Operating instructions
Güntner Motor Management GMM step

www.guentner.de

Contents

1 General notes

1.1 Safety instructions

In order to prevent serious physical injuries or major material damage, work on or with the unit may be performed only by authorised persons with appropriate training and qualifications who are familiar with the set-up, installation, commissioning and operation of speed controllers. These persons must read the operating instructions carefully before the installation and commissioning. In addition to the operating instructions and national accident prevention regulations, all recognised technical rules (safety and professional work under UVV, VBG, VDE etc.) must be followed.

Repairs to the device may only be made by the manufacturer or a repair centre authorised by the manufacturer.

UNAUTHORISED AND IMPROPER INTERVENTIONS WILL INVALIDATE THE WARRANTY!

The applicable national accident prevention regulations must be followed when working on control units under voltage.

1.2 Proper intended use

The unit is intended only for the purposes agreed in the order confirmation. Any other application or use for any additional purpose, is not a proper intended use. The manufacturer accepts no liability for any injury or damage arising from unintended use. Proper intended use is also contingent on compliance with the installation, operating and maintenance procedures described in these operating instructions. The technical data and the details of the connection assignments can be found on the type plate and in the instructions, and must be complied with.

Electronic equipment is not fundamentally failsafe! The user must therefore ensure that his system reverts to a safe condition in the event of failure of the equipment. The manufacturer accepts no responsibility for any damage to life and limb or to material goods and assets in the event of failure to comply with this provision and in the event of improper use.

The electrical installation must be performed in accordance with the relevant regulations (e.g. cable cross-sections, fuses, earth conductor connections, etc.). Additional information is included in the documentation. If the control unit is used in a particular area of application, the required standards and regulations must be complied with.

1.3 Transport and storage, copyright notice

The controllers are packaged appropriately for transport and may only be transported in their original packaging. Avoid any impacts and collisions. Unless otherwise noted on the packaging, the maximum stacking height is 4 packs. When you receive the equipment, check for any damage to the packaging or the controller.

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

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

1.4 Warranty and liability

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

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

1.5 Manufacturer and supplier address

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

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

Service Telephone Germany:
0800 48368637
0800 GUENTNER

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

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service@guentner.de
http://www.guentner.de

1.6 EMC-compliant installation

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

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

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

• The shielding of measuring, signal and bus lines must be earthed at one end only.

• Suitable shielding and routing measures must be taken to ensure that mains cables and motor cables do not give rise to any interference in signal and control lines.

ADVICE

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

2 Commissioning GMM step

The GMM step must be set up in accordance with the configuration of the heat exchanger and the fans. This commissioning process determines the performance of the heat exchanger.

