [Modify] or [>] to continue.





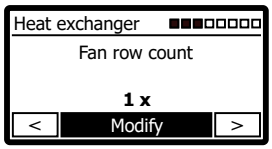
You can now set the number of fans installed on the heat exchanger.



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.

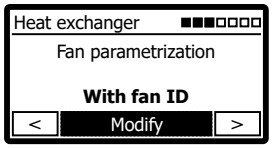
NOTICE
The GMMnext expects the fans to be in ascending order from fan connection 1 to the set number of fans.

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.



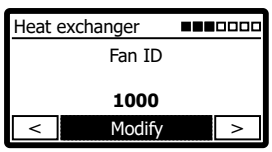
A check will then be carried out to ensure that the communication with these fans is working correctly. Press [>] to continue.

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.

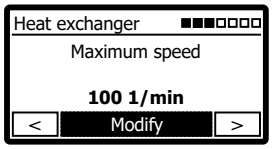
In the next step, the fan ID is entered:



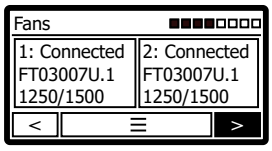
NOTICE

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.

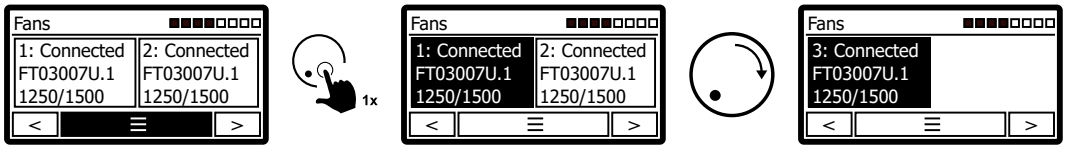
In the next step, you need to enter the maximum speed. If you are commissioning the unit with a fan ID, this step functions as a safety check.



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.

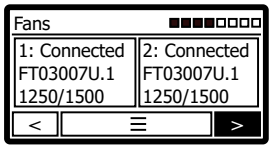


In order to scroll through the list of fans, select [Menu] and scroll through the list with the help of the rotary knob. If necessary, you can view all details for a fan.

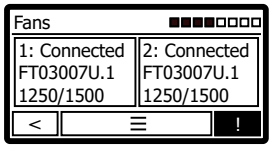


To exit the view, press the “Back” button.

Otherwise, press [>] to continue with the start-up.



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



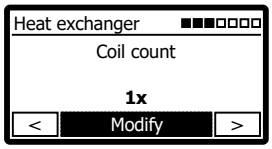
Select [!] to see the result of the fan search.

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

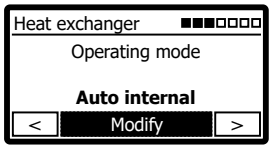
Now disconnect the controller and the fans, check the cabling, the bus connection terminals and possibly the fan itself and then start the start-up process again. The parameters you have entered so far will be retained.

Now select [>] in the search result to continue with the start-up.

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



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

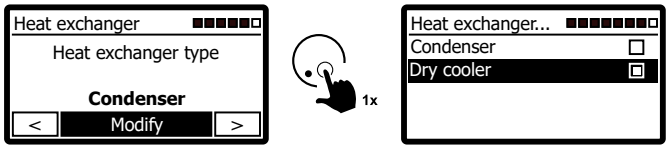


The following options can be selected:

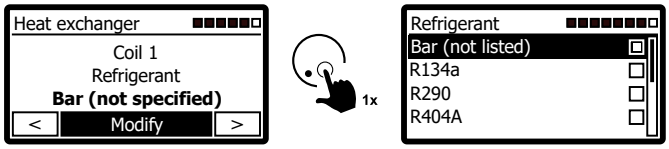
Operating mode	Way of working
Auto internal	The controller records the actual temperature or pressure and adjusts it automatically to a setpoint which can be configured via the menu.
Auto external analogue	The controller records the actual temperature or pressure and adjusts it automatically to a setpoint 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.

In the next step, configure the coils for the heat exchanger.

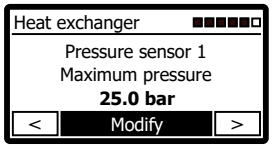
First of all, configure the heat exchanger type.



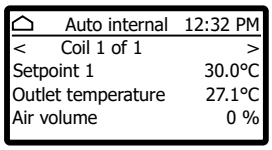
If you have set condenser as the heat exchanger type, you can also select the refrigerant. The controller can then calculate the condensing temperature based on the measured condensing pressure. If the refrigerant is not listed, please use [Bar].



If you are using a condenser with an unknown refrigerant, configure the type of pressure sensor if necessary.



You have now entered all the necessary information for operating the controller and the start-up process is complete. After start-up, 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 start-up again, you can reset the controller to its delivery state in the service menu.

4 Design/versions of the GMMnext

Versions:

GMMnext EC: Is board-based and is only available in a plastic casing. For EC fans connected to the controller via Modbus.

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 start-up. 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 no longer 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 housing for mounting. The equipment may only be fixed at these points, any manipulation of the housing (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 housing 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 unit is installed in a switch cabinet, **proper attention must be paid to the**temperature inside the cabinet (see "Electrical properties").

• 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.

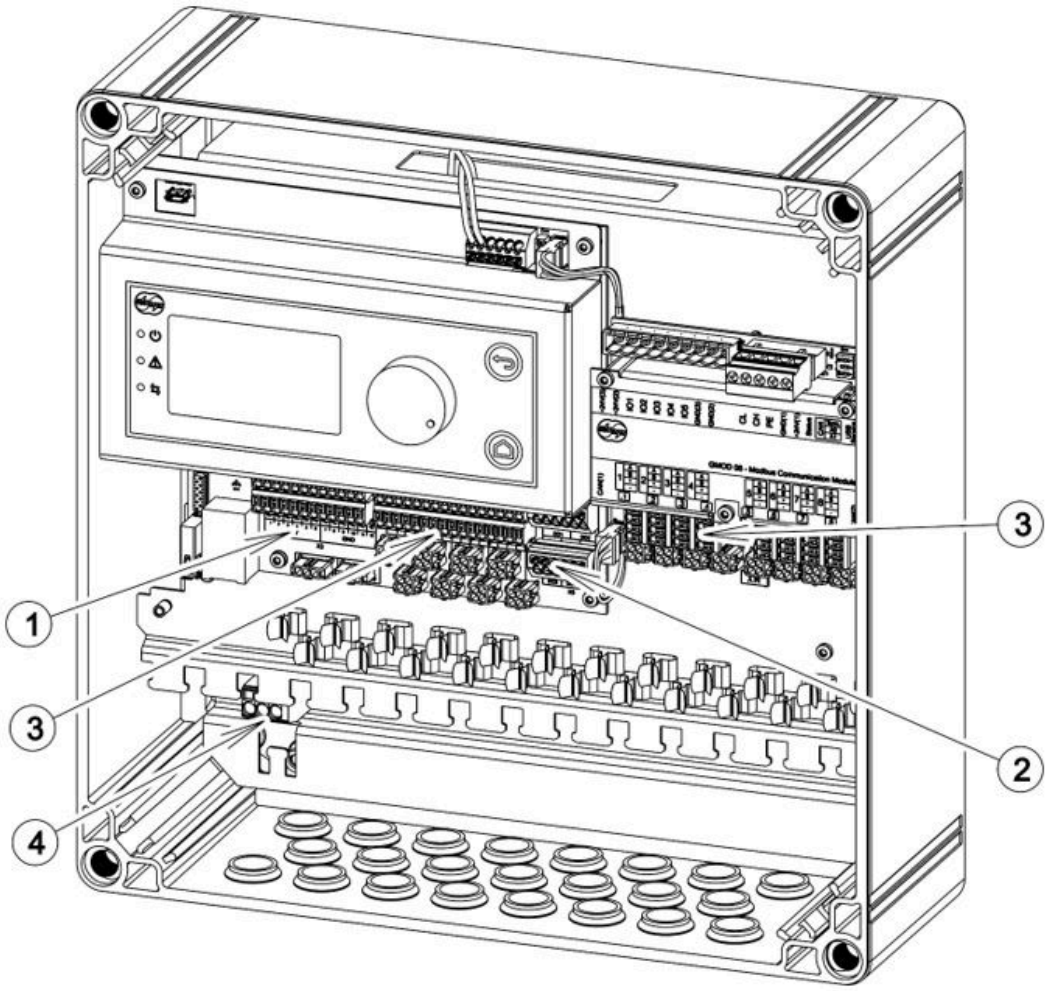
4.2 Connecting the GMMnext

The connecting terminals for the potential-free signal outputs, the control inputs (controller release 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

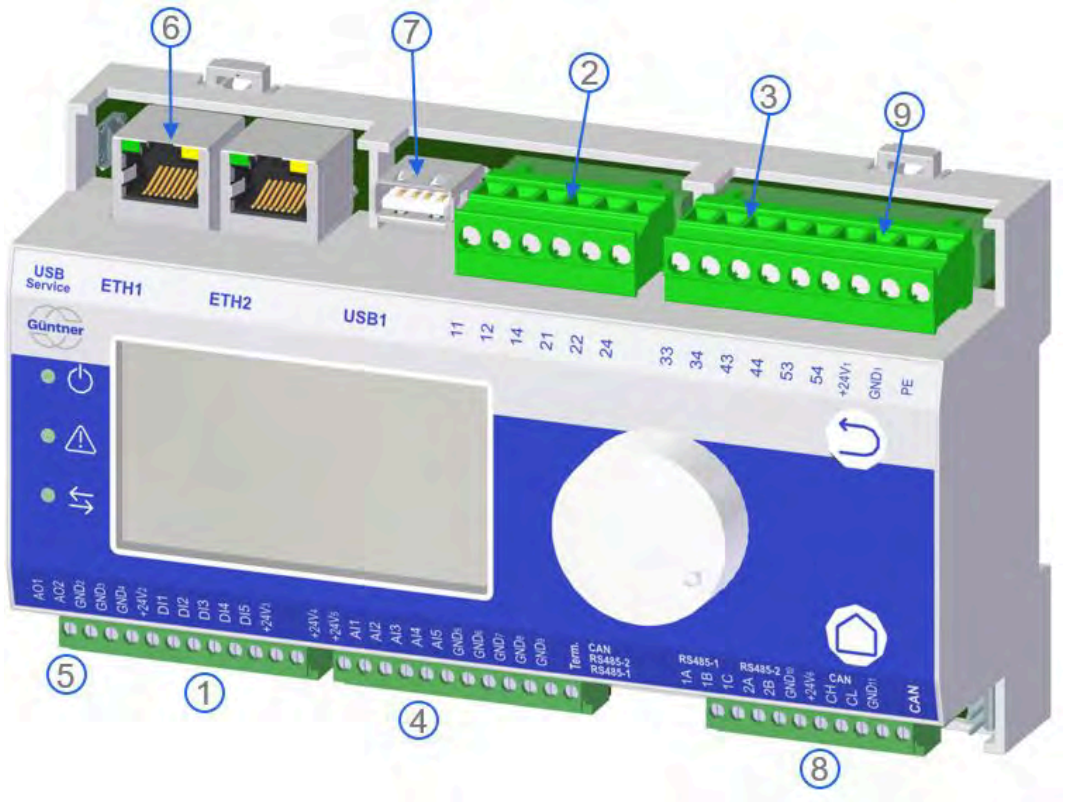
(1) Analogue and digital inputs and outputs (see "Inputs and outputs (IO interface)")

(2) Potential-free signalling outputs (see "Inputs and outputs (IO interface)")

(3)EC fan connections 24 V DC, RS485 (see "Control device fan connection")

(4) Mains connection (see "Controller mains connection")

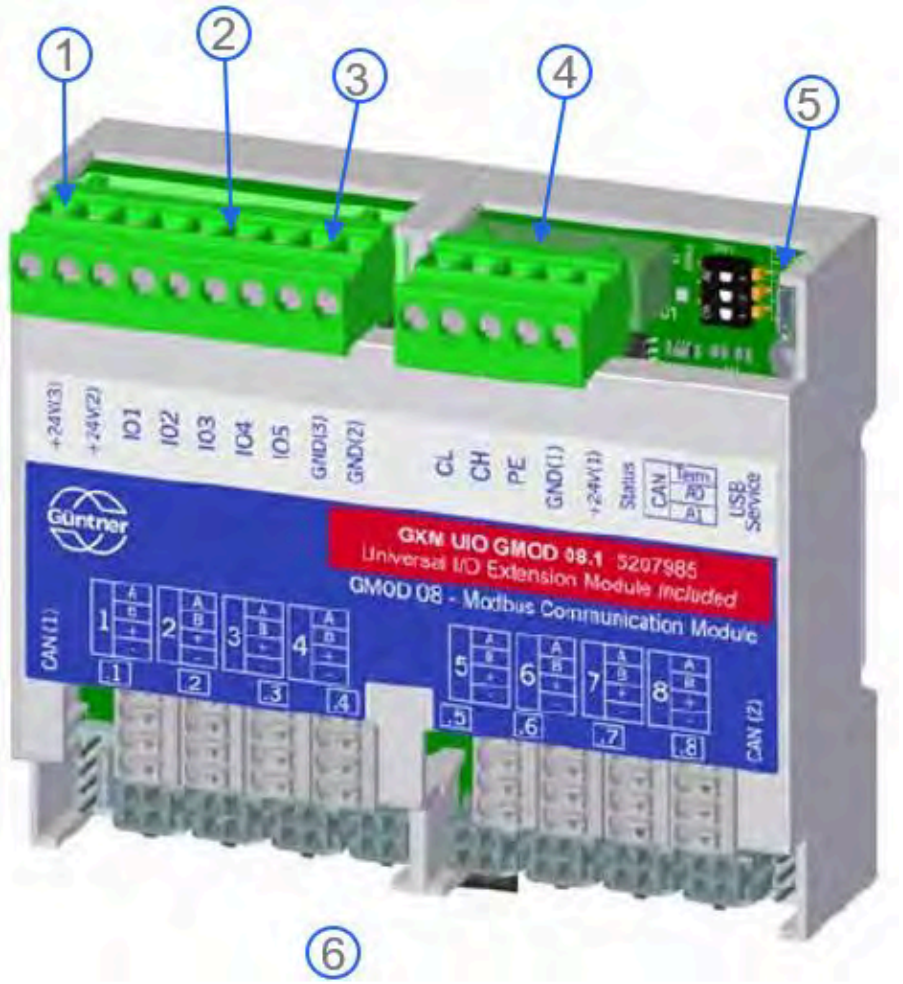
4.2.2 Location of connections on the GMMnext RD/RAIL



Location of connections on the GMMnext RD/RAIL

Type	Number	Description
Digital Input (DI1...DI4)	1	Digital inputs +24 V, GND as Reference potential
Digital output (DO1, DO2)	2	Digital outputs, potential-free**NC-COM-NO**
Digital output (DO3...DO5)	3	Digital outputs, potential-free**NO-COM**
Analogue input (AI1...AI5)	4	Analogue inputs, depending on configuration
Analogue output (AO1, AO2)	5	Analogue outputs, 0 – 10 V depending on the configuration
Ethernet connection	6	Modbus TCP
USB connection	7	USB2.0, software update
RS485	8	Modbus RTU/CAN BUS
24 VDC/GND/PE	9	Power supply

4.2.3 Location of connections on the GMOD UIO



Location of connections on the GMOD UIO

Type	Num-ber	Description
+24 VDC	1	Power supply
AI/DI/AO/DO	2	Configurable I/O
GND	3	Earth
CH/CL/GND/+24 V	4	CAN BUS connection
CAN BUS/RS485	5	Termination
RS485 A/B; +24 V, GND	6	Fan connection

NOTICE
Terminals IO1-IO3 on the GMOD UIO are provided for the sensors on the GMMnext RD.

4.2.4 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".

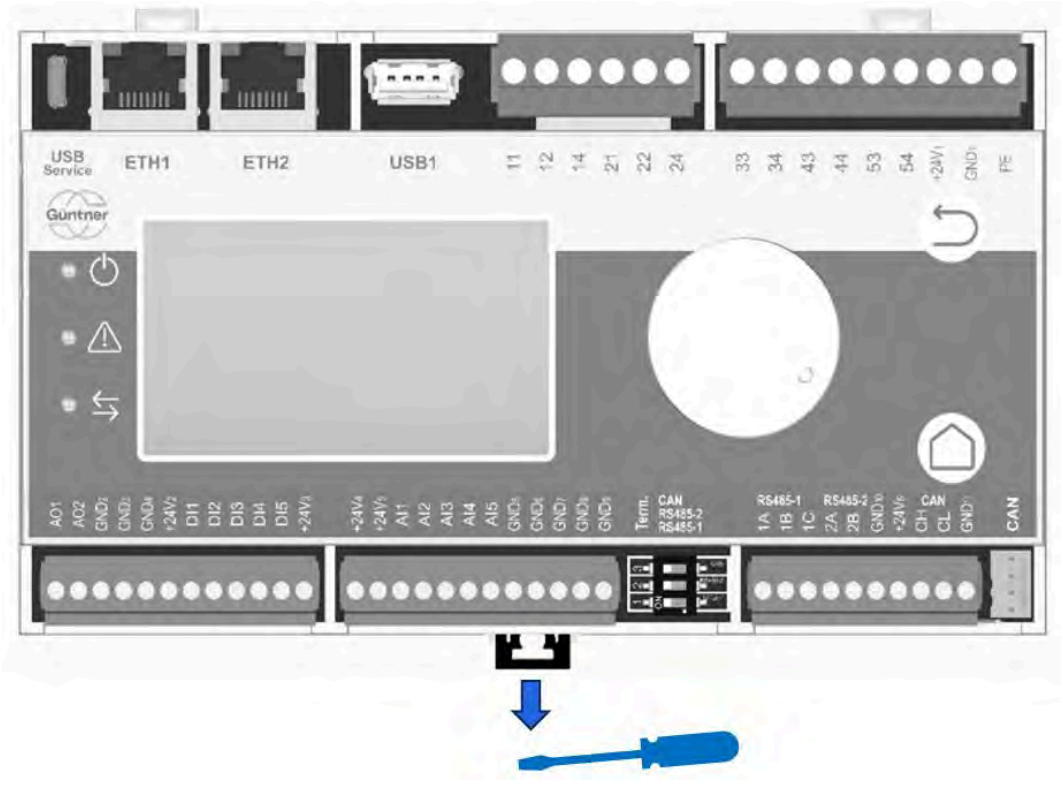
NOTICE
The heat exchanger fans may not be switched on or off by switching the mains on or off, but only via the switch.

- The GMMnext EC is connected to a 230 V 50/60 Hz power supply.
- The rail controllers (GSCnext, GMMnext RD) have a 24 VDC power supply..
- The GMMnext EC RD and GSCnext solutions include a 230 VAC/24 VDC power supply unit.

4.2.5 Splitting the GMMnext EC RD

The GMMnext EC RD is installed in a plastic casing including a 230 VAC/24 VDC power supply unit.

The rail controller on the GMMnext Remote Display can be removed from the plastic casing (A).



Instructions for removal

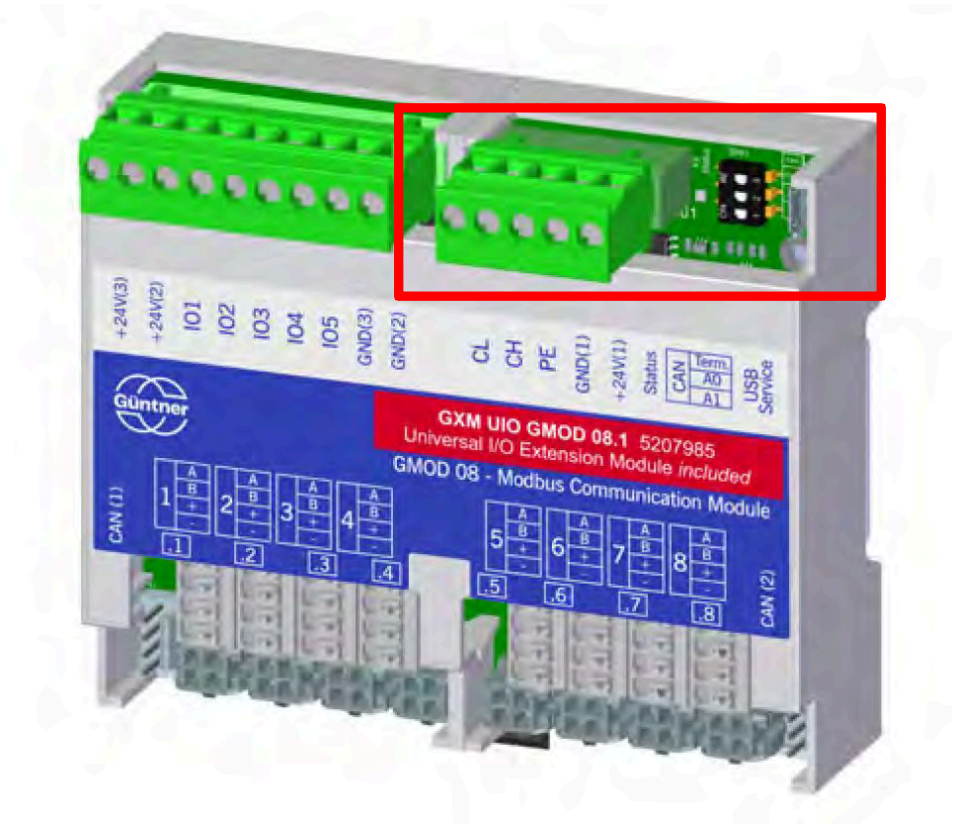
The power supply should be extended accordingly or connected to the RAIL controller.

Switch cabinet

The lever on the GMMnext should be pulled down with a screwdriver. The controller can then be removed. To protect against dust and moisture, the controller must be installed in a suitable housing. A housing with the protection class IP54 is recommended.

The housing also contains the GMOD 08 UIO modules, to which the EC fans are connected via CAN BUS.

The GMOD 08 UIO modules are connected to the RAIL controller via CAN bus.



GMOD 08 UIO

GMMnext RD/RAIL

The CAN bus connection between the RAIL controller and the GMOD 08 UIO modules must be established accordingly when the remote display is removed. CH/CL/GND/+24 V connections.

The CAN bus cable can be up to 100 m long. With longer cables, suitable measures should be taken.

A suitable BUS cable should be used (example: manufacturer TKD, Multibus article number 2003662).

NOTICE
If the controller module has a separate power supply, ensure sufficient potential equalization. Otherwise, galvanic isolation should be provided for the CAN bus.

4.2.6 Control device fan connection

4.2.6.1 EC fans controlled via Modbus

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:

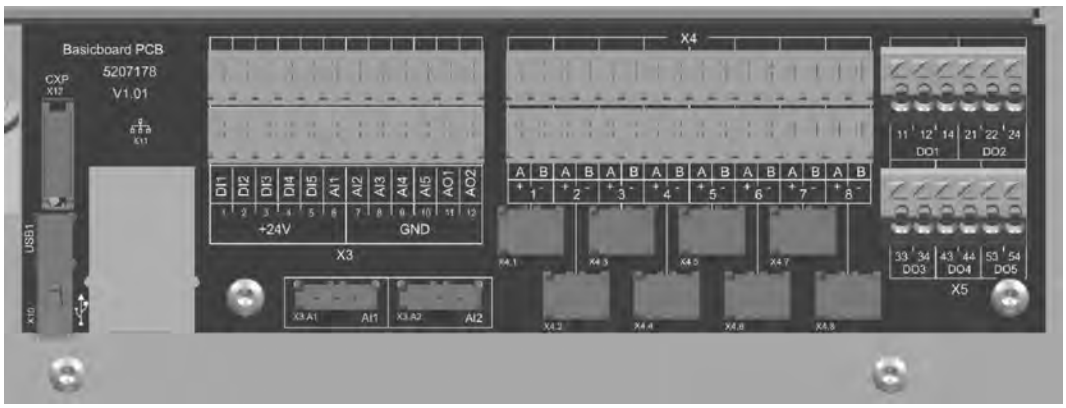
The power connections are located not in the GMMnext but in a separate terminal box (e.g. GPD).

Control connection:

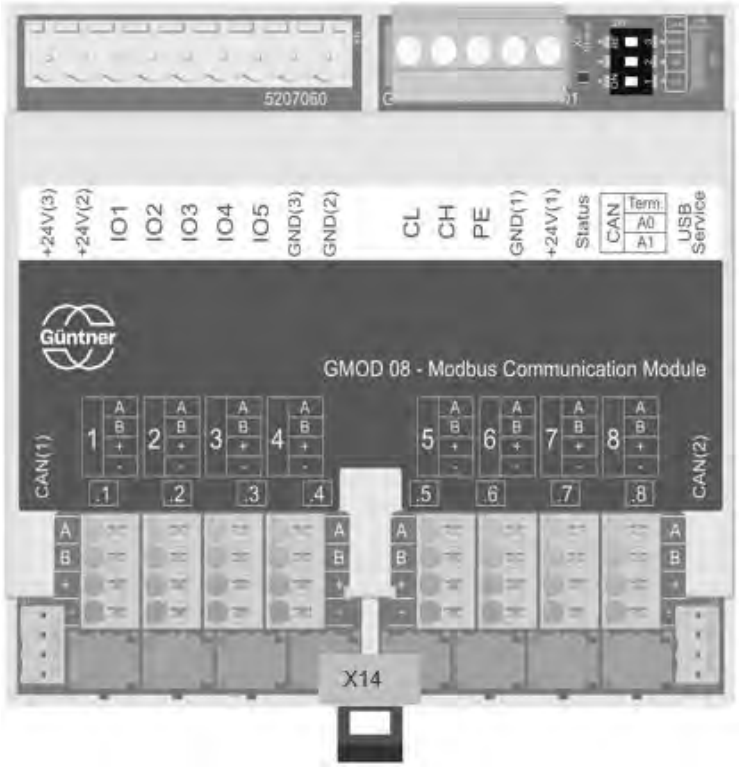
The connection for communication and the DC power supply for the fans is on the terminals X4, X14 and X24.

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).

