

Operating instructions

Güntner Motor Management GMM sincon®



for the management and speed control of AC fans.

GMM sincon® 010.1

GMM sincon® 010.1 UL

GMM sincon® 022.1 UL

GMM sincon® 041.1 UL

GMM sincon® 057.1 UL

GMM sincon® 078.1 UL

GMM sincon® 100.1UL

GMM sincon® 140.1 UL

GMM sincon® 170.1 UL

GMM sincon® 240.1 UL

GMM sincon® 320.1 UL

GMM sincon® 450.1 UL

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1 General notes

The GMM sincon is a speed controller with frequency converter and all-pole sine filter, which has been specially developed for use on heat exchangers. The GMM sincon achieves the best possible level of effectiveness for heat dissipation and consequently increases the cost-effectiveness of the refrigeration system. *The AC fans are also operated especially motor-friendly and with low noise emissions. This increases the system's service life.*

Very good fans radial runout

The sine-form motor voltage enables excellent synchronization of the motors. This consistent sine voltage allows the motors to build up sufficient torque in the lower speed range and very low speeds are therefore already possible from a frequency of 0.5 Hz.

Low emitted interference

Due to its sine-form output voltage the GMM sincon also has a very low emitted interference. This means cables can be used without any special shielding. The cable lengths can also be significantly longer than with frequency converters without sine filters. All EMC (= electromagnetic compatibility) requirements are also met without shielded cables.

The motor doesn't overheat

No additional motor overheating with non-sine form voltage parts, which increases the motor's service life.

Barrier is relieved

There are no voltage peaks, as with frequency converters without all-pole sine filters, which significantly reduces the motors' service life with flashovers in the motor winding.

Long motor cables

The extremely sine-form output voltage means that long feed cables do not have a negative EMC effect. This means that even long cables do not have to be shielded with compliance with installation regulations.

Low mains load

Smoothing coils significantly cap voltage peaks with power consumption from the mains.

Low load current peaks

Inrush current limiters, which are prescribed for larger equipment, are already standard with the GMM sincon, even with the smallest construction size. Long component service life The prevention of current and voltage peaks has a particularly good effect on the service life of all components.

Cos f always > 0.95 with public utility mains

The GMM sincon achieves $\cos f > 0.9$. This means hardly any idle power is generated and additional idle power compensation is not required.

Low noise emissions, high effectiveness

There are no control-related noise emissions with the GMM sincon.

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

1.2 Proper intended use

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 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!

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1.4 Warranty and liability

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

See homepage <http://www.guentner.de>

1.5 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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1.6 EMC-compliant installation

The GMM sincon® 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:

- All measurement and signalling cables (only use measurement cables e.g. LIYCY 3x0.5², not telephone cables!) must be shielded. As must all bus cables (CAN/MODBUS/PROFIBUS/etc.).
- 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.

The GRCF.1 controller module and possible expansion modules are mounted on a top-hat rail and are placed in the switch cabinet on an earthed mounting panel. The electrical supply is connected with cable connectors.

Please note:

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

2 GMM sincon® Controller commissioning

With the GMM sincon® the AC fans are controlled via one or more frequency converters with an optional sine filter.

The or the frequency converters are controlled via CAN BUS .

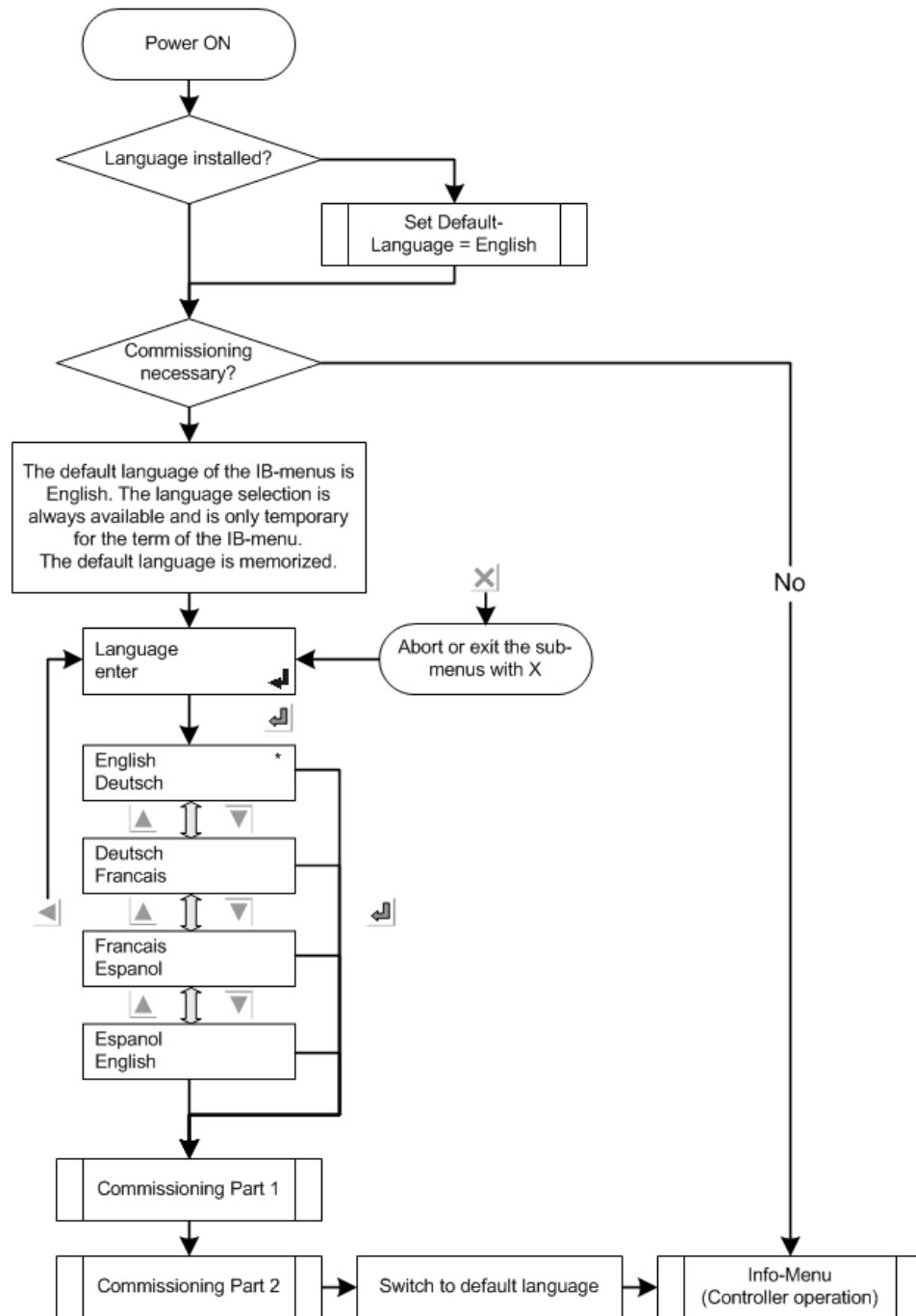
These frequency converters must be set in accordance with the heat exchanger and the fans. The power and volume of the heat exchanger are defined by this commissioning.

The GMM sincon® automatically recognizes whether commissioning has been completed, if yes, normal operation continues.

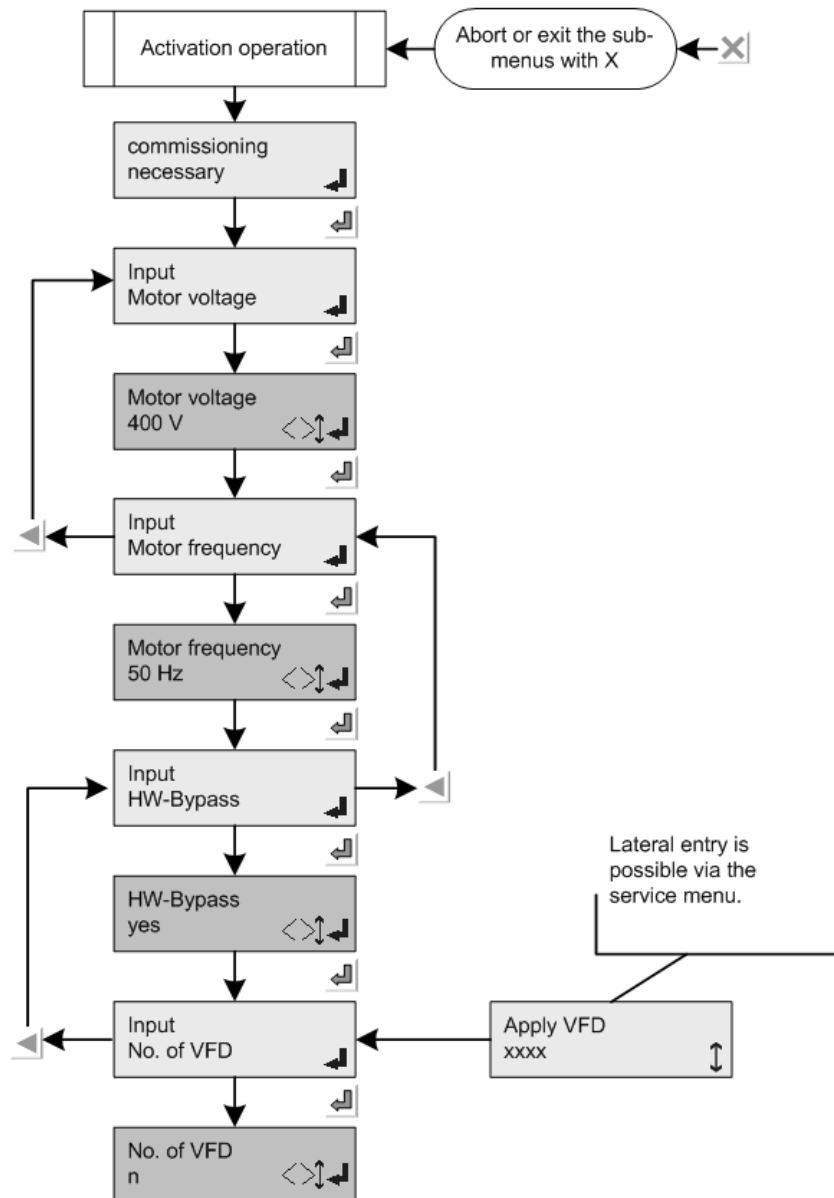
If the GRCF.1 recognizes that commissioning has not been completed, the commissioning procedure will be started. After the procedure is over all set parameters are saved. All values set with the commissioning can also be viewed and changed individually later on in the menus.

2.1 Initial commissioning process

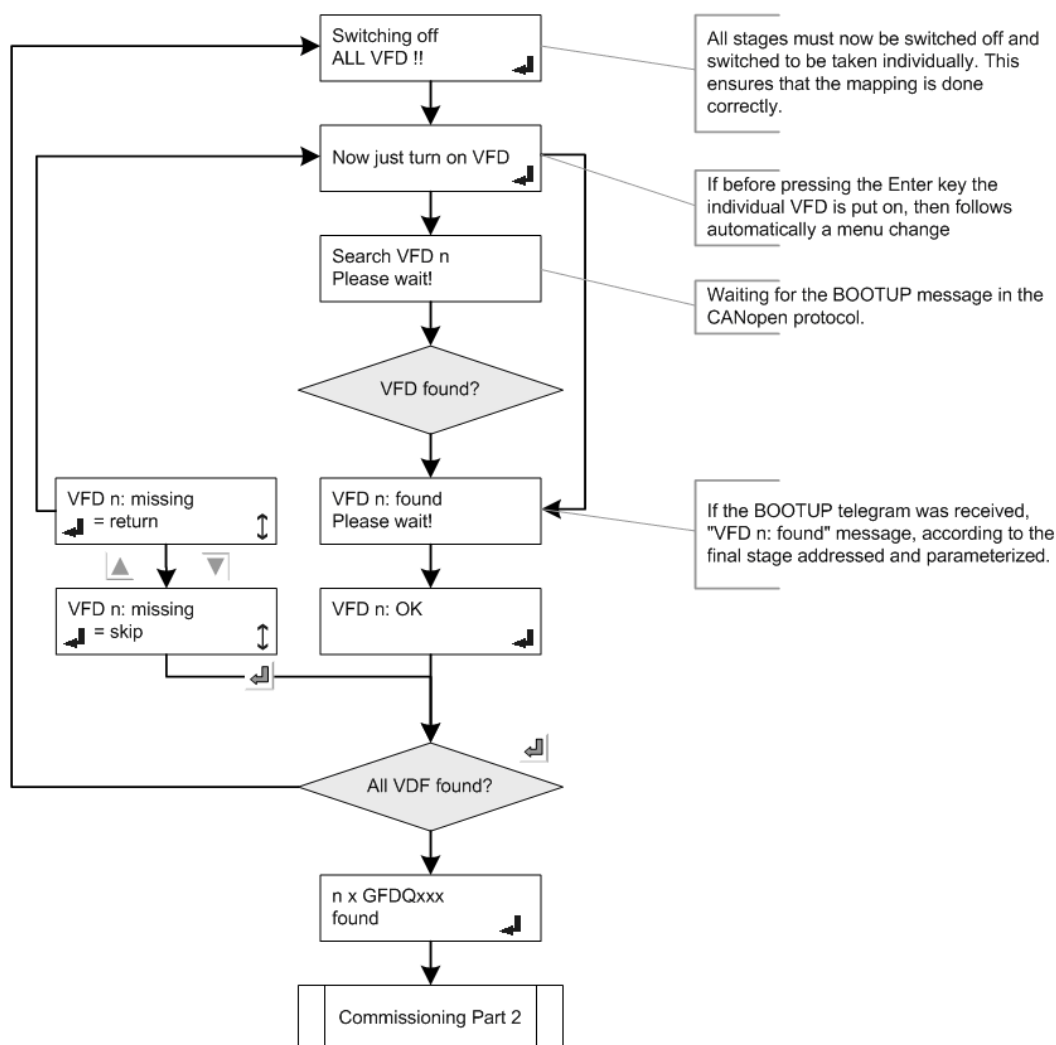
If it is recognized that a commissioning has not yet taken place, the following values are prompted and set in acc. with the following diagram.



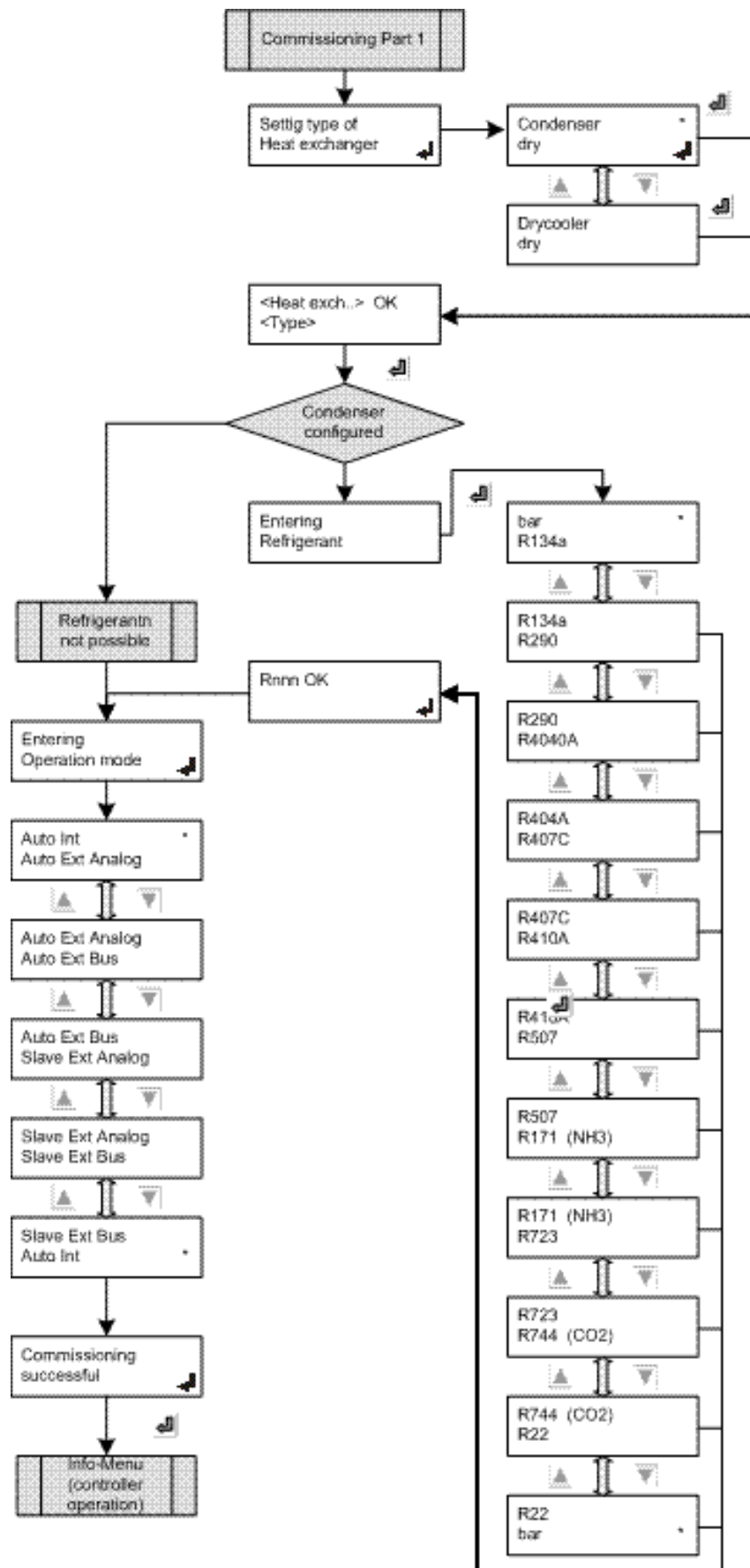
If it is recognized that a commissioning is required, the commissioning menu, is displayed.