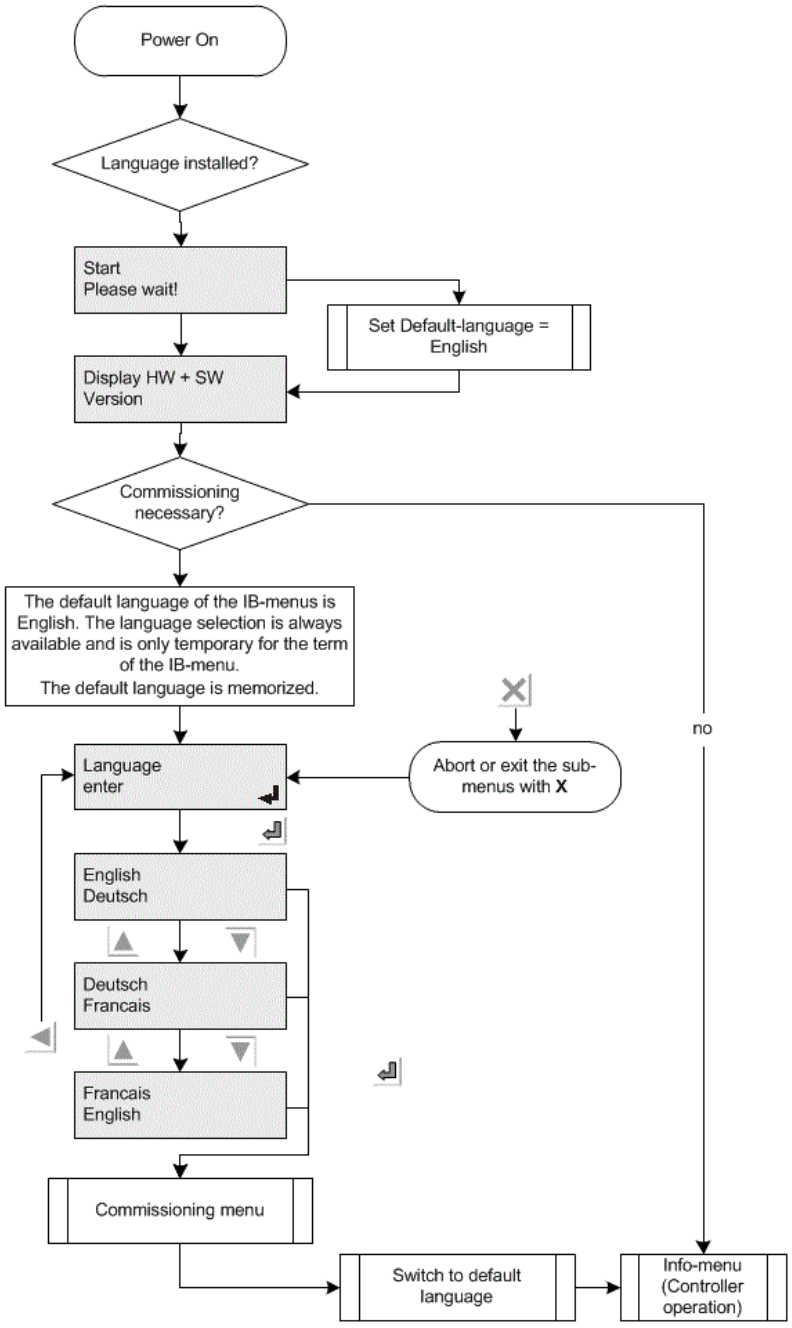
The GMM step automatically detects whether commissioning has been carried out when it is switched on and, if it has, continues with normal operation.

If the GMM step detects that this has not yet been done, it initiates the commissioning procedure. When this procedure has been completed, all the specified parameters are saved.