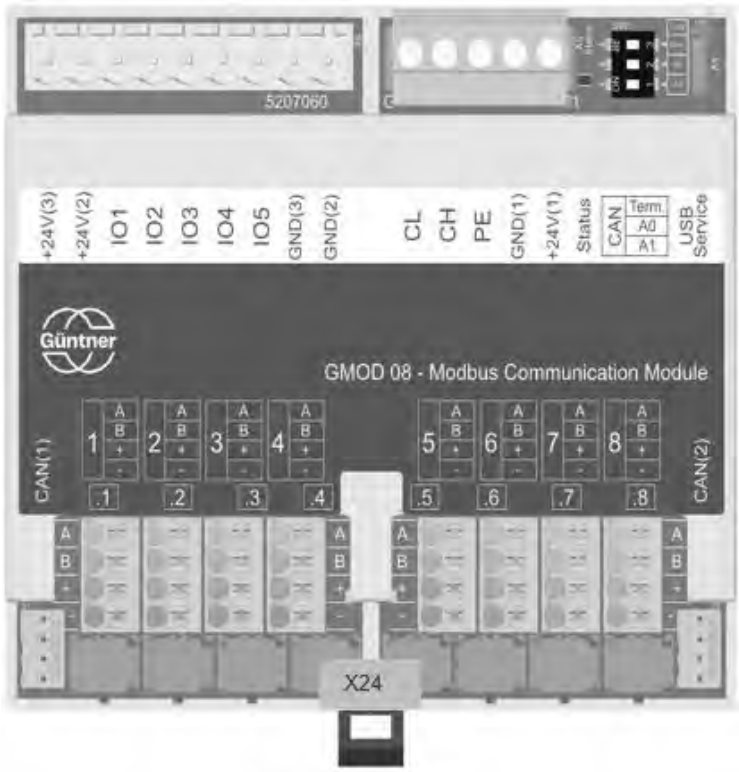
Communication connection Terminal **A (RS485 A)** and **B (RS485 B)**
24 V voltage supply: Terminal **+ (+24V)** and **– (GND)**



Fans 1 to 8 connected to terminal X4



Fans 9 to 16 connected to terminal X14



Fans 17 to 24 connected to terminal X24

4.2.6.2 Power units controlled via analogue signal

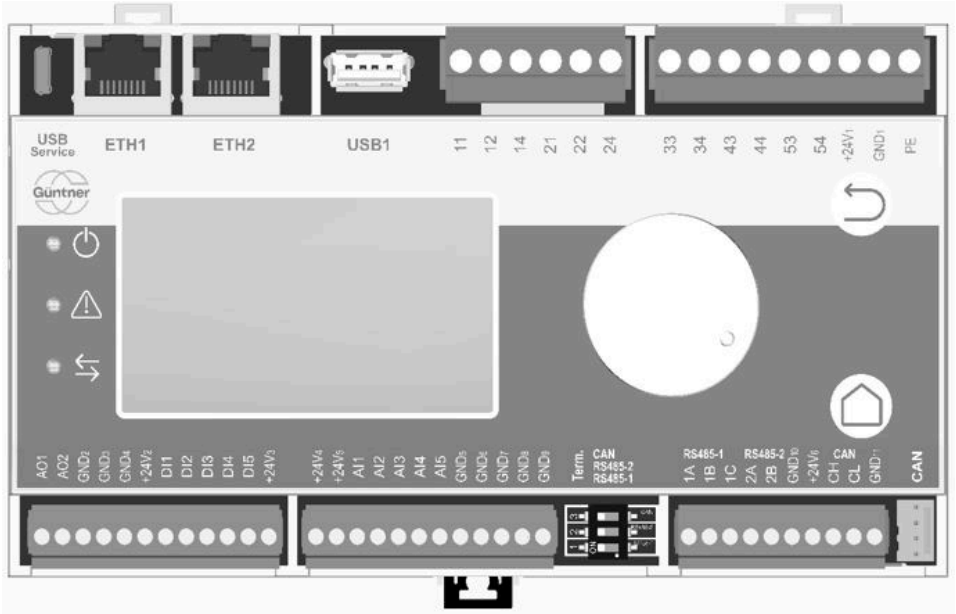
The connection for an analogue controlled power unit (e.g. with AC fans) consists of the power connection and the control connection.

Power connection:

The power connections are located not in the GMMnext but in a separate power unit or terminal box.

Control connection:

The connection for communication (motor speed) with the power unit is achieved via an analogue signal 0..10 V on the terminals AO1 and GND.



Connection of an analogue connected power unit on terminal AO1

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.

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

5.1 Configuration table

NOTICE
The following table shows a “standard configuration” of the controller following start-up. Details of all possible configurations can be found in the section "Function table".

	I/O	Signal/profile	Function
X3	DI1	24 V	Release
	DI2		No function
	DI3		No function
	DI4		No function
	DI5		No function
	AI1	0...10 V 2...10 V 0...20 mA 4...20 mA Resistance thermometer	4...20 mA pressure sensor (scaling 0 - 25 bar) *1)
	AI2		0...10 V no function
	AI3		PT1000 outlet temperature (-30...100 °C) *2)
	AI4		0...10 V control value slave (0...100 %) *3)
	AI5		0...10 V no function
	AO1	0...10V 2...10V	Control value for fan group 1
	AO2		No function

GMMnext EC/xx.1 configuration table

	I/O	Sig-nal/profile	Function
X5	DO1	Poten-tial-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	Sig-nal/profile	Function
X1	DI1	24V	Release
	DI2		No function
	DI3		No function
	DI4		No function
	DI5		No function
X2	AI1	0...10 V 2...10 V 0...20 mA 4...20 mA Resis-tance ther-mometer	4...20 mA pressure sensor (scaling 0 - 25 bar) *1)
	AI2		0...10 V no function
	AI3		PT1000 outlet temperature (-30...100 °C) *2)
	AI4		0...10 V control value slave (0...100 %) *3)
	AI5		0...10V no function
X1	AO1	0...10 V 2...10 V	Control value for fan group 1
	AO2		No function
X9	DO1	Poten-tial-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 in-

puts, 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)	Release 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 coil (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 coil (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 coil (scaling should be configured separately, e.g. 0...25 bar or 0...40 bar)	AI1 to AI5	
AI (0...10 V)	Active temperature sensor, e.g. actual value for the coil 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	

Function table GMMnext EC_xx.1, GMMnext Rail.1

I/O type	Function	Possible I/Os	Recommendation *1)
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 (coil 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

Function table GMMnext EC_xx.1, GMMnext Rail.1

*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 release, are assigned to the inputs.

See "Configuration table".

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 custom
- Current custom
- Resistance custom

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, ambient humidity or other signals for e.g. setpoint setting, setpoint displacement 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.

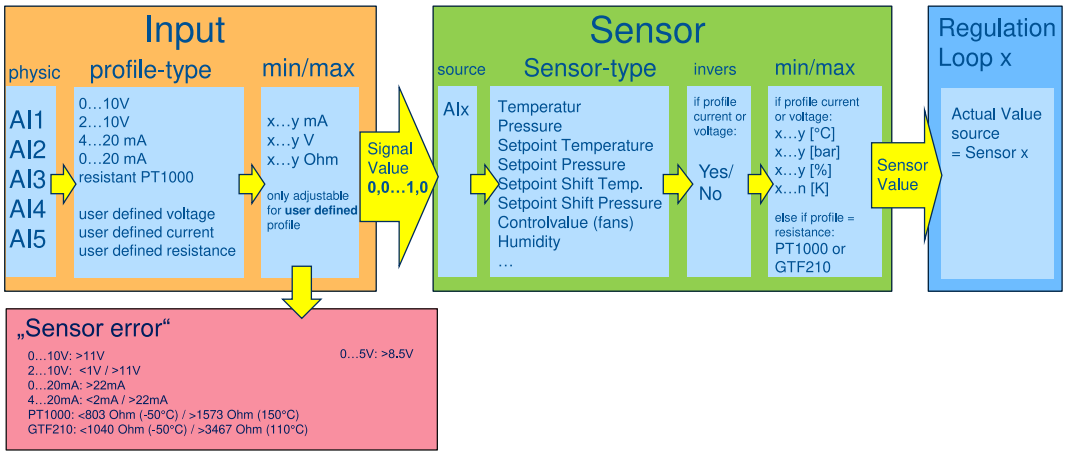
As a result, user-defined sensors/signals such as

- 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 start-up 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 coils.



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)

Name	Design	Connection	Description
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"). 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".

NOTICE

All alarm messages, warning messages and group messages are **wire break-proof signals,** i.e. these signals are inverted by default. A fault status is always signalled with a low signal = deactivated output (relay not energized). This ensures that a fault is signalled even if the controller is not connected to the power supply. See "Digital outputs DO1...DO5 (potential-free)".

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 custom

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 coil 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.

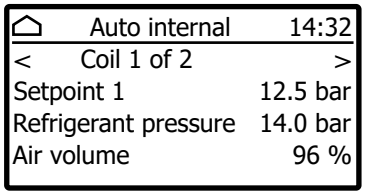
Home button
Takes you back to the home menu

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 coils is shown in the home menu. Depending on the number of coils, this information is automatically scrolled through at set times.

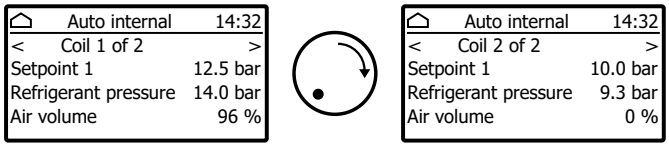
To get to the home menu, press the home button at any time .



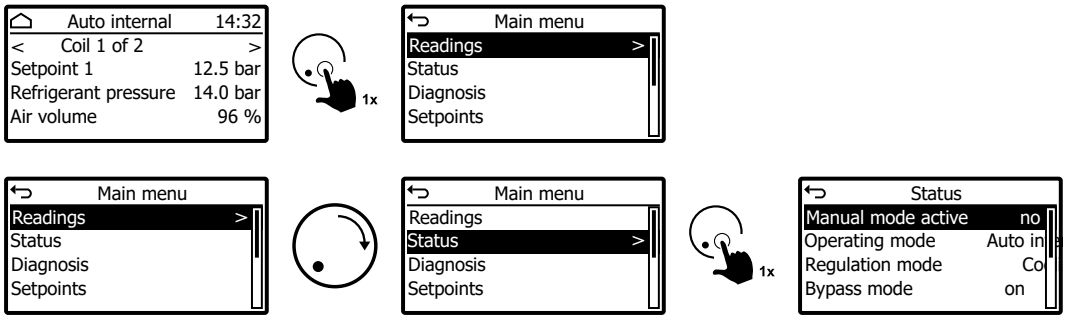
NOTICE
The display's background lighting is switched off after 5 minutes of inactivity. It is switched on again when you press a button or turn the rotary selection knob.

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.

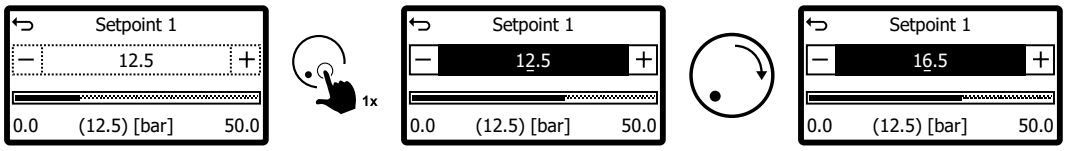


To switch to the previous menu or exit an editing function, simply press the back button .

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.



NOTICE

When changing a numerical value, you can **press and hold the rotary selection knob (2s)** to change the cursor and then select which digit you wish to change.

6.3 LED status display

About the LEDs:

- Top LED **"General operating state"**: lights up green as soon as the application is running on the GMMnext and flashes green as soon as at least one fan is running.
- Middle LED **"Alarm status“**: see below
- Bottom LED **"Internal/external communication"**: not used at the moment.

The middle LED with the designation **"Alarm status"**:

- If an **"Alarm Prio 1“** is reported, the LED will light up **red**.
- If no **"Alarm Prio 1"** is reported, but an **"Alarm Prio 2"** is reported or the **group message for measurement monitoring** reports a warning, the LED will light up **orange**.

"Alarm Prio 1" is active as soon as at least one of the following conditions applies:

- All fans report an alarm.
- The measurement monitoring system reports a warning (optional/configurable).
- Power supply problem
- Communication fault to the master

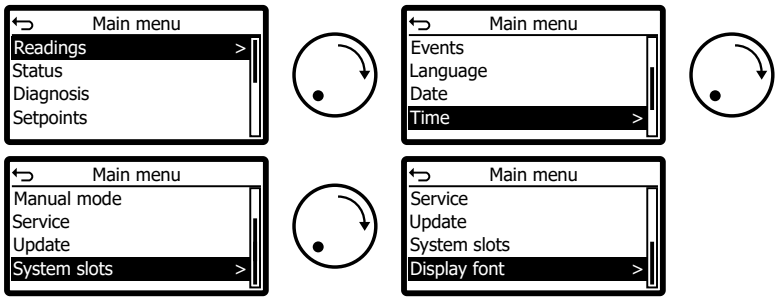
"Alarm Prio 2" is active as soon as at least one of the following conditions applies:

- At least one fan reports an alarm or a warning.
- A sensor or an analogue input reports a warning.
- A pump reports a warning.
- A valve reports a warning.
- The measurement monitoring system reports a warning (optional/configurable).
- A GMOD 08 reports a warning.

7 Main menu

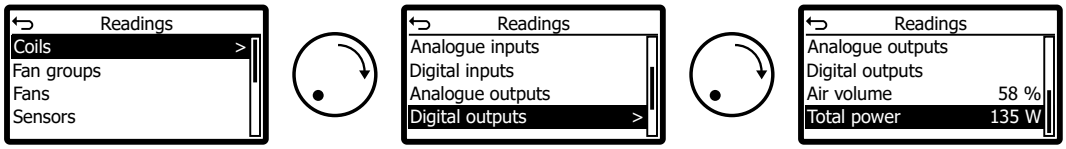
From the top menu, the home menu, you can get to the main menu by pressing the rotary selection knob for a short time. From there, you can navigate to the individual submenu points and the service menu.

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



7.1 Actual values

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

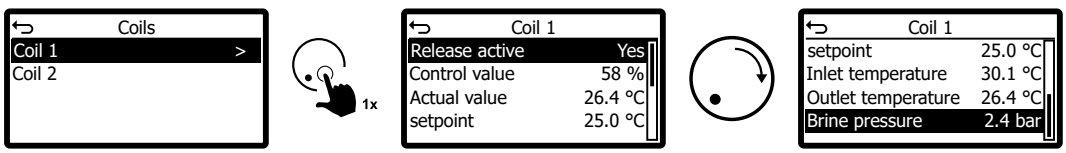


NOTICE

The number of entries in this menu depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

7.1.1 Coils (readings)

Specific information is shown for each coil.



The particular coil configuration determines what information (temperature/pressure) is displayed or not.

The following information may also be shown:

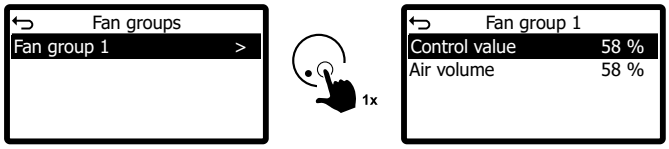
- Current control value in % which is used to control the bypass valve
- Current control value in % which is used to control the HRC valve
- the delta T of the temperature spreads recorded

7.1.2 Fan groups

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

See also "LCMM".

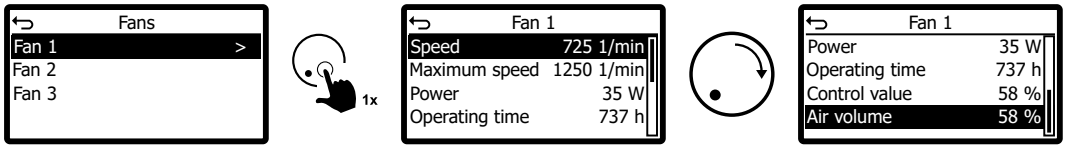
The current control value and the air volume currently generated are shown for each fan group.



If the GMM is configured to control analogue connected power units (e.g. with AC fans) (see Chapter "Analogue operation of AC power units. GMMnext sincon lite & phase-cut lite"), additional information will be shown here. Firstly, the current configured maximum control value for controlling an analogue connected power unit "Control value limitation" will be shown. Secondly, the control value "Analogue mode control value" which is currently output to the power unit can be viewed here.

7.1.3 Fans

The current values are shown for each fan.



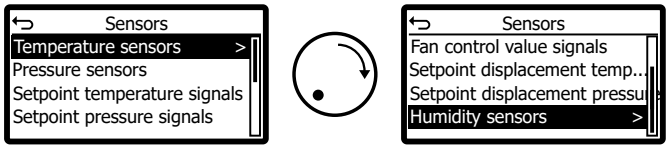
7.1.4 Pad wetting

The actual values for the humidification system (hydroBLU/ ADC) can be found here.

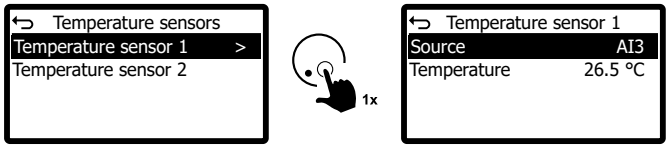
See additional document “Manual GHMnext Pad”

7.1.5 Sensors

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



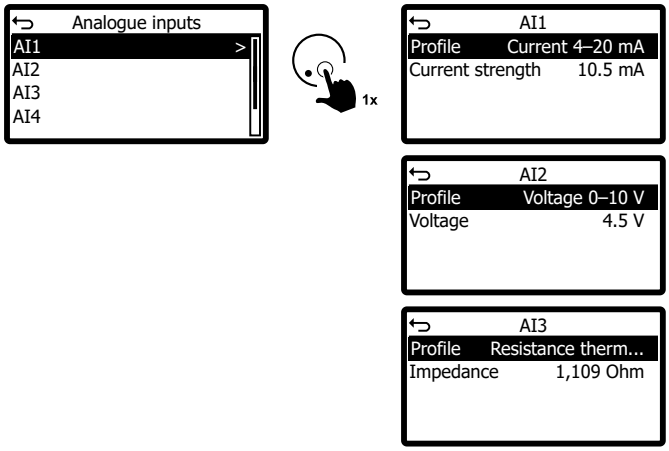
If these sensors are set up, both the signal source and the sensor value currently measured can be displayed here. Here is an example for a temperature sensor:



7.1.6 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.

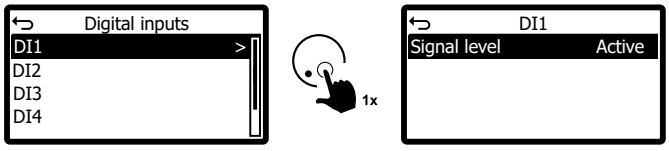


7.1.7 Digital inputs

The current signal level is shown for each digital input.

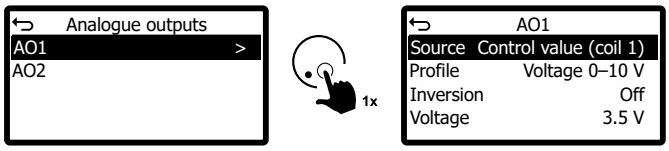
Signal level “active” means that there is a high signal (logically 1, +24 volts) at the input.

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



7.1.8 Analogue outputs

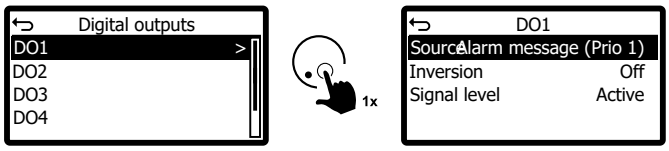
The source of the signal, the selected profile, information as to whether the signal is inverted and the voltage currently output are shown for each analogue output.



7.1.9 Digital outputs

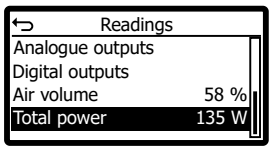
The source of the signal, information as to whether the signal is inverted and the current status are shown for each digital output.

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



7.1.10 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.

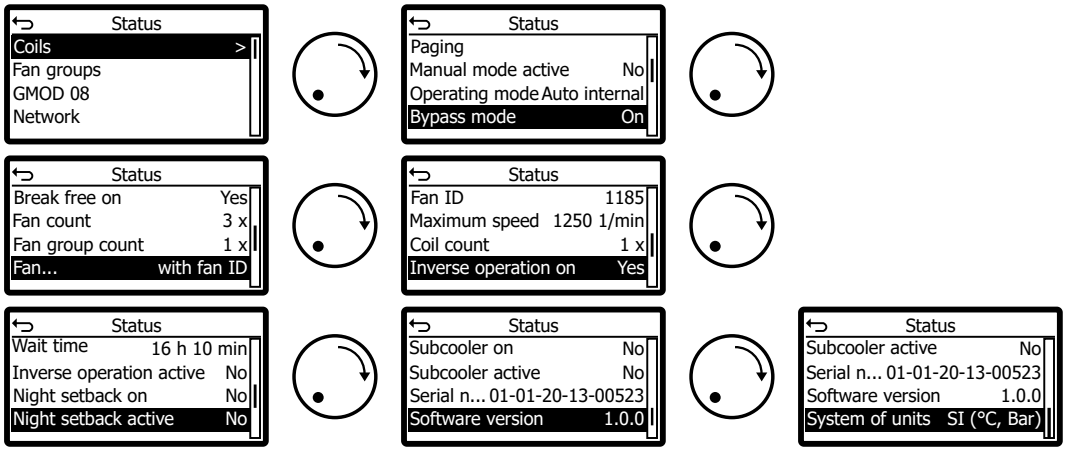


NOTICE

The number of entries in this menu depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

7.2 Status menu

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



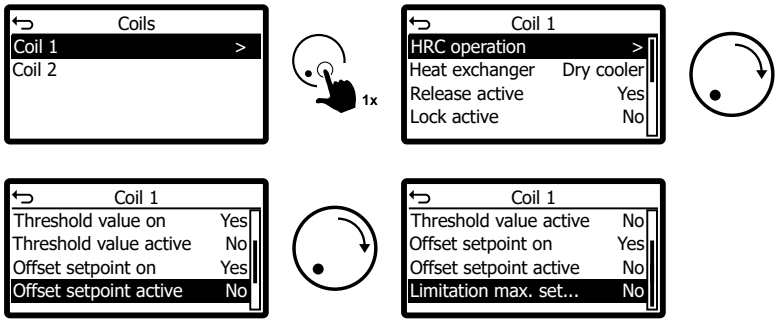
NOTICE

The number of entries in this menu depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

7.2.1 Coils (status menu)

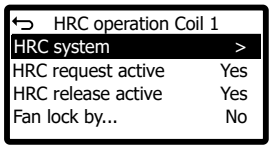
Specific information is shown for each coil. The particular configuration determines whether information is displayed or not.

- Status information for the bypass valve (if function parametrized)
- Status information for HRC operation (if function parametrized)
- The set heat exchanger type
- The release status for the coil. Generally speaking, the release is controlled via a digital input. Alternatively, this can be permanently released.
- The status of an additional lock for the coil. This is the case for example during HRC operation if the working fluid is to be directed to the HRC system and the fans are then no longer to be controlled. See also "Coils (HRC settings)"menu.
- The status as to whether the threshold value function for this coil is switched on and active.
- The status as to whether setpoint displacement is configured for this coil and this is active, i.e. the setpoint is currently being displaced.
- The status of any setback for setpoint displacement, e.g. during HRC operation.
- The status of measurement monitoring



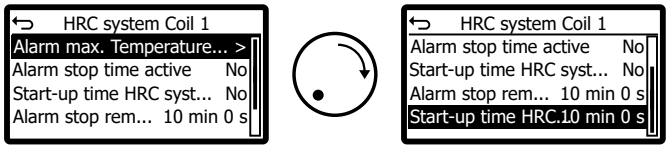
7.2.1.1 HRC operation (heat recovery)

If the HRC operation (heat recovery) function is activated for the relevant coil, the corresponding status information is shown here.



7.2.1.1.1 HRC system

Specific HRC system information for the relevant coil is shown here.



Alarm max. temperature to HRC system active

If the maximum permitted temperature for the WRG system is exceeded, this is shown here. See also "Coils (HRC settings)"menu.

Alarm stop time active

If a timer is currently active following a temperature alarm, this is shown here before the HRC system is released again.

Start-up time HRC system active

If a timer for an HRC system start-up time is running, this is shown here. During this time, the HRC valve will be positioned to the parameter "Limit HRC"

Alarm stop remaining time

The remaining time until the HRC system is released following a temperature alarm is shown here.

Start-up time HRC system remaining time

The remaining time for the "HRC system start-up time) is shown here.

7.2.1.1.2 HRC request active

The status of the control signal (digital input) for the "HRC request" is shown here. See also "Control signal (HRC request)"menu.

7.2.1.1.3 HRC release active

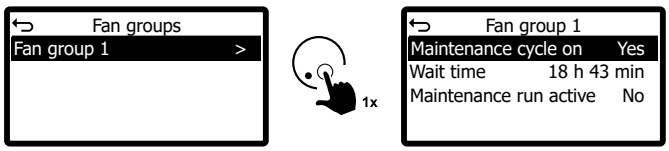
The status of the "HRC release active" output signal is shown here. This output signal can be used as the source for a digital output of the controller in order to signal release to the HRC system.

7.2.1.1.4 Fan lock by HRC active

If the control value for the HRC valve exceeds the "Fan lock from valve position" parameter, this is shown here. If active, the fans will be locked. See also "Fan lock from valve position".

7.2.2 Fan groups

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



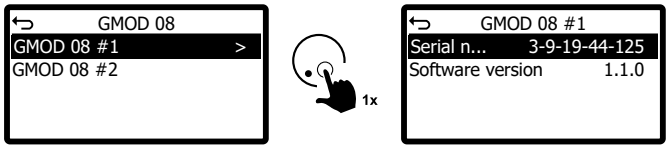
7.2.3 Pad wetting

The status information for the humidification system (hydroBLU/ ADC) can be found here.

See additional document “Manual GHMnext Pad”

7.2.4 GMOD 08

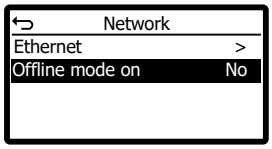
If one or more expansion modules for connecting fans are present, the serial number and software version for all expansion modules are shown here.



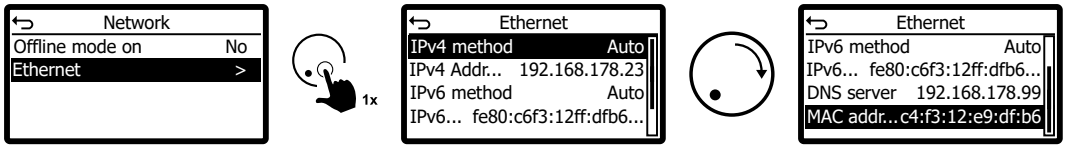
7.2.5 Network

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

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



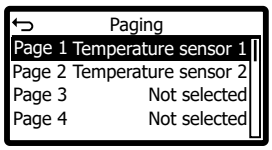
The configuration parameters set, the IP addresses and the MAC address are shown for the Ethernet interface.



