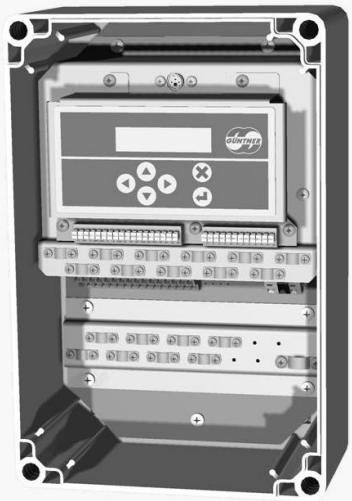
Operating instructions
Güntner Motor Management GMM



for the management and speed control of EC fans using pressure, temperature or voltage

www.guentner.de

Contents

1 General notes

1.1 Safety instructions

In order to prevent serious physical injuries or major material damage, work on or with the unit may be performed only by authorised persons with appropriate training and qualifications who are familiar with the set-up, installation, commissioning and operation of speed controllers. These persons must read the operating instructions carefully before the installation and commissioning. In addition to the operating 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 device may only be made by the manufacturer or a repair centre authorised by the manufacturer.

UNAUTHORISED AND IMPROPER INTERVENTIONS WILL INVALIDATE THE WARRANTY!

The speed controllers are mounted inside the plastic casing (protection rating IP54). This protection rating is guaranteed only while the unit is closed! The UL model is assembled on an open mounting plate.

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

1.2 Proper intended use

Ensure that fuses are always replaced by fuses with the specified rating. Note that fuses may never be repaired or bridged. Only a double-pole circuit tester may be used to check that the unit is disconnected from the power. 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. Proper intended use is also contingent on compliance with the installation, operating and maintenance procedures described in these operating instructions. The technical data and the details of the connection assignments can be found on the type plate and in the instructions, and must be complied with.

Electronic equipment is not fundamentally failsafe! The user must therefore ensure that his system reverts to a safe condition in the event of failure of the equipment. 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. cable cross-sections, fuses, earth conductor connections, etc.). Additional information is included in the documentation. If the control unit is used in a particular area of application, the required standards and regulations must be complied with.

1.3 Commissioning notes

Prior to commissioning of the controller, check whether any residual moisture (condensation) has formed in the housing. If so, the equipment 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 equipment 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 Classification

GMM EC/xx [/RD] [.n] [UL or IP20]	
GMM EC	Güntner Motor Management for EC fans
xx	Number of possible connections for EC fans
/RD	[optional] Remote Display, with detachable controller
.n	Hardware version: without: first released hardware version from .1: changed function of digital inputs from .2: with switchable analogue input B2 (4..20mA or KTY]
UL	[optional] UL model assembled on mounting plate
IP20	[optional] IP20 model assembled on mounting plate

Examples:

GMM EC/01 = Controller and motor management for 1 EC fan
GMM EC/04 = Controller and motor management for up to 4 EC fans
GMM EC/08 = Controller and motor management for up to 8 EC fans
GMM EC/16 = Controller and motor management for up to 16 EC fans

Example for version .1 (changed function of digital inputs):

GMM EC/01.1 = Controller and motor management for 1 EC fan

UL example:

GMM EC/08(.1) UL = Controller and motor management for up to 8 EC fans

Special models are not covered by this device code

1.5 Transport and storage, copyright notice

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 equipment, check for any damage to the packaging or the controller.

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

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

1.6 Warranty and liability

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

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

1.7 Manufacturer and supplier address

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

Güntner GmbH & Co. KG
Hans-Güntner-Strasse 2-6
D-82256 Fürstenfeldbruck, Germany

Service Telephone Germany:
0800 48368637
0800 GUENTNER

Service Telephone Worldwide:
+49 (0)8141 242-4815

Fax. +49 (0)8141 242-422
service@guentner.de
http://www.guentner.de

1.8 EMC-compliant installation

Controllers in the GMM EC/01..16 series fulfil the requirements of EN 61000-6-2 as regards resistance to EMC interference and those of EN 61000-6-3 as regards emissions.

They also comply with standards IEC 61000-4-4/-5/-6/-11 for grid-bound interference. In order to guarantee EM compatibility, the following points must be noted:

• The unit must be properly grounded (with at least 1.5 mm²).

• All measurement and signalling lines must be connected via shielded cables.

• A special cable must be used for bus wiring to the EC fans. e.g. HELUKABEL DeviceNet PUR flexible1x2xAWG24 + 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 give rise to any interference in signal and control lines.

ADVICE

If the equipment is installed in a switch cabinet, **proper attention must be given to the** temperature inside the cabinet. Güntner switch cabinets are provided with sufficient ventilation.

2 Quick guide to rapid commissioning

These pages contain the main information required for rapid commissioning of the GMM EC/01 /04 /08 or /16.

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

Mains connection:	**L1** to terminal **L1** **N** to terminal **N** **PE** to terminal **PE**	
Fuses:	There are no replaceable microfuses **in** the GMM to protect its semiconductors or motor. The unit must be protected by an on-site C 6A circuit breaker for each phase. The **UL** model has a 250V/1A fuse installed on the 24V side of the power supply unit.	
Fan connection: **on the GMM**	Depending on the model, there are 1 to 16 bus outputs for the EC fans **on the lower PCB** (see Location of connections on the GMM EC/08, Page 18.	
	Communications interface:	Terminal **A** and **B** (top row)
	24V power supply to fan logic:	Terminal **+** and **-** (bottom row)

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

Analogue inputs: **on the GMM**	**Pressure sensor**	**1** (brown) on **+24V**
	GSW 4003	**2** (green) on **B1** or **B2**
	GSW 4003.1	**2** (blue) on **B1** or **B2**
	Temperature sensor	**1** (white) on **B3**
		2 (brown) on **GND**
	Standard signal (0 ... 1V)	**plus (+)** on **B4**
		minus (-) on **GND**
Signalling outputs	Connections for signalling outputs, see Potential-free signalling outputs, Page 30	
Enable	The function of input **D1** is to enable the controller. This input must be connected to **GND** for the controller to work and the fans to be able to turn (this jumper is installed in the factory). For version **.1 or higher** (see type plate) input **D1** must be connected to **+24V** !	
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 GMM will generally be ready for use.

"Manual" mode can be selected to check the functioning of the GMM.
See Manual mode, Page 56.

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

Operating mode The GMM operates in different modes depending on the commissioning process.
See also Operating mode, Page 63.

Limiter The speed of the fans can be limited, e.g. to limit noise emissions at night. This value is set in the Night limiter menu option. The night limiter is activated either via input **D2** or using the timer, which is programmed in the Night limiter menu option.

Setpoint switchover It is possible to choose between two setpoints (e.g. for summer and winter operation). The switchover is effected via input **D3**.

The functions **Limiter** and **Setpoint switchover** generally have to be activated in the Service menu.

3 Commissioning GMM EC

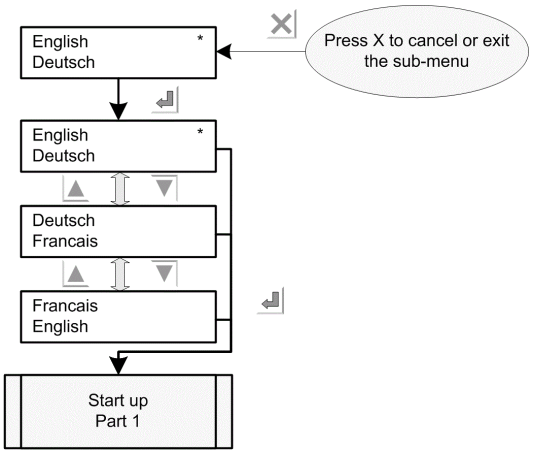
With the GMM, the fans are controlled via a bus. These fans must be set up and checked for use with the condenser or drycooler, depending on the design of the heat exchanger. These settings and checks are necessary on initial commissioning and may need to be repeated when a fan is replaced. This commissioning process determines the performance of the heat exchanger and its noise emissions. In the annex you will find a table showing the fan ID and fan type for different heat exchangers.

The GMM automatically detects whether commissioning has been carried out when it is switched on. If it has, the commissioning menu is skipped and normal operation continues.

3.1 The initial commissioning procedure

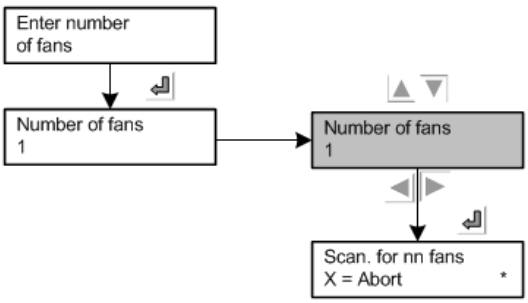
The default language for commissioning is English, even if a different language has been selected for the display. The commissioning language can be freely selected however and only applies to the commissioning menu.

You can exit the commissioning menu at any time by pressing the **"X"** key.

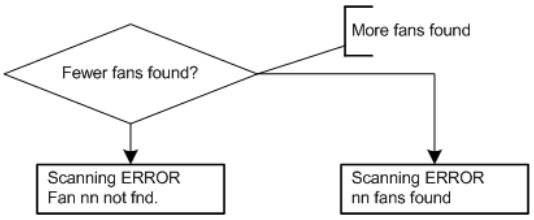


Once the language has been selected, the number of fans is interrogated.

Once the number of fans has been entered, the GMM searches for the connected fans. The flashing* indicates that a search is in progress. If the number of fans found is not the same as the number entered, an error message is returned.



If the number of fans found does not match the number entered, the following menu option appears.

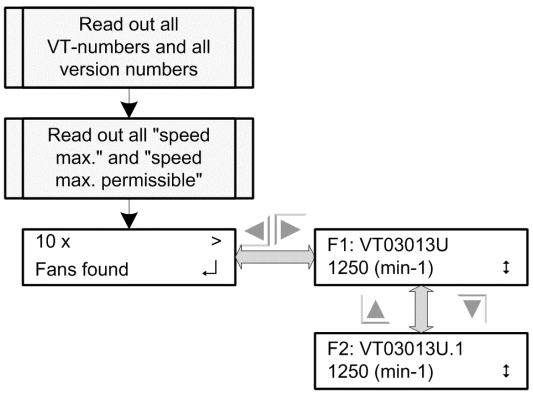


If fewer fans are found, the numbers of all the fans not found are displayed.

On the other hand, if more fans are found, the total number of fans found is displayed.

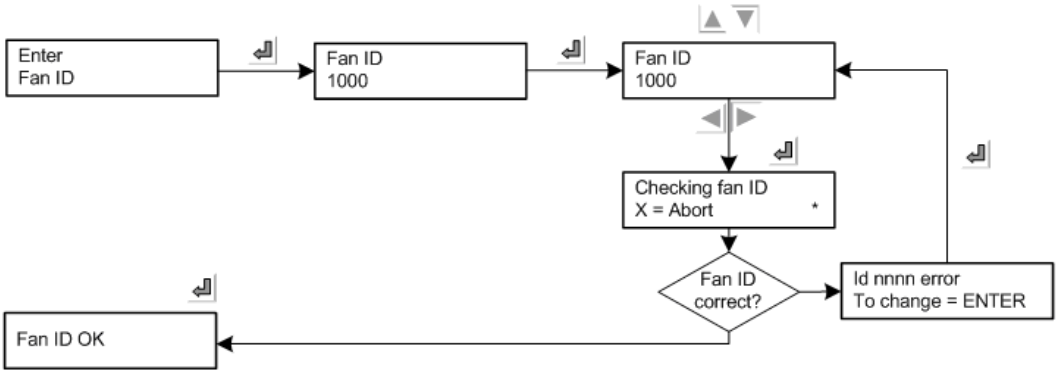
If the search is successful i.e. the specified number of fans is found, the VT numbers of the fans are then read out. The VT number is the type designation of the motor.

If the VT numbers of the fans are not all the same, the VT numbers with discrepancies are output.



It is then not possible to continue commissioning, because all the fans must have the same VT number. You will need to replace any fans with the incorrect VT number. The VT number is printed on the type plate of each fan.

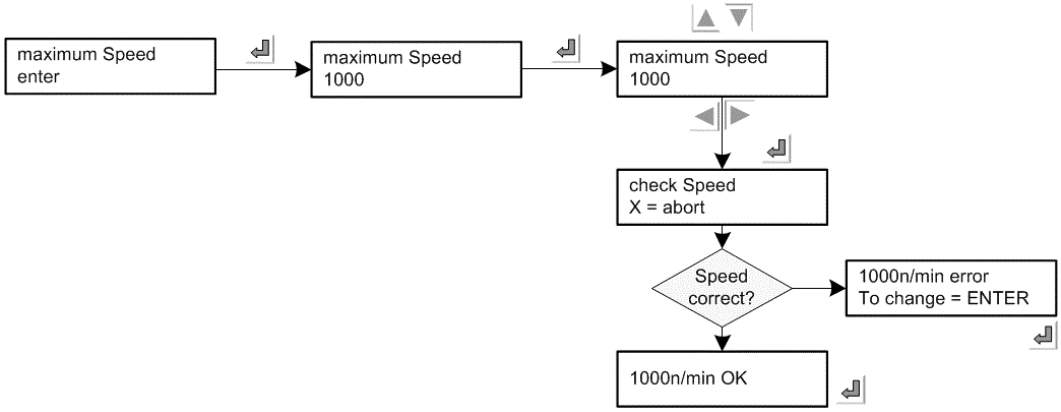
If all the VT numbers of the fans are now the same, the next step is to enter the ID number of the fans. The ID number represents the working point of the fan for this heat exchanger. You will find this number in the electrical circuit diagram of the heat exchanger or the overview table in the annex.



Fan ID 1000 has been entered **here** as an example. On initial commissioning, the smallest fan ID is proposed. If this point (ID input) has previously been completed, the last ID number entered is proposed.

After input, the GMM **checks** the fan ID. The checking process is indicated by a flashing * in the display. If the fan ID is incorrect, you are prompted to make a correct input. With the **"ENTER"** key you go back to the ID entry. However, you can also abort the process by pressing the **"X"** key. If you abort the process, commissioning is not yet complete and normal operation will not be started. Commissioning must first be performed completely.

If the appropriate fan ID is found, you are prompted for the maximum permissible speed for the heat exchanger (depending on the design point).



In the example above, a maximum speed of 1000 rpm has been entered. This speed will be checked.

If it is incorrect, i.e. if it does not match the speed specified by the ID, you will be prompted to modify the input. Once the modified speed has been entered, it is checked and may be acknowledged with **the message,** “Speed OK”. Otherwise you will again be prompted to correct your entry.

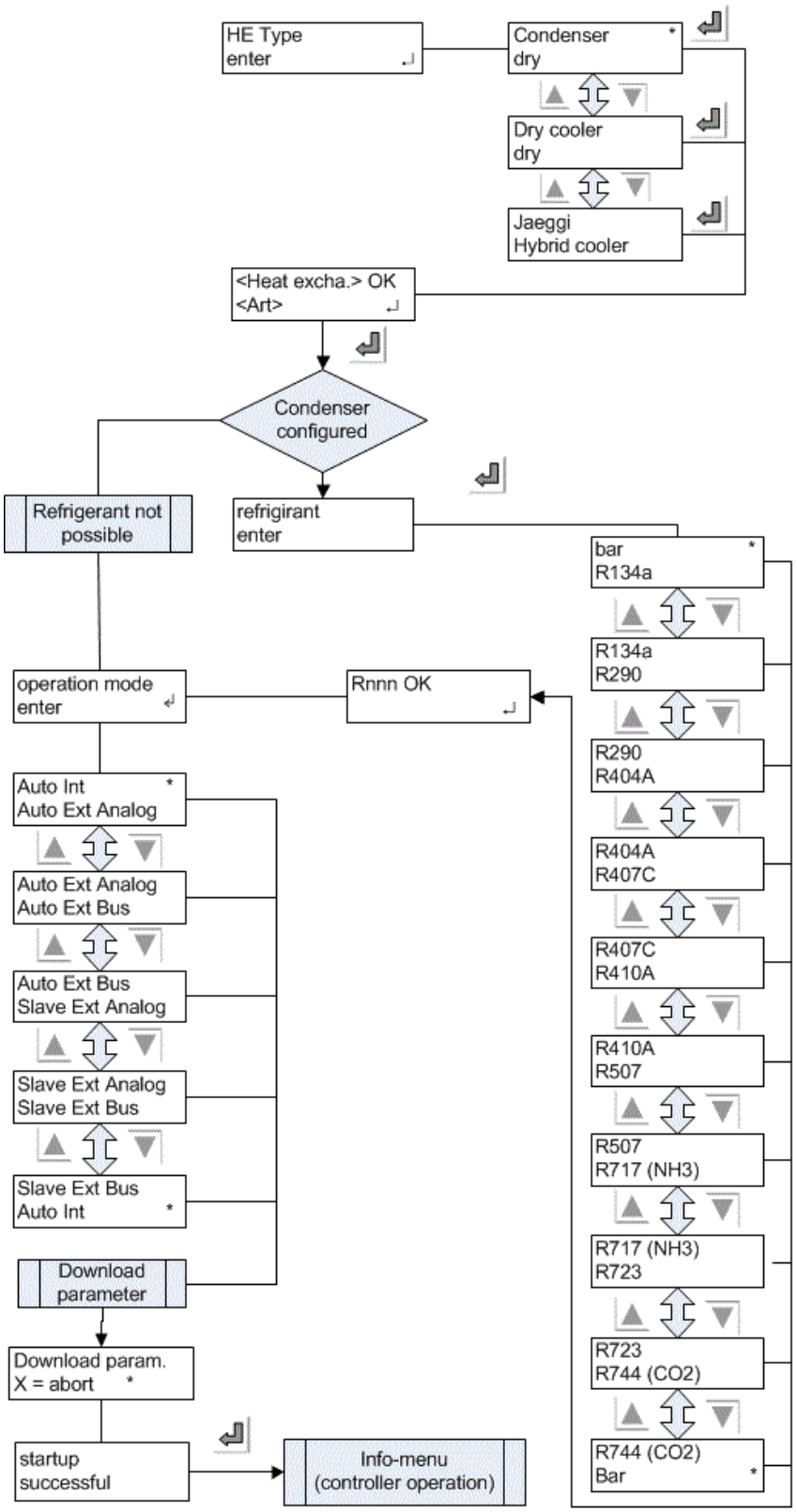
If the maximum speed is correct, you will be asked for the heat exchanger type, refrigerant and operating mode.

You can specify either a condenser (e.g. GVH, etc.) or a drycooler (e.g. GFH, etc.).

If a condenser has been selected, you will be asked for the refrigerant in the next step. There is a choice of 10 refrigerants. If “bar” is selected, the pressure will be displayed in normal operation. When a refrigerant is selected, the condensing temperature corresponding to the pressure will be displayed. The selected refrigerant or “bar” are **indicated by** a “*”.

The default value **is** “bar”.

If a drycooler is selected, the temperature of the refrigerant in normal operation is displayed.



Finally, you need to select the operating mode. When all the parameters have been entered, they are saved. This takes a few seconds.
This completes the commissioning process and the GMM will then display the “INFO” menu.

4 Construction of the GMM EC

4.1 Installing the GMM

4.1.1 Installation of the controller, ventilation

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

Once the equipment 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 fixing drill holes in the housing for installation. The equipment may only be fixed at these points, any manipulations of the housing (e.g. drilling new fixing 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 adjustment (cable screw with adjustment opening).

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

Note:

• If the equipment is installed in a switch cabinet, **proper attention must be given to the** temperature inside the cabinet (see Electrical and mechanical properties of GMM EC, Page 103).

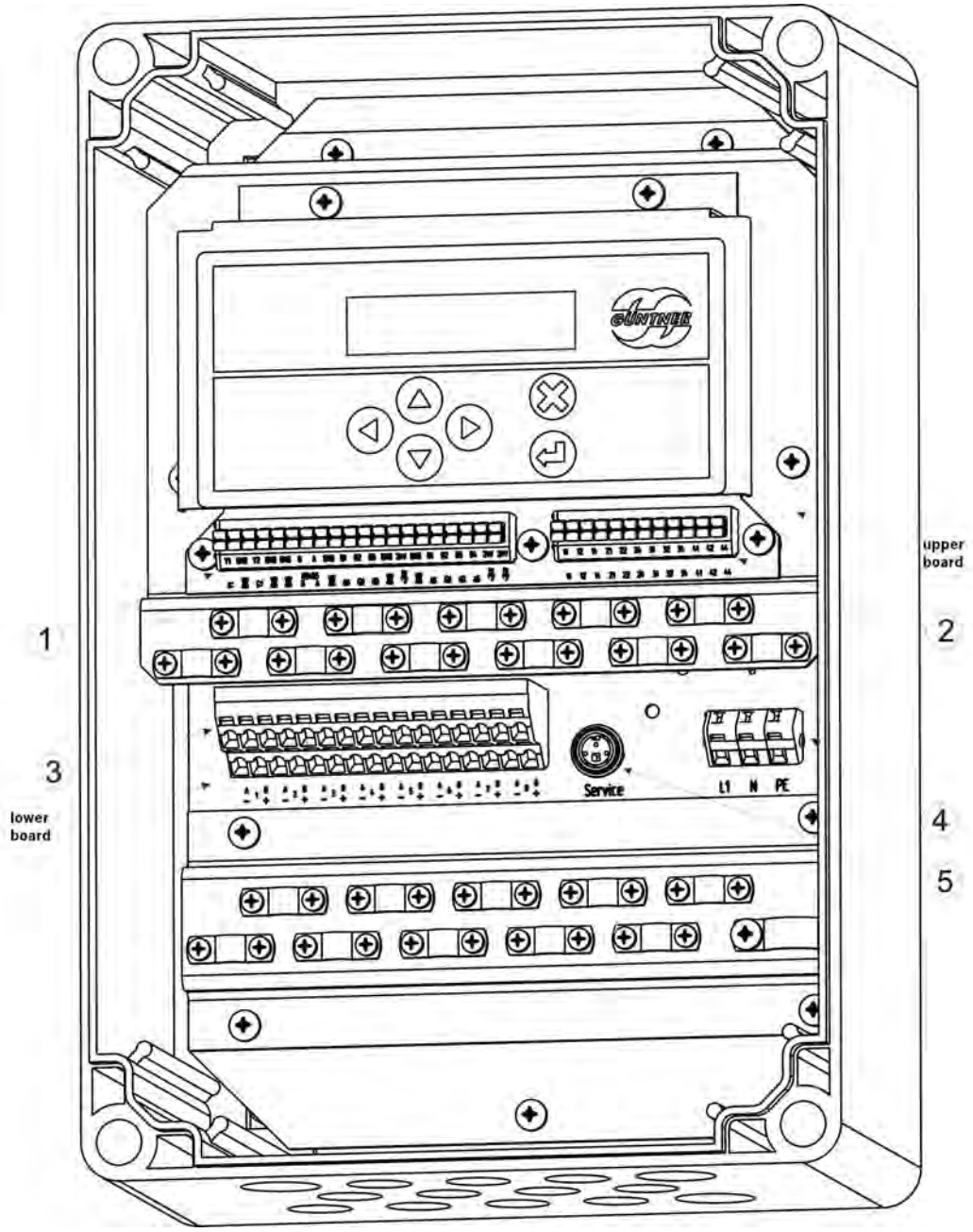
• A hood is prescribed if the equipment is installed in the open air.

• Install the GMM out of direct sunlight and choose a location with the best possible protection against the elements.

4.2 Connecting the GMM

The connector terminals for the potential-free signalling outputs, the control inputs (controller enable etc.) and sensors are located on the upper PCB. The mains connection and bus cables to the EC fans are located on the lower PCB. 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 GMM EC/08



Location of connections on the GMM EC/08

(1) Analogue and digital inputs and outputs (see Control inputs, Page 32).

(2) Potential-free signalling outputs (see Potential-free signalling outputs, Page 30).

(3) EC fan connections 24 V DC, RS485 (see Controller fan connection, Page 20).

(4) Mains connection Controller mains connection, Page 19).

(5) Connection for software update (see **separate description**).

4.2.2 Controller mains connection

The mains connection for the controller is on the following terminals:

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

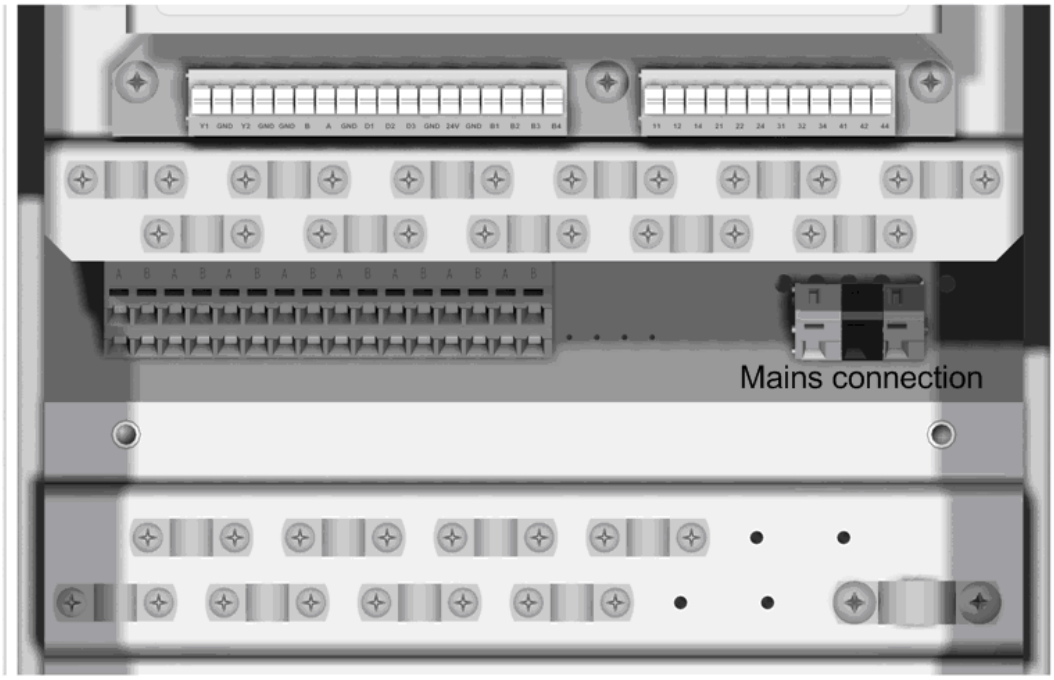
The connector terminals are designed for a maximum cable cross-section of 2.5 mm².

The supply must be fused by means of automatic cable protectors with characteristic “C 6”.

In the **UL** model, the GMM is connected to the 115/230 V AC 50/60 Hz control voltage grid. Always observe the relevant local **UL** regulations.

ADVICE

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



GMM EC mains connection

4.2.3 Controller fan connection

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

Power connection:

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

Control connection:

The communications and the DC power supply for the fans are connected on the GMM's double-level terminal block (see point 3 on equipment connection diagram page Location of connections on the GMM EC/08, Page 18).

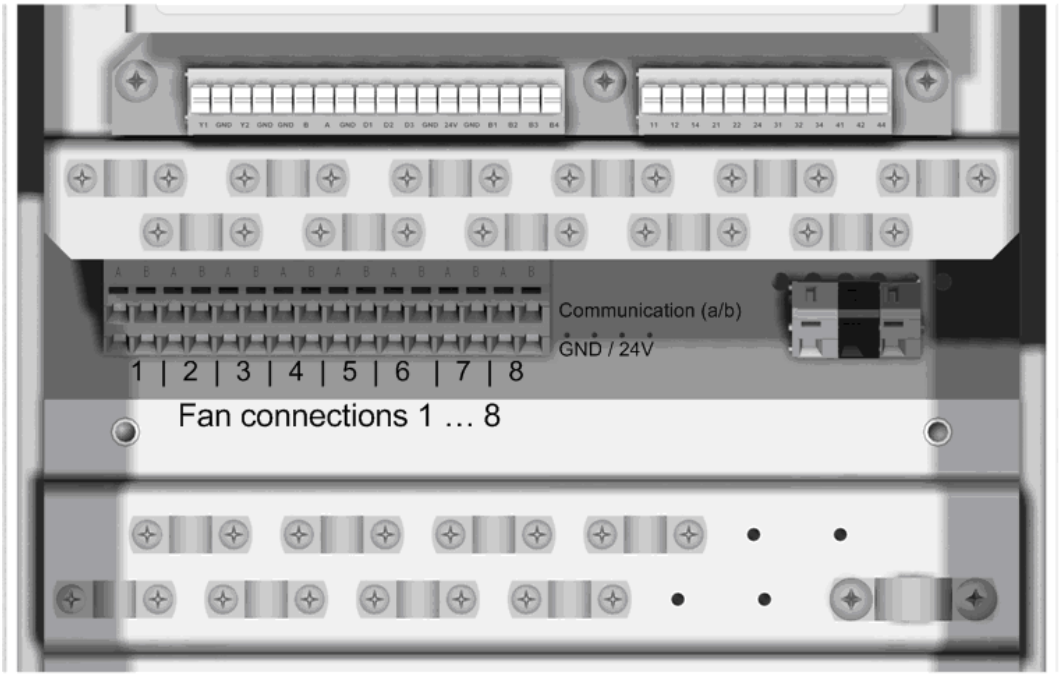
Depending on the model, there are 1 to 16 control connections for the EC fans on the lower PCB.

On the terminal block (see image bottom left), there are 2 terminals for the bus communications and 2 terminals for the power supply for each fan. The fan groups are identified on the PCB under the terminal block. The top row is used for the communications wiring and the bottom row for the power supply to the electronics in the EC fans.

