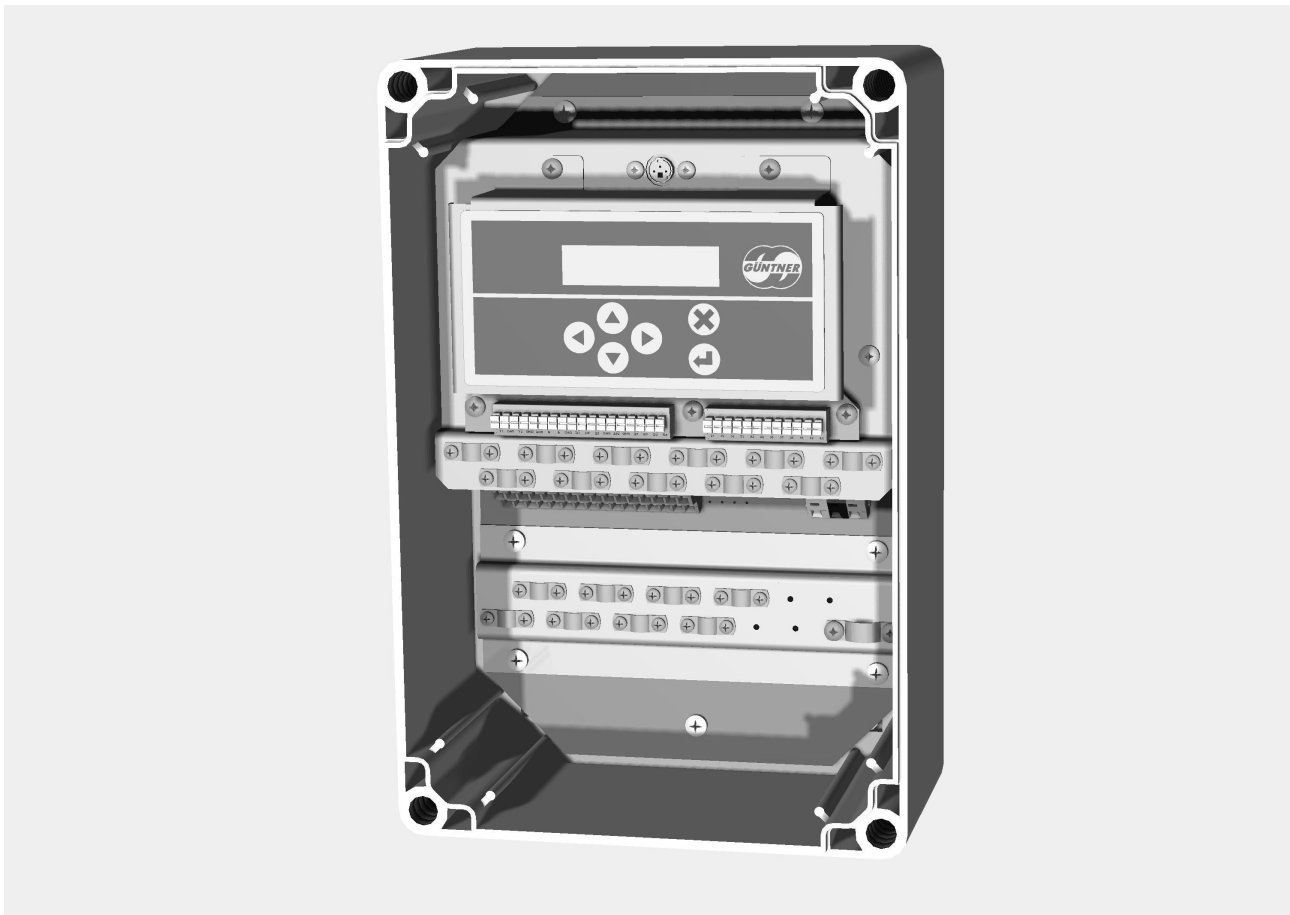




for the management and speed control of EC fans using pressure, temperature or voltage

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

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1 Instructions

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 setup, 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 IP00! The applicable national accident prevention regulations must be followed when working on controllers under voltage.

1.2 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 condensa-

tion (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 functionality 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

Examples UL:

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 - Germany

1.6 Warranty and liability

The current General Terms and Conditions of Güntner AG & Co. KG are applicable.
See the web site of Güntner AG & Co. KG.

1.7 Manufacturer and supplier address

If you have any questions, feedback or special requests, please contact

Güntner AG & Co. KG
Hans-Güntner-Straße 2-6
D-82256 Fürstenfeldbruck
Service Telephone Germany:
0800 48368637
0800 GUENTNER
Service Telephone Worldwide:
+49 (0)8141 242-4810
Fax: +49 (0)8141 242-422
service@guentner.de
<http://www.guentner.de>

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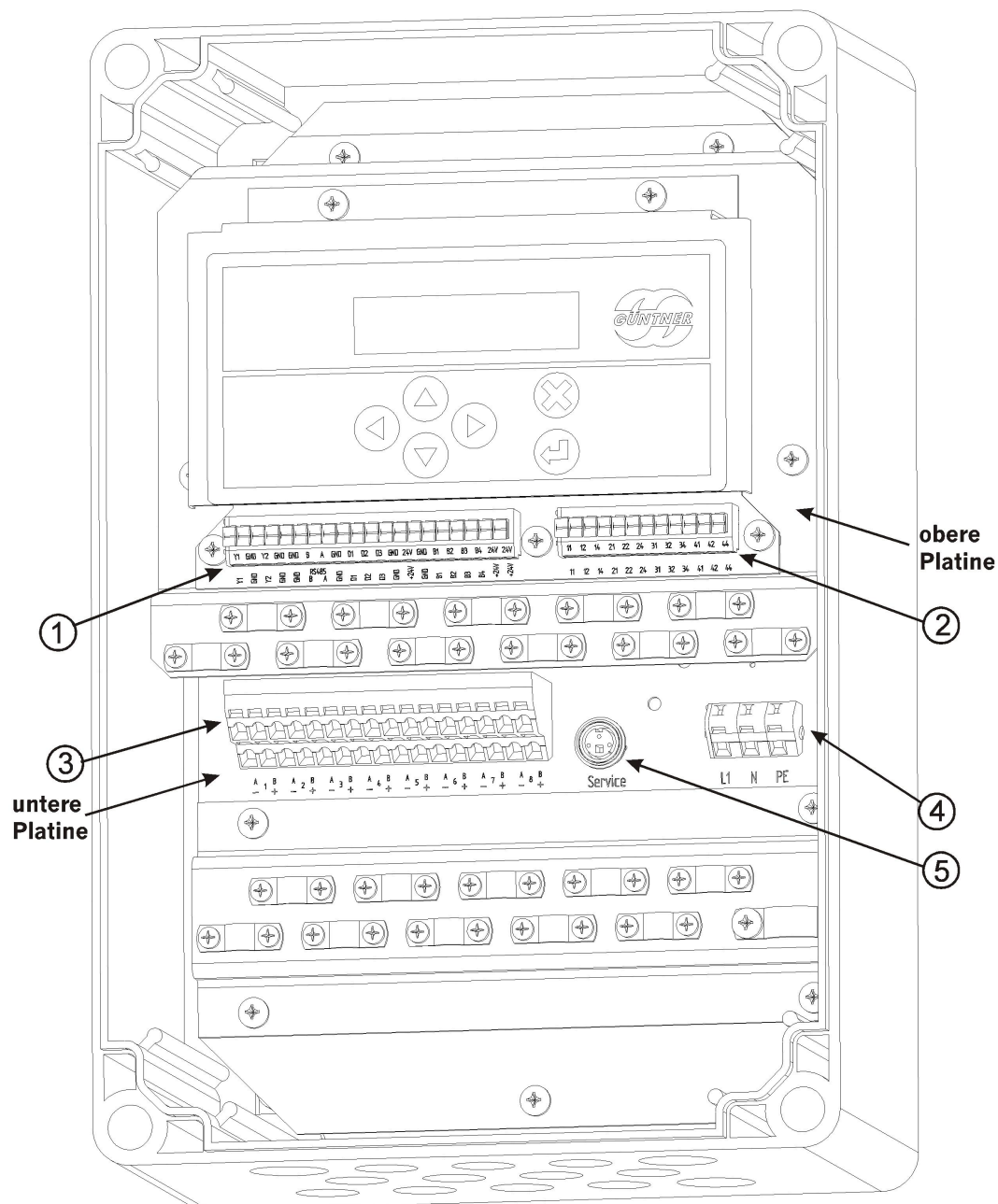
1.8 EMC-compliant installation

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 -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 a wire of min. 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 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**).
- (2) Potential-free signalling outputs (see **Potential-free signalling outputs**)
- (3) EC fan connections 24 V DC, communication connection (see **Controller fan connection**)
- (4) Mains connection (see **Controller mains connection**)
- (5) Connection for software update (see **separate description**)

3 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 2A 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:	depending on the model, there are 1 to 16 bus outputs for the EC fans on the lower PCB on the GMM (see image page 6): Communication interface: Terminals A and B (top row) 24 volt fan power supply: Terminals + and - (bottom row)

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

Analogue inputs on the GMM	Pressure sensor GSW 4003 GSW 4003.1 Temperature sensor Standard Signal (0...10V)	1 (brown) on +24V 2 (green) on B1 or B2 2 (blue) on B1 or B2 1 (white) on B3 2 (brown) on GND Plus (+) on B4 Minus (-) on GND
Signalling outputs	Connections for the signalling outputs see page 14.	
Enabled	The function of the input D1 is to enable the controller. This input must be connected to GND for the controller to work and the fans to be able to turn. (This jumper is installed in the factory) In Version .1 (see nameplate) the input D1 has to be connected to +24V !	
Language	The default language on delivery is English . The display language can be changed in the Language menu option.	
Time	The date and time 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 options with the **↓** key and the confirm with the **>** key. Scroll the "Manual mode on" menu options using the **↑↓** keys and select the functions with the **←** key. A * appears at the end of the first line and indicates that this function is now selected. Now use

the $\downarrow$ key to navigate to the control value function and select it with the $>$ key. The control value (0-100%) is displayed. This control value can now be modified by pressing the $\leftarrow$ key. As soon as the change has been confirmed with the $\leftarrow$ key, 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.

Mode The default mode setting is "**Automatic internal**". This means that the controller controls to the defined 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 setback menu option. The night setback is activated either via input **D2** or via the timer which is programmed in the Night setback menu option.

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

The "**Limiter**" and "**Setpoint switchover**" functions generally need to be activated in the service menu.

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 permissible ambient temperature).
- 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

In principle **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 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.

5.1 Controller mains connection

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

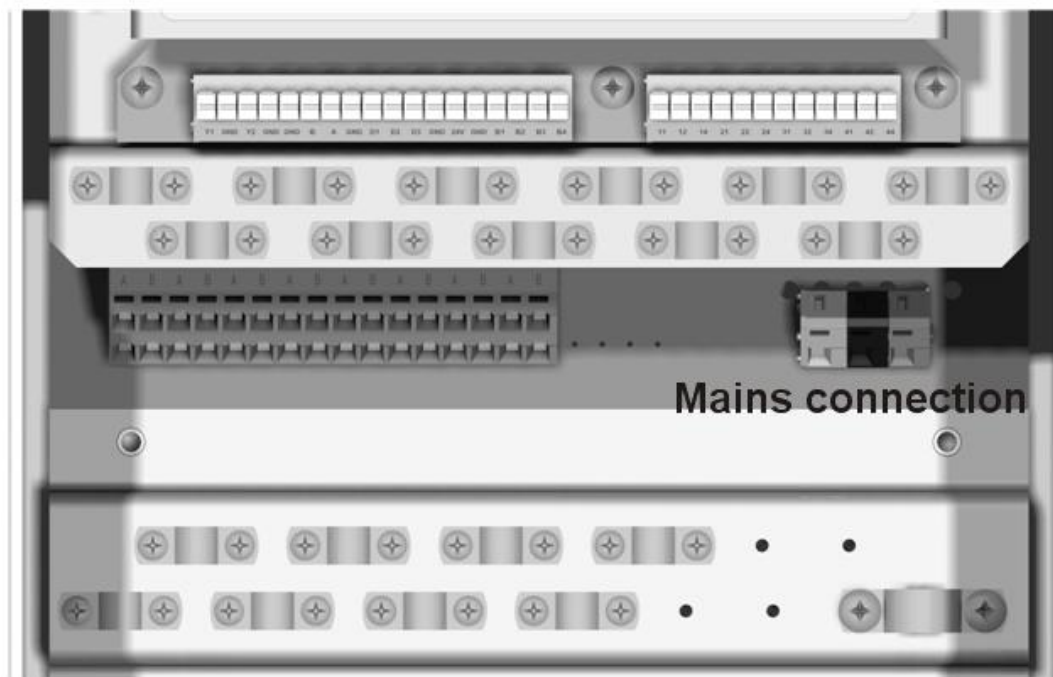
- L1** = Phase conductor
- N** = Neutral conductor
- PE** = Earth conductor

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 corresponding 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

5.2 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).