7.2.6 Paging

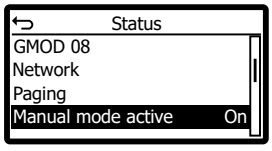
In this submenu, you can see how the so-called “pages” for sensors are configured on the Modbus interface. For more details, see the corresponding Modbus interface specification.

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.



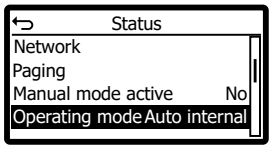
7.2.7 Manual mode active

This shows whether manual mode is active (see also "Manual mode").



7.2.8 Operating mode

The set controller operating mode is shown (see also "Operating mode").



7.2.9 Control mode

The current control mode is shown here: Cooling or heating.

7.2.10 Fan drive

Via the entry "Fan drive", it is possible to see whether the GMM is parametrized for controlling EC fans via Modbus or analogue connected power units (e.g. with AC fans).

7.2.11 Control value limitation

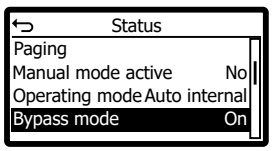
If fan drive is set to "Analogue", the control value limitation parametrized during commissioning will be shown here (see Chapter "Analogue operation of AC power units. GMMnext sincon lite & phase-cut lite").

7.2.12 Tear-off function available

If the tear-off function is available for at least one connected fan, this is shown here (see Chapter "Scope of performance").

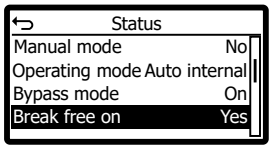
7.2.13 Bypass mode

The status of the bypass function is shown (see also "Bypass").



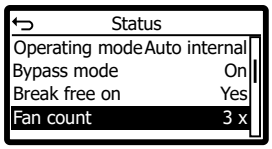
7.2.14 Break free on

The status of the fans' break-free function is shown.



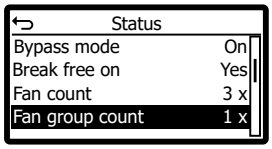
7.2.15 Fan count

The number of fans connected is shown.



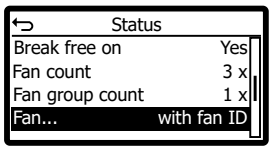
7.2.16 Fan group count

The number of fan groups is shown.



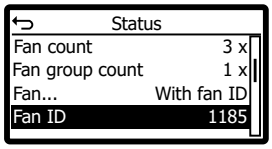
7.2.17 Fan parametrization

Information as to whether the fans were parametrized with or without a fan ID during start-up is shown here (see also "Start-up the GMMnext").



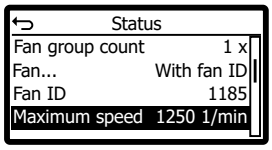
7.2.18 Fan ID

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



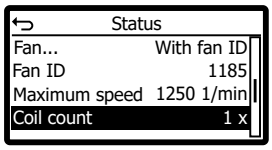
7.2.19 Maximum speed

The maximum speed for fans used during start-up is shown here.



7.2.20 Coil count

The number of configured coils is shown.

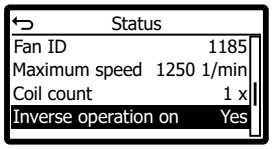


7.2.21 Inverse operation available

If inverse operation is available for all connected fans, this is shown here (see Chapter "Scope of performance").

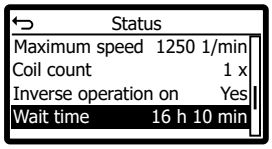
7.2.22 Inverse operation on

This shows whether inverse operation is on.



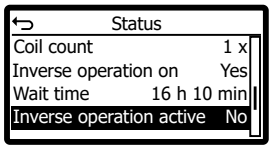
7.2.23 Wait time

This shows the waiting time until the next inverse operation.



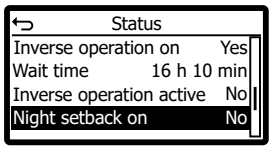
7.2.24 Inverse operation active

This shows whether an inverse operation is active.



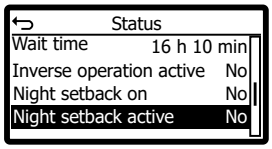
7.2.25 Night setback on

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



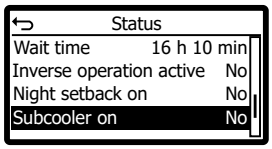
7.2.26 Night setback active

This shows whether night setback is currently active.



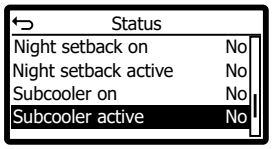
7.2.27 Subcooler on

This shows whether the subcooler function is on.



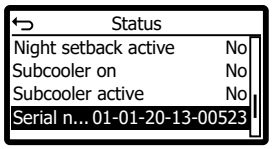
7.2.28 Subcooler active

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



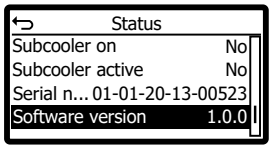
7.2.29 Serial number

The serial number of the controller is shown.



7.2.30 Software version

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

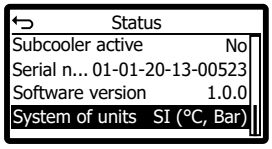


7.2.31 System of units

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

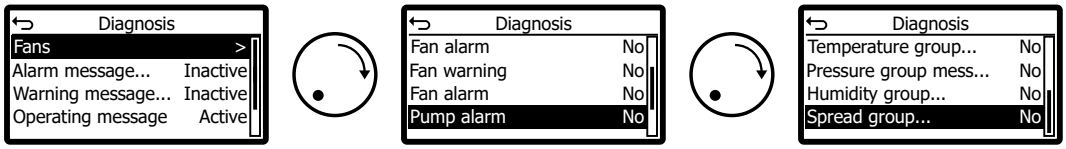
NOTICE
Internally, the controller processes all parameters and process data using the SI system.

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 "System of units").



7.3 Diagnostics

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

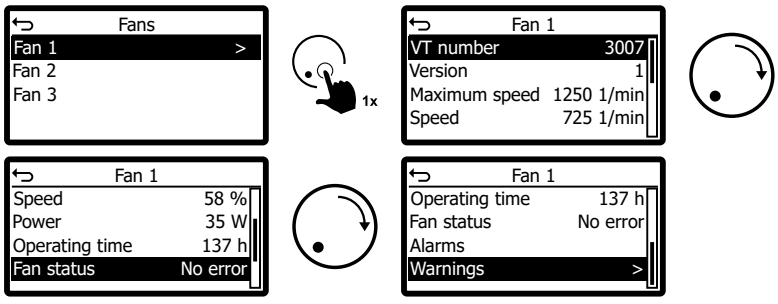


NOTICE

The number of entries in this menu depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

7.3.1 Fans

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



7.3.2 Pad wetting

The diagnostics information for the humidification system (hydroBLU/ ADC) can be found here.

See additional document “Manual GHMnext Pad”

7.3.3 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.

7.3.4 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.

7.3.5 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.

7.3.6 Fan warning

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

7.3.7 Fan alarm

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

7.3.8 Fan alarm

If **all** available EC fans have alarm status, this is shown here.

7.3.9 Power unit fault message

If at least one analogue connected power unit has a critical fault.

In the event of a fault, alarm message Prio 1 will also be activated (see Chapter "Analogue operation of AC power units. GMMnext sincon lite & phase-cut lite").

7.3.10 Motor protection fault message

If at least one analogue connected fan has a fault (thermal contact).

In the event of a fault, warning message Prio 2 will also be activated (see Chapter "Analogue operation of AC power units. GMMnext sincon lite & phase-cut lite").

7.3.11 Pump alarm

If pump alarms are configured and at least one pump has alarm status, this is shown here.

See also "Pump alarm".

7.3.12 Group messages (pressure/temperature/ambient humidity/spread)

In the individual measurement monitoring systems, it is possible to configure whether an indication signal should be included in the various group messages when exiting the valid interval.

All results of the measurement monitoring systems for all coils are included in the relevant group message, i.e. the relevant group message is active as long as at least one measurement monitoring system detects exiting of a valid interval and reports the result accordingly.

See also "coils (measurement monitoring)".

7.3.13 GMOD 08 warning

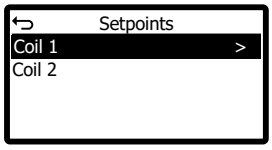
If at least one GMOD 08 module is connected to the GMM, the connection status will be shown via the menu entry "GMOD 08 warning active yes/no". The warning is activated as soon as communication with at least one GMOD 08 is disrupted. In the event of a fault, warning message Prio 2 will also be activated.

7.3.14 GHMspray warning

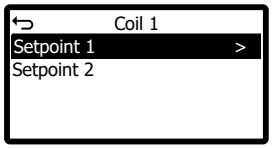
If the "GHMspray on" function is switched on (see Chapter "Hydro management"), the connection status will be shown via the menu entry "GHMspray warning active yes/no". The warning is activated as soon as communication with a GHM is disrupted. In the event of a fault, warning message Prio 2 will also be activated.

7.4 Setpoints

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



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



7.5 Events

In the event memory, both temporary and one-off events are permanently recorded with a time stamp (see "Error messages and warnings").

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.

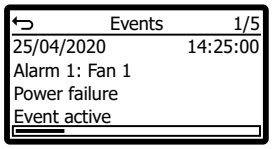
If you navigate to an event, you can press the rotary selection knob to switch to the event itself. By turning the rotary selection knob, you can scroll through the entire event entry.

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

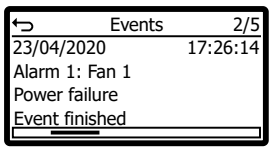
The time stamp for the event is the point at which the event became active.

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.

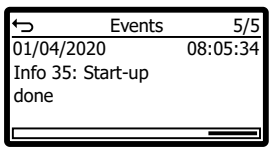


On 23.04.2020, another alarm concerning fan 1 occurred. The event has ended and the alarm is no longer active.



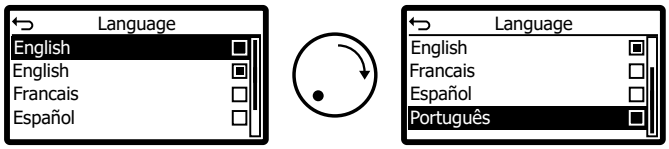
... until the end of the event list.

The controller was commissioned on 01.04.2020 at 08:05.



7.6 Language

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



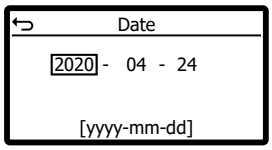
7.7 Date/time

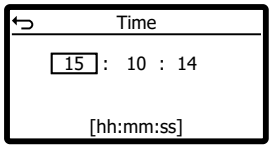
The system time (date and time) can be set here. The time is used to enter the event times in the event memory or for time-controlled functions (e.g. night setback or inverse operation).

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.





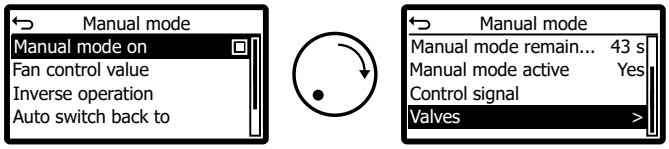
7.8 Manual mode

For information regarding manual operation of the hydroBLU, see the additional document “Manual GHMnext PAD“.

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.

ATTENTION
Manual mode does not depend on a release signal. It has the highest priority and switches off all other regulation modes!

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

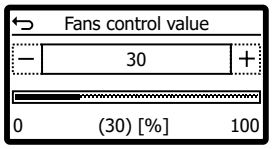


7.8.1 Manual mode on

Manual mode can be switched on and off here.

7.8.2 Fans 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).



7.8.3 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.

NOTICE
The number of entries in this menu depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

7.8.4 Auto switch back to regular operation after

This function allows a manual mode activated manually via the menu (or via fieldbus) to be switched off automatically after an adjustable time and regular operation to be continued. If the “0 min” value is set there is no automatic switch-off and the manual mode stays active until it is switched off manually.

If manual mode is switched on via the control signal (manual mode), there will be no automatic return to regular operation.

7.8.5 Manual mode remaining time

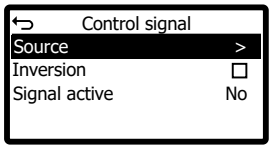
If the parameter "Auto switch back to regular operation after" > 0 and manual mode is switched on manually, the remaining time until a return to regular operation is shown here.

7.8.6 Manual mode active (status)

This shows whether manual mode is active.

7.8.7 Control signal (manual mode)

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.



7.8.7.1 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”.

7.8.7.2 Control signal inversion

If necessary, the external control signal can also be inverted.

If inversion is selected, a high signal (+24 V) 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.

7.8.7.3 Signal active

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

7.8.8 Valves

If valves (e.g. bypass valve or HRC valve) are configured on an analogue output, these will be shown here and can be controlled manually.

In order for control to take place, manual mode must be switched on beforehand.

7.9 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".

7.10 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".

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

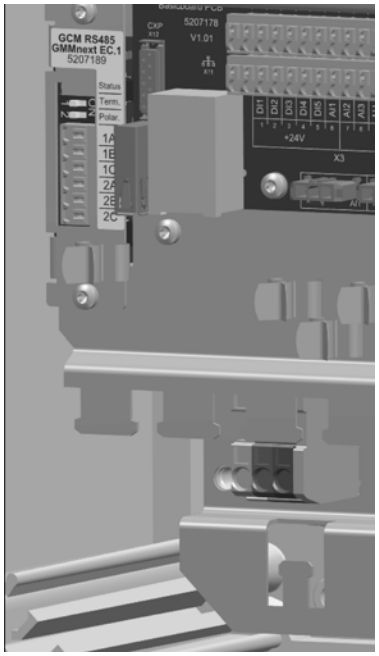
In the future, the update file will be provided for downloading via the Güntner homepage.

See https://www.guentner.eu/products/controls/ for more information.

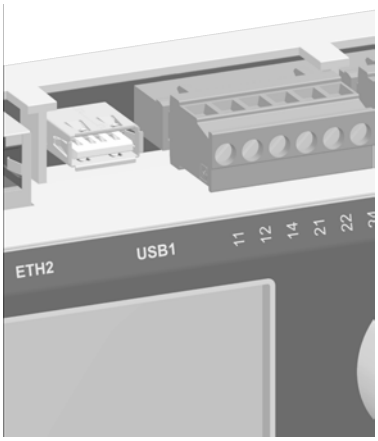
7.10.1 Update procedure

ATTENTION
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".

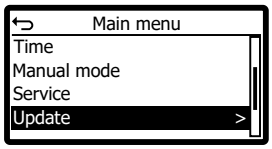
Now switch to the “Update” submenu before you insert the USB storage stick.



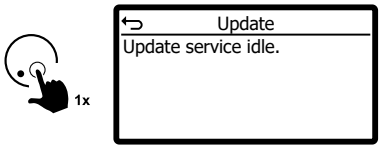
USB1 port on the GMMnext EC



USB1 port on the rail controller

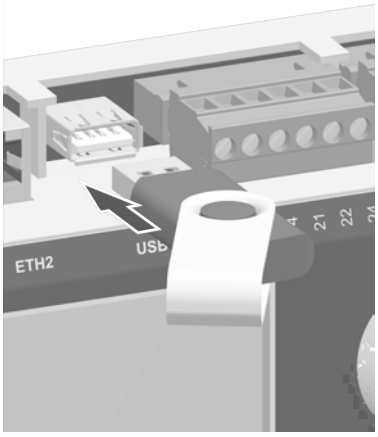


The update service status is then “inactive”, which means that no update procedure is currently under way.



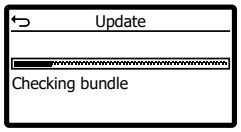
Do not insert the prepared USB storage stick into the USB port USB1 until now.

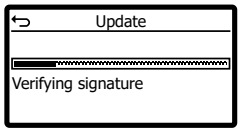
Inserting the USB storage stick into the GMMnext EC

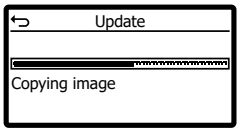


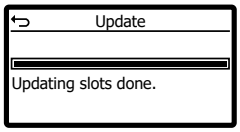
Inserting the USB storage stick into the rail controller

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.

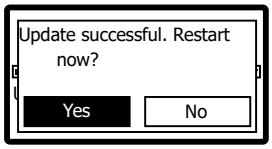




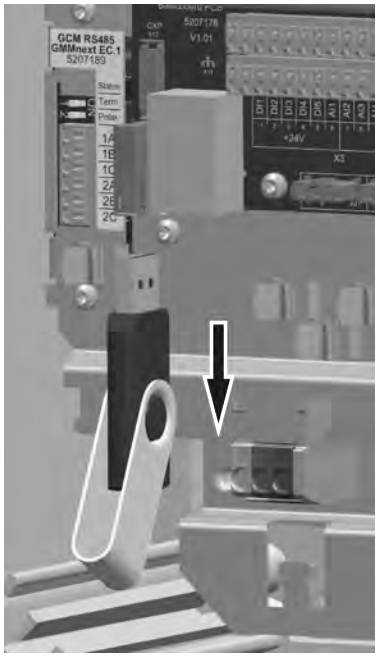




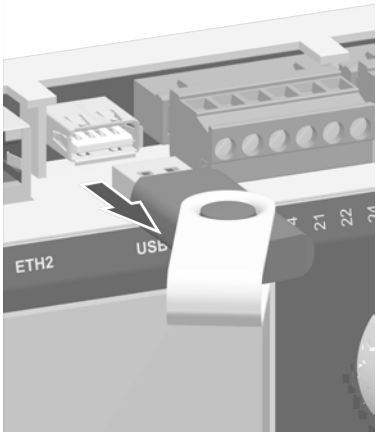
When the update including any data migration is complete, a message will appear:



ATTENTION
Remove the USB stick before restarting the system!

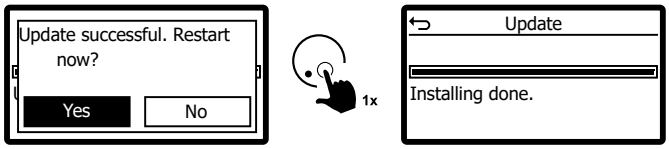


Removing the USB stick from the GMMnext EC



Removing the USB stick from the rail controller

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

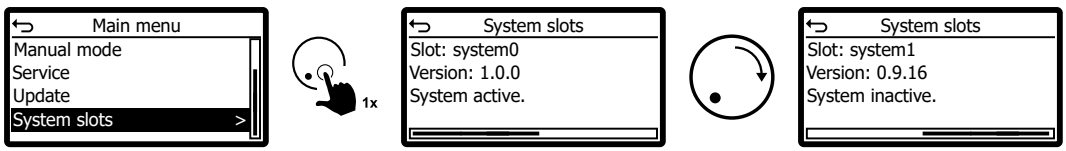


The system will now automatically restart.

7.11 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.



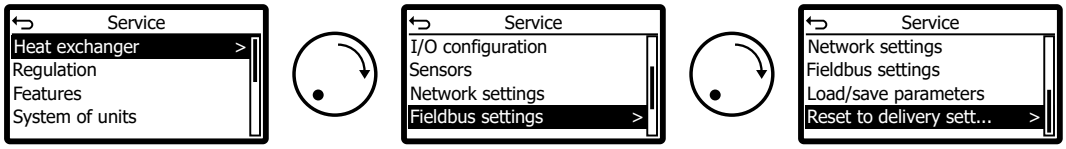
7.12 Display font

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

8 Service menu

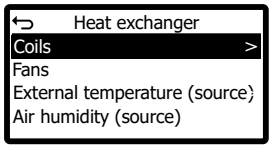
Via the Service menu you can configure all settings for the controller and the connected fans.

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



8.1 Heat exchanger

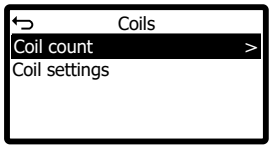
All settings which have an effect on the entire heat exchanger can be configured here.



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

8.1.1 Coils (heat exchanger)

Here, you can configure all basic settings for the coils 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 coil is to be assigned to.



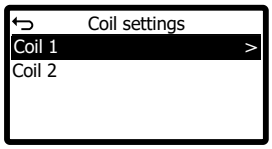
NOTICE
The associated internal coils are configured separately in the menu, see section "Regulation (service menu)".

8.1.1.1 Coil count

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

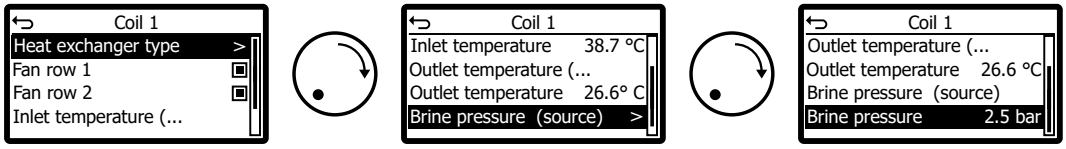
8.1.1.2 Coil settings

You can configure the settings for each coil here.

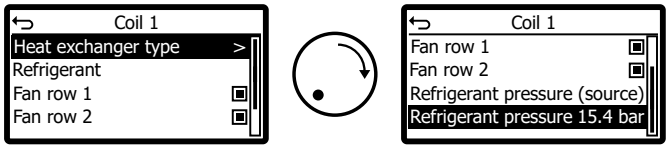


ATTENTION
The parameters available depend on the selected heat exchanger type.

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



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



8.1.1.2.1 Fan row 1

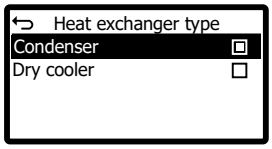
For heat exchangers with 2 fan rows, you can specify whether fan row 1 (left-hand row, viewed from the inlet side) will be influenced by this coil.

8.1.1.2.2 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 coil.

8.1.1.3 Heat exchanger type

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



8.1.1.4 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 regulation 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

8.1.1.5 With a condenser

8.1.1.5.1 Refrigerant 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 coil.

8.1.1.5.2 Refrigerant pressure (current value)

The current measured refrigerant pressure is shown.

8.1.1.6 With a dry cooler

8.1.1.6.1 Inlet temperature (source)

The source of the inlet temperature sensor for this coil can be set here. This temperature is not used to control the coil. 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.

8.1.1.6.2 Inlet temperature (current value)

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

8.1.1.6.3 Outlet temperature (source)

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

8.1.1.6.4 Outlet temperature (current value)

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

8.1.1.6.5 Brine pressure (source)

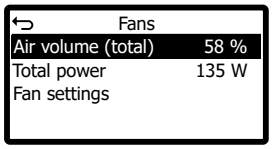
The source of any brine pressure sensor can be configured here.

8.1.1.6.6 Brine pressure (current value)

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

8.1.1.7 Fans

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



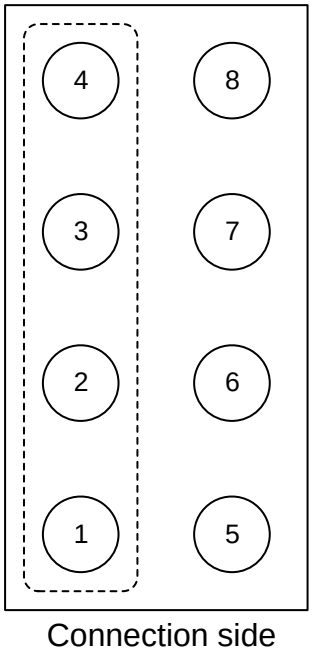
8.1.1.7.1 Counting method for fans

Here, you can define the counting method according to which the fans are numbered on the heat exchanger. The following counting methods are currently supported:

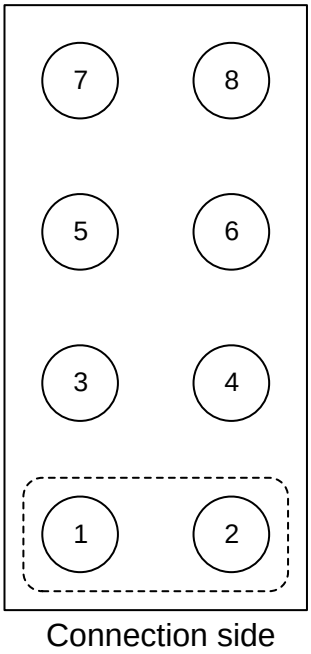
With the **"Along a row"** counting method, the fans in the first fan row are counted first from the front to the back. The fans in the next fan row to the right are counted next.

With the alternative **"Along a column"** counting method, the fans in the first fan column are counted first from left to right. The fans in the next fan column are counted next from the front to the back.

The following illustrations show the various counting methods using a heat exchanger with eight fans spread across two rows as an example.



Counting method along a row



Counting method along a column

If the method of counting fans should deviate from the common standard, this can be taken into account with this setting.

8.1.1.7.2 Air volume

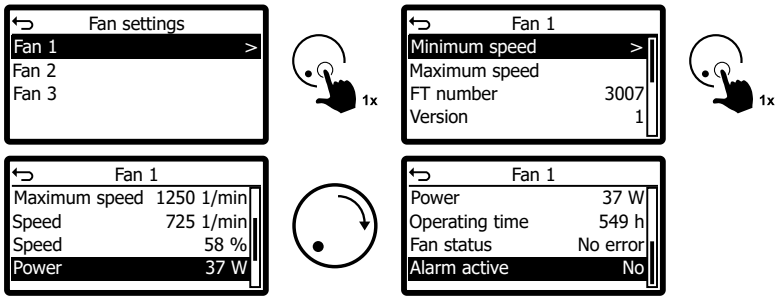
The cumulated total air volume for all fans is shown in %.

8.1.1.7.3 Total power

The current total power for all fans is shown.

8.1.1.7.4 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.



Minimum speed

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

ATTENTION
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 coil for example, configure this in the relevant coil instead.

Maximum speed

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

ATTENTION
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.

FT number

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

Version number

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

Maximum speed

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

Current speed

The fan's current speed is shown.

Speed in %

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

Power

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

Operating time

The fan's operating hours are shown.