Communication connection: Terminal **A** (white) and **B** (blue) **top row**

24 Voltage supply: Terminal **+** (red) and **–** (black) **bottom row**

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



GMM EC fan connections

4.3 Remote controllers

4.3.1 Functional description

Functional description of GRCE.1

The GRCE.1 is the control unit for Güntner Motor Management for EC fans. This control unit is designed to be mounted on a top-hat rail. Among other options, it can also be operated remotely from the remainder of the GMM EC controller.

In order to ensure controlled operation, the controller must have a power supply and must be enabled via digital input DI1. If it is not enabled the process will not be regulated. The unit has an internal PID controller, whose parameters (amplification factor, integral and differential time) can be configured either from the menu or via an external bus module.
The setpoint can be specified via the internal menu, an external analogue value or via an external bus module.
The actual value is determined using a pressure sensor (4-20mA), a temperature sensor (KTY, GTF210) or a 0-10V signal.

The control value is passed via the CAN bus to an EC controller, which distributes the information to the fans via a bus system.

The digital inputs are designed as potential-free contacts that must be connected to +24V.
As well as enable, digital inputs are also used to control the night limiter (DI2) and setpoint switchover (DI3).

ADVICE

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

The relay outputs are used for control messages. Relay 1 reports priority 1 alarms, relay 2 reports priority 2 alarms, relay 3 reports that the fans are in operation and relay 4 is used to implement a threshold function.

Analogue output AO1 shows the current control value from the controller (0-100%) as a voltage in the range 0-10V.

Analogue output AO2 can be used to control an additional subcooler.

4.3.2 Installation / Operating conditions

Installation / Operating conditions GRCE.1

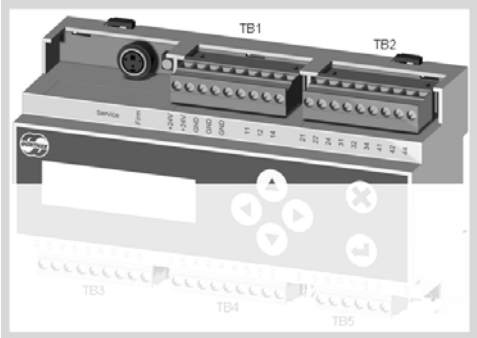
- The module is designed for mounting on a top-hat rail.
- All measurement and signalling lines must be connected via shielded cables.
- The shielding of measuring, signal and bus lines must be earthed at one end only.
- Suitable shielding and routing measures must be taken to ensure that mains cables and motor cables do not give rise to any interference in signal and control lines.
- Temperature:

Storage Transport:	-20°C ... +70°C
Operation:	-20°C ... +65°C

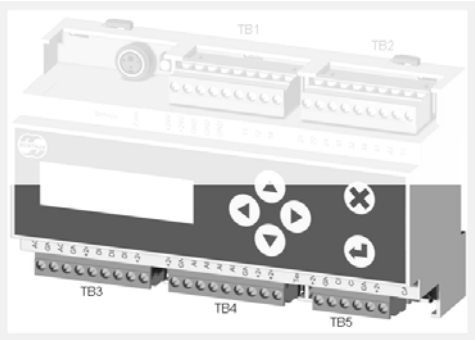
- Protection rating: IP 20
- Recommended cables: Belden 9841, Lapp 2170203, Lapp 2170803, Helukabel 81910

4.3.3 Connections

Connections GRCE.1



Upper row of connections			
	Name	**Description**	
	Service	Service plug only for use by service personnel	
	Firm	Pushbutton only for use by service personnel	
TB1	+24V	External feed for power supply	
	+24V		
	GND	Contact ground for external power feed	
	GND		
	GND		
		Terminal not connected	
	11		Two-way contact for priority 1 alarms
	12		
	14		
TB2	21		Two-way contact for priority 2 alarms
	22		
	24		
	31		Two-way contact for system messages
	32		
	34		
	41		Two-way contact for threshold function
	42		
	44		



Lower row of connections		
	Name	**Description**
TB3	AO1	Analogue output 1, 0-10V
	GND	Ground
	AO2	Analogue output 2, 0-10V
	GND	Ground
	+24V	Voltage +24V
	DI1	Digital input +24V, Release
	DI2	Digital input +24V / night limiter
	DI3	Digital input +24V, setpoint changeover
	+24V	Voltage +24V
TB4	+24V	Voltage +24V
	GND	Ground
	AI1	Analogue output 4-20mA
	AI2	Analogue input 4-20mA or for temperature sensor GTF must be configured in the soft-ware
	AI3	Analogue input for temperature sensor GTF
	AI4	Analogue input 0-10V
	GND	Ground
	+24V	Voltage +24V
	+24V	
	Term	DIP switch for CAN bus termination (120Ω) / ON = termination activated
TB5	+24V	Voltage +24V
	GND	Ground
	CH	CAN high signal
	CL	CAN low signal

Lower row of connections		
	GND	Ground
	+24V	Voltage +24V
	CAN	CAN bus plug including power supply

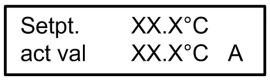
*TB: Terminal block

5 Display and operation

Information are shown on a two-line display. The controller is operated via a membrane keyboard.

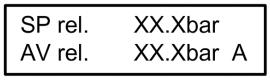
5.1 Info menu

Display with a dry cooler or condenser with selected refrigerant

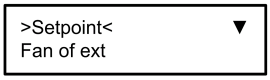


→ Setpoint
→ Actual value

Display with a dry cooler without refrigerant selection

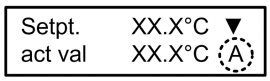


→ Setpoint
→ Actual value



Display only, if function unlocked in the service menu

5.2 Status displays in the Info menu



→ Status display

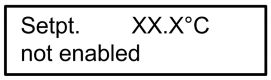
A	Automatic mode – internal control	Static display
H	Manual mode – control value is specified fixed via display	Static display
S	SLAVE mode – control value is specified externally	Static display
F	Priority 1 fault	Alternating with standard display
W	Priority 2 warning	Alternating with standard display

Further messages in the second line

- No release

- Night limiter (alternating with current value)

- Error messages in clear text (alternating with actual value)
See Error messages and warnings , Page 108



→ Text message

5.3 Operation

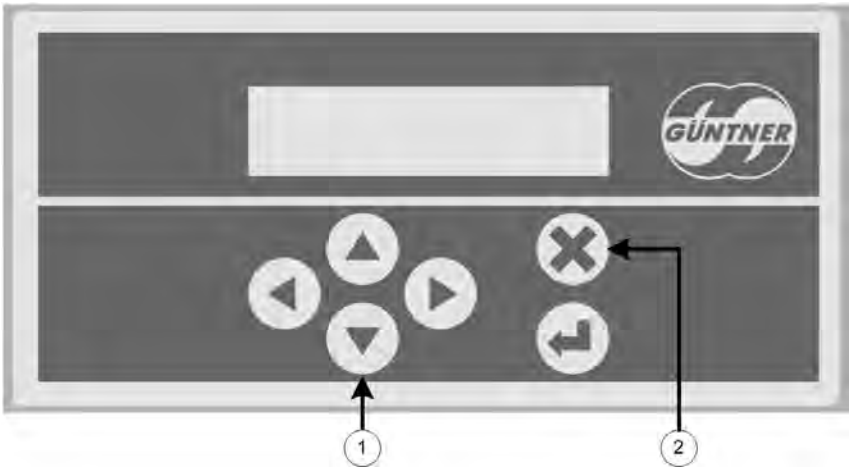
Cancel and return to INFO menu

Enter key for function selection; change to EDIT mode and value acceptance

Right arrow for moving to the next menu level.

Left arrow for moving to the previous menu level.

Up/down arrow for scrolling through the menu level.

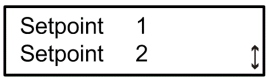


1. Use this key to move from the **INFO** menu to the **Operating menu**.
2. Use this key to return to the **INFO** menu at any time.

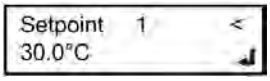
5.4 Edit mode

This mode is required to change values (setpoints, for example).

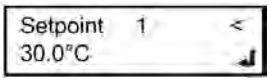
Select menu option you want (top line)

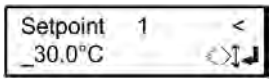


Change to menu option

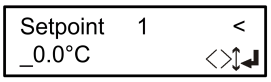


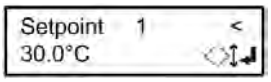
Change to writing mode (cursor flashes)



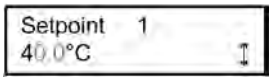


Decimal point selection (cursor flashes)

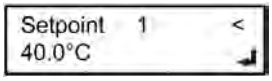




Change value



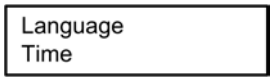
New value acceptance



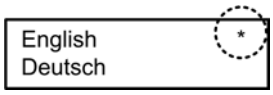
5.5 Selection mode

This mode is required to select functions (language, for example).

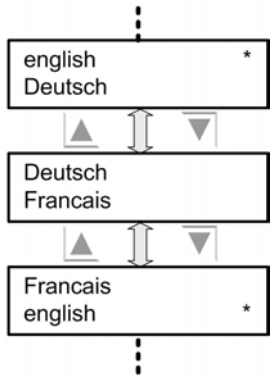
Select menu option you want ("Language", for example, top line)



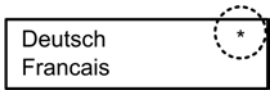
Change to the menu option
→ The function/language currently set is marked with an *asterisk*.



Set target language by scrolling to the top line
→ selected function/language in top line

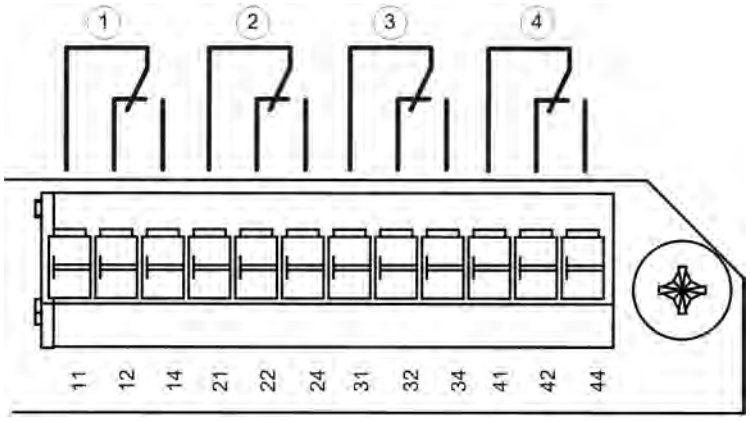


Accept function/language.
→ selected language is marked with an *asterisk*.



5.6 Potential-free signalling outputs

For safety reasons, the potential-free signal outputs (two-way contacts) are designed in such a way that the corresponding signal relay is deactivated when the event is triggered, i.e. the opener of the corresponding two-way contact closes. This has the effect that a malfunction is also signalled if the GMM loses power due to a fault. All signalling outputs must not exceed 250 V / 1 A.



1. Fault
2. Warning
3. System in operation
4. Threshold

5.6.1 Digital output (11/12/14) (fault)

The message on the contact 11/12/14 is a fault, which and signals complete failure and standstill of the heat exchanger.

The signal relay has contacts 11/12/14. A fault is signalled in the following situations:

- For example, all fans have failed (equipment fault)

- Error messages and alarm assignment, see Error messages and warnings , Page 108

If an alarm occurs, the signalling relay is switched (drops out) i.e. the two-way contact 11/12 closes. The load on this potential-free contact must not exceed 250 V / 1 A.

5.6.2 Digital output (21/22/24) (warning)

Signals on contact 21/22/24 are warnings that do not result in the complete failure of the heat exchanger. These are warnings that the operation of the heat exchanger.

The signalling relay has contacts 21/22/24. A warning is signalled in the following situations:

- For example, sensor faults or a failed fan (in equipment with multiple fans)

- Error messages and alarm assignment, see Error messages and warnings , Page 108

If a warning occurs, the signalling relay is switched (drops out) i.e. the two-way contact 21/22 closes. The load on this potential-free contact must not exceed 250 V / 1 A.

5.6.3 Digital output (31/32/34) (Operating message)

The signalling relay has contacts 31/32/34. The two-way contact (31/34) is closed when a control signal is sent to the fans i.e. the fans are operational.

5.6.4 Digital output (41/42/44) (threshold value)

You can configure a threshold function on the GMM (see see Threshold value, Page 75).

The DO4 digital output trips (contact 41/44 closes) when the respective threshold value is exceeded. This can be used, for example, to switch a solenoid valve, control an actuator, activate a spray, etc.

The load on this potential-free contact must not exceed 250VAC/1A.

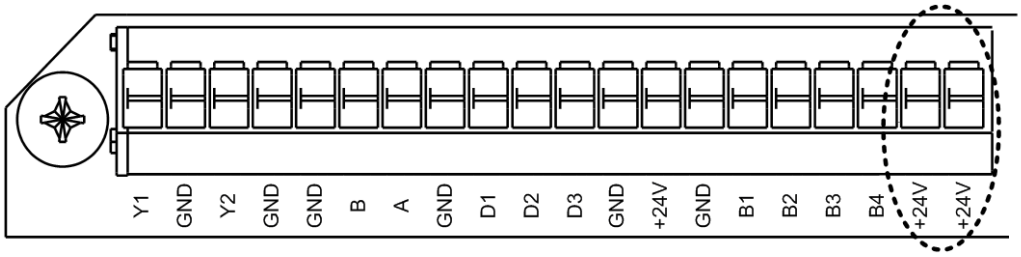
5.7 Control inputs

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 switched between the terminals or **+24V** (depending on the device status) and the **D1** or **D2** or **D3** control input. The function is activated when the contact is closed.

There are two GMM EC versions with different wiring on the digital inputs.

The current GMM ECxx.1 version can be recognized by its two additional +24V terminals.

Types: GMM EC01.1, GMM EC04.1, GMM EC08.1, GMM EC16.1

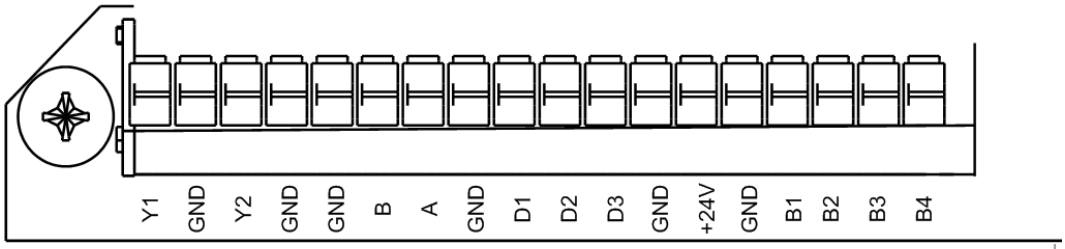


D1...D3 become active with +24V

There are two additional +24V terminals on versions from GMM ECxx.1.

GMM ECxx versions do not have any additional +24V terminals.

Types: GMM EC01, GMM EC04, GMM EC08, GMM EC16



D1...D3 become active with GND

ADVICE

A faulty connection can cause serious damage!

Under no circumstances may the mains voltage be applied to the digital inputs, nor may a different external voltage be used!

5.7.1 Enabling of GMM EC

Fans are enabled via terminal **D1** (enable). Their speed then depends on the control value. If enable is not switched, the fans will be disabled (speed = 0).

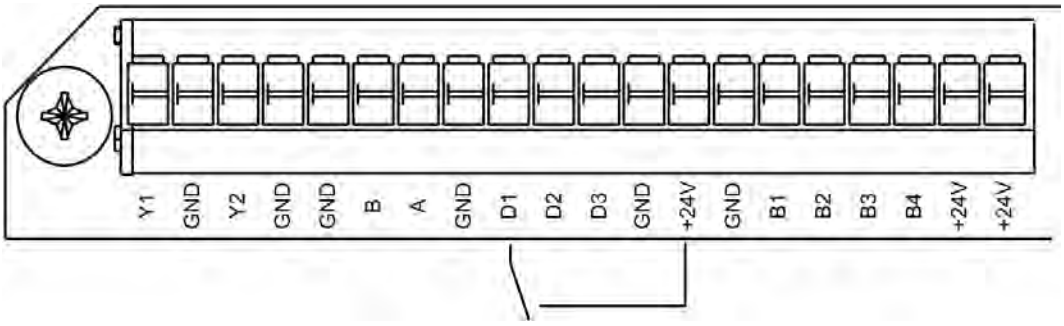
*If they are not to be enabled externally, terminal **D1** must be jumpered.*

This enabling jumper is always installed in the factory.

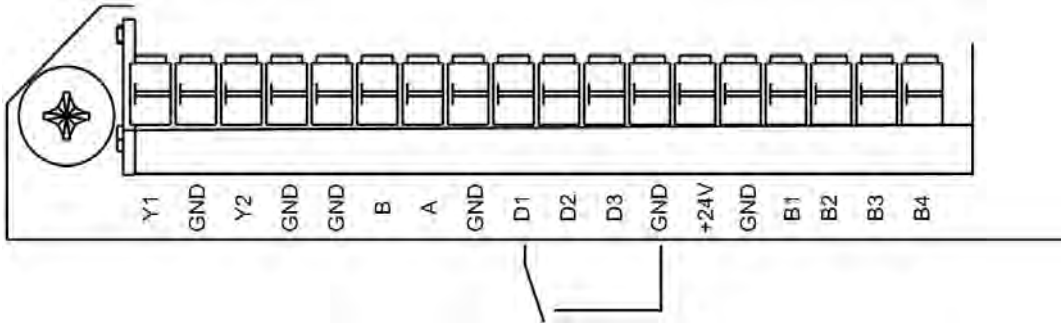
ADVICE

A faulty connection can cause serious damage!

GMM EC01 .1 , GMM EC04.1 , GMM EC08.1 , GMM EC16.1 (see type plate)



GMM EC01 , GMM EC04 , GMM EC08, GMM EC16 (see type plate)



Connecting the external enabling contact

ADVICE

Under no circumstances may the controller be disabled by interrupting the mains voltage ! Continuously switching the supply voltage can damage the controller and such damage is not covered by the warranty!

Enable is not required in "Manual" mode.
See *Manual mode, Page 56*

5.7.2 Speed limiter/External manual mode

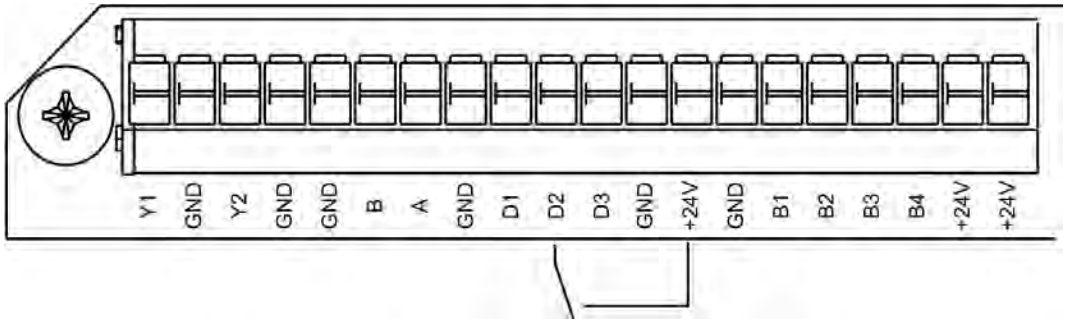
Terminal **D2** can be used to activate the (night) speed limiter. Digital input 2 may have to be configured here accordingly (see IO configuration - Digital inputs, Page 87). When this terminal is switched, the control signal is activated and the fan speed is then limited to the set value. The GMM will then not attempt to set the speed any higher. For setting the speed limiter, see section Setpoints, Page 49 and for general activation see section Service, Page 58.

Alternatively, the input can also be used to activate manual mode. The input has to be configured accordingly for this purpose.

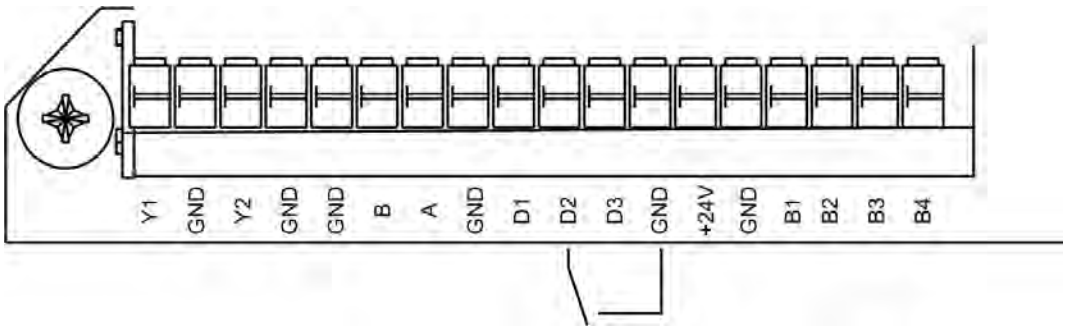
ADVICE

A faulty connection can cause serious damage!

GMM EC01 .1 , GMM EC04.1 , GMM EC08.1 , GMM EC16.1 (see type plate)



GMM EC01 , GMM EC04 , GMM EC08, GMM EC16 (see type plate)



Activating the speed limiter/External manual mode

5.7.3 Switching to 2nd setpoint

Setpoint switchover:

This function enables the switchover between two setpoints, which serve as controlling input values. The switchover is made by connecting the **"D3"** input.

If this terminal is blank, **Setpoint 1** is always active. Ex works, this connection is blank (open).

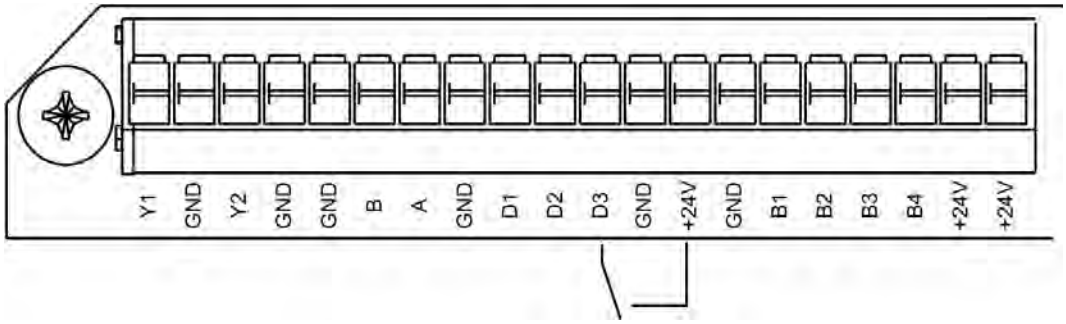
If this function is activated in the Service menu, the control mode can be switched over between heating and cooling. (Cooling and heat pump operation, for example)

The second setpoint and the second setpoint displacement are switched over with the **D3** input.

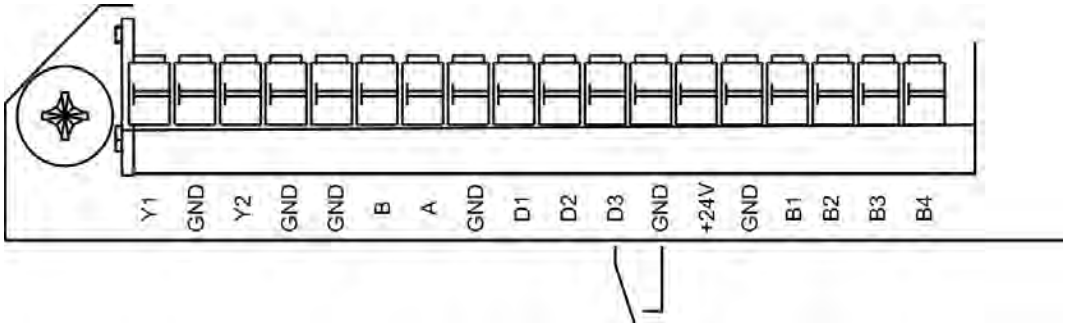
ADVICE

A faulty connection can cause serious damage!

GMM EC01 .1 , GMM EC04.1 , GMM EC08.1 , GMM EC16.1 (see type plate)



GMM EC01 , GMM EC04 , GMM EC08, GMM EC16 (see type plate)



Switchover from setpoint 1 to setpoint 2

5.8 Analogue inputs

The GMM has four sensor inputs:

Input B1	Current input	4-20mA
Input B2	switchable	4-20mA or impedance sensor GTF210
Input B3	Impedance sensor	GTF210
Input B4	Voltage source	0-10V DC

ADVICE

From variant .2, input B2 can be switched over as a 4..20mA input or for a GTF210 resistance sensor.

The various ways of using inputs and how to connect them in each case are described below.

CAUTION! A faulty connection can seriously damage the analogue inputs!

The 4-20mA inputs may be neither poled nor connected directly to 0-10V DC or +24V.

5.8.1 Connecting a pressure sensor to B1/B2

One or two (two-wire) sensors can be connected:

+24V = Common supply voltage (GSW4003.1: brown(1), GSW4003:brown(1))

B1 = 4-20mA signal from sensor 1 (GSW4003.1: blue(3), GSW4003: green(2))

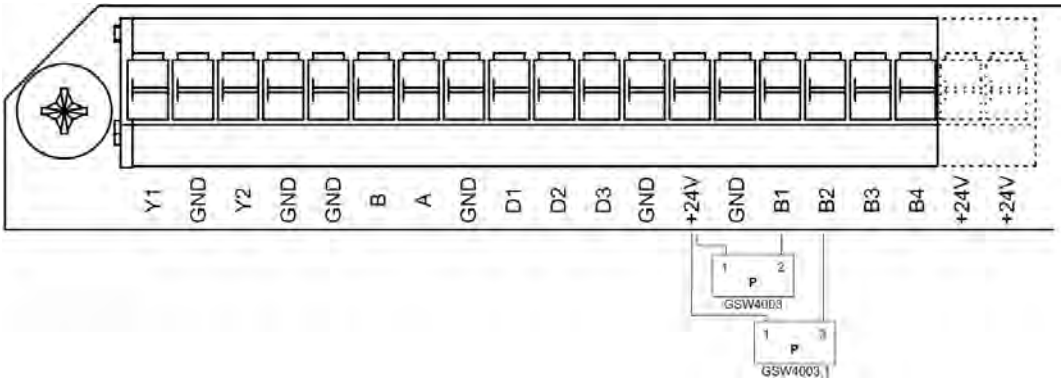
B2 = 4-20mA signal from sensor 2 (GSW4003.1: blue(3), GSW4003: green(2))

The connected pressure sensors must be configured in the hardware configuration.
When two sensors are used the larger signal is always processed by the control unit as the actual value (max. selection)

ADVICE

Three-wire sensors with a 4-20 mA signal output can also be connected, but these then require an additional chassis potential. You can tap this from the *GND* terminal.

Important for pressure sensors: Do not install the sensor in the immediate vicinity of the compressor to protect it from large pressure impacts and vibrations. It should be installed as close to the condenser inlet as possible.



Pressure transmitter connection

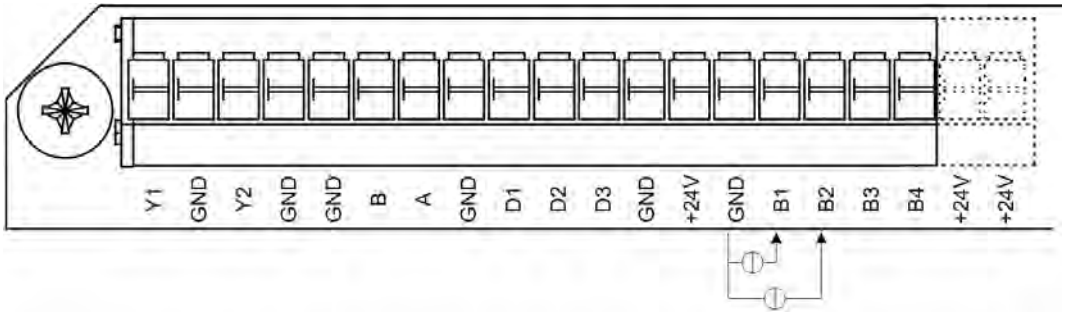
5.8.2 External power signal connection to B1/B2

The B1 or B2 inputs can also be used to control the controller in SLAVE operation.
To do this, this input must be defined as a control value slave in the I/O configuration.
The 4..20mA input signal is scaled 0-100% to a control signal and passed on to the fans.
A setpoint can also, for example, be specified externally via the B1 or B2 inputs.
Up to two power signals (4-20mA) can be connected to the B1 and B2 analogue inputs.

GND = Reference point (**–**).
B1 = Current input (**+**) 4..20mA
B2 = Current input (**+**) 4..20mA

ADVICE

Make sure the current source polarity is correct!



Power source connection

For current inputs, note that currents of less than **2.4mA** or greater than **22mA** will provoke a sensor fault display and corresponding message.

5.8.3 Connecting a temperature sensor on B3

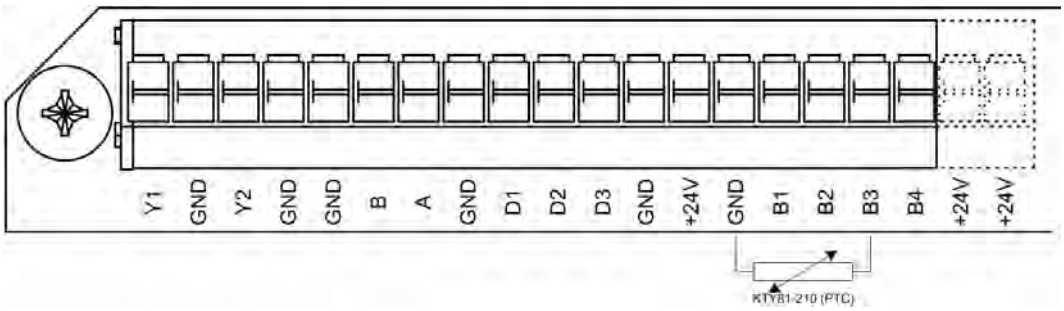
A temperature sensor is connected on the terminals

GND = Earth

B3 = Signal input

There is no particular sequence for the cores.