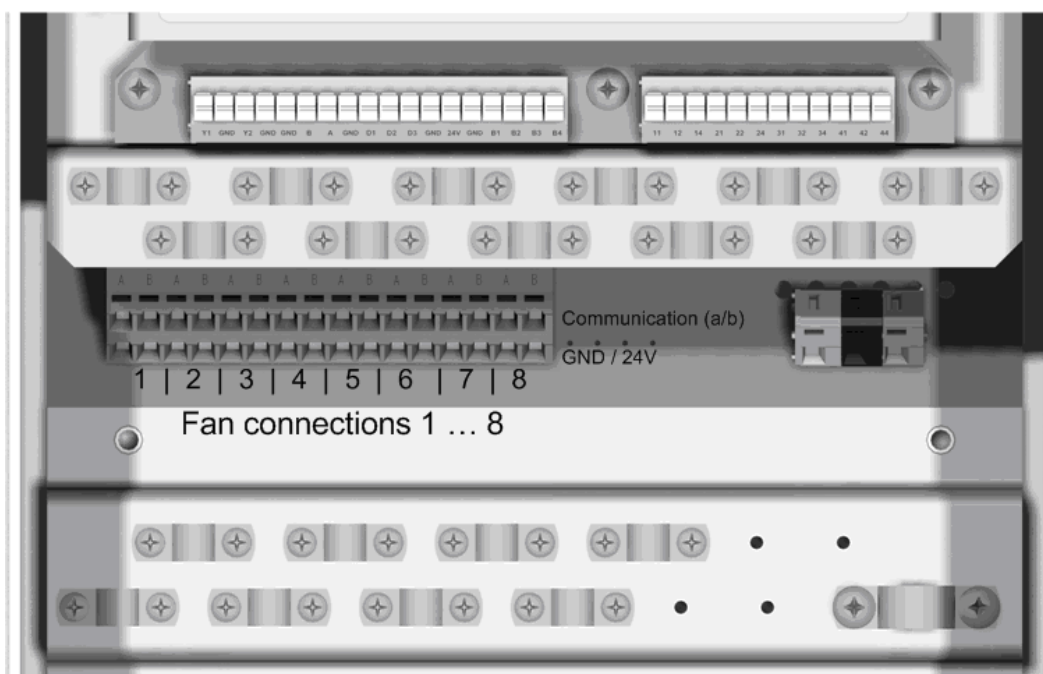
Depending on the model, there are 1 to 16 control connections for the EC fans on the lower PCB.

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.

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

24 volt power 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

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 power supply).

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:

- e.g.: all fans have failed (Unit fault)
- Error messages and alarm assignment see **Table of error messages and warnings on the GMM display**

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.

6.2 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 **Table of error messages and warnings on the GMM display**

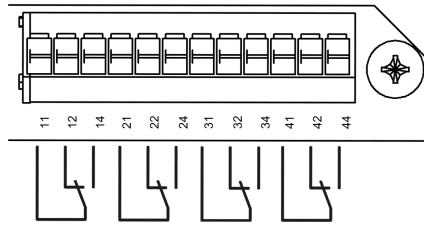
If a warning occurs, the signalling relay is switched (drops out) i.e. the two-way contact 21/22 closes. The load on this potential-free contact must not exceed 250 V / 1 A.

6.3 Digital output (31/32/34) (in operation)

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

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 (contacts 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 switchingpoint. Do not add this contact to your faultreport!

As soon as the set threshold is exceeded, the two-way contact 41/42 is closed. The load on this potential-free contact must not exceed 250 V / 1 A.

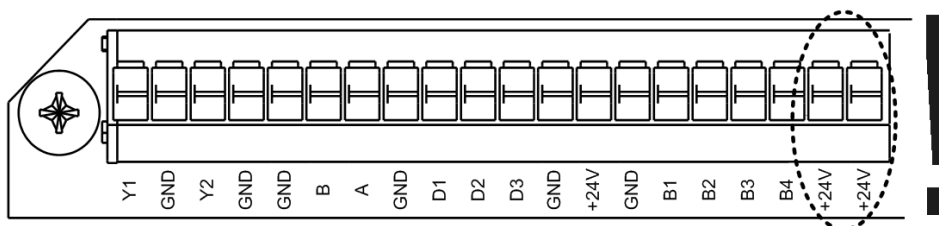
7 Control inputs

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 unit design) and the control input **D1** or **D2** or **D3** (see figures below). The function is activated when the contact is closed.

There are two versions of the GMM EC with different circuiting of the digital inputs.

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

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

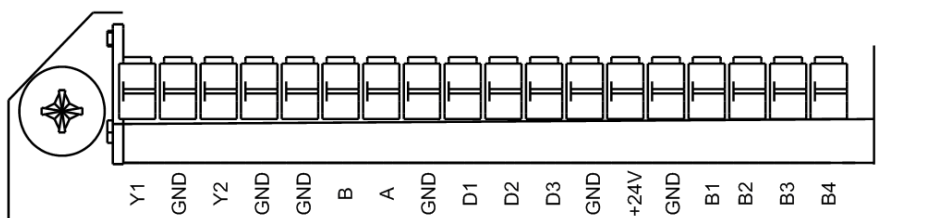


D1...D3 are activated with +24V

2 additional +24V terminals from version GMM ECxx.1

The version GMM ECxx has no additional +24V.

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



D1...D3 are activated by GND

WARNING: Wrong connection can lead to destruction!

Under no circumstances the mains voltage may be connected to the digital inputs, or external voltage applied.

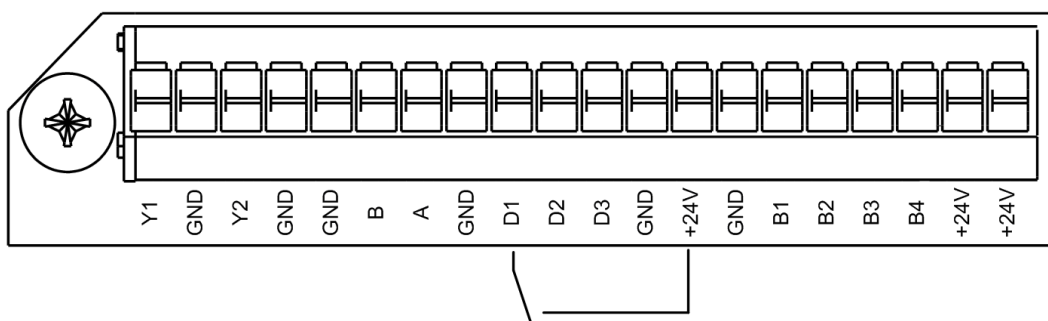
7.1 Enabling the GMM

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

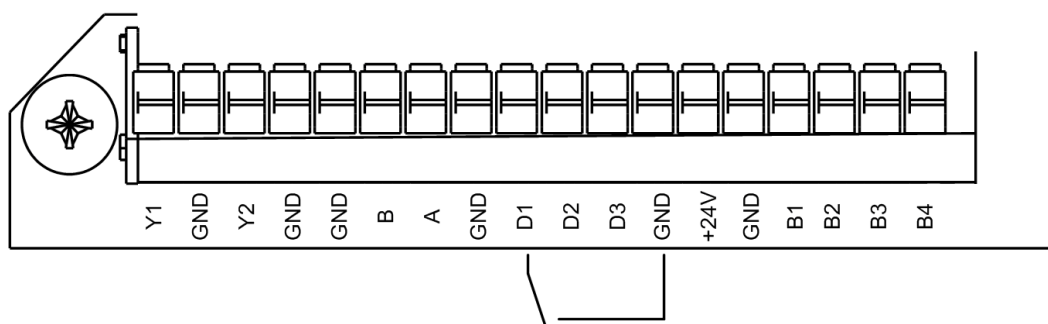
If the GMM is not to be enabled externally, terminal D1 must be connected using a jumper! This enabling jumper is always built in at the factory.

WARNING: Wrong connection can lead to destruction!

GMM EC01 .1 , GMM EC04.1 , GMM EC08.1 , GMM EC16.1 (see nameplate)



GMM EC01 , GMM EC04 , GMM EC08, GMM EC16 (see nameplate)



Connecting the external enabling contact

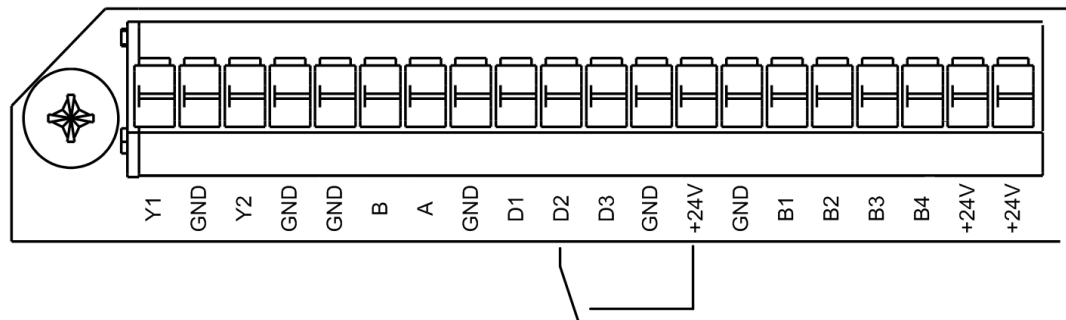
IMPORTANT: Under no circumstances may the controller be disabled by interrupting the mains voltage! Continuous switching of the supply voltage can lead to damage to the controller that is not covered by the warranty!

7.2 Speed limiter (night setback)

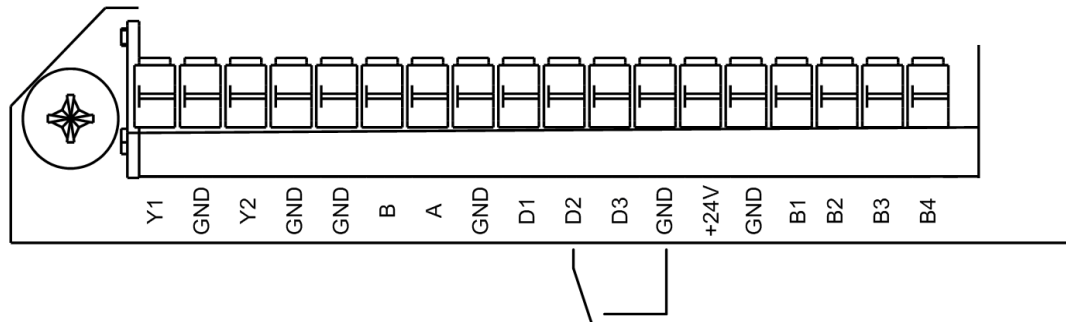
The (night) speed limiter is activated via terminal "D2". If this terminal is connected, the control signal, and hence also the fan speed, is limited to the adjusted value. The GMM will not exceed the speed set there. For setting the speed limiter, see section **Setpoints** and for general activation see section **Service**.

WARNING: Wrong connection can lead to destruction!

GMM EC01 .1 , GMM EC04.1 , GMM EC08.1 , GMM EC16.1 (see nameplate)



GMM EC01 , GMM EC04 , GMM EC08, GMM EC16 (see nameplate)



Activating the speed limiter

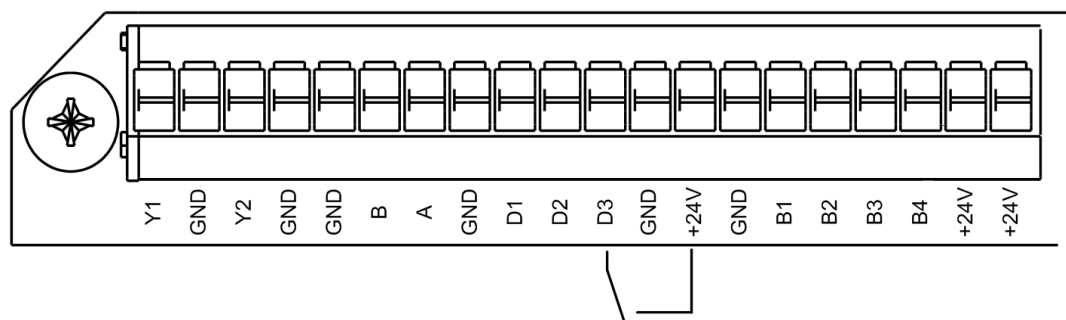
7.3 Switching to 2nd setpoint

The second setpoint, the second setpoint shifting and the second threshold are activated via terminal "D3". This allows you to select two different control characteristics (e.g. summer and winter mode) via one input.

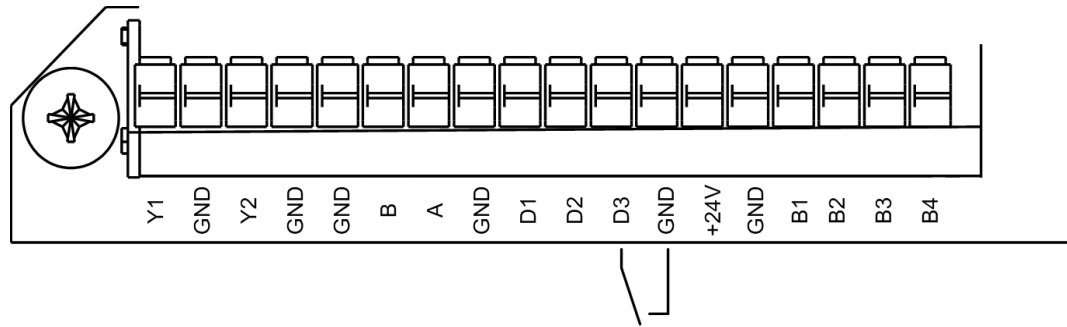
If this terminal is blank, **setpoint 1** is always active. Ex works, this connection is blank (open).

WARNING: Wrong connection can lead to destruction!

GMM EC01 .1 , GMM EC04.1 , GMM EC08.1 , GMM EC16.1 (see nameplate)



GMM EC01 , GMM EC04 , GMM EC08, GMM EC16 (see nameplate)



Switchover from control system 1 to control system 2

8 Analogue inputs

The GMM has four analogue inputs.

Two of these four inputs are current inputs (4 - 20 mA) (**B1** and **B2**).

One input **B3** is an input for impedance sensors (PTC/KTY81-210).

A voltage source of 0 - 10 V DC can be connected to the fourth input **B4**.

In the following the possibilities are described, how the inputs can be used and how they have to be connected.

WARNING: Wrong connection can destroy the analogue inputs!