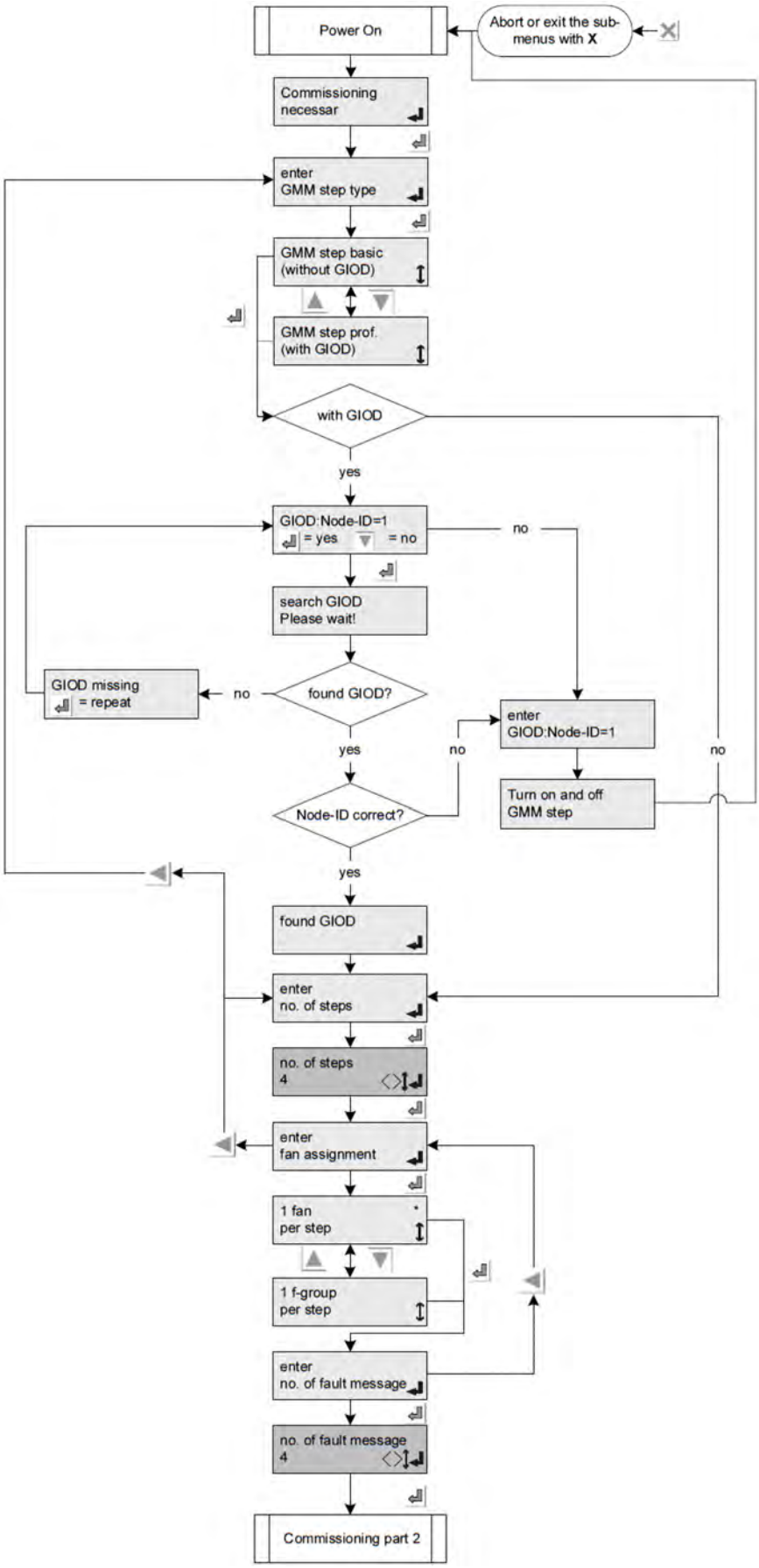
All values set up by the commissioning can also be viewed and changed individually later on in the menus.

