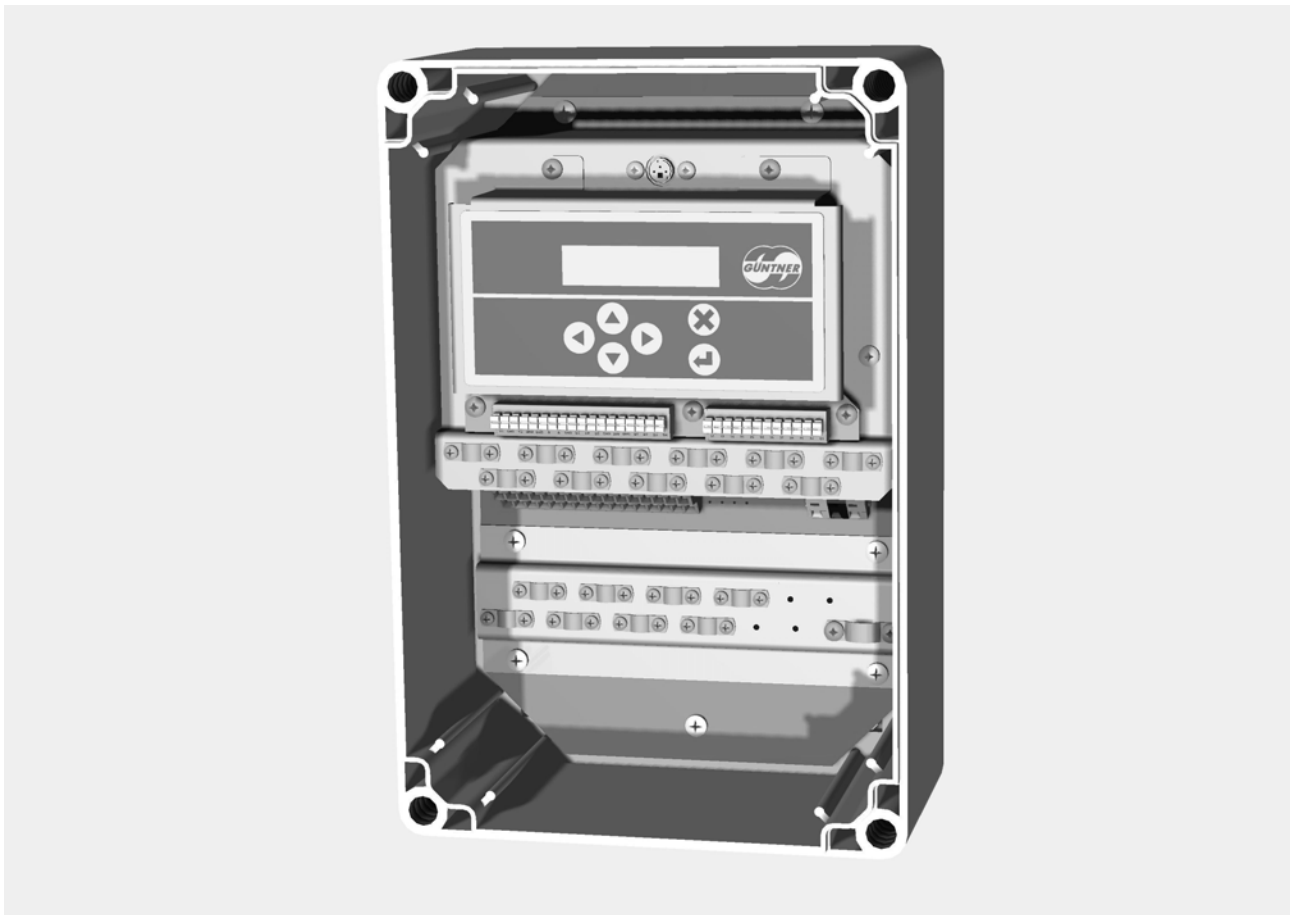




for the management and speed control of EC fans using pressure, temperature or voltage

Series	UL Version	
GMM EC/01		GMM EC/01 UL
GMM EC/04		GMM EC/04 UL
GMM EC/08		GMM EC/08 UL
GMM EC/16		GMM EC/16 UL
GMM EC/01.1		GMM EC/01.1 UL
GMM EC/04.1		GMM EC/04.1 UL
GMM EC/08.1		GMM EC/08.1 UL
GMM EC/16.1		GMM EC/16.1 UL

Contents

1	General notes.....	6
1.1	Safety instructions.....	6
1.2	Proper intended use.....	6
1.3	Commissioning notes.....	7
1.4	Classification.....	7
1.5	Transport and storage, copyright notice.....	8
1.6	Warranty and liability.....	8
1.7	Manufacturer and supplier address.....	9
1.8	EMC-compliant installation.....	9
2	Quick guide to rapid commissioning.....	10
3	Connection.....	12
3.1	Location of connections on the GMM EC/08.....	13
3.2	Controller mains connection.....	14
3.3	Controller fan connection.....	15
4	Installation of the GMM, cabling.....	16
4.1	Installation of the controller, ventilation.....	16
4.2	Cable laying, shielding.....	16
5	GMM commissioning.....	17
5.1	Commissioning menu.....	17
6	Display and operation.....	20
6.1	Basic menu/ Info menu.....	20
6.2	Status displays in the info menu.....	20
6.3	Operation.....	21
6.4	Edit mode.....	22
6.5	Selection mode.....	23
6.6	Potential-free signalling outputs.....	24
6.6.1	Digital output (11/12/14) (priority 1 alarms).....	24
6.6.2	Digital output (21/22/24) (priority 2 alarms).....	24
6.6.3	Digital output (31/32/34) (Operating message).....	24
6.6.4	Digital output (41/42/44) (threshold).....	25
6.7	Control inputs.....	26
6.7.1	Enabling the GMM.....	27
6.7.2	Speed limiter (night limiter).....	28
6.7.3	Switching to 2nd setpoint.....	29
6.8	Analogue inputs.....	30
6.8.1	Pressure sensor connection to B1/B2.....	30
6.8.2	External power signal connection to B1/B2.....	31
6.8.3	Temperature sensor connection to B3.....	32

6.8.4	0-10V voltage signal connection to B4.....	33
6.9	Analogue outputs.....	34
6.10	Operating menu.....	35
6.10.1	Current values.....	36
6.10.1.1	Input current values.....	36
6.10.1.2	External temperature.....	36
6.10.1.3	Control value.....	36
6.10.1.4	Air volume.....	37
6.10.1.5	Overall power.....	37
6.10.1.6	Fan speed.....	37
6.10.1.7	Fan power.....	37
6.10.1.8	Fan operating hours.....	37
6.10.2	Status.....	38
6.10.2.1	Mode.....	38
6.10.2.2	External enabling.....	38
6.10.2.3	Number and type of fans.....	38
6.10.2.4	Max. fan speed.....	38
6.10.2.5	Fan ID.....	38
6.10.2.6	Heat exchanger.....	39
6.10.2.7	Refrigerant.....	39
6.10.2.8	Hardware and software versions.....	39
6.10.2.9	Bus module.....	39
6.10.2.10	Operating mode.....	40
6.10.3	Setpoints.....	41
6.10.3.1	Setpoint 1.....	41
6.10.3.2	Setpoint 2.....	41
6.10.3.3	Threshold value.....	42
6.10.3.4	Night limiter.....	42
6.10.3.4.1	Night limiter activation/deactivation time	42
6.10.3.4.2	Night limiter functions list.....	42
6.10.4	Alarms.....	43
6.10.4.1	Alarm memory.....	43
6.10.5	Language.....	44
6.10.5.1	Language selection.....	44
6.10.6	Time.....	45
6.10.6.1	Time setting.....	45
6.10.7	Date.....	46
6.10.7.1	Set date.....	46
6.10.8	Manual mode.....	47
6.10.8.1	Manual mode ON / OFF / Control value.....	47
6.11	Service.....	48
6.11.1	Control parameters.....	49
6.11.1.1	Control parameters Kp, Ti and Td.....	49
6.11.1.2	Cooling/heating control parameter mode.....	50

6.11.1.3	Base control value and Start control value control parameters.....	50
6.11.2	Heat exchanger.....	51
6.11.2.1	Heat exchanger type.....	51
6.11.3	Refrigerant.....	52
6.11.3.1	Refrigerant selection.....	52
6.11.4	Operating mode.....	53
6.11.4.1	Auto internal.....	53
6.11.4.2	Auto external analogue.....	53
6.11.4.3	Auto external BUS.....	53
6.11.4.4	Slave external analogue.....	53
6.11.4.5	Slave external BUS.....	54
6.11.5	Bypass.....	55
6.11.5.1	Bypass switching.....	55
6.11.6	Functions.....	56
6.11.6.1	Number of setpoints.....	56
6.11.6.2	Nightsetback.....	56
6.11.6.3	Setpoint displacement.....	57
6.11.6.4	Low Capacity Motor Management.....	58
6.11.6.4.1	LCMM hysteresis.....	59
6.11.6.4.2	LCMM Fancycling.....	60
6.11.6.4.3	LCMM Fancycling assignment.....	60
6.11.6.4.4	LCMM min. control value.....	61
6.11.6.4.5	LCMM min. control value adjustment.....	62
6.11.6.5	Subcooler function.....	63
6.11.6.6	External BUS module.....	64
6.11.7	I/O configuration.....	64
6.11.7.1	Analogue inputs.....	64
6.11.7.2	Current inputs AI1 and AI2.....	65
6.11.7.3	AI3 input temperature sensor.....	66
6.11.7.4	0..10V AI4 input.....	66
6.11.7.5	Digital inputs.....	67
6.11.7.6	Analogue outputs.....	67
6.11.7.7	Digital outputs.....	67
6.11.8	SI/IP selection.....	68
6.11.8.1	SI/IP units system.....	68
6.11.9	Factory setting.....	69
6.11.9.1	Control reset (factory setting).....	69
6.11.10	Delivery condition.....	70
6.11.10.1	Control reset (delivery condition).....	70
7	Faults and troubleshooting.....	71
7.1	General notes.....	71
8	Technical data.....	72

8.1	GMM EC/01 /04 /08 (.1) dimensions.....	72
8.2	GMM EC/16 (.1) dimensions.....	73
8.3	GMM EC/01 /04 /08 (.1) UL dimensions.....	74
8.4	GMM EC/16 (.1) UL dimensions.....	75
9	Electrical and mechanical properties.....	76
10	External control value scaling.....	77
11	Parameters after commissioning - Factory setting.....	78
12	Error messages and warnings on the GMM display.....	79
13	Fan IDs.....	81
14	Troubleshooting tips.....	86
15	Index.....	87
16	Picture index.....	91
17	Table index.....	92

1 General notes

1.1 Safety instructions

In order to prevent serious physical injuries or major material damage, work on/with the equipment may only be performed by authorised persons with the appropriate training and qualifications who are familiar with the set-up, installation, commissioning and operation of speed controllers. These persons must read the operating instructions carefully before installation and commissioning. In addition to the operating instructions and national regulations on accident prevention, 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 located in the plastic housing (protection rating IP54). This protection rating is only guaranteed when the equipment is closed! The UL models are assembled on an open mounting plate.

An open controller creates exposure to hazardous electrical voltages; the protection rating of the open equipment is IP100! The applicable national accident prevention regulations must be followed when working on controllers under voltage.

1.2 Proper intended use

Ensure that fuses are only replaced with fuses of the specified rating and note that they must not be repaired or bridged. Only a double-pole circuit tester may be used to check that the equipment is disconnected from the power. The equipment is only intended for the purposes agreed in the order confirmation. Any other or additional use is not in accordance with its intended purpose. The manufacturer accepts no liability for any damage arising from unintended use. The intended use also includes compliance with the installation, operating and maintenance procedure described in these operating instructions. The technical data and the details of the terminal assignments can be found on the type plate and the instructions and must be followed.

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-section, fuses, earth conductor connection etc.). Additional information is included in the documentation. If the controller is used in a particular area of application, the requisite standards and regulations must be followed.

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

Güntner Motor Management for EC Systems	<i>GMM EC/</i>
01 04 08 16 = Number of control outputs for EC fans	<i>X</i>
Code only for UL models (on mounting plate)	<i>UL</i>

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

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

GMM EC/01.1	= Controller and motor management for 1 EC fan
GMM EC/04.1	= Controller and motor management for up to 4 EC fans
GMM EC/08.1	= Controller and motor management for up to 8 EC fans
GMM EC/16.1	= Controller and motor management for up to 16 EC fans

UL examples:

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

All rights, including rights created by patent grant or other registration, are reserved.

These operating instructions are the copyright of

GÜNTNER AG & CO. KG

Fürstenfeldbruck

1.6 Warranty and liability

The current General Terms and Conditions of Güntner AG & Co. KG are applicable.

See 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

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D-82256 Fürstenfeldbruck, Germany

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1.8 EMC-compliant installation

The GMM EC/01..16 series controllers meet the requirements of resistance to EMC interference in accordance with EN 61000-6-2 and emissions in accordance with EN 61000-6-3.

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

- The equipment must be properly earthed (with at least 1.5 mm²).
- All measurement and signalling cables (only use measurement cables e.g. LIYCY 3x0.5², not telephone cables!) must be shielded.
- A special cable must be used for bus wiring to the EC fans. e.g. HELUKABEL DeviceNet PUR flexible 1x2xAWG24 + 1x2xAWG22 / 81910.
- The shielding of measurement, signalling and bus cables must be *earthed* unidirectionally.
- Signalling and control cables must be laid separately from mains and motor cables e.g. in separate cable ducts.

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 exchangeable microfuses built into the GMM for semiconductor and motor protection. The equipment must be fused with a C 6A pro phase circuit breaker provided by the customer. A 250 V / 1 A fuse is built into the UL model on the 24 V side.				
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 13): <table> <tr> <td>Communication interface:</td><td>Terminal A and B (top row)</td></tr> <tr> <td>24 V fan voltage supply:</td><td>Terminal + and - (bottom row)</td></tr> </table>	Communication interface:	Terminal A and B (top row)	24 V fan voltage supply:	Terminal + and - (bottom row)
Communication interface:	Terminal A and B (top row)				
24 V fan voltage supply:	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	<table> <tr> <td>Pressure sensor</td><td>1 (brown) on +24V 2 (green) on B1 or B2 2 (blue) on B1 or B2</td></tr> <tr> <td>Temperature sensor</td><td>1 (white) on B3 2 (brown) on GND</td></tr> <tr> <td>Standard Signal (0 ... 1V)</td><td>Plus (+) on B4 Minus (-) on GND</td></tr> </table>	Pressure sensor	1 (brown) on +24V 2 (green) on B1 or B2 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
Pressure sensor	1 (brown) on +24V 2 (green) on B1 or B2 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 24						
Enable	The function of the D1 input 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) In version .1 (see type plate) the D1 input must be connected with +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 can be set in the Time menu option. The time, date and error code are stored in the log in the event of a fault.						

The GMM is generally operational once the above settings are made.

"Manual" mode can be selected to check the functioning of the GMM. To do this, select the "Manual mode" menu option with the "down" arrow and then confirm with the "right" arrow. Scroll to the "Manual mode on" menu option using the "up/down" arrows and select the function with the "Enter" key. A * appears at the end of the first line and indicates that this function is now selected. Now use the "down" arrow to navigate to the control value function and select it with the "right" arrow. The control value (0 - 100%) is displayed. This control value can now be modified by pressing the "left" arrow. As soon as the change has been confirmed with the "left" arrow, the fans will run with this control value.

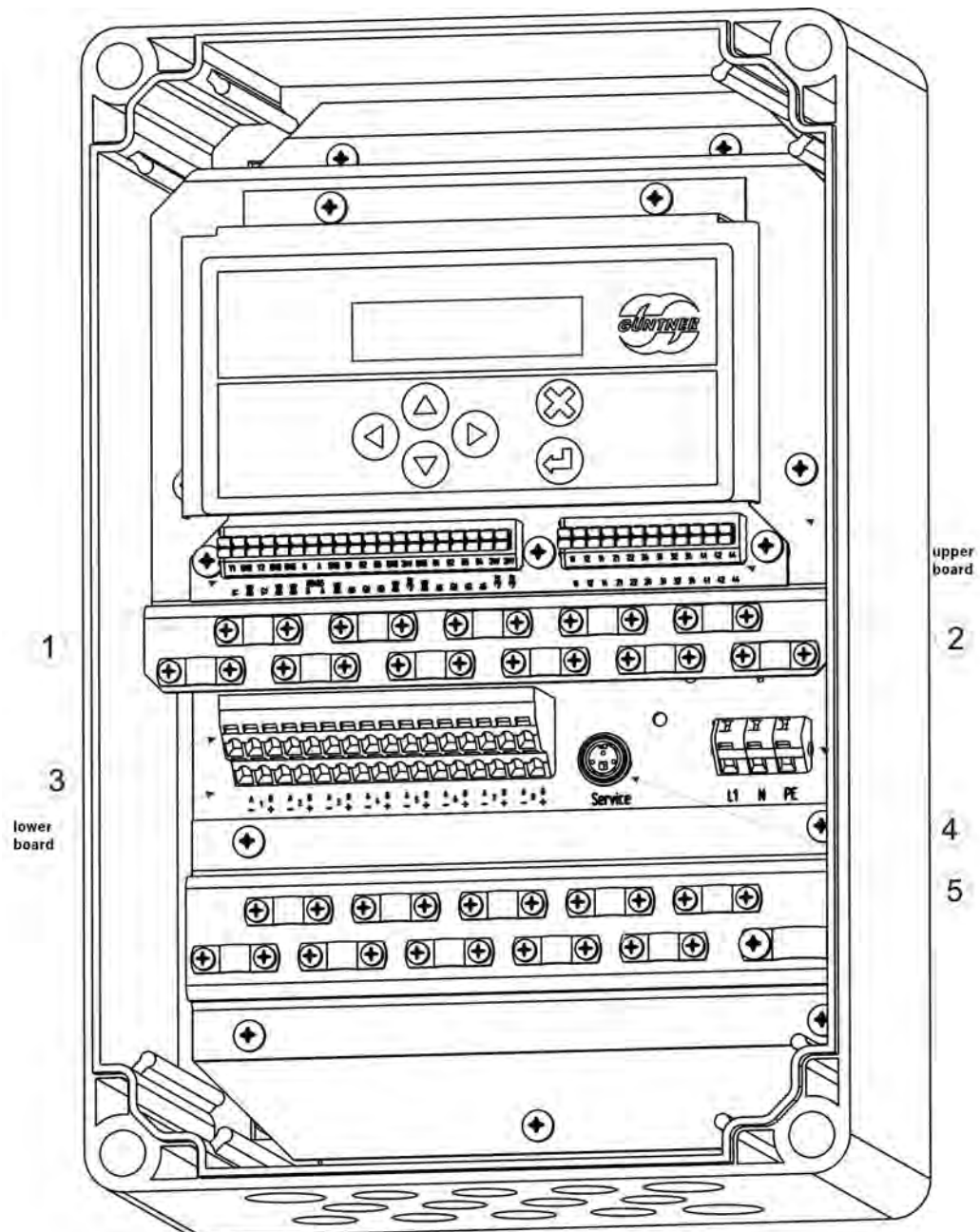
If manual mode is deactivated again after this test, the GMM will revert to the set mode.