The 4-20 mA inputs may not be connected to 0-10V DC or directly to +24V, nor may their poles be reversed.

8.1 Connection of a pressure transmitter 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))

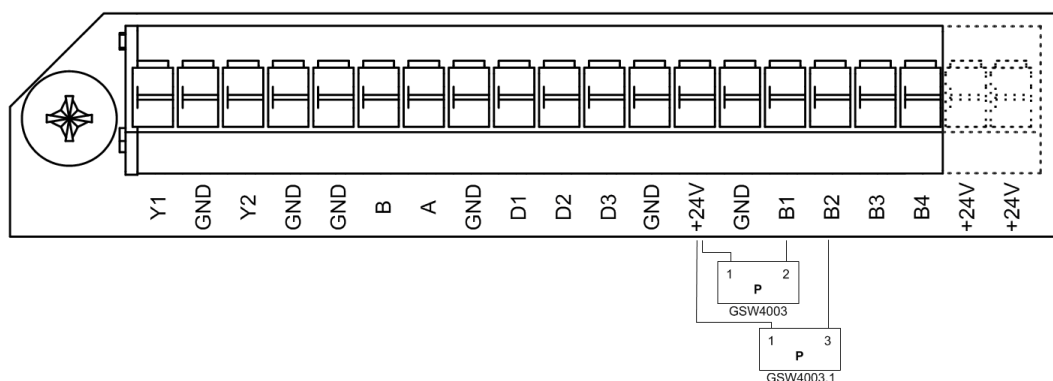
B2 = 4-20mA signal from sensor 2 (GSW4003.1: blue(3), GSW4003: green(2))

If you connect two pressure transmitters and both pressure transmitter inputs are configured for internal control in the I/O configuration (see I/O configuration, the greater signal is forwarded to the control system and used for speed control (MAX - select between the two pressure transmitters).

NOTE: Older 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.



Connection pressure transmitter

8.2 Connection to external current sources at B1/B2

Up to two current sources (4 .. 20mA) can be connected to the analogue inputs **B1** and **B2**:

The inputs B1 or B2 can be used to operate the controller in slave mode. For this purpose, the input must be defined as slave input in the I/O configuration.

The input signal 4..20mA is scaled 0-100% in a control signal and is passed on to the fans.

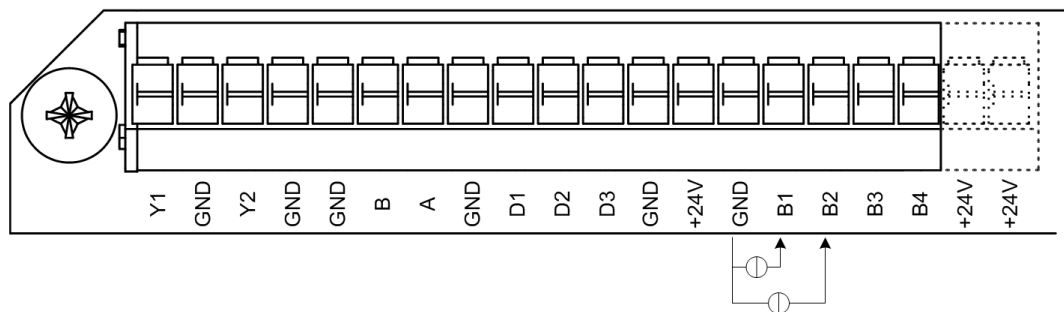
You can also define a setpoint externally via the inputs B1 or B2 e.g.

GND = Earth (—)

B1 = mains in (+) 4 .. 20mA

B2 = mains in (+) 4 .. 20mA

IMPORTANT: Observe correct polarity of current source !



Connection to current source

For the current inputs it has to be observed, the currents smaller than **2mA** or higher than **22mA** lead to reporting of sensor malfunction.

8.3 Connection of temperature sensor B3

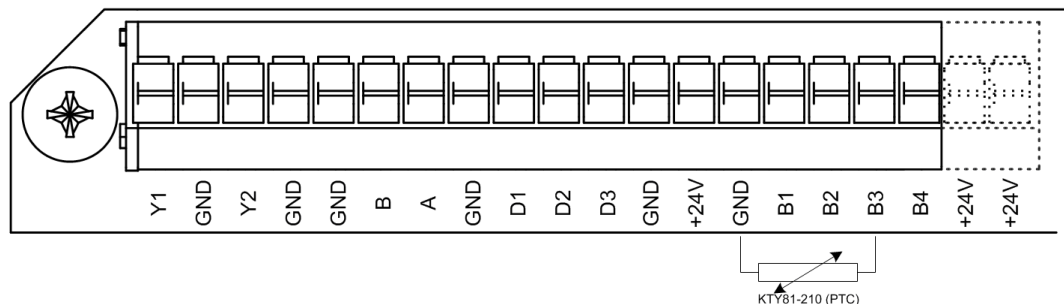
A temperature sensor is always connected on the following terminals:

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. For other temperature ranges, please contact us.



Connection temperature sensor

To test a temperature sensor that may be defective, you can 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 k Ω (-50°C) and 3.27 k Ω (+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
1040 Ω	-50°C	2152 Ω	35°C
1095 Ω	-45°C	2230 Ω	40°C
1150 Ω	-40°C	2309 Ω	45°C
1207 Ω	-35°C	2390 Ω	50°C
1266 Ω	-30°C	2472 Ω	55°C
1325 Ω	-25°C	2555 Ω	60°C
1387 Ω	-20°C	2640 Ω	65°C
1449 Ω	-15°C	2727 Ω	70°C
1513 Ω	-10°C	2814 Ω	75°C
1579 Ω	-5°C	2903 Ω	80°C
1645 Ω	0°C	2994 Ω	85°C
1713 Ω	5°C	3086 Ω	90°C
1783 Ω	10°C	3179 Ω	95°C
1854 Ω	15°C	3274 Ω	100°C
1926 Ω	20°C	3370 Ω	105°C
2000 Ω	25°C	3467 Ω	110°C
2075 Ω	30°C		

Table: Temperature / impedance table

8.4 Connect 0-10V standard signal to B4

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

GND = Earth (negative)

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

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

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

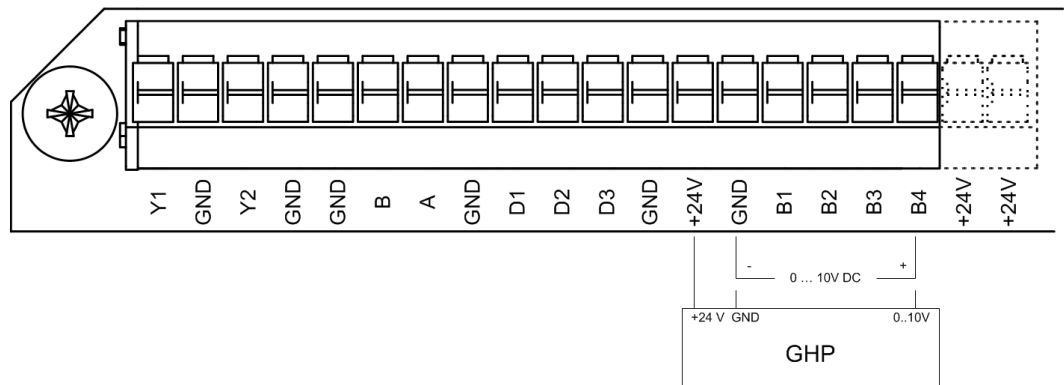
As an alternative, you can also connect a GHP manual potentiometer as a remote control. The connecting terminals on the GHP are labelled with either **1/2/3** or **+/-/Y**.

+ or 3 on **+24V**

- or 1 on **GND**

Y or 2 on **B4**

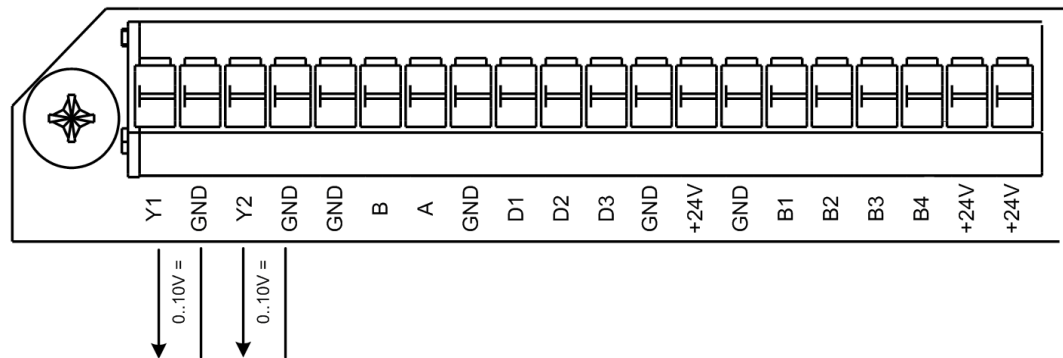
You can then use the speed controller purely as a speed adjuster and specify the fan speed yourself manually.



Connection standard signal 0-10V

9 Analogue outputs

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



Analogue outputs

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

Output **Y1** issues the control signal for a subcooler, if this function is activated. 0..10V corresponds here with a control value of 0..100%.

10 Commissioning the GMM

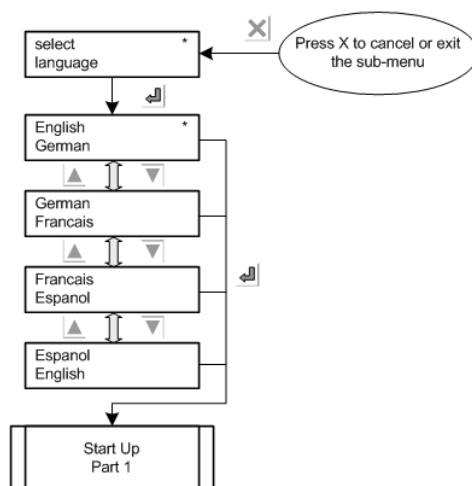
With the GMM, the fans are controlled via a bus. These fans must be set up and checked for the condenser or drycooler depending on the design of the heat exchanger. These settings and checks are necessary on initial commissioning and possibly when a fan is changed. The power and volume of the heat exchanger are defined by this commissioning. The chapter **Table of Fan IDs and VT numbers** shows the fan ID and fan type for various 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.

10.1 Start-Up Menu

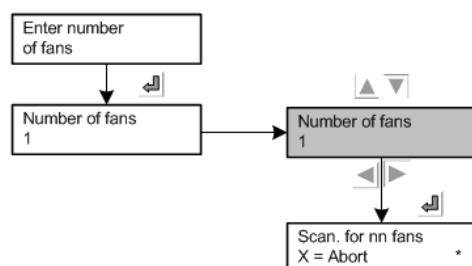
The default language for commissioning is English, even if a different language has been selected for the display. However, the commissioning language can be freely selected and only applies to the commissioning menu.

You can exit the start-up menu at any time by pressing the "X" key.

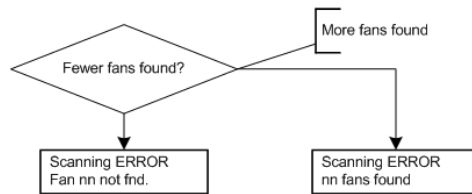


Once the language has been selected, the number of fans is queried next.

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.

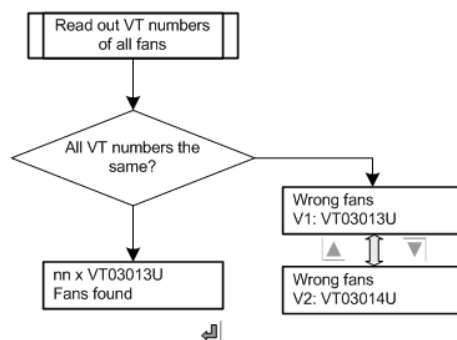


If fewer fans are found, the numbers of all the fans not found are displayed.

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

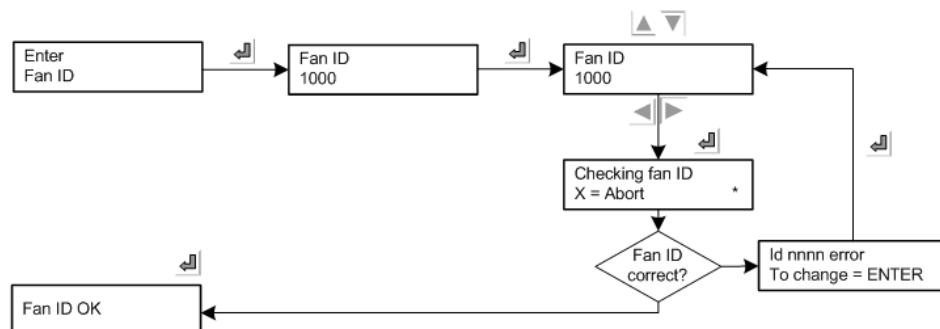
If the search is successful i.e. the specified number of fans is found, the VT numbers of the fans is read out. The VT number is the type designation of the motor.

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.

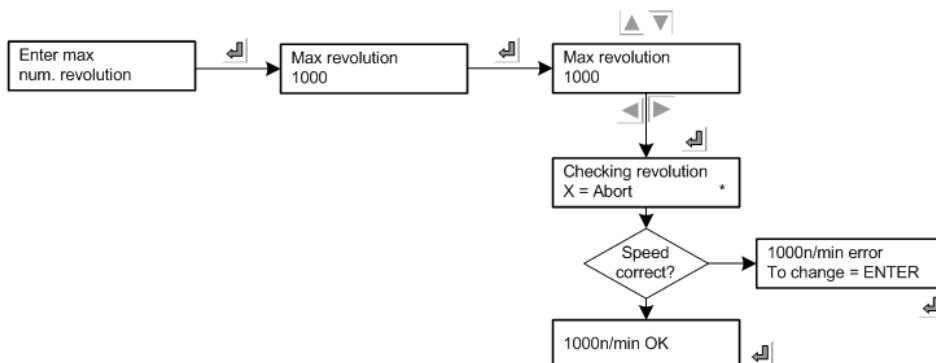
If all the VT numbers of the fans are now the same, the ID number of the fans is entered in the next step. The ID number represents the working point of the fan for the heat exchanger. For the corresponding fan ID, please refer to the wiring diagram of the heat exchanger or to chapter Table of Fan IDs and VT numbers.