The Güntner GTF210 temperature sensor is used in the range -30°C to +70°C. Please contact us for other temperature ranges.



Temperature sensor connection

To test a temperature sensor that may be defective, disconnect it from the controller and measure the impedance of the sensor (with an ohmmeter or multimeter). On the GTF210 , the impedance should be between 1.04 kΩ (-50°C) and 3.27kΩ (+100°C). You can use the table below to check whether the sensor has the correct impedance at a known temperature.

Impedance	Temperature	Impedance	Temperature
1040Ω	-50°C	2075Ω	30°C
1095Ω	-45°C	2152Ω	35°C
1150Ω	-40°C	2230Ω	40°C
1207Ω	-35°C	2309Ω	45°C
1266Ω	-30°C	2390Ω	50°C
1325Ω	-25°C	2472Ω	55°C
1387Ω	-20°C	2555Ω	60°C
1449Ω	-15°C	2640Ω	65°C
1513Ω	-10°C	2727Ω	70°C
1579Ω	-5°C	2814Ω	75°C
1645Ω	0°C	2903Ω	80°C
1713Ω	5°C	2994Ω	85°C
1783Ω	10°C	3086Ω	90°C
1854Ω	15°C	3179Ω	95°C
1926Ω	20°C	3274Ω	100°C
2000Ω	25°C	3370Ω	105°C

Table: Temperature / Impedance

5.8.4 0-10V voltage signal connection to B4

A standard signal (0-10V) is connected on the following terminals

GND = Earth (negative)

B4 = Signal input 0-10V DC (**max. 12V DC**).

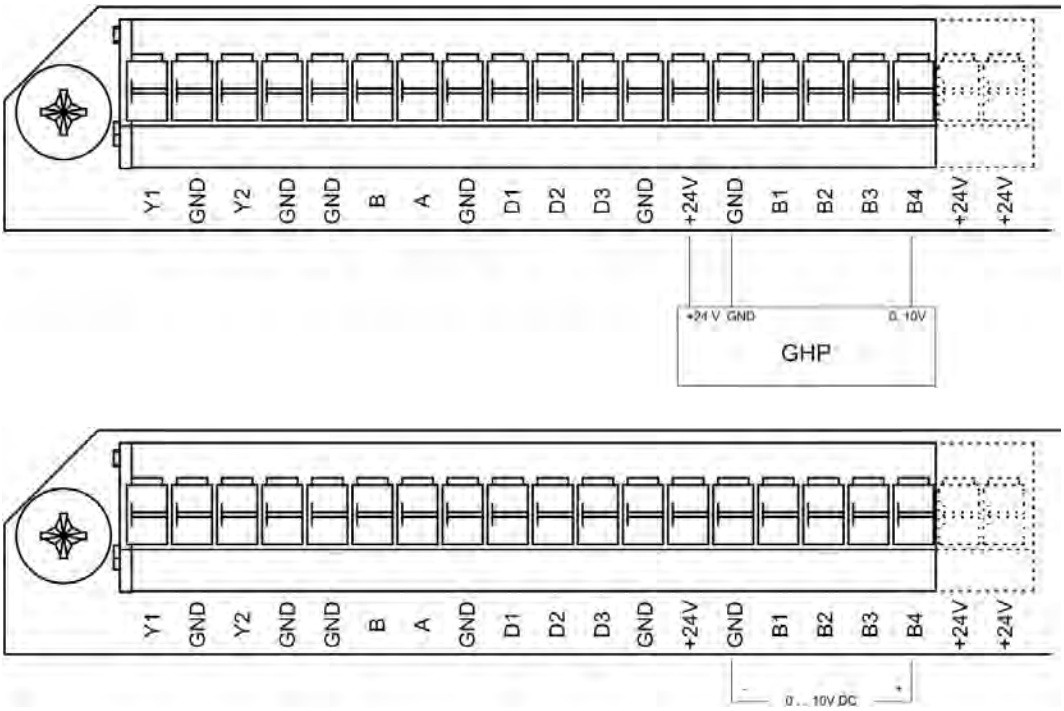
Make sure the polarity is correct (earth to **GND**, signal to **B4**)!

The 0-10V input is mostly used to operate the controller in SLAVE mode. To do this, this input must be defined as a slave input in the I/O configuration. The 0-10V input signal is scaled 0-100% in a control signal and passed on to the fans.

As an alternative, you can also connect a GHP manual potentiometer as a remote control. The connecting terminals on the GHP are labelled with either **1/2/3** or **x/-/Y** :

+ or **3**	on **+24V**
– or **1**	on **GND**
Y or **2**	on **B4**

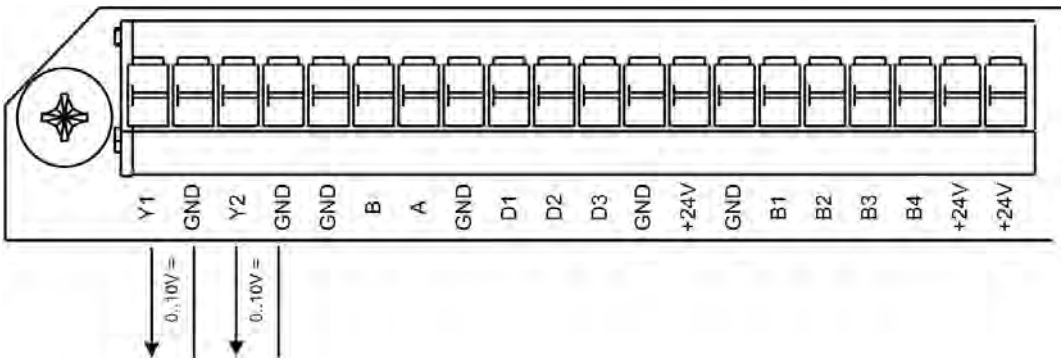
You can then use the speed controller purely as a speed adjuster and specify the fan speed yourself manually.



0-10V standard signal connection

5.9 Analogue outputs

The control unit has 2 analogue outputs with 0..10V output voltage.



Analogue outputs

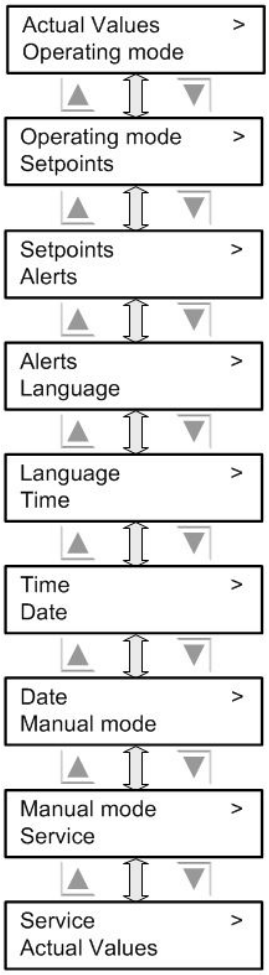
The **Y1** output issues the control signal (0..100%) scaled to 0..10V .

Output **Y2** issues the control signal for a subcooler, if this function is activated. 0..10V corresponds here with a control value of 0..100%.

See Subcooler function, Page 73

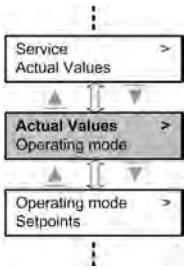
5.10 Operating menu

Structure of basic menu



5.10.1 Actual values

The actual input signals and control values are shown here.



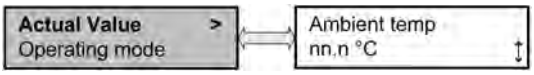
5.10.1.1 Input current values

Different values can be displayed when the *Current values* menu option is opened. The measured pressure, the temperature or the 0-10V control signal is displayed first. The value shown depends on the cooler type (condenser or recirculating cooler) and the operating mode (automatic or slave).

Condenser	No refrigerant	CDS press nn.n bar
Condenser	Refrigerant selected	CDS temp nn.n °C
Drycooler		Outlet temp nn.n °C
Slave	via 0..10V	Input 0..10V nn.n V

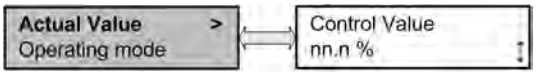
5.10.1.2 Ambient temperature

The current ambient temperature is shown.



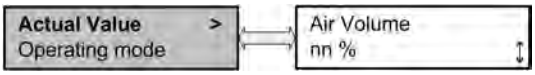
5.10.1.3 Control value

The control value of the controller delivered to the fans is displayed in percent.



5.10.1.4 Air volume

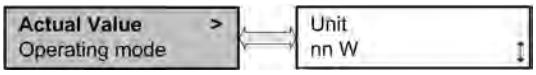
The average control value of all fans is shown here as a percentage.



5.10.1.5 Total power

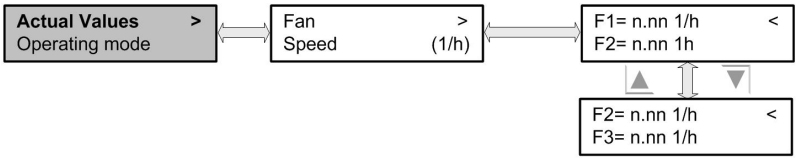
The total power of all fans is shown under this point. The power is calculated from the intermediate circuit voltage and the intermediate circuit current.

More information on each individual fan can be queried under the next menu options.



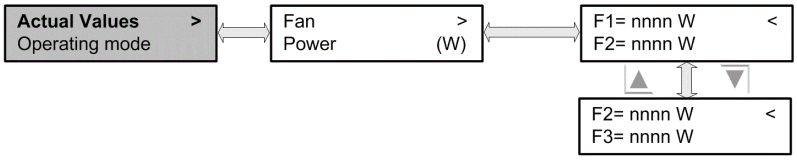
5.10.1.6 Fan speed

The current fan speed of each individual fan is displayed here. The list length is limited by the number of fans connected.



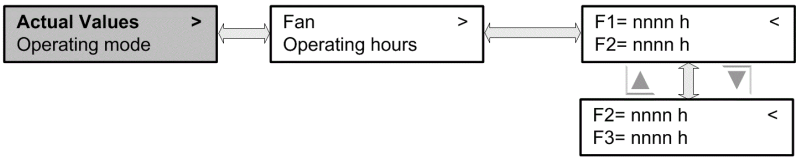
5.10.1.7 Fan power

The current power of any fan, calculated from the intermediate circuit voltage and the intermediate circuit current, is displayed here.



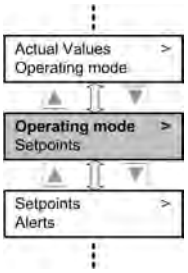
5.10.1.8 Fan operating hours

The operating hours of every EC fan are displayed.



5.10.2 Status

The operating statuses and software/hardware versions are displayed here.



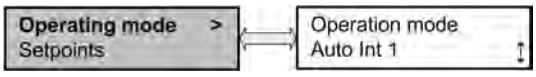
5.10.2.1 Operating mode

This shows the current operating mode.

There are:

Internal control	**Auto int. 1**	Setpoint 1 active	See Auto internal, Page 63
	Auto int. 2	Setpoint 2 active	See Auto internal, Page 63
	Auto ext. 1	Setpoint 1 active	See Auto external analogue, Page 63
	Auto ext. 2	Setpoint 2 active	See Auto external analogue, Page 63
	Auto ext. bus1	Setpoint 1 active	See Auto external BUS, Page 64
	Auto ext. bus 2	Setpoint 2 active	See Auto external BUS, Page 64
Slave	**Slave ext.**	Control value via 0...10V or 4-20mA	See Slave external analogue, Page 64
	Slave ext. bus	Control value via GCM *	See Slave external BUS, Page 64
Manual mode	**Manual mode**		See Manual mode, Page 56

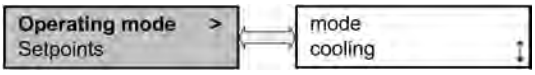
* GCM = Güntner Communication Module



For a precise description of the operating modes see section Operating mode, Page 63

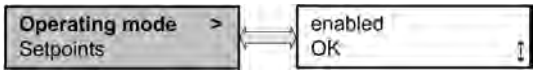
5.10.2.2 Mode

Set heating or cooling mode display.



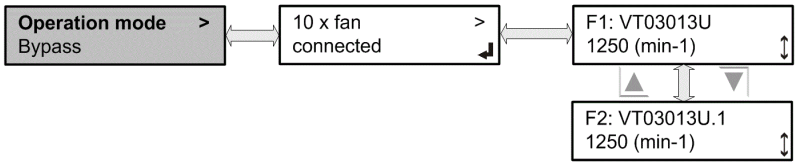
5.10.2.3 External release - Status

Controller on connection **D1** enabled "**OK**" or not "**None**"



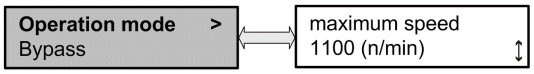
5.10.2.4 Number and type of fans

This displays the number of fans connected and their VT numbers.



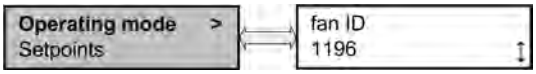
5.10.2.5 Max. fan speed

The set maximum speed appropriate to the design point of the heat exchanger appears. This speed is the same for all fans.



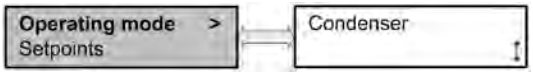
5.10.2.6 Fan ID

This shows which working point is set up for the connected fans via the fan ID. See Fan IDs, Page 110



5.10.2.7 Heat exchanger

The heat exchanger type is displayed here.



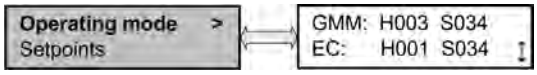
5.10.2.8 Refrigerant

If a condenser has been selected as the heat exchanger, the selected refrigerant is displayed here. If no refrigerant has been selected, “bar” is displayed.

5.10.2.9 Hardware and software versions

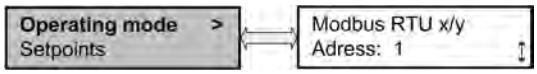
This shows information about the current hardware and software versions of the GMM.

GMM	→ Controller with display and keyboard.
EC	→ Fan management (PCB with fan connections)
H	→ Respective hardware version
S	→ Respective software version



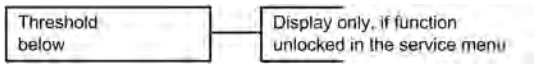
5.10.2.10 Bus module

This display provides information on the module type, firmware version and the address of the GCM bus module, when it is connected.

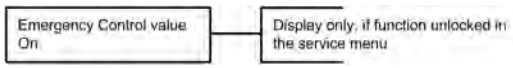


5.10.2.11 Threshold value/emergency control value

If the threshold value function is activated (see Threshold value, Page 75), a status display shows whether the value is above or below the threshold value.



If the emergency control value is issued because of the threshold value function, it is displayed here.

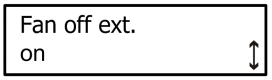


5.10.2.12 GHM Controller

If a GHM spray controller is connected, this will be shown here.

5.10.2.13 Fan OFF external

If the "Selective fan switch-off" function is switched on, it is displayed here (see Fan off external, Page 77).



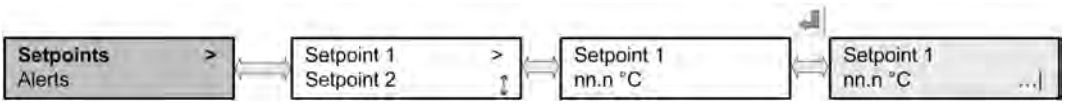
Display only, if function unlocked in the service menu

5.10.3 Setpoints

The setpoints can be set here.
The setpoint is the value (pressure, temperature or voltage) used as the reference for the control.

5.10.3.1 Setpoint 1

The current setpoint is displayed when the Setpoint 1 menu option is opened. What is displayed as the setpoint depends on the actual input value defined (voltage, temperature or pressure) and the operating mode (internal control or slave operation). As an example, setpoint 1 is displayed as the temperature.



Press the enter key to enter EDIT mode.

Use the left/right arrow keys to select the write position. Use the up/down arrow keys to edit the value at the selected position.

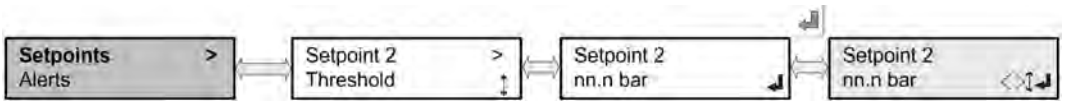
The minimum and maximum adjustment range is:

Set current value	Set operating mode	Setpoint display
Temperature	Control	-30.0 - 100.0 °C
Pressure	Control	0.0 - 50.0 bar
Volt	Control	0.0 - 10.0 V

The values are entered to one decimal place. Press the enter key to accept the set value.

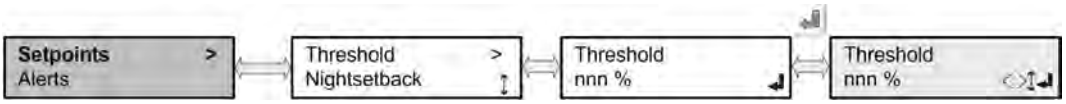
5.10.3.2 Setpoint 2

If 2 setpoints are defined in the **SERVICE** menu, a second setpoint is set here. This can be activated via digital input **DI3**. Setpoint 2 is programmed the same way as **setpoint 1**.



5.10.3.3 Threshold value

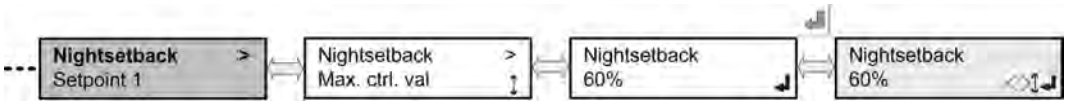
Here you can set the threshold values, violation of which will activate the threshold function. Appropriate threshold values for the configured system are offered in the Service menu (see Threshold value, Page 75).



5.10.3.4 Nightsetback

The Nightsetback function is used to limit the control value for the fans to a maximum value and thus minimise noise emissions. The limiter can be activated via **D2** digital input or via the built-in timer.

Defining maximum value

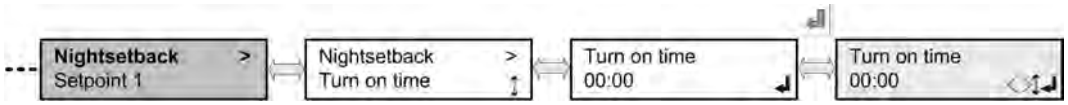


5.10.3.4.1 Night limiter activation/deactivation time

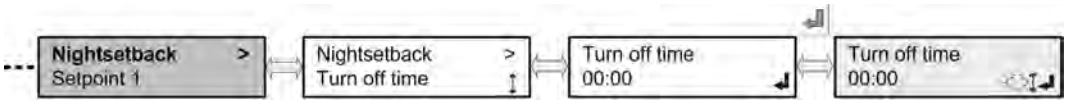
The built-in timer allows the night limiter to be activated and deactivated at specific times.

If the same value is entered for both the activation and deactivation time (e.g. 00:00), the time-controlled night limiter is deactivated.

Set start time



Set end time



5.10.3.4.2 Night limiter functions list

Input	Night limiter with time	Night limiter
Inactive	Off	Off
Active	Off	On
Inactive	On	On
Active	On	On

5.10.4 Alerts

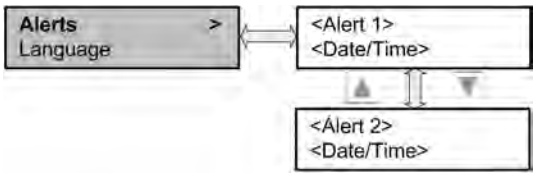
The last 85 alerts can be called up here.

5.10.4.1 Alert memory

The GMM has an alert memory that can accommodate up to 85 incident report, turn-on and reset times stored consecutively (cyclically). These incident reports consist of the fault and the time stamp, comprising the date and time when the fault occurred. For a list of error messages and warnings see Error messages and warnings , Page 108.

When the alert memory is selected, the display shows the last fault that occurred.

Use the “down” arrow key to display older faults.

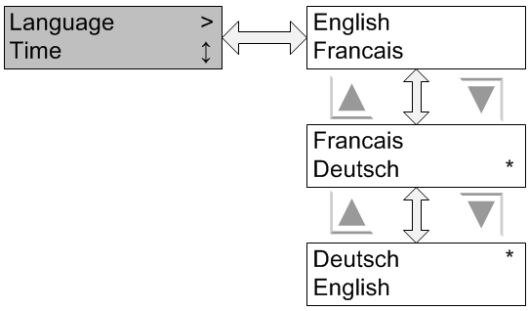


5.10.5 Language

The menu language can be selected here.

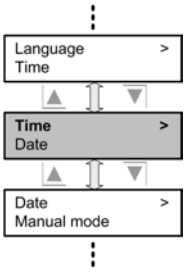
5.10.5.1 Language selection

3 languages can be selected in the Language selection menu. The selected language is marked with an *asterisk*.



5.10.6 Time

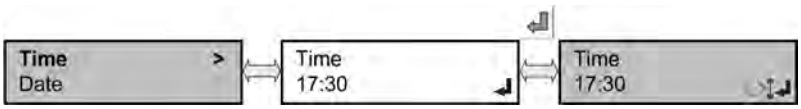
The time can be selected here.



5.10.6.1 Time setting

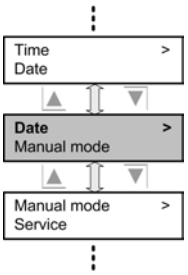
The set time is displayed and changed where required in the 24-hour clock.

The time is used to enter the alarm times in the alarm memory and for all timer functions (night reduction etc.).



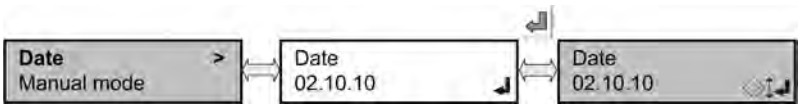
5.10.7 Date

The date can be set here.



5.10.7.1 Set date

The date is used to enter the alarm times in the alarm memory and for all timer functions. (night reduction, etc.)



5.10.8 Manual mode

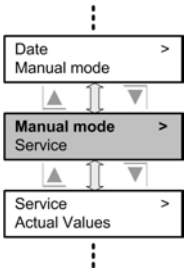
Manual mode is used to start up the heat exchanger fans by hand.

If it is activated, the fans run with the manual mode control value.

Manual mode does not depend on D1 enabling.

Manual mode has the highest priority and switches off all other control types.

The fact that manual mode is active is recorded permanently. In other words, it will still be active after you have switched the system off and back on.



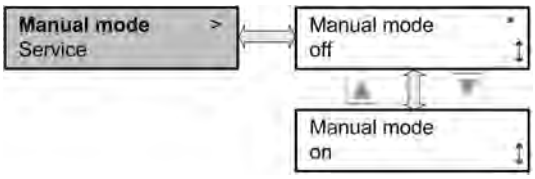
Manual mode can also be activated via digital input 2. The digital input has to be configured accordingly for this purpose in the Service menu (see Digital inputs, Page 87 or Speed limiter/External manual mode, Page 34).
If the input is configured and connected with +24 Volt, the previously defined manual mode control value is output.

5.10.8.1 Manual mode settings

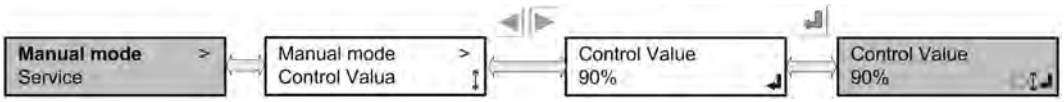
When manual mode is activated, the value in the control value menu can be changed.

The * indicates whether manual mode ON or OFF is active.

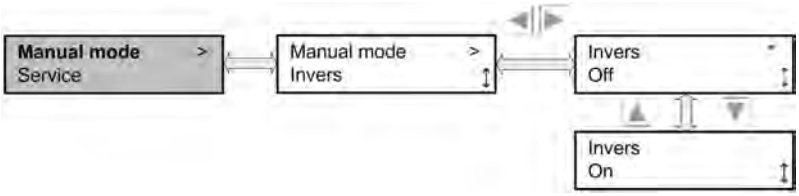
Manual mode ON / OFF



Manual mode control value



Manual inverse operation



While manual operation is active it is possible to cycle the fans in the opposite direction to their preferred direction.
You do this by activating **“Inverse = On”**.

ADVICE

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

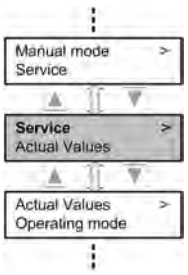
5.11 Service

The Service menu is accessible only with the correct password, which is the first thing you are asked for.

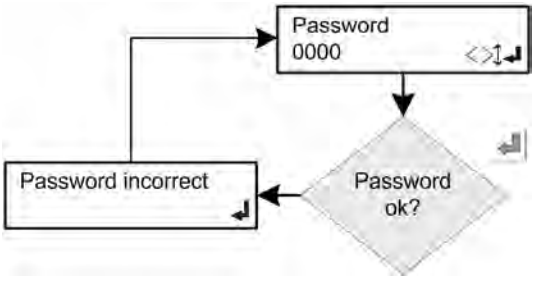
The password is **3795**.

Once the password has been accepted, the Service menu appears.

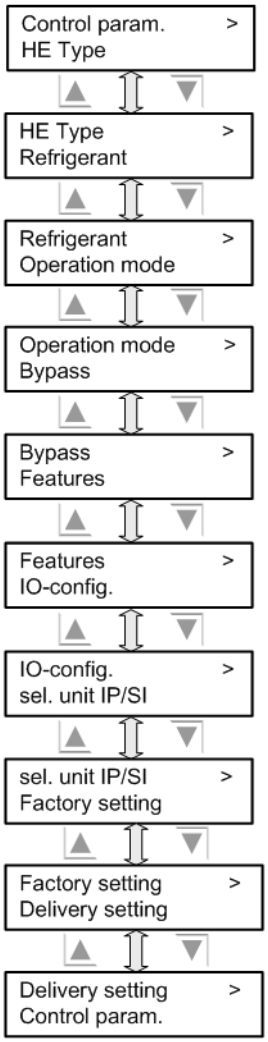
The password is valid for 15 minutes and will not be requested again during this time.



Password prompt

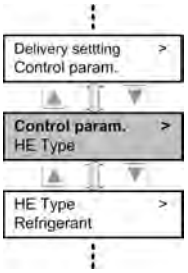


Service menu set-up

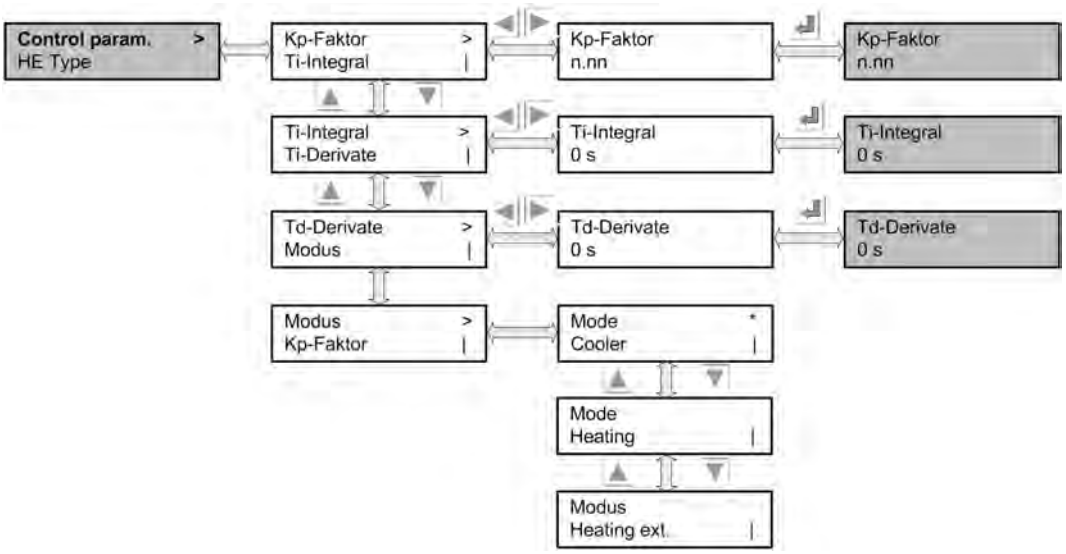


5.11.1 Control parameters

In this menu you configure the control parameters of the digital PID controller (proportional, integral, derivative controller).



5.11.1.1 Control parameters Kp, Ti and Td



The Kp factor can be entered in a range from 0.1 to 100.0 to one decimal place. The Kp factor specifies the control amplification. It is the proportion of the control path following the input signal.

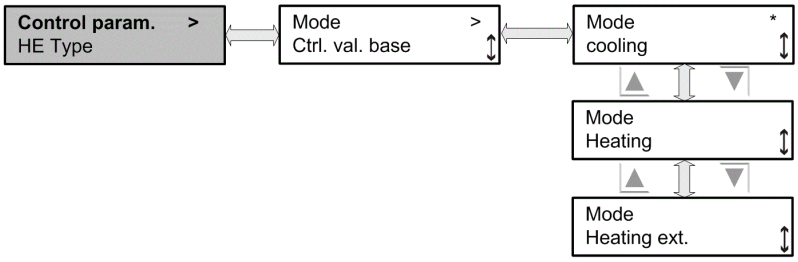
The Ti reset time changes the control value in the set time by the value specified by the proportional factor.
Example: With an unchanged control deviation (X_s) of 1K and X_p = 10 the control signal in Ti = 25s is increased by 10%.