- | | |
|-----------------------------------|---|
| Operating mode | The default mode setting is "Automatic internal" . This means that the controller controls to the set setpoint. For this to be possible, a setpoint must be entered and the input for the actual value must be defined in the I/O configuration. The control parameters Kp, Ti and Td can still be modified in the service menu. |
| 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 the D2 input or via the timer, which is programmed in the Night limiter menu option. |
| Reference point changeover | It is possible to choose between two setpoints (e.g. for summer and winter operation). The switchover is effected via the D3 input. |
- The "Limiter" and **"Setpoint switchover"** functions **Reference point changeover** menu.

3 Connection

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.

3.1 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 26](#)).
- (2) Potential-free signalling outputs (see [Potential-free signalling outputs, Page 24](#)).
- (3) EC fan connections 24 V DC, RS485 (see [Controller fan connection, Page 15](#)).
- (4) Mains connection (see [Controller mains connection, Page 14](#)).
- (5) Connection for software update (see **separate description**).

3.2 Controller mains connection

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

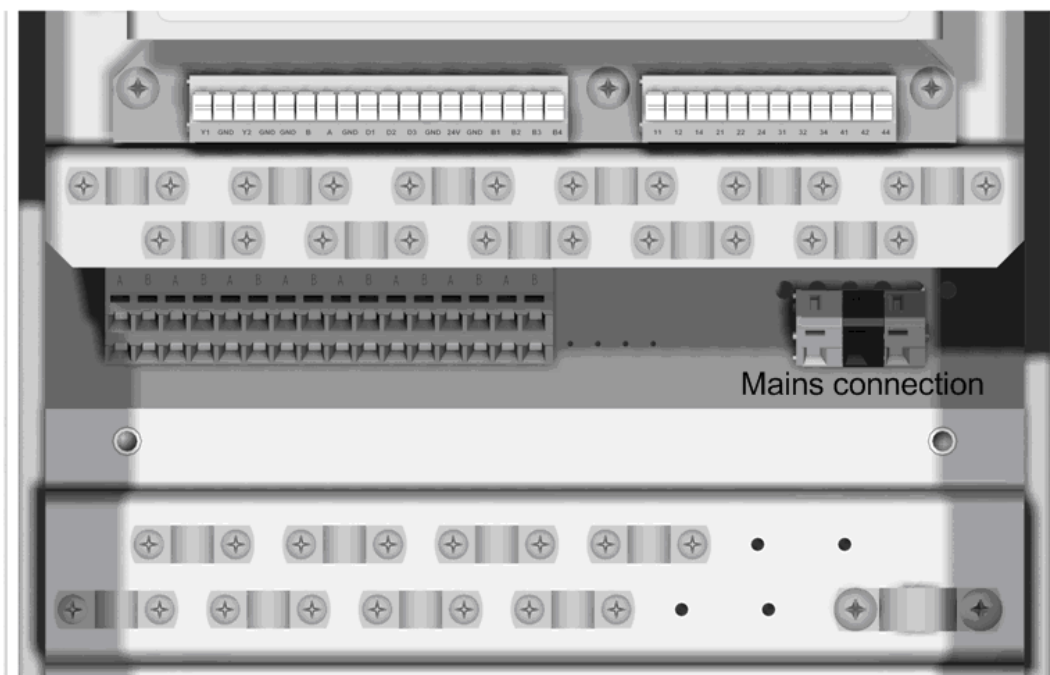
- L1** = Phase conductor
- N** = Neutral conductor
- PE** = Earth conductor

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

The supply must be fused with 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 respective local **UL** regulations.

IMPORTANT: The heat exchanger fans must not be switched on/off by switching the mains on/off, but only via the switch.



GMM mains connection

3.3 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 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 13](#)).

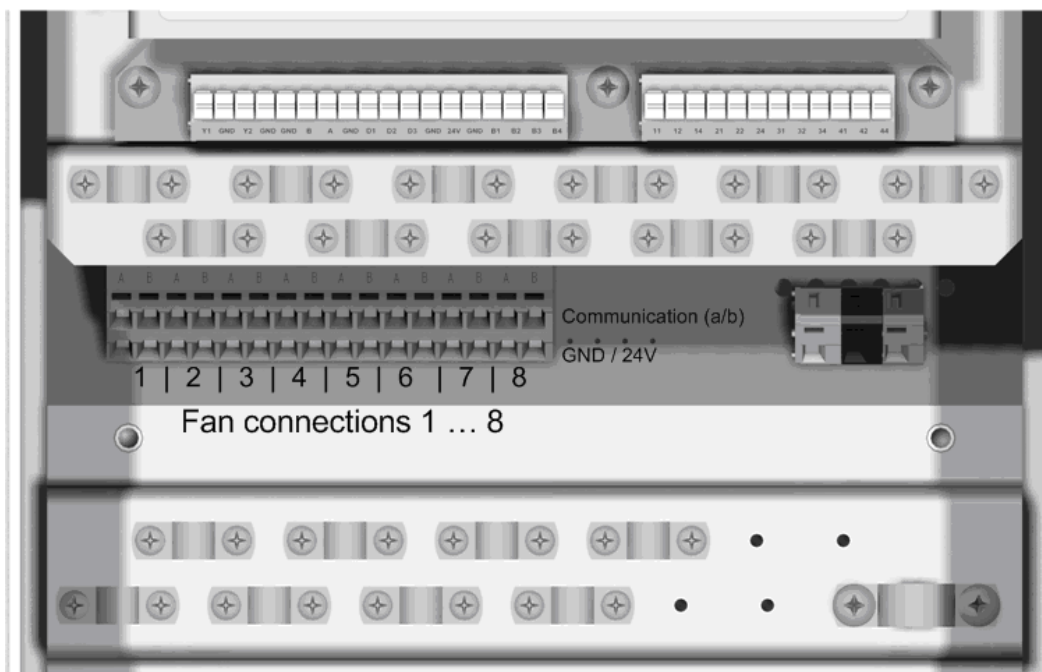
Depending on the model, there are 1 to 16 control connections for the EC fans on the lower PCB.

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 volt

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

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



GMM fan connections

4 Installation of the GMM, cabling

4.1 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, **the** temperature inside the switch cabinet must be heeded (see [Electrical and mechanical properties, Page 76](#)).
- 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 Cable laying, shielding

Basically sensor cables and bus cables must be laid separately from the motor and mains cables i.e. not in the same cable duct. Shielded cable must be used.

5 GMM commissioning

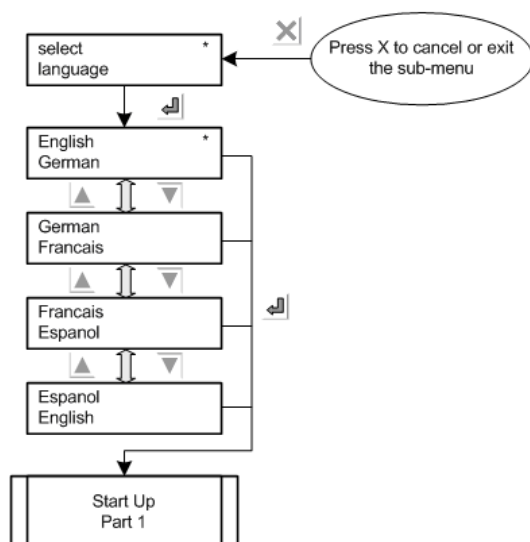
With the GMM, the fans are controlled via a bus. These fans must be set up and checked for the condenser or recirculating cooler depending on the design of the heat exchanger. These settings and checked are necessary on initial commissioning and possibly when a fan is changed. The power and volume of the heat exchanger are defined by this commissioning. In the annex you will find a table, which contains the fan ID and the 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.

5.1 Commissioning menu

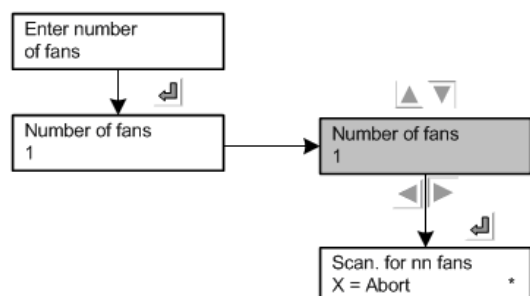
The default language for commissioning is English, even if a different language has been selected for the display. However, the commissioning and only applies to the commissioning menu.

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 queried next.

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



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

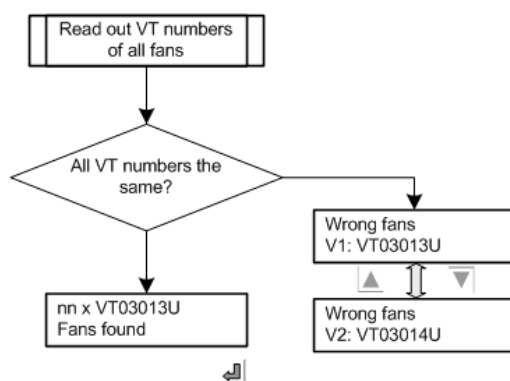


If fewer fans are found, the numbers of all the fans not found are displayed.

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

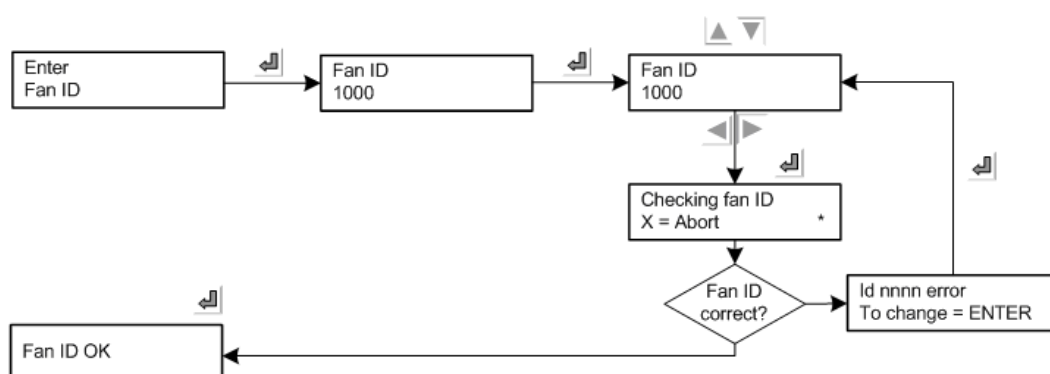
If the search is successful i.e. the specified number of fans is found, the VT numbers of the fans is read out. The VT number is the type designation of the motor.

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



It is then not possible to continue commissioning since all the fans must have the same VT number. It is now essential to change the fans with the incorrect VT number. The VT numbers are printed on the type plate of the fans.

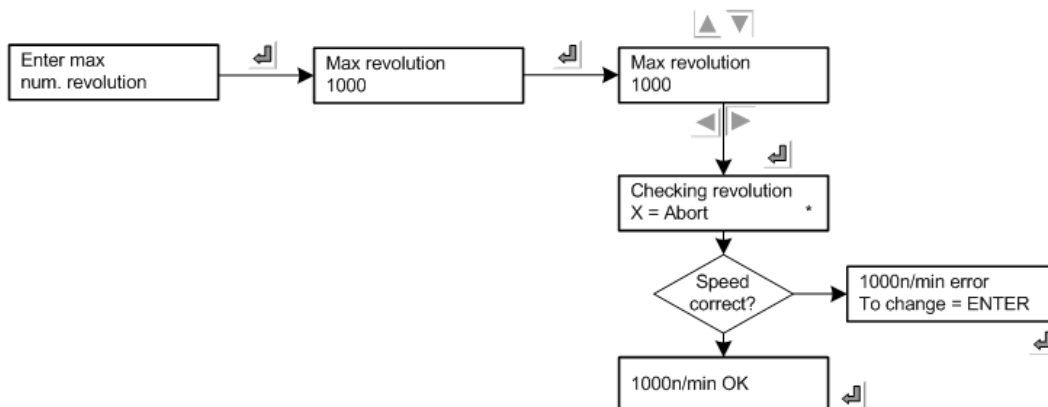
If all the VT numbers of the fans are now the same, the ID number of the fans is entered in the next step. The ID number represents the working point of the fan for this heat exchanger. You will find this number in the electrical circuit diagram of the heat exchanger or the overview table in the annex.



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 been completed before, the last ID number entered is proposed.

After input, the GMM **checks** the fan ID. The text cycle is indicated by a flashing * in the display. If the fan ID is incorrect, you are prompted to make a correct input. With

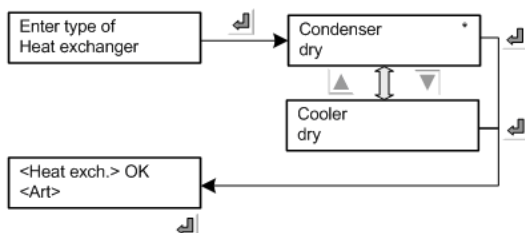
the **"ENTER"** key you go back to the ID entry. However, you can also abort the process by pressing the **"X"** key. If you abort the process, commissioning is not yet complete and normal operation will not be started. Commissioning must first be performed completely. If the appropriate fan ID is found, 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. 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 be prompted again to correct the input.

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



A condenser (e.g. GVH etc.) or a recirculating cooler (e.g. GFH etc.) may be set up.

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 marked* a "*".

The default value is "bar".

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

If all the parameters have now been entered, they are saved. This takes a few seconds.

This completes commissioning and the GMM displays the **"INFO"** menu.

6 Display and operation

Information is shown on a 2-line display. The controller is operated via a membrane keyboard.

6.1 Basic menu/ Info menu

Display with a drycooler or condenser with selected refrigerant

Setpoint	xx.x°C	→ Setpoint
Current Value	xx.x°C A	→ Current value

Display with a drycooler without refrigerant selection

Setpoint	xx.xbar	→ Setpoint
Current Value	xx.xbar A	→ Current value

6.2 Status displays in the info menu

Setpoint	xx.x°C	→ Status display
Current Value	xx.x°C A	

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

Further messages in the second line

- No release
- Night limiter (alternating with current value)
- Error messages in clear text (alternating with current value)

Setpoint	xx.x°C	→ Text message
No release		

6.3 Operation



Cancel and return to INFO menu



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



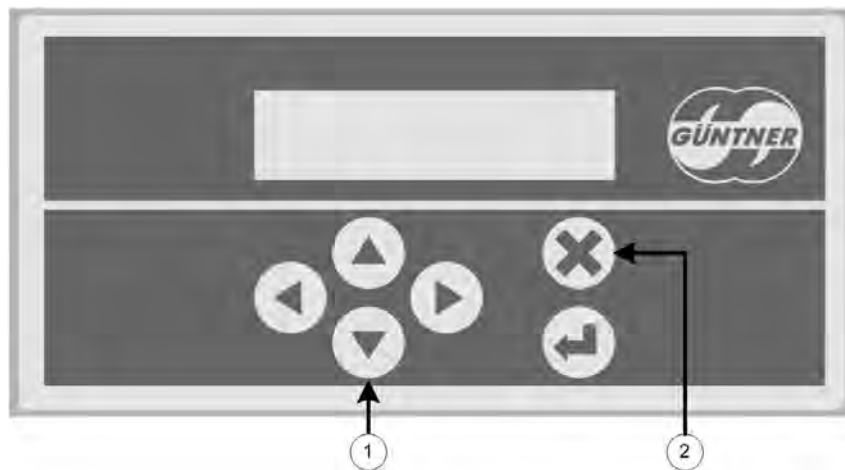
Right arrow for moving to the next menu level



Left arrow for moving to the previous menu level



Left 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

6.4 Edit mode

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



Select menu option you want
(top line)

Setpoint	1
Setpoint	2



Change to menu option

Setpoint	1
30.0°C	



Change to write mode

Setpoint	1
30.0°C	

→ Write mode



Decimal point selection

Setpoint	1
30.0°C	

Setpoint	1
30.0°C	

Setpoint	1
30.0°C	



Change value

Setpoint	1
40.0°C	



New value acceptance

Setpoint	1
40.0°C	

6.5 Selection mode

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



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

Language
Time

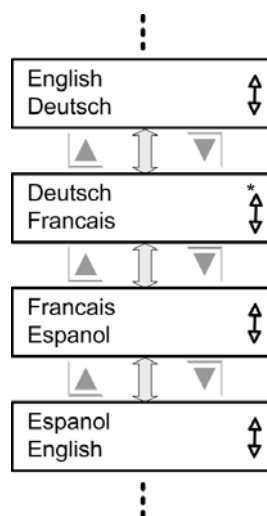


Change to the menu option
→ The function/language currently set
is marked with an *asterisk*.