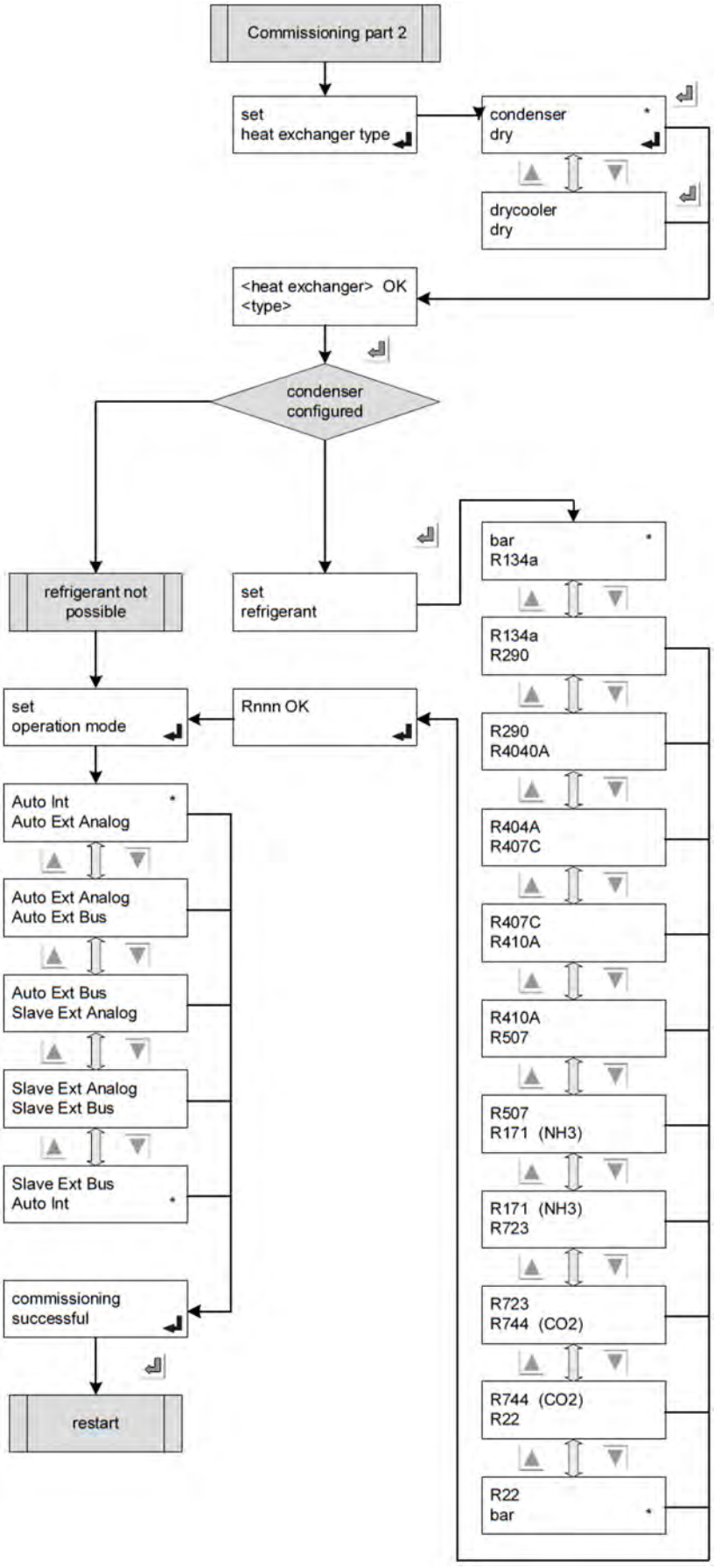
2.1 The initial commissioning procedure

If it is recognized that commissioning has not yet taken place, the following values are interrogated and set up in accordance with the following flow chart.



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





3 Construction of the GMM step

Construction of the GMM step: left GRCS.1, right GIOD.1

3.1 Remote controllers

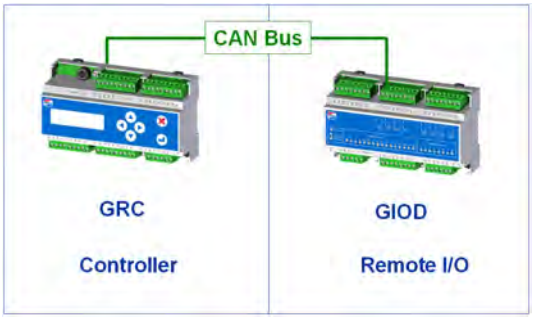
3.1.1 Functional description

Functional description of GRCS.1

The GRCF.1 is used to control step controllers. As a minimal solution, GRCS.1 can control up to four steps.

Variant GMM step basic

If you need more steps or additional functions you will need to combine the GRCS.1 with a GIOD.1 expansion module, ERP no. 5204183.



Variant GMM step professional

In order to operate the controller it must have a power supply and must be enabled via digital input DI1. If it is not enabled the process will not be regulated.
The unit has an internal PID controller, whose parameters (amplification factor, integral and differential time) can be configured either 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 relay outputs controlling the output stages are switched as appropriate for the setpoint and the number of steps. A switch-on threshold can be configured for each step.

The integrated function “Fancycling” makes it possible to balance the running times for the individual fans.

The digital inputs are designed as potential-free contacts that must be connected to +24V. As well as enable (DI1), digital inputs are also used to control external errors (DI2) and the setpoint switchover (DI3).

ADVICE

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

The relay outputs are used to control the output stages. Depending on the configuration (the number of steps and your GMM step basic or GMM step professional configuration) a number of special functions may also be available. The function assignment is described in the configuration table.
See Configuration table, Page 33

Analogue output AO1 shows the current control value from the controller (0-100%) as a voltage in the range 0-10V. Analogue output AO2 can be used to control an additional subcooler.

The CAN interface of the GRCS.1 is an internal interface for communicating with other Güntner equipment (e.g. the expansion module GIOD.1). The following communications modules are available for external bus connections: for Modbus (GCMM.1, ERP no. 5204182) or Profibus (GCMP.1, ERP no. 5204543).