The delay time Td can be set in a range from 0 to 1000 seconds. The D part of the controller does not react to the deviation but to the speed of change.

Normally the GMM is used to cool liquids and refrigerants. With some applications a reversal of the function is required, i.e. liquids are warmed. With the regulator parameter setting “Mode” the control characteristics can be set to heating.

This function can generally be performed once (heating), or it can even be switched over via the DI3 input (heating ext.).

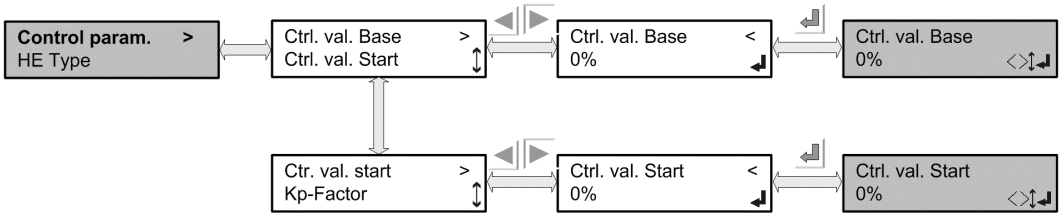
5.11.1.2 Cooling/heating control parameter mode



Normally the GMM 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 “Mode” control parameter setting the control characteristics can be set to heating.

It is possible to change the mode (heating ext) via the DI3 input.

5.11.1.3 Base control value and Start control value control parameters



The **base control value** function is used to set a minimum speed.

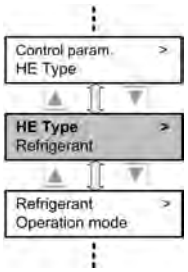
The **start control value** function is used to define a start point for issuing the control value.

Here are some setting examples:

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

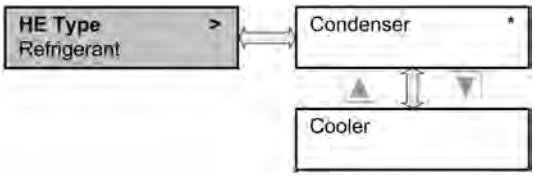
5.11.2 Heat exchanger

The heat exchanger type is selected here.



5.11.2.1 Heat exchanger type

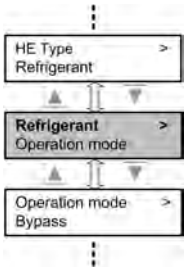
The heat exchanger type is selected here.
The selected type is displayed with a *.



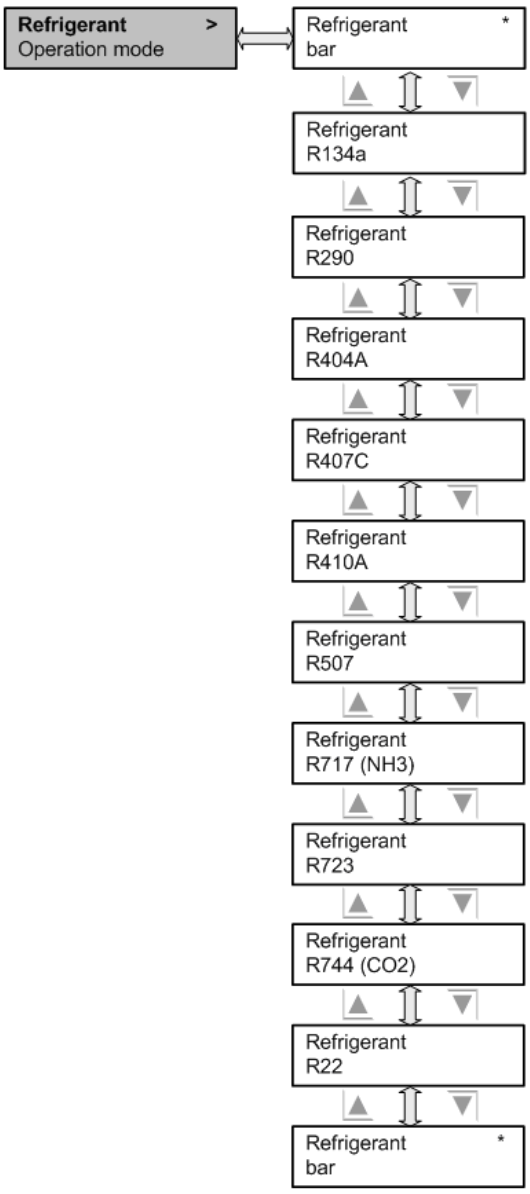
→ Select with ENTER.

5.11.3 Refrigerant

A refrigerant is selected here.



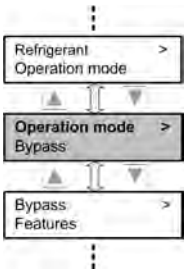
5.11.3.1 Refrigerant selection



In this menu option you can select whether a refrigerant has been defined and whether the display of reference and current values with temperature should be converted accordingly, or whether no refrigerant has been defined (bar) and the setpoints and current values should be displayed as pressure.
The selected option is displayed with a *.

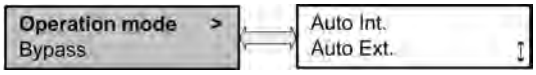
5.11.4 Operating mode

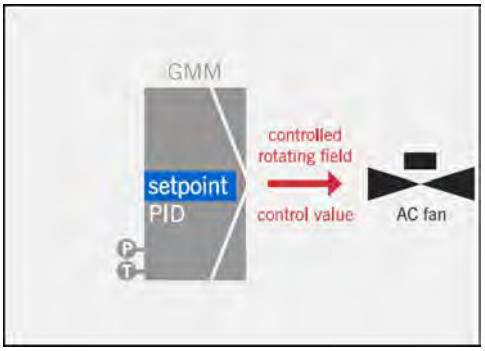
The operating mode can be set in this mode.
The active mode is shown with a *.



5.11.4.1 Auto internal

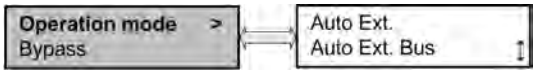
In this mode, control is automatic on the basis of the setpoint defined internally. This setpoint is entered in the **Setpoints** menu option.

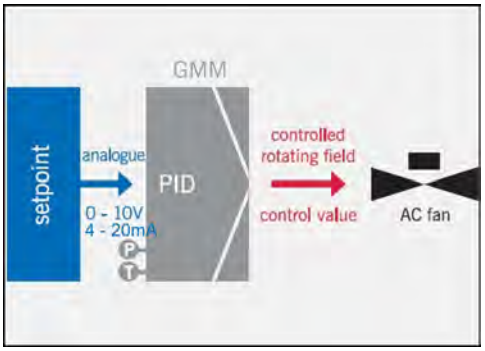




5.11.4.2 Auto external analogue

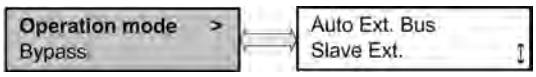
In this mode, control is automatic on the basis of the setpoint defined externally by the analogue input. Which input delivers the setpoint and which the actual value is defined in the IO configuration.

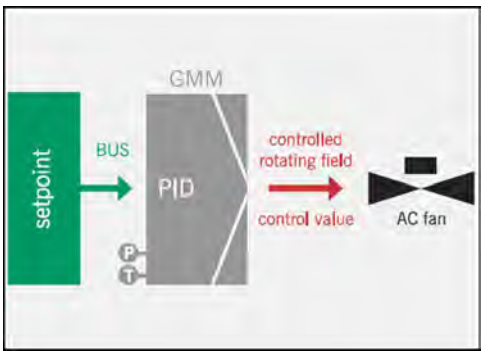




5.11.4.3 Auto external BUS

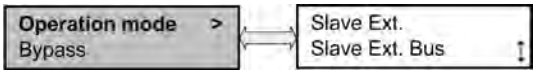
In this mode the setpoint is specified via BUS.
A Güntner Communication Module (GCM module) is required for this operating mode.

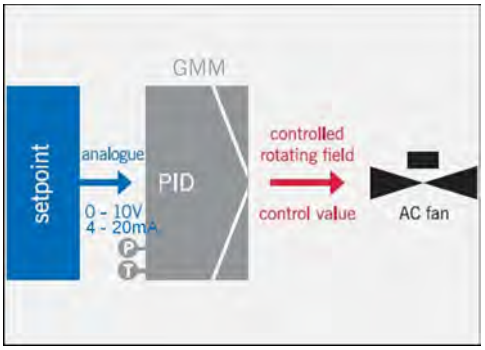




5.11.4.4 Slave external analogue

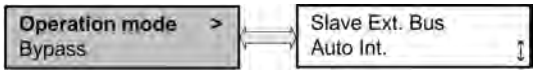
In this mode, there is no internal control. Instead the control value on the slave input is scaled and forwarded directly to the fans. Which input is to be used as the slave input is defined in the I/O configuration.

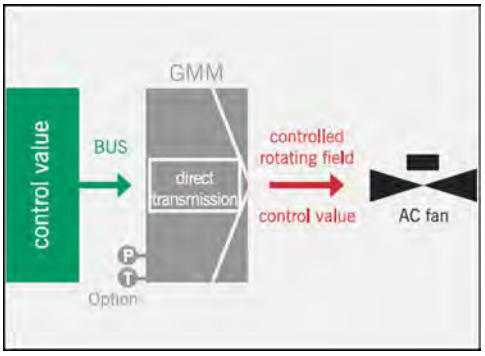




5.11.4.5 Slave external BUS

In this mode the control value is specified via BUS.
A Güntner Communication Module (GCM module) is required for this operating mode.

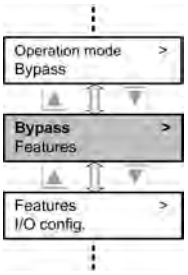




5.11.5 Bypass

The bypass function can be activated or deactivated in this service option. If the function has been activated, the control value for bypass mode can be set.

This function is used to maintain operation in the event of a fault in a GMM component.



5.11.5.1 Bypass switching

The bypass function has the effect that if there is a fault in the GMM the fans will run at the speed specified here.

The bypass speed is activated automatically 10 s after the connection to the GMM is lost or there is a sensor fault.

The bypass mode currently set is shown with an asterisk.

The following options can be set:

Bypass operation ON

Control value 0%

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

→ all the fans stop

Bypass operation ON

Control value 100%

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

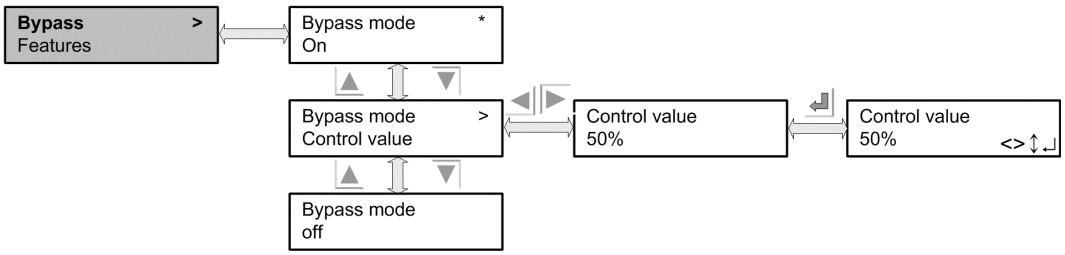
→ all fans run at their maximum speed

Bypass operation OFF

The control value is then not visible on the display and therefore does not have to be set.

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

→ all fans run at their last speed before the GMM failed

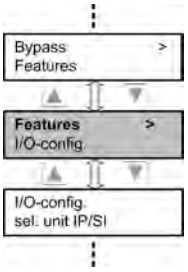


ADVICE

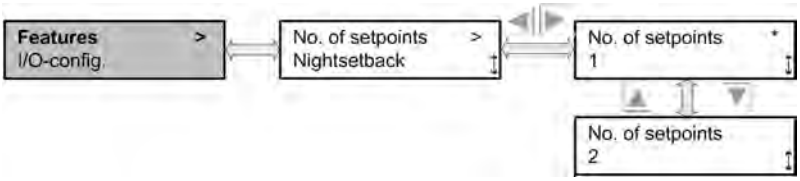
After modifying the bypass function you should switch the fans off and back on.

5.11.6 Features

The special functions, such as number of setpoints, the night limiter or set-point displacement, the Low Capacity Motor Management or the subcooler function, can be selected in this service menu option.



5.11.6.1 Number of setpoints

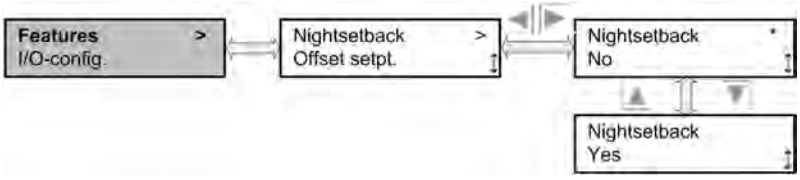


The number of setpoints is set here. The minimum number is 1 setpoint on which control is performed. If 2 setpoints are selected, switchover is via digital input **D3**. If the input is open, setpoint 1 is used for control.

If the **D3** input is connected with **GND,** setpoint 2 is used for control. In version **.1** the **D3** input must be connected with **+24V** to switch over to setpoint 2.

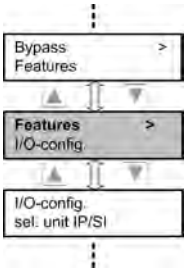
Two different setpoints can consequently be determined for summer and winter operation, for example.

5.11.6.2 Nightsetback



A night limiter is generally activated or deactivated in this service option. The night limiter value is set with the **Night limiter** menu option. The night limiter, i.e. activation and deactivation and the control value, can also be programmed in the normal operating menu. The night limiter can be activated both via digital input **DI2** and via the activation and deactivation time. Both activations can take place in parallel. If the activation and deactivation times are the same, activation is only via the digital input **DI2**.

5.11.6.3 Offset setpoint



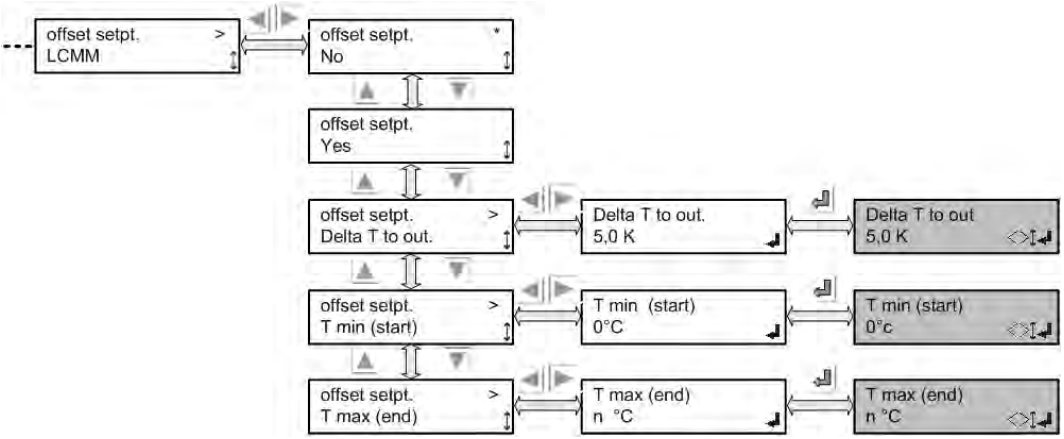
It is beneficial in order to ensure the optimum energy operation to displace the setpoint under certain circumstances, depending on the external temperature.

Setting the min. condensation temperature can cause rising external temperatures, so that the external temperature is above the setpoint. If the system is now only to be operated at partial load, raising the setpoint can save energy on the fans. Without a displacement these fans would always be controlled with 100%, as the high external temperature (above the setpoint) means this setpoint cannot be reached.

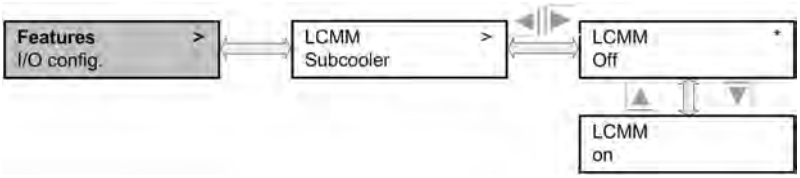
The temperatures Tmin external and Tmax external can be set in the menu. The range between Tmin external and Tmax external marks the range to be displaced into. The ΔT, which defines the offset between the setpoint and the external temperature, must also be defined.

Example:	Setpoint	= 25°C
	ΔT	= 5 K
	Tmin external	= 20°C
	Tmax external	= 40°C

In this example the setpoint must always be 5 K above the external temperature. The displacement therefore begins at 20.1°C external temperature. At this point the setpoint is displaced to 25.1°C. Tmin external and Tmax external limits mark the range in which the displacement works. In this example the setpoint is displaced at 20°C at the earliest, provided the setpoint is low enough. The max. value where the setpoint can be displaced to is at 45°C in this example.



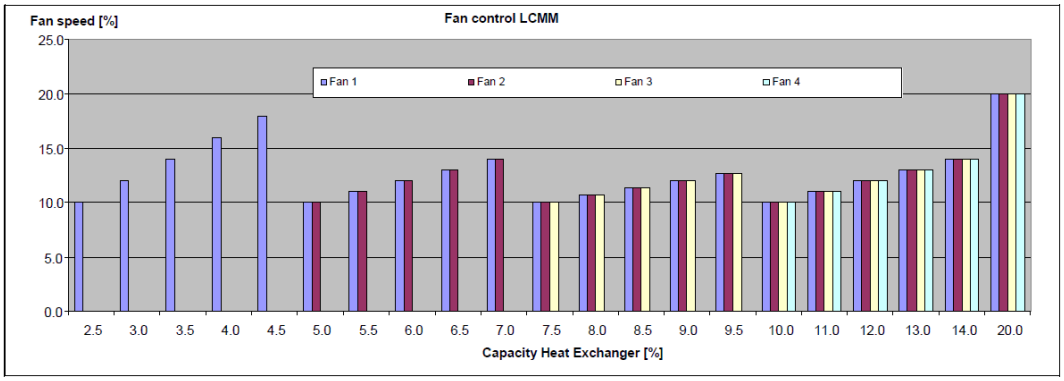
5.11.6.4 Low Capacity Motor Management



EC fans have a minimum speed that is in an approx. 9 – 15% range 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 enables a control value that is lower than the minimum control value of an individual fan by switching the fans off and on (min. control value = min. fans speed / number of fans). With control values that are above the minimum speed of an individual fan (therefore from approx. 9-15%), all fans run regularly and the control is now only via the fans' speed. The advantage of this control is the ability, even with low heat exchanger power, to use the continuous control via the fan speed instead of to running a pure 2 point control.

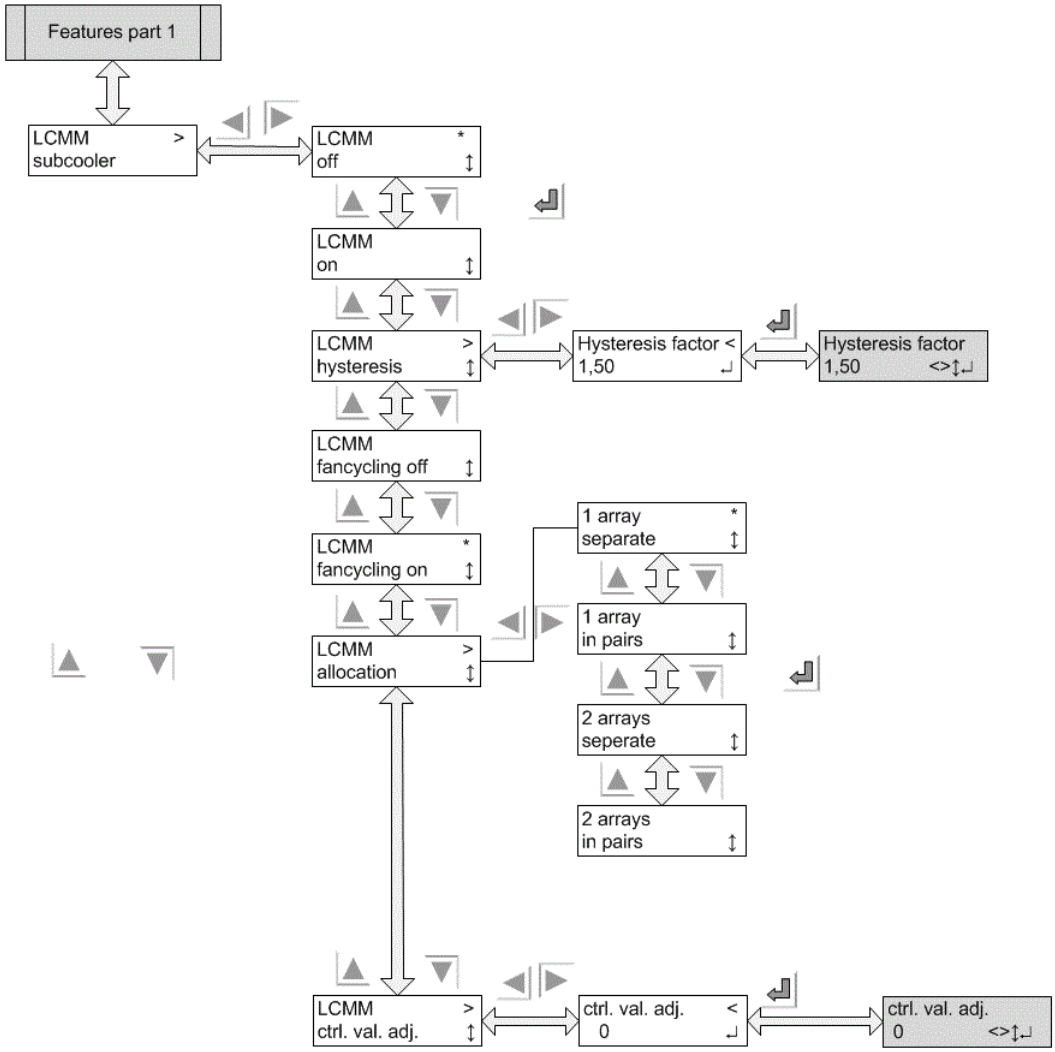
A system with 4 individually controlled fans serves as an example. With an assumed minimum fan speed of 10% of the maximum speed, a control value of 2.5% can be set for the heat exchanger (10% / 4). At this setting one fan runs with the required minimum speed and all other fans are switched off. If the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



LCMM with 4 fans

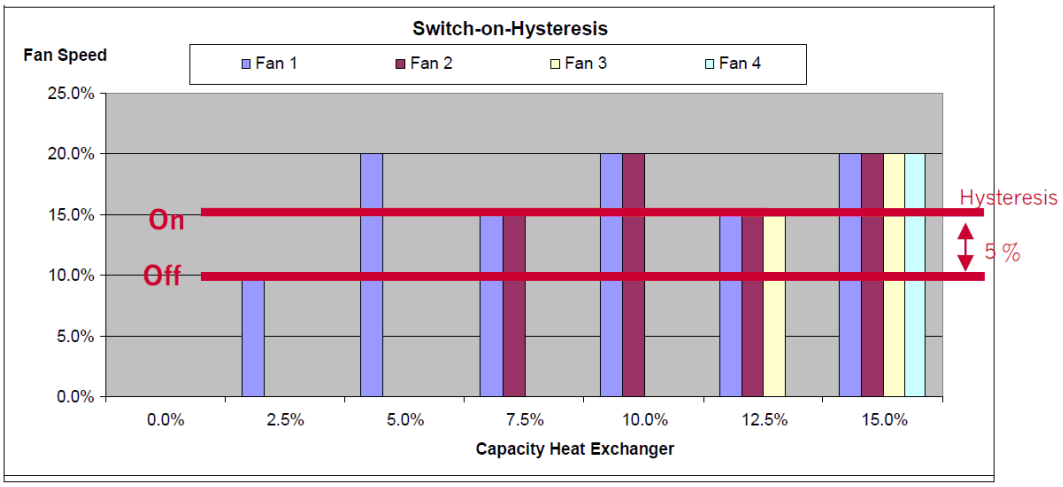
5.11.6.4.1 LCMM hysteresis

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



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

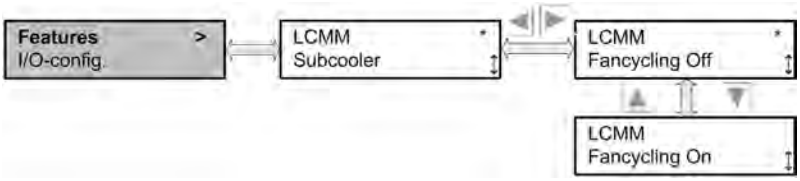
In the example shown below the minimum speed of a fan is at 10%, the hysteresis factor is at 1.5 and therefore the speed at which the first fan is activated is at 15% (this is equal in our example with 4 fans to a heat exchanger power of 3.75%). The first fan is deactivated at a heat exchanger power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



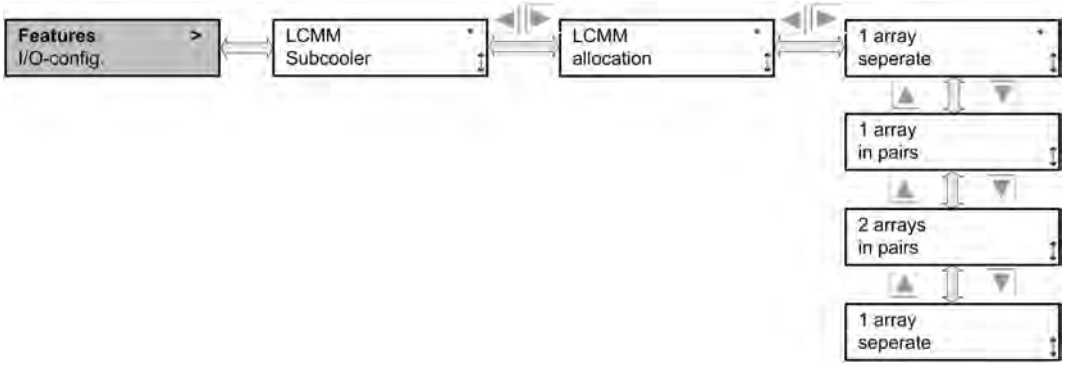
LCMM hysteresis switch-on

5.11.6.4.2 LCMM Fancycling

Via the Fancycling LCMM offers the ability to keep the fans' runtimes 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 devices with the least operating hours are switched on first. This in turn increases the EC fans' overall service life.



5.11.6.4.3 LCMM Fancycling assignment



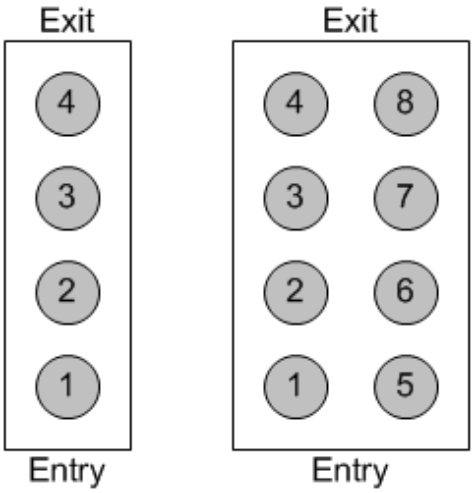
The assignment of how the fan cycling is to run can be performed in 4 different ways. The single row assignment for heat exchangers of up to 8 fans is in 1 row. The two row assignment applies for heat exchangers with up to 16 fans in 2 rows.