English
Deutsch *



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

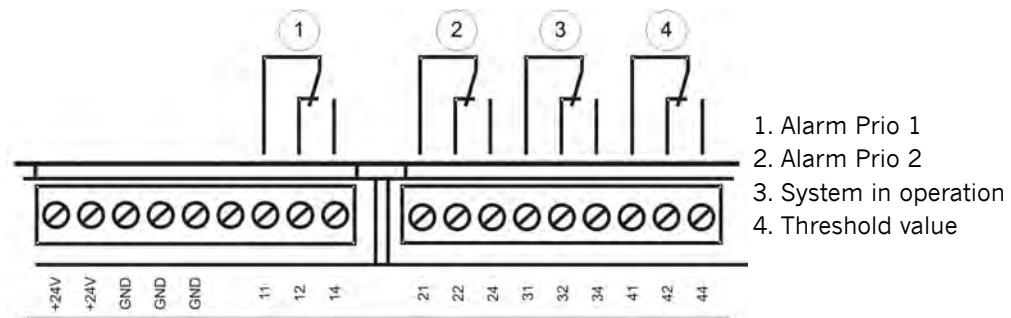


Accept function/language.
→ selected language is marked with an
asterisk.

Deutsch
Francais *

6.6 Potential-free signalling outputs

For safety reasons, the potential-free signalling outputs (two-way contacts) are designed such that the corresponding signalling relay drops out i.e. the break contact of the corresponding two-way contact closes, when an event occurs. As a result a fault is also reported when a fault causes the power to the GMM to be interrupted (e.g. failed voltage supply).



6.6.1 Digital output (11/12/14) (priority 1 alarms)

All signals on the **Priority 1** output are faults signalling the complete failure and shutdown of the heat exchanger.

The signalling relay has contacts 11/12/14. An alarm is signalled in the following situations:

- For example, all fans have failed (equipment fault)
- Error messages and alarm assignment see [Error messages and warnings on the GMM display, Page 79](#)

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.

6.6.2 Digital output (21/22/24) (priority 2 alarms)

All signals on the **Priority 2** output are events that do not result in the complete failure of the heat exchanger. These are warnings that the operation of the heat exchanger is impaired.

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

- e.g. sensor faults or a failed fan (in equipment with multiple fans)
- Error messages and alarm assignment see [Error messages and warnings on the GMM display, Page 79](#)

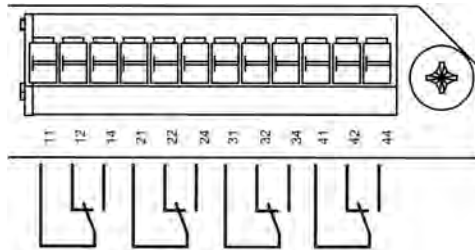
If a warning occurs, the signalling relay is switched (drops out) i.e. the two-way contact 21/22 closes. The load on this potential-free contact must not exceed 250 V / 1 A.

6.6.3 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.

6.6.4 Digital output (41/42/44) (threshold)

You can set a threshold on the GMM. If the control value from the GMM to the fans exceeds this threshold, signalling relay 4 (contact 41/42/44) is tripped. This can be used, for example, to switch a solenoid valve, control an actuator, activate a spray etc.



Signalling outputs

The threshold is not a FAULT, it is just a 2-point controller with an adjustable switching point. Do not add this contact to your fault report!

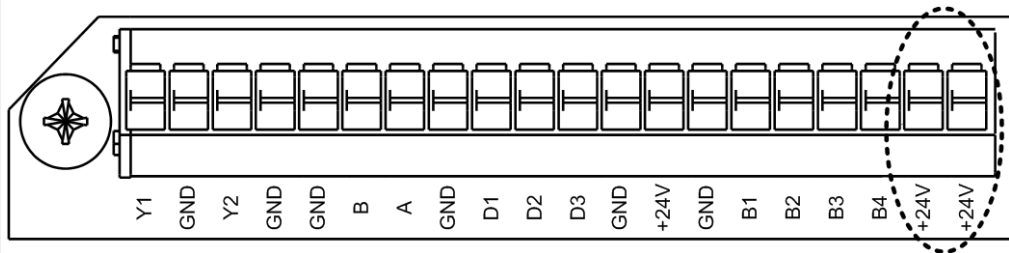
6.7 Control inputs

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 **GND terminal** 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 versions with different wiring on the digital inputs.

The current GMM ECxx.1 version can be recognized by the 2 additional +24V terminals.

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

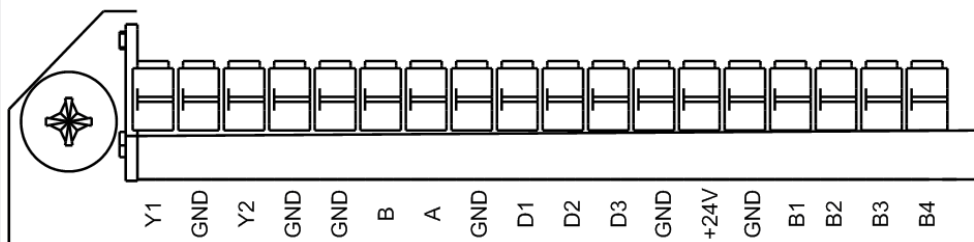


D1...D3 become active with +24V

Two additional +24 volt terminals from GMM ECxx.1 version

The GMM ECxx version does not have any additional +24V.

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



D1...D3 become active with GND

CAUTION! A faulty connection can cause serious damage!

Under no circumstances may the mains voltage be applied to the digital outputs, or may work be performed with another external voltage!

6.7.1 Enabling the GMM

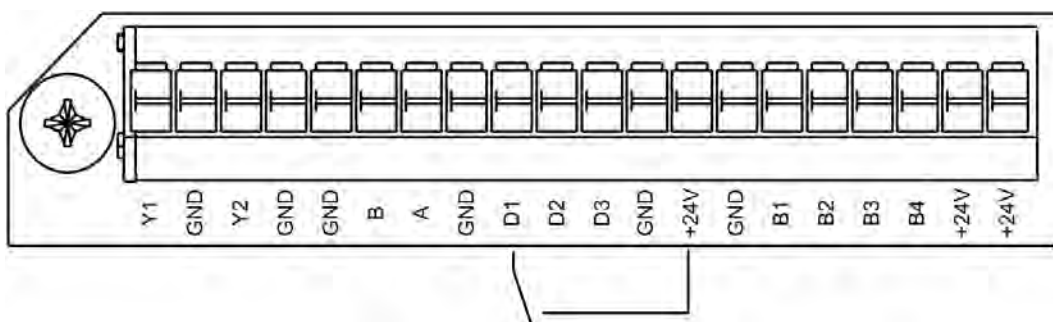
The fans are enabled via terminal "D1"(enable). The speed then depends on the control value. If enable is not switched, the fans will be disabled (speed = 0).

If it is not to be enabled externally, terminal must be connected using a jumper!

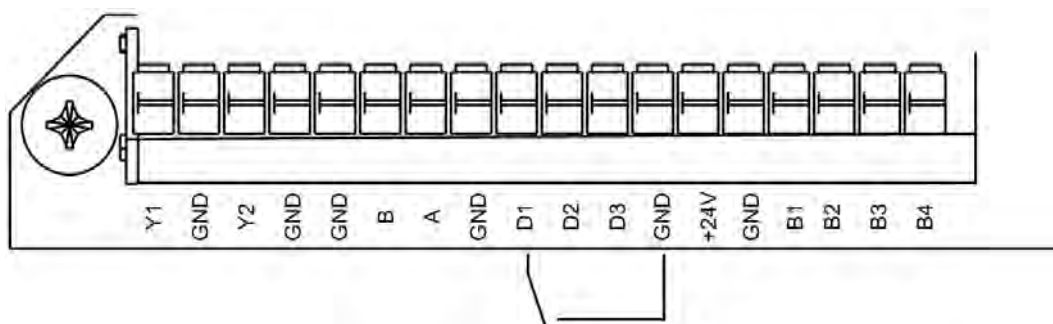
This enabling jumper is always built in at the factory.

CAUTION! 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

Important note: Under no circumstances may the controller be disabled by interrupting the mains voltage ! Continuously switching the supply voltage can damage the controller, which is not covered by warranty for such damage!

In "manual mode" is no release necessary.

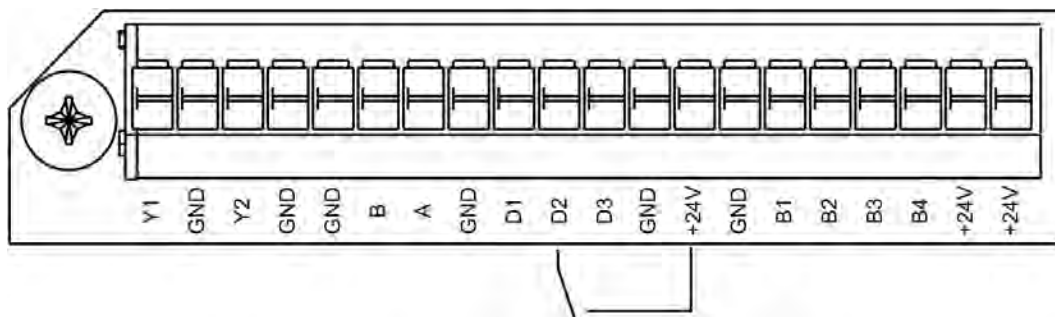
See [Manual mode, Page 47](#)

6.7.2 Speed limiter (night limiter)

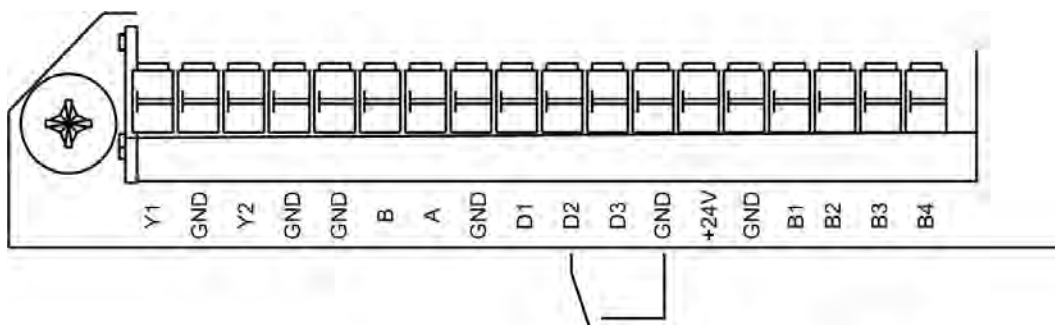
The (night) speed limiter is activated via the "D2" terminal. If this terminal is switched, the control signal is activated and hence the fan speed are limited to the set value. The GMM will not exceed the speed set there. For setting the speed limiter, see [Setpoints, Page 41](#) and for general activation see [Service, Page 48](#).

CAUTION! 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

6.7.3 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).

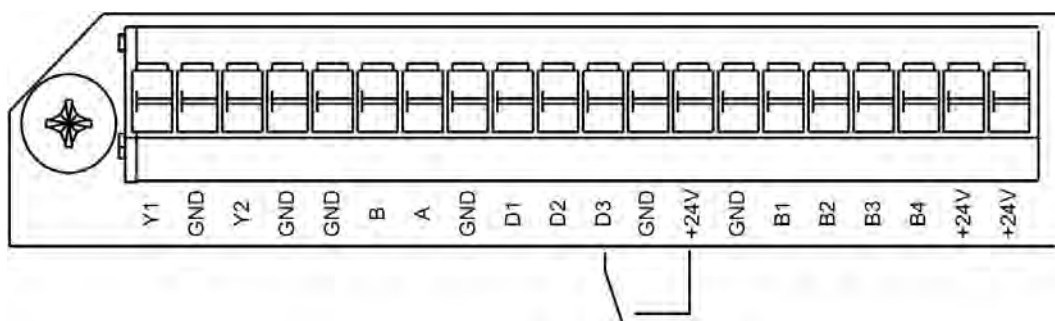
Heating/cooling:

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)

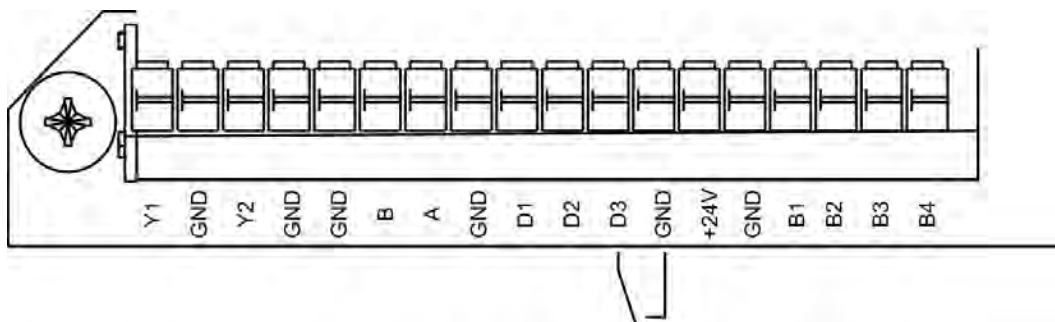
The second setpoint and the second setpoint displacement are switched over with the **"D3"** input.

CAUTION! 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 control system 1 to control system 2

6.8 Analogue inputs

The GMM has four sensor inputs

Input BI1 and BI2	Current input	4-20mA
Input B3	Impedance sensor	PTC/KTY81-210
Input B4	Voltage source	0-10V DC

The options of how inputs can be used and correspondingly must be connected are described below.

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

The 40-20mA inputs may be neither poled nor connected directly to 0-10V DC or +24V.

6.8.1 Pressure sensor connection to B1/B2

1 or 2 sensors (2-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))

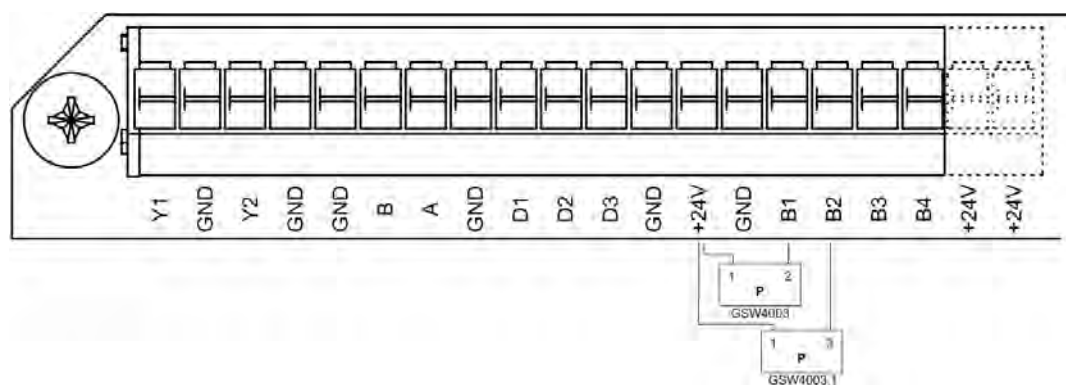
B2 = 4-20mA signal from sensor 2 (GSW4003.1: blue(3), GSW4003: green(2))

The connected pressure sensors must be configured in the hardware configuration.

With use of 2 sensors the greater signal is always processed by the control unit as the current value (max. selection)

NOTE: 3-wire sensors with a 4-20 mA signal output can also be connected but also require an earth 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

6.8.2 External power signal connection to B1/B2

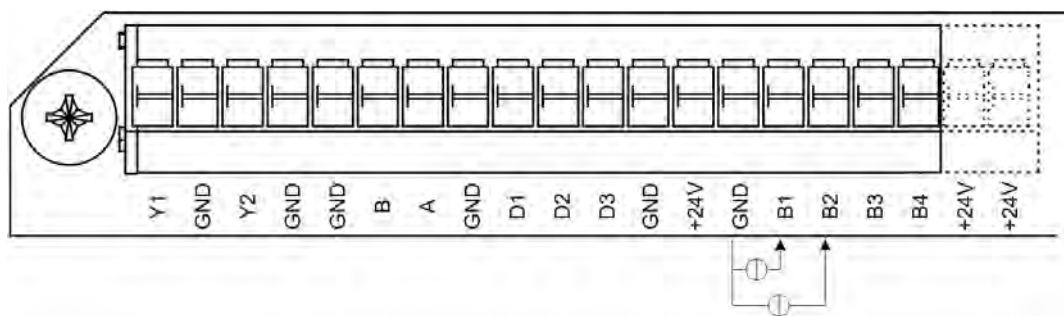
The B1 or B2 inputs can also be used to control the controller in SLAVE operation. To do this, this input must be defined as a control value slave in the I/O configuration. The 420mA input signal is scaled 0-100% in a control signal and passed on to the fans. Furthermore a setpoint, for example, can also 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

Important: Make sure the current source polarity is correct!



Current source connection

With the current inputs ensure currents of less than **2mA** or greater than **22mA** result in sensor fault display and message.

6.8.3 Temperature sensor connection to B3

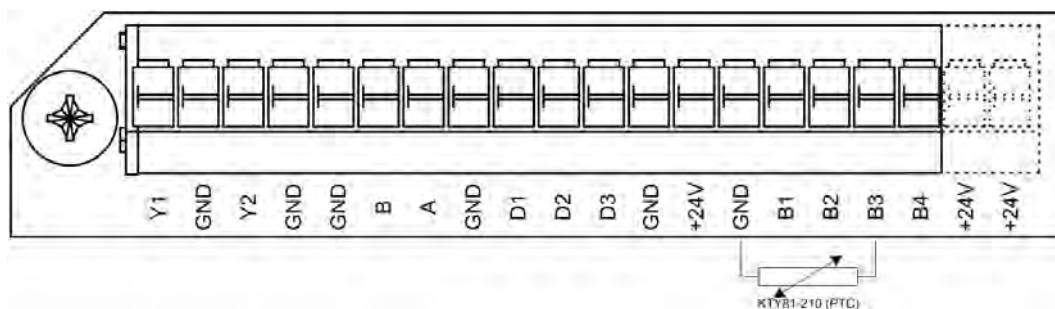
A temperature sensor is connected on the terminals

GND = Earth

B3 = Signal input

There is no particular sequence for the cores.