Functional description of GIOD.1

The GIOD.1 is controlled via CAN by a Güntner controller. The GIOD.1 possesses 16 digital inputs with a rated voltage of 24V DC and 8 relay outputs. The bus address of the GIOD.1 (node ID) is set up using a rotary encoding switch. The address 0xF may not be used for this.

ADVICE

To operate the GIOD on GMM step professional the rotary switch must always be set to address 1.

The GIOD reads this address only when first switched on.

To ensure the bus connection between the controller and one or more other units works correctly, bus termination must be activated at the beginning and end of the bus connection by setting the units' DIP switches labelled "Term". They must be placed in the "ON" position to activate the termination. Units that are in the middle of the bus and therefore permitted to transfer the bus signal may not have bus termination activated.

The status of the inputs and outputs is indicated by LEDs on the front of the casing. A lit LED against the digital inputs signifies that the corresponding input is receiving a "high" signal. A lit LED against the relay outputs signifies that the closer contact is closed. A power LED signifies that the internal electronic components are receiving power.
There is also a status display for the bus connection that involves two LEDs.

Bus status LED	Description
On	The GIOD.1 is in operation
Flashing 50:50	The GIOD.1 can be taken into operation
Brief single flash	The GIOD.1 is currently stopped
Three flashes with error LED	The software is attempting to overrun the stack on the GIOD.1
Alternate flashing with error LED	A “layer setting service” is being performed on the GIOD.1
Synchronous fast flashing with error LED	Reset to default has been selected on the rotary coding switch (setting “F”)

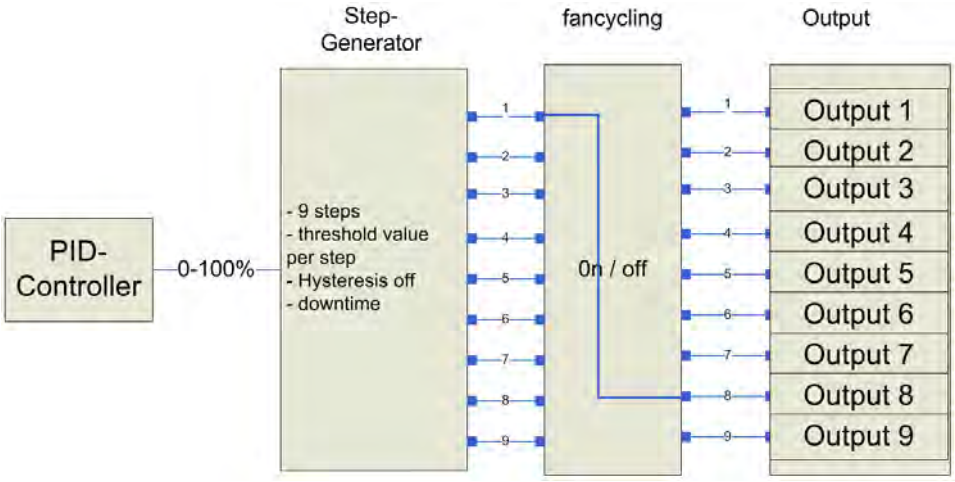
Bus error LED	Description
Off	Unit is operating correctly
On	There is a static fault on the CAN bus
Brief single flash	The warning limit has been reached in the CAN controller
Double flashing	A fault was detected in the lifeguard, nodeguard or heart-beat
Three flashes with the bus status LED	The software is attempting to overrun the stack on the GIOD.1
Alternate flashing with the bus status LED	A “layer setting service” is being performed on the GIOD.1
Synchronous fast flashing with error LED	Reset to default has been selected on the rotary coding switch (setting “F”)

Power LED	Description
On	The internal electronics are receiving power
Off	The unit is not powered or is reverse-poled

Digital input LED	Description
On	The digital input detects a “High” signal
Off	The digital input detects a “Low” signal

Digital output LED	Description
On	The digital output is closed
Off	The digital output is open

3.1.1.1 Configurable step generator



The step generator comprises three main components

1. Step generator
The step generator generates a bit pattern for the outputs that are to be switched depending on the number of steps, their thresholds, their hysteresis and the hold-off time (=default setting).