When the default parameters for all frequency converters have been entered, the individual FCs are found and parameterized.



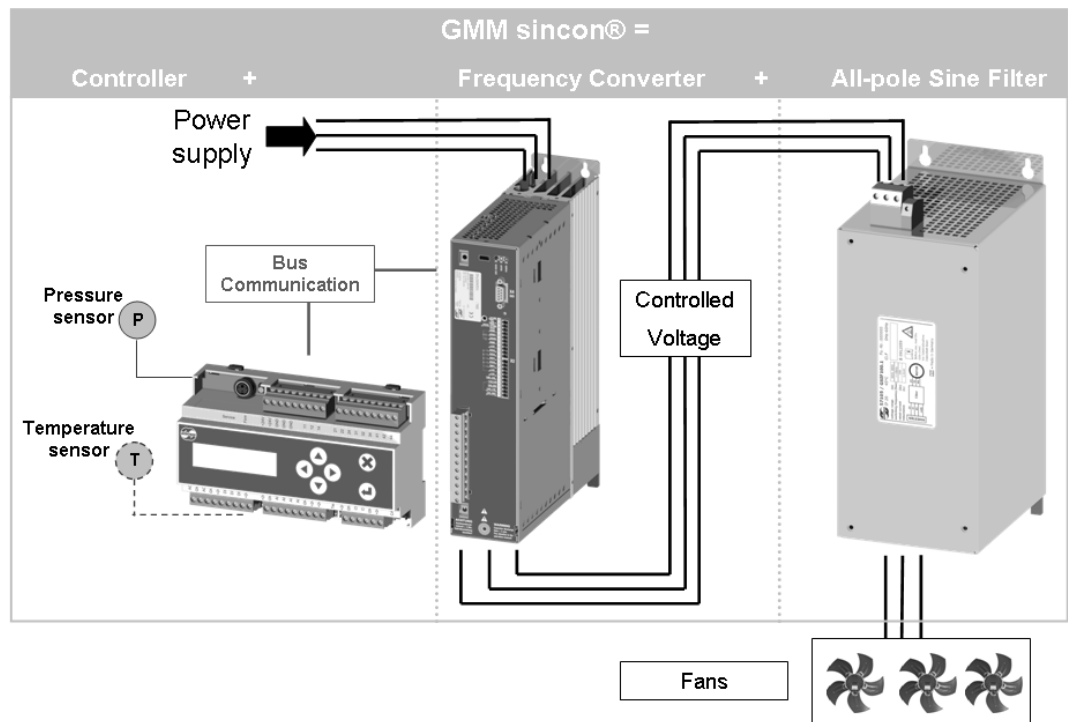
General operating parameters, such as heat exchanger type, refrigerant and operating mode are set in the second part.



2.2 Default parameters with start-up

Language	English
Number of frequency converters	1
Motor voltage	400V
Motor frequency	50Hz
Fan acceleration	5Hz/s
Fan delay	5Hz/s
Boost voltage	10V
Characteristic curve	Square
Hardware bypass from	0% (OFF)
Hardware bypass hysteresis	13%
Hardware bypass delay ON	2 s
Hardware bypass delay OFF	5 s
Thermocontact RESET time	0 min. (OFF)
Control mode	Automatic internal
Manual mode	OFF
Threshold value	100% (OFF)
Night limiter	100% (OFF)
Base value	0%
Setpoint	30°C
Heat exchanger	Drycooler

3 The GMM sincon set-up®



GMM sincon set-up

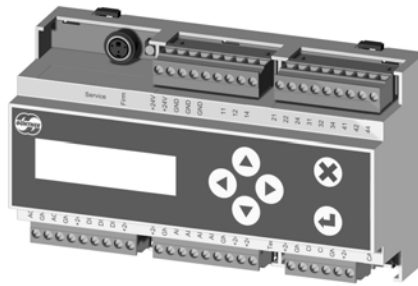
The GMM sincon® consists of the following components: set-up

1. The control unit **GRCF.1** (left)
2. The frequency converter output stage **GFQDxxx.1** (centre)
3. The sine filter **GSIFxxx.1 (optional)** (right)

GMM sincon®		Con- troller	Frequency converter	Sine filter
Description	Type	Type	Type	Type
Sine controller, 0.375 kW, 1.0 A without UL	GMM sincon® 010.1	GRCF.1	GFQD010.1	GSIF013.1
Sine controller, 0.375 kW, 1.0 A with UL	GMM sincon® 010.1 UL	GRCF.1	GFQD010.1 UL	GSIF013.1
Sine controller, 0.750 kW, 2.2 A with UL	GMM sincon® 022.1 UL	GRCF.1	GFQD022.1 UL	GSIF025.1
Sine controller, 1.5 kW, 4.1 A with UL	GMM sincon® 041.1 UL	GRCF.1	GFQD041.1 UL	GSIF040.1
Sine controller, 2.2 kW, 5.7 A with UL	GMM sincon® 057.1 UL	GRCF.1	GFQD057.1 UL	GSIF060.1
Sine controller, 3.0 kW, 7.80 A with UL	GMM sincon® 078.1 UL	GRCF.1	GFQD078.1 UL	GSIF100.1
Sine controller, 4.0 kW, 10.0 A with UL	GMM sincon® 100.1 UL	GRCF.1	GFQD100.1 UL	GSIF100.1
Sine controller, 5.5 kW, 14.0 A with UL	GMM sincon® 140.1 UL	GRCF.1	GFQD140.1 UL	GSIF165.1
Sine controller, 7.5 kW, 17.0 A with UL	GMM sincon® 170.1 UL	GRCF.1	GFQD170.1 UL	GSIF165.1

GMM sincon®		Con- troller	Frequency converter	Sine filter
Sine controller, 11.0 kW, 24.0 A with UL	GMM sincon® 240.1 UL	GRCF.1	GFQD240.1 UL	GSIF240.1
Sine controller, 15.0 kW, 32.0 A with UL	GMM sincon® 320.1 UL	GRCF.1	GFQD320.1 UL	GSIF320.1
Sine controller, 22.0 kW, 45.0 A with UL	GMM sincon® 450.1 UL	GRCF.1	GFQD450.1 UL	GSIF500.1

3.1 GRCF.1



GRCF.1

The GRCF.1 is used for controlling frequency converters. Depending on the of the control algorithm the output frequency is controlled from 0 up to the mains frequency

The unit is controlled by means of menus using a 2-line display and an input keyboard.

The device has an internal PID controller, whose parameters (amplification factor, integral and differential time) can be configured either per menu or via an external bus module.

The setpoint can be given via the internal menu, an external analogue value or via an external bus module.

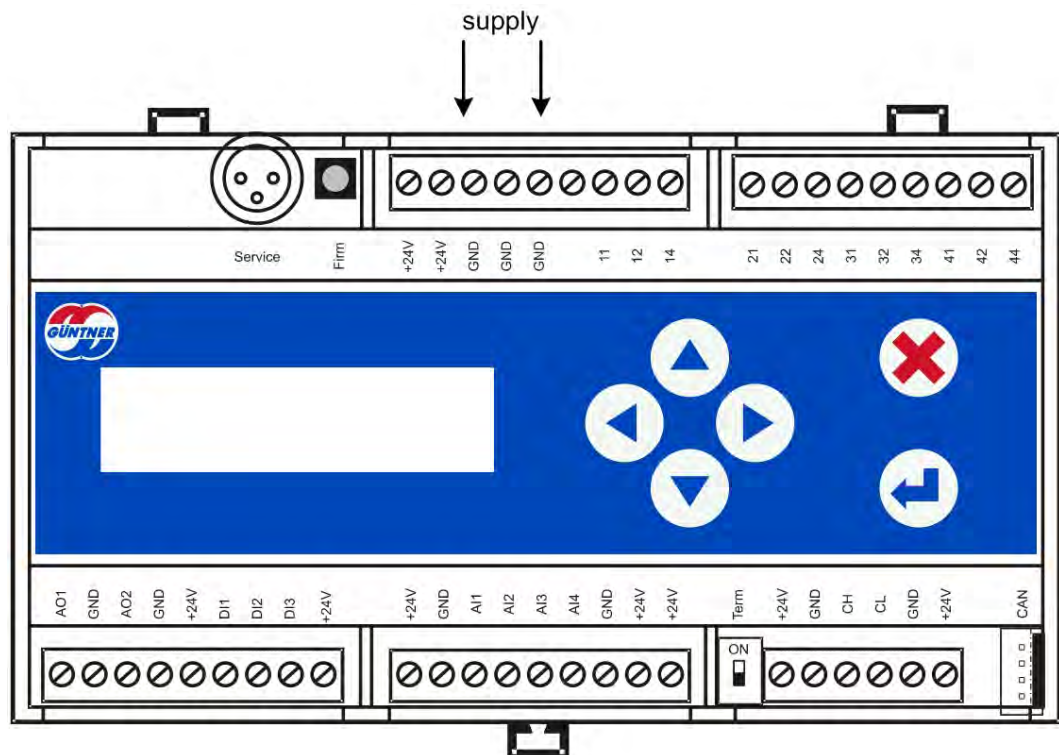
The current value is determined via a pressure sensor (4-20mA), a temperature sensor (KTY, GTF210) or a 0-10V signal.

The control value is sent via a bus system to the power unit (frequency converter). At the same time this value is also provided as a 0-10V signal.

3.1.1 Installation

- The GRCF.1 is mounted on a top-hat rail.
- The wiring is done via plug strips.
- All measurement and signalling cables (**only use measurement cables e.g. LIYCY 3 x 0.5², not telephone cables!!**) must be shielded.
- 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.

3.1.2 Connections



GMM sincon connections

+24V	Voltage supply: +24V DC / 170mA max.
GND	Ground connection
11 / 12 / 14	Relay contacts PRIO 1 Relay
21 / 22 / 24	Relay contacts PRIO 2 Relay
31 / 32 / 34	Relay contacts Frequency converter Operation
41 / 42 / 44	Relay contacts Hard Bypass operation
AO1	Analogue output 1 (0..10V DC)
AO2	Analogue output 2 (0..10V DC)
DI1	Release (active +24V)
DI2	Night limiter (active +24V)
DI3	Setpoint 2 (active +24V)
AI1	
AI2	Analogue input 2 (4-20mA) or temperature sensor GTF210
AI3	Analogue input 3 temperature sensor GTF210

AI4	Analogue input 4 (0-10V)
CAN / CH / CL	CAN interface
Term	Terminal resistance for CAN interface ON / OFF
Service	Programmer plug for software update

3.2 GFQD frequency converter



GFQD frequency converter

The GFQD.1 (frequency converter) is used for variable rotary field generation. Depending on the control value, the output frequency is controlled from 0 Hz through to the mains frequency. Control is via a CAN bus from GRC.

On this frequency converter the AC fans are connected on the output side via a sine filter and rotate in acc. with the output frequency with a speed between 0 and the maximum rpm.

3.2.1 Installation

The frequency converter is mounted vertically on a galvanised mounting panel. This guarantees sufficient air convection in the GFQD.1 is achieved. Proper earthing must be ensured.

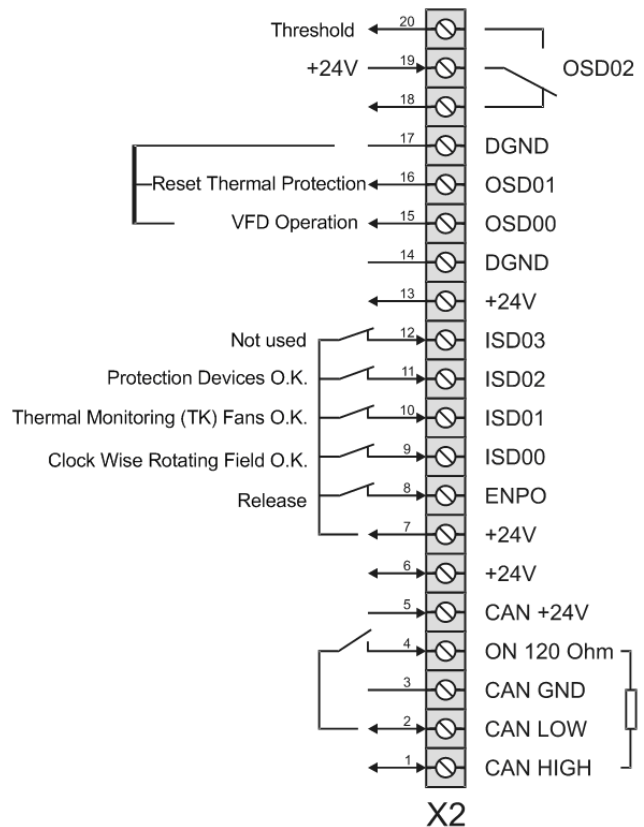
3.2.2 Connections

The frequency converters are supplied with mains voltage. The frequency converters' wiring is defined in the switch cabinet's circuit diagram. It must be ensured that a right-rotating rotary field is connected, as otherwise there can be an abrupt direction change when activating a by-pass switch!

Power connection



Control signals



Power connection → Motor operation

The following must ALWAYS be observed when operating the frequency converter with several fans:

Individual fans can be switched off during the operation without restriction. With a thermo-contact activation, for example.

When switching on motors during operation, it must be ensured that the switch-on power is not higher than the frequency converter peak power. It is helpful if the frequency converter load is >40%. This 40% basic load supports the frequency converter's output voltage when switching on.

ATTENTION

During the switch-on the motor must not be operated in the field weakening range, as the switched on motor would otherwise have to start with reduced ramp up moment.

3.2.3 GFQDxxx.1 LEDs

	device state	red LED (H1)	yellow LED (H2)	green LED (H3)
ERR / WARN (red) H1	Supply voltage located	○	○	●
READY (yellow) H2	Operational (ENPO set)	○	●	●
POWER (green) H3	Active / self-tuning active	○	✱	●
	Warning	●	●	●
	Error (see blinking Code)	✱	○	●
	○ LED off ● LED on ✱ LED blinking			

Red LED flash code	Display Display	Fault cause
1x	E-CPU	Collective fault message
2x	E-OFF	Undervoltage switch-off
3x	E-OC	Overcurrent switch-off
4x	E-OV	Overvoltage switch-off
5x	E-OLM	Motor overloaded
6x	E-OLI	Unit overloaded
8x	E-OTI	Cooling unit temperature too high
9x	E-PLS	Plausibility error, parameters or programme flow
10x	E-PAR	Defective parametering
11x	E-FLT	Floating point error
12x	E-PWR	Power unit unknown
13x	E-EEP	Defective EEPROM

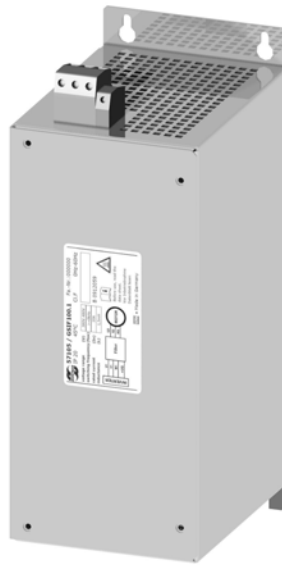
Flash code (number of successive impulses)

These and other fault messages of the GFQDxxx.1 output stages are forwarded to the GRFC.1 Controller, displayed there on the display and also saved in the alarm history.