The Güntner GTF210 temperature sensor is used in a range from -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

6.8.4 0-10V voltage signal connection to B4

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

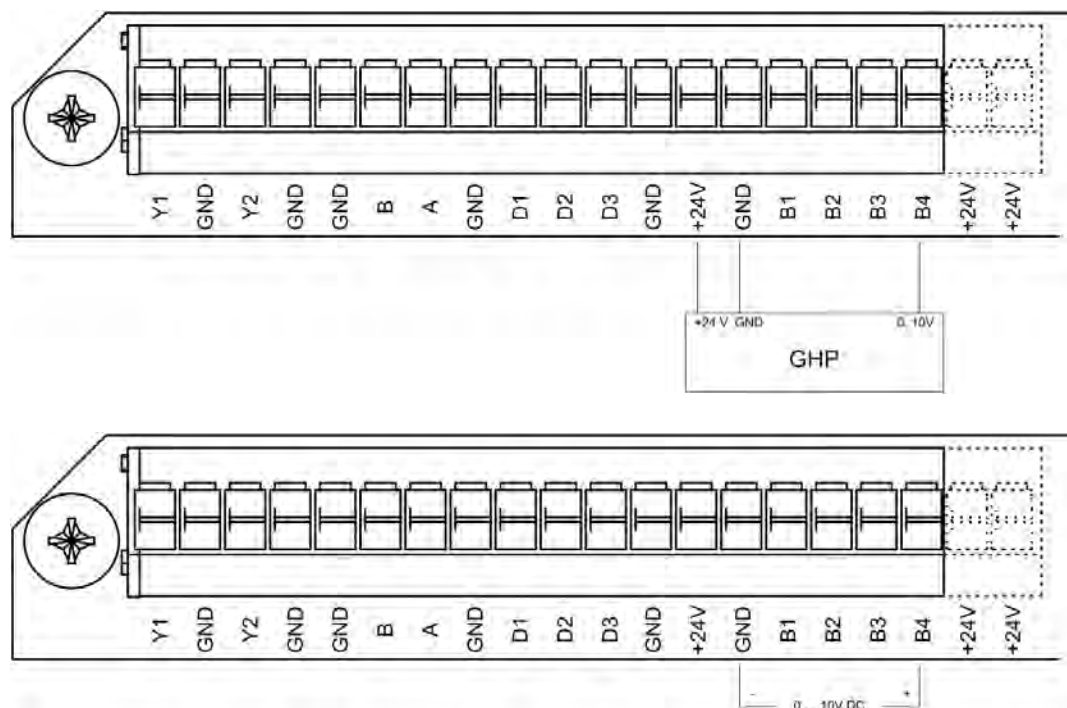
As an alternative, you can also connect a GHP manual potentiometer as a remote control. The connecting terminals on the GHP are labelled with either **1/2/3** or **x/-/Y** :

+ or 3 on **+24V**

- or 1 on **GND**

Y or 2 on **B4**

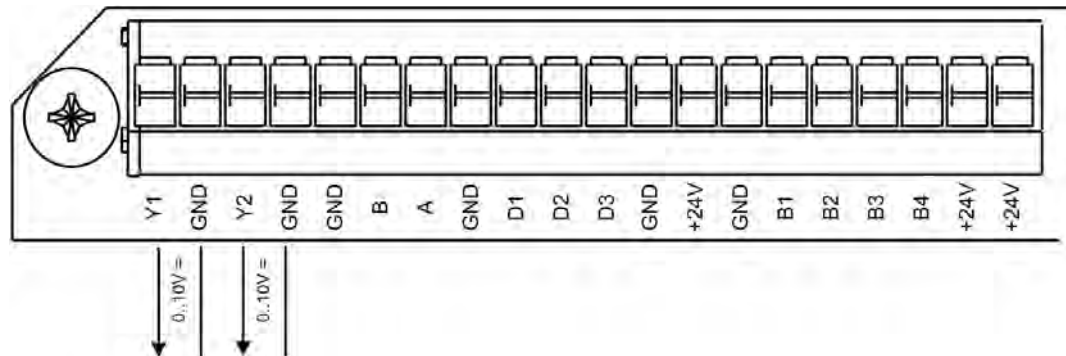
You can then use the speed controller purely as a speed adjuster and specify the fan speed yourself manually.



0-10V standard signal connection

6.9 Analogue outputs

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



Analogue outputs

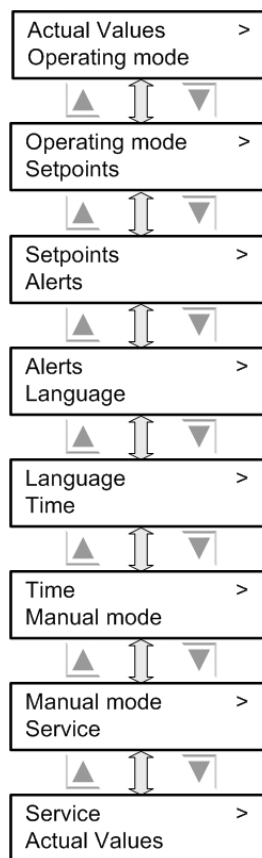
The **Y1** output issues the control signal (0..100%) scaled on 0..10V.

The **Y2** output 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 63](#)

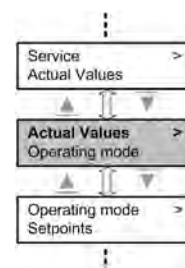
6.10 Operating menu

Set-up Basic menu



6.10.1 Current values

The current values for input signals, control values, current and power are displayed here.



6.10.1.1 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

6.10.1.2 External temperature

The current external temperature is displayed when an external temperature is configured.



6.10.1.3 Control value

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



6.10.1.4 Air volume

This displays the average control value of all fans in percent. This value is fed back by the fans.



6.10.1.5 Overall power

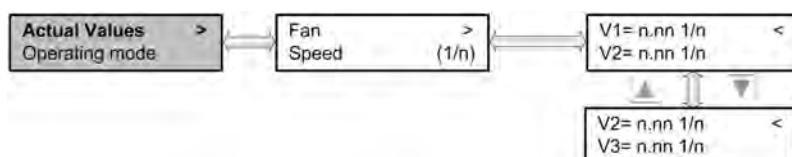
This displays the all connected fans. The power is calculated from the intermediate circuit voltage and the intermediate circuit current.

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



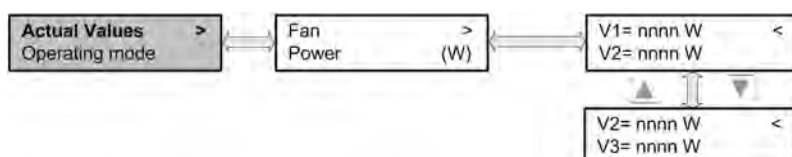
6.10.1.6 Fan speed

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



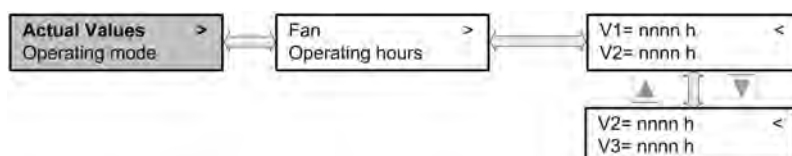
6.10.1.7 Fan power

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



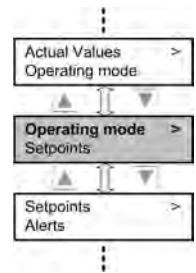
6.10.1.8 Fan operating hours

The operating hours of every EC fan are displayed.



6.10.2 Status

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



6.10.2.1 Mode

Set heating or cooling mode display.



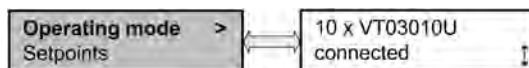
6.10.2.2 External enabling

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



6.10.2.3 Number and type of fans

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



6.10.2.4 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.



6.10.2.5 Fan ID

The working point that is set for the connected fans via the fan ID is displayed here. See [Fan IDs, Page 81](#)



6.10.2.6 Heat exchanger

The heat exchanger type is displayed here. The **"Dry"** function is default.



6.10.2.7 Refrigerant

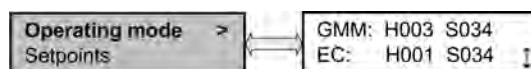
If a condenser has been selected as the heat exchanger, the selected refrigerant is displayed here. If no refrigerant has been selected, "bar" is displayed.



6.10.2.8 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



6.10.2.9 Bus module

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



6.10.2.10 Operating mode

The set operating mode is displayed here.

There are:

Internal control	Auto int. 1	Setpoint 1 active	See Auto internal, Page 53
	Auto int. 2	Setpoint 2 active	See Auto internal, Page 53
	Auto ext. analogue 1	Setpoint 1 active	See Auto external analogue, Page 53
	Auto ext. analogue 2	Setpoint 2 active	See Auto external analogue, Page 53
	Auto ext. bus1	Setpoint 1 active	See Auto external BUS, Page 53
	Auto ext. bus 2	Setpoint 2 active	See Auto external BUS, Page 53
Slave	Slave ext. analogue	Control value via 0...10V or 4-20mA	See Slave external analogue, Page 53
	Slave ext. bus	Control value via GCM *	See Slave external BUS, Page 54
Manual mode	Manual mode		See Manual mode, Page 47

* GCM = Güntner Communication Module

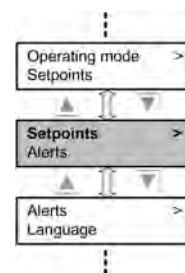


See [Operating mode, Page 53](#) for a precise description of the operating modes

6.10.3 Setpoints

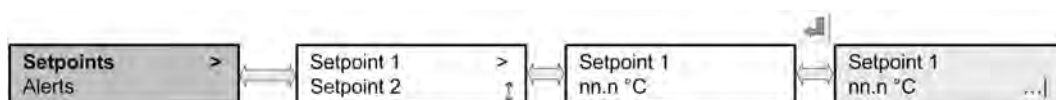
The setpoints can be set here.

The setpoint is the value (pressure, temperature or voltage) used as the reference for the control.



6.10.3.1 Setpoint 1

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

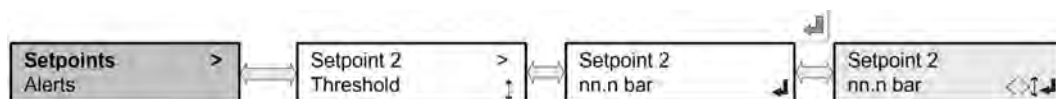
The minimum and maximum adjustment range is:

Set current value	Set operating mode	Setpoint display
Temperature	Control	0.00 - 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.

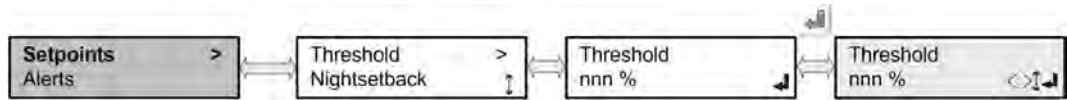
6.10.3.2 Setpoint 2

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



6.10.3.3 Threshold value

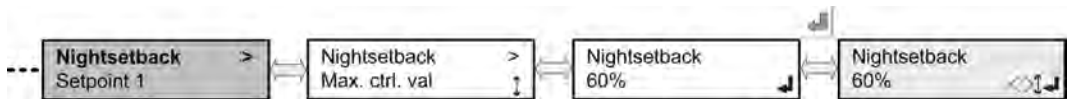
A value between 0 and 100% is set here. If the control value on the fans exceeds this value, the threshold relay trips. When the value with the 2% hysteresis falls below the threshold, the relay drops out again. A 100% threshold value means this function is deactivated.



6.10.3.4 Night limiter

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

Defining maximum value

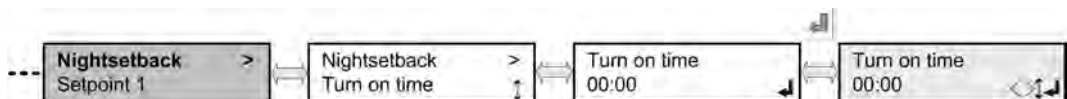


6.10.3.4.1 Night limiter activation/deactivation time

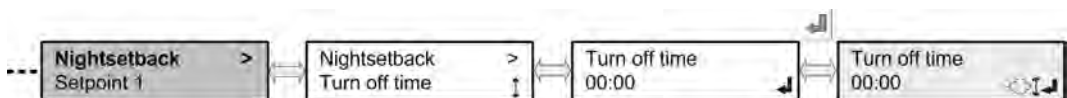
The built-in timer allows the night limiter to be activated and deactivated at specific times.

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

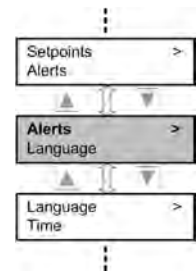


6.10.3.4.2 Night limiter functions list

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

6.10.4 Alarms

The last 85 alarms can be called up here.

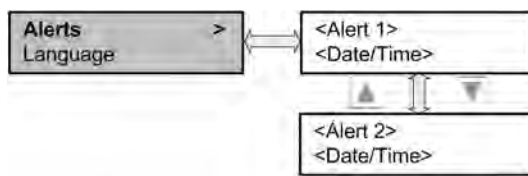


6.10.4.1 Alarm memory

The GMM has an alarm memory where up to 37 priority 1 and 2 (warnings) are stored consecutively (ring memory). These error messages consist of the fault and the time stamp, comprising the date and time, at which the fault occurred. For the error messages and warnings listing see [Error messages and warnings on the GMM display, Page 79](#).

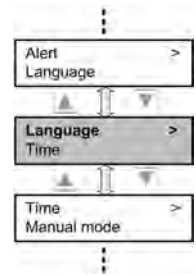
When the alarm memory is selected, the display shows the last fault that occurred.

Use the "down" arrow key to display older faults.



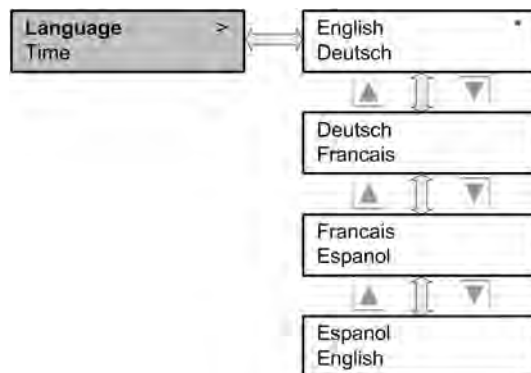
6.10.5 Language

The menu language can be selected here.



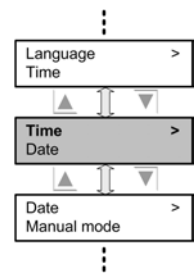
6.10.5.1 Language selection

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



6.10.6 Time

The time can be selected here.



6.10.6.1 Time setting

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

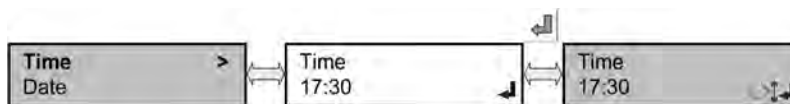
If you want to change the time, enter the EDIT mode by pressing the enter key.

The time appears first. Use the up/down keys to move between time and date. If you press the enter key to enter EDIT mode while the date or time is displayed, you can use the right/left keys to select the position you want to edit.

The second line shows the position currently selected. Use the enter key to leave the EDIT mode and set the time.

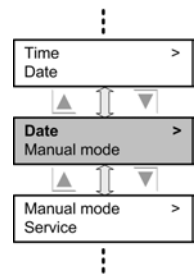
You leave the time menu with the left arrow key. The "X" key also closes the mode any time. If the "X" key is pressed in the EDIT mode, the time is not changed.

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



6.10.7 Date

The date can be set here.

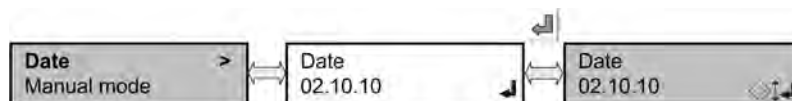


6.10.7.1 Set date

The entry button is changed to the EDIT mode to change the date.

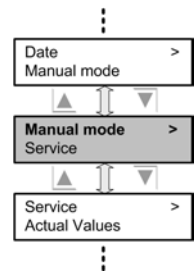
If the **X** button is pressed in the EDIT mode, the date is not changed.

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



6.10.8 Manual mode

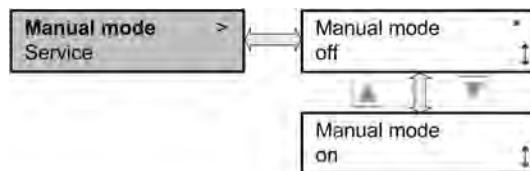
The manual mode is used for starting the heat exchanger fans manually. If it is activated, the fans run with the manual mode control value. The manual mode depends on the D1 enabling. The manual mode has the highest priority and switches all other control types off.



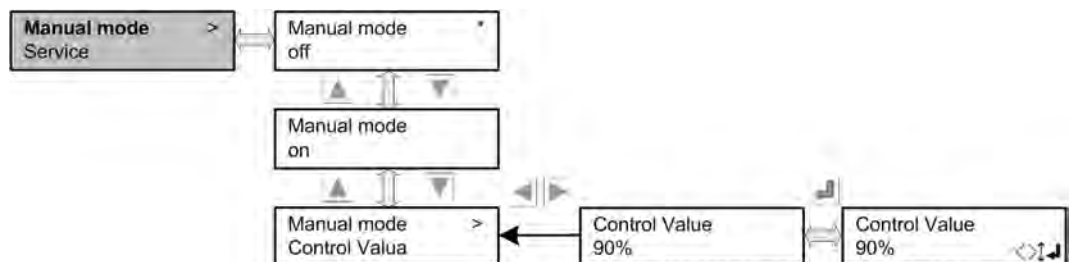
6.10.8.1 Manual mode ON / OFF / Control value

When the manual mode is activated, the control value can be modified. The * indicates whether manual mode ON or OFF is active.