2. Fancycling
Fancycling ensures even distribution of the running times for the outputs (the fans). To this end it records and evaluates the running times of all the active outputs.

Active fancycling means,

- when a step is switched on, the output with the least running time is activated.
No change is made to any outputs that were already active.

- when a step is switched off, the output with the highest running time is deactivated.

- when no change is made (the number of outputs does not change for a period of one hour) no outputs are switched over.

- An even distribution of running times can be achieved only in association with the installation's general control behaviour on the basis of higher or lower heat exchanger performance.

ADVICE

When fancycling is deactivated, steps and outputs are correlated 1:1. In other words, step 1 switches output 1, step 2 switches output 2, and so on.

When fancycling is active, an active step is assigned to an output depending on its running time.
The current assignments are shown in the Current values menu.

3. Outputs
The outputs are the physical correlations of steps to outputs.
This depends on the type of GMM step and the number of steps.
See also Configuration table, Page 33

3.1.2 Installation / Operating conditions

Installation / Operating conditions GRCS.1

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

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

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

Installation / Operating conditions GIOD.1

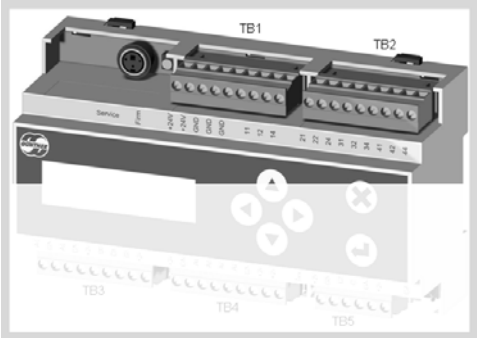
- The module is designed for mounting on a top-hat rail.
- Bus lines that are not wired via the supplied ribbon cable must be shielded.
- The shielding of bus lines must be earthed at one end only.
- Suitable shielding and routing measures must be taken to ensure that mains cables and motor cables do not give rise to any interference in signal and control lines.
- Temperature:

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

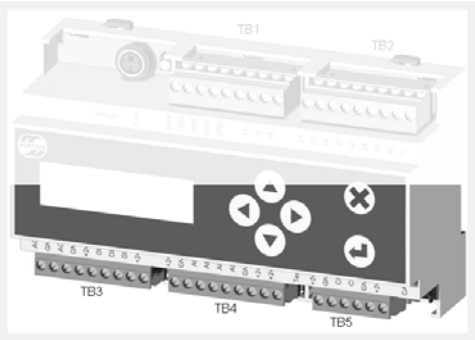
- Protection rating: IP 20

3.1.3 Connections

Connections GRCS.1



Upper row of connections			
	Name	**Description**	
	Service	Service plug only for use by service personnel	
	Firm	Pushbutton only for use by service personnel	
TB1	+24V	External feed for power supply	
	+24V		
	GND	Contact ground for external power feed	
	GND		
	GND		
		Terminal not connected	
	11		relay DO1
	12		
	14		
TB2	21		relay DO2
	22		
	24		
	31		relay DO3
	32		
	34		
	41		relay DO4
	42		
	44		