As an example, fan ID **1000** has been entered here. 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. Press the "**ENTER**" key to return to the ID input. 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.

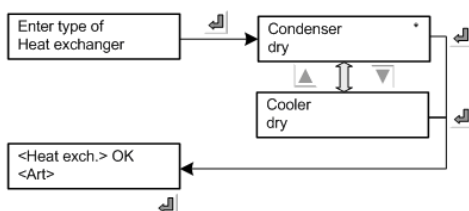
If the appropriate fan ID is found, you are prompted for the maximum permissible speed for the heat exchanger (depending on the design point).



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 drycooler (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 with a "*".

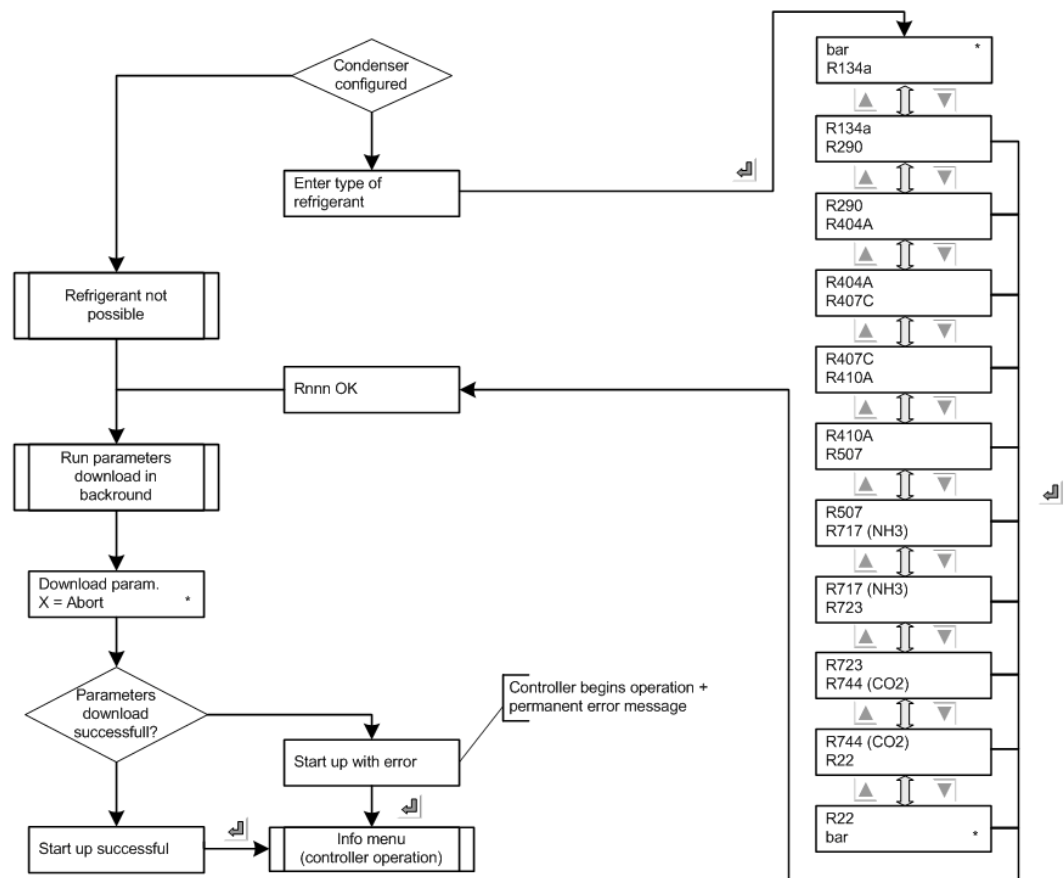
The default value is "**bar**".

If a drycooler 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.

10.2 Flow diagramm



Selection of refrigerant

11 Display and operation

Information is shown on a 2-line display with white text on a blue background. A membrane keyboard is used for input and to operate the controller.

11.1 Info menu

Setpoint	xx.x°C	SP rel.	xx.xbar
Actual value	xx.x°C	AV rel.	xx.xbar

The **setpoint** is displayed in the first line of the info menu. It can be displayed as a pressure or temperature value depending on the cooler type condenser or drycooler) and whether or not a refrigerant is specified for the condenser. The following display assignments are possible:

		Display	
Condenser:	no refrigerant refrigerant	Pressure (relative) Temperature	Refrigerant-dependent
Drykühler:		Temperature	

The actual value is displayed using the same assignment in the second line of the display.

The last character in the second line of the display indicates the operating mode of the controller. The following displays are possible:

A	Automatic mode	Static display
S	SLAVE mode	Static display
H	Manual mode	Static display
F	Priority 1 error	Alternating with default display
W	Priority 2 warning	Alternating with default display

Table: Error display abbreviations

A Automatic mode	In this mode, the actual value (relative pressure, temperature) follows the defined setpoint.
S Slave mode	In this mode, there is no separate control; instead the setpoint for the fans is supplied externally, normally via the 0-10V input where 10 volts is equivalent to 100% modulation.
H Manual mode	In this mode, the setpoint (in %) for the fans is displayed. The value is entered via the control panel.
F Error	This status display appears alternating with the mode (A/S/H) and indicates a priority 1 error (centralised fault / fan and Unit fault) The error is also displayed as plain text in line 2, again alternating with the actual value.
W Warning	This status display appears alternating with the mode (A/S/H) and indicates a priority 2 warning (sensor fault).

In addition to the error messages in plain text, controller switching functions are displayed in alternation with the actual value.

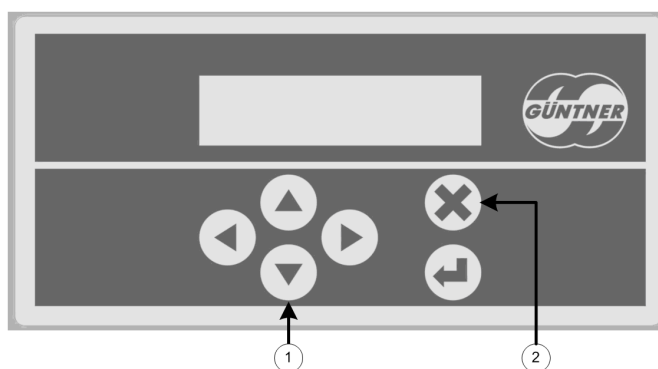
These are the two messages **-Night setback-** and **-Disabled-**.

The **Night setback** message appears when the max. control value of the controller is limited.

The **Disabled** message appears when input **D1** is not connected to **GND** (from **version .1** with **+24V**), i.e. the controller is deactivated.

You can navigate through the menu using the membrane keyboard. The right hand side of the display shows information on which keys can be used.

- ← Enter key for entering values or activating a function.
- < Right arrow for moving to the next menu level.
- > Left arrow for moving to the previous menu level.
- ↑↓ Up/down arrow for scrolling through the menu level.
- X You can only exit the service menu by using the button "X".



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.

11.2 Operating menu

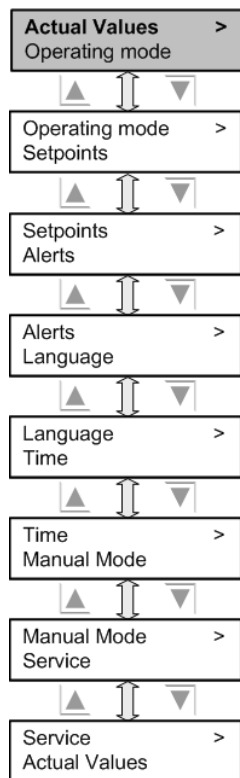
A selection of menu options are displayed in the operating menu. You can use the > key to move to the menu option displayed in the first line.

The individual menus are selected using the ↑↓ keys.

If you want to edit values, enter EDIT mode by pressing the ← key. There you can use the <> keys to select the item for which the value should be modified.

The keys that can be selected are displayed in the last character of a line in every menu.

11.2.1 Actual values



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

11.2.1.1 Input actual values

Multiple values are displayed when the Actual 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 drycooler) and the control mode (automatic or slave).

Condenser no refrigerant

Condenser refrigerant selected

Drycooler

Slave via 0..10V

CDS press
nn.n bar

11.2.1.2 Ambient temperature

The current ambient temperature is displayed, if an ambient temperature sensor is configured.

Ambient temp
nn.n °C

11.2.1.3 Control value

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

Control Value
nn %

11.2.1.4 Air volume

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

Air Volume nn %

11.2.1.5 Overall power

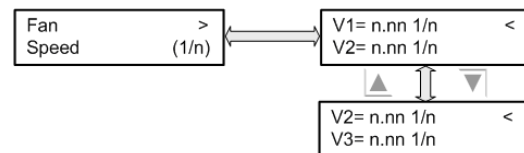
This displays the link power of all connected fans. The power is calculated from the intermediate circuit voltage and the intermediate circuit current.

Unit nn W

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

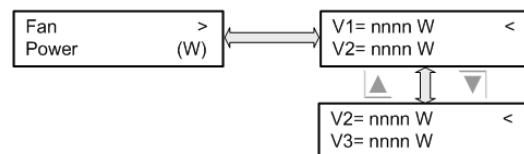
11.2.1.6 Fan speed

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



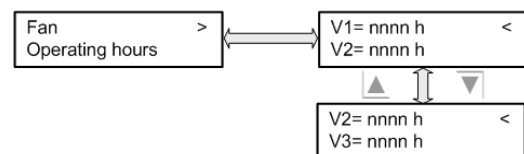
11.2.1.7 Fan power

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

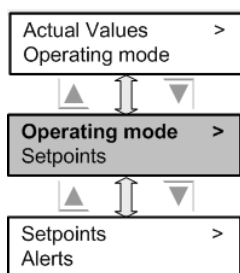


11.2.1.8 Fan operating hours

The operating hours of every EC fan are displayed.



11.2.2 Operating mode



The heat exchanger settings are displayed here.

11.2.2.1 Regulation

The set control mode is displayed when the Operating mode - Regulation menu option is opened. There are 5 different control modes.

Auto int.	1 or 2	see Auto Intern
Auto Ext. Analog	1 or 2	see Auto Extern
Auto Ext. Bus	1 or 2	see Auto Extern
Slave Ext. Analog	via 0...10V	see Slave Extern Anal.
Slave Ext. Bus	via GCM	see Slave Extern Bus
Manual Mode		see Manual Mode

Regulation
Setpoint Int 1 <

11.2.2.2 Mode

This display whether the unit operates in cooling or heating mode

Mode
cooling <

11.2.2.3 Enabled externally

This shows whether or not the controller is enabled via connection FG.

Enabled externally <
pass

11.2.2.4 Number and type of fans

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

10 x VT03010U <
connected

11.2.2.5 Max. fan speed

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

Max. revolution <
1100 (n/min)

11.2.2.6 Fan ID

This shows which operating point is set for the connected fans via the fan ID. (See table of Fan IDs)

Ventilator ID 1196	<
-----------------------	---

11.2.2.7 Heat exchanger

This indicates whether the heat exchanger is a condenser or a drycooler. The "dry" function is the default.

Condenser dry	<
------------------	---

11.2.2.8 Refrigerant

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

Refrigerant R134a	<
----------------------	---

11.2.2.9 Hardware and software versions

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

GMM is the controller with the display and keyboard.
 EC is the fan management (PCB with fan connections).
 H is the hardware version.
 S is the software version.

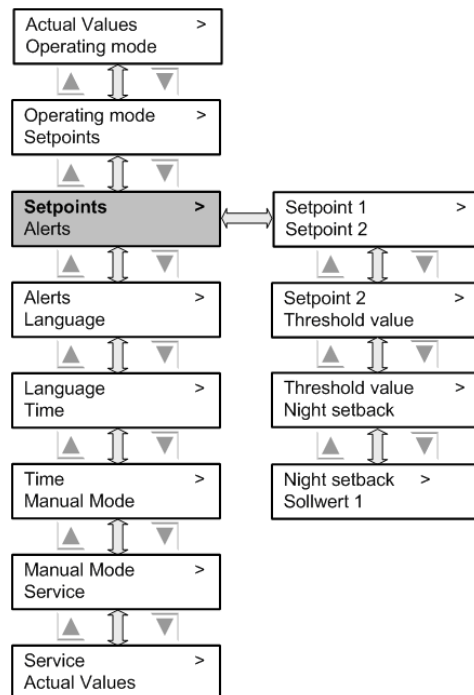
GMM: H003 S034 EC: H001 S034	<
---------------------------------	---

11.2.2.10 Bus module

This displays information about the module type, firmware version and the address of the bus module GCM if it is connected.

Modbus RTU x/y Adress: 1	<
-----------------------------	---

11.2.3 Setpoints



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

11.2.3.1 Setpoint 1

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

Setpoint 1
nn.n °C

Press the ← key to enter EDIT mode.

Setpoint 1
nn.n °C ...I

Use the <> keys to select the write position. The position is displayed on the right of the second line. Use the ↑↓ keys to edit the value at the selected position.

The minimum and maximum adjustment range is:

Pressure	1 bar to 50 bar
Temperature	0°C to 100°C
Volt	0V to 10V

The values are entered to one decimal place. Press the ← key to accept the adjusted value.