Manual mode ON / OFF



Manual mode control value

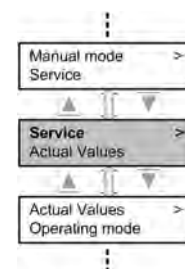
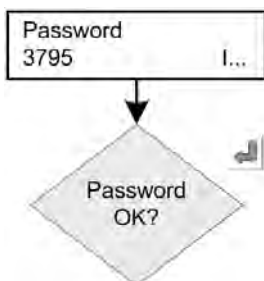


6.11 Service

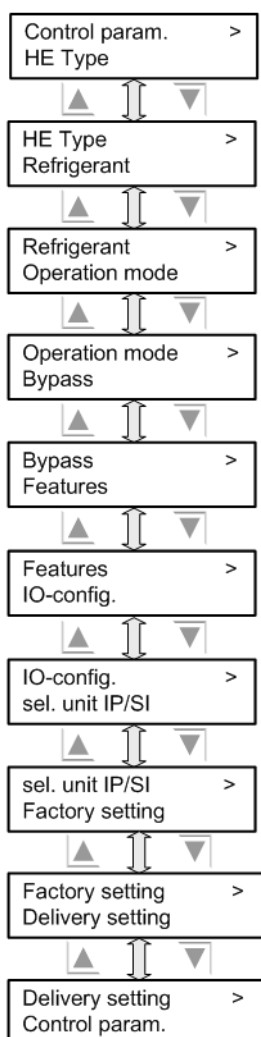
The Service menu is only accessible with a password, which you are prompted for first. The password is **3795**.

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

The password is valid for 15 min. and is not prompted again in this time.

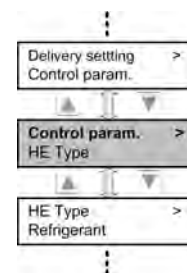


Service menu set-up

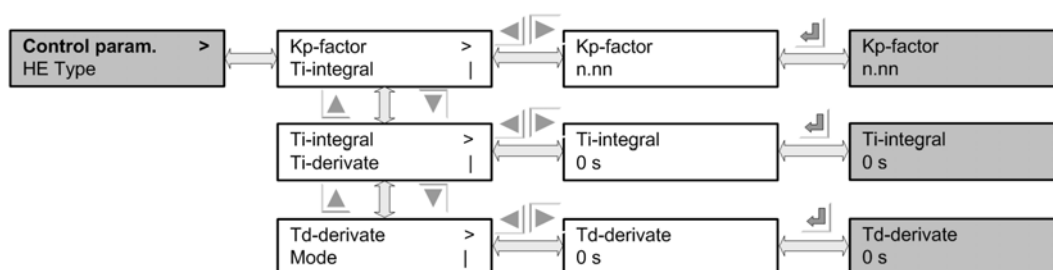


6.11.1 Control parameters

The control parameters are configured in this menu option.



6.11.1.1 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.

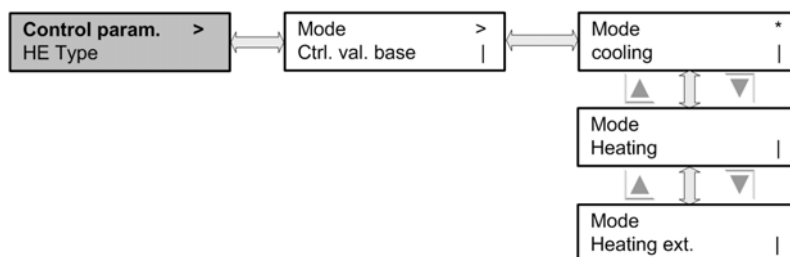
The reset time Ti can be set in a range from 0 to 1,000 seconds. The I part of the control achieves a time reconciliation with the setpoint. The reset time, for example TI = 2s, means that at time t=0 the output value after 2s has reached the value of the constant input value.

The rate time Td can be set in a range from 0 to 1000 seconds. The D part of the control reacts not to the control deviation but to the speed of change.

Normally the GMM is used to cool liquids and cooling agents. 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.).

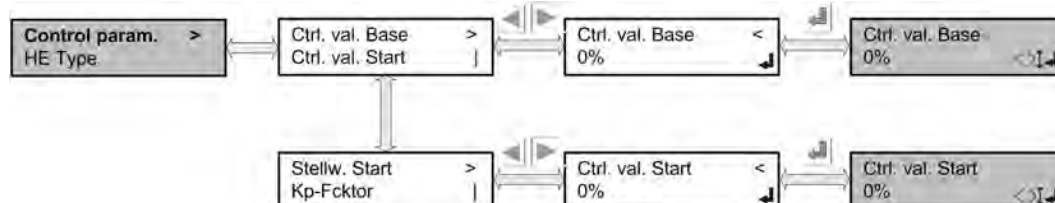
6.11.1.2 Cooling/heating control parameter mode



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.

6.11.1.3 Base control value and Start control value control parameters



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

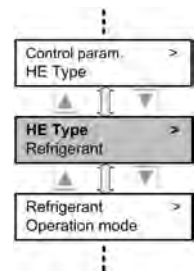
The **start control value** function is used to define a start point for issuing the control value.

Here are some setting examples:

Base control value	Start control value	Function
0%	0%	Functions of, normal control 0%-100% with release
10%	0%	At least 10% control value is issued, when the release is active
10%	5%	At least 10% control value is only then issued when the control has reached 5% and the release 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 release (5%-100%).

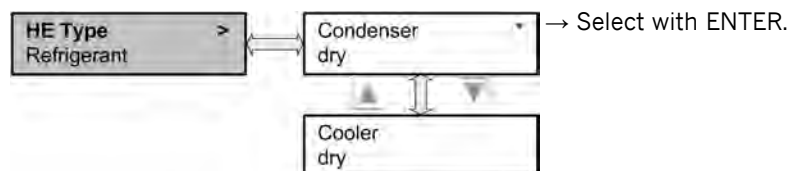
6.11.2 Heat exchanger

The heat exchanger type is selected here.



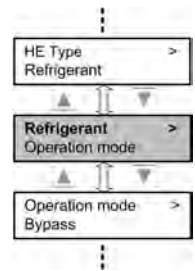
6.11.2.1 Heat exchanger type

The options are recirculating cooler and condenser in the dry version (no spray). The selected type is displayed with a *.

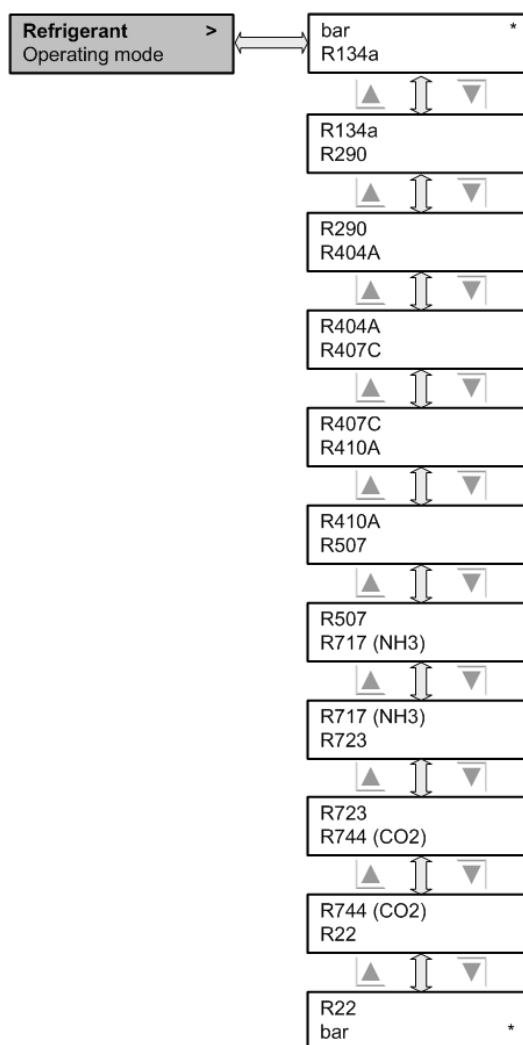


6.11.3 Refrigerant

A refrigerant is selected here.



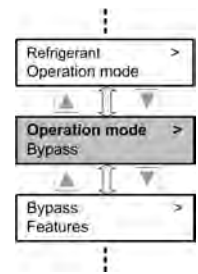
6.11.3.1 Refrigerant selection



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 *.

6.11.4 Operating mode

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



6.11.4.1 Auto internal



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

6.11.4.2 Auto external analogue



In this mode, control is automatic on the setpoint defined externally by the analogue input.
Which input delivers the setpoint and which the current value is set in the IO configurations.

6.11.4.3 Auto external BUS



Table: +Title

In this mode the setpoint is specified via BUS.
A GCM module is required for this operating mode.

6.11.4.4 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.

6.11.4.5 Slave external BUS

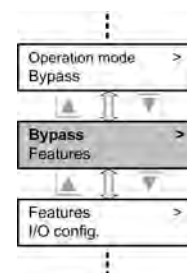


In this mode the control value is specified via BUS.
A GCM module is required for this operating mode.

6.11.5 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 with a GMMEC component fault.



6.11.5.1 Bypass switching

The bypass function causes the fans to run with a GMM fault at a speed that must be set here first.

The bypass speed is automatically activated after the connection to the GMM fails and with a sensor fault with a delay of 10 s.

The bypass mode currently set is shown with an asterisk. The mode is selected with the ← key. Display the control value by using the > key. The value is changed as described in the **Operating menu**.

The following options can be set:

Bypass operation ON

Control value 0%

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

→ all fans stop

Bypass operation ON

Control value 100%

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

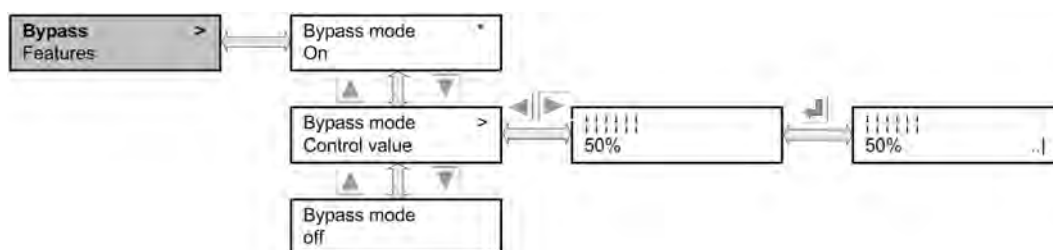
→ all fans run at a speed of 100%

Bypass operation OFF

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

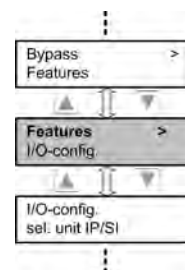
... if the GMM is defective or the connection to the fans has been interrupted:

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

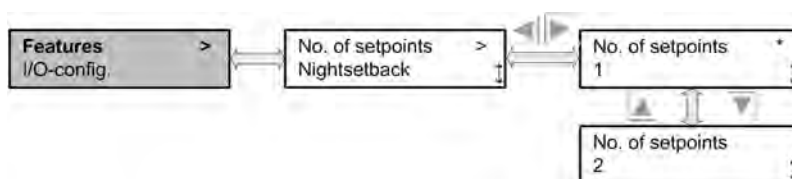


6.11.6 Functions

The control functions, such as number of setpoints, the night limiter or setpoint displacement, the Low Capacity Motor Management or the subcooler function are selected in this service menu option.



6.11.6.1 Number of setpoints

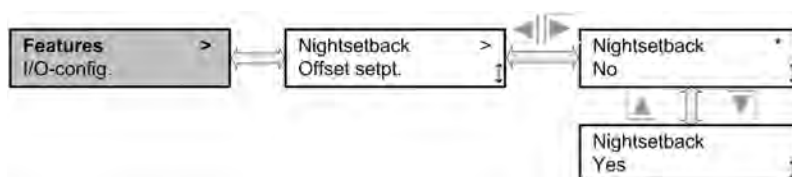


The number of setpoints is set here. The minimum number is 1 setpoint on which control is performed. If 2 setpoints are selected, switchover is via the **D3** digital input. If the input is open, setpoint 1 is used for control.

If the **D3** must be 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.

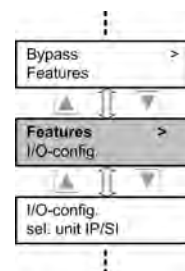
6.11.6.2 Nightsetback



A night limiter is generally activated or deactivated in this service option. The value of the night limiter is set in the **Nightsetback** 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 is activated both via the **DI2** digital input 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 **DI2**.

6.11.6.3 Setpoint displacement

It is beneficial 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.

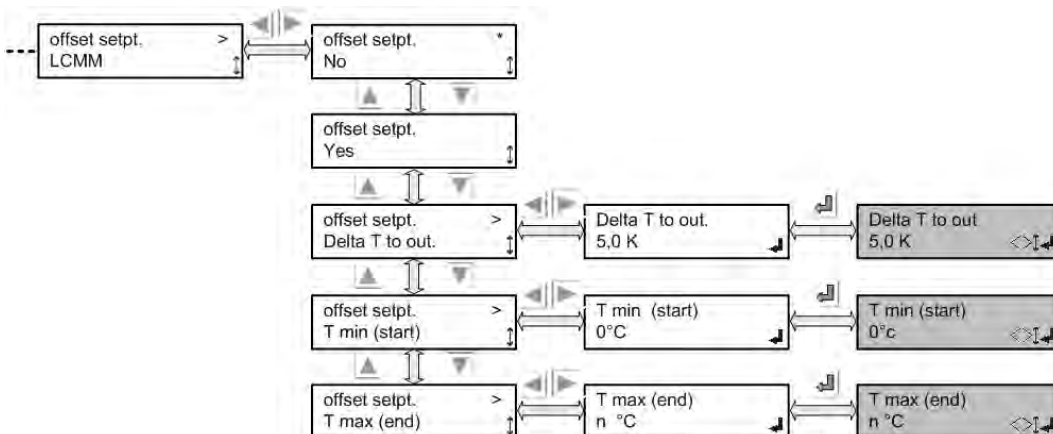


The temperatures T_{min} external and T_{max} external can be set in the menu. The range between T_{min} external and T_{max} external marks the range to be displaced into. The ΔT , which defines the offset between the setpoint and the external temperature, must also be defined.

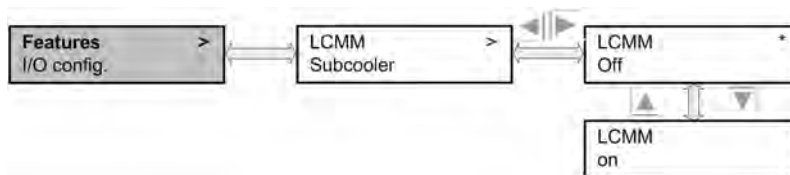
Example:

Setpoint	= 25°C
ΔT	= 5 K
T_{min} external	= 20°C
T_{max} 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. T_{min} external and T_{max} 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.



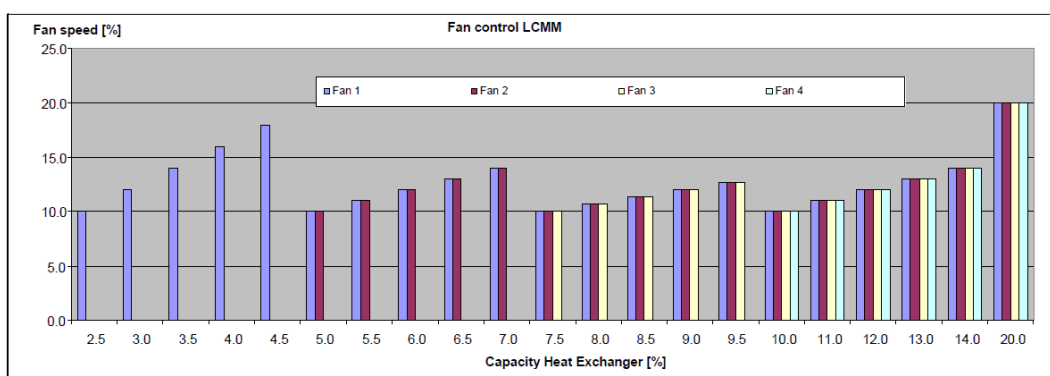
6.11.6.4 Low Capacity Motor Management



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.

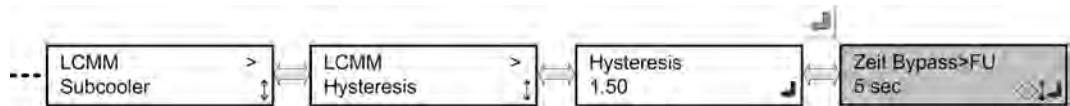
A system with 4 individually controlled fans serves as an example. With an assumed minimum fan speed of 10% of the maximum speed, a control value of 2.5% can be set for the heat exchanger (10% / 4). At this setting one fan runs with the required minimum speed and all other fans are switched off. If the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

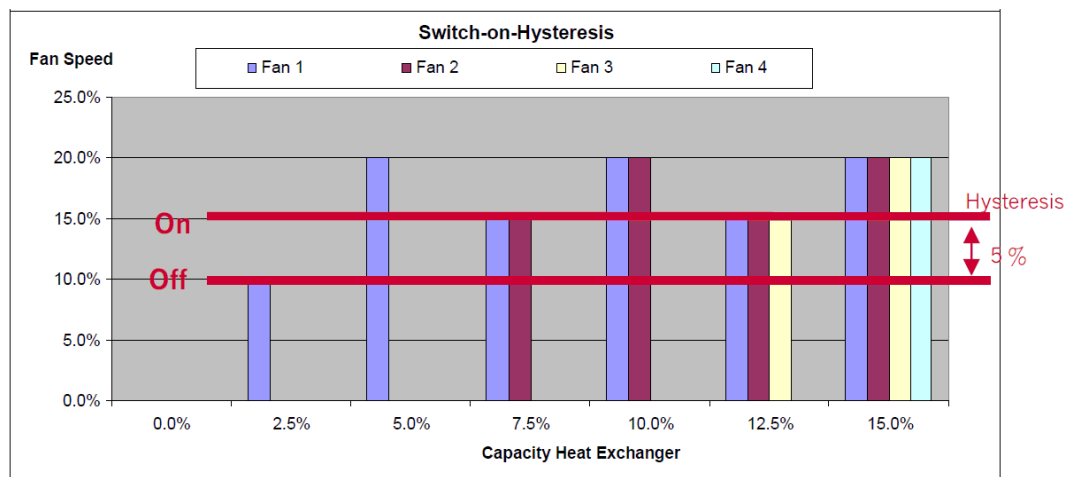
6.11.6.4.1 LCMM hysteresis

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.