3.2.4 Inputs and outputs

Input and output functions			
	Name	Function	Description
Inputs	ENPO	FC release	Power unit released
	ISD00	Phase sequence	Phase sequence OK
	ISD01	TC error	Thermocontact error occurred
	ISD02	Motor protection	Motor protection OK
	ISD03	--	Free
Outputs	OSD00	Motor protection	Switch FC protection
	OSD01	TC reset	Reset thermocontact error
	OSD02	Threshold value	Threshold value reached

3.3 GSIF sine filter



GSIF sine filter

All frequency converters generate strong electrical noise signals, which are amplified with the parallel operation of several motors on one frequency converter, which is usual with heat exchangers. These noise signals can cause damage on the external rotor motors. Bearing damage that is caused by bearing through fault current is possible here, and voltage spikes cause damage that can lead to short circuits in the coil. Both effects cause the fan to fail.

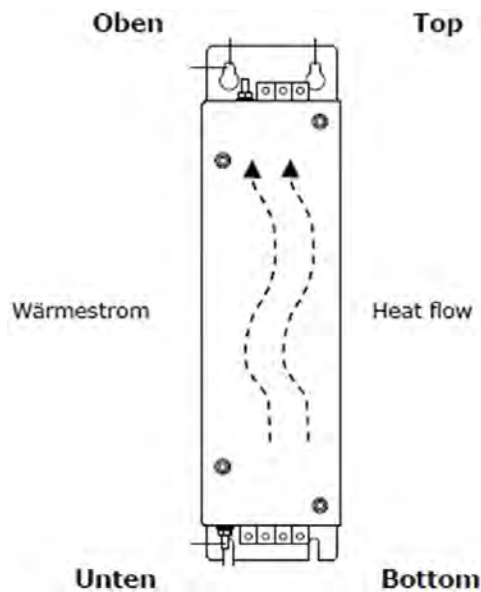
The GSIF sine filter in combination with the GFQD frequency converter reduces precisely these bearing currents and voltage spikes to guarantee a safer system operation and a long service life for the fans. The typical frequency converter noises are also reduced to a minimum to achieve very quiet system operation.

Despite the frequency converter, use of the GSFI sine filter allows all motor cables to be operated without shielding. Significantly longer cables can also be used.

With a missing sine filter, noise signals in the axial fan destroy the bearing. In this case the warranty is null and void.

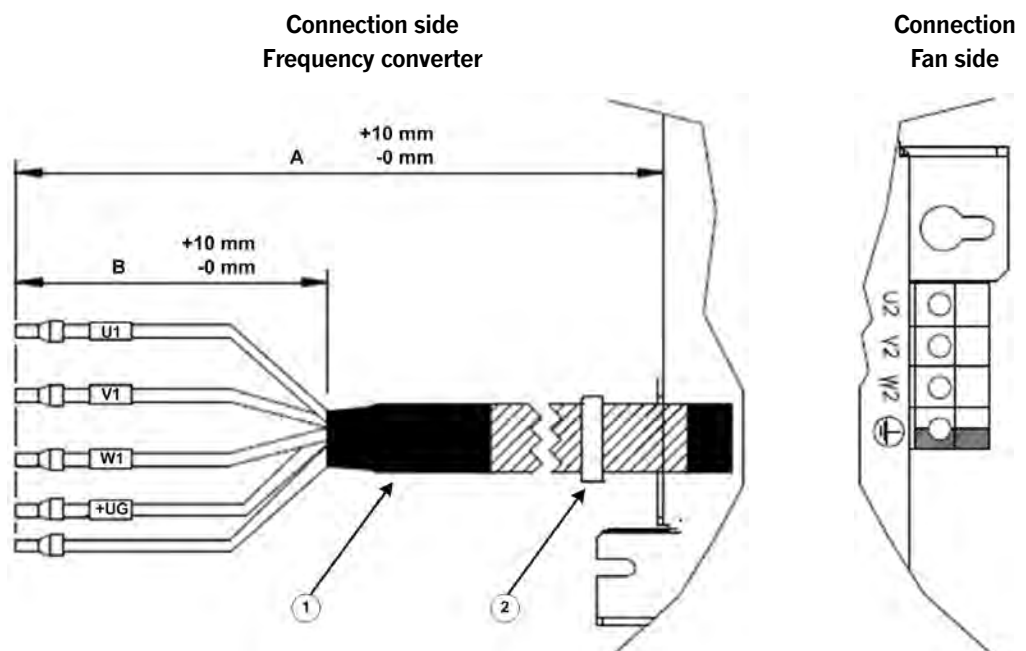
3.3.1 Installation

The sine filter must be installed vertically to enable sufficient air convection.
Placing beside the FC must be planned for if possible; otherwise under the FC.



3.3.2 Connections

The sine filter's wiring is defined in the switch cabinet's circuit diagram.



- 1) Insulated against splaying
- 2) Shield earthed via cable clip on the enclosure

4 Display and operation

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

4.1 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

4.2 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
H	Manual mode – control value is specified fixed via display	Static display
S	SLAVE mode – control value is specified externally	Static display
F	Priority 1 fault	Alternating with 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		

4.3 Operation



Cancel and return to INFO menu



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



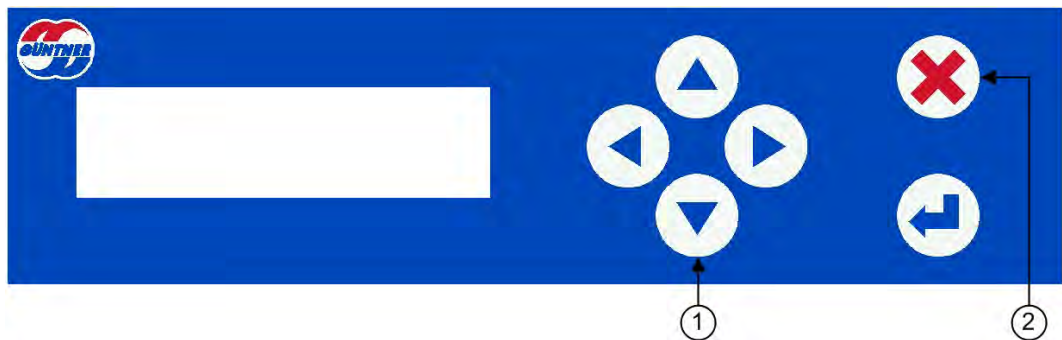
Right arrow for moving to the next menu level



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

4.4 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 writing mode
(cursor flashes)

Setpoint	1
30.0°C	

Setpoint	1	<
_30.0°C		<>I↓



Decimal point selection
(cursor flashes)

Setpoint	1	
30.0°C		<>I↓

Setpoint	1	<
30.0°C		<>I↓



Change value

Setpoint	1	
40.0°C		I



New value acceptance

Setpoint	1
40.0°C	

4.5 Selection mode

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



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

Language
Time

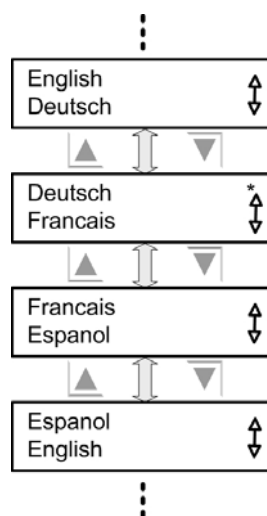


Change to the menu option
→ The function/language currently set
is marked with an *asterisk*.

English
Deutsch *



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

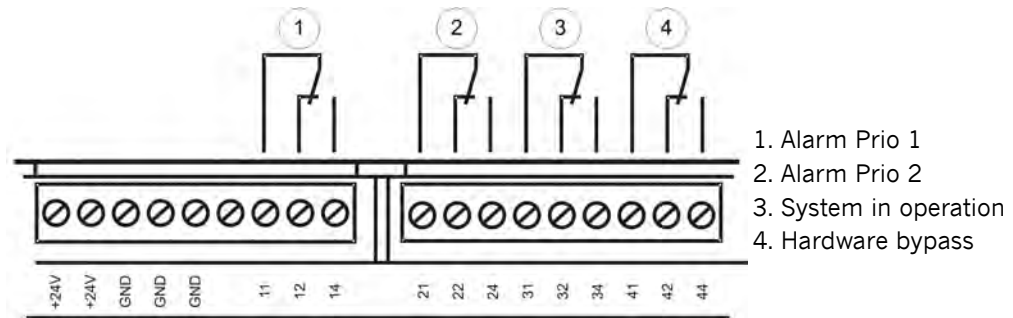


Accept function/language.
→ selected language is marked with an
asterisk.

Deutsch
Francais *

4.6 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. A fault is also signalled when the GMM has no power because of an error. All signalling outputs must not exceed 250V/1A.



Potential-free signalling outputs

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

The message on the **Prio 1** output is a fault, which and which signals the complete failure and standstill of the heat exchanger.

Contact 11/12 is closed in alarm status.

Alarms, see [Error messages and warnings on the GMM display, Page 97](#)

4.6.2 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.

Contact 21/22 is closed with a warning.

4.6.3 Digital output (31/32/34) (System in operation)

The two-way contact (31/34) is closed when a control signal is sent to the frequency converter, i.e. the fans are turning.

4.6.4 Digital output (41/42/44) (hard bypass operation)

If a bypass value, above which the frequency converter is to be bridged, is programmed, this relay (contacts 41/44) will be switched above this bypass value after a settable delay time.

For the precise function description, see [Bypass, Page 65](#)

4.7 Control inputs

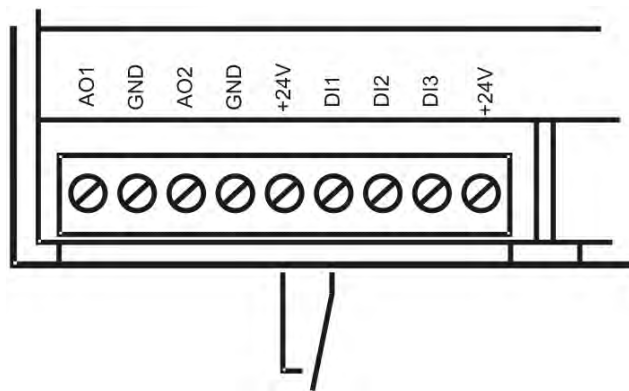
The control inputs are designed as a **low-voltage connection** and are connected via a potential-free contact (relay, contactor contact, switch etc.). The potential-free contact must be switched between the **+24V** and the **DI1** or **DI2** or **DI3** control input. The function is activated when the contact is closed.

4.7.1 Release GMM sincon®

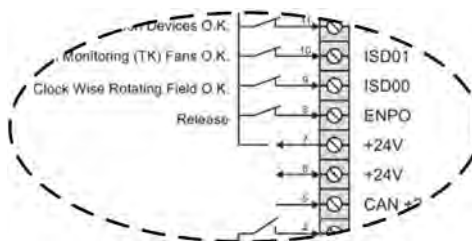
via terminal **DI1** (enable) for the fans. The speed then depends on the control value. If enable is not switched, the fans will be disabled (speed = 0).

*If it is not to be enabled externally, terminal **DI1** must be connected using a jumper!*

This enabling jumper is always built in ex factory.



Connecting the external enabling contact



Apart from the GRCF the power unit has to be enabled too. The GFQD frequency converter's EN-PO input has to be connected to +24V (terminals 7/8) to do so.

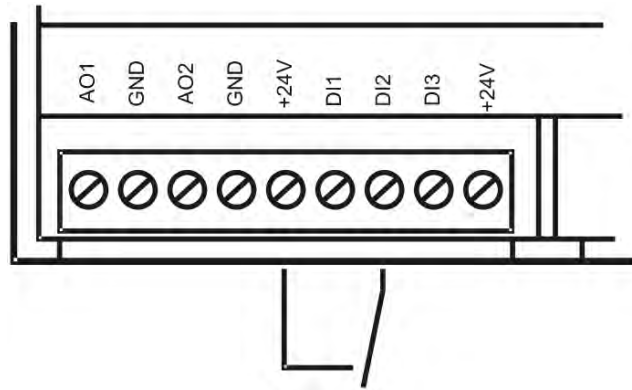
Important note: Under no circumstances may the controller be disabled by interrupting the supply voltage! Continuously switching the supply voltage can damage the controller, which is not covered by warranty for such damage!

A release is not required in the "Manual mode".

See [Manual mode, Page 55](#)

4.7.2 Speed limiter (night limiter)

is activated via the terminal **DI2** the control signal and the fan speed are limited to the set value. This is then the maximum speed. For setting the speed limiter, see section [Night limiter, Page 50](#) and for general activation see section [Service, Page 56](#).



External speed limiter activation

4.7.3 Switching to 2nd Setpoint (or between heating and cooling mode)

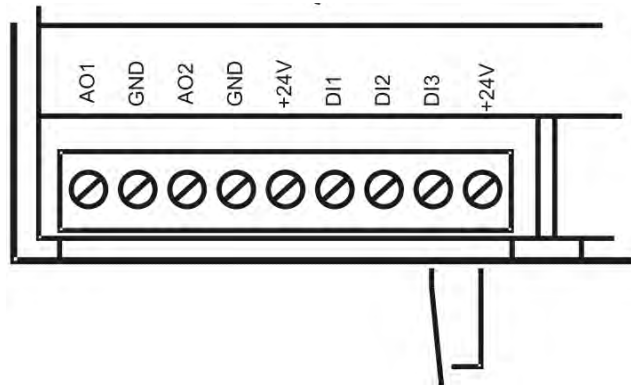
Setpoint switchover:

This function enables the switchover between two setpoints, which serve as controlling input values. The switchover is made by connecting the **"DI3"** 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)



Switch from setpoint 1 to setpoint 2 or heating/cooling

The second setpoint and the second setpoint displacement are switched over with the **"DI3"**.

4.8 Analogue inputs

The GMM has four sensor inputs

Input AI1	Current input	4-20mA
Input AI2	can be switched over	4-20mA or impedance sensor GTF210
Input AI3	Impedance sensor	GTF210
Input AI4	Voltage source	0-10V DC

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

4.8.1 Pressure sensor connection to AI1/AI2

1 or 2 sensors (2-wire sensors) can be connected:

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

AI1 = 4-20mA signal from sensor 1 (GSW4003.1: blue(3), GSW4003: green(2))

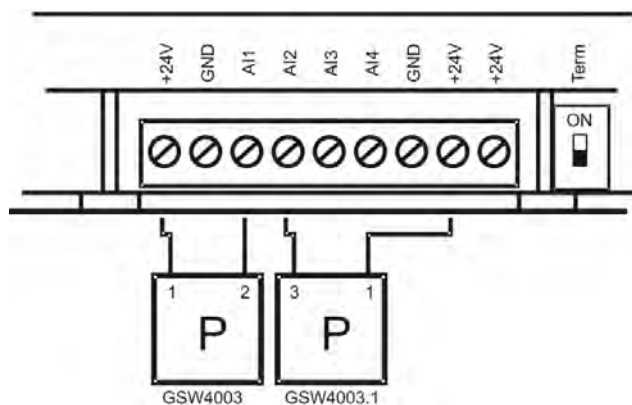
AI2 = 4-20mA signal from sensor 2 (GSW4003.1: blue(3), GSW4003: green(2))

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 actual 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

4.8.2 External power signal connection to AI1/AI2

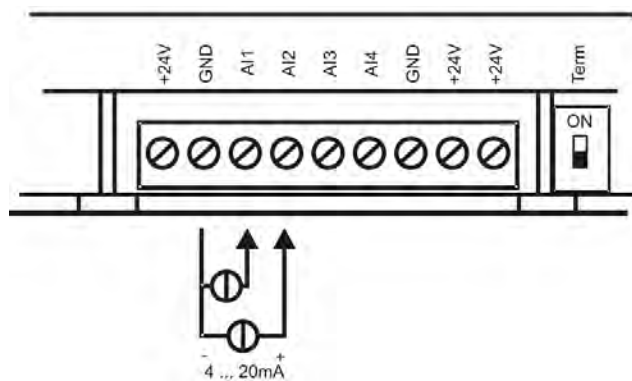
The AI1 or AI2 inputs can also be used to control the controller in SLAVE operation. To do this, this input must be defined as a control value slave in the I/O configuration. The 420mA input signal is scaled 0-100% in a control signal and passed on to the fans. Furthermore a setpoint, for example, can also be specified externally via the AI1 or AI2 inputs. Up to two power signals (4-20mA) can be connected to the AI1 and AI2 analogue inputs.

GND = Reference point (-).

AI1 = Current input (+) 4..20mA

AI2 = 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.

4.8.3 Temperature sensor connection to AI3

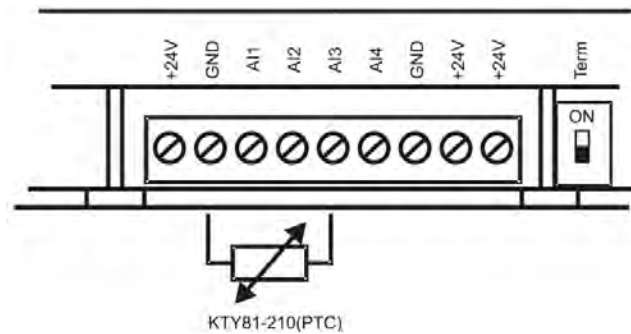
A temperature sensor is connected on the terminals

GND = Earth

AI3 = Signal input

There is no particular sequence for the cores.