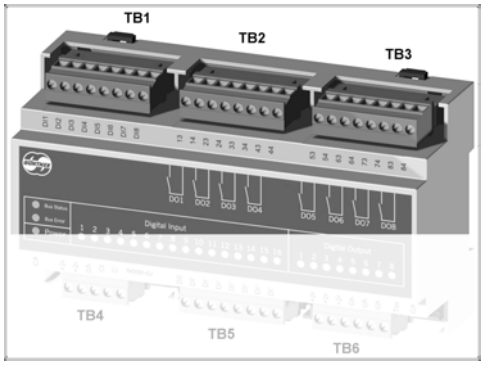


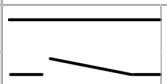
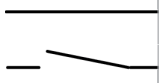
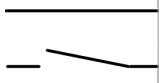
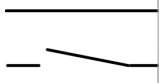
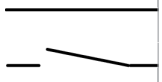
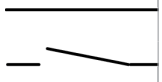
Lower row of connections		
	Name	**Description**
TB3	AO1	Analogue output 1, 0-10V
	GND	Ground
	AO2	Analogue output 2, 0-10V
	GND	Ground
	+24V	Voltage +24V
	DI1	Digital input +24V, Release
	DI2	No function / collective fault / external manual operation
	DI3	Digital input +24V, setpoint changeover
	+24V	Voltage +24V
TB4	+24V	Voltage +24V
	GND	Ground
	AI1	Analogue output 4-20mA
	AI2	Analogue input 4-20mA or for temperature sensor GTF must be configured in the soft-ware
	AI3	Analogue input for temperature sensor GTF
	AI4	Analogue input 0-10V
	GND	Ground
	+24V	Voltage +24V
	+24V	
	Term	DIP switch for CAN bus termination (120Ω) / ON = termination activated
TB5	+24V	Voltage +24V
	GND	Ground
	CH	CAN high signal
	CL	CAN low signal

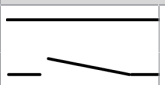
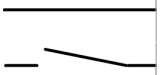
Lower row of connections		
	GND	Ground
	+24V	Voltage +24V
	CAN	CAN bus plug including power supply

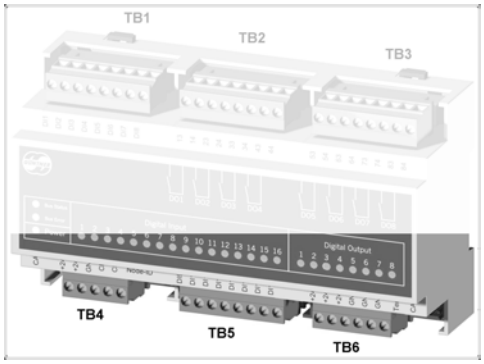
*TB: Terminal block

Connections GIOD.1



	Upper row of connections	
	Name	**Description**
TB1	DI1	Digital input 1
	DI2	Digital input 2
	DI3	Digital input 3
	DI4	Digital input 4
	DI5	Digital input 5
	DI6	Digital input 6
	DI7	Digital input 7
	DI8	Digital input 8
TB2	13	 Relay contact 1 closer
	14	
	23	 Relay contact 2 closer
	24	
	33	 Relay contact 3 closer
	34	
	43	 Relay contact 4 closer
	44	
TB3	53	 Relay contact 5 closer
	54	
	63	 Relay contact 6 closer
	64	

	Upper row of connections		
	Name	Description	
	73		Relay contact 7 closer
	74		
	83		Relay contact 8 closer
	84		



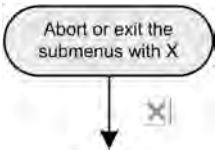
	Lower row of connections	
	Name	**Description**
	CAN	CAN bus plug including power supply
TB4	+24V	External feed for power supply
	+24V	
	GND	Contact ground for external power feed
	CH	CAN high signal
	CL	CAN low signal
	Node ID	Rotary switch for setting the bus node address 0: Address 0 1: Address 1 - - E: Address 14 F: Reset CANopen parameters to their default values
TB5	DI9	Digital input 9
	DI10	Digital input 10
	DI11	Digital input 11
	DI12	Digital input 12
	DI13	Digital input 13
	DI14	Digital input 14
	DI15	Digital input 15
	DI16	Digital input 16
TB6	+24V	Voltage +24V
	+24V	
	+24V	
	GND	Ground
	GND	

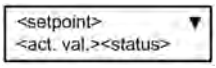
	Lower row of connections	
	Name	**Description**
	GND	
	Term	DIP switch for CAN bus termination (120Ω)
	CAN	CAN bus plug including power supply

4 Display and operation

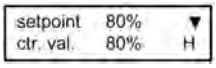
Information are shown on a two-line display. The controller is operated via a membrane keyboard.

4.1 Info menu

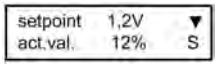




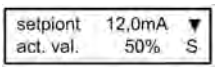
The setpoint, actual value, controller status, info and error messages are displayed in the info menu.
The possible states are shown below.