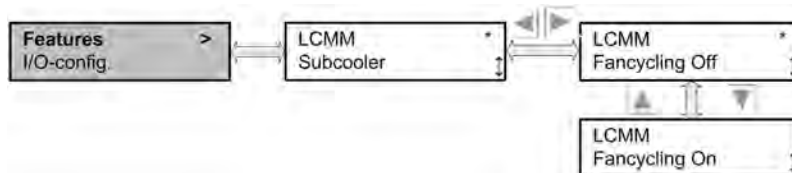
In the example shown below the minimum speed of a fan is at 10%, the hysteresis factor is at 1.5 and therefore the speed at which the first fan is activated is at 15% (this is equal in our example with 4 fans to a heat exchanger power of 3.75%). The first fan is deactivated at a heat exchanger power 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%.



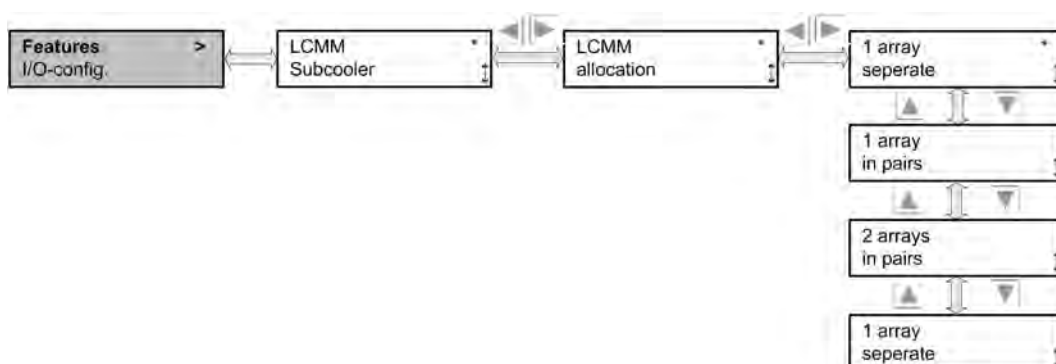
LCMM hysteresis switch-on

6.11.6.4.2 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.

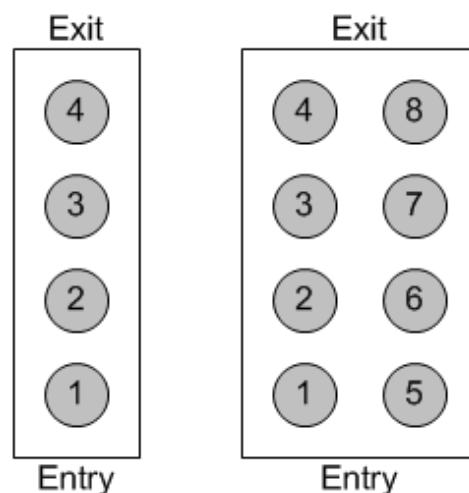


6.11.6.4.3 LCMM Fancycling assignment



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)

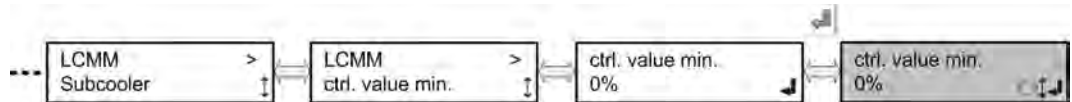


6.11.6.4 LCMM min. control value

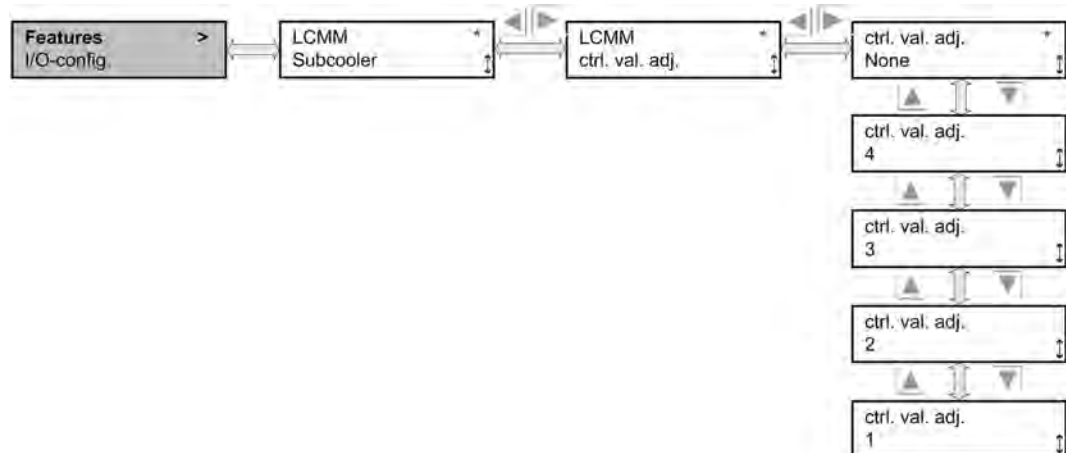
With an active LCMM function and unit release the control value programmed with min. control value should always be issued to the fans, even when the control value of the control element should be lower.

As soon as the control value of the controller is greater than the min. control value, this is then issued.

The min. control value adjusting range is 0-100%.



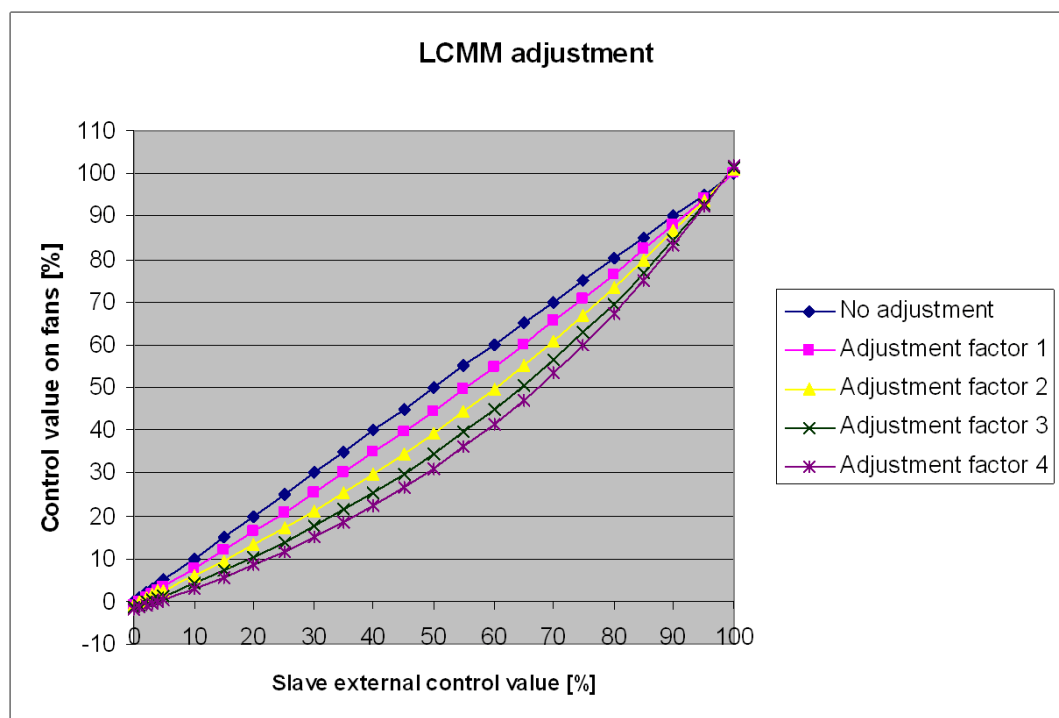
6.11.6.4.5 LCMM min. control value adjustment



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

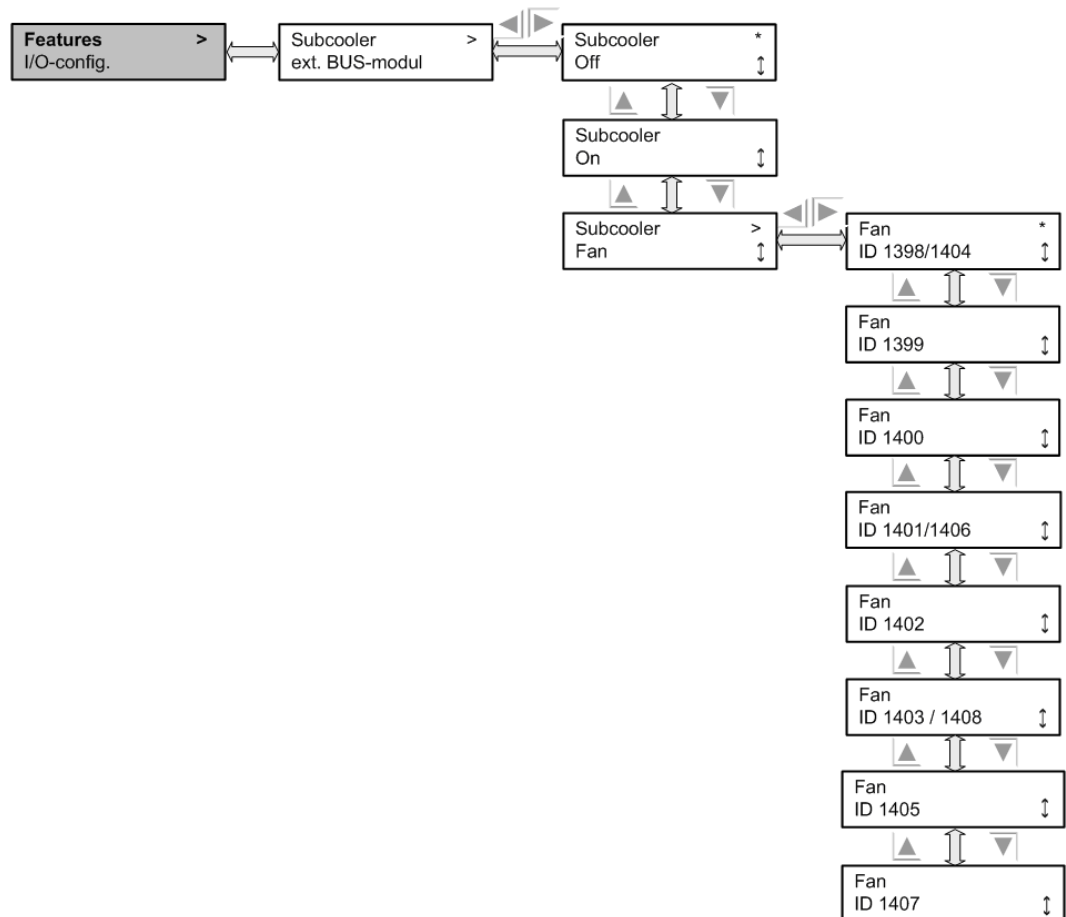
6.11.6.5 Subcooler function

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 release.

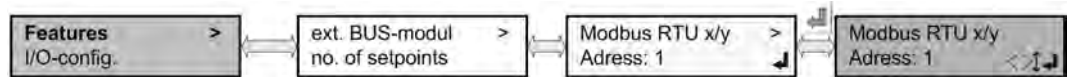
The subcooler function can be switched on and off in the functions menu.

The fan type used is selected in the selection menu.



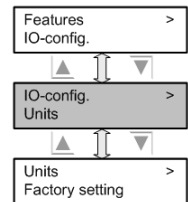
6.11.6.6 External BUS module

This function allows you to change the external BUS module address. The default value is 1. The x/y points show the firmware version of the modules. x = MODBUS module, y = CAN module.



6.11.7 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.



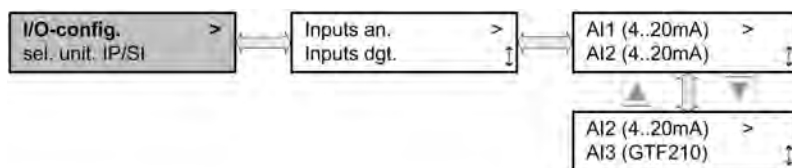
6.11.7.1 Analogue inputs

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 terminals **B1** and **B2** are two current inputs (4-20mA).
Terminal **B3** has an input for the GTF210 temperature sensor.
There is an input for 0-10 V DC on terminal **B4**.



6.11.7.2 Current inputs AI1 and AI2



Current value means that the current measurement signal is present on this input. With pressure sensor **GSW4003** this is the current corresponding to the pressure. Make sure that the "Auto int" mode has been selected in the menu. There is a special situation if both current inputs are configured as current value. The current input delivering the greatest measurement signal is then selected (**MAX selection**).

A **current 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 current value (see [Error messages and warnings on the GMM display, Page 79](#)). The origin of the current value has then still to be configured. Make sure that the "Auto ext" mode has been selected in the operating mode menu.

Setpoint 2 is only offered if the number of setpoints has been configured to **2** (see [Number of setpoints, Page 56](#)). If setpoint 2 is configured, the same applies as described with **Setpoint 1**.

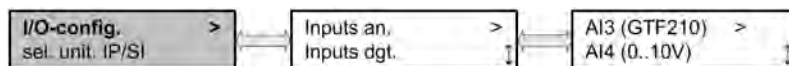
No function is selected if this input is to be inactive.

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

Temperature current value means that a temperature sensor with 4..20mA current output (-30°C to +70°C) is connected on this current input. Function as **current value**.

External temperature 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 external temperature recording.

6.11.7.3 AI3 input temperature sensor

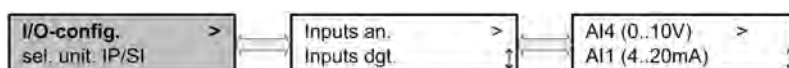


Current temperature value means that a **GTF210** temperature sensor is connected to this input. Make sure that the **"Auto int"** mode has been selected in the menu

External temperature 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.

6.11.7.4 0..10V AI4 input



Current value means that the current value (0..10V) for control is on this input. Make sure that the **"Auto int"** mode has been selected in the menu

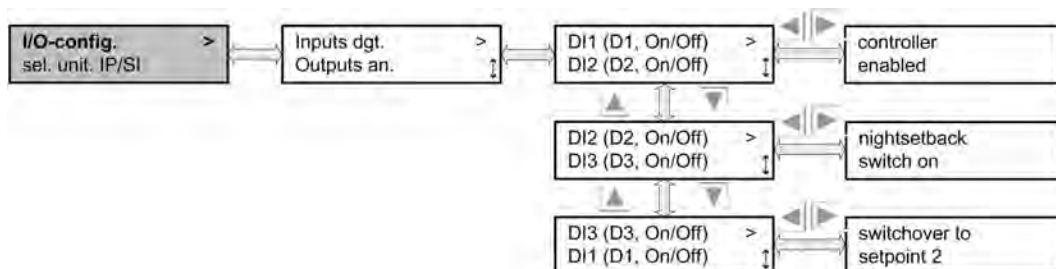
Slave control value means that the control signal for the fans follows this input. The characteristic curve is linear from 0-100%. Make sure that the **"Auto int"** operating mode menu.

Setpoint 1 means that the setpoint 1 on which internal control is performed is specified via the voltage input. The voltage input is scaled to the set current value ([See Error messages and warnings on the GMM display, Page 79](#)). The origin of the current value has then still to be configured. Make sure that the **"Auto ext"** mode has been selected in the operating mode menu.

Setpoint 2 is only offered if the number of setpoints has been configured to **2** (see [Number of setpoints, Page 56](#)). If setpoint 2 is configured, the same applies as described with **Setpoint 1**.

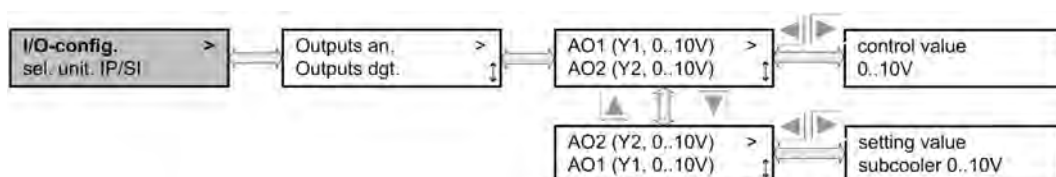
6.11.7.5 Digital inputs

The digital inputs on terminals **D1**, **D2** and **D3** are control inputs. Their function is permanently assigned according to the diagram below.