The Güntner temperature sensor GTF210 is set in the range from -30...+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 k Ω (-50°C) and 3.27k 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	2075 Ω	30°C
1095 Ω	-45°C	2152 Ω	35°C
1150 Ω	-40°C	2230 Ω	40°C
1207 Ω	-35°C	2309 Ω	45°C
1266 Ω	-30°C	2390 Ω	50°C
1325 Ω	-25°C	2472 Ω	55°C
1387 Ω	-20°C	2555 Ω	60°C
1449 Ω	-15°C	2640 Ω	65°C
1513 Ω	-10°C	2727 Ω	70°C
1579 Ω	-5°C	2814 Ω	75°C
1645 Ω	0°C	2903 Ω	80°C
1713 Ω	5°C	2994 Ω	85°C
1783 Ω	10°C	3086 Ω	90°C
1854 Ω	15°C	3179 Ω	95°C

Table: Temperature / Impedance

Impedance	Temperature	Impedance	Temperature
1926Ω	20°C	3274Ω	100°C
2000Ω	25°C	3370Ω	105°C

Table: Temperature / Impedance

4.8.4 0-10V voltage signal connection to AI4

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

GND = Earth (negative)

AI4 = Signal input 0-10V DC (**max. 12V DC**)

Make sure the polarity is correct (earth to **GND**, signal to **AI4**)!

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.

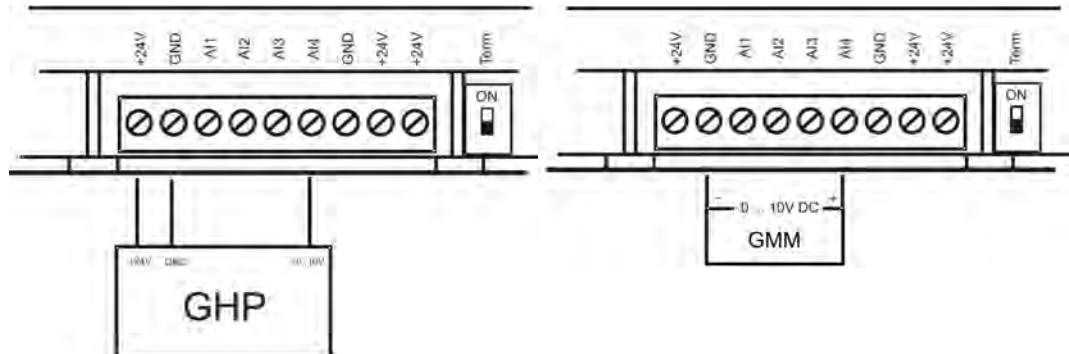
As an alternative, you can also connect a GHP manual potentiometer as a remote control. The connecting terminals on the GHP are labelled with either **1/2/3** or **x/-/Y**.

+ or 3 on **+24V**

- or 1 on **GND**

Y or 2 on **AI4**

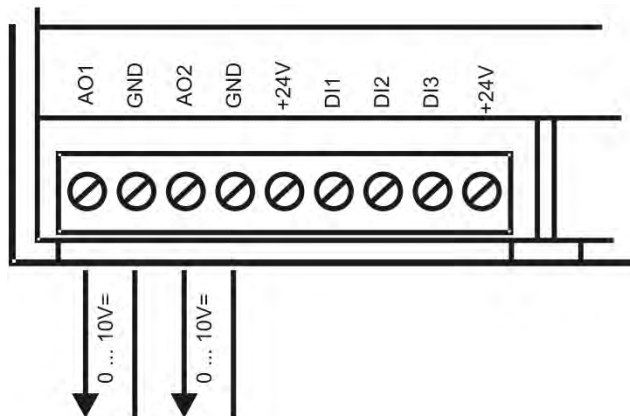
You can then use the speed controller purely as a speed adjuster and specify the fan speed yourself manually.



0-10V standard signal connection

4.9 Analogue outputs

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



Analogue outputs

Output **AO1** issues the control signal (0..100%) scaled to 0..10V .

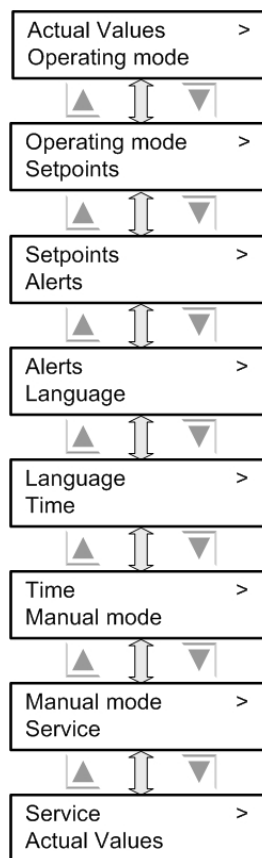
See [Subcooler function, Page 71](#)

Output **A02** 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 71](#)

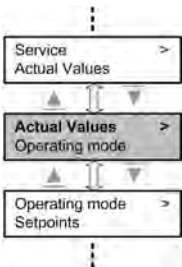
4.10 Operating menu

Set-up Base menu



4.10.1 Current values

The actual input signals and control values are shown here.



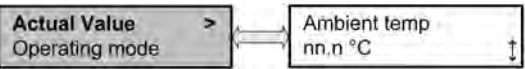
4.10.1.1 Input current values

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 or 4..20mA	Control Value Master nn.n V

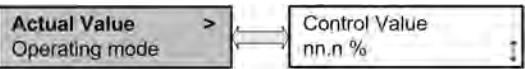
4.10.1.2 External temperature

The actual external temperature is shown.



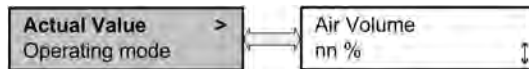
4.10.1.3 Control value

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



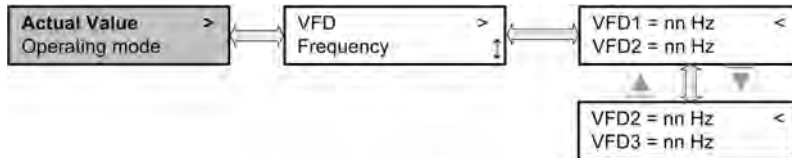
4.10.1.4 Air volume

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



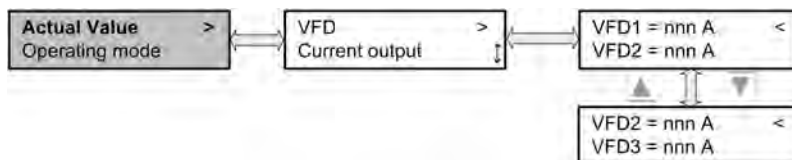
4.10.1.5 Frequency converter output frequency

The output frequency of every connected frequency converter is displayed.



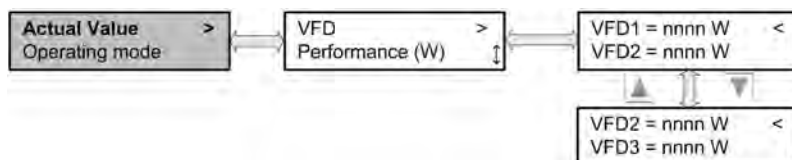
4.10.1.6 Frequency converter output power

The output power of every frequency converter is displayed. This is the power of all fans connected to this frequency converter. The active current is shown.



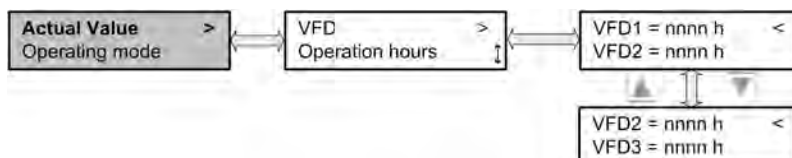
4.10.1.7 Frequency converter power

The current power of every frequency converter with its connected fans is shown here as active current.



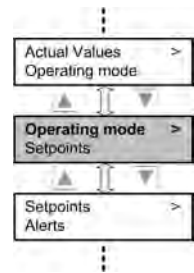
4.10.1.8 Operating hours

The operating hours of every frequency converter are displayed.



4.10.2 Status

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



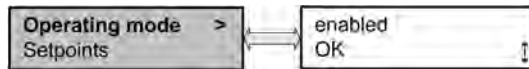
4.10.2.1 Mode

Set heating or cooling mode display.



4.10.2.2 External Release

Controller on connection **DI1** enabled **OK** or not **None**"



4.10.2.3 Heat exchanger

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



4.10.2.4 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.



4.10.2.5 HW bypass

Whether the HW bypass function is switched on or off is shown here.

See [Hardware bypass \(HW bypass\)](#), Page 67



4.10.2.6 Hardware and software versions

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

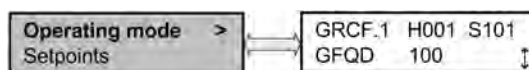
GRCF.1 → Controller with display and keyboard

H → Respective hardware version

S → Respective software version

GFQD → shows that the output stage is a frequency converter

34,001 → shows the frequency converter's type number



4.10.2.7 GFQD Software version

This display gives information about the current software version of the frequency converter.



4.10.2.8 GFQD article number

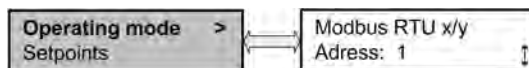
The frequency converter's article number is displayed here.



(BAAN no. = article number)

4.10.2.9 Bus module

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



4.10.2.10 Operating mode

This shows the set operating mode.

There are:

Internal control	Auto int. 1	Setpoint 1 active	See Auto internal, Page 62
	Auto int. 2	Setpoint 2 active	See Auto internal, Page 62
	Auto ext. 1	Setpoint 1 active	See Auto external , Page 62
	Auto ext. 2	Setpoint 2 active	See Auto external , Page 62
	Auto ext. bus1	Setpoint 1 active	See Auto external BUS, Page 64
	Auto ext. bus 2	Setpoint 2 active	See Auto external BUS, Page 64
Slave	Slave ext.	Control value via 0...10V or 4-20mA	See Slave external , Page 64
	Slave ext. bus	Control value via GCM *	See Slave external BUS, Page 65
Manual mode	Manual mode		See Manual mode, Page 55

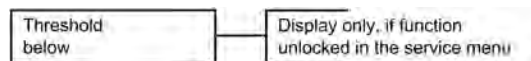
* GCM = Güntner Communication Module



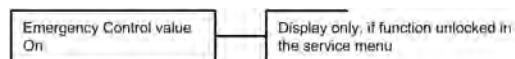
For a precise description of the operating modes see chapter [Operating mode, Page 62](#)

4.10.2.11 Threshold value/emergency control value

If the threshold value function is activated (reference to Service menu), a status display shows whether the value is above or below the threshold value.



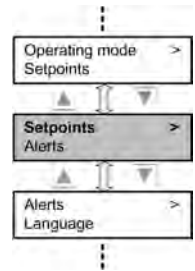
If the emergency control value is issued because of the threshold value function, it is displayed here.



4.10.3 Setpoints

The setpoints can be set here.

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



4.10.3.1 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.

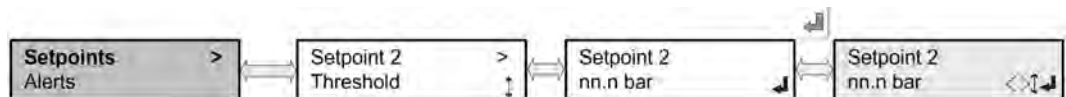
The minimum and maximum adjustment range is:

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.

4.10.3.2 Setpoint 2

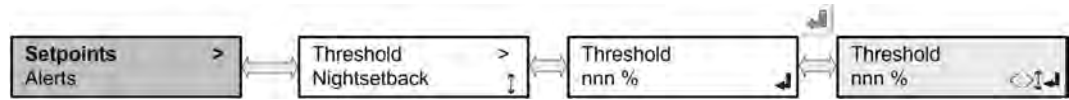
If 2 setpoints are defined in the **SERVICE** menu, a second setpoint is set here. This can be activated via the **DI3** digital input. Setpoint 2 is programmed the same way **Setpoint 1** is.



4.10.3.3 Threshold value

The threshold value or values that activate the threshold function when exceeded, can be set here. The respective threshold values are offered according to the configuration in the Service menu (see [Threshold value, Page 72](#)).

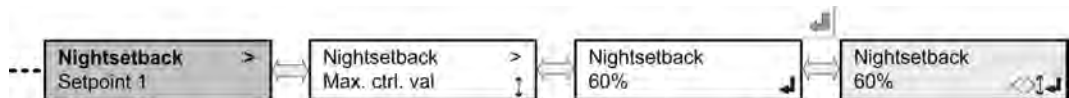
The threshold relay trips when the threshold value is exceeded (OSD02 an the GFQD frequency converter).



4.10.3.4 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 "DI2" digital input or via the built-in timer.

Defining maximum value

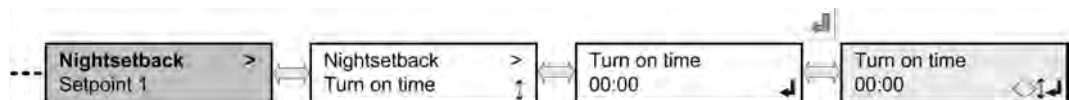


4.10.3.4.1 Night limiter activation/deactivation time

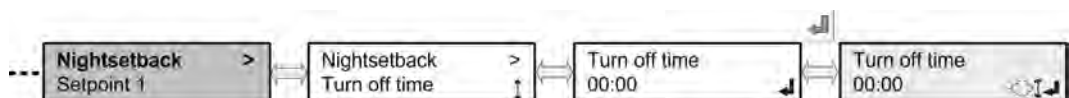
The built-in timer allows the night limiter to be activated and deactivated at specific times.

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



4.10.3.4.2 Night limiter functions list

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

4.10.4 Alarms

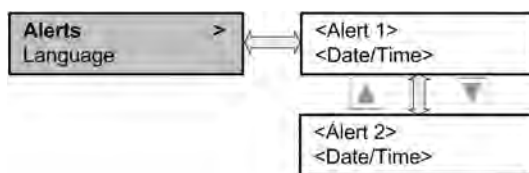
The last 85 alarms can be called up here.



4.10.4.1 Alarm memory

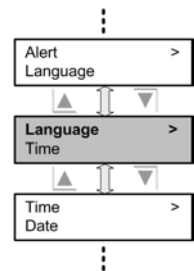
The GMM has an alarm memory. Up to 85 priority 1 and 2 (warnings) error messages, the switch-on and RESET times are stored consecutively (ring memory). These error messages consist of the fault and the time stamp, comprising the date and time, at which the fault occurred. For the error messages and warnings listing see [Error messages and warnings on the GMM display, Page 97](#).

When the alarm memory is selected, the display shows the last fault that occurred. Use the "down" arrow key to display older faults.



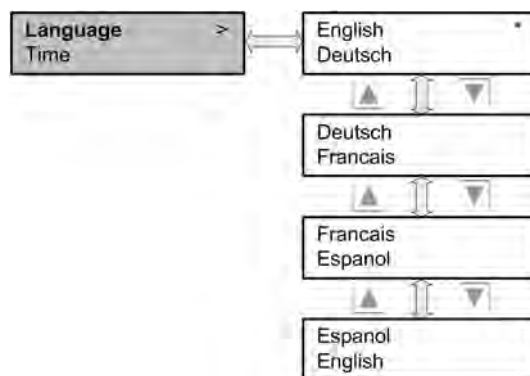
4.10.5 Language

The menu language can be selected here.



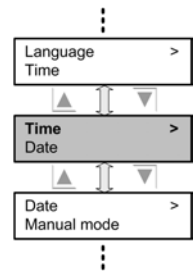
4.10.5.1 Language selection

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



4.10.6 Time

The time can be selected here.



4.10.6.1 Time setting

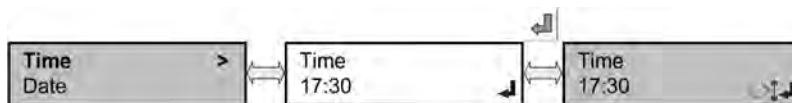
The set time is displayed and changed where required in the 24-hour clock.

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

The display flashes and can be set with the up/down arrows. Use the right/left arrows to change between hours and minutes.

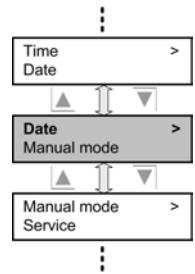
You leave the time menu with the left arrow key. The **"X"** key also closes the mode any time. If the **"X"** key is pressed in the EDIT mode, the time is not changed.

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



4.10.7 Date

The date can be set here.