Fan status

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

Alarm active

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

8.1.1.8 External temperature(Source)

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

8.1.1.9 External temperature (current value)

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

8.1.1.10 Ambient humidity(Source)

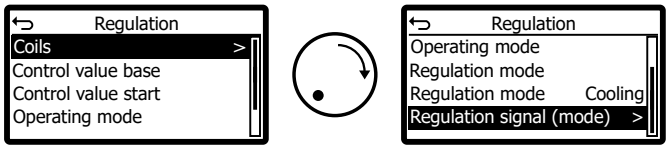
Here, you can configure the source of an ambient humidity sensor. Select an ambient humidity sensor which you set up previously here.

8.1.1.11 Ambient humidity (current value)

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

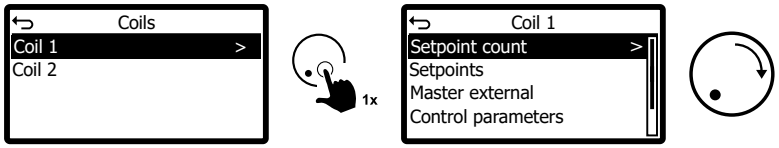
8.2 Regulation (service menu)

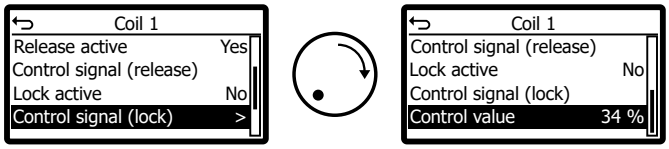
Here, you can configure settings which apply either to each coil or to all coils.



8.2.1 Coils (regulation)

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

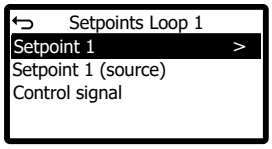




8.2.1.1 Setpoint count

Up to 2 setpoints can be configured for each coil. 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.

8.2.1.2 Setpoint settings



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.

8.2.1.2.1 Setpoint 1/2

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

8.2.1.2.2 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 "Setpoint temperature signals/setpoint pressure signals"menu.

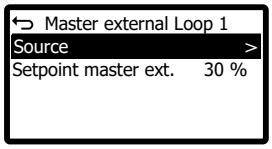
8.2.1.2.3 Control signal

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

8.2.1.3 Master external

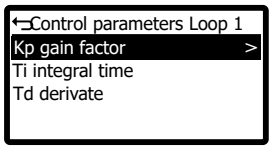
In the “Slave external analog” operating mode, the control value for the fans is given via an analogue signal. Here, you can configure the source of the previously configured fan control value signal.

See also "Fan control value signals".



8.2.1.4 PID control parameters

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



8.2.1.4.1 Kp gain factor

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

8.2.1.4.2 Ti hold time

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

8.2.1.4.3 Td derivate

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

8.2.1.5 Releasing and locking the coil

An explicit release control signal and an explicit locking control signal can be configured for each coil. The source of the signal and inversion if desired can be set for this purpose.

Both signals can be used separately and flexibly to influence the output signal of the coil with various logic approaches.

In order that the coil (PID controller) works and generates the desired output signal to control the fans, the release signal must be 1 (= High) **AND** the locking signal 0 (= Low). Otherwise, the output signal for the coil is 0, i.e. the assigned fans are not controlled.

By default, the first coil is released via digital input 1 and no additional lock is configured. However, the release can also be configured via other inputs. All other settings should be configured as necessary according to the number of coils and additional functions.

With**GSCnext units,**both functions, motor management and hydro management, are enabled on the DI1. If the hydro management is to be enabled separately, this can be set under:

Service → Functions → Pad wetting → Control → Control signal

8.2.1.5.1 Release active

This shows whether the coil is released (either by a control signal or permanently).

8.2.1.5.2 Control signal (release)

Here, you can configure the source of the control signal which releases the chosen coil. If necessary, the signal can also be inverted.

ATTENTION
If no control signal for release is configured, the coil is always released.

8.2.1.5.3 Lock active

If the coil is locked (either via a digital input or possibly via another function, e.g. "Fan lock from valve position" during HRC operation), this is shown here.

8.2.1.5.4 Control signal (lock)

Here, you can configure the source of the control signal which locks the coil. If necessary, the signal can also be inverted.

ATTENTION
If no control signal for the lock is configured, the lock is not effective.

8.2.2 Control value base and control value start

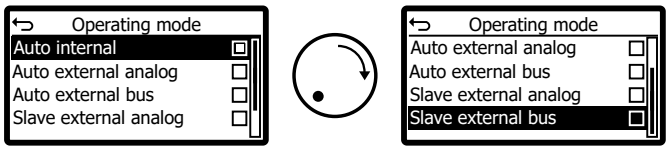
The control value base function is used to set a minimum speed. The control value start function is used to define a start point for issuing the control value.

Here are some setting examples:

Control value base	Control value start	Function
0 %	0 %	Functions off, normal regulation 0 %...100 % with release
10 %	0 %	At least 10 % control value is output, when the release is active
10 %	5 %	At least 10 % control value is only then output when the regulation has reached 5 % and the release is due
10 %	10 %	The 10 %...100 % control value is only output when the regulation reaches 10 %

Control value base	Control value start	Function
0 %	5 %	The control value is 0 % when the control value is under 5 %. The control value is output from 5 % regulation with given release (5 %-100%).

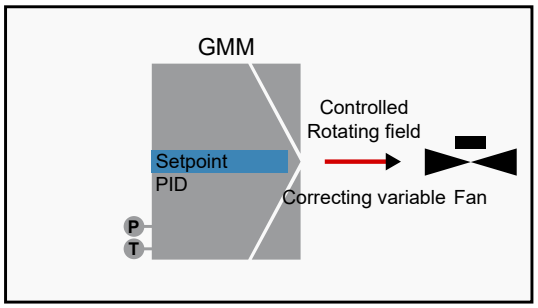
8.2.3 Operating mode



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

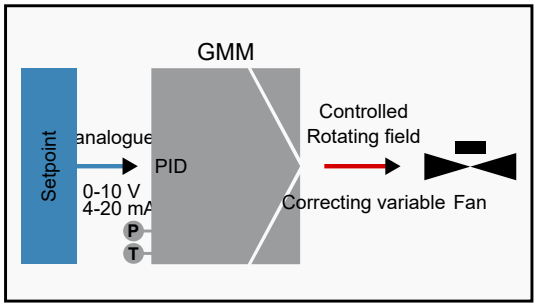
8.2.3.1 Auto internal

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 coil under “Setpoints” in the menu.



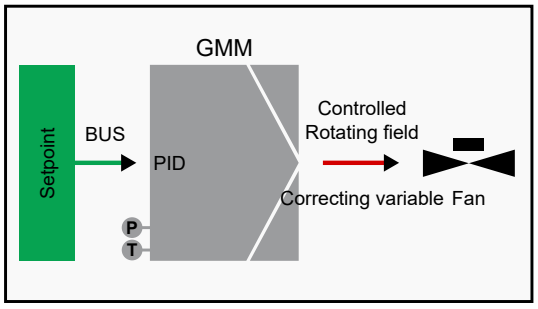
8.2.3.2 Auto external analog

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



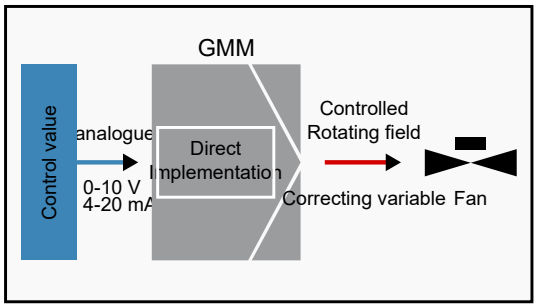
8.2.3.3 Auto external bus

In this mode, the setpoint is given via one of the possible fieldbus interfaces/protocols. In order for the fieldbus interface to operate, a further communication module may be necessary, see also "Options"to configure the fieldbus interface, see "Fieldbus settings".



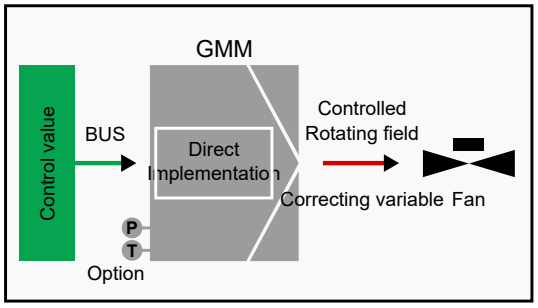
8.2.3.4 Slave external analog

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 coil as a master control value, see also "Fan control value signals".



8.2.3.5 Slave external bus

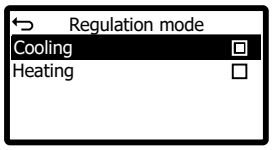
In this mode, the control value is given via one of the possible fieldbus interfaces/protocols. In order for the fieldbus interface to operate, another communication module may be required, see also in order to configure the fieldbus interface, see "Fieldbus settings".



8.2.4 Regulation 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 “Regulation mode” parameter, you can set the regulation logic globally to Heating for all coils.

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



8.2.5 Regulation mode (current)

The current regulation mode is shown.

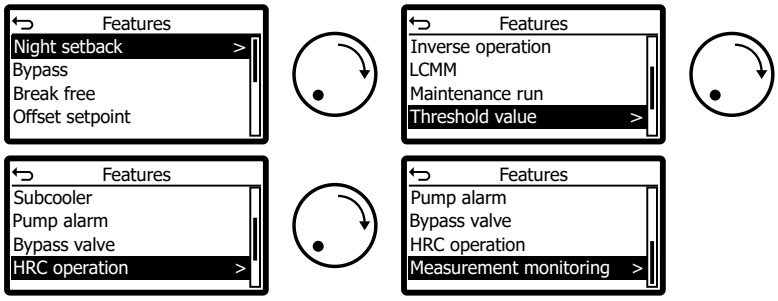
8.2.6 Control signal (control mode)

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 coils.

8.3 Features

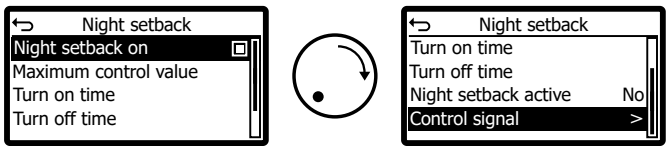
With this item in the service menu, you can activate and configure special functions if necessary.



8.3.1 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 turn on and turn off times must be different. Please also ensure that the system time is set correctly, see also "Date/time". 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.



8.3.1.1 Night setback on

The function can be switched on or off here. Night setback depending on the time will only work if the function is switched on.

8.3.1.2 Maximum control value

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

8.3.1.3 Turn on time

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

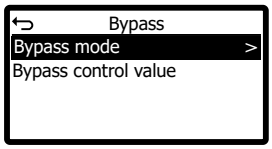
8.3.1.4 Turn off time

The turn off time for night setback can be set here. The limiting of the fan control value will then be turned off again.

8.3.1.5 Control signal

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

8.3.2 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

8.3.3 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 on at least one EC fan.

NOTICE
The availability of this function depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

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 starting current and in alternating directions. The GMMnext does not issue a fault message during this time. If the fan does succeed in rotating it then changes automatically to its preferred direction and goes into normal operation.

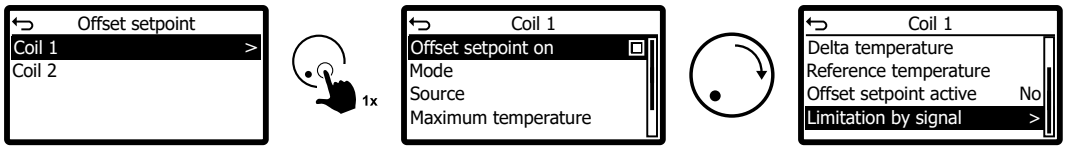
If this also fails to start rotation the fan will then report this in the form of a Blocked message. It will then use its minimum starting current to continue attempting to start up, in alternating directions.

8.3.4 Offset setpoint

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

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

Setpoint offset can be configured separately for each coil.



8.3.4.1 Offset setpoint on

Setpoint offset for the relevant coil can be switched on and off here.

8.3.4.2 Mode

Select the setpoint offset mode here.

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

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

8.3.4.3 Source

This menu option is only available if the "Direct offset" mode is set.

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

See also "Setpoint temperature signals/setpoint pressure signals".

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

8.3.4.4 Maximum temperature

This menu option is only available if the "Reference offset" mode is set.

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

8.3.4.5 Delta temperature

This menu option is only available if the "Reference offset" mode is set.

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

8.3.4.6 Reference temperature

This menu option is only available if the "Reference offset" mode is set.

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

External temperature-dependent setpoint offset

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. condensing 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 an offset 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 offset works. In this example, the setpoint is displaced from 20 °C. The max. value up until which the setpoint can be displaced to is 45 °C in this example.

8.3.4.7 Offset setpoint active

This shows whether setpoint offset is currently active.

8.3.4.8 Limitation by signal

This menu option is only available if the "Reference offset" mode is set. Setpoint offset can be limited by a signal. If the signal is present, the final result of setpoint offset can be limited to the value set under "Maximum temperature".

This function is used during HRC operation for example in order to ensure that the HRC system in combination with the dry cooler functions reliably and with optimum energy consumption when setpoint offset is activated. See "HRC operation (heat recovery)".

8.3.4.8.1 Maximum temperature

If the signal for limiting setpoint displacement is active, the displacement signal will only influence the displacement up to this new maximum temperature.

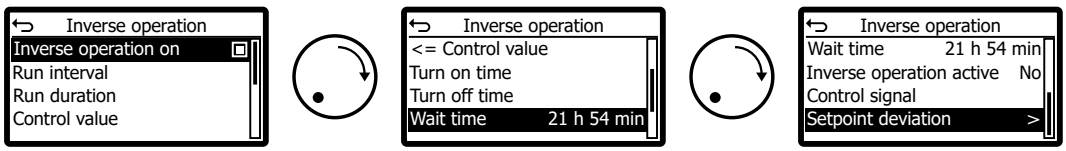
8.3.4.8.2 Limitation max. setpoint offset active

If the limiting of setpoint offset by a signal is active, this is shown here.

8.3.4.8.3 Control signal (limitation by signal)

The source and, if desired, inversion of the control signal for limiting setpoint offset can be set here.

8.3.5 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 coils ≤ 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 coils is not greater than the configured Δ max value

Inverse operation is performed independently of the releasing 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 regular 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.

NOTICE
The availability of this function depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

8.3.5.1 Inverse operation on

This is used to turn the function on or off.

8.3.5.2 Run 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. Standstill times are not counted.

8.3.5.3 Run duration

This is used to specify the duration of inverse operation.

8.3.5.4 Control value

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

8.3.5.5 Inverse operation condition

Condition for inverse operation. Inverse operation is released only if the current control value for all PID controllers in the coils is ≤ this configured control value.

8.3.5.6 Turn on time/turn off 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.

8.3.5.7 Wait time

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

8.3.5.8 Inverse operation active

This shows whether inverse operation is currently taking place.

8.3.5.9 Control signal

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

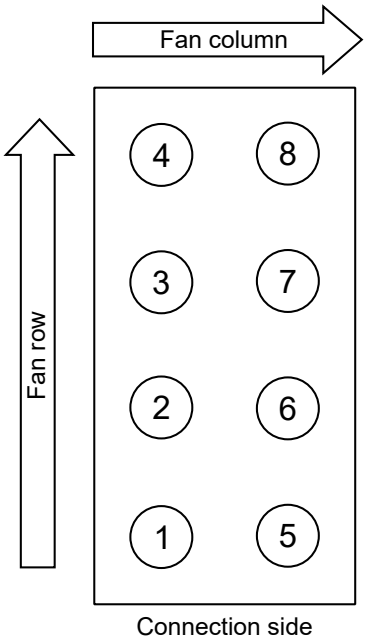
8.3.5.10 Setpoint deviation

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

8.3.6 LCMM

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

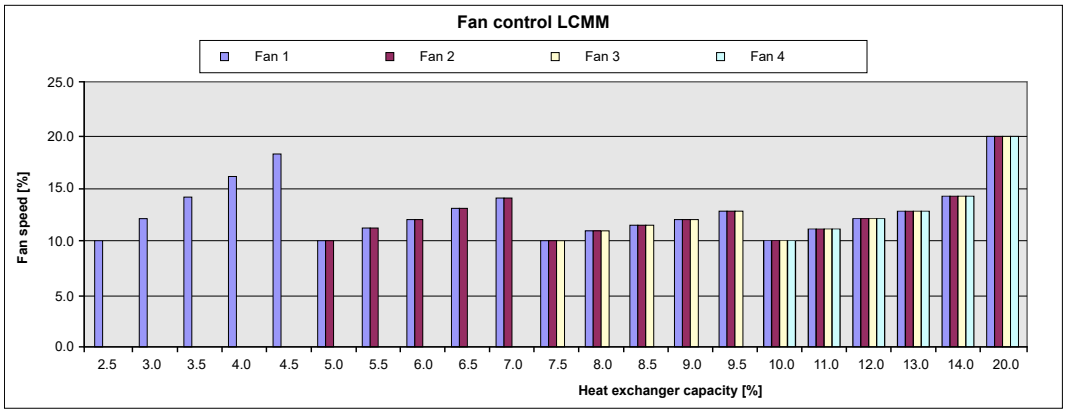
- **Fan row**
  This refers to a row of fans which stretches one-dimensionally from the connection side of the heat exchanger to its rear side.
- **Fan column**
  This refers to a number of fans running orthogonally to a row of fans. Generally speaking, this term is used for two-row units.
- **Fan group**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



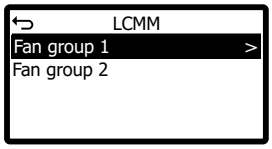
EC fans have a minimum speed which lies somewhere between 5 and15 % of the maximum speed. With systems with one fan this is simultaneously the smallest possible control value of the controller for the overall system.

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 control now takes place 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.

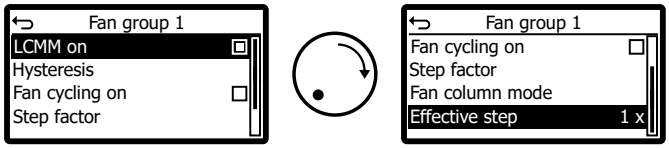
A system with 4 individually controlled fans serves as an example. With an assumed minimum fan speed of 10 % of the maximum speed, a control value of 2.5 % can be set for the heat exchanger (10 % / 4). At this setting one fan runs with the required minimum speed and all other fans are switched off. If 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).



The LCMM function is configured for each fan group.



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



8.3.6.1 LCMM on

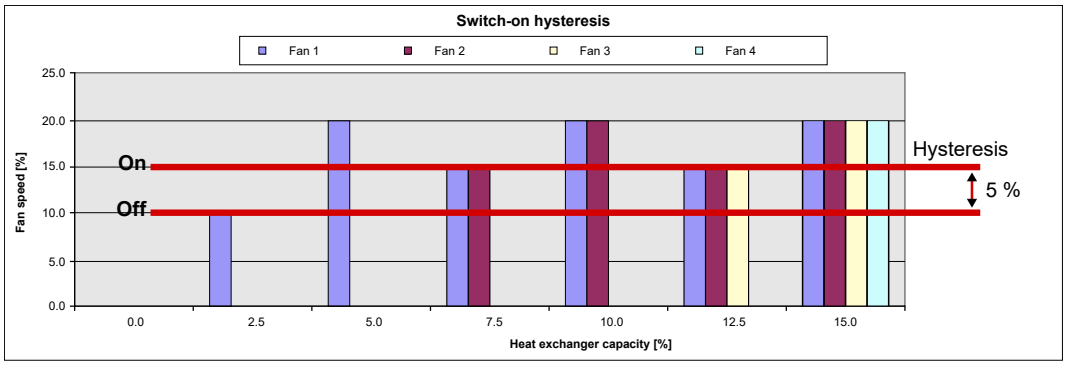
Here you can switch the LCMM function on and off for this fan group.

8.3.6.2 Hysteresis (LCMM)

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. Only 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 %.



8.3.6.3 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

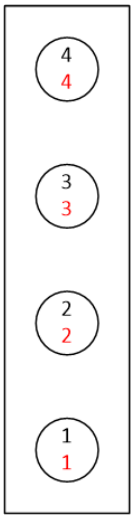
an alternating sequence, so that the units with the least operating hours are switched on first. This should increase the EC fans' overall service life.

8.3.6.4 Step factor

The step size is used to determine how many fans within a group are switched on or off at the same time. The bigger the step size, 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 step size:

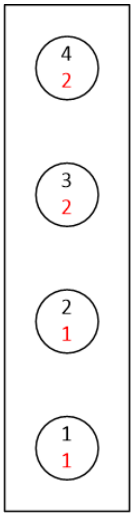
- **Atomic step size**
  If all fans within a column are to be controlled synchronously, the smallest step size with which the fans can be switched on and off is calculated from the number of fan rows within the particular fan group.
- **Step factor**
  Using an integral factor, the granularity of the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

The step factor is 1 by default. With large heat exchangers, a higher step size 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 step of 1. This corresponds to the “1 row individual” option for the old GMM EC.

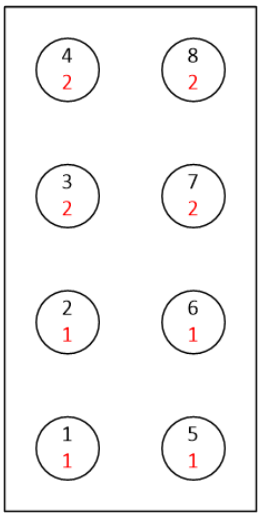


The fans are switched on and off individually.

The effects of a step size 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 step of 2 for a single-row heat exchanger



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

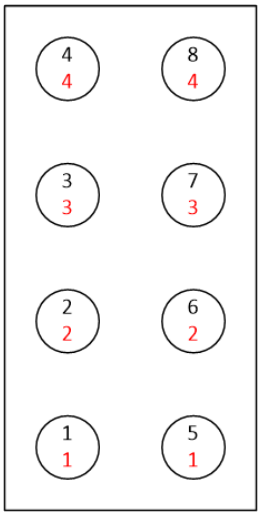
8.3.6.5 Fan column mode

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

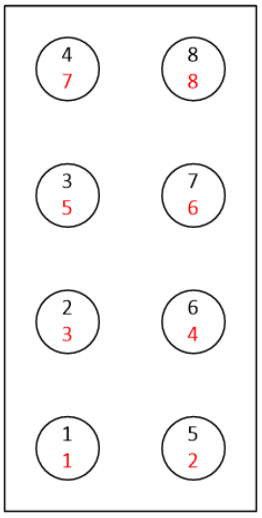
With a number of multi-row heat exchangers, the fans within a fan column must also be controlled as synchronously as possible. In this case, two options are available:

- Fan column mode = **uniformly**
  All fans within a column (i.e. with respect to the neighbouring row) are controlled with the same control value. The step size 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.



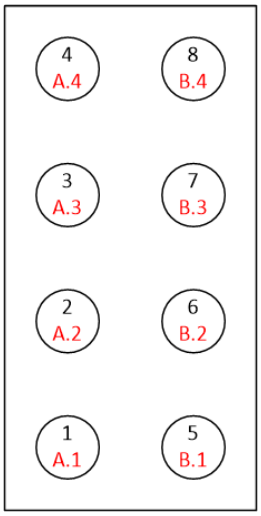
The fans within a column receive the same control value

- Fan column mode = **balanced**
  Fan control differs in no more than one column. In this case, the atomic step size 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 column mode = **independent**
  If a heat exchanger with a number of coils 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.

8.3.6.6 Effective step

The effective step is shown.

8.3.7 Natural Convection Control

Introduction

The**Natural Convection Control**(NCC) can preferably be used for applications where supercooling of the refrigerant is undesirable from a technical point of view.

In order to achieve this, the fans run in reverse and are regulated to an optimum speed, accumulating heat rising owing to convection in the heat exchanger. This actively reduces the cooling performance of the heat exchanger.

NOTICE
NCC can only be used in systems with a control circuit and only in conjunction with the operating modes Auto Internal, Auto external analogue or Auto external bus.

NOTICE
The availability of this function depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

Summary

The NCC function can be switched on and off via the parameter "NCC on".

The entire configuration of the start and stop conditions can be viewed via the service menu and possibly changed depending on the system configuration and the local conditions.

The start condition for NCC is set via the parameter "Hysteresis". In order to activate the NCC function, an additional release via a digital control signal "NCC release" is needed (the signal can also be inverted and is thus permanently active). NCC mode is activated if all of the following start conditions are met:

- Function is switched on.
- Control signal for controller release is active.
- Control signal for NCC release is active.
- Manual mode is not active.
- Setpoint deviation exceeds the hysteresis value, i.e. the medium is sufficiently supercooled.

The stop condition can be parametrized via the parameter "Hysteresis delay". NCC mode ends if at least one of the following conditions is met:

- Function is switched off.
- Control signal for controller release is not active.
- Control signal for NCC release is not active.
- Manual mode is active.
- Setpoint deviation falls below the zero limit for a sufficient period of time, i.e. the medium is no longer supercooled.

8.3.7.1 Control parameter (Kp amplification factor)

In this menu, the Kp amplification factor for the controller can be viewed and set. The higher the amplification factor, the harder the system tries to counteract the control deviation. If the factor is set too high, the system will tend to vibrate.

8.3.7.2 NCC on

With this parameter, the NCC function can be switched on or off. If this function is activated, NCC mode can only start if all other start criteria are met.

8.3.7.3 Hysteresis

Temperature/pressure difference with respect to the controller setpoint (unit "K" or "°F" / "bar" or "psi") as setpoint for the NCC function.

8.3.7.4 Hysteresis delay

With this parameter, the stop condition for NCC can be delayed. (Setting range 0-60 seconds)

Without a delay, NCC mode will end automatically if the deviation from the setpoint is corrected (i.e. setpoint deviation <= 0). In order to maintain NCC mode for longer at low speeds or in the event of short-term discrepancies, an additional delay can be configured via this parameter once NCC has ended.

8.3.7.5 Maximum control value

With this parameter, the speed of the fans can be limited to a maximum value during NCC mode. If the parameter is set to 100 %, the entire control value range between 0 and 100 % of the fan speed is enabled and no limitation takes place.

The limitation prevents NCC working in a non-optimum speed range.

8.3.7.6 Setpoint deviation

The setpoint deviation is shown here.

8.3.7.7 NCC active

This shows whether NCC mode is currently active, i.e. all start criteria are met and the fans are controlled during inverse operation.

8.3.7.8 Control signal

The source for the signal "NCC release" and, if desired, inversion can be set here.**An active enabling signal is essential here.**

NOTICE
The control signal "NCC release" can also be linked to the general controller release. Under "Service menu > Functions > NCC > Control signal (NCC release)" the same digital input as the one which was selected for the general controller release in the "Service > Control > Control circuits > Control signal (release) > Source" menu can be configured.