1 row single (1- 2 - 3- 4- 5- 6- 7- 8)

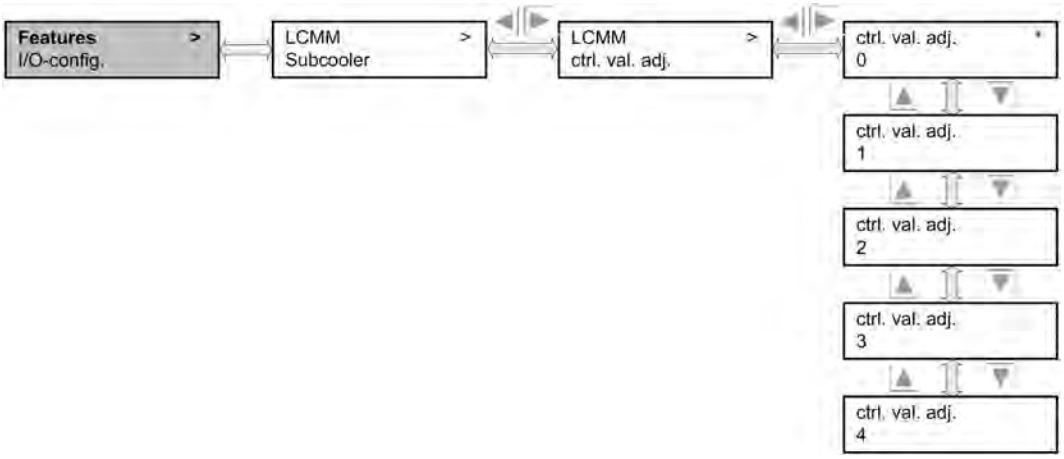
1 row in pairs (1+2, 3+4, 5+6, 7+8)

2 rows single beside one another (e.g. with fan unit 8: 1-5-2-6-3-7-4-8)

2 rows in pairs (e.g. with fan unit 8: 1+5, 2+6, 3+7, 4+8)



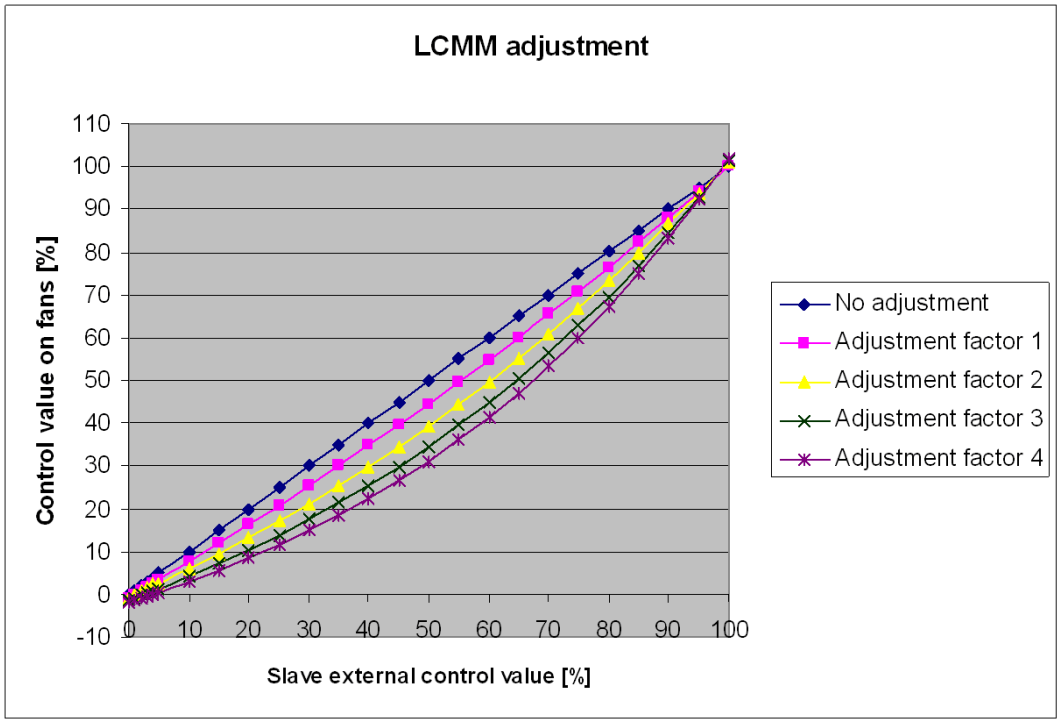
5.11.6.4.4 LCMM min. control value adjustment



The control value adjustment means that with the “Slave external” operating mode the pre-set control value 1:1 is not issued, but it can be adjusted to a maximum of 4 levels.

This makes it possible to make a “Signal adjustment” over the 0-100% range, whereby the values 0% and 100% are not adjusted.

The adjustment is shown in the diagram below. The X axis gives the external pre-set control value in % and the control value for the fans can be read in % on the Y axis.



LCMM adjustment

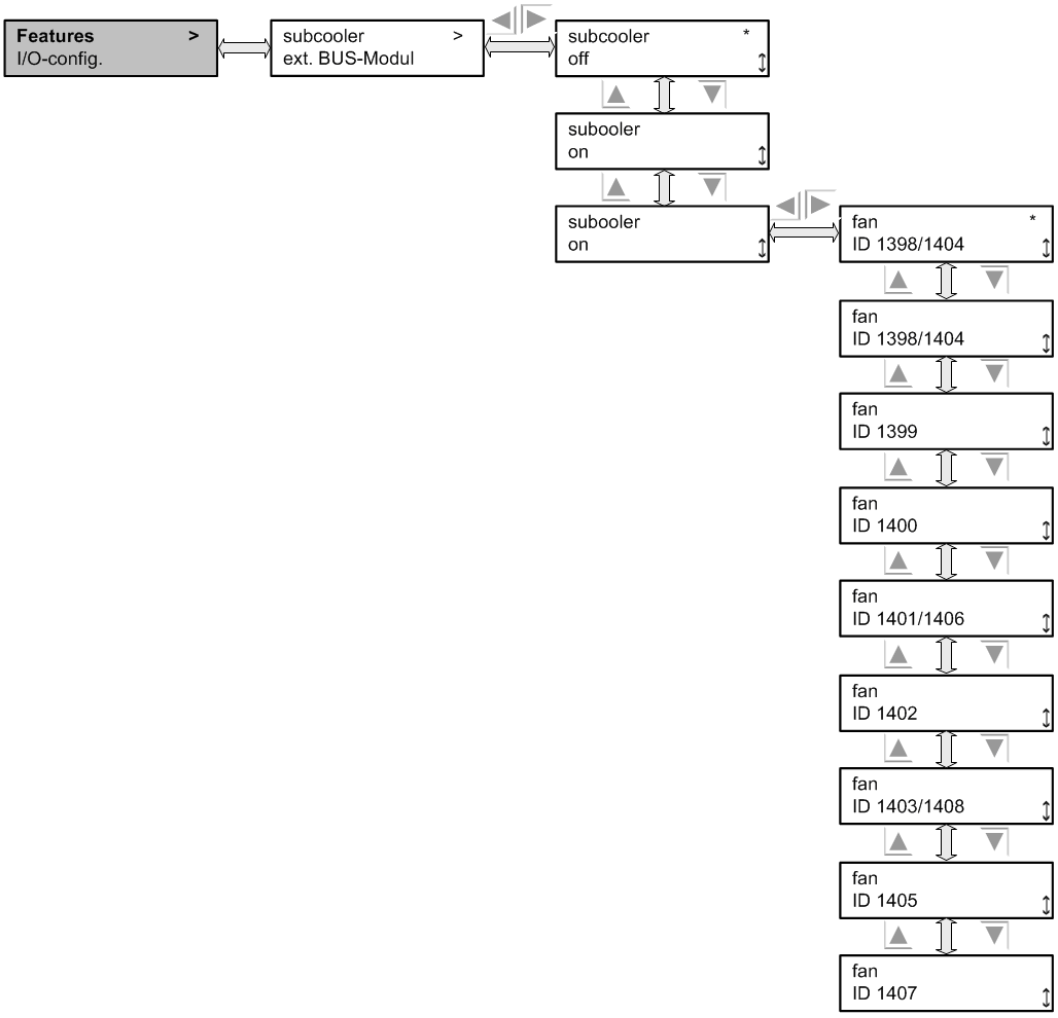
5.11.6.5 Subcooler function

This function allows a separate EC fan to be operated as subcooler. The control value for the subcooler fan (0..10V = 0..100%) is given via the "AO2" output to the fan.

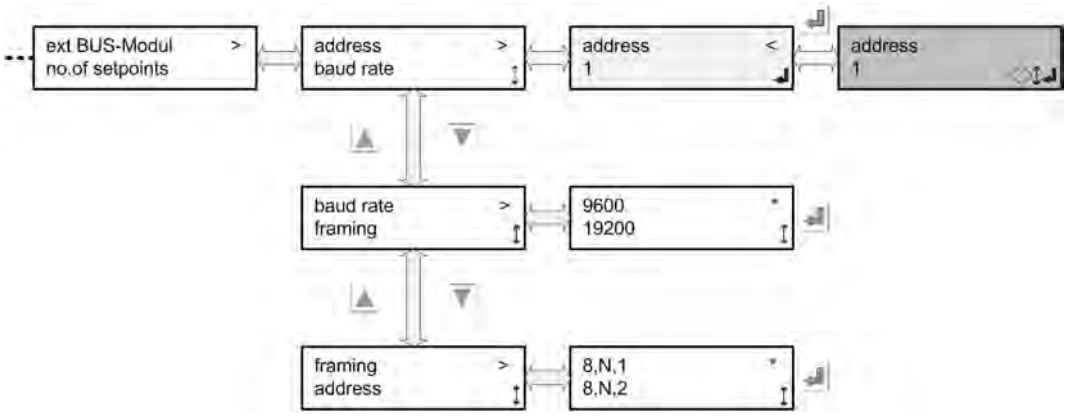
This subcooler runs constantly, independent of the regulation of the control unit with the set speed. It is activated like the regulated fans via the enable.

The subcooler function can be switched on and off in the functions menu.

The fan type used is selected in the selection menu.



5.11.6.6 External BUS module



These functions allow you to change the interface parameters of the connected bus module.

The following parameters can be changed for a Modbus RTU module:

Address:	1....247
Baud rate:	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200 Baud
Framing:	8,E,1 (8 Bit, even parity, 1 Stop Bit) 8,N,1 (8 Bit, no parity, 1 Stop Bit) 8,N,2 (8 Bit, no parity, 2 Stop Bit) 8, O,1 (8 Bit, odd parity, 1 Stop Bit)

Only the fieldbus address can be changed for a Profibus (0....126); the baud rate is set automatically.

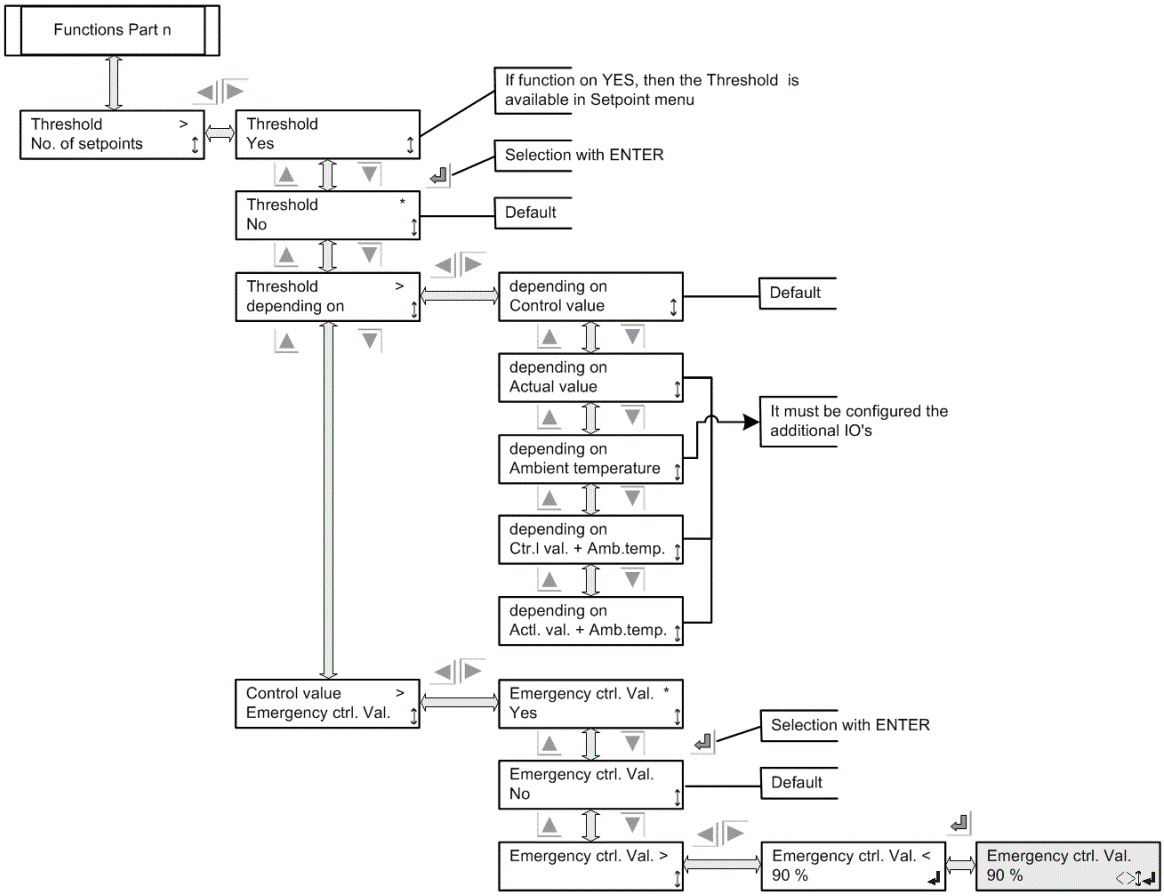
ADVICE

Turn off the power to GMM + bus module after every address change. Only then will the new parameters be accepted.

5.11.6.7 Threshold value

Using the threshold value function, the threshold value relay (digital output DO4, contact 41/44) can be tripped depending on various parameters.

The function must first be activated and pre-configured in the Service menu for this.
The respective threshold values can then be set in the Setpoints menu.
The function is deactivated by default.



YES/NO threshold value:
The function can be switched on or off here. Only when the function is switched on is this active and offered in the Setpoints menu.

Threshold value depends on:
What the function depends on can be configured here.

Depends on
control value:
The threshold value relay is tripped when the control value is greater than the configured threshold value.

Depends on
actual value:
The threshold value relay is tripped when the actual value is greater than the configured threshold value.

Depends on
control value + Ext. temp..:
The threshold value relay is tripped when the control value AND the external temperature are greater than the configured threshold values.

Depends on
actual value + ext. temp.:
The threshold value relay is tripped when the actual value AND the external temperature are greater than the configured threshold values.

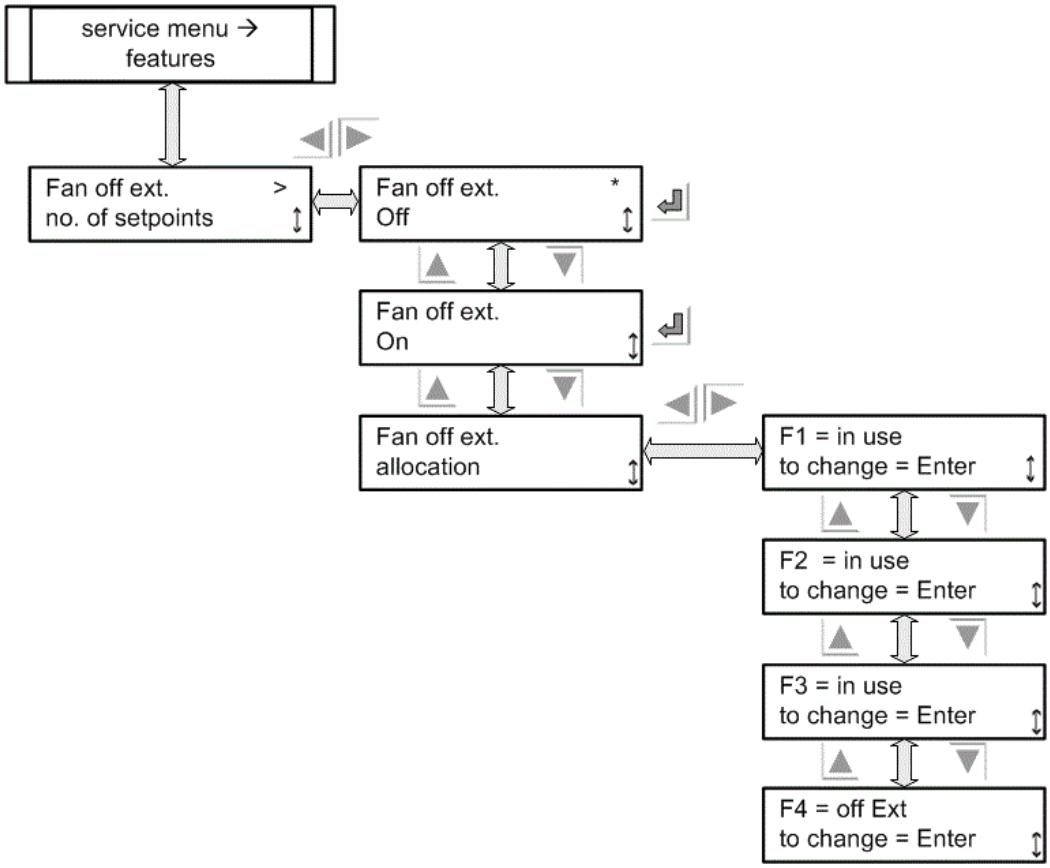
Emergency control value Yes/No/Emergency control value:
The emergency control value is issued as a control value when the following conditions are satisfied:
- Threshold value function is active
- Threshold value condition(s) exceeded
- Emergency control value function is active
- Emergency control value is greater than its calculated control value (e.g. with control operation or bypass value with sensor fault)
- Manual mode is not active
- External enable provided

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

5.11.6.8 Fan off external

With this function you can selectively switch off specific fans using the DI3 digital input (speed = 0).

The function is deactivated by default.



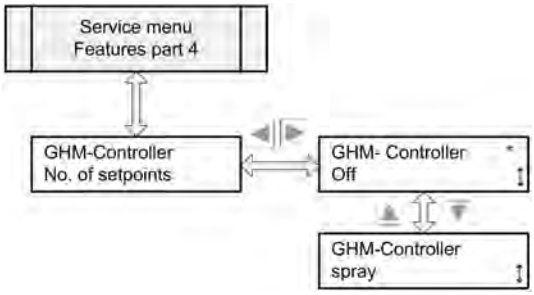
Fan off Ext
Off/On
This allows the function to be switched on/off.

Fan off Ext
Allocation
For each connected fan you can select here if it will be switched offwith activated DI3 input.

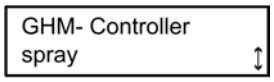
5.11.6.9 GHM Controller

When a GMM is coupled with a GHM spray via the CAN bus, this function has to be activated for the GMM (master).
The GMM is then responsible for the control and monitoring of the GHM.

If the connection fails, an entry is made in the GMM alarm history (and that of the GHM).

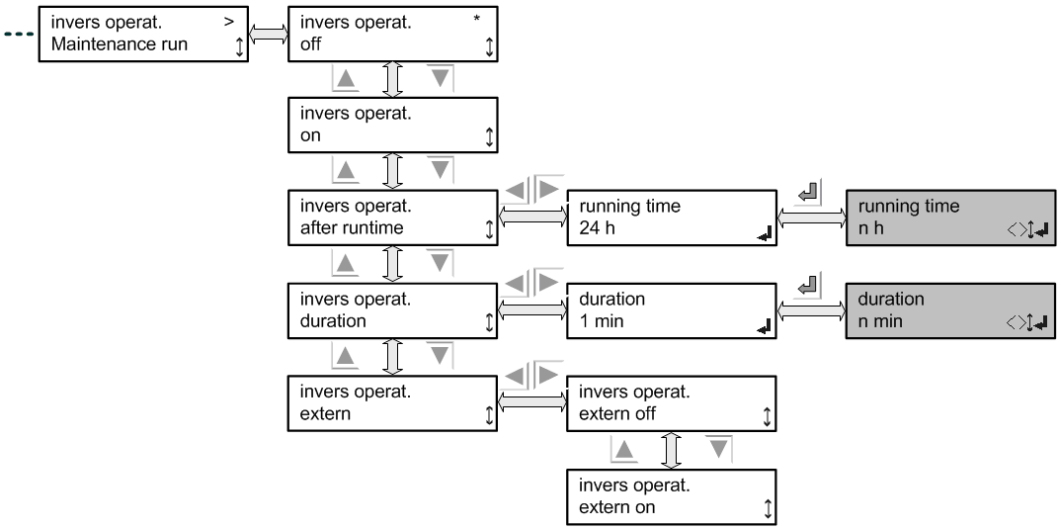


If the GHM spray function is activated, this will be displayed in the status menu:



If the function is corrupt (e.g. GHM is off), GHM-NOK will be displayed in the Info menu.
Furthermore, a priority 2 incident report is issued and an entry made in the alarm history.

5.11.6.10 Inverse operation



Activation of inverse operation depends on the fan having been in operation for a certain time. It is always carried out with the fan at full speed and in the opposite direction.

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

This function is carried out directly following normal fan operation when the following conditions are fulfilled:

- Manual operation is deactivated
- Control value of the PID controller = 0, i.e. no speed request
- Night limiter is off
- No fault pending

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

If the run-time limit is exceeded while the unit is in operation, inverse operation will be delayed until the next time the fans stop.

If a speed request is made during inverse operation, or if one of the above conditions is not fulfilled, inverse operation will be aborted and the controller will return to normal operation. In such cases, inverse operation is considered to have not been performed and will therefore be repeated the next time the fans stop. Aborting inverse operation always resets the counter for the inverse operation duration.

Inverse operation is not considered to be complete until a complete cycle has been carried out at one time.

Inverse operation can also be activated via digital input DI3. This can be activated via the "Inverse operation external" menu option. The "Inverse external" function via DI3 has a higher priority in this case in relation to a potentially configured Setpoint 2, Fan off external or Heating external function, which is also activated via input DI3.

ADVICE

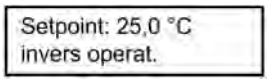
This function is possible only with EC fans supplied later than 2012 (approximate figure, because old stocks may have been being used up).

The following parameters can be set up:

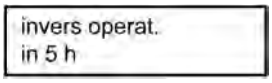
"Inverse operation On/Off":
default = **OFF**
This is used to turn the function on or off.

"Inverse operation according to run-time":
default= **24 hours**, Min = 5 hrs, Max = 240 hrs
When the fans have been in operation for this length of time, the start of inverse operation is scheduled.
Only actual operating time in seconds is counted. Time during which the fans are at rest is not included.

"Inverse operation duration":
default = **1 min**, Min = 1 min, Max = 10 min
This is used to specify the duration of inverse operation.

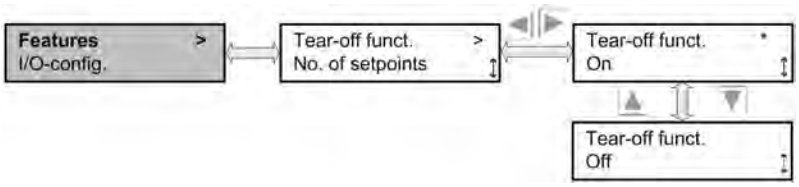


Displays in the Info menu: "**Inverse operation**" flashes when inverse operation is active.



Displays in the Status menu: "**Inverse operation in: nnn h**"
This shows the remaining required operating time before the next inverse operation.

5.11.6.11 Tear-off function



- The tear-off function prevents the fans from being blocked by snow during the winter.
- The GMM menu offers this function only if it is possible for all the EC fans.

ADVICE

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

The following parameters can be configured:

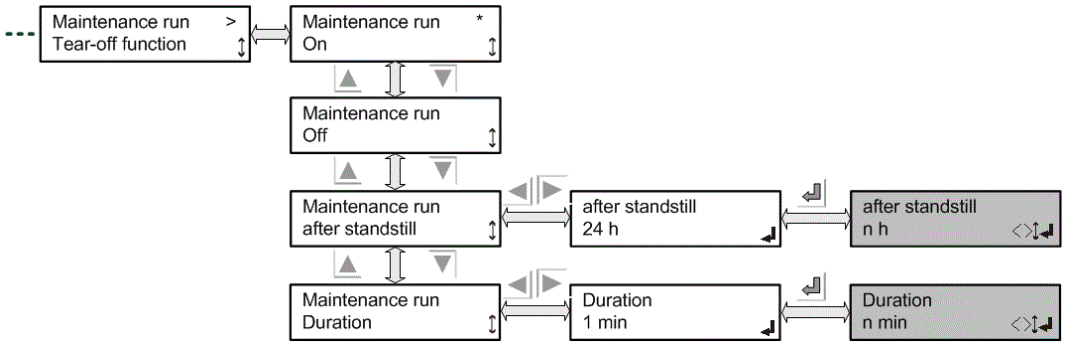
Tear-off function On/off:
Default : **On**

While 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-drive-current attempts to start up in the preferred direction.

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

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

5.11.6.12 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 standstill period depends on the following conditions being fulfilled:
a) Manual operation is deactivated
b) Control value of the PID controller = 0, i.e. no speed request
c) No fault pending

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

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

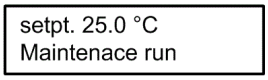
A maintenance run is carried out at full speed, but this will be reduced by an active night limit.

The following parameters can be set up:

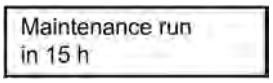
“Maintenance run On/Off”:
Default = **On**
This is used to turn the function on or off.

“Maintenance run after standstill”:
Default: **24 hrs**, min=1, max = 1000 hrs
If the fans have not been in operation at all during this configured period then a maintenance run will be started.

“Duration of maintenance run ”:
Default =**1 min**, min = 1 min, max = 10 min
This is used to specify the duration of a maintenance run.



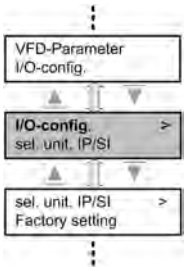
The Info menu display “**Maintenance run**” flashes while a maintenance cycle is in operation.



Status menu display: “**Maintenance run in: nnn h**”
This shows the remaining required stationary period before the next maintenance cycle.

5.11.7 I/O configuration

This menu option is used to configure the analogue and digital inputs and outputs.
Selected functions can be assigned to the inputs and outputs.



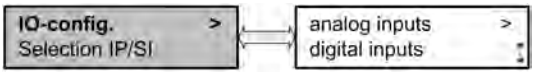
5.11.7.1 Analogue inputs

The analogue inputs are measurement inputs for recording temperature or pressure values.

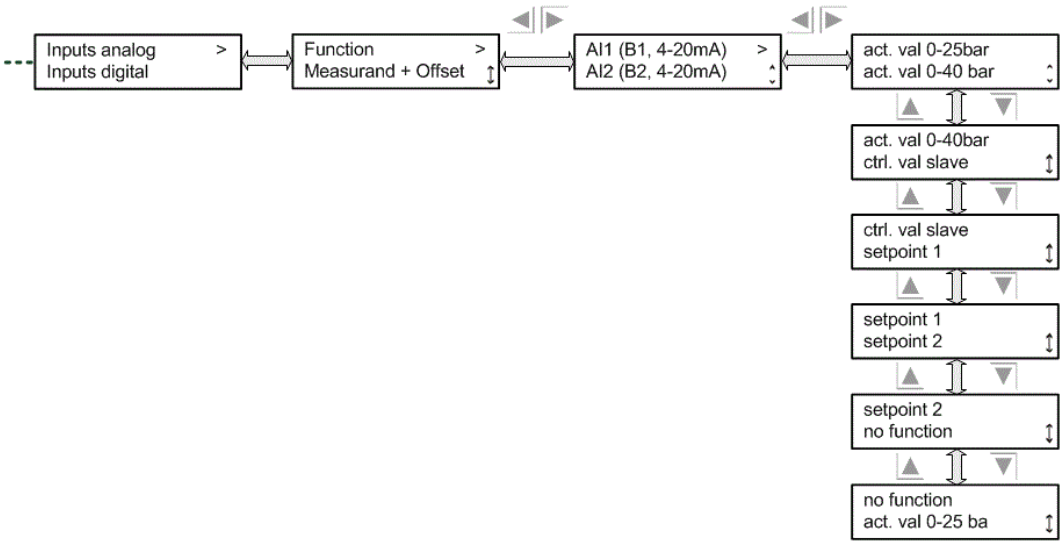
These inputs can also be used to prescribe control values (slave mode).

The terminal **B1** is a current input (4-20 mA)
The terminal **B2** is a switchable input (4-20 mA or for a GTF210 temperature sensor)

Terminal **B3** has an input for the GTF210 temperature sensor.
There is an input for 0-10 V DC on terminal **B4** .



5.11.7.1.1 Current inputs AI1



Actual value means that the current measurement is signalled on this input. With pressure sensor **GSW4003** this is the current corresponding to the pressure. Make sure that **"Auto Int" mode has been selected** in the Operating mode menu. There is a special situation if both current inputs are configured as the actual value. The current input delivering the greatest measurement signal is then selected **(MAX selection)**. A **Actual value** of **0-25 bar** or **0-40 bar** can be selected with the current input

Slave control value means that the control signal for the fans follows this input. With current input this means that 4 mA generates a control signal of 0%, and 20mA input current a control signal of 100% on the fans. Make sure that the "Slave ext" mode has been selected in the Operating mode menu.

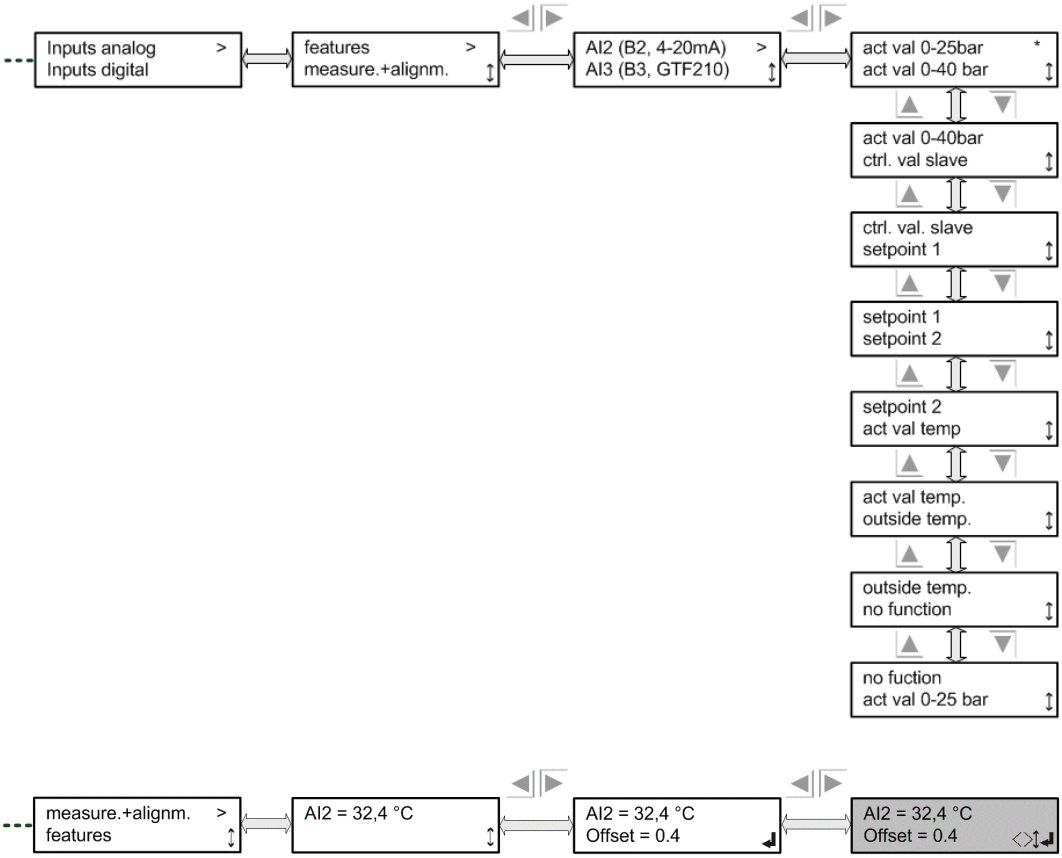
Setpoint 1 means that setpoint 1 on which internal control is performed is specified via the current input. The current input is scaled to the set actual value (see table Error messages and warnings , Page 108). The origin of the actual value still has to be configured. Make sure that the "Auto ext" mode has been selected in the Operating mode menu.