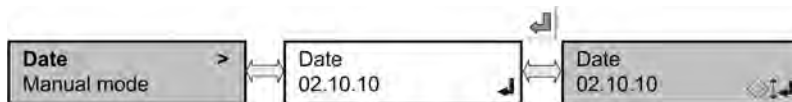


4.10.7.1 Set date

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.).



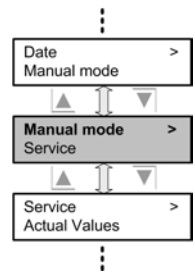
4.10.8 Manual mode

The manual mode is used for starting the fans of the heat exchanger manually.

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

The manual mode depends on the DI1 enabling.

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

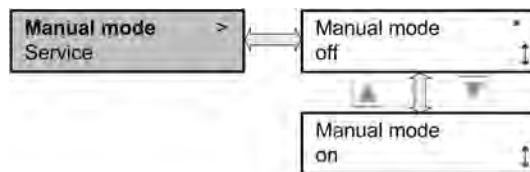


4.10.8.1 Manual mode ON/OFF/Control value/

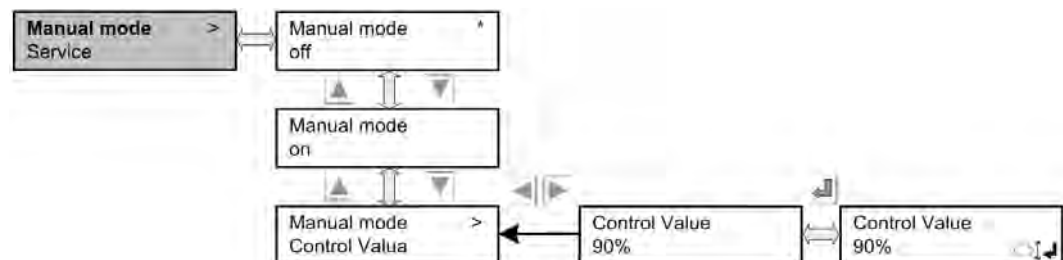
When the manual mode is activated, the value in the control value menu can be changed.

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

Manual mode ON / OFF



Manual mode control value

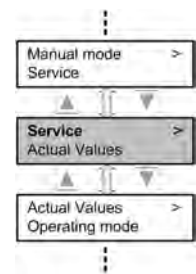
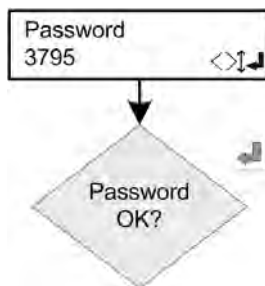


4.11 Service

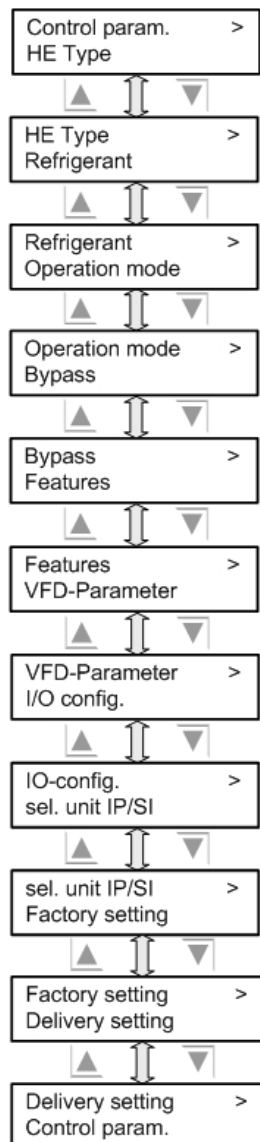
The Service menu is only accessible with a password, which you are prompted for first. The password is **3795**.

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.

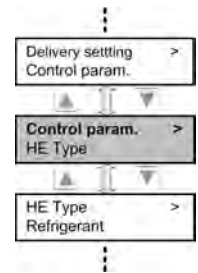


Service menu set-up

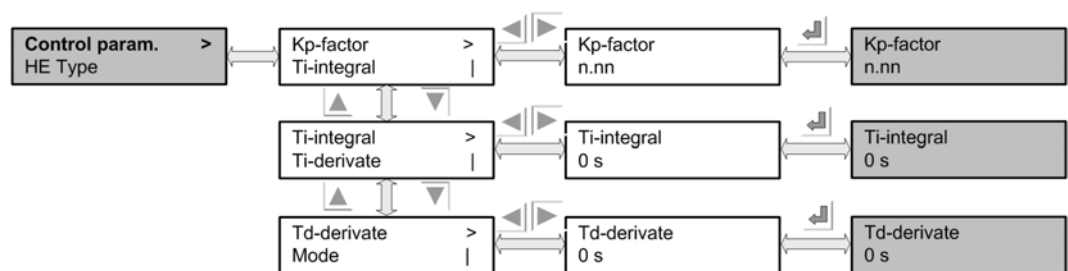


4.11.1 Control parameters

The control parameters are configured in this menu option.



4.11.1.1 Control parameters Kp, Ti and Td



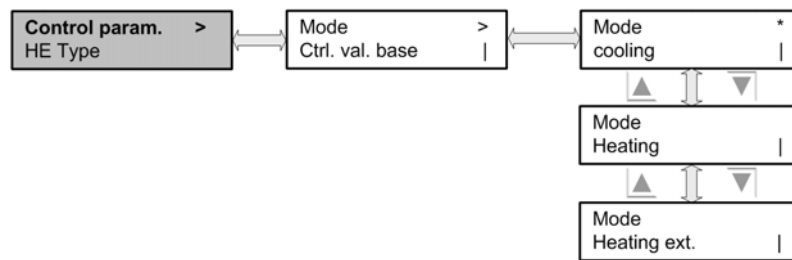
The Kp factor can be entered in a range from 0.1 to 10.0 to one decimal place. The Kp factor specifies the control amplification. It is the proportion of the control path following the input signal.

The Ti reset time changes the control value in the set time by the value that is predefined by the proportional factor.

Example: With an unchanged control deviation (X_S) of 1K and $X_P = 10$ the control signal in Ti = 25s is increased by 10%.

The 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.

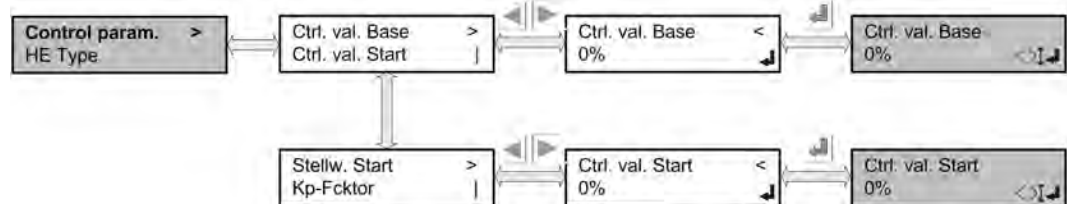
4.11.1.2 Cooling/heating control parameter mode



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.

4.11.1.3 Base control value and Start control value control parameters



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

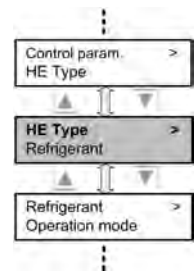
The **start control value** function is used to define a start point for issuing the control value.

Here are some setting examples:

Base control value	Start control value	Function
0%	0%	Functions 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%).

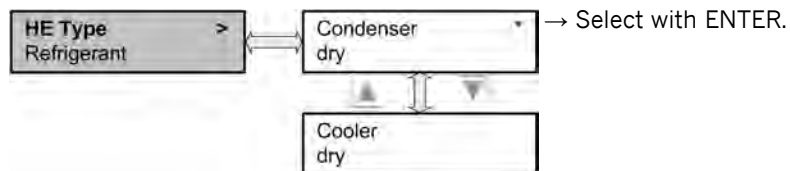
4.11.2 Heat exchanger

The heat exchanger type is selected here.



4.11.2.1 Heat exchanger type

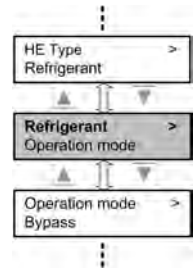
The options are recirculating cooler and condenser in the dry version (no spray). The selected type is displayed with a *.



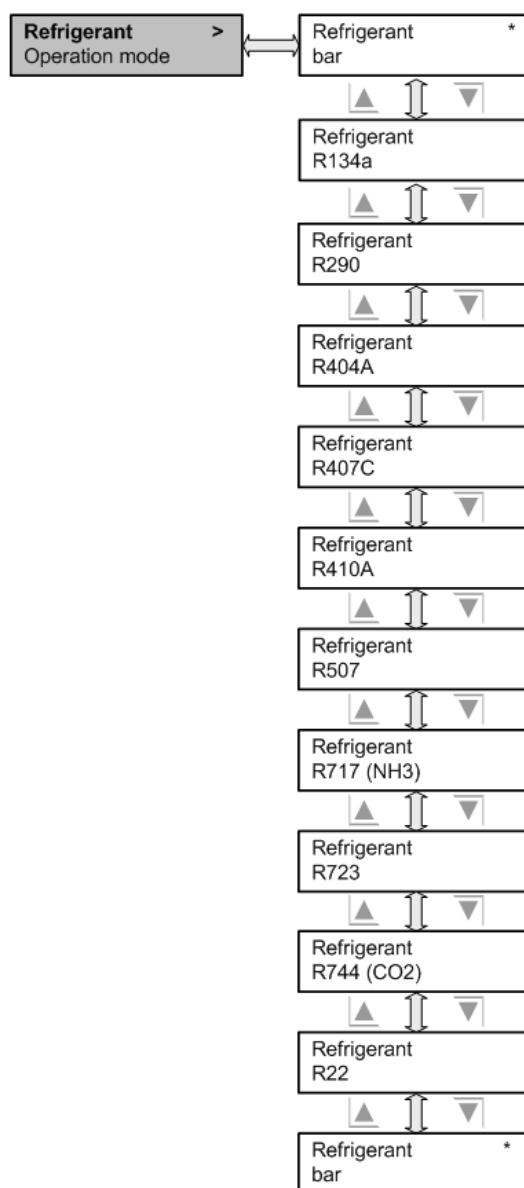
4.11.3 Refrigerant

A refrigerant is selected here.

This menu option is not offered if a drycooler is defined with the heat exchanger.



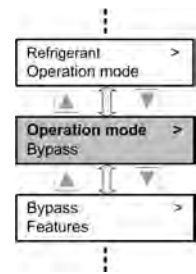
4.11.3.1 Refrigerant selection



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 *.

4.11.4 Operating mode

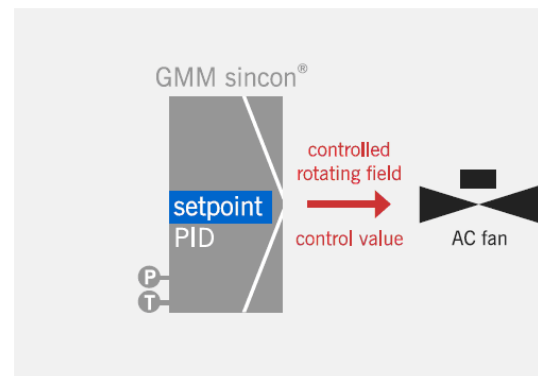
The operating mode can be set in this menu.
The active operating mode is shown with a *.



4.11.4.1 Auto internal



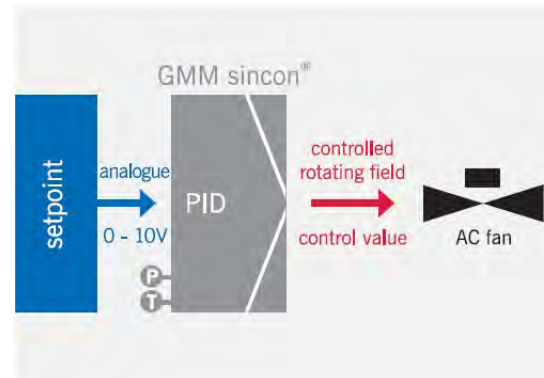
In this mode, control is automatic on the setpoint set internally. This setpoint is entered in the **Setpoints** menu option.



4.11.4.2 Auto external



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 I/O configurations.

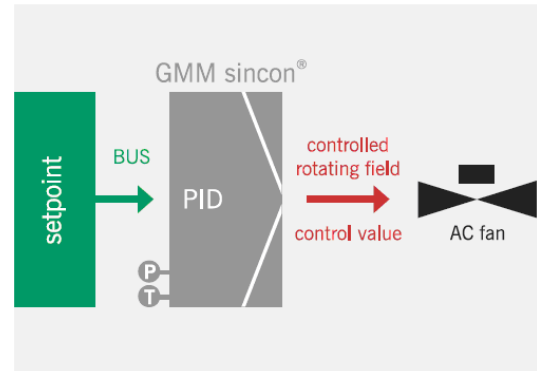


4.11.4.3 Auto external BUS



In this mode the setpoint is specified via BUS.

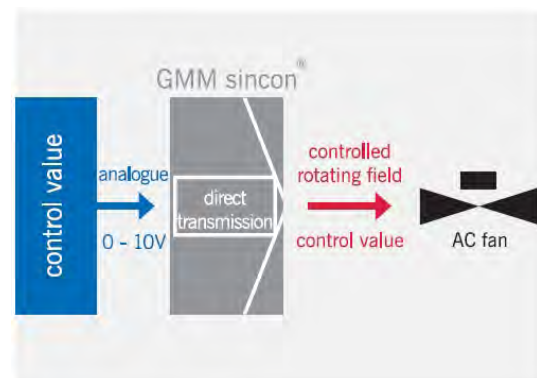
A Güntner Communication Module (GCM module) is required for this operating mode.



4.11.4.4 Slave external



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.

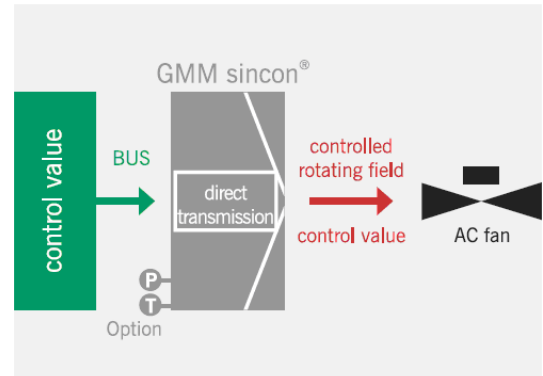


4.11.4.5 Slave external BUS



In this mode the control value is specified via BUS.

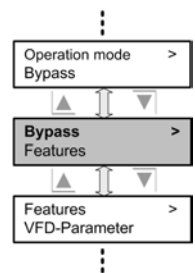
A Güntner Communication Module (GCM module) is required for this operating mode.



4.11.5 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 GMM sincon® component fault.



The Hardware bypass function continues to be used to bypass the frequency converter at full load and therefore relieve it.

4.11.5.1 Bypass switching

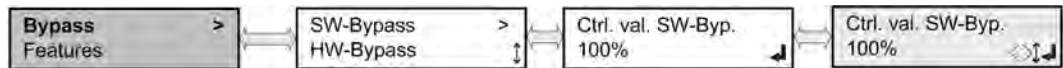
There are two kinds of bypass – the software bypass and the hardware bypass; in the following they are called **SW** bypass and **HW** bypass.

The **SW**bypass function causes the fans to run with a GRCF controller fault at a speed that must be set here first. This speed is automatically activated after the connection to the GR-CF fails with a delay of 10 s.

The **HW** bypass is a function that bridges the frequency converter, if the control value exceeds a settable value. It is used to switch the full voltage to the fans, without the loss of the frequency converters.

The HW bypass can also be switched with a frequency converter fault.

4.11.5.2 Software bypass (SW bypass).



The following variants can be set with the SW bypass:

Bypass operation OFF

Control value 0%

... if the GRFC is defective or the connection to the frequency converters is damaged:

→ all fans stop

Bypass operation ON

Control value > 0% (e.g. 100%)

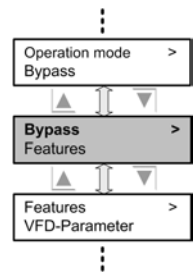
... if the GRFC is defective or the connection to the frequency converters is damaged:

→ all fans run at a speed of 100%, for example

4.11.5.3 Hardware bypass (HW bypass).

The HW bypass is used to relieve the frequency converter or is activated if a frequency converter is damaged.