8.3.8 Maintenance run

A maintenance run 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 run after the configured system standstill period depends on all the following conditions being fulfilled:

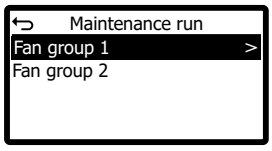
- Manual mode is deactivated
- Control value for all PID controllers in the coil = 0, i.e. no speed requirement
- No unit fault

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

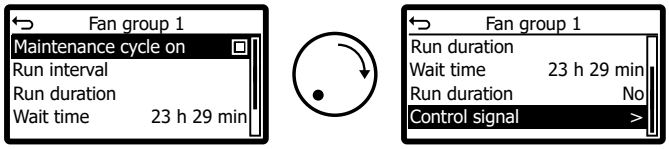
If a speed request is made during a maintenance run, the maintenance run will be aborted and the system will return to regulation mode. In such cases, maintenance is deemed to have been performed, because the fans have been in operation.

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

The maintenance run can be set for each fan group.



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



8.3.8.1 Maintenance run on/off

This is used to turn the function on or off.

8.3.8.2 Run interval

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

8.3.8.3 Run duration

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

8.3.8.4 Wait time

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

8.3.8.5 Maintenance run active

This shows whether a maintenance run is currently taking place.

8.3.8.6 Control signal

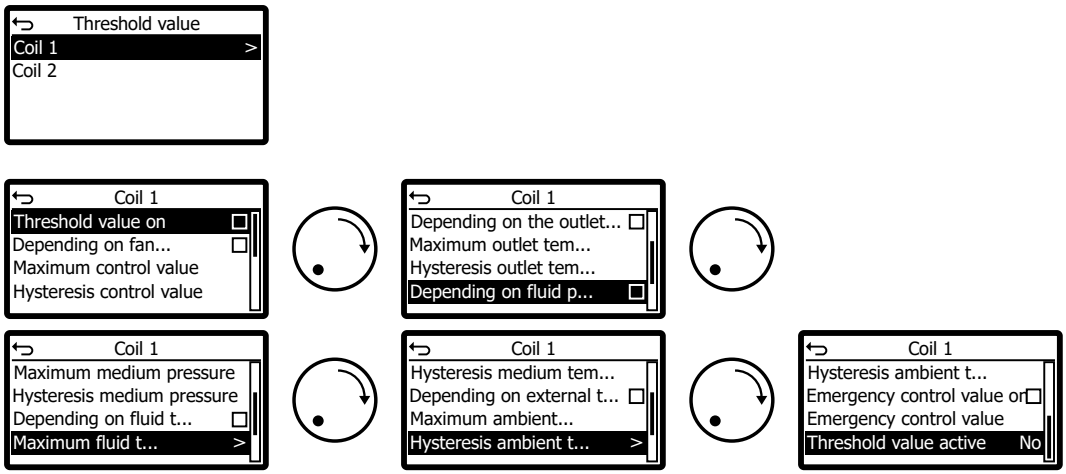
The maintenance run can also be activated via an external control signal. This can be configured here.

8.3.9 Threshold value

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

ATTENTION
You can select a number of dependencies. The results of the dependencies come together in an **AND function** i.e. the threshold function is only fulfilled if all activated dependencies are fulfilled. For each dependency, a **Maximum value** and a **Hysteresis** can be set.

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:

8.3.9.1 Depending on the fan control value

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

8.3.9.2 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 coil is of the dry cooler type.

8.3.9.3 Depending on the refrigerant pressure

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

8.3.9.4 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 coil is of the condenser type and an appropriate refrigerant is configured.

8.3.9.5 Depending on the external temperature

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

8.3.9.6 Maximum value

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

8.3.9.7 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 coil.

8.3.9.8 Emergency control value on

The emergency control value is issued as the control value for the relevant coil 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
- coil is released

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

8.3.9.9 Emergency control value

The relevant emergency control value can be set here.

8.3.9.10 Threshold value active

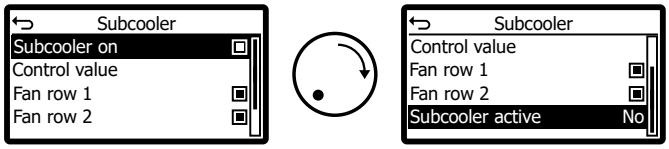
This shows whether a threshold value signal is active for this coil.

8.3.10 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 regulation. 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.



8.3.10.1 Subcooler on

The subcooler function can be switched on here.

8.3.10.2 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.

8.3.10.3 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.

8.3.10.4 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.

8.3.10.5 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 coil 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

Fan ID	FT No.	Speed [rpm]	Control value
1406	FT03040U	880	5.3
1407	FT03040U	610	3.7
1408	FT03040U	374	2.2

8.3.11 Pump alarm

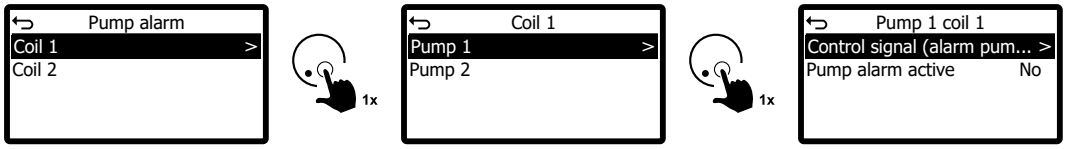
Fault messages from external pumps, e.g. circulating pumps (in the form of digital input signals) can be recorded and processed by the GMMnext. These "pump alarms" are also recorded in the event memory.

They always result in any HRC operation which is currently under way being interrupted. See "HRC operation (heat recovery)"

NOTICE
Active pump alarms are always signalled as a warning message Prio 2. Pump alarms are also shown in the diagnostics menu.

8.3.11.1 Coils (pump alarm)

The pump alarms can be configured for each coil here.



8.3.11.1.1 Pumps 1 + 2

Up to 2 pump alarms can be configured independently of each other for each coil.

Control signal

In order to signal a pump alarm, an active high signal must be present internally. The source and any inversion of the external signal which may be required can be configured here.

Source

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

If you do not wish to have a control signal, select “no option selected”.

Inversion

If necessary, the external control signal can be inverted.

If inversion is selected, a high signal (+24 V) at the selected control input will be internally inverted. A low signal (open input or GND) at the selected control input will lead to the alarm being activated. If a high signal comes from the pump, this means that the pump is OK and the signal must then be inverted.

Signal active

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

Pump alarm active

If a pump alarm is currently active, this is shown here.

8.3.12 Bypass valve

With this service menu option, so-called bypass valves can be configured. These valves are generally used in secondary cooling systems (solutions for "waterloop" systems) in conjunction with dry coolers. They control the flow of working fluid from the cooling system return to the dry cooler (or any "HRC" heat recovery system) or to the cooling system's flow system. See also "HRC operation (heat recovery)".

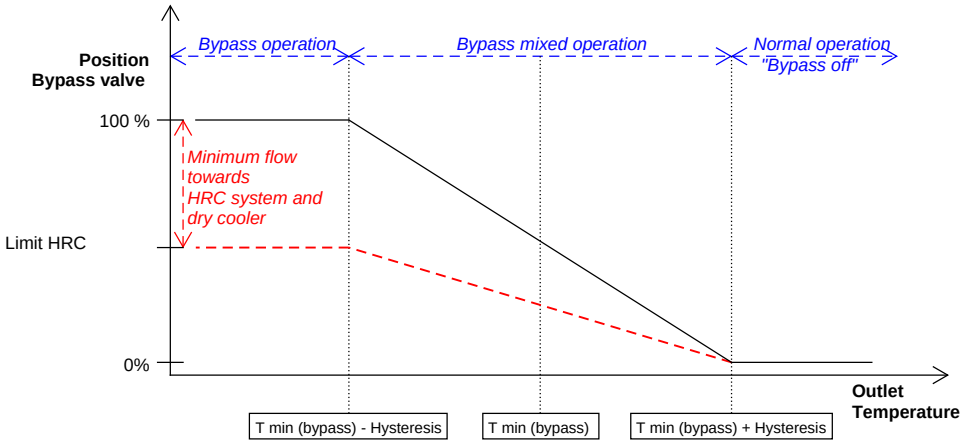
The bypass valve **is controlled depending** on the outlet temperature of the relevant coil.

NOTICE
If a bypass valve is used, the outlet temperature sensor must always be installed behind the bypass valve in the direction of flow of the cooling system!

See also example "HRC operation (heat recovery)".

The valve position for the bypass valve is explained in more detail below.

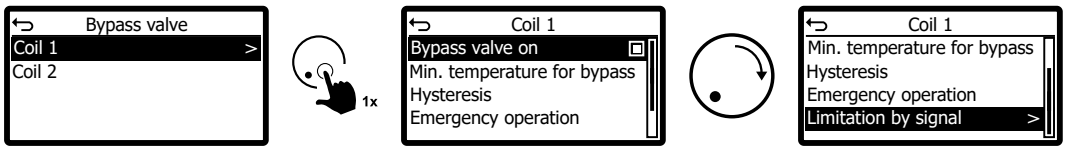
Valve position (%)	Description
0	The entire flow is directed towards the dry cooler (and any heat recovery system present).
0 < position < 100	The flow is split according to the valve position between the cooling system and the dry cooler (and any heat recovery system present).
100	The entire flow is fed back towards the cooling system.



Note: the red broken line shows the behaviour of the valve if the HRC function is also active and limitation by the control signal is active. See "Coils (bypass valve)"menu.

8.3.12.1 Coils (bypass valve)

A bypass valve can be configured for each coil.



8.3.12.1.1 Bypass valve on

The bypass valve function can be switched on or off for each coil here.

8.3.12.1.2 Min. temperature for bypass

This temperature defines the mid point of the control function for the bypass valve.

When the outlet temperature for this coil reaches this value **plus** the configured hysteresis, the valve is in position 0 %.

When the outlet temperature reaches this value **minus** the configured hysteresis, the valve is in position 100 % or, if the "Limitation by signal" function is active, in the "Limitation max. bypass valve opening" position.

In the case of secondary cooling systems (solutions for "waterloop" systems), this temperature is the minimum temperature of the working fluid for the cooling system (outlet to the cooling system or inlet to existing cooling units in the cooling system).

8.3.12.1.3 Hysteresis

Defines the temperature range relative to "Min. temperature for bypass“ for the valve position 0 % and 100 % or, for HRC request, the Limit HRC position.

As a result, the working fluid is split linearly in relation to the outlet temperature between the cooling system and dry cooler (+ any HRC system). Note: In reality, the working fluid can be split in a non-linear manner depending on the valve used and its control characteristics.

8.3.12.1.4 Emergency operation

To ensure reliable system operation even in the event of a fault, the outlet temperature in the direction of the cooling system is also monitored and, in the event of a fault, the valve is set according to the preset emergency position.

A critical lower and upper threshold as well as a delay can be set for this purpose. Emergency operation takes place as soon as the temperature signal for the set delay has left the valid interval.

Emergency operation is also active if the measured signal is invalid, e.g. owing to a defective sensor.

NOTICE
During emergency operation, a warning message Prio 2 is signalled.

Upper threshold

The critical upper threshold for the temperature can be set here.

Lower threshold

The critical lower threshold for the temperature can be set here.

Delay

The delay which determines how long the temperature signal must exceed the critical thresholds before the emergency position is assumed can be set here.

Hysteresis temperature signal

An additional hysteresis which the temperature signal must undershoot at the upper threshold or exceed at the lower threshold can be set here in order to end emergency operation.

Emergency position

The valve position of the valve can be set for emergencies here.

8.3.12.1.5 Limitation by signal

Limitation of the maximum valve position can be set here if a corresponding signal is present. Both digital inputs and process data, e.g. "HRC request active" can be selected as the signal source.

This function is used for example in combination with HRC operation to ensure a minimum flow towards the HRC system. The other part-flow is fed back to the cooling system to increase the temperature of the working fluid or keep it at a set level.

Max. valve opening

The maximum valve opening when the control signal is active can be set here.

Limitation max. bypass valve opening active

If the bypass valve is limited owing to the signal present, this is shown here.

Control signal (limitation by signal)

The source of the control signal which leads to the bypass valve being limited can be configured here. If necessary, the signal can also be inverted.

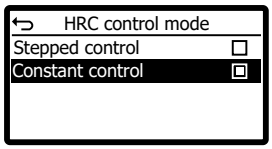
ATTENTION
If no control signal is configured, no limitation will take place.

8.3.13 HRC operation (heat recovery)

For HRC operation, the GMMnext provides two different control options. A choice can be made between "stepped" control and "constant" control. An additional temperature sensor is needed for constant control. The setpoint can be specified either as a temperature or as a temperature difference.

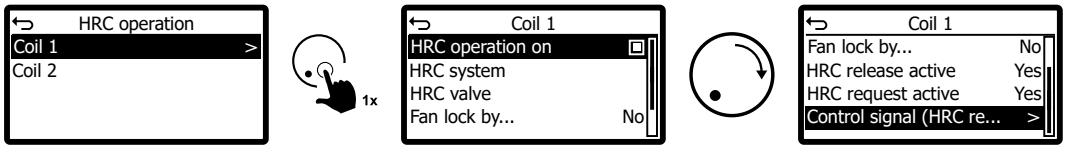
8.3.13.1 HRC control Modbus

In HRC control Modus, a choice can be made between stepped and constant control. The control option chosen is used in all circuits.



8.3.13.2 Coils (HRC settings)

HRC operation can be configured for each coil.



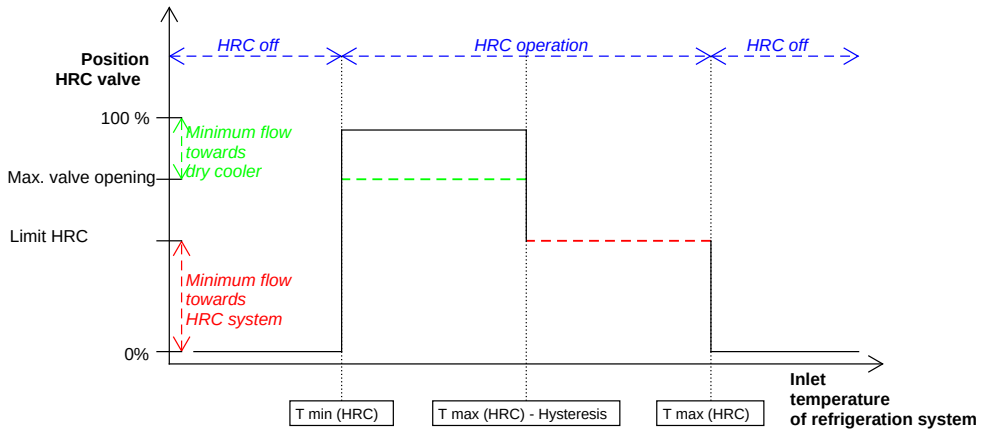
8.3.13.2.1 HRC operation on

The HRC function can be switched on or off for each coil here.

8.3.13.2.2 HRC system

The behaviour of the HRC valve depending on the inlet temperature is shown below. This control behaviour applies to stepped and constant control.

If a warm-up time is configured, the HRC valve will temporarily be limited for the set time once all operating conditions for HRC operation are met. See "HRC system".



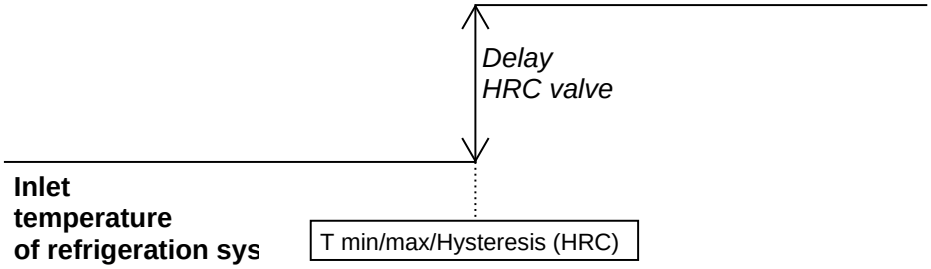
Note: The inlet temperature from the cooling system corresponds to the outlet temperature to the HRC system and thus to the inlet temperature into a HRC system, e.g. a heat pump.

To ensure that the HRC system works within the specified temperature range, the inlet temperature from the cooling system is also monitored. The maximum permitted outlet temperature to the HRC system of the HRC system used can be configured.

The start-up and alarm behaviour can also be adjusted via additional parameters.

If the maximum outlet temperature to the HRC system is exceeded, this will be signalled with a warning message Prio 2.

Note: The HRC valve will resume controlled operation only after a configurable delay time. See "HRC system".



The corresponding parameters are described below

Min. temperature to HRC system

The lower threshold value for the inlet temperature from the cooling system above which HRC operation is possible can be set here.

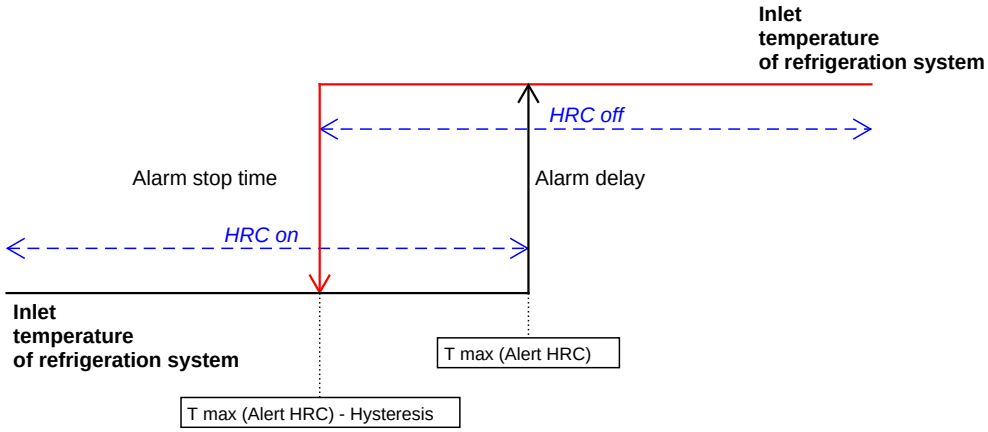
Max. temperature to HRC system

The upper threshold value for the inlet temperature from the cooling system below which HRC operation is possible can be set here.

Max. temperature hysteresis

The hysteresis relative to the maximum value above which a part-volume flow is directed in the direction of the dry cooler can be set here. The HRC valve will then be set to the "HRC limitation" position.

The illustration below shows how the HRC system behaves if the inlet temperature exceeds the max. alarm temperature to the HRC system.



Alarm max. temperature to HRC system

The maximum permitted inlet temperature from the cooling system or the outlet temperature to the HRC system can be set here.

Alarm delay

The time it takes until the flow towards the HRC system is blocked after the measured temperature exceeds the set "Alarm max. temperature to HRC system active" value.

Alarm stop time

The time it takes until the HRC system is released again after the measured temperature has fallen below the set maximum value.

Alarm stop hysteresis

The additional threshold to be undershot, relative to the maximum value, can be set here so that the alarm stop time is started.

Start-up time HRC system

When all conditions for HRC operation are met, the so-called HRC system start-up time will begin.

Generally speaking, the start-up time begins when a switch from non-HRC operation to HRC operation takes place.

During this start-up time, the HRC valve will be positioned according to the parameter "Limit HRC"

8.3.13.2.3 HRC release active

The status of the "HRC release active" output signal is shown here.

The following conditions must be met:

- the HRC function is switched on,
- the inlet temperature from the cooling system or the outlet temperature to the HRC system (the inlet temperature into the HRC system, the heat pump etc.) is within the specified temperature range, i.e. between "Min. and max temperature to HRC system",
- the position of the HRC valve is calculated and any control delay has expired,
- the external control signal "HRC request" is active,
- the maximum temperature for the HRC system has not been exceeded,
- no alarm for a circulating pump is active,
- manual mode is off.

This output signal can be used as the source for a digital output of the controller in order to signal release to the HRC system.

8.3.13.3 HRC valve (settings)

The parameters for the HRC valve can be set here.

8.3.13.3.1 Limit HRC

The position of the HRC valve where the minimum flow in the direction of the HRC system is guaranteed can be set here. The other part-flow is directed to the dry cooler to cool the working fluid in the system or cooling and HRC system.

8.3.13.3.2 Max. valve opening in HRC operation

The absolute maximum control value for the HRC valve can be set here. As a result, it is possible to ensure a minimum flow via the dry cooler to prevent working fluid in the dry cooler being cooled to a very low temperature during HRC operation and possibly being directed to the cooling system and the cooling equipment installed in it.

8.3.13.3.3 Fan lock from valve position

If in HRC operation the entire working fluid is directed to the HRC system and no longer via the dry cooler, the release will be withdrawn from the fan coils as they no longer need to work. The valve position from which the fans are to be locked can be set here.

The result of this calculation gives a process datum which must then be used in the control circuits as a control signal for a fan lock. See "Releasing and locking the coil".

8.3.13.3.4 Emergency operation

To ensure reliable system operation even in the event of a fault, the inlet temperature from the cooling system or the outlet temperature to the HRC system is also monitored and, in the event of a fault, the HRC valve is set according to the configured emergency position.

A critical lower and upper threshold as well as a delay can be set for this purpose. Emergency operation takes place as soon as the temperature signal for the set delay has left the valid interval.

During emergency operation, a warning message Prio 2 is signalled.

Upper threshold

The critical upper threshold for the temperature can be set here.

Lower threshold

The critical lower threshold for the temperature can be set here.

Delay

The delay which determines how long the temperature signal must exceed the critical thresholds before the emergency position is assumed can be set here.

Hysteresis

An additional hysteresis which the temperature signal must undershoot at the upper threshold or exceed at the lower threshold can be set here in order to end emergency operation.

Emergency position

The valve position of the valve can be set for emergencies here.

8.3.13.4 Fan lock by HRC active

If the signal for locking the fans owing to the valve position is active, this is shown here. This signal must be selected as the lock signal for the corresponding coil in order for the fans to be locked.

8.3.13.5 HRC request active

The status of the control signal (digital input) for the "HRC request" is shown here.

8.3.13.5.1 Control signal (HRC request)

The source and, if desired, inversion of the control signal for releasing this HRC system can be set here.

8.3.13.6 Stepped HRC control

With this service menu option, the parameters relating to heat recovery (HRC) operation can be viewed and set.

HRC operation allows the waste heat produced by the refrigerated equipment for example to be used. In the process, the flow of working fluid is controlled according to the temperatures in the cooling circuit and the set control parameters.

For this to function correctly, the necessary I/O profiles, sensors and control parameters must be set. Depending on the design and configuration of the system, the control parameters as well as parameters for the heat recovery system and the valves can be configured individually via the Service menu.

This function ensures that the heat recovery system works in the specified temperature range.

The **inlet temperature** of the relevant circuit and the external HRC request signal are monitored for this purpose.

If pump alarms are configured and such an alarm is present, HRC operation will also be interrupted. See "Pump alarm".

Depending on the inlet temperature, the flow of the working fluid is split towards the HRC system and the dry cooler. In the process, the HRC valve is controlled according to the inlet temperature and the external HRC request. If the "HRC request" signal is not received, the entire flow will be directed towards the dry cooler. In order to ensure that the HRC system works at low or high working fluid temperatures, a limit for the control value of the HRC valve can be configured. This limit should be set so as to ensure a minimum flow towards the HRC system (e.g. min. volume flow for plate heat exchangers, other heat exchangers or heat pumps). This in turn will ensure that the HRC system functions and actually exchanges heat.

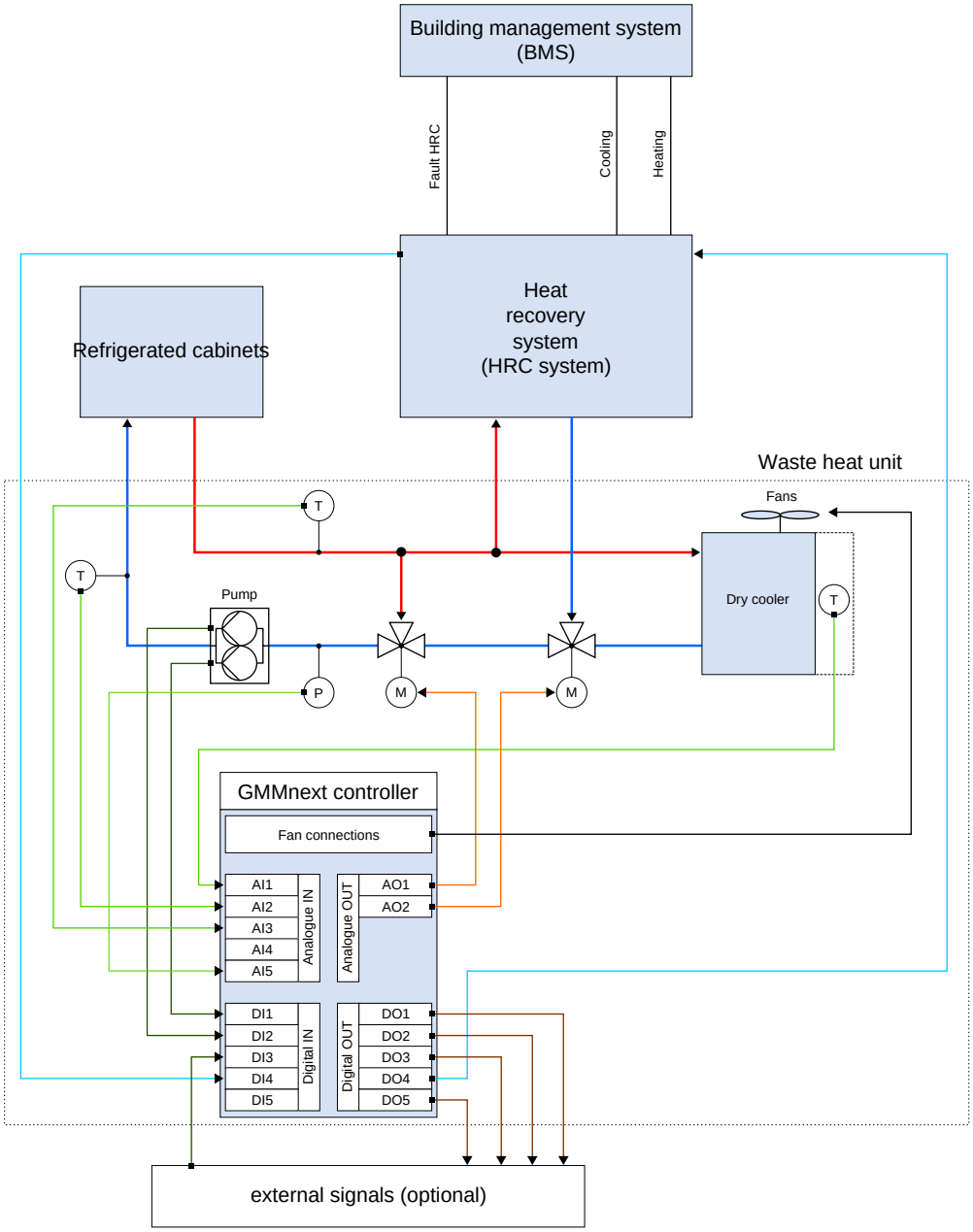
To ensure that the HRC system in conjunction with the dry cooler can operate optimally for as long as possible (the HRC system does not take all available energy from the cooling system, a part-volume flow is fed to the dry cooler), the setpoint offset for the dry cooler (fan regulation) can be adjusted in this case. During active HRC operation, i.e. when the working fluid is directed towards the HRC system, the calculated setpoint displacement of the fan circuits on the dry cooler can be limited to this temperature. In order to achieve this, a further limitation by signal should be configured for the setpoint offset. See "Limitation by signal".