11.2.3.2 Setpoint 2

Under this option is a second set value defined. This can be activated via the digital input **DI3**. Setpoint 2 is programmed in the same manner as **Setpoint 1**.

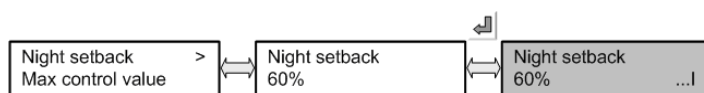
11.2.3.3 Threshold

A value between 0 and 100% is set under this option. If the control value on the fans exceeds this value, the threshold relay trips. When the value falls below the threshold, the relay drops out again. If 100% is entered as the threshold, this function is deactivated.

The above also applies to setpoint 2, offset setpoint 2 and threshold 2.

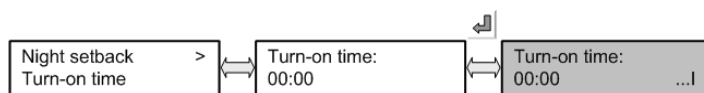
11.2.3.4 Night setback

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



The maximum control value is set according to the diagram above, whereby again, as described above, EDIT mode is activated by pressing the ENTER key, the left and right arrows are used to select the write position and the up and down key are used to modify the value.

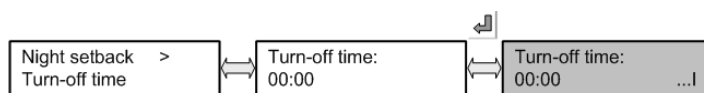
11.2.3.5 Night setback - turn-on time



The built-in timer allows the night setback to be activated and deactivated at specific times (see also Night setback).

The time is set according to the diagram above, whereby again, as described above, EDIT mode is activated by pressing the ENTER key, the left and right arrows are used to select the write position and the up and down key are used to modify the value.

11.2.3.6 Night setback - turn-off time

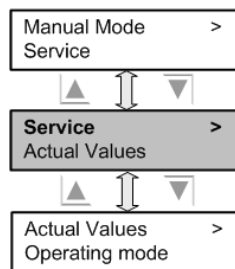


If the same value is entered for both the turn-on and turn-off time (e.g. 00:00), the time-controlled night setback is deactivated.

11.2.3.7 Night setback - list of functions

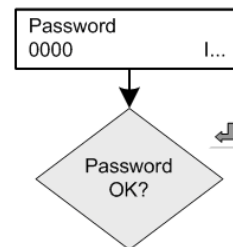
Input	Night setback with time	Night setback
inactive	off	off
active	off	on
inactive	on	on
active	on	on

11.3 Service

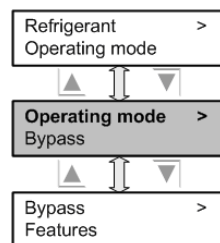


The Service menu is only accessible with a password which you are prompted for first. The password is 3795.

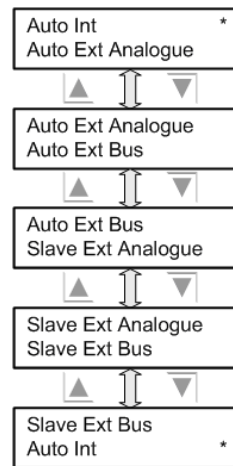
Once the password has been accepted, the Service menu appears.



11.3.1 Operation mode



The active operation mode is marked with a *.



11.3.1.1 Auto Internal

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

11.3.1.2 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 actual value is set in the **I/O configuration**.

11.3.1.3 Auto external bus

This mode has not yet been implemented.

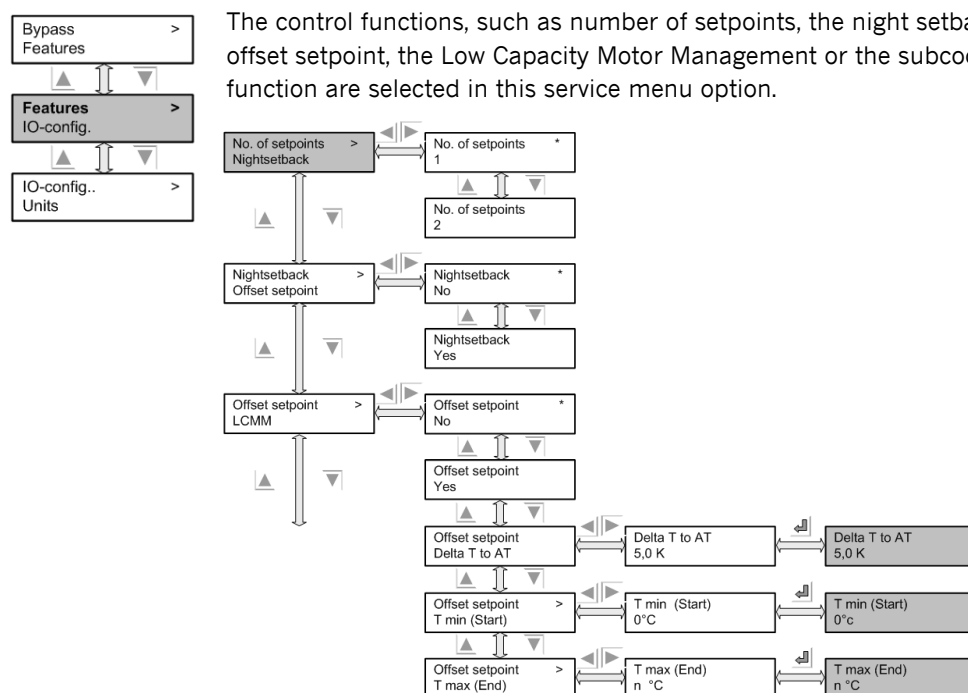
11.3.1.4 Slave external analogue

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 **I/O configuration**.

11.3.1.5 Slave external bus

This mode is in preparation.

11.3.2 Features



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

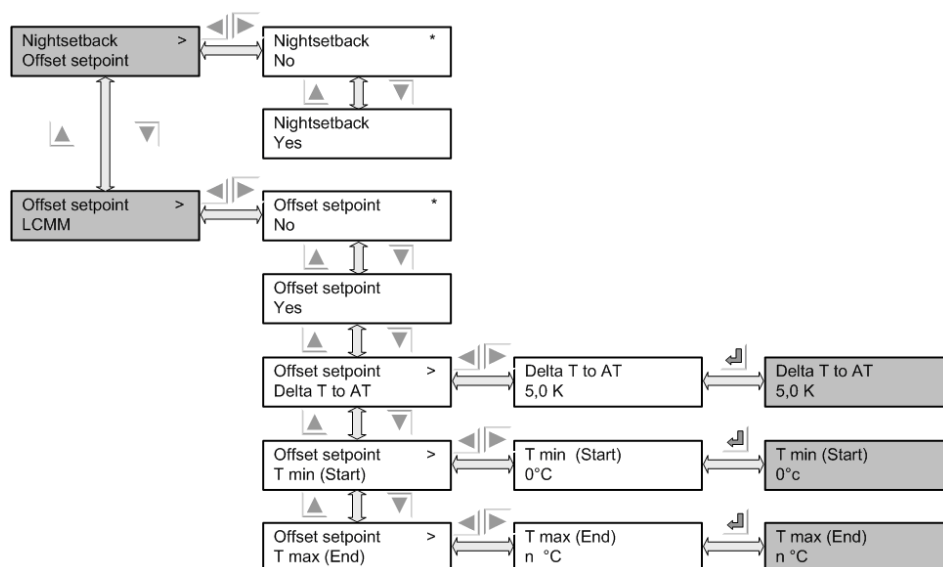
11.3.2.1 Number of setpoints

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

If different setpoints are used for control in summer and winter, the switchover can be effected via a digital input if the number of setpoints is set to 2.

11.3.2.2 Night setback

A night setback is generally activated or deactivated in this service option. The value of the night setback is set in the Setpoints menu option (**Night setback**). The night setback, i.e. turn-on and turn-off time and the control value, can also be programmed there in the normal operating menu. The night setback is activated both via digital input **D12** and via the turn-on and turn-off time. Both activations can take place in parallel. If the turn-on and turn-off times are the same, activation is only via the digital input **D12**.



11.3.2.3 Offset setpoint

In order to ensure an energetically optimal operation, it makes sense with some boundary conditions to shift the setpoint in relation to the ambient temperature.

When setting the min. condensing temperature it can occur with increasing ambient temperatures that the ambient temperature is above the setpoint. If the plant shall only be operated at partial load, energy can be saved at the fans by increasing the setpoint. Without a setpoint shifting these fans would still be controlled at 100 %, because due to the high ambient temperature (via setpoint) this setpoint can never be achieved.

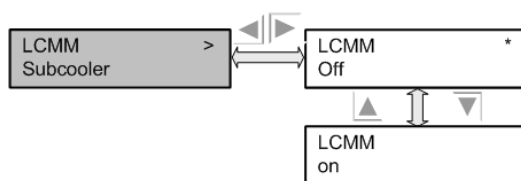
In this menu, the temperatures Tmin ambient and Tmax ambient can be set. The range between Tmin ambient and Tmax ambient is the range in which the setpoint is shifted. In addition, the ΔT has to be determined, that defines the Offset between setpoint and ambient temperature.

Example:

Setpoint	= 25°C
ΔT	= 5 K
TMin ambient	= 20°C
TMax ambient	= 40°C

In this example, the setpoint always has to be above 5 K of the ambient temperature. The shifting starts thus at 20.1 °C ambient temperature. At that moment the setpoint is shifted to 25.1 °C. The limits of T_{min} ambient and T_{max} ambient define the range for shifting. In this example the setpoint is shifted at the earliest at 20 °C if the setpoint is low enough. The max value to which the setpoint can be shifted is in this example at 45 °C.

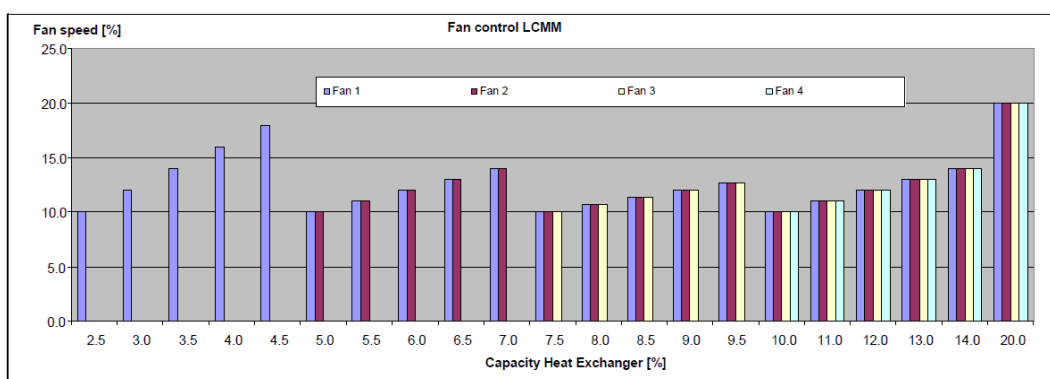
11.3.2.4 Low Capacity Motor Management



EC fans have a minimum speed which is in the range of about 9%-15% of the maximum speed. With a single fan installed the smallest possible control value depends on its minimum speed. With several fans installed the LCMM feature enables a control value which is lower than the minimum speed of a fan. The minimum control value is calculated as follows: Control Value = Minimum fan speed [%] / number of fans. This control value is reached by switching fans on and off as needed.

The running fans will be speed controlled by the GMM as usual. When control values above the minimum speed are needed then all fans will run as usual. The advantage of LCMM is a continuous control of the heat exchanger performance even in the low capacity region instead of a 2 point control (on/off).

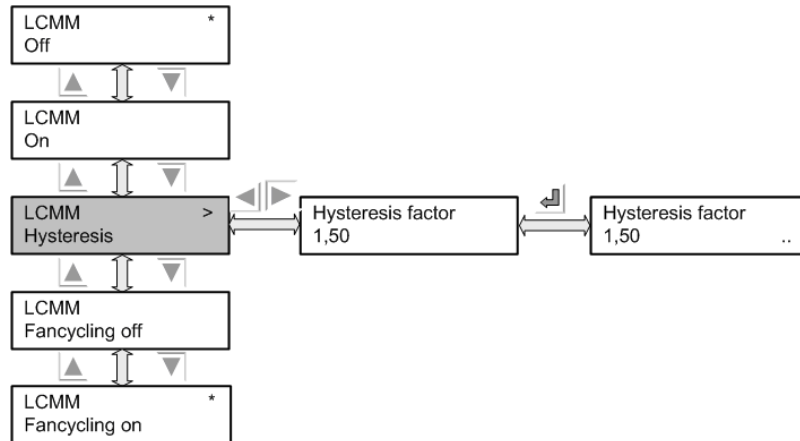
The figure below shows an example with 4 fans. At an assumed minimum speed of 10% of the maximum speed the heat exchanger can operate at a control value of 2.5% (10% minimum fan speed / 4 fans). At this particular setting a single fan operates at minimum speed whereas all other fans are switched off. If the control value increases the operating fan will increase the speed. As soon as a control value of 5% is reached the second fan will be switched on. Both fans will now run at minimum speed. At 7.5% control value the third fan is switched on and at 10% all are operating. The figure below illustrates this behaviour. Without LCMM the smallest possible heat exchanger capacity is 10% even though the control value might be lower.