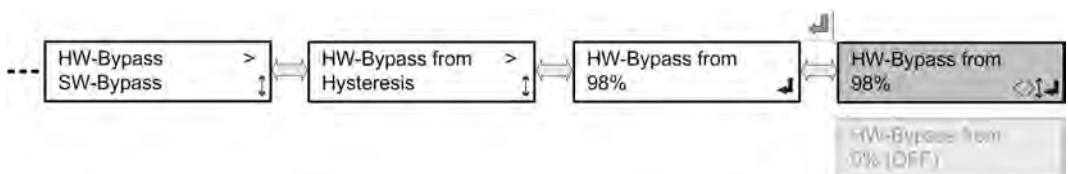
The following parameters can be set with the HW bypass:



HW bypass from

... Setting, from which control value the frequency converter is switched off and the bypass switch is switched on and whether this is activated if a frequency converter is damaged.

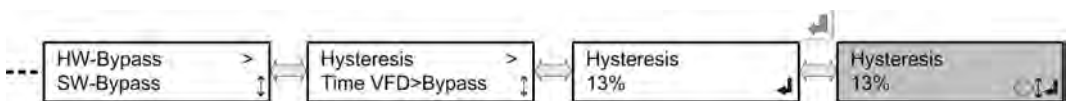
0% → OFF



Hysteresis

... Setting of the value which the control value must be below the "HW bypass from" value to switch back the frequency converter operation

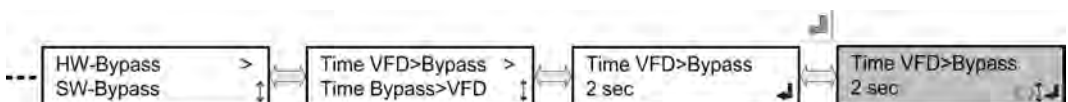
98% → ON with control signal 98%



FC time > bypass

... Delay time setting with which the bypass operation is switched

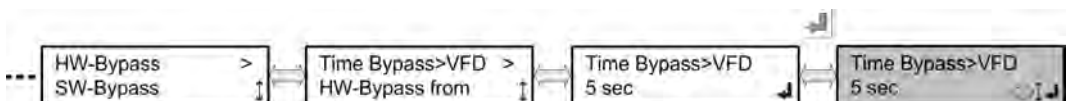
Delay time → Time that the fans require to stop



Bypass time > FC

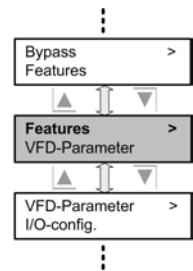
... Delay time between bypass switch drop-out and switching on the frequency converter operation switch

Delay time → Time selection high enough so the fans almost no longer turn, so the frequency converter cannot be smoothly synchronised with its own phase system.

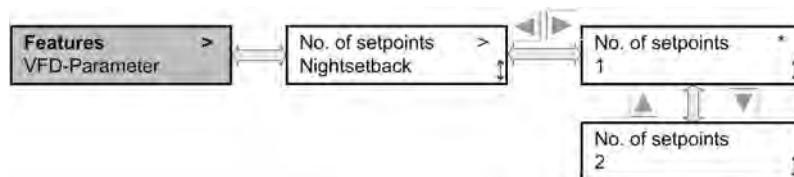


4.11.6 Functions

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



4.11.6.1 Number of setpoints

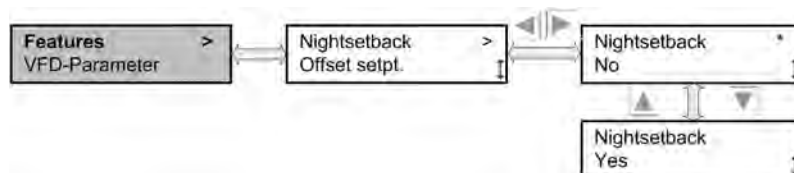


The number of setpoints is set here. The minimum number is 1 setpoint on which control is performed. If 2 setpoints are selected, switchover is via the **DI3** digital input. If the input is open, setpoint 1 is used for control.

If the **DI3** input must be connected with **+24V**, setpoint 2 is used for control.

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

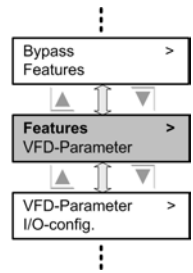
4.11.6.2 Nightsetback



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**.

4.11.6.3 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.

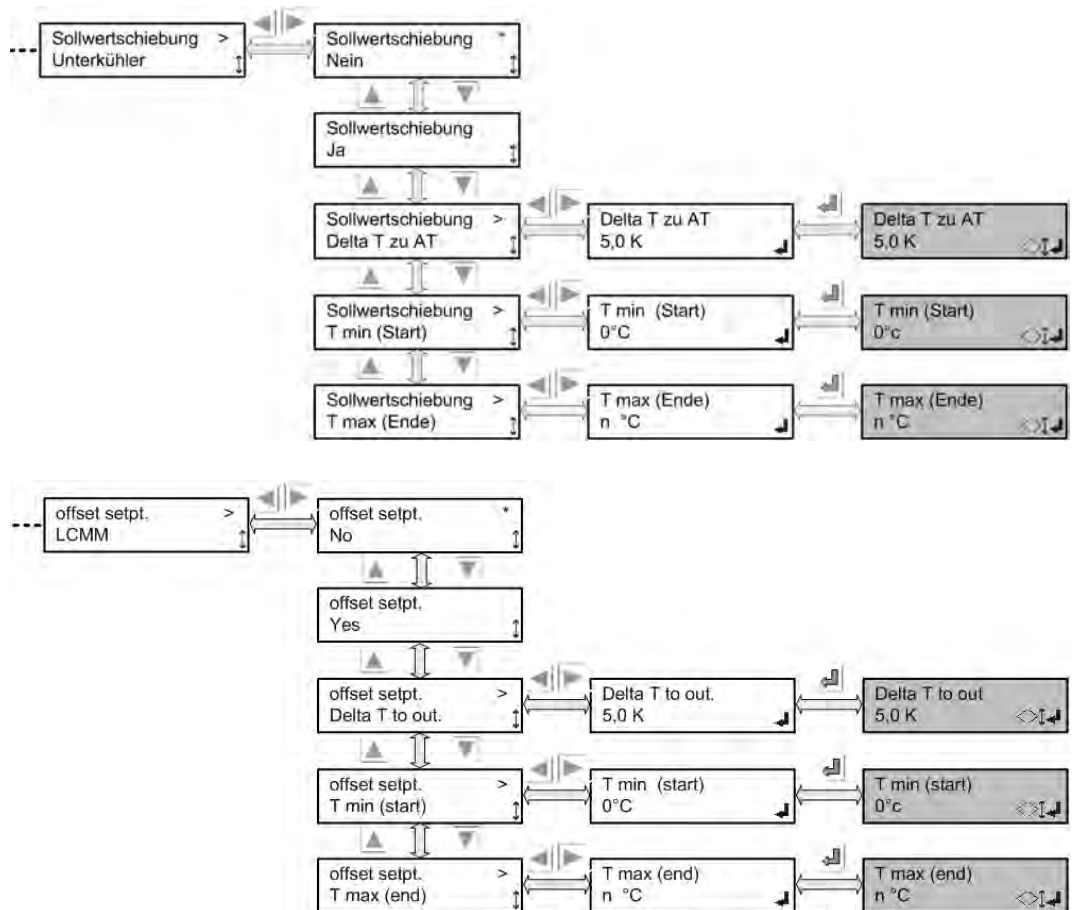


The temperatures T_{min} external and T_{max} external can be set in the menu. The range between T_{min} external and T_{max} external marks the range to be displaced into. The ΔT , which defines the offset between the setpoint and the external temperature, must also be defined.

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.



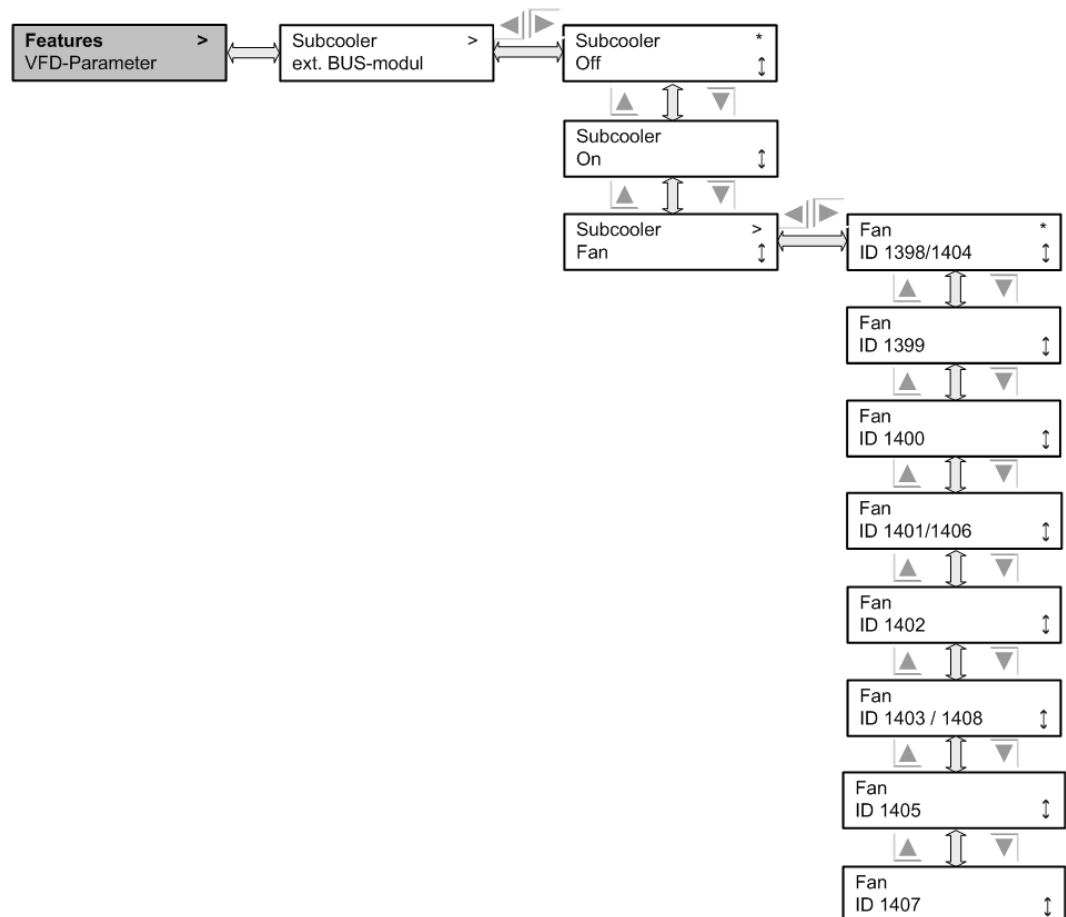
4.11.6.4 Subcooler function

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.

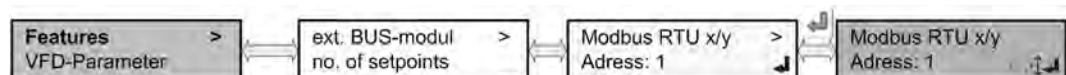
This subcooler runs constantly, independent of the regulation of the control unit with the set speed. It is activated like the regulated fans via the release.

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

The fan type used is selected in the selection menu.



4.11.6.5 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.

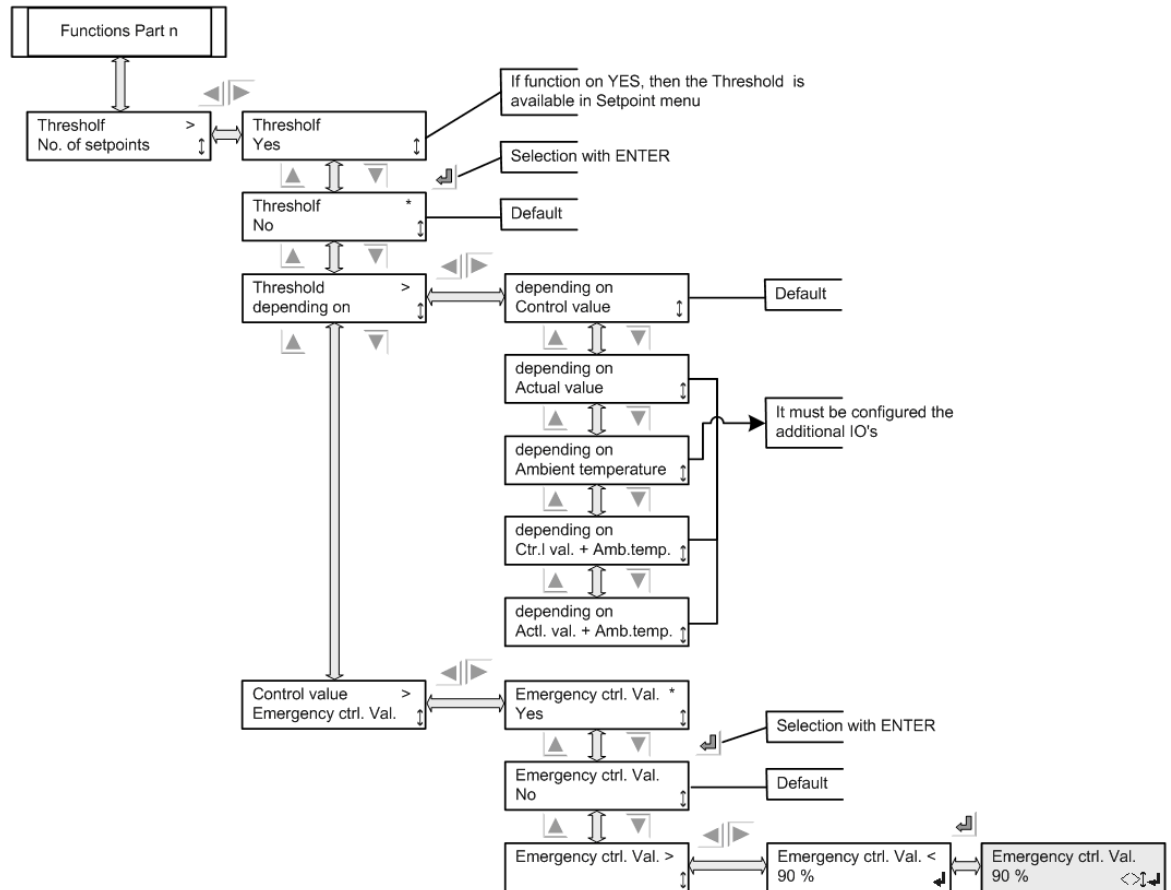
4.11.6.6 Threshold value

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

The function must first be activated and pre-configured in the Service menu for this.

The respective threshold values can then be set in the Setpoints menu.

The function is deactivated by default.



YES/NO threshold value:

The function can be switched on or off here. Only when the function is switched on is this active and offered in the setpoints menu.

Threshold value depends on:

What the function depends on can be configured here.

Depends on**Control value:**

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

Depends on**Actual value:**

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

Depends on**Ctrl value + ext. temp.:**

The threshold value relay is tripped when the control value AND the external temperature are greater than the configured threshold value.

Depends on**Actual value + ext. temp.:**

The threshold value relay is tripped when the actual value AND the external temperature are greater than the configured threshold value.

Emergency control value Yes/No/Emergency control value:

The emergency control value is issued as control value when the following conditions are satisfied:

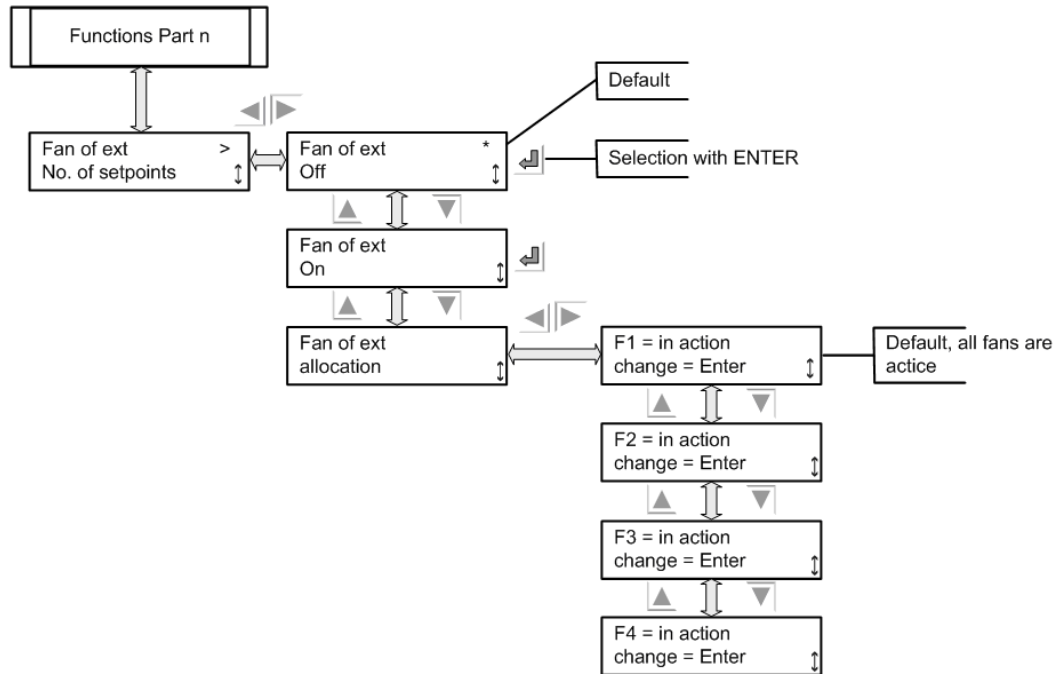
- Threshold value function is active
- Threshold value condition(s) exceeded
- Emergency control value function is active
- Emergency control value is greater than its calculated control value (e.g. with control operation or bypass value with sensor fault)
- Manual mode is not active
- External release provided

The emergency control value is reduced to an active night limit.