The valve positions for the HRC valve are explained in more detail below:

Valve position (%)	Description
0	The entire flow is directed towards the dry cooler, thus circumventing the HRC system completely.
0 < position < 100	The flow of working fluid is split between the HRC system and the dry cooler according to the valve position.

Valve position (%)	Description
100	The entire flow is directed towards the HRC system, thus circumventing the dry cooler completely.

An example flow chart for a secondary cooling system (a solution for "waterloop" systems) with a heat recovery system is shown below.
The IO configuration is given only by way of example. It can be adjusted flexibly.



GMMnext I/O	Description
AI1	Ambient temperature
AI2	Outlet temperature
AI3	Inlet temperature
AI4	Free
AI5	Brine pressure (system pressure)
DI1	Fault message pump 1
DI2	Fault message pump 2
DI3	Night setback
DI4	HRC request (+ Switchover setpoint 2)
DI5	Free
AO1	Bypass valve
AO2	HRC valve
DO1	Alarm message Prio 1
DO2	Warning message Prio 2
DO3	Operating message
DO4	HRC release
DO5	Threshold value

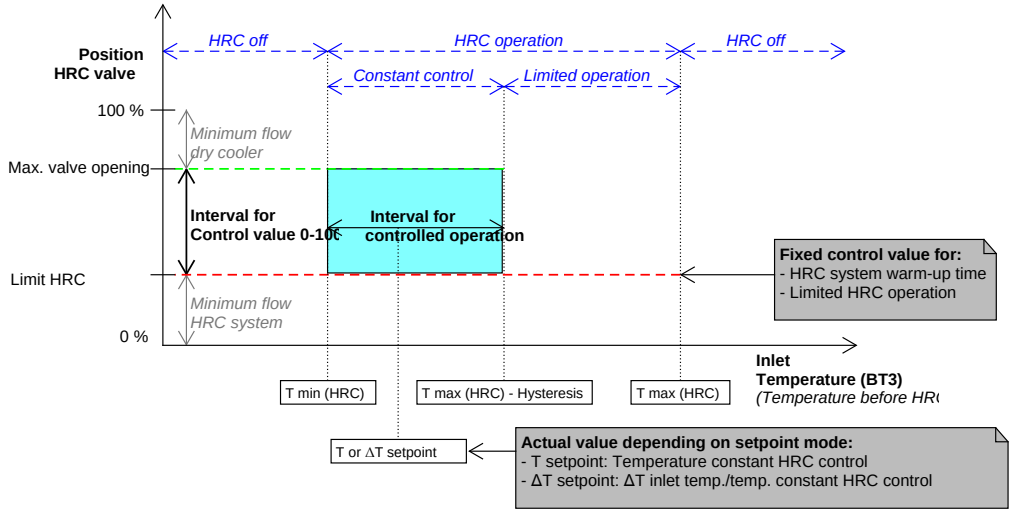
8.3.13.6.1 Valve control delay

The period of time until the HRC valve control value associated with a temperature range is switched, after the temperature falls below or exceeds a threshold can be set here.

8.3.13.7 Constant HRC control

Unlike with “stepped” HRC control, the flow of the medium is adjusted dynamically by a PID controller. An additional temperature sensor provides an actual value for this purpose in order to control a set temperature setpoint or a ΔT temperature setpoint. The system continuously calculates a control value on the basis of the control difference determined. This avoids sudden changes in the valve control value, which allows flexible system operation.

The behaviour of the HRC valve depending on the inlet temperature and the additional temperature sensor is shown below.



The following configuration parameters are process variables and are shown exclusively in the constant HRC control mode.

8.3.13.7.1 Control parameters

Here, you can set the control parameters for the PID controller Kp, Ti and Td.

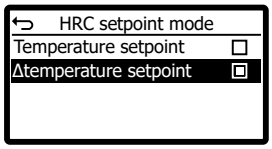
Kp gain factor:
The Kp factor specifies the control gain. It is the proportion of the control path following the input signal.

Ti hold time:
The I part of the control constantly changes the degree of control until the actual value reaches the setpoint.

Td rate time:
The D part of the control reacts not to the control deviation but to the speed of change.

8.3.13.7.2 HRC setpoint mode

Control is possible on the basis of a temperature setpoint or a ΔT temperature setpoint. With the temperature setpoint, the HRC inlet temperature for example is controlled. With the ΔT temperature setpoint, a set temperature spread is maintained. The setpoint and actual value are compared all the time and the valve setting is adjusted accordingly. An additional temperature sensor as an actual value source is used for this purpose.

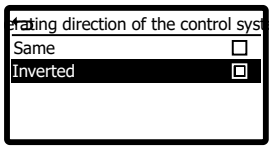


8.3.13.7.3 Setpoints (HRC operation)

Depending on the HRC setpoint mode selected, either a temperature value or a temperature difference can be present here for the setpoint.

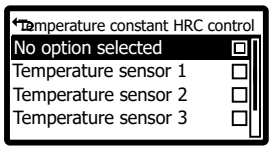
8.3.13.7.4 Operating direction of the control system

The operating direction of the control system can be inverted.



8.3.13.7.5 Temperature constant HRC control (source)

The temperature sensor which provides the actual value for the PID controller during constant HRC control can be selected here.



8.3.13.7.6 Temperature constant HRC control

The measured value from the temperature sensor can be viewed here.

8.3.13.7.7 Difference between the inlet temperature and the temperature for constant HRC control

The current calculated spread between the inlet temperature and the temperature for constant HRC control can be viewed here. This value is only shown if the setpoint mode is set to “ΔT setpoint”.

8.3.13.7.8 Setpoint deviation

The current calculated setpoint deviation can be viewed here.
Setpoint deviation = setpoint - actual value.

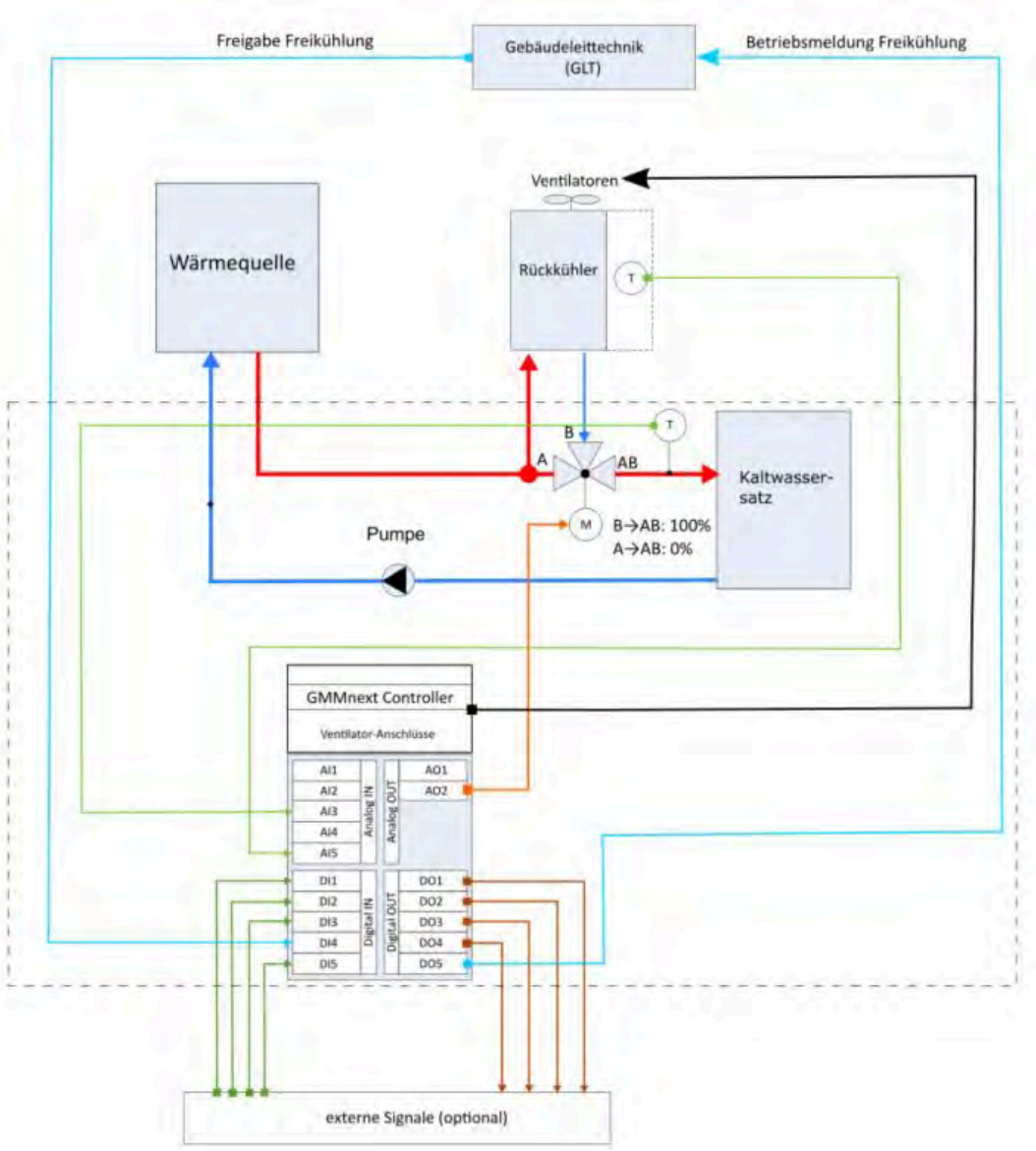
8.3.13.8 Bypass valve (limitation through HRC)

If a bypass valve is present, this can optionally be configured in the menu “Service > Functions > Bypass valve” so that the maximum valve opening is limited to a preset maximum value depending on the “HRC requirement” signal. This way, a minimum flow in the direction of the HRC system can be ensured, even if 100% bypass is required.

8.3.14 Free cooling

This service menu item can be used to configure the valve control for free cooling.

Free cooling is a method for using low ambient temperatures to support water/brine cooling which can then be used for industrial processes or air conditioning systems. The aim is to reduce the operating time of the compressor in the chiller. If the ambient temperature is lower in relation to the temperature of the refrigerating medium, this system uses the cool ambient temperature as a free cooling source. This way, the free cooling unit supports mechanical cooling with the same cooling capacity.

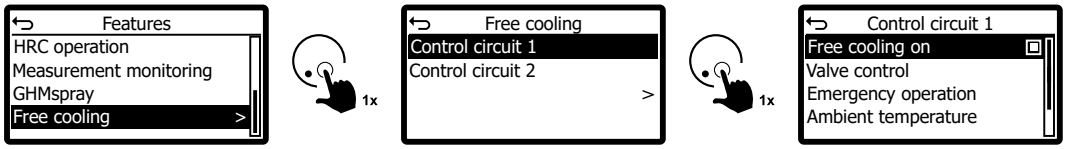


GMMnext I/O	Description
AI1	Free
AI2	Free
AI3	Outlet temperature
AI4	Free
AI5	Ambient temperature
DI1	Release
DI2	(Night) setback
DI3	Setpoint 2
DI4	Free cooling release
DI5	Free

GMMnext I/O	Description
AO1	Free
AO2	Free cooling valve
DO1	Alarm
DO2	Warning
DO3	Operating message
DO4	Threshold value
DO5	Free cooling valves operating message

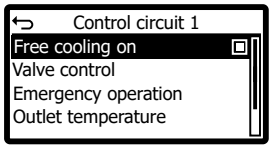
8.3.14.1 Control circuits (free cooling)

A free cooling valve can be configured for each control circuit.



8.3.14.1.1 Free cooling on

The free cooling function can be switched on or off for each control circuit here.



8.3.14.1.2 Valve control

The free cooling valve is controlled in free cooling mode. Control takes place via an analogue output.

If all start conditions for free cooling mode are met, the valve will be regulated to a specific setpoint. If the cooling fluid overheats and needs to be cooled, an attempt is made to adjust the setpoint by opening the free cooling valve. If the setpoint cannot be reached using the valve, the cooling power will also be controlled by the fans.

The valve is controlled via the PID controller. The same applies to the fans.

8.3.14.1.3 Control parameters

Here, you can set the control parameters for the PID controller Kp, Ti and Td.

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

Ti reset time:
The I part of the regulation constantly changes the degree of regulation until the actual value reaches the setpoint.

Td derivative time:
The D part of the regulation reacts not to the control deviation but to the speed of change.

8.3.14.1.4 Control value base and control value start

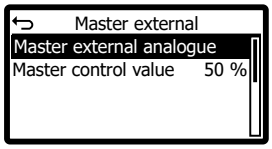
The control value base function is used to set a minimum valve position. The control value start function is used to define a start point for issuing the control value.

Here are some setting examples:

Control value base	**Control value start**	**Function**
0 %	0 %	Functions off, normal regulation 0 %...100 % with release
10 %	0 %	At least 10 % control value is output, when the release is active.
10 %	5 %	At least 10 % control value is only then output when the regulation has reached 5 % and the release is due.
10 %	10 %	The 10 %...100 % control value is only output when the regulation reaches 10 %
0 %	5 %	The control value is 0 % when the control value is under 5 %. The control value is output from 5 % regulation with given release (5 %...100 %).

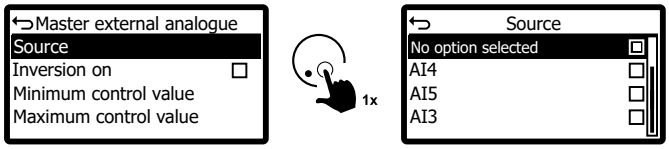
8.3.14.1.5 Master external analogue

In the “Master external analogue” operating mode, the control value for the free cooling valve is given via an analogue signal.



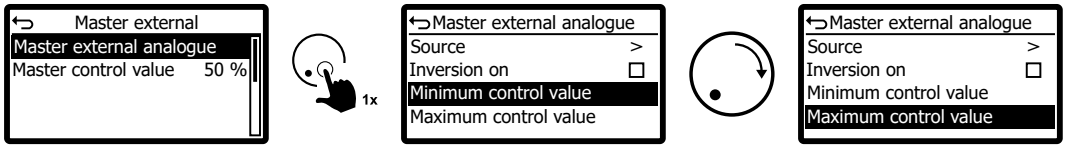
Master external analogue (source)

The source for controlling the free cooling valve and, if desired, inversion can be set here.



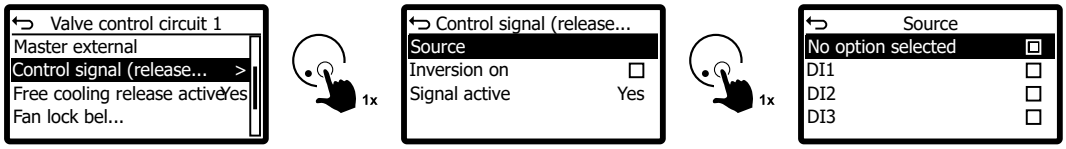
Control value

The minimum/maximum parameters are used to configure scaling for the input signal. As a result, the minimum and maximum control value can be set flexibly.



8.3.14.1.6 Control signal (free cooling release)

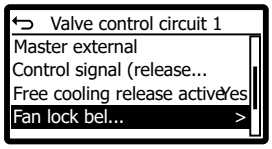
If necessary, the source of a control signal (digital input) for activating free cooling can be configured here. If desired, inversion can be set. If a signal source is not explicitly configured, the release is deemed to be implicitly granted.



8.3.14.1.7 Fan lock below valve position

In free cooling mode, the valve position from which the fans are to be released can be set. If the control value for the set valve position is exceeded, the valve control value is increased to 100 % and the fans start control.

If the working fluid is no longer routed via the free cooling unit outside of free cooling mode, the release of the fan control circuits is withdrawn as they no longer need to work in this case.



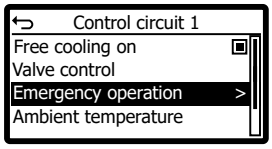
The result of this calculation gives a process datum which must then be used in the control circuits as a control signal for a fan lock. See "Releasing and locking the coil".

8.3.14.1.8 Emergency operation

To ensure reliable system operation even in the event of a fault, the outlet temperature in the direction of the cooling system is also monitored and, in the event of a fault, the free cooling valve is set according to the configured emergency position. Emergency mode is also activated if the outlet temperature or ambient temperature is not available, e.g. owing to a sensor fault.

A critical lower and upper threshold as well as a delay can be set for this purpose. Emergency operation takes place as soon as the temperature signal for the set delay has left the valid interval.

During emergency operation, a warning message Prio 2 is signalled.



Upper threshold

The critical upper threshold for the temperature can be set here.

Lower threshold

The critical lower threshold for the temperature can be set here.

Delay

The delay which determines how long the temperature signal must exceed the critical thresholds before the emergency position is assumed can be set here.

Hysteresis

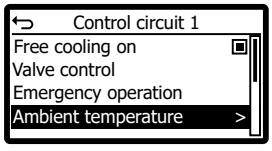
An additional hysteresis which the temperature signal must undershoot at the upper threshold or exceed at the lower threshold can be set here in order to end emergency operation.

Emergency position

The valve position of the valve can be set for emergencies here.

8.3.14.1.9 Ambient temperature

To ensure that the free cooling unit works in the specific temperature range, the temperature of the ambient air is monitored.



Min. ambient temperature

The lower threshold value for the ambient temperature from the free cooling unit above which free cooling operation is possible can be set here.

Max. ambient temperature

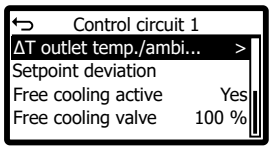
The upper threshold value for the ambient temperature from the free cooling unit up to which free cooling operation is possible can be set here.

Hysteresis

In order to prevent the free cooling mode switching back and forth unintentionally, a hysteresis can be configured for each condition. If the ambient temperature is exceeded or undershot, this is only deemed to be not fulfilled if the dependent value is less than the maximum minus the hysteresis or greater than the minimum plus the hysteresis.

8.3.14.1.10 Difference between outlet and ambient temperature

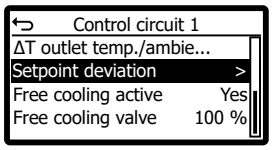
A minimum ΔT between the outlet temperature and the ambient temperature before free cooling is activated can be configured here. This ensures that sufficient power can be transferred to the ambient temperature when switching to free cooling mode.



8.3.14.1.11 Setpoint deviation

In order to prevent the free cooling mode switching back and forth, a setpoint deviation and a hysteresis can be configured. The setpoint deviation delays the entry into free cooling mode by the set setpoint deviation. The hysteresis delays the exit from free cooling mode by the set value.

Free cooling will then start when there is a sufficient cooling requirement.



8.3.15 Measurement monitoring

With this function, it is possible to monitor measurements (i.e. process data such as temperature, pressure, humidity or spread) in order to determine whether they are in a configurable valid interval.

ATTENTION
In order for this function to work, the relevant sensors must be configured and assigned correctly to the relevant analogue inputs. If a sensor is not configured or a sensor signal is faulty, this function will automatically not work. Sensor faults are dealt with outside this function and signalled separately as such. If the measurements leave the valid interval, this function will generate an internal alarm status. This alarm status is always recorded in the event memory.

It is also possible to configure for example whether a warning message Prio 2, an alarm message Prio 1 or a corresponding collective message is generated. Multiple options can be selected here.

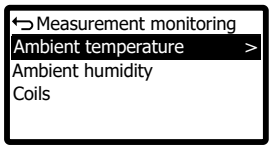
Monitoring can be switched on and off separately for the relevant measurements.

The valid interval for each measurement is determined by

- a lower threshold which must not be undershot.
- an upper threshold which must not be exceeded.
- a delay time until a switch to the alarm status takes place.
- a hysteresis to end the alarm status.

In cases where the thresholds are exceeded or undershot only briefly, the delay time helps to ensure that this does not immediately result in an alarm status. When the valid interval is left, a timer with a corresponding delay time is started first. A switch to an alarm status will only take place after this delay time has expired and if the measurement is still outside the valid interval. If during the delay time the measurement moves back into the valid interval, the timer will be deleted and no alarm will be triggered.

The alarm status will be left as soon as the measurement undershoots the upper threshold minus the hysteresis or exceeds the lower threshold plus the hysteresis.



The following measurements can be monitored.

- Measurements which **apply to the** condenser:
  - Ambient temperature
  - Ambient humidity
  - Wet bulb temperature
- Measurements which **apply to each** coil **of a dry** condenser:
  - Inlet temperature
  - Outlet temperature
  - Brine pressure
  - Spread ΔT between the inlet and outlet temperature
  - Spread ΔT between the outlet and ambient temperature
- Measurements which **apply to each** coil **of a** condenser:
  - Refrigerant pressure
  - Refrigerant temperature
  - Spread ΔT between the refrigerant and ambient temperature

Monitoring the spread between the inlet and outlet temperature of a dry cooler can be used for system monitoring for example. Possible problems with hydraulic systems for example –

"Pump power set too low", "Filter blocked" or "Mixing valve defective" can be identified early on.

The spread monitoring "ΔT refrigerant temperature/ambient temperature" for a condenser or "ΔT outlet temperature/ambient temperature" for a dry cooler is used to identify possible problems with the heat exchanger, e.g. soiling, early on. To ensure that such monitoring can be evaluated in a meaningful manner, special conditions must be taken into account. The setting parameters therefore vary according to the type of spread.

In addition to common parameters such as monitoring on/off, lower threshold, upper threshold, delay and hysteresis, additional dependencies can be configured as follows. These are available depending on the type of spread monitoring:

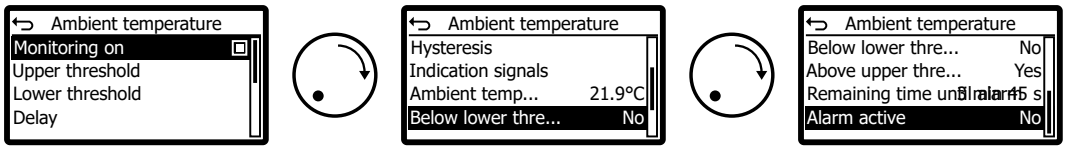
- Minimum ambient temperature
  Monitoring is deactivated if the ambient temperature **is below** this threshold.
- Minimum control value
  Monitoring is deactivated if the control value for the fans **is below** this threshold. It must be ensured that the control value for the fans can be limited for example by active night setback and that this function may then have no effect.
- Maximum bypass valve position
  Monitoring is deactivated if the position of the bypass valve **is above** this threshold.
- Maximum HRC valve position
  Monitoring is deactivated if the position of the HRC valve **is above** this threshold.

The following process data for outputting are provided for each measurement monitoring system. These are also available on the fieldbus interface.

- Monitoring switched on yes/no
- Alarm active yes/no
- Lower threshold is undershot yes/no
- Upper threshold is exceeded yes/no
- Remaining time until alarm

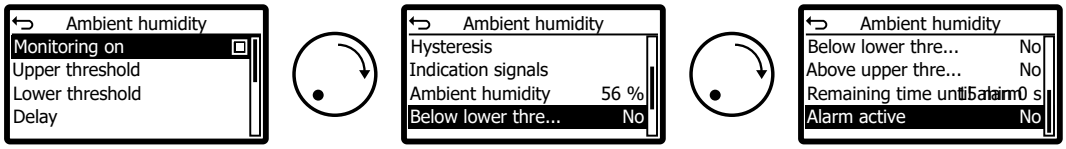
8.3.15.1 Ambient temperature

The measurement monitoring for the ambient temperature can be set and the current monitoring status viewed here.



8.3.15.2 Ambient humidity

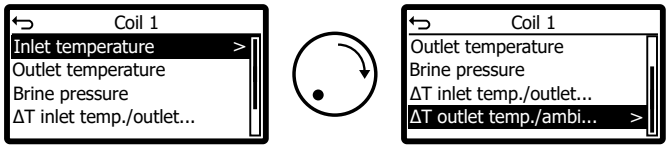
The measurement monitoring for the ambient humidity can be set and the current monitoring status viewed here.



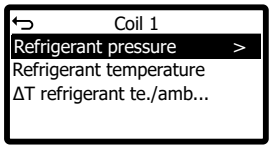
8.3.15.3 coils (measurement monitoring)

Various options for measurement monitoring are available depending on the particular heat exchanger type for the coil.

Example dry cooler



Example condenser

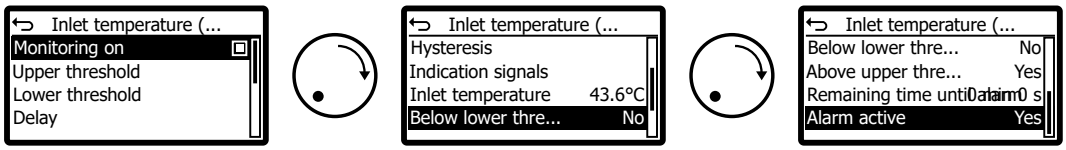


NOTICE

The refrigerant temperature and spread are only shown if a refrigerant is configured. This is the only way to determine these values.

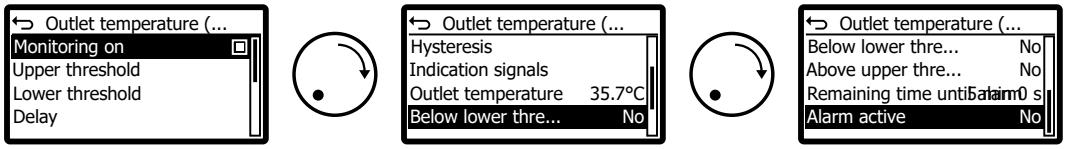
8.3.15.3.1 Inlet temperature

The measurement monitoring for the inlet temperature can be set and the current monitoring status viewed here.