Setpoint 2 is offered only if the number of setpoints has been configured as **2** (see Number of setpoints, Page 66). If setpoint 2 is configured, the same applies as described with **Setpoint 1** .

No function is selected if this input is to be inactive.

The same essentially applies to **current input 2** as to current input **1**, except that there are still two additional setting options.

5.11.7.1.2 Switchover input AI2



ADVICE

The Service menu enables you to adjust the temperature sensors by specifying an offset for the configured temperature inputs AI2 and AI3.

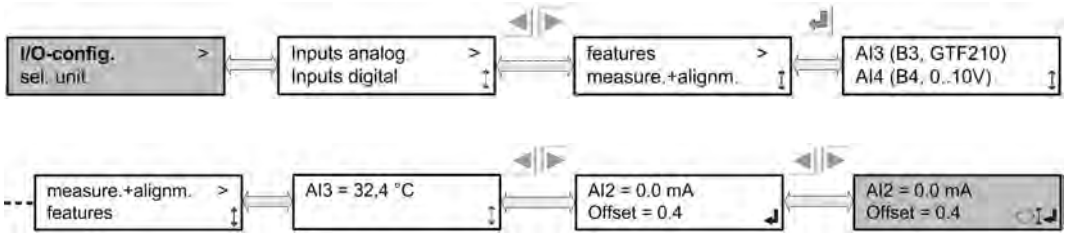
The function of this input has been extended in hardware version .2.

The following functions exist in addition to the functions offered with input AI1:
act. val. temp. means that a temperature sensor with 4..20mA current output (-30°C to +70°C) is connected on this current input. Function as described for **actual value**.

outside temp. means that a temperature sensor with 4..20mA current output (-50°C to +50°C) is connected on this current input. This input is used exclusively for recording external temperature.

act val. GTF210 means that a GTF210 temperature sensor is connected to this input. Please note! This function is only available with the corresponding software version.

5.11.7.1.3 AI3 input temperature sensor



ADVICE

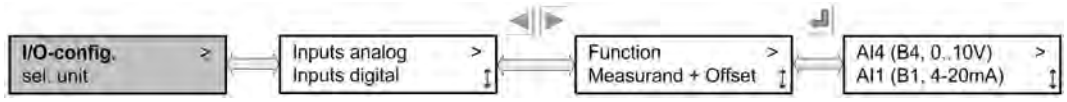
The Service menu enables you to adjust the temperature sensors by specifying an offset for the configured temperature inputs AI2 and AI3.

act val GTF210 means that a **GTF210** temperature sensor is connected to this input.

outside temp. means that a **GTF210** temperature sensor is connected to this input to record the external temperature. The measurement range is -30°C to +70°C. It is ensured that only 1 external temperature can be selected.

No function is selected if this input is to be inactive.

5.11.7.1.4 0..10V AI4 input



act. val 0.10V means that the current value (0-10V) for the controller should be connected to this input. Make sure that the **mode** “Auto Int” has been selected from the Operating mode menu.

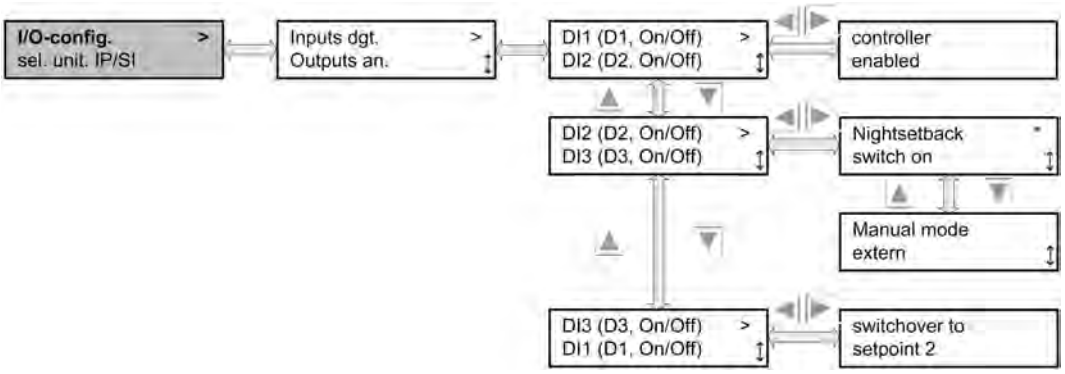
ctrl. val slavesignifies that the fans are addressed in response to the input signal (0-10V). The characteristic curve is linear from 0-100%. A 10V signal corresponds to a control value of 100% for the fans. Make sure that the **mode “Slave Ext” has been selected from the** Operating mode menu.

setpoint 2 is offered only if the number of setpoints has been configured as **2** (see Number of setpoints, Page 66). If setpoint 2 is configured, the same applies as described for **Setpoint 1** .

5.11.7.2 Digital inputs

The digital inputs on terminals **D1**, **D2** and **D3** are control inputs.

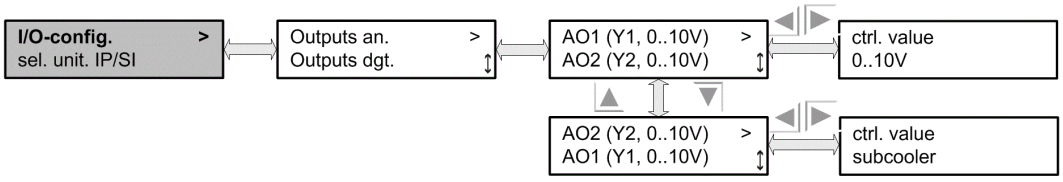
Their function is permanently assigned according to the diagram below.



The inputs are active when they are connected to **+24V** . They can only be switched with potential-free contacts (e.g. relay contact).

In the case of older generation controllers (**versions prior to .1**) the inputs are active when they are connected with **GND**. Please also note the information in the circuit diagram in this respect. see Control inputs, Page 32

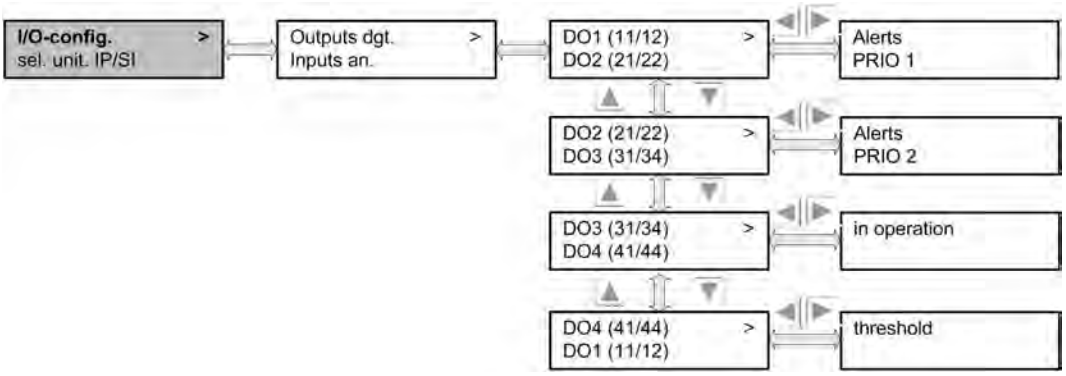
5.11.7.3 Analogue outputs



The analogue outputs can output a voltage of 0-10 V DC. Fixed functions are assigned to analogue outputs 1 and 2. Output 1 issues the control signal from 0-100% scaled as a 0-10V signal.

Output 2 issues the control signal for the subcooler, when the function is selected.

5.11.7.4 Digital outputs

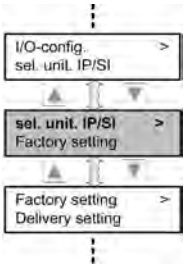


The digital outputs are relay contacts. Each output has a 250V/1A two-way contact. The alarm outputs Prio 1 and Prio 2 are **connected as failsafe** contacts, i.e. the contact is closed when there is no current.

Fixed functions are assigned to the digital outputs.

5.11.8 SI/IP selection

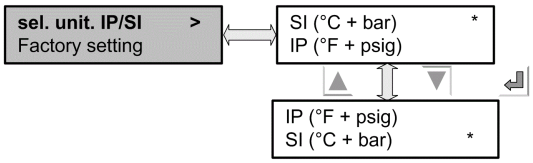
The units system can be selected here.



5.11.8.1 SI/IP units system

Unit selection for pressure and temperature.

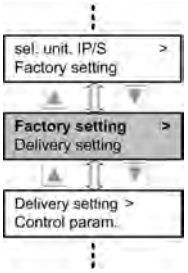
International units →	**SI** (**S**ystème **i**nternational d´ unités)
Anglo-American units →	**IP** (**Imp**erial System)



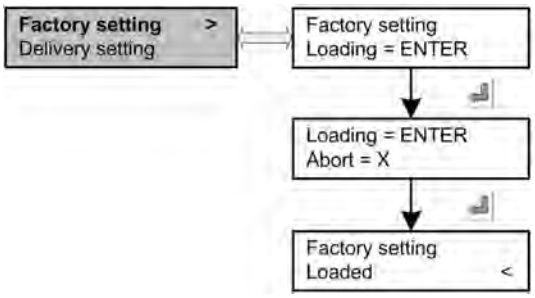
The selected unit of measurement is marked with a *****.

5.11.9 Factory setting

The control can be reset to factory settings here.



5.11.9.1 Control reset (factory setting)



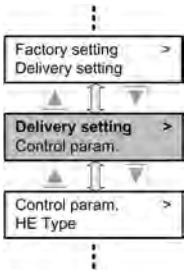
ADVICE

Any changes made locally will be deleted. Factory commissioning values will be retained. The control functions and the bypass are reset to their default values.

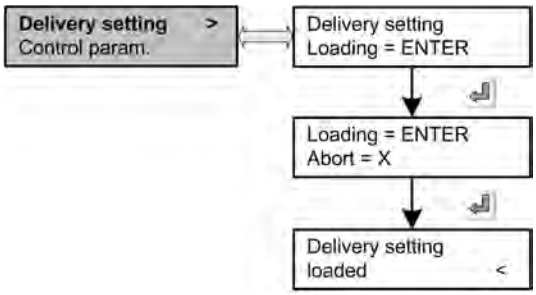
See Parameters after commissioning -Factory setting, Page 107

5.11.10 Delivery condition

The control can be reset to delivery condition here.
Commissioning is then not necessary.



5.11.10.1 Control reset (delivery condition)



ADVICE

Any changes made locally and the **commissioning values** will be cleared. Once this function has been completed, a completely new factory commissioning must be carried out.

6 Faults and troubleshooting

6.1 General notes

Most faults that occur during commissioning are due to wiring faults or defective sensors. It is only in the rarest of cases that the speed controller itself is defective. Check the following points before ordering a replacement:

Status info menu:

• Is a fault displayed in the info menu? (You can always return to the Info menu by pressing **X**).

• If **NO**, then go to **Test point 2.**

• If the message “Equipment failure” is displayed, there is a fault in the EC controller (lower PCB with fan connections).
In this case please check the fan connections on the EC controller. Are the 24V DC supply cables properly connected to the fans? Are the bus connections **A** and **B** properly connected and with the correct polarity.

I• f the "**Vn temperature**" message appears, one or more of the fans has a temperature fault. **Vn** represents the fan number. If more than one fan is affected, they are listed in succession. A temperature fault exists if the motor winding or motor end stage is too hot.

• If the "**Vn mains failure**“ message appears, one or more of the fans has a phase failure (only on 3-phase fans). For single-phase fans, the message "**Vn general error**" appears. **Vn** represents the fan number. If more than one fan is affected, they are listed in succession.

If the message "**No sensor selected**" appears, no sensor input has been selected in the IO configuration.

TEST POINT 2:

Mains connection:

• Are all phases present? (The message**"V? general fault" appears if there is a missing phase on one or more**fans. **V?** stands for the fan number. If more than one fan is affected, they are listed in succession.

Sensor connection:

• Is the sensor connected correctly? Cf "Sensor connection" section

• Sensor OK? (Measure! Pressure: 4-20mA, Temp.: 1.2-2.7kΩ, default signal: 0-10V)

• Are the sensor cables laid in the immediate vicinity of the mains or motor cable? Consider increasing the distance!

• Are the sensor cables shielded? If not – swap for shielded cables!

• Is the shielding applied unidirectionally on the controller?

Fuses:

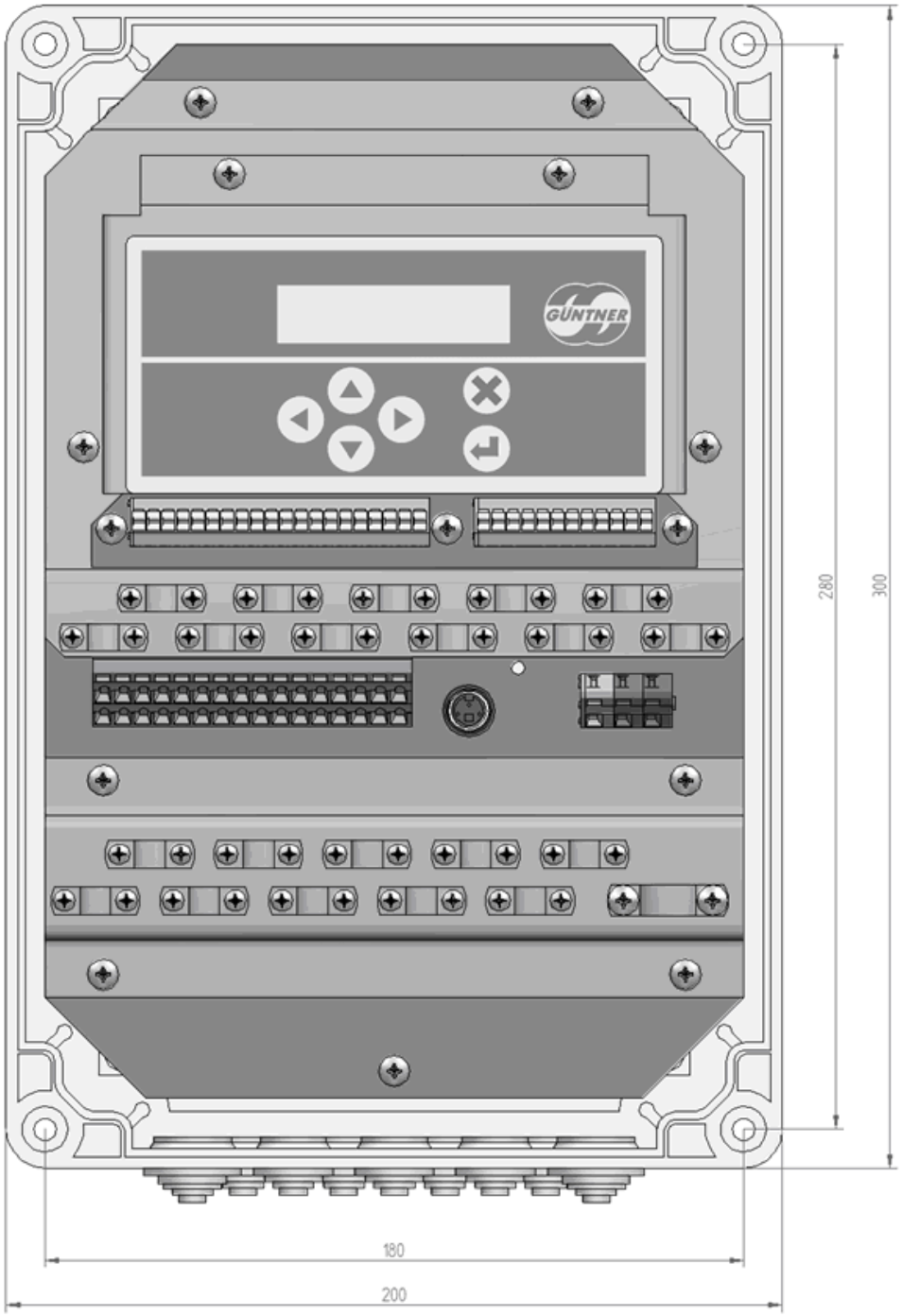
• Is the fuse on the controller supply OK?

7 Technical data

7.1 GMM EC/01 /04 /08 (.1, .2) dimensions

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

Fixing drill holes max. Ø 7.5 mm.

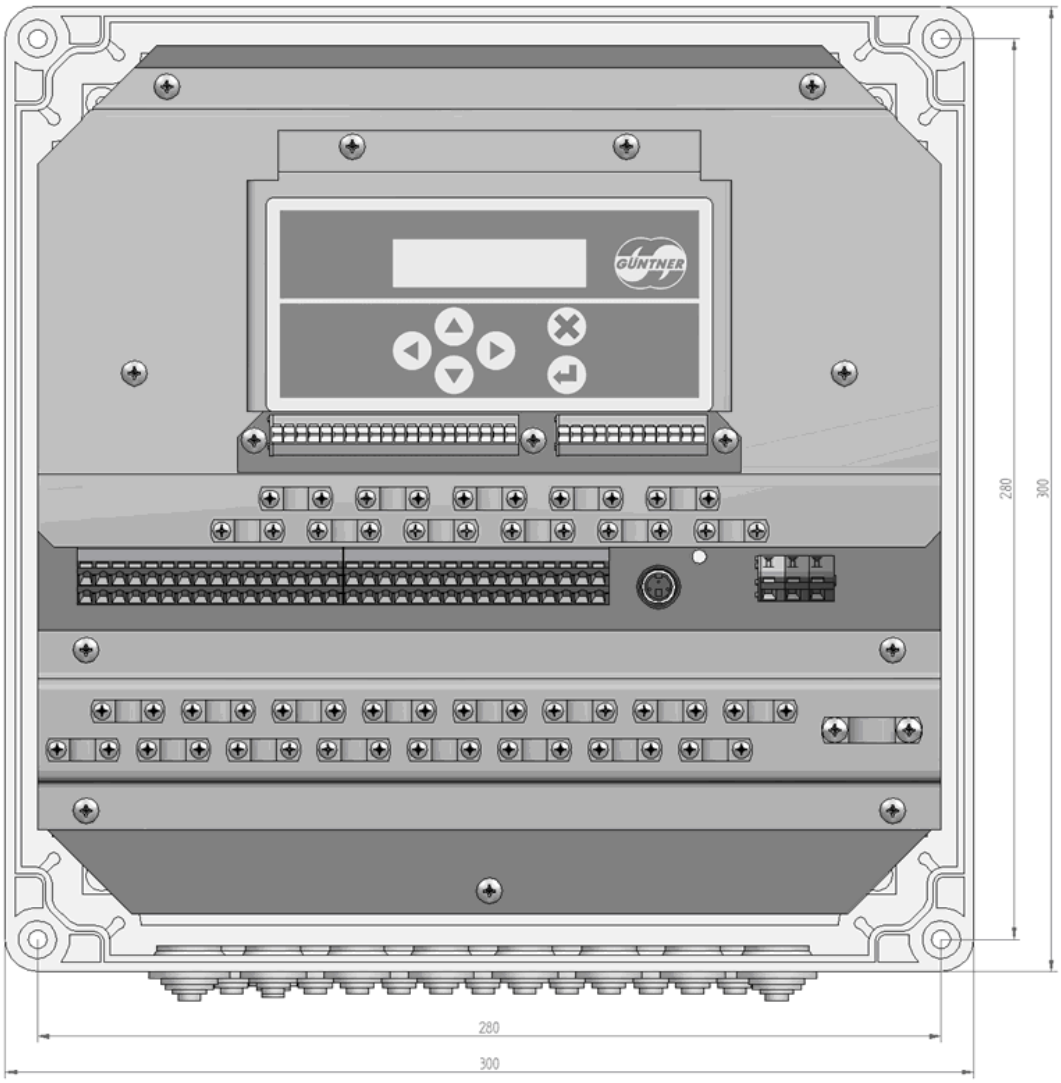


GMM EC 01 / 04 / 08 (.1, .2) casing dimensions

7.2 GMM EC/16 (.1, .2) dimensions

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

Fixing drill holes max. Ø 7.5 mm.



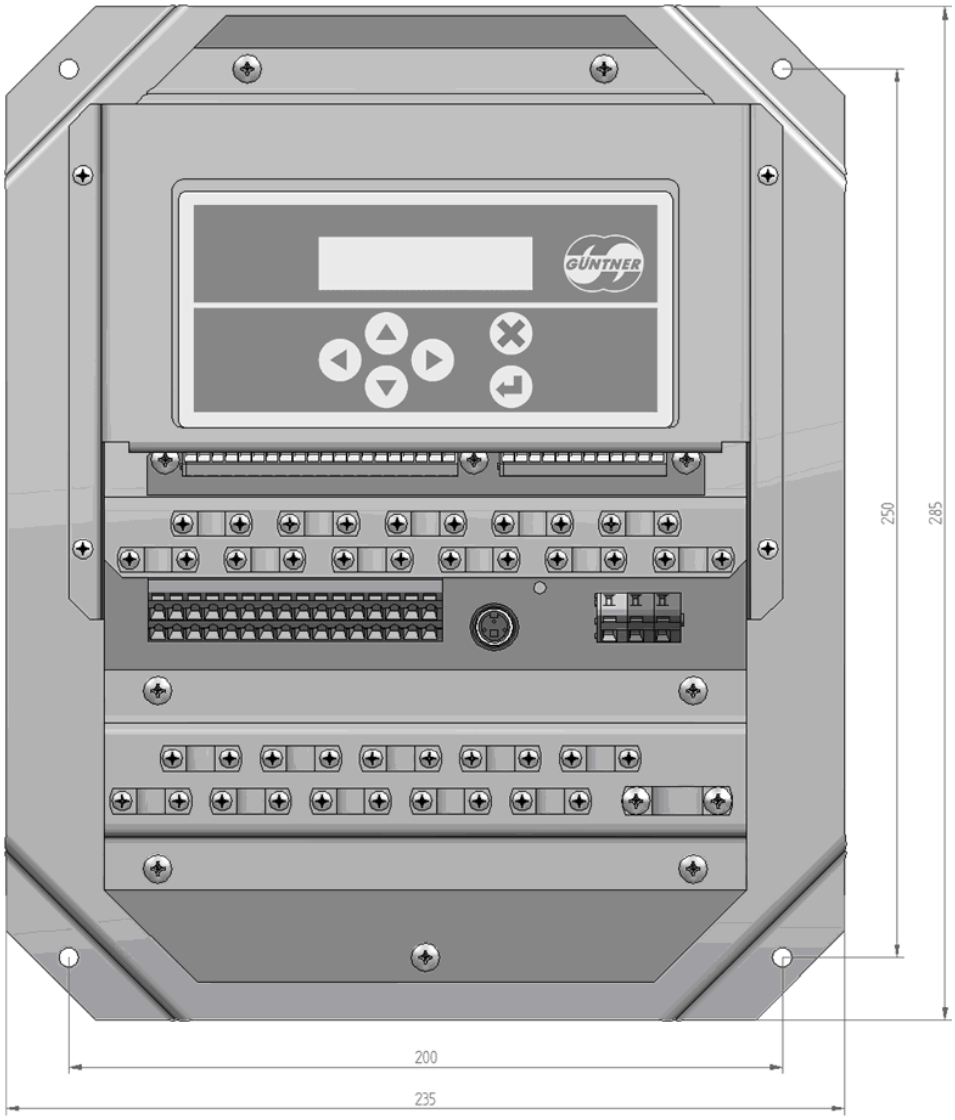
GMM EC 16 (.1, .2) casing dimensions

7.3 Dimensions of GMM EC/01 /04 /08 (.1,.2) UL or IP20 (w/o UL)

The dimensions of the housing and fixing for the UL or IP20 version are shown below.

All dimensions are given in millimetres.

Fixing drill holes max. Ø 5mm.



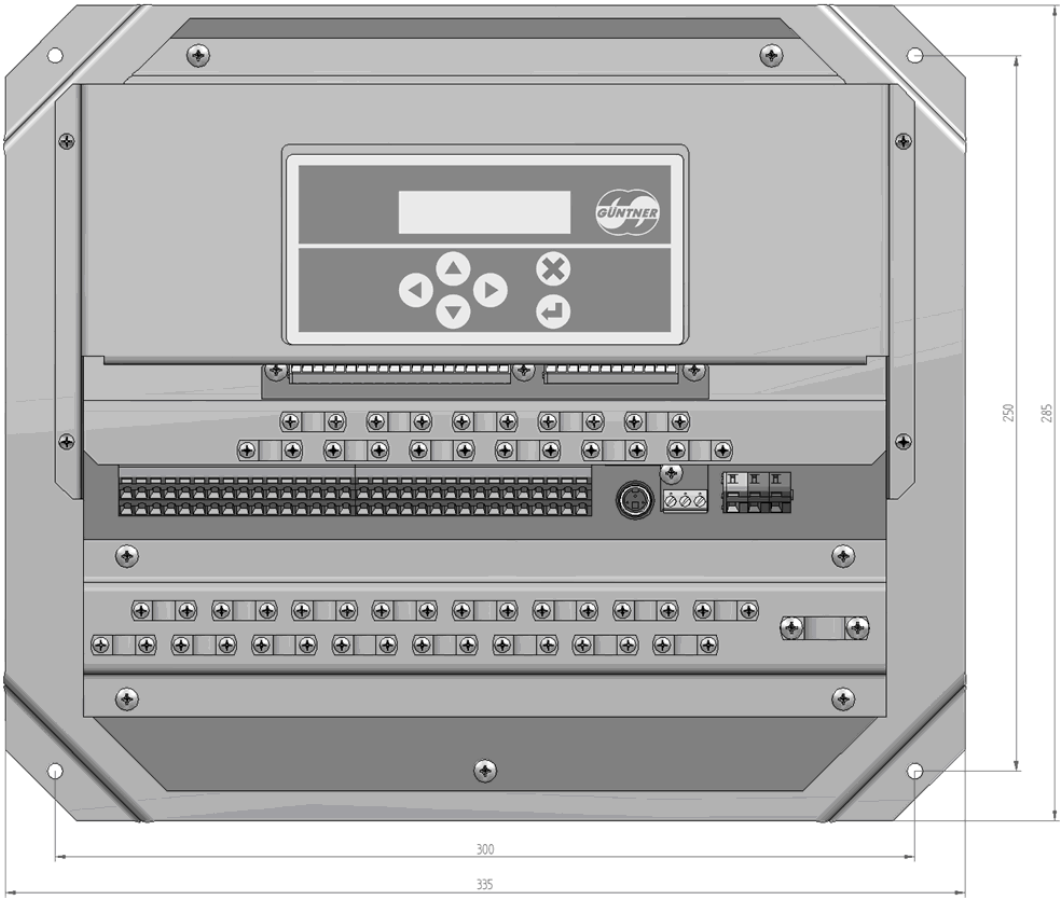
Casing dimensions of GMM EC/01 /04 /08 (.1,.2) UL or IP20 (w/o UL)

7.4 Dimensions of GMM EC/16 (.1,.2) UL or IP20 (w/o UL)

The dimensions of the housing and fixing for the UL or IP20 version are shown below.

All dimensions are given in millimetres.

Fixing drill holes max. Ø 5mm.