LCMM Fan Control

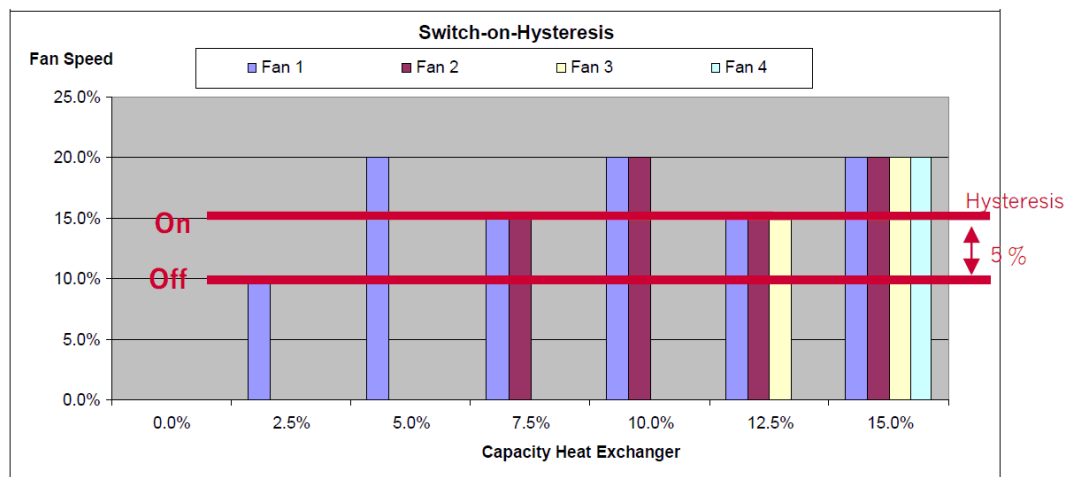
11.3.2.4.1 LCMM Hysteresis

To prevent continuous switching between on and off state depending on the control value a hysteresis factor between 1.0 and 2.5 can be defined. The GMM uses the user defined hysteresis factor and multiplies it with the minimum fan speed.



minimum fan speed. When the first fan(s) reach this speed the next fan(s) are switched on. A setting of 1.0 means no hysteresis. Within the Hysteresis curve the fans operate as described above. Only the points where fans are switched on or off have changed.

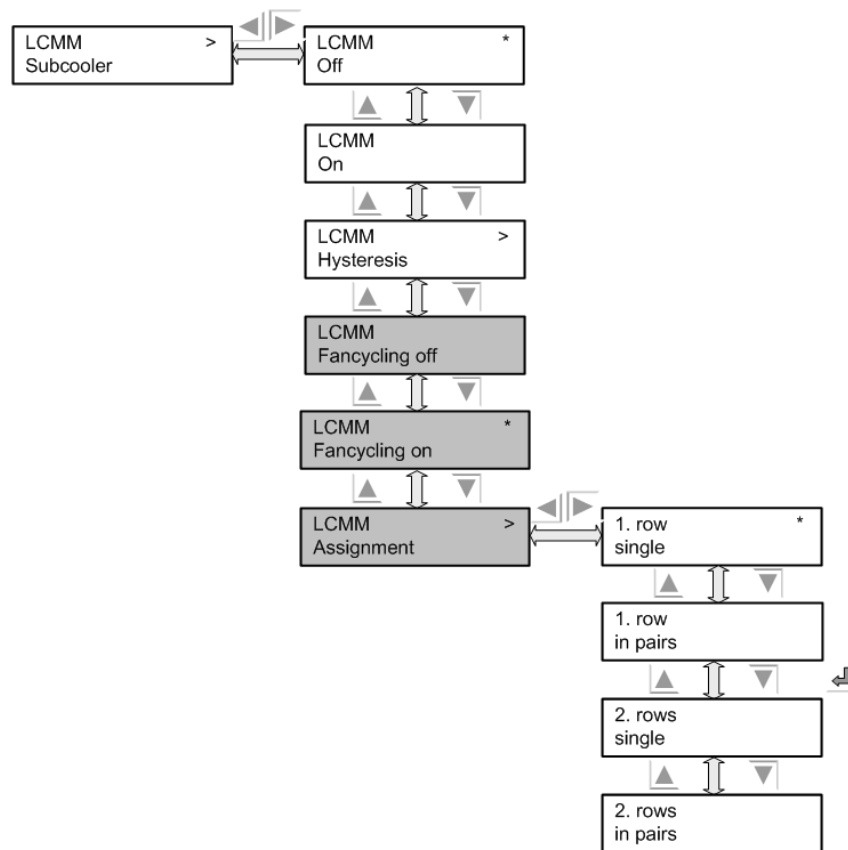
In the example below the minimum speed of the fans is 10% of the maximum value. The Hysteresis factor is 1.5. This means that the threshold to turn on the next fan is set to 15%. In our example with 4 fans this relates to a heat exchanger capacity of 3.75% to switch on the first fan. The fan is switched off again when the Heat Exchanger capacity drops below 2.5%. The second fan is turned on when a heat exchanger capacity of 7.5% is needed. (15% / 4 * 2) – The third fan at a capacity of 11.25% and the fourth at a capacity of 15%.



LCMM Hysteresis

11.3.2.4.2 LCMM Fancycling

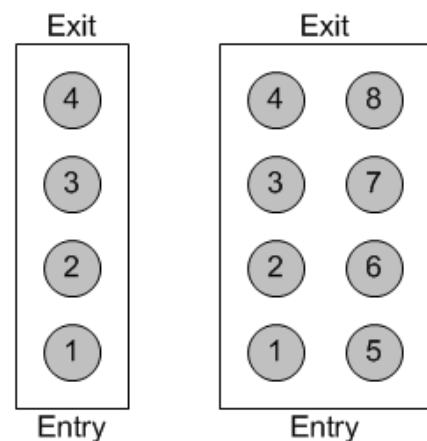
The fancycling feature of LCMM gives the opportunity to level the operating hours of the individual fans. When activating this feature the fans will be switched on in a changing order. The fans with the least operating hours are switched on first thus increasing the lifetime expectation of the fans.



11.3.2.4.3 LCMM fan cycling 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)

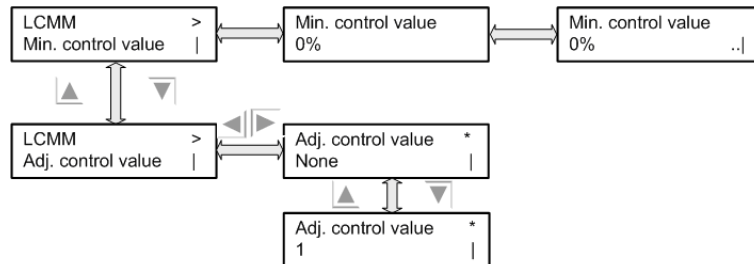


11.3.2.4.4 LCMM min control value

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%.

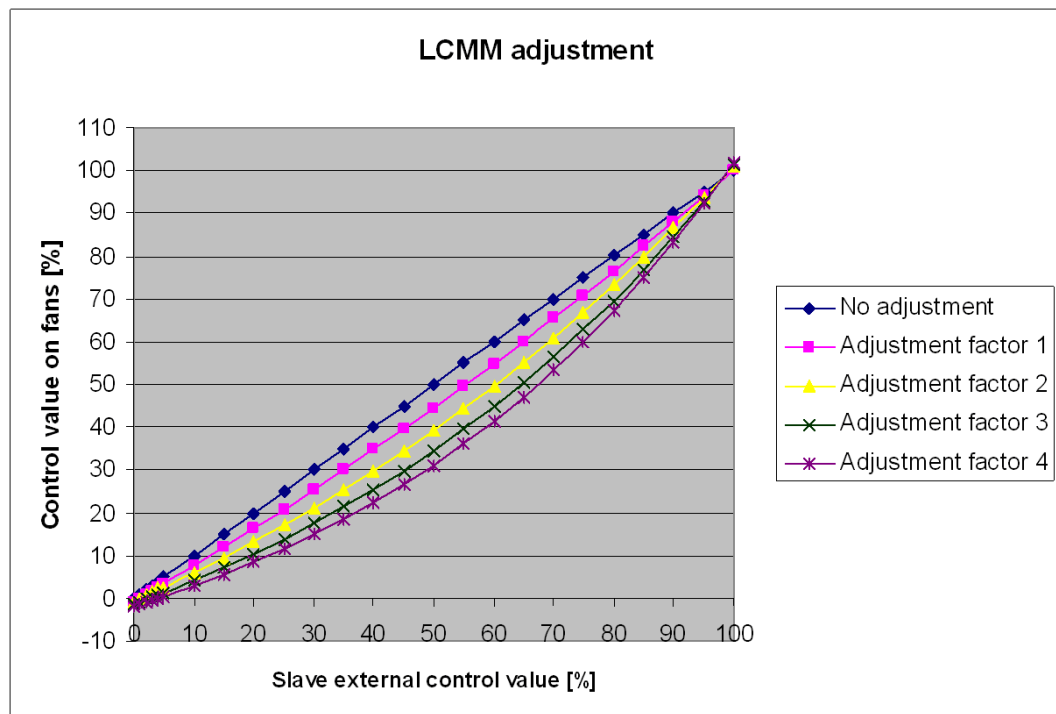


11.3.2.4.5 LCMM control value adjustment

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

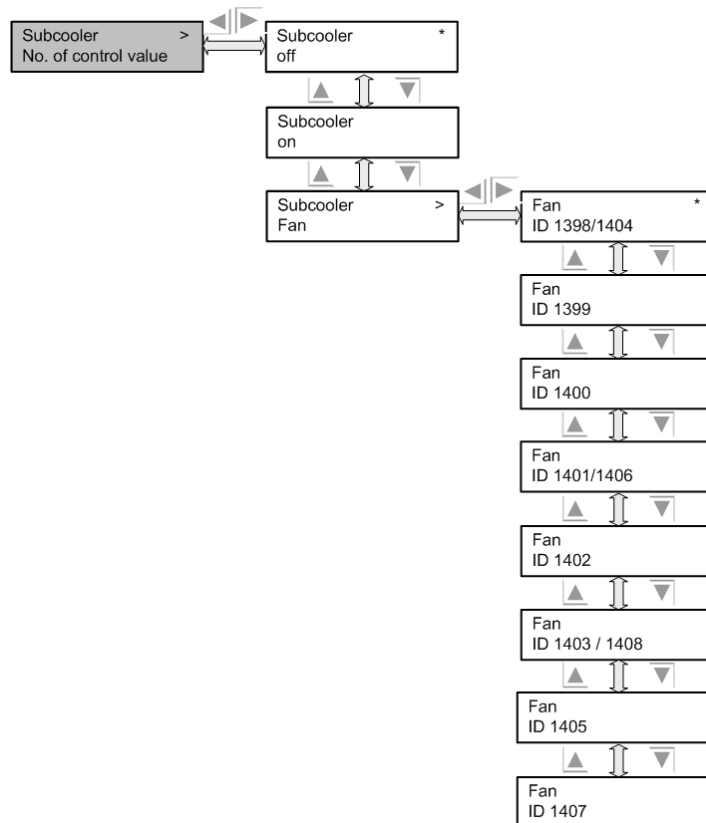
11.3.2.5 Subcooler function

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 is activated if the control value of the regulation is > 5%.

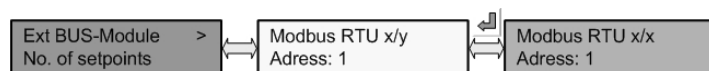
The subcooler function can be switched on and off in the functions menu.

The fan type used is selected in the selection menu.

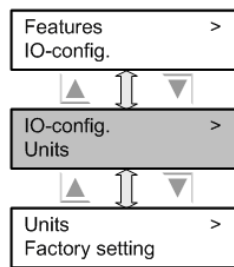


11.3.2.6 External BUS-Module

With this function it is possible to change the address of the external BUS Module. The default value is 1. The firmware version of the module components is shown at the positions marked with x/y. x = MODBUS Module, y = CAN-Module.

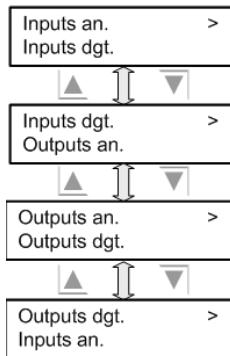


11.3.3 I/O configuration

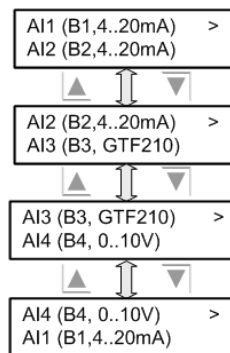


This menu option is used to configure the analogue and digital inputs and outputs. Selected functions can be assigned to the inputs and outputs.

This is done at 3 menu levels. The input or output groups are selected at the first level.

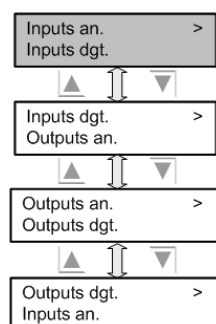


The individual inputs or outputs in a group are selected at the second level. Here are the analogue inputs as an example.



A function can be assigned to the individual inputs and outputs at the third level.

11.3.3.1 Inputs analogue



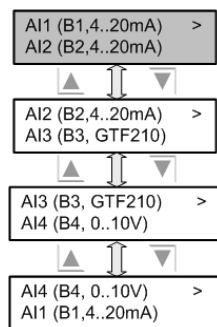
-Level 1-

The analogue inputs are measurement inputs for recording temperature or pressure values. These inputs can also be used to prescribe control values (slave mode).

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

11.3.3.2 Current inputs

- Level 2 -



- Level 3 -

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

A **current value** of **0-25 bar** or of **0-40 bar** can be selected with the power input.

Ctrl. val slave 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 hence the fans are stationary. A 20 mA input current would generate a control signal of 100% on the fans. Make sure that "Slave Ext" mode has been selected in the **Operation mode** menu.

Setpoint 1 means that setpoint 1 on which internal control is performed is specified via the current input. The current input is scaled to the set actual value (see **Table of error messages and warnings on the GMMdisplay**). The origin of the actual value has then still to be configured. Make sure that "Auto Ext" mode has been selected in the **Operation mode** menu.