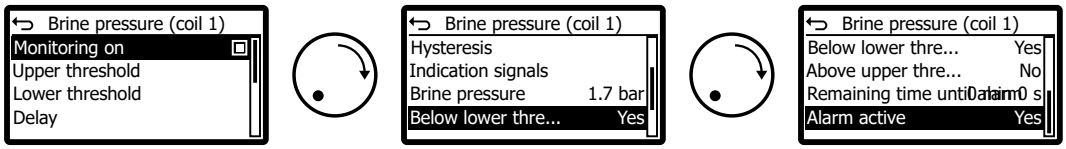
8.3.15.3.2 Outlet temperature

The measurement monitoring for the outlet temperature can be set and the current monitoring status viewed here.



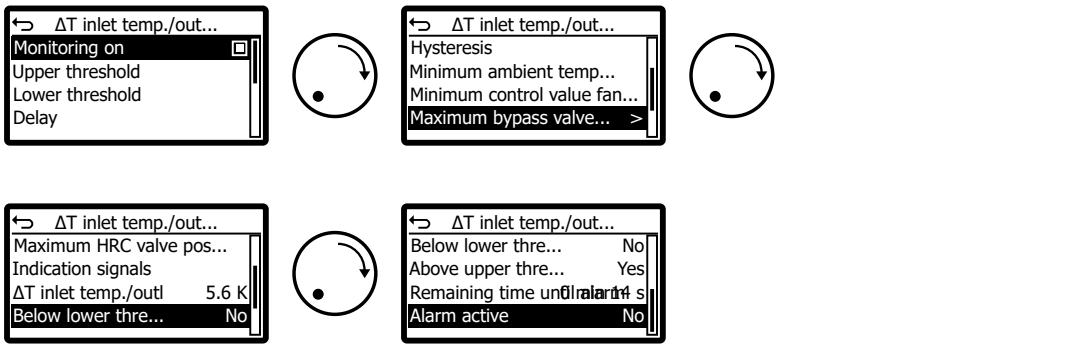
8.3.15.3.3 Brine pressure

The measurement monitoring for the brine pressure can be set and the current monitoring status viewed here.



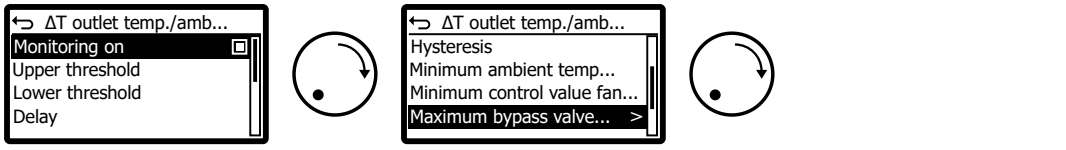
8.3.15.3.4 Spread ΔT inlet temperature/outlet temperature

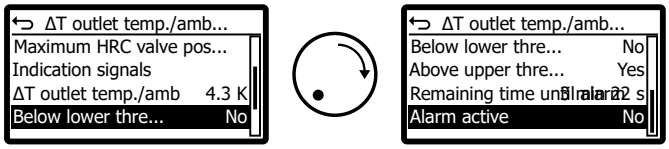
The measurement monitoring for the spread of the inlet temperature in relation to the outlet temperature can be set and the current monitoring status viewed here.



8.3.15.3.5 Spread ΔT outlet temperature/ambient temperature

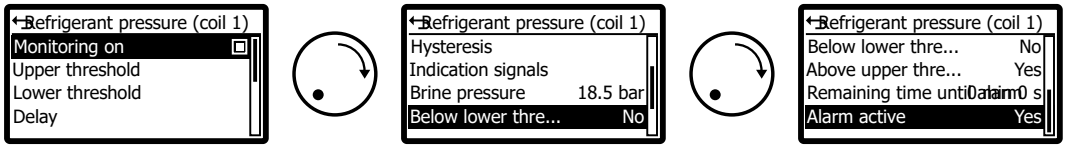
The measurement monitoring for the spread of the outlet temperature in relation to the ambient temperature can be set and the current monitoring status viewed here.





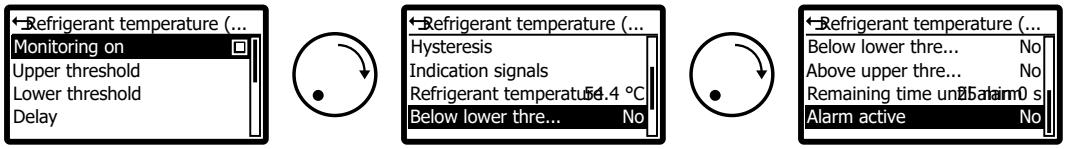
8.3.15.3.6 Refrigerant pressure

The measurement monitoring for the refrigerant pressure can be set and the current monitoring status viewed here.



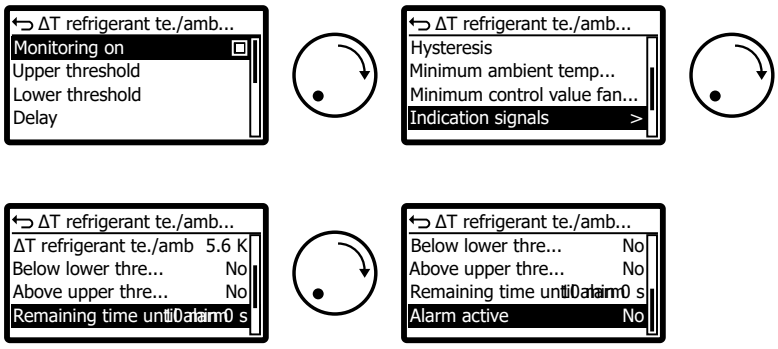
8.3.15.3.7 Refrigerant temperature

The measurement monitoring for the refrigerant temperature can be set and the current monitoring status viewed here.



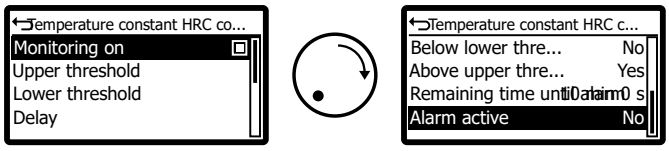
8.3.15.3.8 Spread ΔT refrigerant temperature/ambient temperature

The measurement monitoring for the spread of the refrigerant temperature in relation to the ambient temperature can be set and the current monitoring status viewed here.



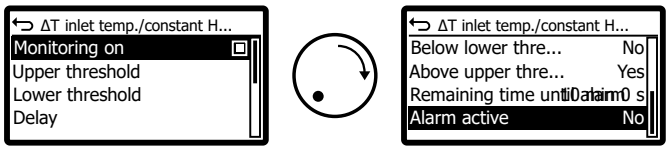
8.3.15.3.9 Temperature constant HRC control

The measurement monitoring for the temperature constant HRC control can be set and the current monitoring status viewed here.



8.3.15.3.10 Spread ΔT inlet temperature/temperature constant HRC control

The measurement monitoring for the spread of the inlet temperature in relation to the temperature constant HRC control can be set and the current monitoring status viewed here.



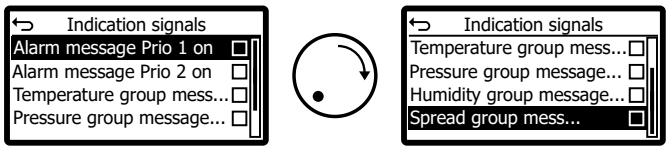
8.3.15.3.11 Indication signals (assignment of the measurement monitoring to the indication signals)

Which controller indication signals are to be generated when the alarm status for measurement monitoring is active can be configured here.

Multiple options can be selected here.

Depending on the type of measurement monitoring (temperature/pressure/humidity/spread), corresponding group messages are available.

When the digital outputs are being configured, it is then possible to select which signal it represents.



8.3.16 Hydro management

When a GMM is coupled with a GHM spray via the CAN bus, the function "GHMspray on" must be activated on the GMM.

The GMM is then responsible for the control and monitoring of the GHM.

If the connection fails, an entry "GHMspray not available" will be made in the GMM's event memory and warning message Prio 2 will be activated.

If the "GHMspray on" function is switched on, the connection status will be shown via the additional entry "GHMspray warning active yes/no".

NOTICE
This requires a GHMspray controller with at least Version 017 firmware.

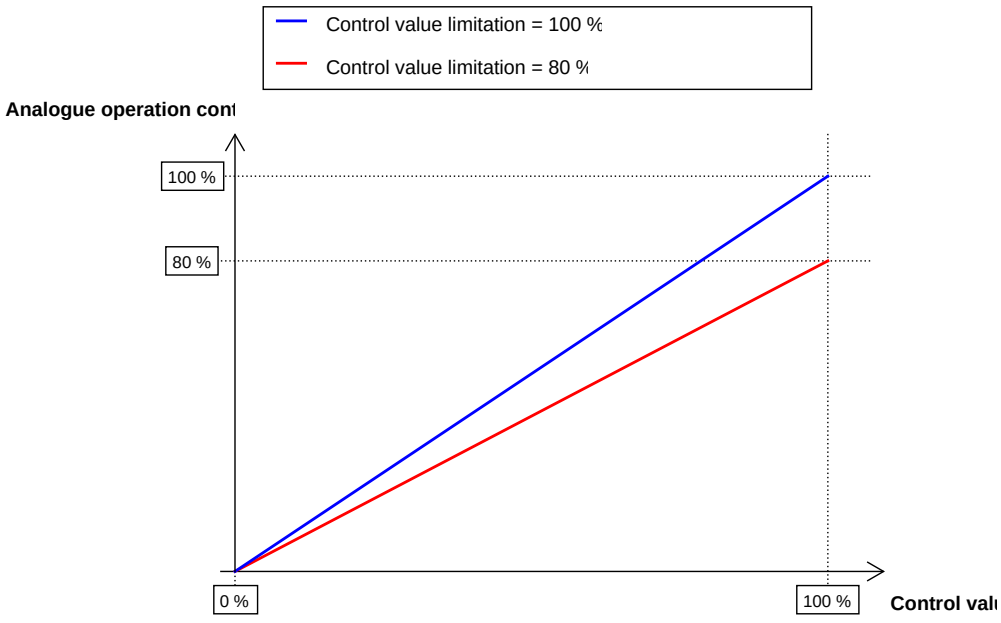
8.3.17 Analogue operation of AC power units. GMMnext sincon lite & phase-cut lite

During analogue operation, power units with e.g. AC fans are controlled via an analogue signal.

NOTICE
The availability of this function depends on the system configuration and the type of fans connected (see Chapter "Scope of performance").

In order to activate analogue operation, the option "Analogue" must be selected when selecting the fan drive during commissioning. The control of analogue connected power units (e.g. with AC fans) can then be parametrized here.

A limitation of the control value to be output to the power unit can be configured for each fan group. The limitation is necessary if the connected fans are to be controlled in partial load mode, i.e. the speed at the intended working point is less than the maximum possible speed of the connected fans.



Limitation of control value for partial load operation of fans

In order to output the control signal including the set limitation to an analogue output, the option "Analogue operation control value (fan group 1..2)" must be configured in the menu under "Service > I/O configuration > Analogue outputs > AO1..2 > Source" (see Chapter "Analogue outputs").

Power unit and/or fan fault statuses can also be received and further processed. Up to two external fault messages can be configured for this and the current fault status can be viewed via the status variables "Power unit fault message active" and "Motor protection fault message active".

A corresponding digital input for receiving the message and possibly an inversion of the signal can be configured in the settings for each fault message.

The fault messages are wire break-proof as standard, i.e. a fault will be signalled even if there is no active signal at the digital input.

In the event of a fault, corresponding events will be logged in the GMMnext's event memory for both fault messages.

The following fault messages can be configured for analogue operation:

- Power unit fault message
  - This fault message signals a critical fault in the power unit. When the fault is received, an alarm message Prio 1 will automatically be activated.
- Motor protection fault message
  - This fault message signals that a warning has been issued (e.g. thermocontact fault in at least one fan). When the fault is received, a warning message Prio 2 will automatically be activated.

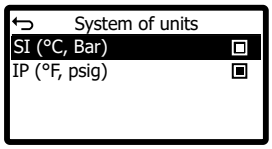
8.3.18 Pad wetting

The settings for hydro management should be configured here.

See additional document “Manual GHMnext Pad”

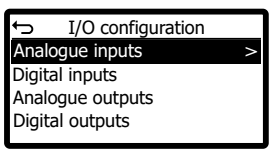
8.4 System of units

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



8.5 I/O configuration

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



8.5.1 Analogue inputs

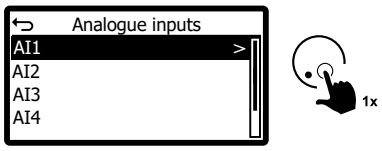
The analogue inputs are multifunctional inputs which can measure either current, voltage or resistance.

See also "Analogue inputs AI1...AI5".

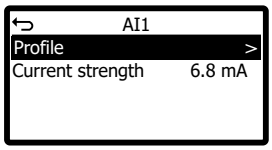
A so-called profile can be assigned freely to each of the analogue inputs. Select the relevant input and set your desired profile.

Both 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 custom
- Current custom
- Resistance custom

With the custom profiles, you can also configure the minimum and maximum value 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.

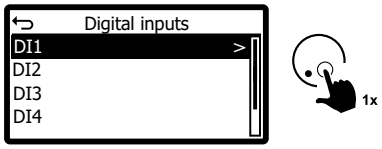
8.5.2 Digital inputs

Only the statuses of the digital inputs can be shown here.

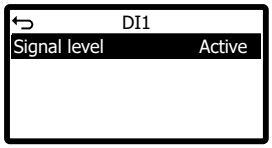
See also "Digital inputs DI1...DI5 (control inputs)".

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.

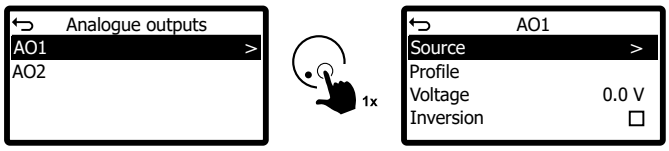
Inactive means that a “low level = logically 0” is present.

8.5.3 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 analogue operation for each fan group
- Control value for the PID controller for the relevant coil
- Control value for a fan
- Control value for the subcooler function
- Bypass valve (coil 1)
- HRC valve (coil 1)
- Free cooling valve (circuit 1)
- ....

The following profiles can be set:

- Voltage 0 – 10 V
- Voltage 2 – 10 V
- Voltage (custom)

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

8.5.4 Digital outputs

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

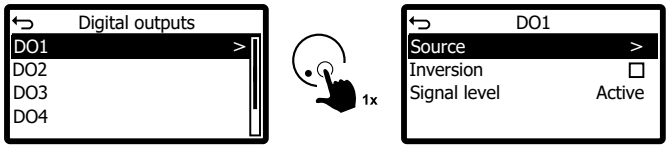
In addition, the current signal level is shown here.

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)".

Select a digital output...



...and assign to 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 coils
- Alarm message Prio 1
- Warning message Prio 2
- Operating message
- HRC release (coil 1)
- Free cooling valves operating message
- Pump alarm
- Group message with temperature monitoring
- Group message with pressure monitoring
- Group message with ambient humidity monitoring
- Group message with temperature spread monitoring

NOTICE

All alarm messages, warning messages and group messages are **wire break-proof signals,** i.e. these signals are inverted by default. A fault status is always signalled with a low signal = deactivated output (relay not energized). This ensures that a fault is signalled even if the control unit is not connected to the power supply.

The collective fault signals for temperature, pressure, humidity and spread exist only once, i.e. all collective faults from the various coils result in the relevant group messages.

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

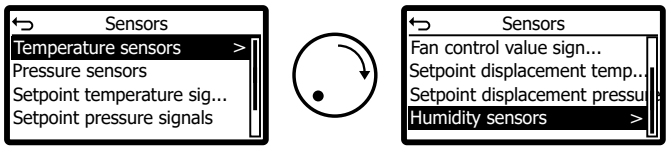
This can also be used to manually switch the status of the digital output on and off for test purposes.

8.6 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 as signal sources for control circuits or other functions. See also "Analogue inputs AI1...AI5".

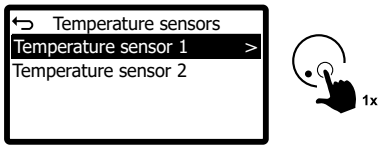
Selecting the correct profile for the analogue input is important in order to ensure that the sensors function correctly. See also "Analogue inputs".



Sensors can be added here during start-up or later on.

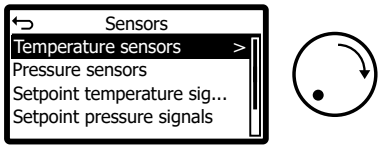
To configure an existing sensor, select the sensor and then change its settings.

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



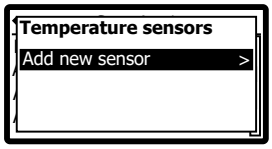
...and then make your desired changes.

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



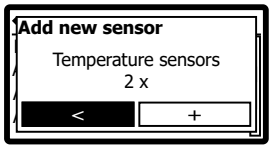
...and then press and hold (for at least 2 seconds) the rotary selection knob.

The context menu will now open.

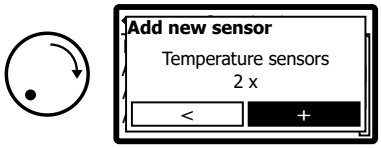


Press the rotary selection knob briefly to continue adding the sensors.

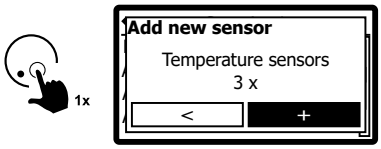
You will also see how many temperature sensors have already been set up.



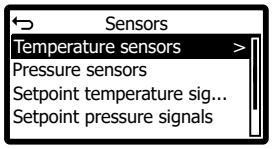
Now select the “+” field by turning the selection knob.



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.

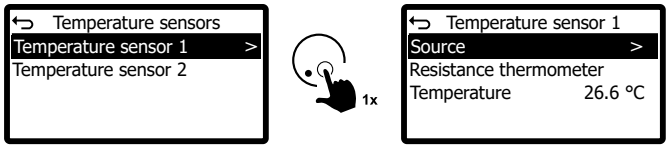


You can exit the context menu by pressing the “Back” button twice.



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.



8.6.1 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.

8.6.2 Setpoint temperature signals/setpoint pressure signals

In the “Auto external analog” 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 coil.

Use “Setpoint temperature signals” if regulation relates to the temperature.

Use “Setpoint pressure signals” if regulation 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.

8.6.3 Fan control value signals

In the “Slave external analog” operating mode, the control values for the coil 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 coil.

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.

8.6.4 Temperature setpoint offset/pressure setpoint offset

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

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

Use “Temperature setpoint offset” if regulation relates to the temperature.

Use “Pressure setpoint offset” if regulation 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 offset – this is calculated on the basis of the specified analogue source signal. The setpoint offset 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 offset signal.

8.6.5 Humidity sensors

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

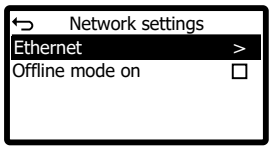
Any analogue input can be selected as the signal source. You can also configure the minimum and maximum figure for the ambient humidity – this is calculated on the basis of the specified analogue source signal.

It is also possible to invert the ambient humidity signal.

8.7 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.



8.7.1 Offline mode on

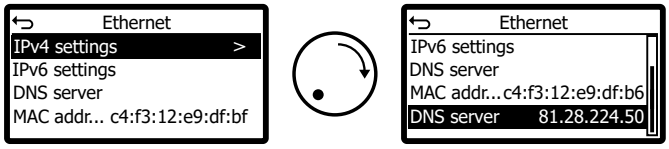
Activate "Offline mode on" if you wish to deactivate **all** network connections completely.

8.7.2 Ethernet

Here, you can configure all settings for the relevant Ethernet connection.

The GMMnext/GSCnext has one Ethernet connection (ETH1).

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



8.7.2.1 IPv4 settings

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

8.7.2.1.1 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.

8.7.2.1.2 IPv4 address (manual)

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

8.7.2.1.3 IPv4 prefix length

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

8.7.2.1.4 IPv4 gateway

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

8.7.2.1.5 IPv4 address (current)

The current IPv4 address for the Ethernet connection is shown here.

8.7.2.2 IPv6 settings

You can configure the settings which apply to the IPv6 protocol here.

8.7.2.2.1 IPv6 method

You can set the method for obtaining an IPv6 address here.

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.

8.7.2.2.2 IPv6 address (manual)

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

8.7.2.2.3 IPv6 prefix length

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

8.7.2.2.4 IPv6 gateway

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

8.7.2.2.5 IPv6 address (current)

The current IPv6 for the Ethernet connection is shown here.

8.7.3 DNS server

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

8.7.4 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.

8.7.5 DNS server (current)

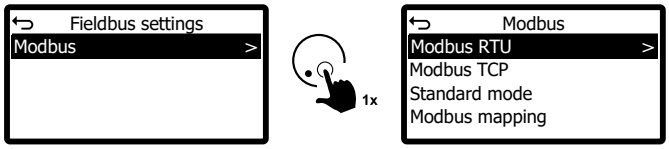
The current IP address for the DNS server is shown here.

8.8 Fieldbus settings

You can configure the available fieldbuses here. The fieldbuses are shown in this menu depending on which ones are available.

8.8.1 Modbus

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



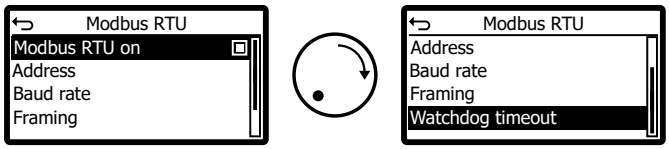
8.8.1.1 Modbus RTU settings

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.



8.8.1.1.1 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.

8.8.1.1.2 Address

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

8.8.1.1.3 Baud rate

The baud rate can be set here.

8.8.1.1.4 Framing

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

8.8.1.1.5 Watchdog timeout (RTU)

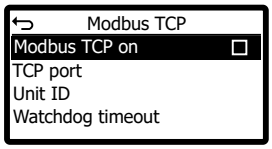
Here, you can configure a watchdog timeout which can be reacted to downstream if no messages are received for the timeout set here.

8.8.1.2 Modbus TCP settings

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.



8.8.1.2.1 Modbus TCP on

The Modbus TCP protocol can be activated or deactivated here.

8.8.1.2.2 TCP port

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

The standard TCP port is **502**.

8.8.1.2.3 Unit ID

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

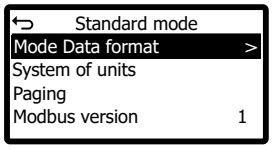
8.8.1.2.4 Watchdog timeout (TCP)

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

8.8.1.3 Standard mode

The GMMnext offers 2 modes in which data points are offered on the Modbus interface. See also "Modbus mapping"menu. 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.

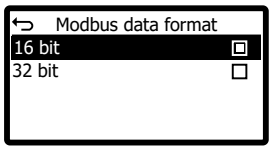


8.8.1.3.1 Modbus data format

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.

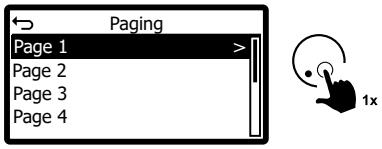


8.8.1.3.2 System of units

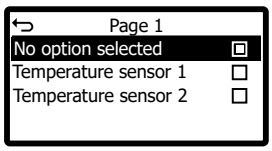
Here, you can specify the units system used when transferring parameters and process data on the Modbus interface. This setting is independent of the units system for the display.

8.8.1.3.3 Paging

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.

8.8.1.3.4 Modbus version

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

8.8.1.4 Modbus mapping

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

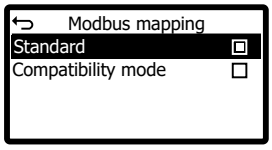
It now allows more IOs, more interfaces, more fans and more functions.

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 developed, i.e. you should select the 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.

8.9 Load/save configuration

The controller allows you to save all settings in the form of a configuration. This configuration can be loaded again later on in order to restore the previously saved controller settings and thus put the unit into a clearly defined status. However, a configuration can also be used to transfer the settings from one controller to another identical controller.

Configurations are essentially files whose name ends in ".gmmnext". The rest of the file name can be selected at will. Configurations can be stored either in the controller's internal memory or on an external USB storage medium such as a USB stick. Up to 20 configurations can be stored in the internal memory.

NOTICE
To ensure that a USB stick is correctly recognized by the GMMnext and can be used by it, it must be formatted with the FAT32 file system. You should also ensure that the USB stick that you use to manage configurations was not previously used to update the GMMnext software to avoid triggering accidental updates.

When a configuration is saved, it is automatically given a generated file name which includes things like the date and time when it was created. Because the controller configurations are sorted according to their file names by default, this implicitly results in sorting according to the date and time of creation. If the configuration is saved on a USB stick or exported, a sepa-

rate directory containing the configuration will be created for each unit on the basis of its serial number. As a result, the assignment between configuration and controller remains clear if one and the same USB stick is used to manage the configurations of a number of units.

If the file name of a configuration is to be changed, the configuration can first be saved on a USB stick or exported. The USB stick can then be connected to a standard computer in order for the file name to be changed. The renamed configuration can then be imported to the controller again.

A number of application scenarios can have far-reaching consequences for the current controller settings. These include the "Load configuration", the "Load factory settings" and the "Resetting the unit to its delivery state". The controller allows you to create a backup configuration in the internal memory which can be accessed later on if necessary. This is a comfort function to make application scenarios with far-reaching consequences as easy and secure as possible. If there is no more space available in the controller's internal memory for a backup configuration, an existing configuration must first be removed via the "Delete configuration" menu item. Alternatively, you can of course save the current configuration on a USB stick via the "Save configuration" menu item so that there is no need for a backup configuration in the internal memory.

8.9.1 Save configuration

You first select your desired storage medium on which the current GMMnext configuration is to be saved. You can choose from the GMMnext's internal memory or a connected USB stick. After that, you only need to confirm the save procedure. Once you have done this, you will be given the file name under which the configuration was saved on the storage medium.

8.9.2 Load configuration

First of all, you select the storage medium from which you wish to load a configuration. You can choose from the GMMnext's internal memory or a connected USB stick. After that, you can view your chosen storage medium with the help of an integrated file manager and select the configuration which is to be loaded. Once you have successfully loaded the configuration, the GMMnext will switch to a shorter start-up procedure during which the loaded fan settings can be checked and changed if necessary.