4.11.6.7 Fan from external

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

The function is deactivated by default.



Fan from ext.

Off/On

This allows the function to be switched on/off.

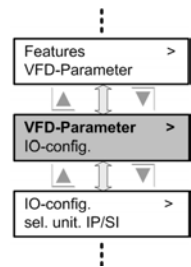
Fan from ext.

Assignment

For each connected fan you can select here if it will be switched on or not with activated DI2 input.

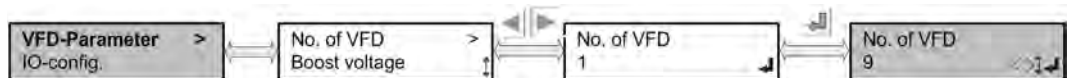
4.11.7 Frequency converter parameters

IMPORTANT: All FC parameters are only accepted after a **MAINS OFF / MAINS ON!**



4.11.7.1 Number of frequency converters (FC)

The number of frequency converters that are connected on a GMM is entered under this point. A maximum of nine FCs can be connected.



4.11.7.2 Boost voltage

A start voltage in the range of 0- 100V, which is present with frequencies > 0Hz on the fan, is set here.

The voltage boost is shown with "VB" in the U/f characteristic curve graphic.



4.11.7.3 Motor voltage

The fans' nominal voltage is entered here. The frequency converter's output voltage is limited to this voltage.



4.11.7.4 Motor frequency

The fans' nominal frequency is entered here. The fan speed is controlled up to this frequency. Values between 45Hz and 60Hz can be set here.

This value must agree with the information on the fans' type plate



4.11.7.5 Acceleration

The acceleration with which the fans run up to their new control value is entered here.



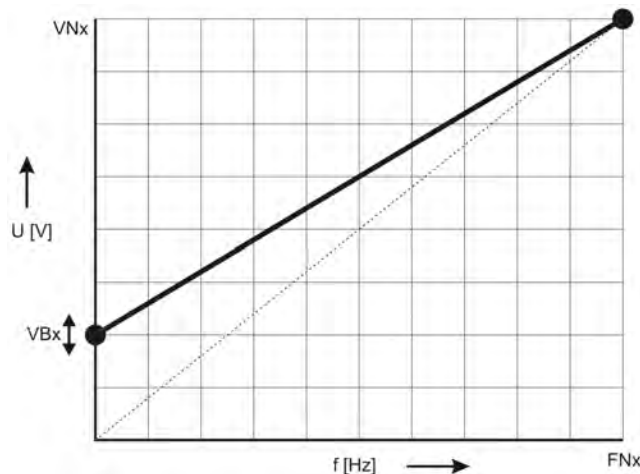
4.11.7.6 Delay

The negative acceleration with which the fans slow down to their new control value is entered here.

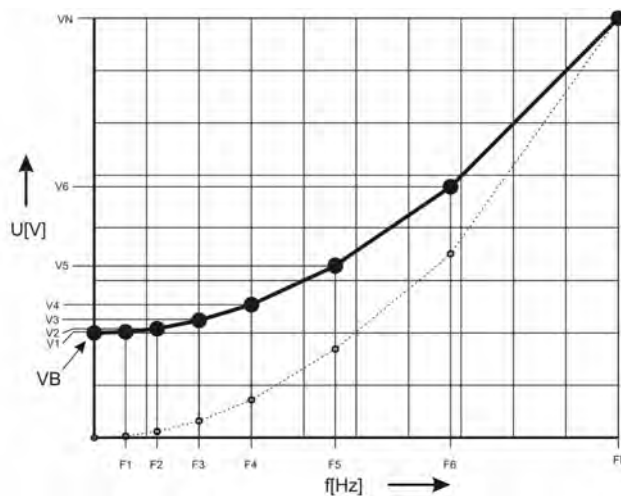


4.11.7.7 Characteristic curve

Switching is made here between linear and square fan characteristic curve.



Linear U/f characteristic curve with voltage boost (VB)



Square U/f characteristic curve and voltage boost (VB)

Linear/square fan characteristic curve explanation:

With the linear fan characteristic curve, the magnetic flow of an asynchronous fan and therefore the torque remains constant over the entire speed range (magn. flow = V/f).

However, as with low speeds fans require less torque, it would be sensible to reduce the torque to save energy. This can be achieved with a higher reduction in the voltage with lower frequencies, i.e. with a square characteristic curve.

The voltage boost is switched off with a 0Hz output frequency.

4.11.7.8 TC reset time

If a thermocontact error has been detected, the respective fan is separated from the output stage. You can switch the fan back to the output stage after a cooling down phase (TC reset time). The time that must pass to activate a thermocontact RESET is entered here. If the 0 min. value is entered, there is no thermocontact RESET.



It must be noted that the failed fan or fans may possibly be switched on in running operation. This can cause a power overload on the FC. (See [Connections, Page 23](#))

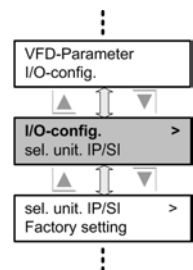
The user is responsible for activating this function.

A GRFC motor can therefore be switched back in automatic operation.

4.11.8 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.



4.11.8.1 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 **AI1** and **AI2** are two current inputs (4-20mA).

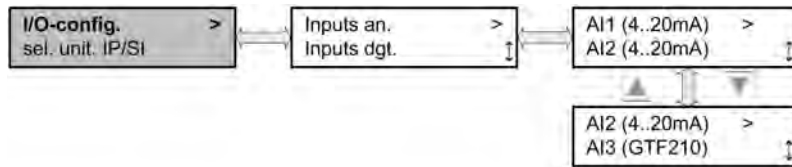
Input **AI2** can be switched over as input for a temperature sensor.

Terminal **AI3** has an input for the GTF210 temperature sensor.

There is an input for 0-10 V DC on terminal **AI4**.



4.11.8.2 Power inputs AI1



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 actual value (see table [External control value scaling, Page 94](#)). The origin of the actual value still has to be configured. Make sure that the "Auto ext" mode has been selected in the operating mode menu.

Setpoint 2 is only offered if the number of setpoints has been configured to **2** (see [Number of setpoints, Page 68](#)). If setpoint 2 is configured, the same applies as described with **Setpoint 1**.

No function is selected if this input should be inactive.

Basically the same applies for **current input 2**, as with current input **1**, except that there are two additional setting options.

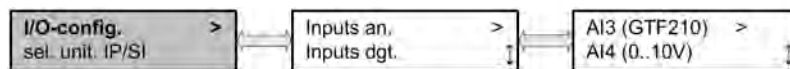
4.11.8.3 Switchover input AI2

In addition to the functions offered by input AI1, the following functions are also offered: **Actual temperature value** means that a temperature sensor with 4..20mA (-30°C bis +70°C) is connected on this current input. Function as described with **actual 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.

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

4.11.8.4 AI3 input temperature sensor

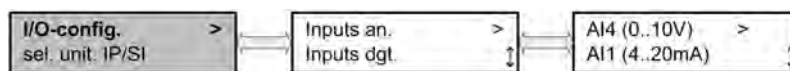


Temp actual value means that a GTF210 temperature sensor **is connected to this input**.

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.

4.11.8.5 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

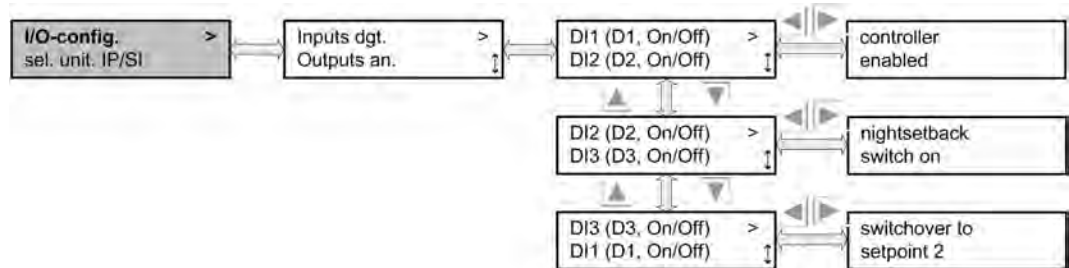
Slave control value means that the control signal for the fans follows this input. The characteristic curve is linear from 0-100%. Make sure that the **"Auto int"** operating mode menu.

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 actual value (see [External control value scaling, Page 94](#)). The origin of the actual value still has to be configured. Make sure that the **"Auto ext"** **Operating mode** operating mode menu.

Setpoint 2 is only offered if the number of setpoints has been configured to **2** (see [Number of setpoints, Page 68](#)). If setpoint 2 is configured, the same applies as described with **Setpoint 1**.

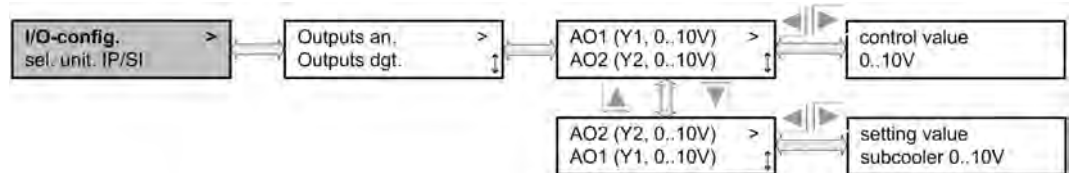
4.11.8.6 Digital inputs

The digital inputs on terminals **DI1**, **DI2** and **DI3** are control inputs. Their function is permanently assigned according to the diagram below.



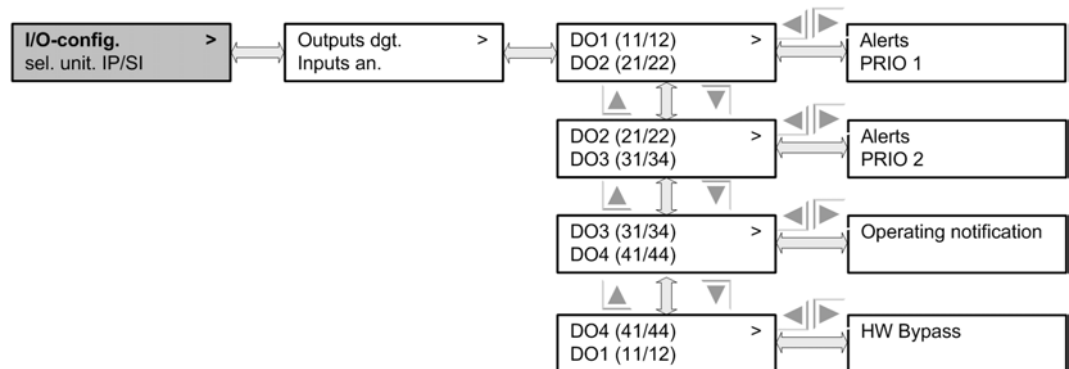
The inputs are active when they are connected to **+24V**. They can only be switched with potential-free contacts (relay contact) or with the internal **+24V**.

4.11.8.7 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.

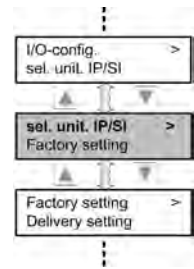
4.11.8.8 Digital outputs



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.

4.11.9 SI/IP selection

The units system can be selected here.



4.11.9.1 SI/IP units system

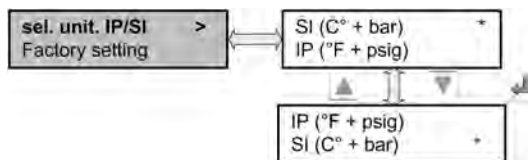
Unit selection for pressure and temperature.

International units →

SI (Système international d'unités)

Anglo-American units →

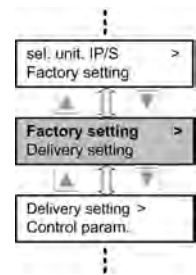
IP (Imperial System)



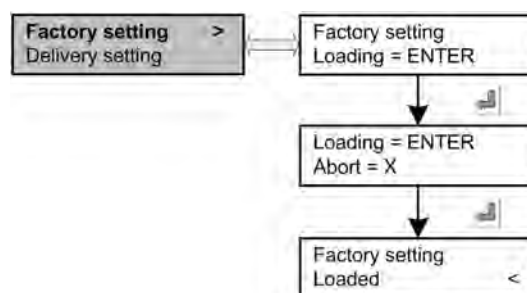
The selected unit of measurement is shown with a *.

4.11.10 Factory setting

The control can be reset to factory settings here.



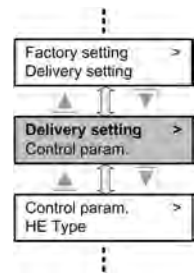
4.11.10.1 Control reset (factory setting)



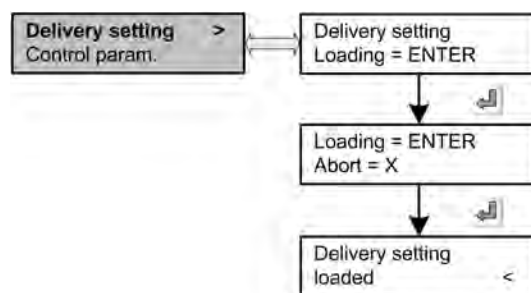
CAUTION any changes made locally will be deleted. Factory commissioning values will be retained. The bypass and control functions are reset to their defaults.

4.11.11 Delivery condition

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



4.11.11.1 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.

5 Faults and troubleshooting

5.1 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 "**Unit fault**" message is displayed, there is an error on the Frequency converter(s).

Please check if there is voltage supply on the frequency converter.

- For other error messages see Table [Error messages and warnings on the GMM display, Page 97](#)

TEST POINT 2:

Mains connection:

- Are all phases present? Rotary field OK?

Sensor connection:

- Is the sensor connected correctly? Cf "Sensor connection" section
- Sensor OK? (Measure! Pressure: 4-20mA, Temp.: 1.2-2.7kΩ, default signal: 0-10V)
- Are the sensor cables laid in the immediate vicinity of the mains or motor cable? Consider increasing the distance!
- Are the sensor cables shielded? If not – swap for shielded cables!
- Is the shielding applied unidirectionally on the controller?