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

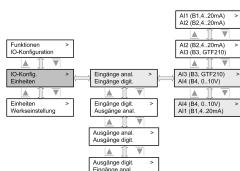
No function is selected if this input should be inactive.

For current input 2 in general the same applies as for current input 1, however two additional possibilities for setting exist.

Actual Value Temperature means that a temperature sensor with 4...20mA current output (-30°C to +70°C) is connected to this current input. The function is the same as described in **Actual Value**.

Ambient Temperature means that a temperature sensor with 4...20mA current output (-50°C to +50°C) is connected to this current input. This input is only intended for temperature measurement.

11.3.3.3 Temperature sensor input



Act val temp means that a **GTF210** temperature sensor is connected to this input. Make sure that "Auto Int" mode has been selected in the **Operation mode** menu.

Ambient Temperature means that a GTF210 temperature sensor is connected to this input for measurement of the ambient temperature. The measurement range is -30°C to +70°C. It is ensured that only 1 ambient temperature sensor can be selected.

No function is selected if this input should be inactive.

11.3.3.4 Input 0...10V

Actual value means that the actual value (0-10V) for regulation exists on this input. Make sure that "Auto Int" mode has been selected in the **Operation mode** menu.

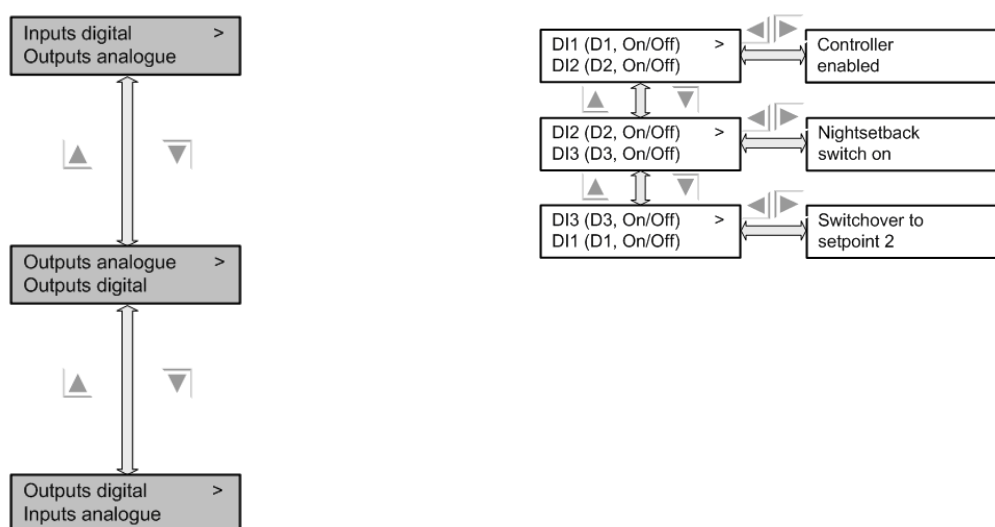
Ctrl. val slave means that the control signal for the fans follows this input. The characteristic curve is linear from 0-100%. Make sure that "Slave Ext" mode has been selected in the **Operation mode** menu.

Setpoint 1 means that setpoint 1 on which internal control is performed is specified via the voltage input. The voltage input is scaled to the set actual value (see Setpoint scaling table). The origin of the actual value has then still to be configured. Make sure that "Auto Ext" mode has been selected in the 10.3.4 Operation mode menu.

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

11.3.3.5 Inputs digital

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



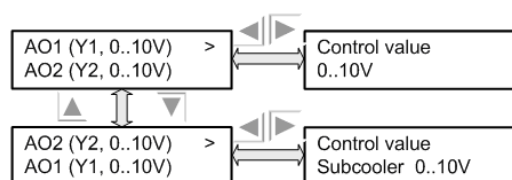
The inputs are active when they are connected to **GND**. From Version **.1**, the terminals are active when they are connected to **+24V**. They can only be switched with potential-free contacts (relay contact).

11.3.3.6 Outputs analogue

The analogue outputs can output a voltage of 0-10 V DC. A fixed function is assigned to analogue output 1 and 2.

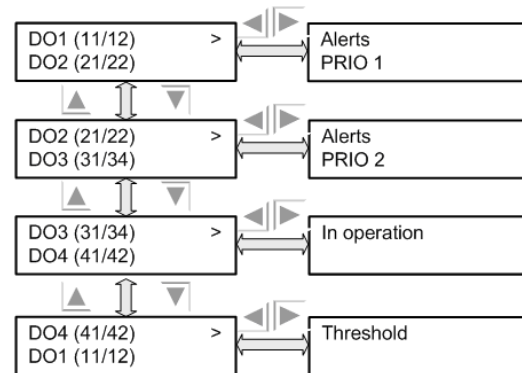
Output 1 outputs the control signal from 0-100% scaled as a 0-10V signal.

Output 2 outputs the control signal for the cooler when the functions is selected.



11.3.3.7 Outputs digital

The digital outputs are relay contacts. Each output has a 250 V / 1 A 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. See Table of error messages and warnings on the GMM display.



12 Errors and troubleshooting

12.1 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:

Operating mode 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**, go to **Test point 2**.
- If the Unit fault **message** is displayed, there is a fault in 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 "**Fx temperature**" message appears, one or more of the fans has a temperature fault. **Fx** represents the fan number. If more than one fan is affected, they are listed in succession. A temperature fault exists if the motor winding or motor end stage is too hot.
- If the "**Fx 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 "**Fx general error**" appears. **Fx** represents the fan number. If more than one fan is affected, they are listed in succession.
- If the message "**No sensor selected**" appears, no sensor input has been selected in the 10.3.7 I/O configuration.

TEST POINT 2:

Mains connection:

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

Sensor connection::

- Is the sensor connected correctly? Cf section 7. .
- 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::

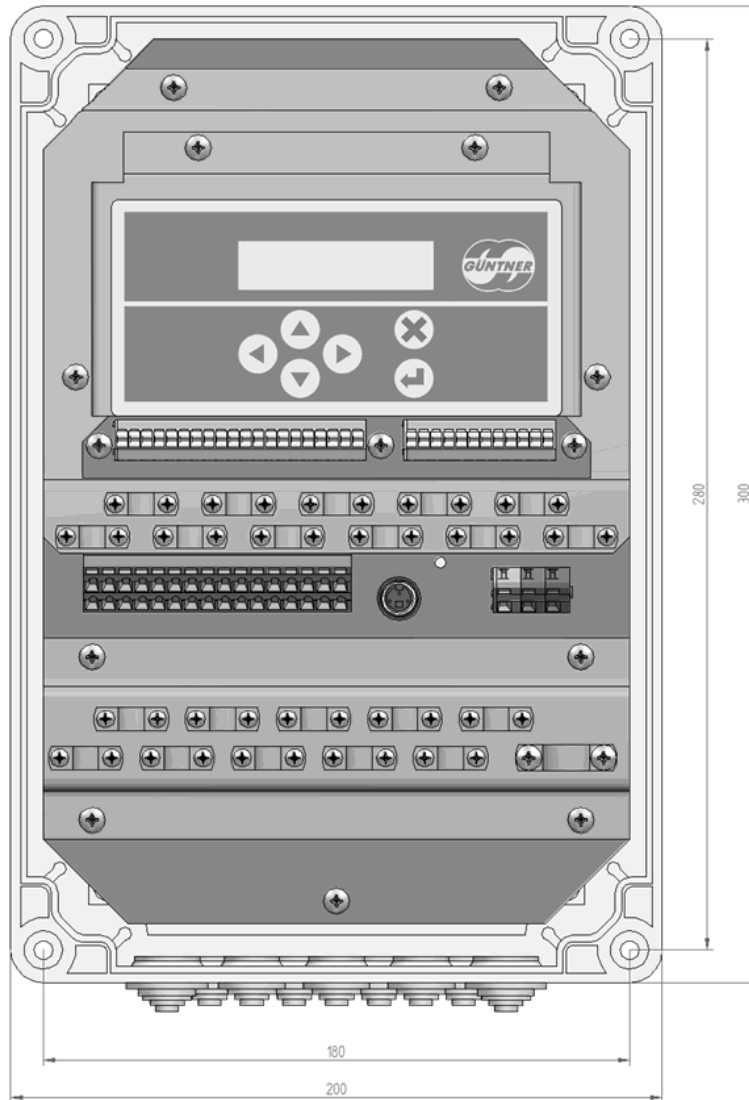
- Is the fuse on the controller supply OK?

13 Technical data

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

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

Fixing drill holes max. Ø 7,5 mm

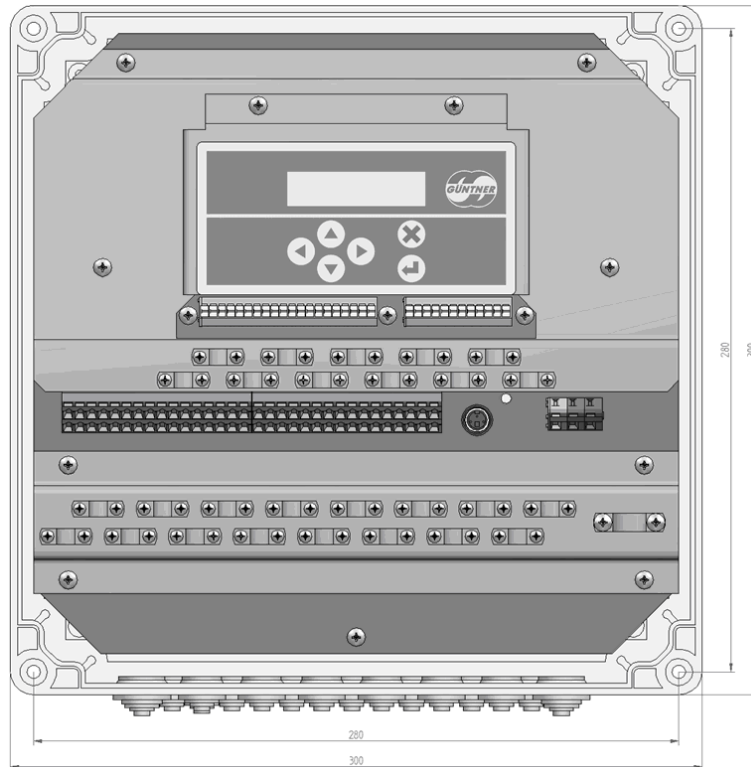


GMM EC/01 /04 /08 (.1) housing dimensions

13.2 GMM EC/16 (1.)

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

Fixing drill holes max. Ø 7,5 mm.

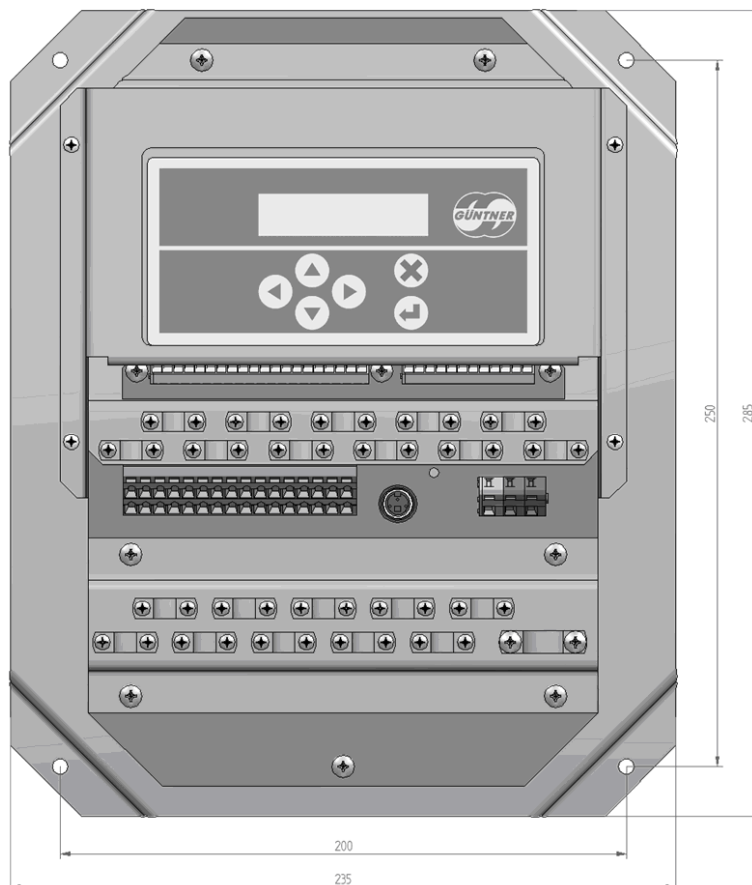


GMM EC/16 (.1) housing dimensions

13.3 GMM EC/01 /04 /08 UL

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

Fixing drill holes max. Ø 5mm.

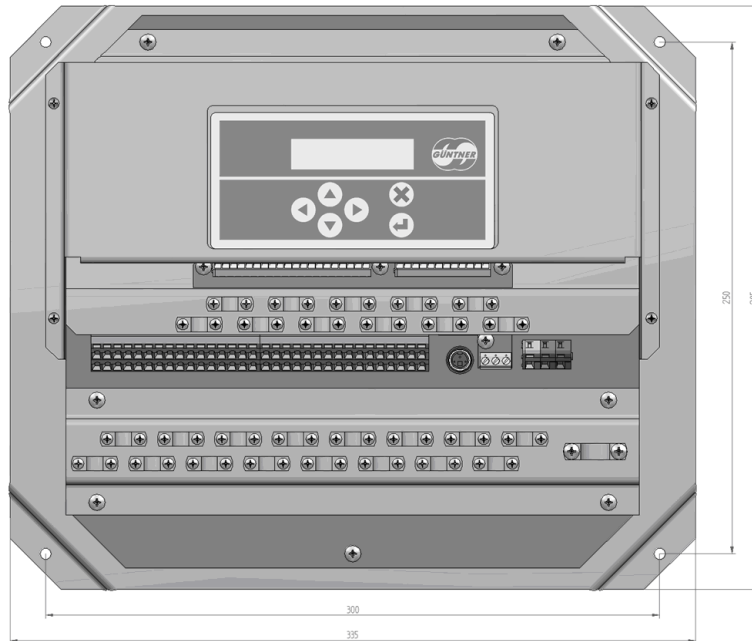


GMM EC/01 /04 /08 UL housing dimensions

13.4 GMM EC/16 UL

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

Fixing drill holes max. Ø 5mm.