8.9.3 Import configuration

With the help of the import function, you can copy a configuration from a connected USB stick to the GMMnext's internal memory without influencing the GMMnext's current settings. With this facility, you can save a configuration on the GMMnext and load it from the internal memory later on if required.

8.9.4 Export configuration

With the help of the export function, you can transfer a configuration which was saved in the GMMnext's internal memory to a connected USB stick. With this function, you can create backup copies of important configurations in case the GMMnext ever needs to be replaced.

8.9.5 Delete configuration

Via this menu item, you can delete existing configurations from the GMMnext's internal memory and thus free up space which can then be used to store new configurations.

8.10 Factory settings

The factory settings are order-related settings with which the GMMnext is preconfigured in the factory. If these factory settings are saved on the GMMnext, the GMMnext can be reset to use these settings later on. If factory settings are available, the menu will show various information including the date on which the factory settings were saved.

8.10.1 Load factory settings

Via this menu item, you can reset the GMMnext to its original factory settings.

8.11 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.

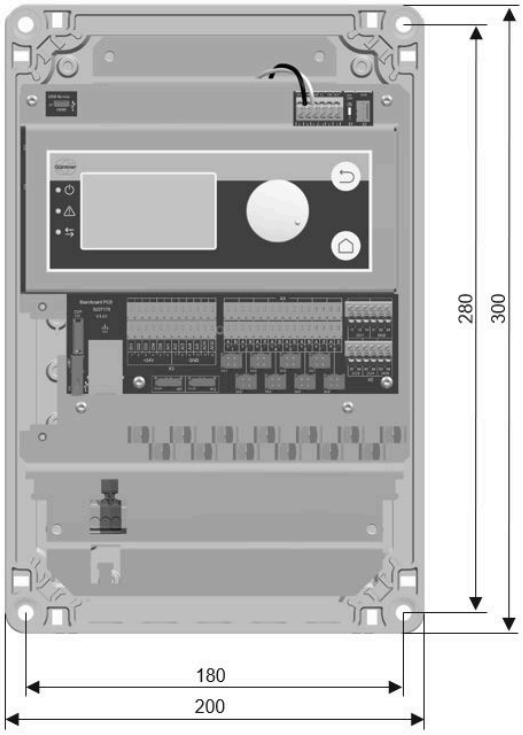
ATTENTION
Select this menu item only if you understand the implications and have all parameters for this step.

9 Technical data

9.1 Dimension drawing of GMMnext EC/08.1

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

Fixing drill holes max. Ø 7.5 mm.

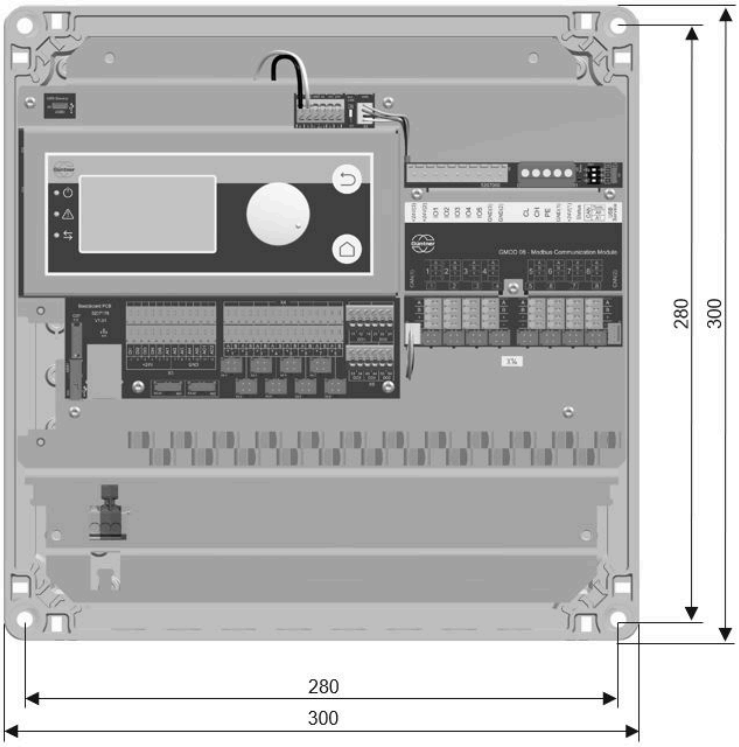


Dimension drawing of GMMnext EC/08.1 housing

9.2 Dimension drawing of GMMnext EC/16.1

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

Fixing drill holes max. Ø 7.5 mm.

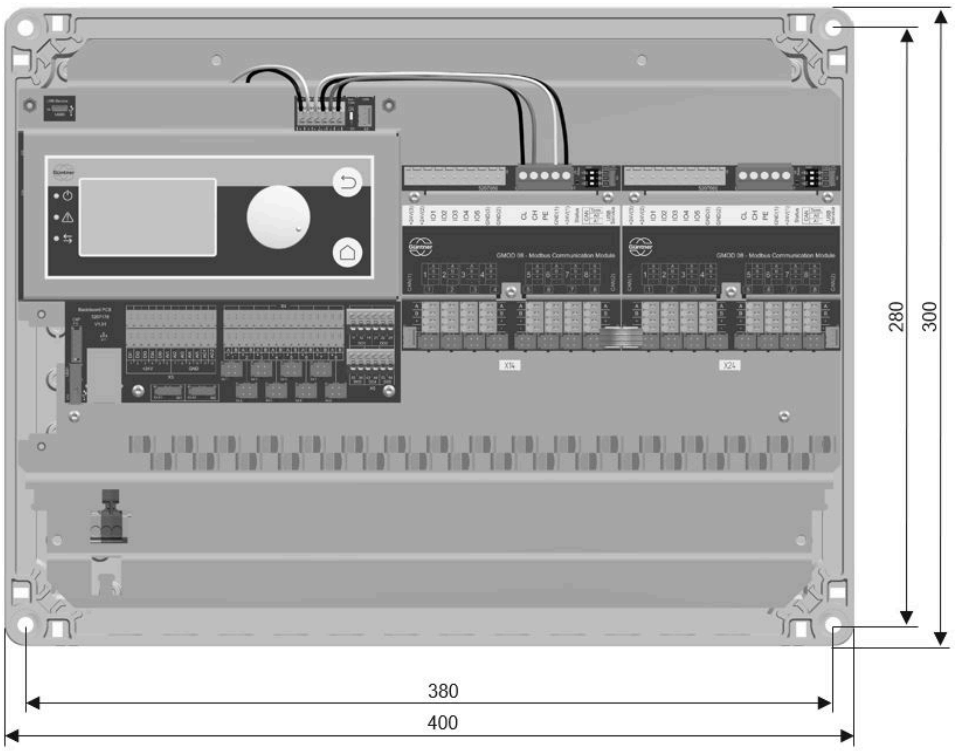


Dimension drawing of GMMnext EC/16.1 housing

9.3 Dimension drawing of GMMnext EC/24.1

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

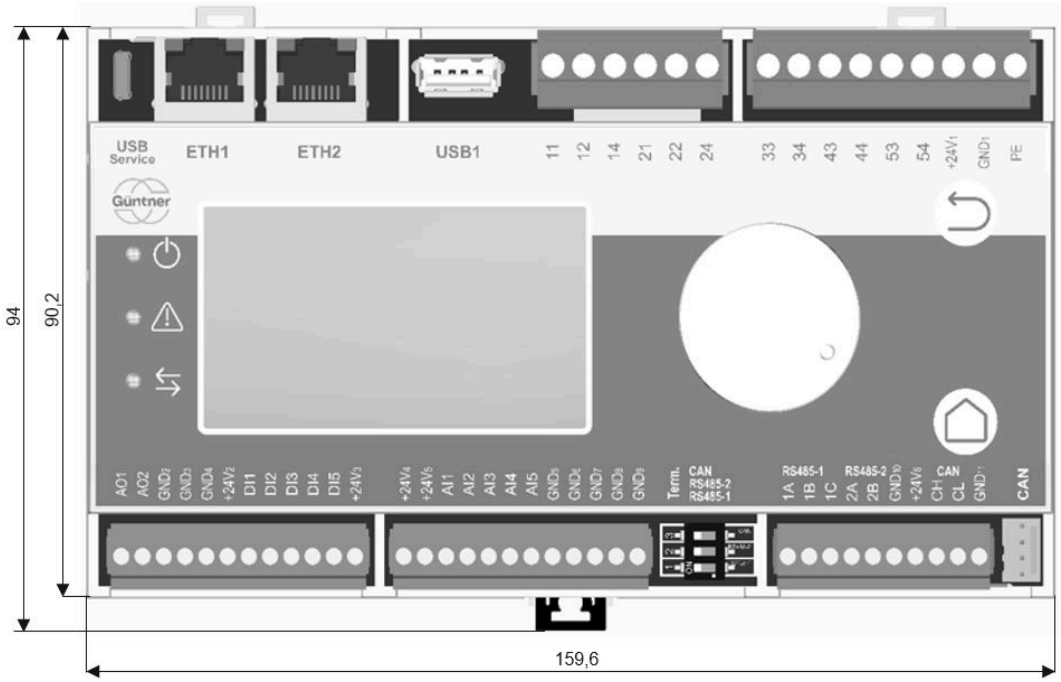
Fixing drill holes max. Ø 7.5 mm.

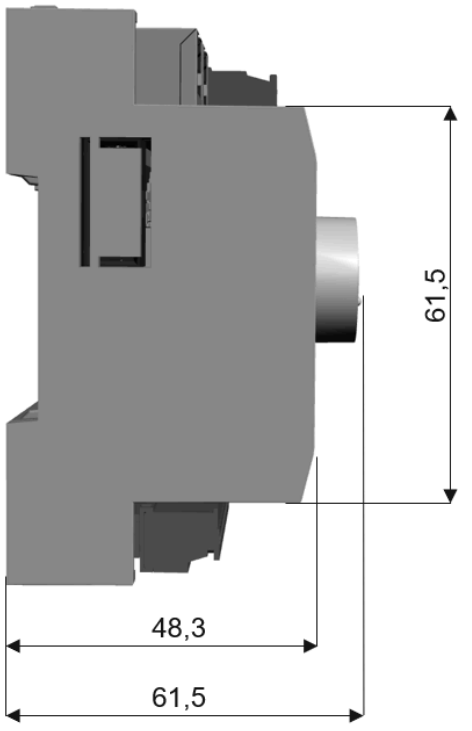


Dimension drawing of GMMnext EC/24.1 housing

9.4 Dimension drawing of Rail.1 controller

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

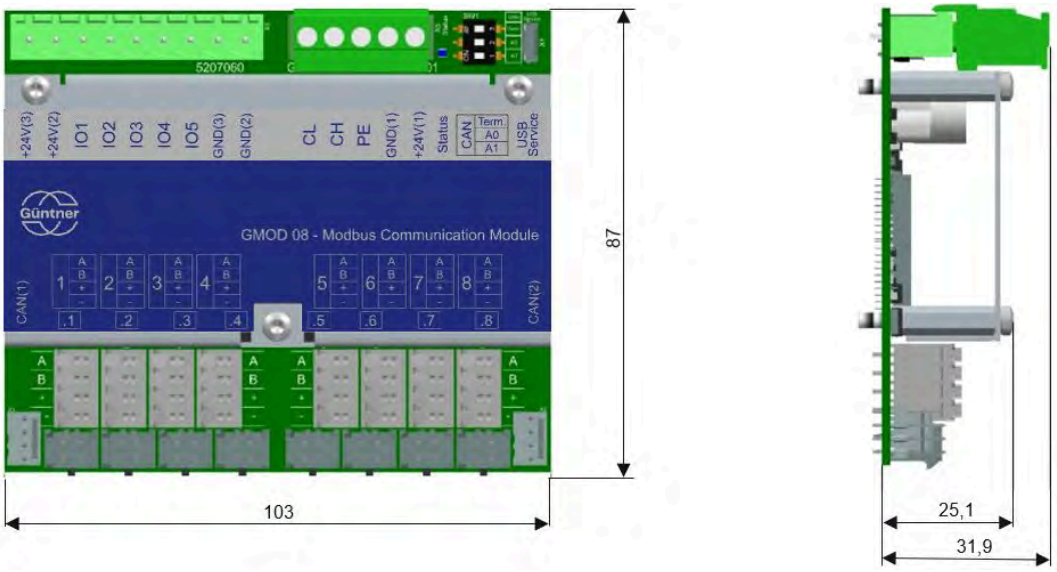




Dimension drawing of Rail.1 controller

9.5 Dimension drawing of GMOD 08 GMMnext EC.1

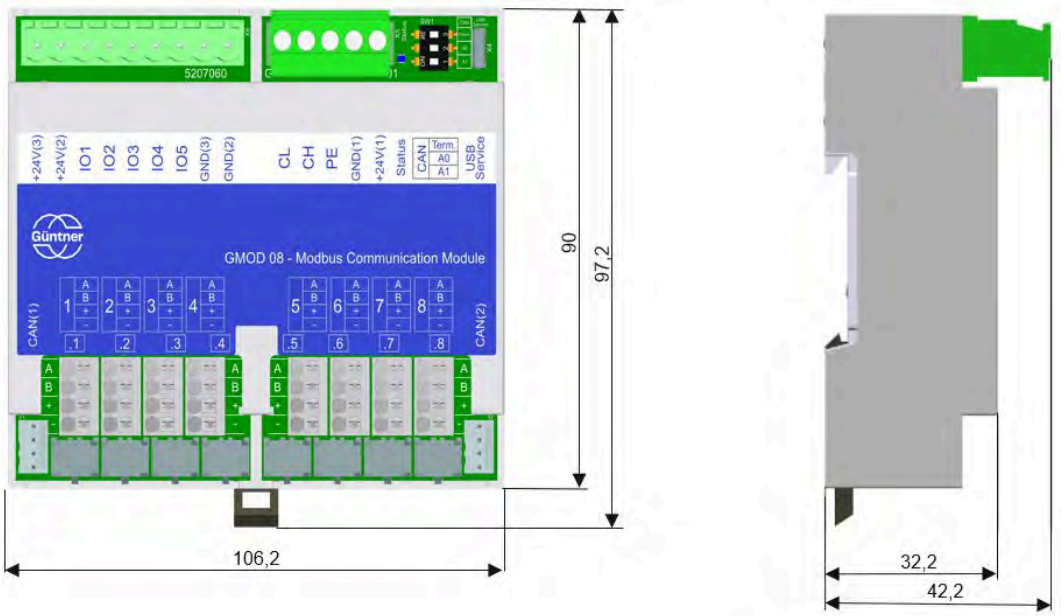
The dimensions of the housing and fixings are shown below. All dimensions are given in millimetres.



Dimension drawing of GMOD 08 GMMnext EC.1

9.6 Dimension drawing of GMOD 08 Rail.1

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



Dimension drawing of GMOD 08 Rail.1

10 Electrical properties

Description	Min	Typ.	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
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
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

Electrical properties

Description	Min	Typ.	Max	Unit
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 VAC)			0.45	A
Current resistive load (250 VDC)			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
Analogue input general				
Potential separation	No			
Dielectric strength	-5		30	V
Resolution			12	Bit
Analogue input voltage mode 0...10 V				
Measuring range	0		12	V
Error		0.25	0.5	% *3)
Input resistor	100			kΩ
Analogue input current mode 0...25 mA				
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

Electrical properties

Description	Min	Typ.	Max	Unit
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		
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		
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		

Electrical properties

Description	Min	Typ.	Max	Unit
Voltage DC		24	30	V
Voltage AC			250	V
Current resistive load (30 VDC)			1.0	A
Current inductive load (30 VAC)			0.45	A
Current resistive load (250 VDC)			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

Electrical properties

*1) The maximum current consumption includes supplying two connected pressure transmitters and one 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.

*3) Error relating to measuring range end value

*4) Error relating to range end value

11 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 Modbus RS485 GMMnext EC.1
ERP No. 5207189

12 Error messages and warnings

The table shows which signalling relay (**PRIO 1** or **PRIO 2**) is assigned to which message on the display in the event memory.

			In the GMMnext event memory	Report relay to GMMnext
Code	**Component / function**	**Severity**	**Text in the event memory (DE)**	**Prio**
1	Fan	Alarm	Fan <1…24> power outage.	Priority 2
2	Fan	Alarm	Fan <1…24> overheated.	Priority 2
3	Fan	Alarm	Fan <1…24> fault. *	Priority 2
4	Fan	Alarm	Fan <1…24> overheated.	Priority 2
5	Fan	Alarm	Fan <1…24> Hall sensor fault.	Priority 2
6	Fan	Alarm	Fan <1…24> blocked.	Priority 2
9	Fan	Alarm	Fan <1…24> undervoltage. (*)	Priority 2
27	Fan	Alarm	Fan <1…24> cable broken.	Priority 2
28	Fan	Alarm	Fan <1…24> wrong FT No.	Priority 2
29	Analogue input	Warning	AI <1…5> current high.	Priority 2
30	Analogue input	Warning	AI <1…5> current low.	Priority 2
31	Analogue input	Warning	AI <1…5> resistance high.	Priority 2
32	Analogue input	Warning	AI <1…5> resistance low.	Priority 2
33	Analogue input	Warning	AI <1…5> voltage high.	Priority 2
34	Analogue input	Warning	AI <1…5> voltage low.	Priority 2
35	Controller	Info	Commissioning complete.	-
36	Pump alarm	Warning	Pump <1/2> (coil <1…5>): Pump alarm.	Priority 2
37	Bypass valve	Warning	Bypass valve (coil <1…5>): Outlet temperature above the critical interval.	Priority 2
38	Bypass valve	Warning	Bypass valve (coil <1…5>): Outlet temperature below the critical interval.	Priority 2
39	HRC operation	Warning	HRC valve (coil <1…5>): Inlet temperature above the critical interval.	Priority 2
40	HRC operation	Warning	HRC valve (coil <1…5>): Inlet temperature below the critical interval.	Priority 2
41	Measurement monitoring	Warning	Inlet temperature (coil <1…5>): above the interval.	Prio 2 (*²)

			In the GMMnext event memory	Report relay to GMMnext
Code	**Component / function**	**Severity**	**Text in the event memory (DE)**	**Prio**
42	Measurement monitoring	Warning	Inlet temperature (coil <1…5>): below the interval.	Prio 2 (*²)
43	Measurement monitoring	Warning	Outlet temperature (coil <1…5>): above the interval.	Prio 2 (*²)
44	Measurement monitoring	Warning	Outlet temperature (coil <1…5>): below the interval.	Prio 2 (*²)
45	Measurement monitoring	Warning	Ambient temperature above the interval.	Prio 2 (*²)
46	Measurement monitoring	Warning	Ambient temperature below the interval.	Prio 2 (*²)
47	Measurement monitoring	Warning	Brine pressure (coil <1…5>): above the interval.	Prio 2 (*²)
48	Measurement monitoring	Warning	Brine pressure (coil <1…5>): below the interval.	Prio 2 (*²)
49	Measurement monitoring	Warning	Fluid temperature (coil <1…5>): above the interval.	Prio 2 (*²)
50	Measurement monitoring	Warning	Fluid temperature (coil <1…5>): below the interval.	Prio 2 (*²)
51	Measurement monitoring	Warning	Fluid pressure (coil <1…5>): above the interval.	Prio 2 (*²)
52	Measurement monitoring	Warning	Fluid pressure (coil <1…5>): below the interval.	Prio 2 (*²)
53	Measurement monitoring	Warning	Air humidity above the interval.	Prio 2 (*²)
54	Measurement monitoring	Warning	Air humidity below the interval.	Prio 2 (*²)
55	Measurement monitoring	Warning	Wet bulb temperature above the interval.	Prio 2 (*²)
56	Measurement monitoring	Warning	Wet bulb temperature below the interval.	Prio 2 (*²)
57	Measurement monitoring	Warning	ΔT fluid temp./ambient temp. (coil <1…5>): above the interval.	Prio 2 (*²)
58	Measurement monitoring	Warning	ΔT fluid temp./ambient temp. (coil <1…5>): below the interval.	Prio 2 (*²)
59	Measurement monitoring	Warning	ΔT inlet temp./outlet temp. (coil <1…5>): above the interval.	Prio 2 (*²)
60	Measurement monitoring	Warning	ΔT inlet temp./outlet temp. (coil <1…5>): below the interval.	Prio 2 (*²)
61	Measurement monitoring	Warning	ΔT outlet temp./ambient temp. (coil <1…5>): above the interval.	Prio 2 (*²)
62	Measurement monitoring	Warning	ΔT outlet temp./ambient temp. (coil <1…5>): below the interval.	Prio 2 (*²)

			In the GMMnext event memory	Report relay to GMMnext
Code	**Component / function**	**Severity**	**Text in the event memory (DE)**	**Prio**
63	Controller	Warning	GMOD 08 <1...3> not available.	Priority 2
64	Load/save configuration	Info	Configuration loaded.	-
65	Factory setting	Info	Factory settings loaded.	-
66	Controller	Warning	GHMspray not available.	Priority 2
	Failure of all fans	-	-	Priority 1

*) Fault also occurs if the fan is without power

*²) Default setting; see "coils (measurement monitoring)"

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16 Annex

16.1 Default I/O configuration

	DI1	DI2	DI3	DI4	DI5
Function	Release (all coils)	(Night) setback*	Setpoint changeover** (all coils)	Power unit fault message***	Motor protection fault message***
Wire breakproof input	No	No	No	Yes	Yes

Default configuration of digital inputs after commissioning

*: The maximum control value for the setback can be set, e.g. via the menu "Night setback".

**: For setpoint changeover to work, a second setpoint must first be configured, e.g. via the menu "Coils (regulation)".

***: If the fan drive was set to "analogue" during commissioning.

	DO1	DO2	DO3	DO4	DO5
Function	Alarm message (Prio 1)	Warning message (Prio 2)	In operation	Threshold value (coil 1)	-
Broken wire-secure output	Yes	Yes	No	No	No

Default configuration of digital outputs after commissioning

	AO1	AO2
AO profile	0-10V	0-10V
Function	Control value/Control value analogue operation*** (fan group 1)	-

Default configuration of analogue outputs after commissioning

***: "Control value analogue operation" will be output if the fan drive was set to "Analogue" during commissioning.

	AI1	AI2	AI3	AI4	AI5
Operating mode	**4-20mA**	**0-10V**	**PTC / PT1000**	**0-10V**	**PTC / PT1000**
Slave external analogue	-	Control value fans (coil 1)	-	Control value fans (coil 2)**	-
Slave external bus	-	-	-	-	-

Default configuration of analogue inputs after commissioning for dry coolers and condensers and slave operating modes

	AI1	AI2	AI3	AI4	AI5
Operating mode	**4-20mA**	**0-10V**	**PTC / PT1000**	**0-10V**	**PTC / PT1000**
Auto internal & Auto external bus	-	-	Actual value temperature sensor (coil 1)	-	Actual value temperature sensor (coil 2)**
Auto external analogue	-	Setpoint setting (coil 1)	Actual value temperature sensor (coil 1)	Setpoint setting (coil 2)**	Actual value temperature sensor (coil 2)**

Default configuration of analogue inputs after commissioning for dry coolers and automatic operating modes

	AI1	AI2	AI3	AI4	AI5
Operating mode	**4-20mA**	**0-10V**	**4-20mA**	**0-10V**	**PTC / PT1000**
Auto internal & Auto external bus	Actual value pressure sensor (coil 1)	-	Actual value pressure sensor (coil 2)**	-	-
Auto external analogue	Actual value pressure sensor (coil 1)	Setpoint setting* (coil 1)	Actual value pressure sensor (coil 2)**	Setpoint setting (coil 2)**	-

Default configuration of analogue inputs after commissioning for condensers and automatic operating modes

*: If a refrigerant is selected, a temperature setpoint is specified, otherwise a pressure setpoint.

**: If two coils are set, otherwise free.

16.2 Default parameters

	Setpoint	Pressure sensor	PID-Kp*	PID-Ti*
dry cooler	30.0 °C	-	5	25 s
Condenser with undefined refrigerant	12.5 bar	25 bar or 40 bar**	20	40 s
Condenser with R744 ($_{CO2}$) as refrigerant	25.0 °C	40 bar	10	25 s
Condenser with other refrigerant	40.0 °C	25 bar	10	25 s

Default parameters after commissioning

*: The PID control parameters are set to the specified default values whenever the heat exchanger type or refrigerant is changed (e.g. subsequent change via the service menu).

**: The type of pressure sensor (25 or 40 bar) can be selected during commissioning.

16.3 Load predefined parameter settings

Auto external analogue 0-10V dry cooler:

With this preset, the system is regulated automatically to a setpoint defined externally in an analogue fashion. This must be transmitted via 0-10V at analogue input AI2.

Auto external analogue 4-20mA dry cooler:

With this preset, the system is regulated automatically to a setpoint defined externally in an analogue fashion. This must be transmitted via 4-20mA at analogue input AI2.

Auto external analogue 4-20mA dry cooler with 2 circuits:

With this preset, the system is regulated automatically to a setpoint defined externally in an analogue fashion for each circuit. This must be transmitted via 4-20mA at analogue input AI2 (circuit 1) and AI4 (circuit 2).

Auto internal condenser + ambient air temperature sensor:

With this preset, the system is regulated automatically to the setpoint defined internally. In addition, an ambient air temperature sensor is configured for a possible setpoint deviation.

Auto internal condenser; 2 circuits:

With this preset, the system is regulated automatically to the setpoint defined internally. This is carried out for each circuit.

Auto internal dry cooler; 2 circuits:

With this preset, the system is regulated automatically to the setpoint defined internally. This is carried out for each circuit.

Auto internal dry cooler + ambient air temperature sensor:

With this preset, the system is regulated automatically to the setpoint defined internally. In addition, an ambient air temperature sensor is configured for a possible setpoint deviation.

Slave external analogue 0-10V dry cooler:

With this preset, the fan control signal specified externally via 0-10V at analogue input AI4 is passed straight to the fans.

Slave external analogue 0-10V dry cooler; 2 circuits:

With this preset, the fan control signal specified externally via 0-10V at analogue input AI2 (circuit 1) and analogue input AI4 (circuit 2) is passed straight to the fans.

Slave external analogue 4-20mA dry cooler:

With this preset, the fan control signal specified externally via 4-20mA at analogue input AI4 is passed straight to the fans.

Slave external analogue 4-20mA; dry cooler; 2 circuits:

With this preset, the fan control signal specified externally via 4-20mA at analogue input AI2 (circuit 1) and analogue input AI4 (circuit 2) is passed straight to the fans.