Fuses:

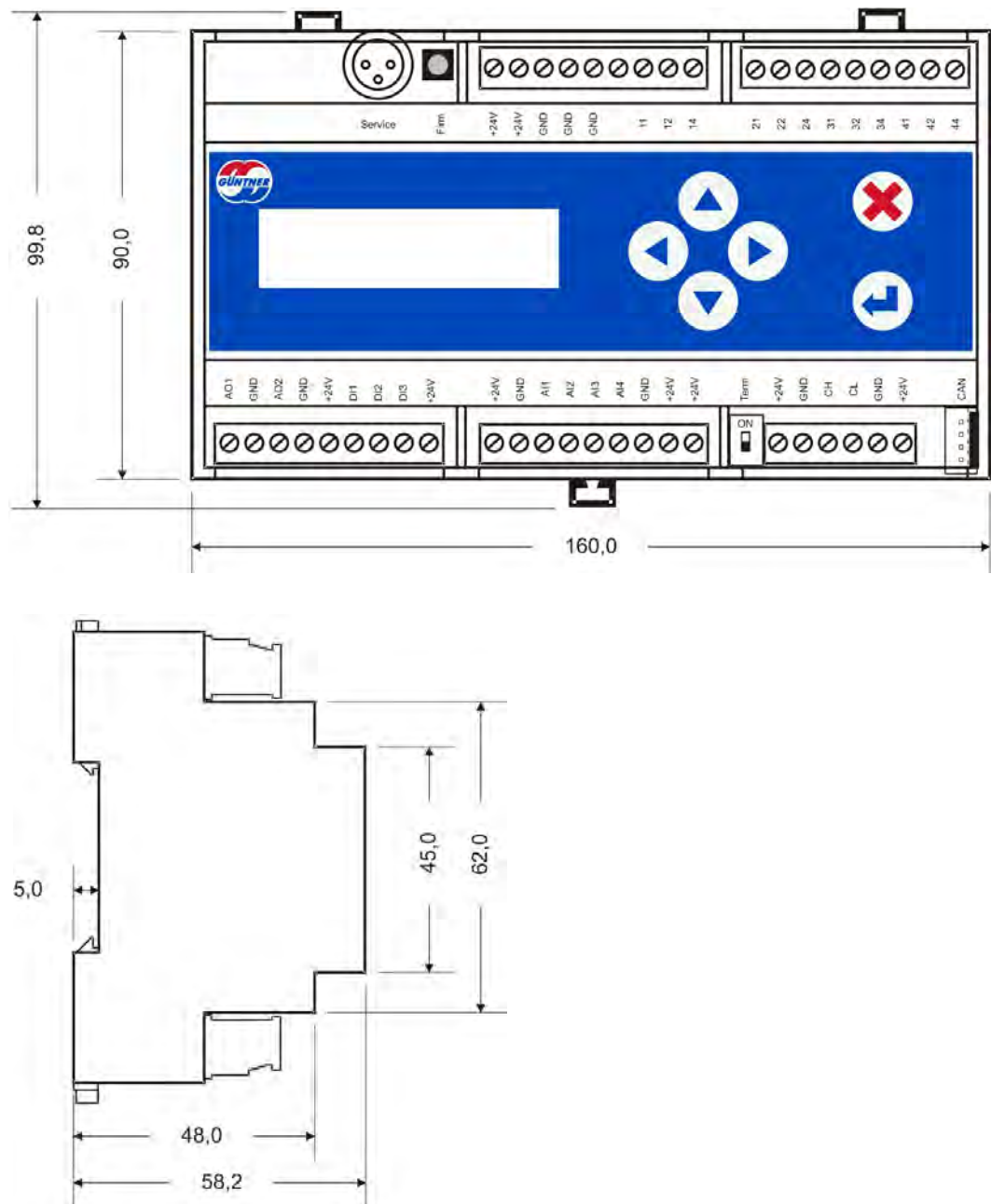
- Is the fuse on the controller supply OK?

6 Technical data

6.1 Controller - GRCF.1

Dimensions

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



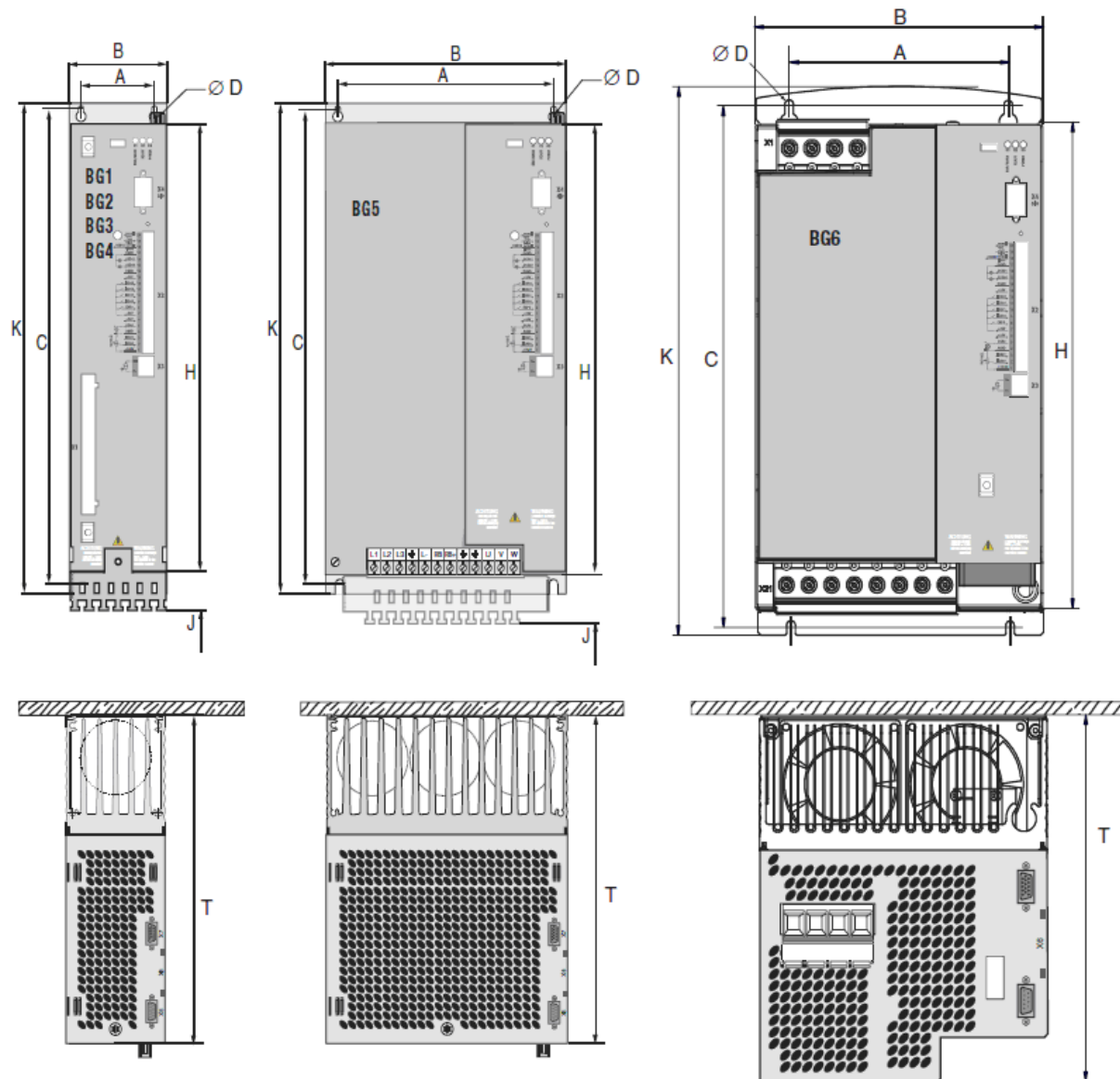
GRCF.1 casing dimensions

Electrical and mechanical properties**GRCF.1**

Voltage supply	+24V DC
Current consumption	250mA max.
Heat loss	Approx. 1.2W
Sensor connection	Pressure transmitter 4-20mA or temperature sensor GTF210 (-30...+ 70°C) or default signal 0-10V
Ambient temperature	-20...+ 70°C
Storage temperature	0-+50°C dry
Weight	340g
Protection rating	IP00

6.2 Frequency converter – GFQD

Dimensions



	BG2	BG3	BG4	BG5	BG6
Weight [kg]	3.5	4.4	6.5	7.2	13
W width [mm]	70	70	120	170	190
H height [mm]	247	300	300	300	348
D depth [mm]	220	218	218	218	230
A [mm]	40	40	80	130	150
C [mm]	260	320	320	320	365

	BG2	BG3	BG4	BG5	BG6
D Ø [mm]	4.8	4.8	4.8	4.8	5.6
J [mm]	45	45	45	55	-
K [mm]	270	330	330	330	382

Electrical and mechanical properties
GFQD

Mains voltage: 3 x 400 V (-15%)- 3 x 460 V (+10%)

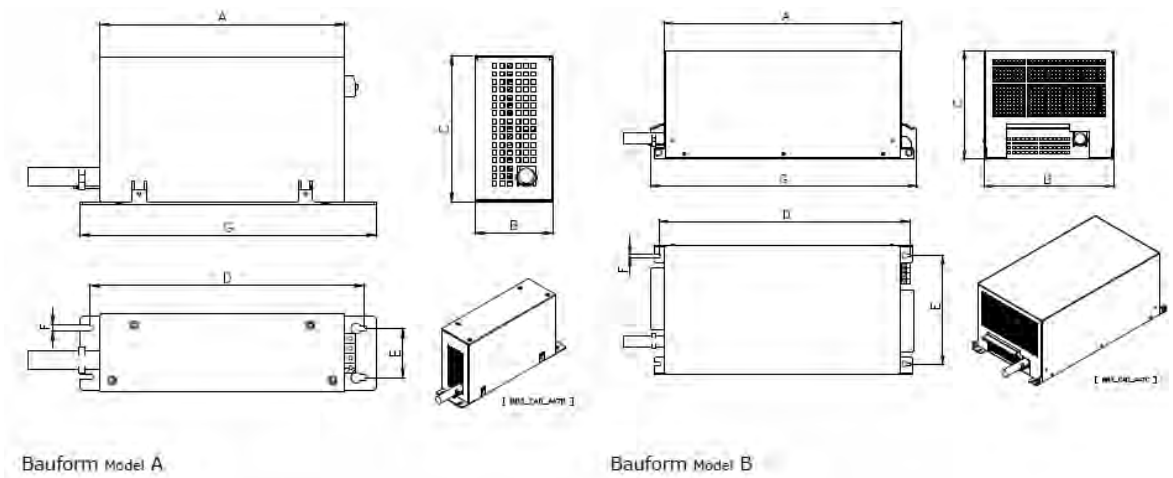
Frequency 50/60 Hz +/-10%

Type	Power [kW]	Current [A]	Size	Power loss [W]
GFQD010.1	0.375	1.00	BG2	30
GFQD010.1 UL	0.375	1.00	BG2	30
GFQD022.1 UL	0.75	2.20	BG2	70
GFQD041.1 UL	1.5	4.10	BG2	112
GFQD057.1 UL	2.2	5.70	BG2	148
GFQD078.1 UL	3	7.80	BG3	162
GFQD100.1 UL	4	10.00	BG3	207
GFQD140.1 UL	5.5	14.00	BG4	268
GFQD170.1 UL	7.5	17.00	BG4	325
GFQD240.1 UL	11	24.00	BG5	400
GFQD320.1 UL	15	32.00	BG5	510
GFQD450.1 UL	22	45.00	BG6	610

Feature		GQFD010.1- GQFD450.1
Thermal conditions	during operation in acc. with EN 61800-2 IEC 60721-3-3 Class 3K3	+5- +40°C (2) with relative air humidity 5- 85% without condensation
	during storage in acc. with EN 61800-2 IEC 60721-3-1 Class 1K3 + 1K4	-25- +55°C (3) with relative air humidity 5- 95%
	during transport in acc. with EN 61800-2 IEC 60721-3-2 Class 2K3	-25-+70°C (4) with relative air humidity at 95% with max. +40°C
Protection rating	Unit	IP20 (connector terminals IO00)
	Cooling concept	IP20 convection
Contact protection		BGV 3
Installation height		Up to 1,000 m above sea level, above 1,000 m above sea level with power reduction, max. 2,000 m above sea level

6.3 Sine filter - GSIF

Dimensions



BAAN no.	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	Design /model	Weight [kg]
57111	250	80	150	280	50	6	290	A	3.2
57102								A	4.7
57103	290		170	320			330	A	7.4
57104								A	8.1
57105	320	135	200	340	100	6.5	360	A	11
57106									A
57107	370	260	200	400	230		430	B	25
57108	400	280		430			460	B	27
57109	450	310	250	480			510	B	34
57112	500			530	250		560	B	45
57110	350			580			610	B	56

Electrical and mechanical properties**Measurement data**

Number of phases		3
Measurement voltage	[V]	400
Voltage range	[V]	0 - 480
Measurement frequency	[Hz]	0 - 60
Converter clock frequency	[kHz]	>= 8
Load description		Symmetrical load caused by motors
Push-pull attenuation	[dB]	> 20 of the clock frequency components
Push-push attenuation	[dB]	> 20 of the clock frequency components
Max. du/dt on the filter output	[V/μs]	< 10

Operating conditions

Ambient temperature	[°C]	-10- +45
Temperature class - VDE		F
Temperature class - UL		Class 155
Cooling type		AN
Air speed	[m/s]	-
Operating mode		DB

Usage conditions

Temperature		
Storage	[°C]	-25- +60
Transport	[°C]	-25- +70
Operation	[°C]	-10- +45
Setup height		0m above sea level (1000- 4000 m above sea level, power reduction 5%/1000 m)

Types overview

Product name	BAAN no.	Max. power [A] 1) / 2)	Inductivity [mH]	Power loss @16kHz [W] typical	Power loss @12kHz [W] typical	Power loss @8kHz [W] typical
GSIF013.1	57111	1.3 / 1	19.0	9	10	11
GSIF025.1	57102	2.5 / 2	15.0	17	19	20
GSIF040.1	57103	4 / 3	7.0	28	31	34
GSIF060.1	57104	6 / 4.8	4.5	41	45	49
GSIF100.1	57105	10 / 8	4.0	69	76	83
GSIF165.1	57106	16.5 / 13	2.4	114	125	137
GSIF240.1	57107	24 / 19	1.5	166	183	199
GSIF320.1	57108	32 / 24	1.25	207	228	248
GSIF400.1	57109	40 / 32	1.0	276	304	331
GSIF500.1	57112	50 / 40	0.8	345	380	414

1) = @ 400V, +45°C temperature in switch cabinet

2) = @ 400V, +55°C temperature in switch cabinet

Version

Type:

UL 508-17th edition
CSA Standard C22.2 No. 14-2010

7 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 -30 .. 100°C	4mA = 0°C 20mA = 100°C	0V = 0°C 10V = 100°C
Voltage 0 .. 10V	Voltage 0 .. 10V	4mA = 0V 20mA = 10V	0V = 0V 10V = 10V

Table: External control value scaling

8 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.
Base control value	0%	0%	0%	0%	0%	0%
Start control value	0%	0%	0%	0%	0%	0%
Setpoint 1 (2)	30°C	86°F	40°C (25°C CO2)	104°F (77°F CO2)	12.5 bar	181 psig
Threshold value 1	100%	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
Number of frequency converters	1	1	1	1	1	1

Number of fans	1	1	1	1	1	1
Motor voltage	400V	400V	400V	400V	400V	400V
Motor frequency	50Hz	50Hz	50Hz	50Hz	50Hz	50Hz
Nom. motor speed	0	0	0	0	0	0
Acceleration	5Hz/s	5Hz/s	5Hz/s	5Hz/s	5Hz/s	5Hz/s
Delay	5Hz/s	5Hz/s	5Hz/s	5Hz/s	5Hz/s	5Hz/s
HW Bypass VZ on	2s	2s	2s	2s	2s	2s
HW Bypass VZ off	5s	5s	5s	5s	5s	5s

9 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 or faulty; no cooling at heat exchanger; is displayed if all FUs are faulty.
"No sensor selected"			No sensor activated in the I/O configuration
Sensor fault x		x	The sensor with no. x is defective or the signal is outside the measurement ranges
Disabled			DI1 (enable) not switched
Setpoint 2			control is on the setpoint, DI3 is wired
Night limiter			Night limiter is on, DI2 is switched on or active via clock
FU n: missing		x	Frequency converter n not present
FU n: KK-TEMP		x	Frequency converter n temperature warning
FU n: TK fault		x	Thermo-contact switch FU n was activated
FU n: !ENPO		x	Input ENPO not active on FU n, but GRCF.1 is enabled
FU n: E-BUS xx	x		CAN connection to FU n interrupted or no mains on FU n
FU n: E-CPU xx	x		Frequency converter n collective faults
FU n: E-OFF 1	x		Frequency converter n DC link voltage 0V
FU n: E-OC xx	x		Frequency converter n overcurrent
FU n: E-OV xx	x		Frequency converter n overvoltage
FU n: E-OLM xx	x		Frequency converter n lxlxt current too high
FU n: E-OLI xx	x		Frequency converter n lxt current too high
FU n: E-OTI xx	x		Frequency converter n excess temperature
FU n: E-PLS xx	x		Frequency converter n parameter plausibility
FU n: E-PAR xx	x		Frequency converter n parameter errors
FU n: E-FLT xx	x		Frequency converter n floating point error
FU n: E-PWR xx	x		Frequency converter n output stage unknown
FU n: E-CAN xx	x		Frequency converter n CAN communication
FU n: E-EEP xx	x		Frequency converter n EEPROM error
FU n: Protective circuit		x	Protective circuit FU n was activated
FU n: Rotary field		x	Rotary field on the FU n is not connected correctly

Table: Error messages/warnings on the GMM display

xx	= Fault type, can help with detailed diagnosis	
ii	= Input number	
PRI0 1	= Relay contacts 11/12	
PRI0 2	= Relay contacts 21/22	
Operating message	= Relay contacts 31/34	if control signal > 0%
Hard-Bypass operation	= Relay contacts 41/42	

10 Troubleshooting tips

Errors	Possible cause, suggested solution
Fans are not turning	If when the controller is switched on and appears in the Info menus , check the Operating mode and the I/O configuration. The operating mode appears on the far right of the 2nd line (A = automatic, S = slave mode, H = manual mode). The wrong input function has been chosen for the selected operating mode in the I/O configuration. (See I/O configuration, Page 78). • If the setpoint and the actual 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. (See Operating mode, Page 62). • 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.

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