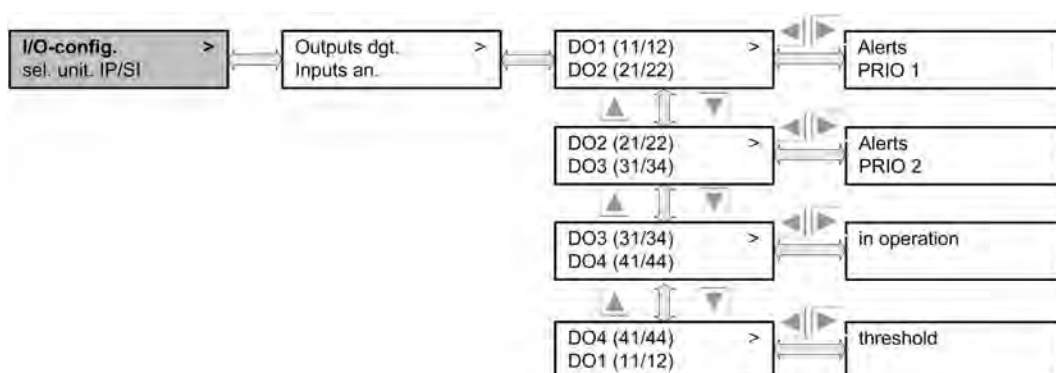
The inputs are active when they are connected to **GND**. From version **1** the inputs are active when they are connected with **+24V**. They can only be switched with potential-free contacts (relay contact).

6.11.7.6 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 1 issues the control signal for the subcooler, when the function is selected.

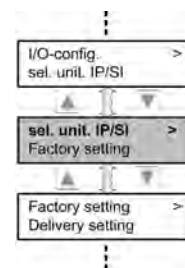
6.11.7.7 Digital outputs



The digital outputs are relay contacts. Each output has a 250V/1A two-way contact. The alarm output PRIO 1 is **switched as a failsafe** contact i.e. the contact is closed when there is no current. Fixed functions are assigned to the digital outputs.

6.11.8 SI/IP selection

The units system can be selected here.



6.11.8.1 SI/IP units system

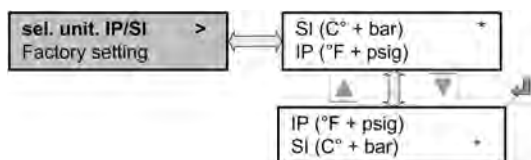
Unit selection for pressure and temperature.

International units →

SI (Système international d'unités)

Anglo-American units →

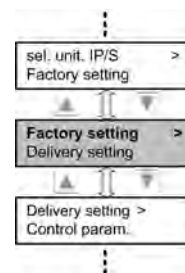
IP (Imperial System)



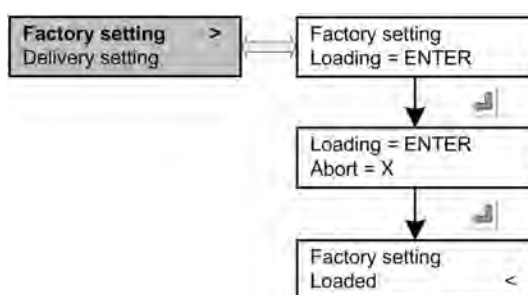
The selected unit of measurement is shown with a *.

6.11.9 Factory setting

The control can be reset to factory settings here.



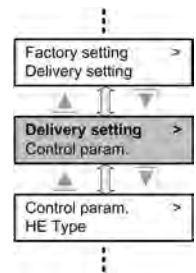
6.11.9.1 Control reset (factory setting)



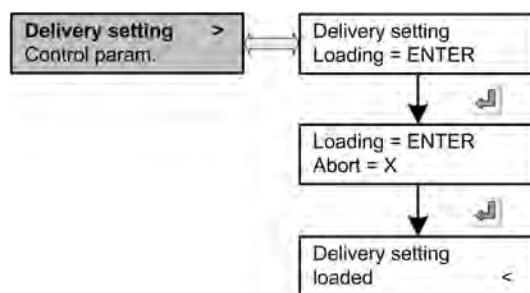
CAUTION, any changes made locally will be deleted. Factory commissioning values will be retained. The bypass and control functions are reset to their defaults.

6.11.10 Delivery condition

The control can be reset to delivery condition here.



6.11.10.1 Control reset (delivery condition)



CAUTION, any changes made locally and commissioning values will be deleted. Once this function has been completed, a completely new factory commissioning must be carried out.

7 Faults and troubleshooting

7.1 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 the **"X"**key).
- If **NO**, then go to **Test point 2**.
- If the **"Equipment fault"** message is displayed, there is a fault on the EC controller(lower PCB with fan connections).Then please check the fan connections on the EC controller. Are the 24V DC supply cables connected to the fans properly? Are the bus connections **A** and **B** connected properly and with the correct polarity.
- If the **"Vn temperature"**message appears, one or more of the fans has a temperature fault. **Vn** stands for 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 fault" appears**"bar". **Vn** stands for the fan number. If more than one fan is affected, they are listed in succession.
- If the **"No sensor selected"**appears, no sensor input has been selected in the I/O configuration.

TEST POINT 2:

Mains connection:

- Are all phases present? (The message **"V? general fault" appears if there is a missing phase appears**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, Standard 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:

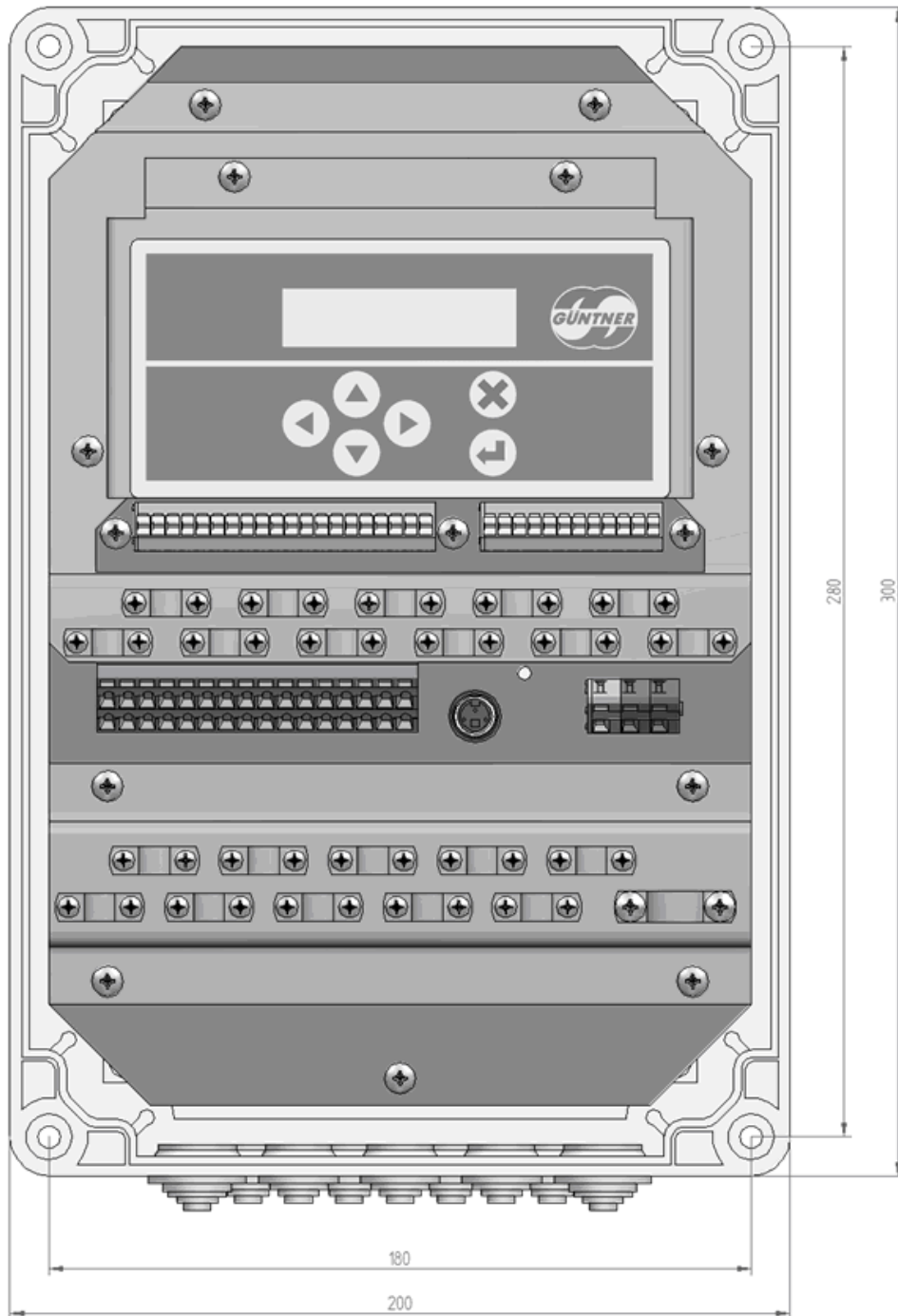
- Is the fuse on the controller supply OK?

8 Technical data

8.1 GMM EC/01 /04 /08 (.1) 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.

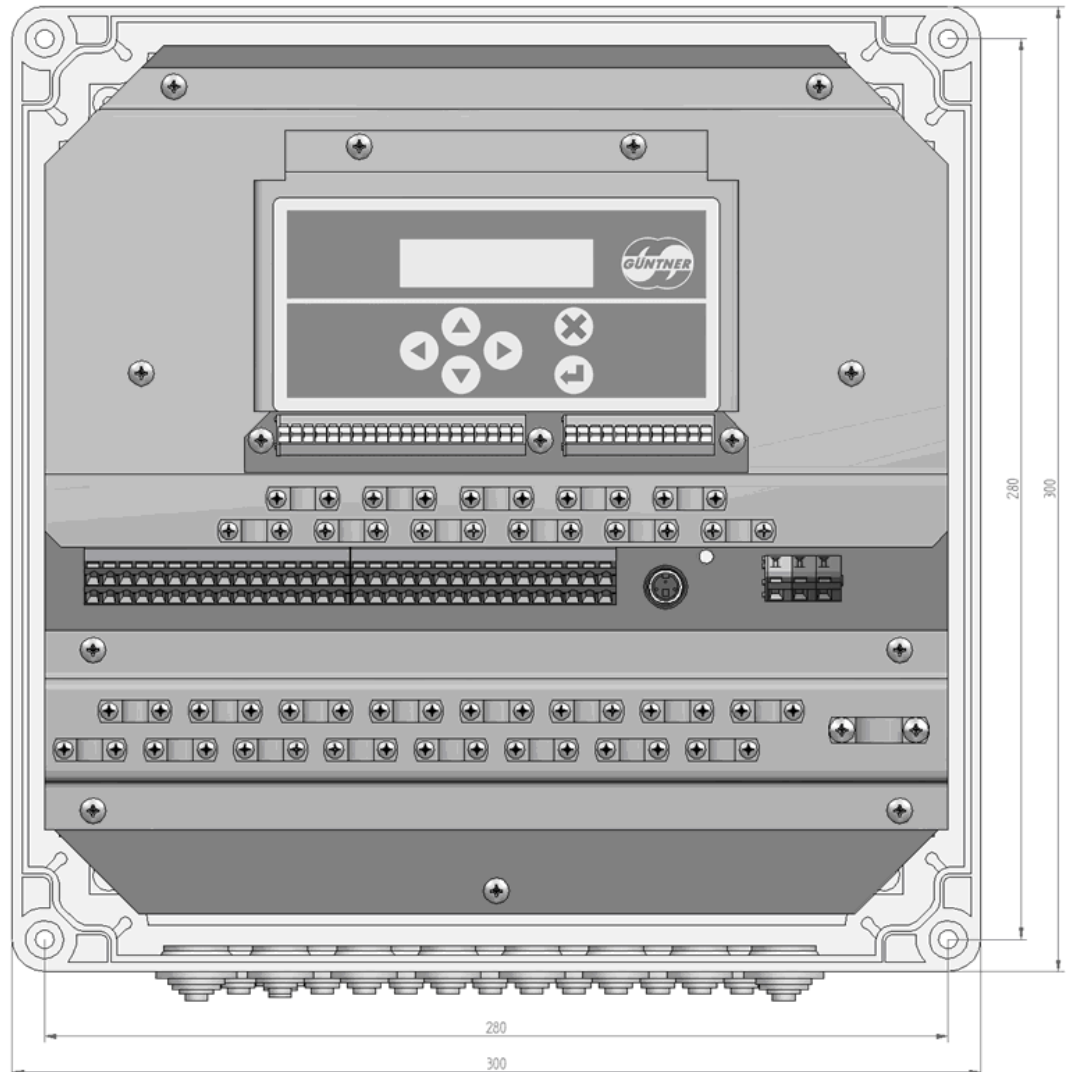


GMM EC 01 / 04 / 08 (.1) housing dimensions

8.2 GMM EC/16 (1.) 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.

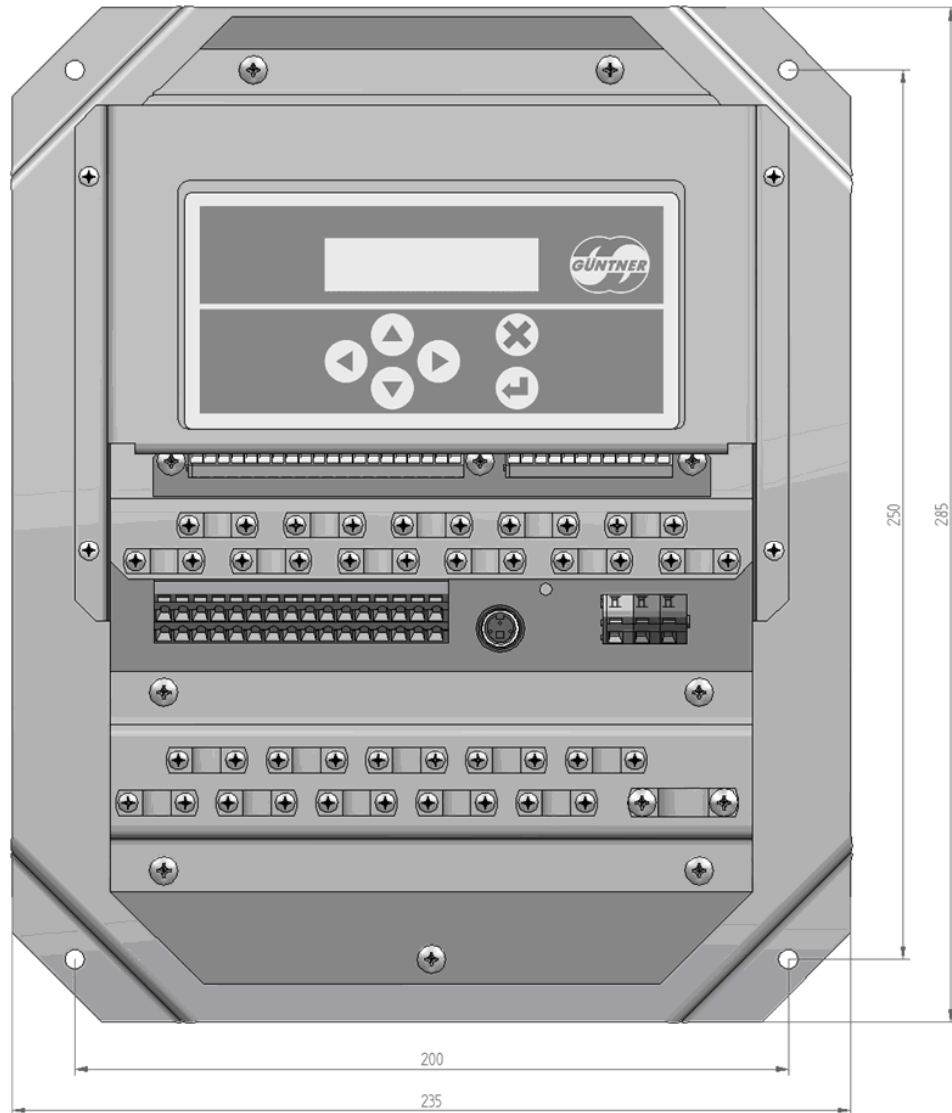


GMM EC 16 (1.) housing dimensions

8.3 GMM EC/01 /04 /08 (.1) UL dimensions

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

Fixing drill holes max. Ø 5mm.

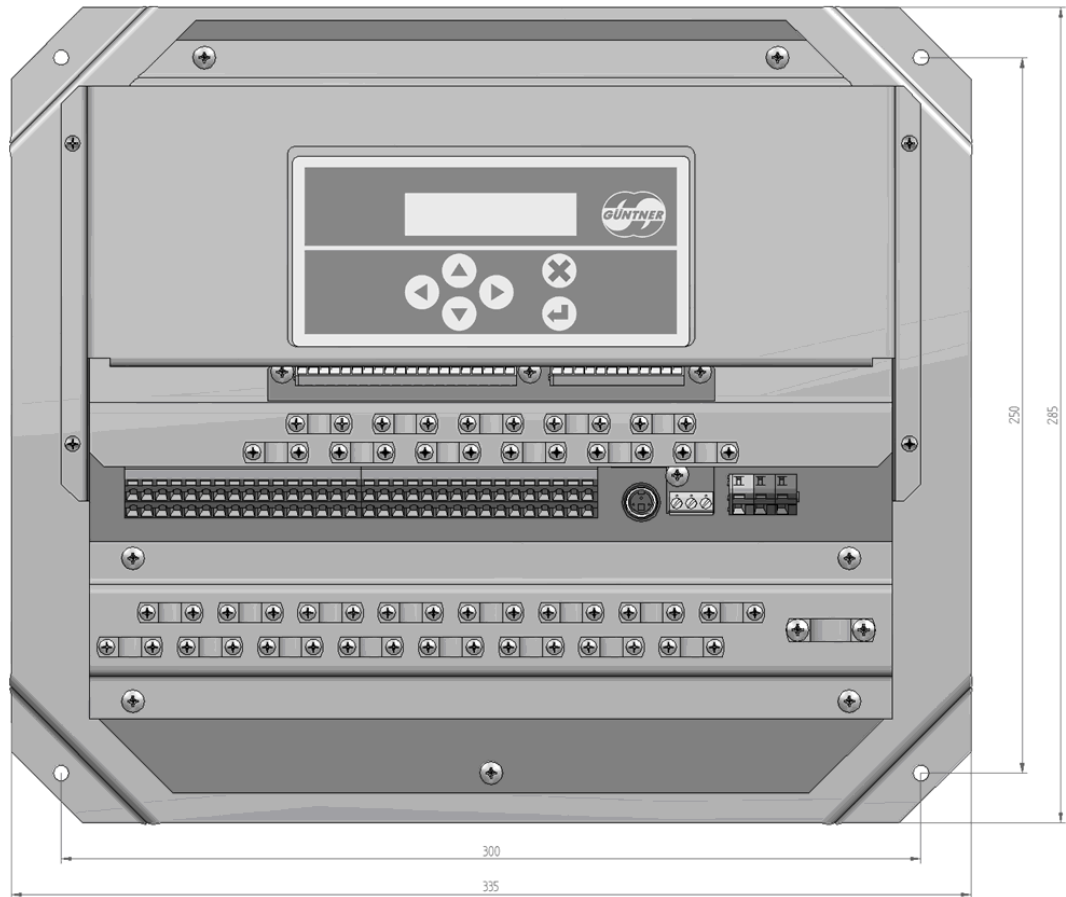


GMM EC 01 / 04 / 08 (.1) UL housing dimensions

8.4 GMM EC/16 (.1) UL dimensions

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

Fixing drill holes max. Ø 5mm.