GMM EC/16 UL housing dimensions

14 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)	ca. 14W
	GMM EC/04.(.1)	ca. 18W
	GMM EC/08.(.1)	ca. 20W
	GMM EC/16.(.1)	ca. 30W
Sensor connection:	Pressure transmitter 4-20mA 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:	IP54	
Dimensions:	GMM EC/01 /04 /08 (.1)	
	GMM EC/16 (.1)	
	GMM EC/01 /04 /08 (.1) UL	
	GMM EX/16 (.1) UL	

15 External control value scaling table

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	Control value internal depending on current value	Control value external current 4 .. 20mA	Control value 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: Scaling external control value

16 Parameters after putting into operation (factory settings)

	Drycooler		Condenser with refrigerant		Condenser without refrigerant	
Units	SI	IP	SI	IP	SI	IP
Language	English	English	English	English	English	English
Setpoints 2 exist	no	no	no	no	no	no
Night operation	no	no	no	no	no	no
Bypass	yes	yes	yes	yes	yes	yes
Offset setpoint	no	no	no	no	no	no
Operation mode	Automatic internal	Automatic internal	Automatic internal	Automatic internal	Automatic internal	Automatic internal
Kp	10.0	10.0	10.0	2.0	20.0	2.0
Ti	0 sec.	0 sec.	25 sec.	25 sec.	40 sec.	40 sec.
Td	0 sec.	0 sec.	0 sec.	0 sec.	0 sec.	0 sec.
Serpoint1 (2)	30°C	86°F	40°C (25°C CO2)	104°F (77°F CO2)	12,5 bar	181 psig
Threshold 1	100%	100%	100%	100%	100%	100%
Night limit	100%	100%	100%	100%	100%	100%
Manual operation Control Value	0%	0%	0%	0%	0%	0%
Offset setpoint ΔT	5 K	5 K	5 K	5 K	5 K	5 K
Ambient temp. shifting min.	0°C	32°F	0°C	32°F	0°C	32°F
Ambient temp. shifting max.	50°C	122°F	50°C	122°F	50°C	122°F
Ambient temp. depending on shift- ing	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

17 Table of 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
Unit fault	x		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.
Not enabled			D1 not switched (Controller is not enabled)
Controller 2			Control system 2 activated
Night setback			Night setback activated
F x cable break		x	Communications fault on fan x
F x Temp M		x	Temperature fault on fan x, motor
F x Temp E		x	Temperature fault on fan x, output stage
F x Temp I		x	Temperature fault on fan x, electronics
F x wrong VT		x	Fan x wrong VT number
F x power fail		x	Fan x has no power x
F x blocked		x	Fan x blocked
F x not OK		x	Internal communications fault in motor electronics on fan x. Warning: This error is also displayed if the power supply of the fan fails. For 1-phase motors in case of power failure. For 3-phase motors in case of failure of 2 or 3 phases.
F x Hallsensor		x	Hall sensor on fan x not working
F x fault B		x	Fan x braking operation (external operation)
F x fault H		x	Fan x intermediate circuit, overvoltage
Fx fault L		x	Fan x intermediate circuit, undervoltage

Table: Error messages / Warnings on the GMM Display

PRIO 1 = Relay contacts 11/12

PRIO 2 = Relay contacts 21/22

In operation = Relay contacts 31/34 if control signal > 0%



Threshold

= Relay contacts 41/42

the contacts close when the control signal has reached the set threshold. Setting a threshold see **Threshold**.



18 Table of Fan IDs and fan numbers

Heat Exchanger		EC fans			
		Fan type	Fan-ID	Working point (maximum speed) n [min-1]	Voltage [V]
Gxx045xxxNW		VT03007U	1185	1250	230
GVX.0xxxNW		VT03007U	1185	1250	230
Gxx045xxxLW		VT03006U	1186	1000	230
GVX.0xxxLW		VT03006U	1272	900	230
Gxx045xxxSW		VT03006U	1187	770	230
GVX.0xxxLW		VT03006U	1273	750	230
Gxx052xxxND		VT03013U	1188	1500	400
Gxx052xxxNJ		VT03013U	1188	1500	400
Gxx05xxxND		VT03013U	1396	1100	400
GVX.0xxxND		VT03012U	1195	1455	400
Gxx052xxxNS		VT03011U	1189	1140	230
GVX.0xxxNS		VT03010U	1196	1070	230
Gxx052xxxLD		VT03011U	1190	1000	230
Gxx052xxxLJ		VT03011U	1190	1000	230
GVX.0xxxLD		VT03010U	1197	930	230
Gxx052xxxLS		VT03009U	1191	785	230
Gxx052xxxSD		VT03009U	1240	750	230
GVX.0xxxSD		VT03008U	1198	710	230
Gxx052xxxED		VT03009U	1193	660	230
GVX.0xxxED		VT03008U	1199	640	230
GVX.0xxxLS		VT03008U	1200	620	230
Gxx052xxxSS		VT03009U	1192	610	230
GVX.0xxxSS		VT03008U	1201	570	230
Gxx052xxxES		VT03009U	1194	385	230
GVX.0xxxES		VT03008U	1271	375	230
S-GHN		VT03070U	1738	1240	230
Gxx067xxxND		VT03017U	1202	1300	400
Gxx067xxxNJ		VT03017U	1202	1300	400

Table: Fan IDs + Fan numbers

		EC fans			
Heat Exchanger		Fan type	Fan-ID	Working point (maximum speed) n [min-1]	Voltage [V]
miscellaneous		VT03017U	1826	1310	400
Gxx067xxxNS		VT03016U	1203	1050	400
Gxx067xxxLD		VT03016U	1204	890	400
Gxx067xxxLJ		VT03016U	1204	890	400
Gxx067xxxLS		VT03015U	1205	745	230
Gxx067xxxSD		VT03015U	1206	715	230
Gxx067xxxED		VT03014U	1208	615	230
Gxx067xxxSS		VT03014U	1207	550	230
Gxx067xxxES		VT03014U	1209	400	230
Gxx06xxxxLD		VT03071U	1744	890	230
GVX071.0xxxND		VT03021U	1279	1220	400
GVX071.0xxxMD		VT03021U	1280	1150	400
GVX071.0xxxMS		VT03021U	1281	960	400
GVX071.0xxxNS		VT03021U	1278	900	400
GVX071.0xxxLD		VT03020U	1274	845	400
GVX071.0xxxLS		VT03020U	1275	720	400
GVX071.0xxxSD		VT03020U	1276	620	400
GVX071.0xxxSS		VT03035U	1282	500	230
GVX071.0xxxED		VT03035U	1283	415	230
GVX071.0xxxES		VT03035U	1284	340	230
Gxx080xxxND miscellaneous		VT03025U	1828	1000	400
Gxx080xxxNL miscellaneous		VT03025U	1828	1000	400
Gxx080xxxND		VT03025U	1210	975	400
Gxx080xxxNL		VT03025U	1210	975	400
Gxx080xxxNJ		VT03025U	1241	900	400
Gxx080xxxMD		VT03025U	1212	865	400
Gxx080xxxNS		VT03025U	1211	770	400
Gxx080xxxML		VT03025U	1211	770	400
Gxx080xxxLD		VT03024U	1219	735	400

Table: Fan IDs + Fan numbers

		EC fans			
Heat Exchanger		Fan type	Fan-ID	Working point (maximum speed) n [min ⁻¹]	Voltage [V]
Gxx080xxxMJ		VT03024U	1242	700	400
Gxx080xxxLL		VT03024U	1741	600	400
Mxx080xxxLL		VT03024U	1741	600	400
Gxx080xxxSL		VT03024U	1742	500	400
Mxx080xxxSL		VT03024U	1742	500	400
Gxx080xxxMS		VT03023U	1213	600	230
Gxx080xxxLL		VT03023U	1213	600	230
Gxx080xxxLS		VT03023U	1214	575	230
Gxx080xxxLJ		VT03023U	1243	545	230
Gxx080xxxSD		VT03023U	1237	470	230
Gxx080xxxSL		VT03023U	1237	470	230
Gxx080xxxED		VT03022U	1217	435	230
Gxx080xxxEL		VT03022U	1217	435	230
Gxx080xxxSJ		VT03022U	1217	435	230
Gxx080xxxSS		VT03022U	1216	380	230
Gxx080xxxEJ		VT03022U	1216	380	230
Gxx080xxxES		VT03022U	1218	300	230
Gxx080.1...C .xx.ND		VT03059U	1656	1000	400
Gxx080.1...C .xx.NL		VT03059U	1656	1000	400
Gxx080.1...CND		VT03059U	1830	975	400
Gxx080.1...CNL		VT03059U	1830	975	400
Gxx080.1...CNS		VT03059U	1657	770	400
Gxx080.1...CML		VT03059U	1657	770	400
Gxx080.1...CMD		VT03059U	1658	865	400
Gxx080.1...CNJ		VT03059U	1659	900	400
Gxx080.1...CLD		VT03060U	1660	735	400
Gxx080.1...CMJ		VT03060U	1661	710	400
Gxx080.1...CMS		VT03061U	1662	600	230
Gxx080.1...CLL		VT03061U	1662	600	230
Gxx080.1...CLS		VT03061U	1663	575	230
Gxx080.1...CSD		VT03061U	1664	470	230
Gxx080.1...CSL		VT03061U	1664	470	230

Table: Fan IDs + Fan numbers

		EC fans			
Heat Exchanger		Fan type	Fan-ID	Working point (maximum speed) n [min-1]	Voltage [V]
Gxx080.1...CLJ		VT03061U	1665	545	230
Gxx080.1...CSS		VT03062U	1682	380	230
Gxx080.1...CEJ		VT03062U	1682	380	230
Gxx080.1...CED		VT03062U	1683	435	230
Gxx080.1...CEL		VT03062U	1683	435	230
Gxx080.1...CSJ		VT03062U	1683	435	230
Gxx080.1...CES		VT03062U	1684	300	230
Gxx090xxxMD		VT03030U	1220	960	400
Gxx090xxxML		VT03030U	1220	960	400
Gxx090xxxMJ		VT03030U	1220	960	400
Gxx090xxxNS		VT03029U	1221	910	400
Gxx090xxxLL		VT03028U	1244	825	400
Gxx090xxxLJ		VT03028U	1244	825	400
Gxx090xxxMS		VT03028U	1222	690	400
Gxx090xxxSL		VT03027U	1245	650	400
Gxx090xxxSJ		VT03027U	1245	650	400
Gxx090xxxSD		VT03027U	1224	610	400
Gxx090xxxLD		VT03027U	1223	570	400
Gxx090xxxED		VT03027U	1225	530	400
Gxx090xxxEL		VT03027U	1225	530	400
Gxx090xxxSS		VT03026U	1227	485	230
Gxx090xxxEJ		VT03026U	1227	485	230
Gxx090xxxLS		VT03026U	1226	355	230
Gxx090xxxES		VT03026U	1228	355	230
miscellaneous		VT03030U	1391	920	400
miscellaneous		VT03030U	1325	910	400
Gxx090.1...CMD		VT03063U	1668	960	400
Gxx090.1...CNS		VT03064U	1671	910	400
Gxx090.1...CMS		VT03065U	1672	690	400
Gxx090.1...CLL		VT03065U	1673	825	400
Gxx090.1...CLJ		VT03065U	1673	825	400

Table: Fan IDs + Fan numbers

		EC fans			
Heat Exchanger		Fan type	Fan-ID	Working point (maximum speed) n [min ⁻¹]	Voltage [V]
Gxx090.1...CLD		VT03066U	1674	570	400
Gxx090.1...CSD		VT03066U	1675	610	400
Gxx090.1...CED		VT03066U	1676	530	400
Gxx090.1...CEL		VT03066U	1676	530	400
Gxx090.1...CSL		VT03066U	1677	650	400
Gxx090.1...CSJ		VT03066U	1677	650	400
Gxx090.1...CLS		VT030667U	1678	355	230
Gxx090.1...CSS		VT03067U	1679	485	230
Gxx090.1...CEJ		VT03067U	1679	485	230
Gxx090.1...CES		VT03067U	1680	335	230
Gxx100xxxND		VT03032U	1233	935	400
Gxx100xxxNS		VT03031U	1229	735	400
Gxx100xxxLD		VT03031U	1229	735	400
Gxx100xxxSD		VT03031U	1231	640	400
Gxx100xxxED		VT03031U	1238	575	400
Gxx100xxxLS		VT03031U	1230	525	400
Gxx100xxxSS		VT03031U	1232	470	400
Gxx100xxxES		VT03031U	1239	380	400

Table: Fan IDs + Fan numbers

19 Troubleshooting table

Error	Possible cause, suggested solution
Fans are not spinning round	• If NOTHING happens when the controller is switched on and nothing appears in the Info menu either as a setpoint or a actual value, check the operation mode and the I/O configuration. The operation 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 operation mode in the I/O configuration. • If the setpoint and the actual value appear in the Info menu but the setpoint does not match the defined 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: Should deliver 4-20 mA (check with ampmeter). • Temperature sensor: Measure the resistance, it should 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 more quickly. 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 should 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.

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