Casing dimensions of GMM EC/16 (.1,.2) UL or IP20 (w/o UL)

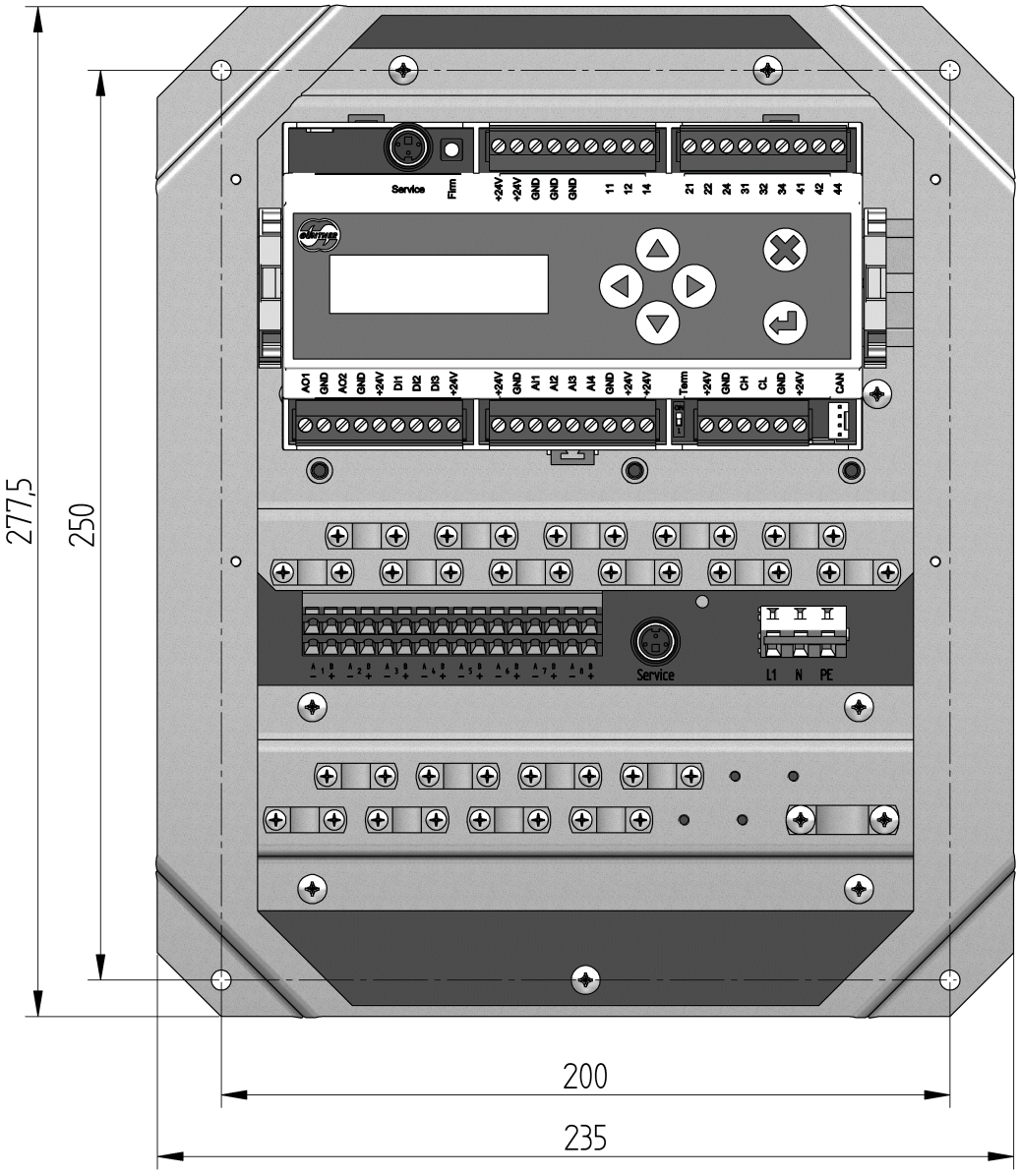
7.5 Dimensions of GMM EC/08 /16 RD.2 UL

ADVICE

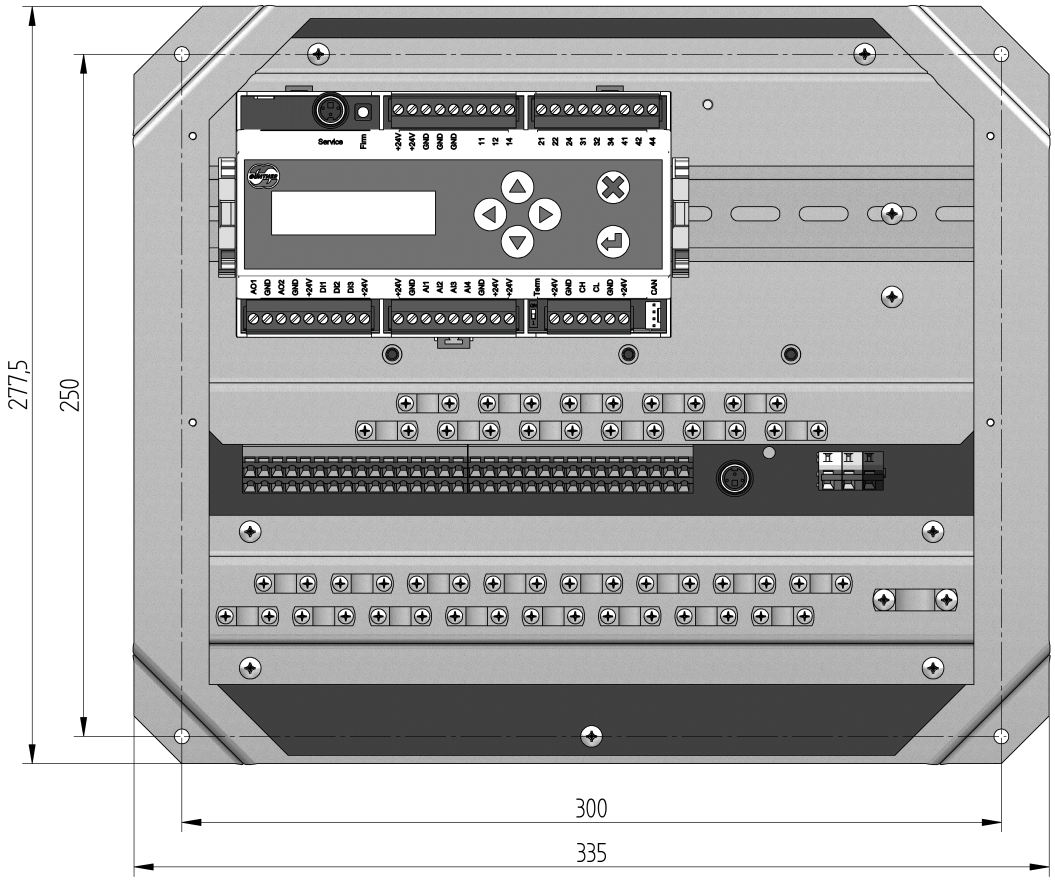
The flange-mounted CAN repeater is only required if the GRCE control module is offset by more than 3 m.

Otherwise the GRCE module can be offset directly by means of a customised cable.
Version A (1500 mm) ERP number: 5206233
Version B (3000 mm) ERP number: 5206232

All dimensions are given in millimetres.



Casing dimensions of GMM EC/08 RD.2 UL

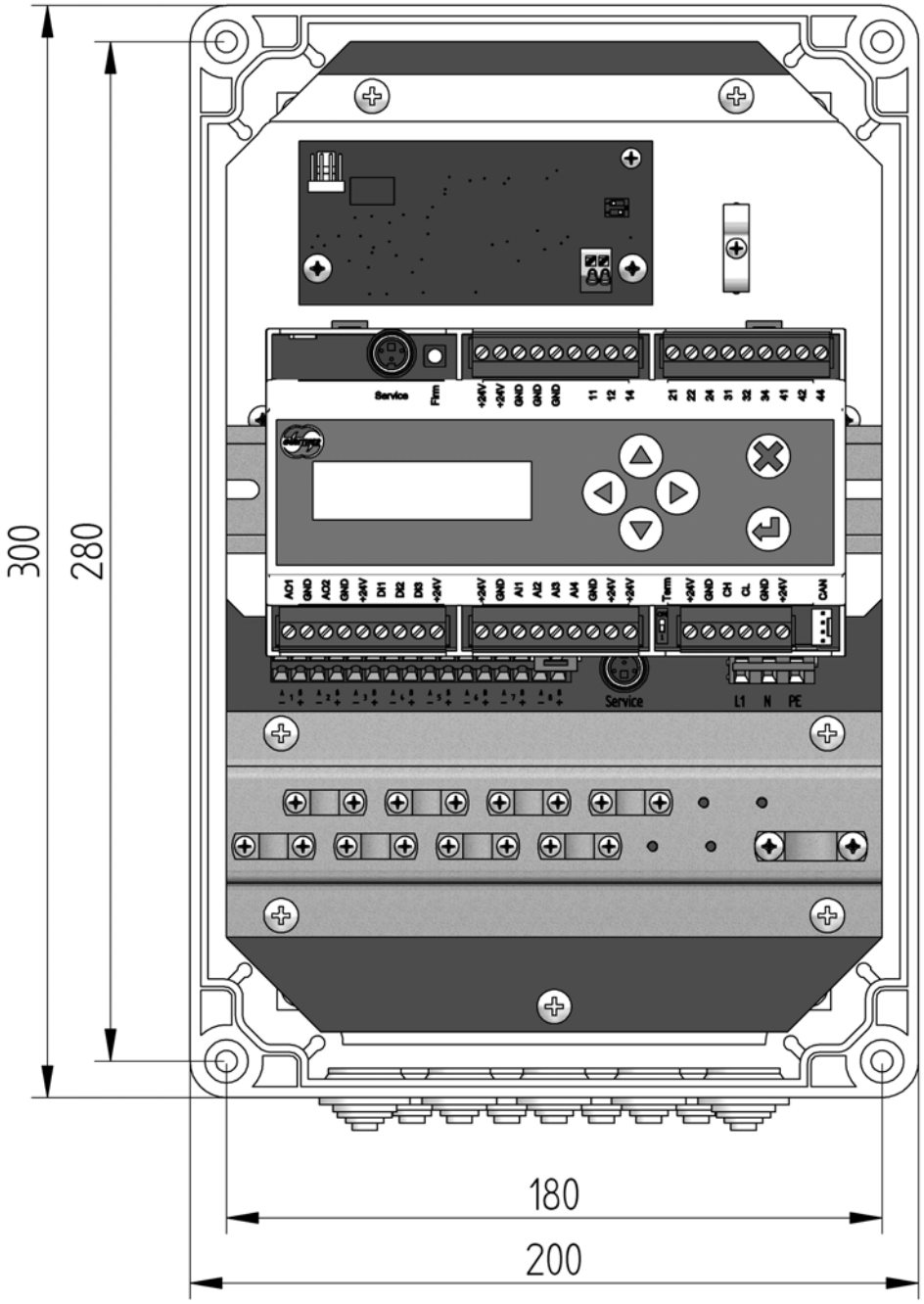


Casing dimensions of GMM EC/16 RD.2 UL

7.6 Dimensions of GMM EC/01 /04 /08 RD.2

The CAN repeater supplied can be used to offset the controller module by up to a maximum length of 350 metres.

All dimensions are given in millimetres.

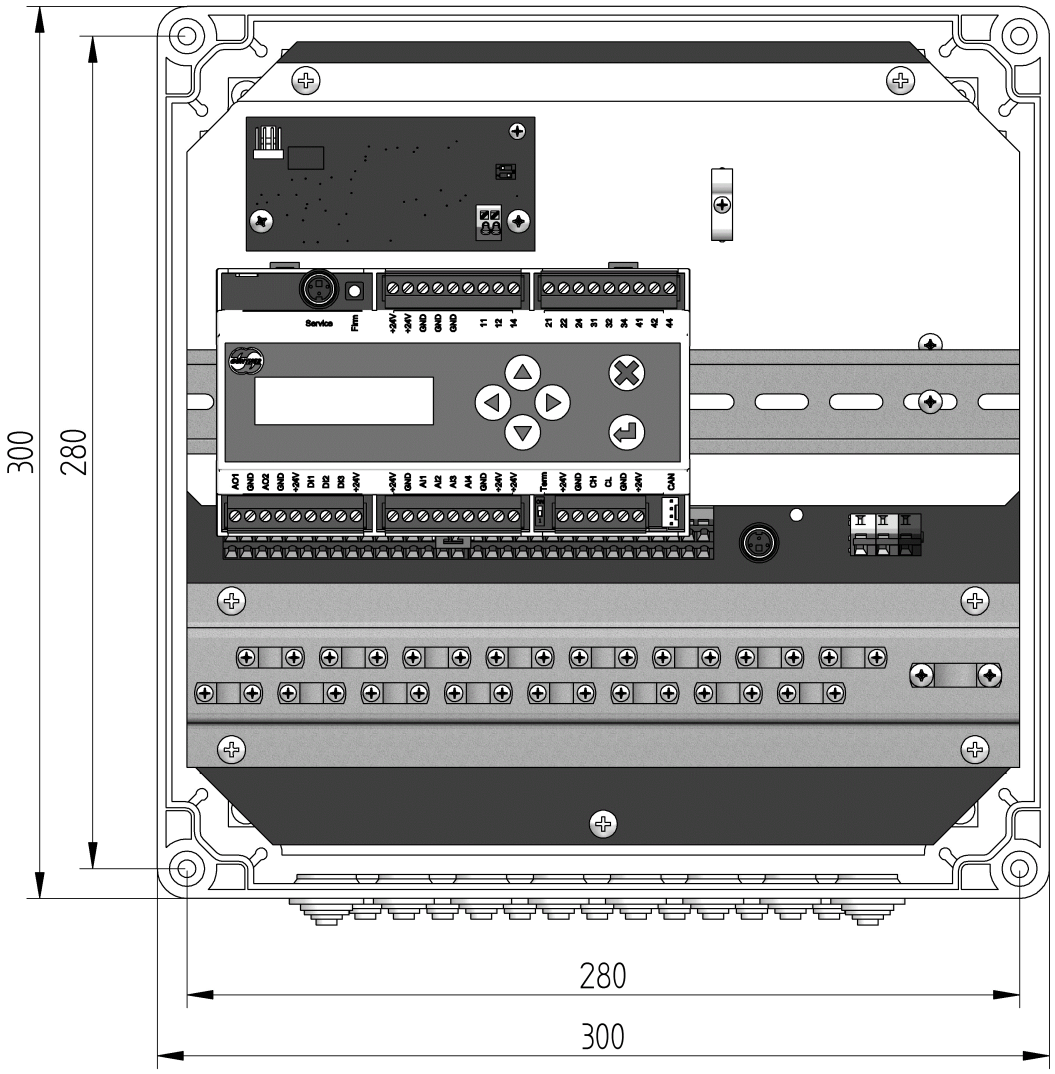


Casing dimensions of GMM EC/08 RD.2

7.7 Dimensions of GMM EC/16 RD.2

The CAN repeater supplied can be used to offset the controller module by up to a maximum length of 350 metres.

All dimensions are given in millimetres.



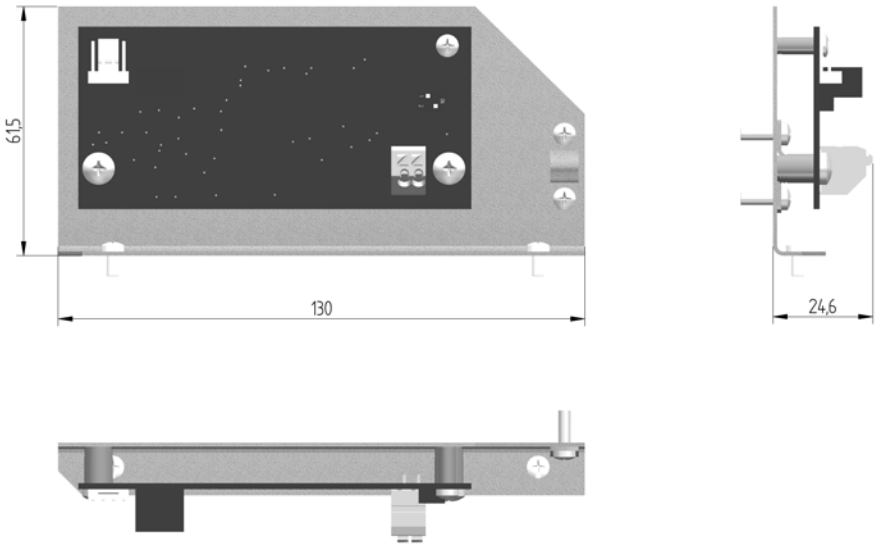
Casing dimensions of GMM EC/16 RD.2

7.8 Dimensions of CAN repeater

This CAN repeater can be integrated as an expansion module in the GMM EC/08 RD.2 UL and GMM EC/016 RD.2 UL controllers.
This allows the controller module to be offset by up to a maximum length of 350 metres.

ERP number: 5206172

All dimensions are given in millimetres.

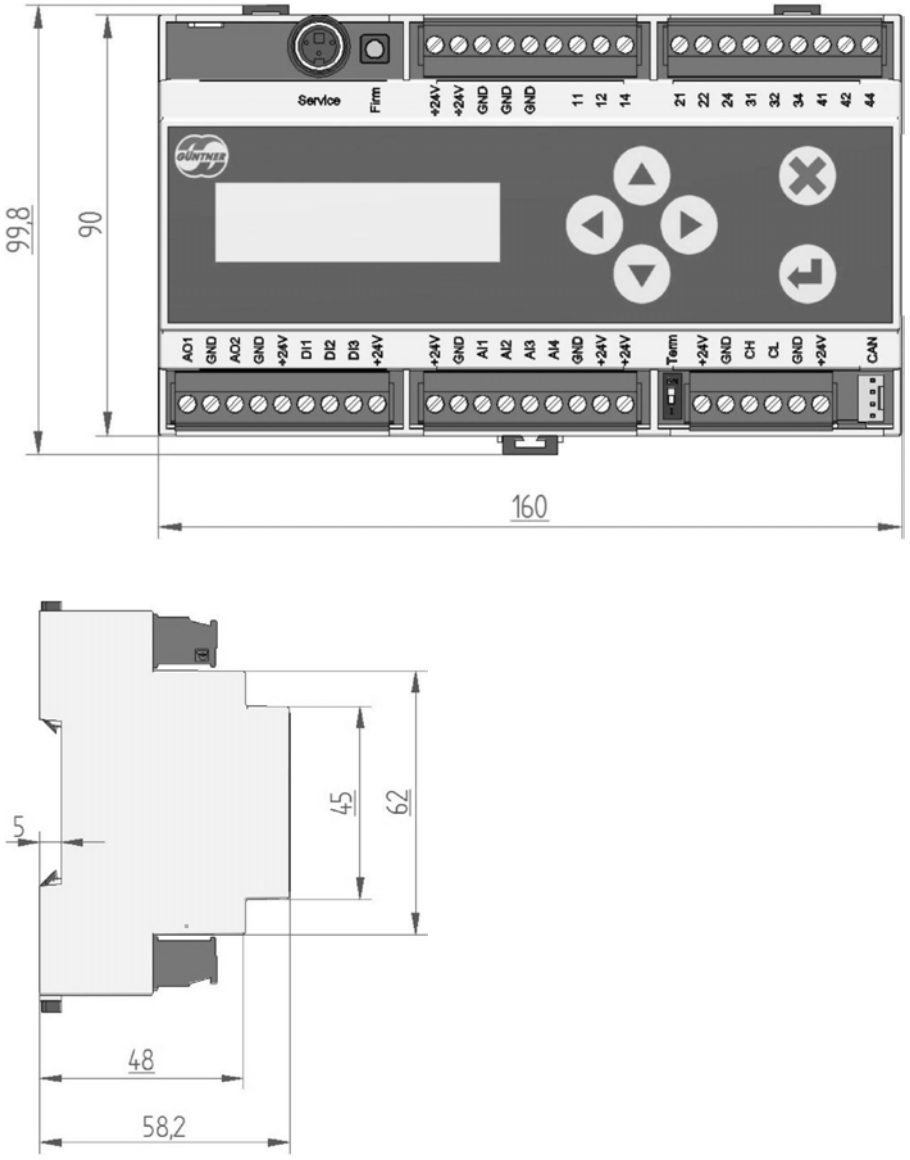


Dimensions of CAN repeater

7.9 Component dimensions - Dimensions / Weight

Dimensions of GRCE.1

You will find the casing dimensions below. All dimensions are given in millimetres.



Casing dimensions of GRCE.1

Weight:
ca. 340g

8 Electrical and mechanical properties of GMM EC

Mains voltage	100 - 240V +/- 10% 50-60 Hz	
Current consumption	GMM EC/01.(.1, .2)	0.3A
	GMM EC/04 /08 /16 (.1, .2)	0.47A
Heat loss	GMM EC/01.(.1, .2)	approx. 14W
	GMM EC/04.(.1, .2)	approx. 18W
	GMM EC/08.(.1, .2)	approx. 20W
	GMM EC/16.(.1, .2)	approx. 30W
Sensor connection	Pressure transmitter 4-20 mA or temperature sensor GTF210 (-30...+70°C) or standard signal 0-10V	
Ambient temperature	-20...+55°C	
Storage temperature	-20 ...+70 °C dry	
Weights	GMM EC/01.(.1, .2) = 2.6 kg GMM EC/04.(.1, .2) = 2.8 kg GMM EC/08.(.1, .2) = 2.8 kg GMM EC/16.(.1, .2) = 3.9 kg GMM EC/01.(.1, .2) UL (or IP20) = 2.7 kg GMM EC/04.(.1, .2) UL (or IP20) = 2.9 kg GMM EC/08.(.1, .2) UL (or IP20) = 2.9 kg GMM EC/16.(.1, .2) UL (or IP20) = 4.0 kg	
Protection rating	IP 54	
Dimensions	See drawings	

9 Electrical properties of the components

Electrical properties of GRCE.1				
	Min	**Type**	**Max**	**Unit**
Voltage supply	21	24	30	V
Current consumption		80	250[1]	mA
Digital inputs				
High level	15	24	30	V
Low level	-3	0	5	V
Relay outputs				
Voltage DC		24	30	V
Voltage AC			250	V
Current resistive load 24V DC/250V AC			1	A
Current inductive load 24V DC/250V AC			1	A
Switch cycles, mechanical	$1*10^6$			Switching cycles
Switch cycles, electrical	$1*10^5$			Switching cycles
Voltage input				
Dielectric strength	-24		30	V
Measuring range	0		12	V
Resolution			10	bit
Fault			1	%[2]
Input resistor:		230		kΩ
Current input				
Dielectric strength	-24		30	V
Measuring range	0		21	mA
Resolution			10	bit
Fault			1	%[2]
Input resistance (without protective circuit)		130		Ω

Table: Electrical properties of GRCE.1

	Min	Type	Max	Unit
Voltage output				
Voltage range	0		10	V
Load resistance		>=100		kΩ
Resolution			10	bit
Fault			2.5	%[2]
Short protection		Yes		
Potential separation		No		
Temperature input				
Dielectric strength	-24		30	V
Measuring range	-30		100	°C
Resolution			10	bit
Precision			3	%[2]
CAN bus				
Dielectric strength	-24		24	V
Transmission rate		125		kbit/s
Galvanic separation		No		

Table: Electrical properties of GRCE.1

1. The maximum current consumption includes supplying two attached pressure transponders and one attached temperature sensor.

2. Of the appropriate range

10 External control value scaling

The dependencies of the external control value specs for the actual value regulations are explained in this table. A 0 ..10V external voltage can, for example, specify a temperature control value. 0V is then equal to a temperature of 0°C and a voltage of 10V is equal to a control value temperature of 100°C.

Current value	Setpoint internal, depending on current value	Setpoint external Current 4 .. 20mA	Setpoint external Voltage 0 .. 10V
Pressure 0 ..25 bar	Pressure 0 .. 50 bar	4mA = 0 bar 20mA = 50 bar	0V = 0 bar 10V = 5 bar
Temperature 0 .. 100°C	Temperature -30 .. 100°C	4mA = 0°C 20mA = 100°C	0V = 0°C 10V = 100°C
Voltage 0 .. 10V	Voltage 0 .. 10V	4mA = 0V 20mA = 10V	0V = 0V 10V = 10V

Table: External control value scaling

11 Parameters after commissioning - Factory setting

	Dry cooler		Condenser with refrigerant		Condenser without refrigerant	
Units	**SI**	**IP**	**SI**	**IP**	**SI**	**IP**
Language	English					
Setpoint 2 present	No					
Night-time operation	No					
Bypass	Yes					
Setpoint displacement	No					
Operating mode	Automatic internal					
Kp	10.0	10.0	10.0	10.0	20.0	2.0
Ti	25 sec.	25 sec.	25 sec.	25 sec.	40 sec.	40 sec.
Td	0 sec.					
Base control value	0%					
Start control value	0%					
Setpoint 1 (2)	30°C	86°F	40°C (25°C CO2)	104°F (77°F CO2)	12.5 bar	181 psig
Threshold value 1	100%					
Night limiter	100%					
Manual mode control value	0%					
Setpoint displace-ment Δ T	5 K					
External temperature displacement min.	0°C	32°F	0°C	32°F	0°C	32°F
External temperature displacement max.	50°C	122°F	50°C	122°F	50°C	122°F
External temperature dependent disp.	off					
Subcooler function	off					
Heating function	off					
LCMM function	Off					

12 Error messages and warnings

The table shows which signal relay (**PRIO 1** or **PRIO 2**) is tripped with which message on the display.

* There is a pause of 5 seconds between the flash codes.

Messages/warnings on the display	PRIO 1	PRIO 2	Explanation
Display dark, GMM off	x		GMM has no supply voltage
unit fault	x		All fans off, no cooling on the heat exchanger
failure BUS	x		The connection between the control module and the EC controller is faulty or the EC controller is defective
No sensor selected			No sensor activated in the I/O configuration
sensor fault x		x	The sensor with no. x has a fault
not enabled			D1 (enable) not switched
setpoint 2			Setpoint 2 is activated
nightsetback			Night limiter activated
fan off Ext.			The "Fan off external" function is activated
Inverse operat.			Inverse operation is currently active
maintenance run			The maintenance run is currently active
Fx cable break		x	Communications fault on fan x (poss. cable break)
Fx Temp M		x	Temperature fault on fan x, motor
Fx Temp E		x	Temperature fault on fan x, output stage
Fx Temp I		x	Temperature fault on fan x, electronics
Fx wrong VT		x	Fan x wrong fan number
Fx power fail		x	Power fail on fan x
Fx blocked		x	Fan x blocked
Fx not OK		x	Fan x internal communication errors in the motor electronics. **Caution**: This error is also displayed when the mains supply on the fan fails. For 1-phase motors, when the mains fails. For 3-phase motors, when 2 or 3 phases fail.
Fx Hallsensor		x	Hall sensor on fan x defective
Fx failure B		x	Fan x braking operation (external operation)
Fx failure H		x	Fan x intermediate circuit, overvoltage
Fx failure L		x	Fan x intermediate circuit, undervoltage
Fx overVoltag.		x	Fan x mains overvoltage

Table: Error messages / warnings on the display

Messages/warnings on the display	PRIO 1	PRIO 2	Explanation
Fx underVolta.		**x**	Fan x mains undervoltage
GHM NOK		**x**	A connected hydromanagement system cannot be accessed via the CAN bus.