GMM EC 16 (.1) UL housing dimensions

9 Electrical and mechanical properties

Mains voltage	100 - 240V +/- 10% 50-60 Hz	
Current consumption	GMM EC/01.(.1)	0.3A
	GMM EC/04 /08 /16 (.1)	0.47A
Heat loss	GMM EC/01.(.1)	approx. 14W
	GMM EC/04.(.1)	approx. 18W
	GMM EC/08.(.1)	approx. 20W
	GMM EC/16.(.1)	approx. 30W
Sensor connection	Pressure transmitter 4-20 mA or temperature sensor GTF210 (-30...+70°C) or standard signal 0-10V	
Ambient temperature	-20...+40°C	
Storage temperature	0 - +50°C dry	
Weights	GMM EC/01.(.1) = 2.6 kg	
	GMM EC/04.(.1) = 2.8 kg	
	GMM EC/08.(.1) = 2.8 kg	
	GMM EC/16.(.1) = 3.9 kg	
	GMM EC/01.(.1) UL = 2.7 kg	
	GMM EC/04.(.1) UL = 2.9 kg	
	GMM EC/08.(.1) UL = 2.9 kg	
	GMM EC/16.(.1) UL = 4.0 kg	
Protection rating	IP 54	
Dimensions	GMM EC/01 /04 /08 (.1)	
	GMM EC/16 (.1)	
	GMM EC/01 /04 /08 (.1) UL	
	GMM EX/16 (.1) UL	

10 External control value scaling

The dependencies of the external control value specs for the current 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 0 .. 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

	Drycooler		Condenser with refrigerant		Condenser without refrigerant	
Units	SI	IP	SI	IP	SI	IP
Language	English	English	English	English	English	English
Setpoint 2 present	No	No	No	No	No	No
Night-time operation	No	No	No	No	No	No
Bypass	Yes	Yes	Yes	Yes	Yes	Yes
Setpoint displacement	No	No	No	No	No	No
Operating mode	Automatic internal	Automatic internal	Automatic internal	Automatic internal	Automatic internal	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.	0 sec.	0 sec.	0 sec.	0 sec.	0 sec.
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%	100%	100%	100%	100%	100%
Night limiter	100%	100%	100%	100%	100%	100%
Manual mode control value	0%	0%	0%	0%	0%	0%
Setpoint displacement ΔT	5 K	5 K	5 K	5 K	5 K	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 depending on disp.	Off	Off	Off	Off	Off	Off
Subcooler function	Off	Off	Off	Off	Off	Off
Heating function	Off	Off	Off	Off	Off	Off
LCMM function	Off	Off	Off	Off	Off	Off

12 Error messages and warnings on the GMM display

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

Messages/warnings on the display	PRIO 1	PRIO 2	Explanation
Display dark, GMM off	x		GMM has no supply voltage
Equipment fault	x		All fans off, no cooling on the heat exchanger
No sensor selected			No sensor activated in the I/O configuration
Sensor fault x		x	The sensor with no. x has a fault
Disabled			D1 (enable) not switched
Controller 2			Control system 3 activated
Night limiter			Night limiter activated
V x cable break		x	Communications fault on fan x (poss. cable break)
V x Temp M		x	Temperature fault on fan x, motor
V x Temp E		x	Temperature fault on fan x, output stage
V X Temp I		x	Temperature fault on fan x, electronics
V x wrong VT		x	Fan x wrong VT number
V x mains failure		x	Mains failure on fan x
V x disabled		x	Fan x disabled
Vx 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. With 1-phase motors with mains failure. With 3-phase motors with failure of 2 or 3 phases.
V x Hall sensor		x	Hall sensor on fan x defective
V x fault B		x	Fan x braking operation (external operation)
V x fault H		x	Fan x intermediate circuit, overvoltage
V x fault L		x	Fan x intermediate circuit, undervoltage

Table: Error messages/warnings on the GMM display

PRI0 1	= Relay contacts 11/12	
PRI0 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 Setpoints, Page 41

13 Fan IDs

Fan Ø	Heat exchanger / Device		Use until	EC fans			
	Series	Type		Motor type	Fan ID	Working point Max. speed n [min-1]	Voltage [V]
450	GVH/V.1	NW		VT03007U	1185	1250	230
		LW		VT03006U	1186	1000	230
		SW		VT03006U	1187	770	230
	GVX.1	NW		VT03007U	1185	1250	230
		LW		VT03006U	1272	900	230
		SW		VT03006U	1273	750	230
	S-GHN			VT03070U	1738	1240	230
500	GVH/V.1 / GFH/V.0 / GVHX.1	ND		VT03013U	1188	1500	400
		NS		VT03011U	1189	1140	230
		NJ		VT03013U	1188	1500	400
		NW		VT03013U	1188	1500	400
		LD		VT03011U	1190	1000	230
		LS		VT03009U	1191	785	230
		LJ		VT03011U	1190	1000	230
		LW		VT03009U	1190	1000	230
		SD		VT03009U	1191	785	230
		SS		VT03009U	1192	610	230
		SW		VT03009U	1191	785	230
		ED		VT03009u	1193	660	230
		ES		VT03009U	1194	385	400
	GVX.1	ND		VT03012U	1195	1455	400
		NS		VT03010U	1196	1070	230
		LD		VT03010U	1197	930	230
		LS		VT03008U	1200	620	230
		SD		VT03008U	1198	710	230
		SS		VT03008U	1201	570	230
		ED		VT03008U	1199	640	230
		ES		VT03008U	1271	375	230
	Other			VT03013U	1396	1100	400
				VT03009U	1240	750	230
650	GVH/V.1 / GFH/V.0	ND		VT03017U	1202	1300	400
		NS		VT03016U	1203	1050	400



Fan Ø	Heat exchanger / Device		Use until	EC fans			
	Series	Type		Motor type	Fan ID	Working point Max. speed n [min-1]	Voltage [V]
		NJ		VT03017U	1202	1300	400
		LD	05/2010	VT03016U	1204	890	400
		LD		VT03071U	1744	890	230
		LS		VT03015U	1205	745	230
		LJ	05/2010	VT03016U	1204	890	400
		LJ		VT03071U	1744	890	230
		LW		VT03071U	1744	890	230
		SD		VZ03015U	1206	715	230
		SS		VT03014U	1207	550	230
		SW		VT03015U	1206	715	230
		ED		VT03014U	1208	615	230
		ES		VT03014U	1209	400	230
		EW		VT03014U	1208	615	230
	Other			VT03071U	1826	1310	400
710	GVX.1 / GVHX.1	ND		VT03021U	1279	1220	400
		NS		VT03021U	1278	900	400
		MD		VT03021U	1280	1150	400
		MS		VT03021U	1281	960	400
		LD		VT03020U	1274	845	400
		LS		VT03020U	1275	720	400
		SD		VT03020U	1276	620	400
		SS		VT03035U	1282	500	230
		ED		VT03035U	1283	415	230
		ES		VT03035U	1284	340	230
800	GVH/V.3 / GFH/V.3 / GVW.2 / GFW.2 / GVD.2 / GFD.1	ND		VT03025U	1210	975	400
		NS		VT03025U	1211	770	400
		NJ		VT03025U	1241	900	400
		NL		VT03025U	1210	975	400
		MD		VT03025U	1212	865	400
		MS		VT03023U	1213	600	230
		MJ		VT03024U	1242	700	400
		ML		VT03025U	1211	770	400
		LD		VT03024U	1219	735	400
		LS		VT03025U	1214	575	230



Fan Ø	Heat exchanger / Device		Use until	EC fans			
	Series	Type		Motor type	Fan ID	Working point Max. speed n [min-1]	Voltage [V]
		LJ		VT03023U	1243	545	230
		LL		VT03023U	1213	600	230
		LL		VT03024U	1741	600	400
		SD		VT03023U	1237	470	230
		SS		VT03022U	1216	380	230
		SJ		VT03022U	1217	435	230
		SL		VT03023U	1237	470	230
		SL		VT03024U	1742	500	400
		ED		VT03022U	1217	435	230
		ES		VT03022U	1218	300	230
		EJ		VT03022U	1216	380	230
		EL		VT03022U	1217	435	230
	GVD.1 / GFD.1 Jumbo	ND		VT03059U	1656	1000	400
		ND		VT03059U	1657	770	400
		NJ		VT03059U	1659	900	400
		NL		VT03059U	1656	1000	400
		MD		VT03059U	1658	865	400
		MS		VT03061U	1662	600	230
		MJ		VT03060U	1661	710	400
		ML		VT03059U	1657	770	400
		LD		VT03060U	1660	735	400
		LS		VT03061U	1663	575	230
		LJ		VT03061U	1665	545	230
		LL		VT03061U	1662	600	230
		SD		VT03061U	1664	470	230
		SS		VT03062U	1682	380	230
		SJ		VT03062U	1683	435	230
		SL		VT03061U	1664	470	230
		ED		VT03062U	1683	435	230
		ES		VT03062U	1684	300	230
		EJ		VT03062U	1682	380	230
		EL		VT03062U	1683	435	230
	Other			VT03025U	1828	1000	400
				VT03059U	1830	975	400



Fan Ø	Heat exchanger / Device		Use until	EC fans			
	Series	Type		Motor type	Fan ID	Working point Max. speed n [min-1]	Voltage [V]
900	GVH/V.3 / GFH/V.3 / GVW.2 / GFW.2 / GVD.2 / GFD.1	NS		VT03029U	1221	910	400
		MD		VT03030U	1220	960	400
		MS		VT03028U	1222	690	400
		MJ		VT03030U	1220	960	400
		ML		VT03030U	1220	960	400
		LD		VT03027U	1220	570	400
		LS		VT03026U	1226	355	230
		LJ		VT03028U	1244	825	400
		LL		VT03028U	1244	825	400
		SD		VT03027U	1224	610	400
		SS		VT03026U	1227	485	230
		SJ		VT03027U	1245	650	400
		SL		VT03027U	1245	650	400
		ED		VT03027U	1225	530	400
		ES		VT03026U	1228	335	230
		EJ		VT03026U	1227	485	230
		EL		VT03027U	1225	530	400
	GVD.1 / GFD.1 Jumbo	NS		VT03064U	1671	910	400
		MD		VT03063U	1668	960	400
		MS		VT03065U	1672	690	400
		MJ		VT03063U	1688	960	400
		ML		VT03063U	1688	960	400
		LD		VT03066U	1674	570	400
		LS		VT03067U	1678	355	230
		LJ		VT03065U	1673	825	400
		LL		VT03065U	1673	825	400
		SD		VT03066U	1675	610	400
		SS		VT03067U	1679	485	230
		SJ		VT03066U	1677	650	400
		SL		VT03066U	1677	650	400
		ED		VT03066U	1676	530	400
		ES		VT03067U	1680	335	230
		EJ		VT03067U	1679	485	230
		EL		VT03066U	1676	530	400



Fan Ø	Heat exchanger / Device		Use until	EC fans			
	Series	Type		Motor type	Fan ID	Working point Max. speed n [min-1]	Voltage [V]
1000	Other			VT03030U	1391	920	400
				VT03030U	1325	910	400
	GVH.2 / GFH.2	ND		VT03032U	1233	935	400
		NS		VT03031U	1229	735	400
		LD		VT03031U	1229	735	400
		LS		VT03031U	1230	525	400
		SD		VT03031U	1231	640	400
		SS		VT03031U	1232	470	400
		ED		VT03031U	1238	575	400
		ES		VT03031U	1239	380	400

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 a current value, check the "Auto int" 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 current value appear in the Info menu, but the setpoint 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 Index

0

0..10V AI4 input).....	66
0-10V voltage signal.....	33

3

3-wire sensors.....	30, 30
---------------------	--------

A

Alarm memory.....	43
Alarms.....	43
Analogue inputs.....	30, 64
Analogue outputs.....	34, 67
Auto external.....	53
Auto external BUS.....	53
Auto internal.....	53

B

Base/Start control value control parameters.....	50
base control value.....	50
Basic menu.....	20, 35
Bus module.....	39
Bypass.....	55
Bypass switching.....	55

C

cable entries.....	16
Centralised fault.....	24
Classification.....	7
Commissioning menu.....	17
Commissioning notes.....	7
Connection cables.....	12
Connections.....	13
Control inputs.....	26
Controller installation.....	16
Controller properties.....	76
Control parameters.....	49
Control reset (delivery condition).....	70
Control reset (factory setting).....	69
Control value.....	36
Cooling/heating control parameter mode.....	50
Current inputs.....	65
Current pressure value.....	65
Current temperature value.....	66
current value (0..10V).....	66
Current values.....	36

D

Date.....	46
Delivery condition.....	70
Digital inputs.....	67
Digital outputs.....	67



Display.....	20
E	
Edit mode.....	22
Enabling the GMM.....	27
Equipment fault.....	71
Error messages.....	79
External BUS module.....	64
External enabling.....	38
External temperature.....	36
F	
Factory setting.....	69, 78
Fan connection.....	15
fan current.....	36
Fan ID.....	38
Fan IDs.....	81
Fan operating hours.....	37
Fan power.....	37
Fan speed.....	37, 38
Fan type.....	38
Faults – General notes.....	71
Function.....	56
Fuses fault.....	71
G	
General notes.....	6
GMM EC 16 dimensions.....	73
GMM EC 16 UL dimensions	75
GMM EC 1-8 dimensions.....	72
GMM EC 1-8 UL dimensions.....	74
GSW4003.....	65
GTF210.....	32
H	
Hardware and software versions.....	39
Heat exchanger.....	39, 51
Heat exchanger type.....	51
Heating/cooling.....	29
I	
I/O configuration.....	64
Info menu.....	20
Input current values.....	36
Input DI2.....	56
Installation.....	16
L	
Language.....	44
language can be freely selected.....	17
Language selection.....	44
LCMM adjustment.....	62
LCMM Fancycling.....	4, 60
LCMM Fancycling assignment.....	60

LCMM function.....	58
LCMM hysteresis.....	59
LCMM min. control value.....	61

M

Mains connection.....	14
Manual mode.....	47
Manual mode control value.....	47
Manual mode ON / OFF.....	47
Max. fan speed.....	38
MAX selection.....	65
Mode.....	38
moisture protection.....	16

N

Night limiter.....	42
night limiter).....	28
Night limiter activation time.....	42, 42
Nightsetback.....	56
Notes.....	6
Number of setpoints.....	56

O

Operating menu.....	35
Operating mode.....	40, 53
Operation.....	20, 21
Output (11/12/14).....	24
Output (21/22/24).....	24
Output (31/32/34).....	24
Output (41/42/44).....	25
Overall power.....	37

P

password.....	48
Pressure transmitter connection.....	30
Proper intended use.....	6

Q

Quick guide.....	10
------------------	----

R

Refrigerant.....	39, 52
Refrigerant selection.....	52

S

Safety instructions.....	6
Search for number of fans.....	17
Selection mode.....	23
Sensor connection fault.....	71
Service.....	48
Service menu.....	48
Service Number.....	9
Set date.....	46
Setpoint 1.....	41, 65
Setpoint 2.....	41, 65

Setpoint displacement.....	57
Setpoints.....	41
Setpoint switchover.....	29
SI/IP selection.....	68
Signalling outputs.....	24
Slave control value.....	65
Slave external.....	53
Slave external BUS.....	54
Speed limiter.....	28
start control value.....	50
Status.....	38
Status displays.....	20
Subcooler function.....	63
Switchover from control system 1 to control system 2.....	
T	
Temperature sensor connection.....	32
Temperature sensor input	66
Threshold.....	25
Threshold value.....	42
Time.....	45
Time setting.....	45
U	
UL.....	6, 7, 10, 14
V	
Ventilation.....	16
W	
Warnings.....	79

16 Picture index

Image 1:	Location of connections on the GMM EC/08.....	13
Image 2:	GMM mains connection.....	14
Image 3:	GMM fan connections.....	15
Image 4:	Signalling outputs.....	25
Image 5:	Connecting the external enabling contact	27
Image 6:	Activating the speed limiter	28
Image 7:	Switchover from control system 1 to control system 2.....	29
Image 8:	Pressure transmitter connection.....	30
Image 9:	Current source connection.....	31
Image 10:	Temperature sensor connection.....	32
Image 11:	0-10V standard signal connection.....	33
Image 12:	Analogue outputs.....	34
Image 13:	LCMM with 4 fans.....	58
Image 14:	LCMM hysteresis switch-on.....	59
Image 15:	LCMM adjustment.....	62
Image 16:	GMM EC 01 / 04 / 08 (.1) housing dimensions.....	72
Image 17:	GMM EC 16 (.1) housing dimensions.....	73
Image 18:	GMM EC 01 / 04 / 08 (.1) UL housing dimensions.....	74
Image 19:	GMM EC 16 (.1) UL housing dimensions.....	75

17 Table index

Table 1:	Temperature / Impedance.....	32
Table 2:	External control value scaling.....	77
Table 3:	Error messages/warnings on the GMM display.....	79