Table: Error messages / warnings on the display

PRIO 1	= Relay contacts 11/12	
PRIO 2	= Relay contacts 21/22	
Operating message	= Relay contacts 31/34	if control signal > 0%
Threshold value	= Relay contacts 41/42	the contacts close when the control signal has reached the set threshold. See Threshold value, Page 50

13 Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
450	VT03007U.1	2533	1~ 230V 50/60Hz	0.4716	1425
450	VT03007U.1	2532	1~ 230V 50/60Hz	0.401	1350
450	VT03007U.1	2531	1~ 230V 50/60Hz	0.3378	1275
450	VT03007U.1	2530	1~ 230V 50/60Hz	0.2816	1200
450	VT03007U.1	2529	1~ 230V 50/60Hz	0.232	1125
450	VT03007U.1	2528	1~ 230V 50/60Hz	0.1887	1050
450	VT03007U.1	2527	1~ 230V 50/60Hz	0.151	975
450	VT03007U.1	2526	1~ 230V 50/60Hz	0.1188	900
450	VT03007U.1	2525	1~ 230V 50/60Hz	0.0915	825
450	VT03007U.1	2524	1~ 230V 50/60Hz	0.0688	750
450	VT03007U.1	2523	1~ 230V 50/60Hz	0.0501	675
450	VT03007U.1	2409	1~ 230V 50/60Hz	0.55	1500
450	VT03007U.1	2419	1~ 230V 50/60Hz	0.375	1350
450	VT03006U	1272	1~ 230V 50/60Hz	0.14	900
450	VT03070U	1738	1~ 230V 50/60Hz	0.31	1240
450	VT03007U	1304	1~ 230V 50/60Hz	0.28	1100
450	VT03006U	1273	1~ 230V 50/60Hz	0.08	750
450	VT03006U	1187	1~ 230V 50/60Hz	0.1	770
450	VT03006U	1186	1~ 230V 50/60Hz	0.21	1000
450	VT03007U	1185	1~ 230V 50/60Hz	0.31	1250
500	VT03011U.1	2522	1~ 230V 50/60Hz	0.4319	1200
500	VT03011U.1	2521	1~ 230V 50/60Hz	0.3655	1135
500	VT03011U.1	2520	1~ 230V 50/60Hz	0.3062	1070
500	VT03011U.1	2519	1~ 230V 50/60Hz	0.2575	1010
500	VT03011U.1	2518	1~ 230V 50/60Hz	0.2109	945
500	VT03011U.1	2517	1~ 230V 50/60Hz	0.1703	880
500	VT03011U.1	2516	1~ 230V 50/60Hz	0.1378	820
500	VT03011U.1	2515	1~ 230V 50/60Hz	0.1076	755
500	VT03011U.1	2514	1~ 230V 50/60Hz	0.0839	695
500	VT03011U.1	2513	1~ 230V 50/60Hz	0.0625	630
500	VT03011U.1	2512	1~ 230V 50/60Hz	0.0451	565
500	VT03158U.1	2451	1~ 230V 50/60Hz	0.5	1260

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
500	VT03011U.1	2421	1~ 230V 50/60Hz	0.39	1150
500	VT03011U.1	2411	1~ 230V 50/60Hz	0.5	1260
500	VT03010U	1393	1~ 230V 50/60Hz	0.375	1140
500	VT03008U	1392	1~ 230V 50/60Hz	0.12	785
500	VT03008U	1271	1~ 230V 50/60Hz	0.2	375
500	VT03009U	1240	1~ 230V 50/60Hz	0.11	750
500	VT03008U	1201	1~ 230V 50/60Hz	0.7	570
500	VT03008U	1200	1~ 230V 50/60Hz	0.06	620
500	VT03008U	1199	1~ 230V 50/60Hz	0.65	640
500	VT03008U	1198	1~ 230V 50/60Hz	0.9	710
500	VT03010U	1197	1~ 230V 50/60Hz	0.2	930
500	VT03010U	1196	1~ 230V 50/60Hz	0.3	1070
500	VT03009U	1194	1~ 230V 50/60Hz	0.03	385
500	VT03009U	1193	1~ 230V 50/60Hz	0.08	660
500	VT03009U	1192	1~ 230V 50/60Hz	0.06	610
500	VT03009U	1191	1~ 230V 50/60Hz	0.12	785
500	VT03011U	1190	1~ 230V 50/60Hz	0.25	1000
500	VT03011U	1189	1~ 230V 50/60Hz	0.38	1140
500	VT03091U.1	2693	3~ 400V 50/60Hz	1.3	1770
500	VT03013U.1	2563	3~ 400V 50/60Hz	1.1031	1680
500	VT03013U.1	2562	3~ 400V 50/60Hz	0.944	1595
500	VT03013U.1	2561	3~ 400V 50/60Hz	0.793	1505
500	VT03013U.1	2560	3~ 400V 50/60Hz	0.6591	1415
500	VT03013U.1	2559	3~ 400V 50/60Hz	0.5473	1330
500	VT03013U.1	2420	3~ 400V 50/60Hz	1	1600
500	VT03013U.1	2410	3~ 400V 50/60Hz	1.29	1770
500	VT03141U.1	2343	3~ 400V 50/60Hz	2.825	1780
500	VT03091U	2198	3~ 400V 50/60Hz	0.42	1270
500	VT03013U	1396	3~ 400V 50/60Hz	0.3	1100
500	VT03012U	1395	3~ 400V 50/60Hz	0.69	1500
500	VT03012U	1195	3~ 400V 50/60Hz	0.6	1455
500	VT03013U	1188	3~ 400V 50/60Hz	0.69	1500
500	VT03048U	1690	3~ 230V 50/60Hz	0.75	1500
500	VT03048U	1689	3~ 230V 50/60Hz	0.69	1455

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
500	VT03047U	1688	3~ 230V 50/60Hz	0.75	1500
500	VT03047U	1687	3~ 230V 50/60Hz	0.75	1500
630	VT03145U.1	2511	1~ 230V 50/60Hz	0.2215	730
630	VT03145U.1	2510	1~ 230V 50/60Hz	0.1912	695
630	VT03145U.1	2509	1~ 230V 50/60Hz	0.16	655
630	VT03145U.1	2508	1~ 230V 50/60Hz	0.1325	615
630	VT03145U.1	2507	1~ 230V 50/60Hz	0.1111	580
630	VT03145U.1	2506	1~ 230V 50/60Hz	0.0897	540
630	VT03145U.1	2505	1~ 230V 50/60Hz	0.0712	500
630	VT03145U.1	2504	1~ 230V 50/60Hz	0.0554	460
630	VT03145U.1	2503	1~ 230V 50/60Hz	0.0437	425
630	VT03145U.1	2502	1~ 230V 50/60Hz	0.0325	385
630	VT03145U.1	2501	1~ 230V 50/60Hz	0.0234	345
630	VT03145U.1	2500	1~ 230V 50/60Hz	0.017	310
630	VT03145U.1	2414	1~ 230V 50/60Hz	0.26	770
630	VT03144U.1	2722	3~ 400V 50/60Hz	0.7	1000
630	VT03144U.1	2558	3~ 400V 50/60Hz	0.6002	950
630	VT03144U.1	2557	3~ 400V 50/60Hz	0.5103	900
630	VT03144U.1	2556	3~ 400V 50/60Hz	0.4299	850
630	VT03144U.1	2555	3~ 400V 50/60Hz	0.3584	800
630	VT03144U.1	2554	3~ 400V 50/60Hz	0.2953	750
630	VT03144U.1	2553	3~ 400V 50/60Hz	0.2401	700
630	VT03143U.1	2552	3~ 400V 50/60Hz	2.7465	1435
630	VT03143U.1	2551	3~ 400V 50/60Hz	2.5504	1360
630	VT03143U.1	2550	3~ 400V 50/60Hz	1.9721	1285
630	VT03143U.1	2549	3~ 400V 50/60Hz	1.6466	1210
630	VT03143U.1	2548	3~ 400V 50/60Hz	1.359	1135
630	VT03143U.1	2547	3~ 400V 50/60Hz	1.0914	1055
630	VT03144U.1	2413	3~ 400V 50/60Hz	0.7	1000
630	VT03143U.1	2412	3~ 400V 50/60Hz	3.2	1510
650	VT03071U	1744	1~ 230V 50/60Hz	0.53	890
650	VT03014U	1209	1~ 230V 50/60Hz	0.06	400
650	VT03014U	1208	1~ 230V 50/60Hz	0.17	615
650	VT03014U	1207	1~ 230V 50/60Hz	0.13	550

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
650	VT03015U	1206	1~ 230V 50/60Hz	0.27	715
650	VT03015U	1205	1~ 230V 50/60Hz	0.32	745
650	VT03017U.1	1826	3~ 400V 50/60Hz	1.83	1310
650	VT03016U	1204	3~ 400V 50/60Hz	0.49	890
650	VT03016U	1203	3~ 400V 50/60Hz	0.72	1050
650	VT03017U.1	1202	3~ 400V 50/60Hz	1.83	1300
650	VT03050U	1693	3~ 230V 50/60Hz	1.83	1310
650	VT03049U	1692	3~ 230V 50/60Hz	0.51	890
650	VT03049U	1691	3~ 230V 50/60Hz	0.84	1050
710	VT03035U	1284	1~ 230V 50/60Hz	0.06	340
710	VT03035U	1283	1~ 230V 50/60Hz	0.1	415
710	VT03035U	1282	1~ 230V 50/60Hz	0.14	500
710	VT03020U	1274	3~ 400V 50/60Hz	0.68	845
710	VT03020U	2200	3~ 400V 50/60Hz	0.665	840
710	VT03021U.1	2199	3~ 400V 50/60Hz	1.2	940
710	VT03020U	1409	3~ 400V 50/60Hz	0.74	875
710	VT03021U.1	1397	3~ 400V 50/60Hz	2.82	1250
710	VT03021U.1	1281	3~ 400V 50/60Hz	1.3	960
710	VT03021U.1	1280	3~ 400V 50/60Hz	2.2	1150
710	VT03021U.1	1279	3~ 400V 50/60Hz	2.65	1220
710	VT03021U.1	1278	3~ 400V 50/60Hz	1.1	900
710	VT03020U	1276	3~ 400V 50/60Hz	0.26	620
710	VT03020U	1275	3~ 400V 50/60Hz	0.42	720
710	VT03052U	1703	3~ 230V 50/60Hz	3	1250
710	VT03052U	1702	3~ 230V 50/60Hz	1.36	960
710	VT03052U	1701	3~ 230V 50/60Hz	2.34	1150
710	VT03052U	1700	3~ 230V 50/60Hz	2.79	1220
710	VT03052U	1699	3~ 230V 50/60Hz	1.12	900
710	VT03051U	1697	3~ 230V 50/60Hz	0.81	875
710	VT03051U	1696	3~ 230V 50/60Hz	0.29	620
710	VT03051U	1695	3~ 230V 50/60Hz	0.45	720
710	VT03051U	1694	3~ 230V 50/60Hz	0.73	845
800	VT03062U.1	2675	1~ 230V 50/60Hz	0.0668	320
800	VT03062U.1	2674	1~ 230V 50/60Hz	0.1738	440

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
800	VT03062U.1	2673	1~ 230V 50/60Hz	0.121	390
800	VT03062U.1	2715	1~ 230V 50/60Hz	0.2051	465
800	VT03061U.1	2713	1~ 230V 50/60Hz	0.3462	565
800	VT03061U.1	2712	1~ 230V 50/60Hz	0.294	535
800	VT03062U.1	2672	1~ 230V 50/60Hz	0.24	490
800	VT03061U.1	2671	1~ 230V 50/60Hz	0.48	630
800	VT03061U.1	2714	1~ 230V 50/60Hz	0.2472	505
800	VT03062U.1	2447	1~ 230V 50/60Hz	0.24	490
800	VT03062U	1684	1~ 230V 50/60Hz	0.06	300
800	VT03061U	1665	1~ 230V 50/60Hz	0.31	545
800	VT03061U	1662	1~ 230V 50/60Hz	0.43	600
800	VT03062U.1	2499	1~ 230V 50/60Hz	0.2051	465
800	VT03062U.1	2498	1~ 230V 50/60Hz	0.1738	440
800	VT03062U.1	2497	1~ 230V 50/60Hz	0.1458	415
800	VT03062U.1	2496	1~ 230V 50/60Hz	0.121	390
800	VT03062U.1	2495	1~ 230V 50/60Hz	0.0992	365
800	VT03062U.1	2494	1~ 230V 50/60Hz	0.0802	340
800	VT03062U.1	2493	1~ 230V 50/60Hz	0.0668	320
800	VT03062U.1	2492	1~ 230V 50/60Hz	0.0524	295
800	VT03062U.1	2491	1~ 230V 50/60Hz	0.0402	270
800	VT03062U.1	2490	1~ 230V 50/60Hz	0.03	245
800	VT03062U.1	2489	1~ 230V 50/60Hz	0.0217	220
800	VT03062U.1	2488	1~ 230V 50/60Hz	0.0151	195
800	VT03061U.1	2487	1~ 230V 50/60Hz	0.4146	600
800	VT03061U.1	2486	1~ 230V 50/60Hz	0.3462	565
800	VT03061U.1	2485	1~ 230V 50/60Hz	0.294	535
800	VT03061U.1	2484	1~ 230V 50/60Hz	0.2472	505
800	VT03061U.1	2483	1~ 230V 50/60Hz	0.1993	470
800	VT03061U.1	2482	1~ 230V 50/60Hz	0.1635	440
800	VT03061U.1	2448	1~ 230V 50/60Hz	0.48	630
800	VT03097U	2254	1~ 230V 50/60Hz	0.25	505
800	VT03096U	2258	1~ 230V 50/60Hz	0.05	280
800	VT03096U	2257	1~ 230V 50/60Hz	0.09	355
800	VT03096U	2256	1~ 230V 50/60Hz	0.15	425

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
800	VT03102U	2275	1~ 230V 50/60Hz	0.16	435
800	VT03102U	2272	1~ 230V 50/60Hz	0.34	555
800	VT03102U	2274	1~ 230V 50/60Hz	0.25	505
800	VT03102U	2273	1~ 230V 50/60Hz	0.29	530
800	VT03097U	2255	1~ 230V 50/60Hz	0.16	435
800	VT03097U	2253	1~ 230V 50/60Hz	0.29	530
800	VT03097U	2252	1~ 230V 50/60Hz	0.34	555
800	VT03103U	2247	1~ 230V 50/60Hz	0.05	280
800	VT03103U	2246	1~ 230V 50/60Hz	0.09	355
800	VT03103U	2245	1~ 230V 50/60Hz	0.15	425
800	VT03062U	1683	1~ 230V 50/60Hz	0.16	435
800	VT03062U	1682	1~ 230V 50/60Hz	0.11	380
800	VT03061U	1664	1~ 230V 50/60Hz	0.2	470
800	VT03061U	1663	1~ 230V 50/60Hz	0.37	575
800	VT03023U	1243	1~ 230V 50/60Hz	0.31	545
800	VT03023U	1237	1~ 230V 50/60Hz	0.2	470
800	VT03022U	1218	1~ 230V 50/60Hz	0.06	300
800	VT03022U	1217	1~ 230V 50/60Hz	0.16	435
800	VT03022U	1216	1~ 230V 50/60Hz	0.11	380
800	VT03023U	1214	1~ 230V 50/60Hz	0.37	575
800	VT03023U	1213	1~ 230V 50/60Hz	0.43	600
800	VT03059U.1	2676	3~ 400V 50/60Hz	1.539	950
800	VT03059U.1	2709	3~ 400V 50/60Hz	0.919	800
800	VT03059U.1	2711	3~ 400V 50/60Hz	1.1024	850
800	VT03059U.1	2710	3~ 400V 50/60Hz	1.795	975
800	VT03060U.1	2670	3~ 400V 50/60Hz	0.9	770
800	VT03060U.1	2546	3~ 400V 50/60Hz	0.7716	730
800	VT03060U.1	2545	3~ 400V 50/60Hz	0.6561	695
800	VT03060U.1	2544	3~ 400V 50/60Hz	0.5527	655
800	VT03060U.1	2543	3~ 400V 50/60Hz	0.38	575
800	VT03060U.1	2542	3~ 400V 50/60Hz	0.46	615
800	VT03059U.1	2541	3~ 400V 50/60Hz	1.539	950
800	VT03059U.1	2540	3~ 400V 50/60Hz	1.3086	900
800	VT03059U.1	2539	3~ 400V 50/60Hz	1.1024	850

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
800	VT03059U.1	2538	3~ 400V 50/60Hz	0.919	800
800	VT03059U.1	2537	3~ 400V 50/60Hz	0.7573	750
800	VT03059U.1	2536	3~ 400V 50/60Hz	0.6157	700
800	VT01445U.1	2535	3~ 400V 50/60Hz	2.6579	1045
800	VT01445U.1	2534	3~ 400V 50/60Hz	2.2599	990
800	VT01445U.1	2568	3~ 400V 50/60Hz	0.21	440
800	VT01445U.1	2567	3~ 400V 50/60Hz	0.67	670
800	VT01445U.1	2566	3~ 400V 50/60Hz	1.12	800
800	VT01445U.1	2565	3~ 400V 50/60Hz	1.73	930
800	VT01445U.1	2564	3~ 400V 50/60Hz	2.56	1060
800	VT03060U.1	2449	3~ 400V 50/60Hz	0.9	770
800	VT03059U.1	2480	3~ 400V 50/60Hz	1.795	1000
800	VT03059U.1	1656	3~ 400V 50/60Hz	1.795	1000
800	VT01445U.1	2415	3~ 400V 50/60Hz	3.1	1100
800	VT03059U.1	1658	3~ 400V 50/60Hz	1.25	865
800	VT03098U	2261	3~ 400V 50/60Hz	0.31	550
800	VT03101U	2270	3~ 400V 50/60Hz	0.51	670
800	VT03100U.1	2263	3~ 400V 50/60Hz	1.32	880
800	VT03098U	2262	3~ 400V 50/60Hz	0.19	460
800	VT03099U.1	2249	3~ 400V 50/60Hz	1.16	815
800	VT03099U.1	2248	3~ 400V 50/60Hz	1.32	880
800	VT03101U	2271	3~ 400V 50/60Hz	0.46	650
800	VT03100U.1	2267	3~ 400V 50/60Hz	0.63	690
800	VT03100U.1	2266	3~ 400V 50/60Hz	0.77	735
800	VT03100U.1	2265	3~ 400V 50/60Hz	0.92	780
800	VT03100U.1	2264	3~ 400V 50/60Hz	1.16	815
800	VT03098U	2260	3~ 400V 50/60Hz	0.46	640
800	VT03098U	2259	3~ 400V 50/60Hz	0.51	670
800	VT03099U.1	2251	3~ 400V 50/60Hz	0.63	690
800	VT03099U.1	2250	3~ 400V 50/60Hz	0.92	780
800	VT01426U	2306	3~ 400V 50/60Hz	2.8	1100
800	VT03025U.1	1212	3~ 400V 50/60Hz	1.25	865
800	VT03059U.1	1830	3~ 400V 50/60Hz	1.795	975
800	VT03025U.1	1828	3~ 400V 50/60Hz	1.795	1000

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
800	VT03059U.1	2201	3~ 400V 50/60Hz	1.05	815
800	VT03024U	1742	3~ 400V 50/60Hz	0.25	500
800	VT03024U	1741	3~ 400V 50/60Hz	0.4	600
800	VT03060U	1661	3~ 400V 50/60Hz	0.6	710
800	VT03060U	1660	3~ 400V 50/60Hz	0.67	735
800	VT03059U.1	1659	3~ 400V 50/60Hz	1.56	900
800	VT03059U.1	1657	3~ 400V 50/60Hz	0.88	770
800	VT03024U	1242	3~ 400V 50/60Hz	0.6	700
800	VT03025U.1	1241	3~ 400V 50/60Hz	1.56	900
800	VT03024U	1219	3~ 400V 50/60Hz	0.67	735
800	VT03025U.1	1211	3~ 400V 50/60Hz	0.88	770
800	VT03025U.1	1210	3~ 400V 50/60Hz	1.795	975
800	VT03054U	1709	3~ 230V 50/60Hz	1.31	900
800	VT03054U	1708	3~ 230V 50/60Hz	1.16	865
800	VT03054U	1707	3~ 230V 50/60Hz	0.82	770
800	VT03054U	1706	3~ 230V 50/60Hz	1.8	975
800	VT03053U	1705	3~ 230V 50/60Hz	0.64	710
800	VT03053U	1704	3~ 230V 50/60Hz	0.7	735
900	VT03067U.1	2699	1~ 230V 50/60Hz	0.34	500
900	VT03067U.1	2689	1~ 230V 50/60Hz	0.14	370
900	VT03067U.1	2688	1~ 230V 50/60Hz	0.28	470
900	VT03067U.1	2687	1~ 230V 50/60Hz	0.4	530
900	VT03067U.1	2686	1~ 230V 50/60Hz	0.34	500
900	VT03067U.1	2707	1~ 230V 50/60Hz	0.14	370
900	VT03067U.1	2705	1~ 230V 50/60Hz	0.28	470
900	VT03067U.1	2704	1~ 230V 50/60Hz	0.47	560
900	VT03067U.1	2700	1~ 230V 50/60Hz	0.4	530
900	VT03067U.1	2569	1~ 230V 50/60Hz	0.47	560
900	VT03026U	1226	1~ 230V 50/60Hz	0.12	355
900	VT03104U	2302	1~ 230V 50/60Hz	0.22	410
900	VT03116U	2293	1~ 230V 50/60Hz	0.1	320
900	VT03104U	2304	1~ 230V 50/60Hz	0.1	320
900	VT03104U	2303	1~ 230V 50/60Hz	0.1	335
900	VT03104U	2301	1~ 230V 50/60Hz	0.3	470

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
900	VT03116U	2292	1~ 230V 50/60Hz	0.1	335
900	VT03116U	2291	1~ 230V 50/60Hz	0.22	410
900	VT03116U	2290	1~ 230V 50/60Hz	0.3	470
900	VT03067U	2088	1~ 230V 50/60Hz	0.25	430
900	VT03067U	1680	1~ 230V 50/60Hz	0.11	335
900	VT03067U	1679	1~ 230V 50/60Hz	0.325	485
900	VT03067U	1678	1~ 230V 50/60Hz	0.12	355
900	VT03026U	1228	1~ 230V 50/60Hz	0.11	335
900	VT03026U	1227	1~ 230V 50/60Hz	0.325	485
900	VT03026U	2080	1~ 230V 50/60Hz	0.25	430
900	VT03066U.1	2684	3~ 400V 50/60Hz	0.69	640
900	VT03065U.1	2683	3~ 400V 50/60Hz	0.94	690
900	VT03065U.1	1672	3~ 400V 50/60Hz	0.94	690
900	VT03065U.1	2691	3~ 400V 50/60Hz	1.3	785
900	VT03084U.1	1958	3~ 400V 50/60Hz	3.3	1200
900	VT03147U.1	2690	3~ 400V 50/60Hz	1.8	950
900	VT03066U.1	2685	3~ 400V 50/60Hz	0.6	610
900	VT03084U.1	2677	3~ 400V 50/60Hz	3.3	1200
900	VT03065U.1	2682	3~ 400V 50/60Hz	1.5	825
900	VT03065U.1	2708	3~ 400V 50/60Hz	1.3	785
900	VT03147U.1	2706	3~ 400V 50/60Hz	1.8	950
900	VT03084U.1	2703	3~ 400V 50/60Hz	2.9	1150
900	VT03084U.1	2702	3~ 400V 50/60Hz	2.7	1120
900	VT03147U.1	2701	3~ 400V 50/60Hz	2.1	1000
900	VT03066U.1	2698	3~ 400V 50/60Hz	0.6	610
900	VT03066U.1	2678	3~ 400V 50/60Hz	0.69	640
900	VT03084U.1	2681	3~ 400V 50/60Hz	2.9	1150
900	VT03084U.1	2680	3~ 400V 50/60Hz	2.7	1120
900	VT03147U.1	2679	3~ 400V 50/60Hz	2.1	1000
900	VT03066U	2450	3~ 400V 50/60Hz	0.7	640
900	VT03136U.1	2321	3~ 400V 50/60Hz	1.25	852
900	VT03136U.1	2320	3~ 400V 50/60Hz	1.5	905
900	VT03136U.1	2318	3~ 400V 50/60Hz	2.25	1036
900	VT03136U.1	2316	3~ 400V 50/60Hz	3	1135

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
900	VT03140U.1	2342	3~ 400V 50/60Hz	7.52	860
900	VT03136U.1	2319	3~ 400V 50/60Hz	1.875	975
900	VT03136U.1	2317	3~ 400V 50/60Hz	2.5	1073
900	VT03136U.1	2315	3~ 400V 50/60Hz	3.3	1200
900	VT03136U.1	2323	3~ 400V 50/60Hz	0.75	719
900	VT03136U.1	2322	3~ 400V 50/60Hz	1.125	822
900	VT03147U.1	2416	3~ 400V 50/60Hz	2.4	1050
900	VT03113U	2286	3~ 400V 50/60Hz	0.71	625
900	VT03106U.1	2298	3~ 400V 50/60Hz	1.1	745
900	VT03112U.1	2280	3~ 400V 50/60Hz	1.1	745
900	VT03113U	2288	3~ 400V 50/60Hz	0.44	550
900	VT03110U.1	2283	3~ 400V 50/60Hz	1.6	840
900	VT03105U	2277	3~ 400V 50/60Hz	0.59	590
900	VT03109U.1	2300	3~ 400V 50/60Hz	1.4	825
900	VT03106U.1	2299	3~ 400V 50/60Hz	0.7	625
900	VT03108U.1	2297	3~ 400V 50/60Hz	1.55	835
900	VT03108U.1	2295	3~ 400V 50/60Hz	1.81	875
900	VT03115U.1	2294	3~ 400V 50/60Hz	2.83	1140
900	VT03111U.1	2285	3~ 400V 50/60Hz	1.42	825
900	VT03105U	2278	3~ 400V 50/60Hz	0.44	550
900	VT01424U	2241	3~ 400V 50/60Hz	2.7	1040
900	VT03108U.1	2296	3~ 400V 50/60Hz	1.6	840
900	VT03113U	2289	3~ 400V 50/60Hz	0.37	510
900	VT03113U	2287	3~ 400V 50/60Hz	0.59	590
900	VT03110U.1	2284	3~ 400V 50/60Hz	1.55	835
900	VT03110U.1	2282	3~ 400V 50/60Hz	1.81	875
900	VT03112U.1	2281	3~ 400V 50/60Hz	0.7	625
900	VT03105U	2279	3~ 400V 50/60Hz	0.37	510
900	VT03105U	2276	3~ 400V 50/60Hz	0.71	625
900	VT03114U.1	2305	3~ 400V 50/60Hz	2.83	1140
900	VT03083U.1	1956	3~ 400V 50/60Hz	3.3	1200
900	VT03066U	1677	3~ 400V 50/60Hz	0.8	650
900	VT03066U	1676	3~ 400V 50/60Hz	0.42	530
900	VT03066U	1675	3~ 400V 50/60Hz	0.65	610

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
900	VT03066U	1674	3~ 400V 50/60Hz	0.49	570
900	VT03065U.1	1673	3~ 400V 50/60Hz	1.5	825
900	VT03064U.1	1671	3~ 400V 50/60Hz	1.9	910
900	VT03063U.1	1670	3~ 400V 50/60Hz	2.1	920
900	VT03063U.1	1669	3~ 400V 50/60Hz	2	910
900	VT03063U.1	1668	3~ 400V 50/60Hz	2.39	960
900	VT03030U.1	1391	3~ 400V 50/60Hz	2.1	920
900	VT03030U.1	1325	3~ 400V 50/60Hz	2	910
900	VT03027U	1245	3~ 400V 50/60Hz	0.8	650
900	VT03028U.1	1244	3~ 400V 50/60Hz	1.5	825
900	VT03027U	1225	3~ 400V 50/60Hz	0.42	530
900	VT03027U	1224	3~ 400V 50/60Hz	0.65	610
900	VT03027U	1223	3~ 400V 50/60Hz	0.49	570
900	VT03028U.1	1222	3~ 400V 50/60Hz	0.94	690
900	VT03029U.1	1221	3~ 400V 50/60Hz	1.88	910
900	VT03030U.1	1220	3~ 400V 50/60Hz	2.39	960
900	VT03058U	1719	3~ 230V 50/60Hz	2.2	920
900	VT03058U	1718	3~ 230V 50/60Hz	2.13	910
900	VT03058U	1717	3~ 230V 50/60Hz	2.5	960
900	VT03057U	1716	3~ 230V 50/60Hz	1.91	910
900	VT03056U	1715	3~ 230V 50/60Hz	1.58	825
900	VT03056U	1714	3~ 230V 50/60Hz	0.92	690
900	VT03055U	1713	3~ 230V 50/60Hz	0.585	650
900	VT03055U	1712	3~ 230V 50/60Hz	0.32	530
900	VT03055U	1711	3~ 230V 50/60Hz	0.48	610
900	VT03055U	1710	3~ 230V 50/60Hz	0.39	570
1000	VT01446U.1	2417	3~ 400V 50/60Hz	3.3	800
1000	VT01455U.1	2418	3~ 400V 50/60Hz	1.5	710
1000	VT03031U.1	2082	3~ 400V 50/60Hz	0.64	610
1000	VT03031U.1	1239	3~ 400V 50/60Hz	0.16	380
1000	VT03031U.1	1238	3~ 400V 50/60Hz	0.53	575
1000	VT03032U.1	1233	3~ 400V 50/60Hz	2.2	935
1000	VT03031U.1	1232	3~ 400V 50/60Hz	0.3	470
1000	VT03031U.1	1231	3~ 400V 50/60Hz	0.7	640

Table: Fan IDs

Fan–Diameter [mm]	Motor type [ERP No.]	FanID	Electrical connection	Nominal electric power [kW]	Working point Speed [min-1]
1000	VT03031U.1	1230	3~ 400V 50/60Hz	0.42	525
1000	VT03031U.1	1229	3~ 400V 50/60Hz	1.2	735
1000	VT03031U.1	2086	3~ 400V 50/60Hz	0.2	410
1000	VT03031U.1	2084	3~ 400V 50/60Hz	0.36	500

Table: Fan IDs

14 Troubleshooting tips

Errors	Possible cause, suggested solution
Fans are not turning	If NOTHING happens when the controller is switched on and nothing in the either as a setpoint or an actual value, check the **operating mode** and the **I/O configuration**. The operating mode appears on the far right of the 2nd line (A = automatic, S = slave mode, H = manual mode). The wrong input function has been chosen for the selected operating mode in the I/O configuration. • If the setpoint and the actual value appear in the Info menu, but the setpoint shown does not match the set setpoint, check the mode for any setpoint that may have been set externally. • Check the power supply and the cable to the fan for faults (cable break etc.). • Has the sensor failed? Check: • **2-wire pressure sensor**: Must deliver 4-20 mA (check with ampmeter). • **Temperature sensor**: Measure the impedance; it must be between 1200 and 2700 Ohm. Lower values indicate a short circuit or similar fault (e.g. water in the terminal box), higher values indicate a loose connection or cable break. • **Standard signal**: May be between 0 and 10V. If it is permanently at 0V, a defect is probable.
Fan does not reach its maximum speed or runs too slowly in normal operation	• Is the limiter active? The maximum fan speed is limited to the speed set here. Check the setting! • The control system may be incorrectly set up. • The fan speed increases when you increase the setpoint. If this does not help, you can adjust the Kp factor carefully: if the Kp factor is increased, the fan will reach its maximum speed quicker. **NOTE**: too great an increase in the Kp factor can lead to "oscillation"! If this happens, reduce the Kp factor again. • Is the sensor delivering a correct signal? If it is too low, the fan will not reach the requisite speed. Check: • **Temperature sensor**: Has the sensor been installed correctly? An incorrect value will be recorded near heat sources or e.g. in direct sunlight. Check the sensor and wiring! (Cable break? Has a wire come loose from the connection terminals?) • **Standard signal** 0-10V: Measure the signal on the terminals using a multimeter. It must be between 0 and 10V. Is the polarity correct? • **Pressure transmitter**: The 2-wire sensor delivers 4-20 mA; check this value (ammeter). If the value is not within this range or remains constant even when the pressure changes, the pressure transmitter is defective.

15 Expansion modules

The following add-on modules are available for the GMM EC and its models:

Product	ERP number	Description
GCM MOD GMM EC08.1	5203905	Modbus module for GMM EC01-08.x
GCM MOD GMM EC16.1	5203906	Modbus module for GMM EC16.x
GCM MOD GMM EC.1	5206415	Modbus module for GMM EC01-16.x
GCM PROF GMM EC08.1	5204483	Profibus module for GMM EC01-08.x
GCM PROF GMM EC16.1	5204484	Profibus module for GMM EC16.x
GCM (W)LAN GMM EC.1	5206083	(W) LAN module for GMM EC01-16.x
CAN adapter for GMM EC01-08	5205033	CAN adapter for GMM EC01-08.x
CAN adapter for GMM EC16	5205034	CAN adapter for GMM EC16.x

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