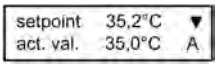
Operating mode = Manual



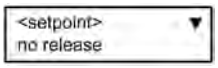
Operating mode = Slave
Setpoint input = Voltage



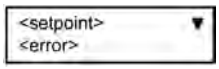
Operating mode = Slave
Setpoint input = Current



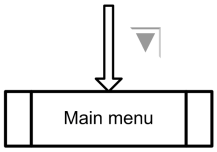
Operating mode = Automatic
Control on setpoint



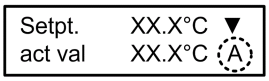
Operating mode = **X**
Display static, no enable, release contact must be switched



Operating mode = **X**
Error display, must be acknowledged with **X** key.



4.2 Status displays in the Info menu



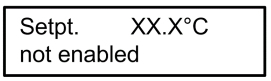
→ Status display

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

Further messages in the second line

- No release

- Error messages in clear text (alternating with actual value)
See Error messages and warnings , Page 96



→ Text message

4.3 Operation

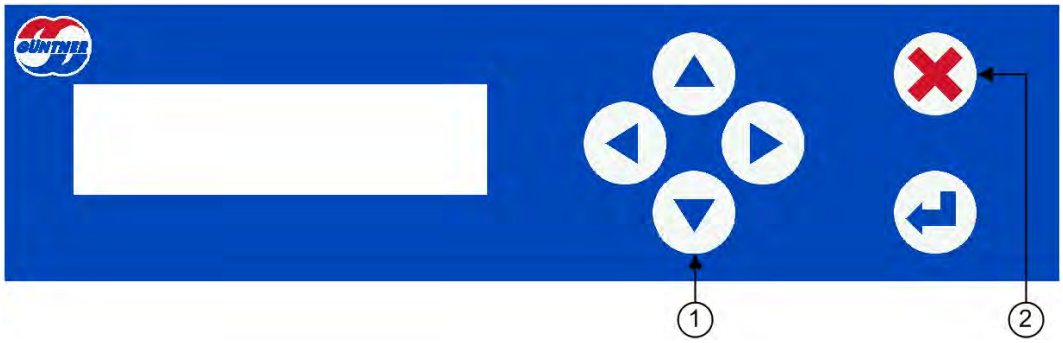
Cancel and return to INFO menu

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.

Up/down arrow for scrolling through the menu level.

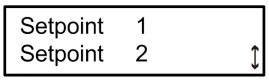


1. Use this key to move from the **INFO** menu to the **Operating menu**.
2. Use this key to return to the **INFO** menu at any time.

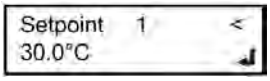
4.4 Edit mode

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

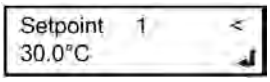
Select menu option you want (top line)

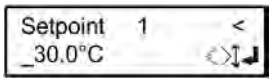


Change to menu option

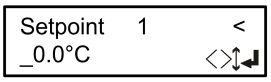


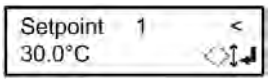
Change to writing mode (cursor flashes)



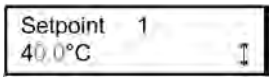


Decimal point selection (cursor flashes)

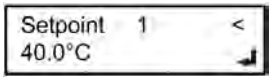




Change value



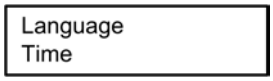
New value acceptance



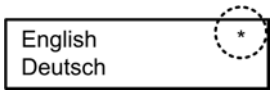
4.5 Selection mode

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

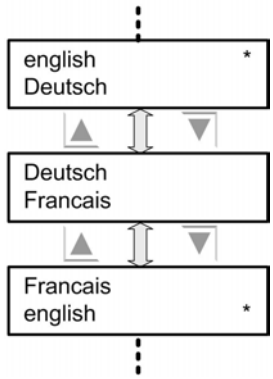
Select menu option you want ("Language", for example, top line)



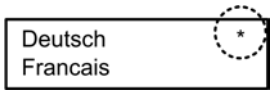
Change to the menu option
→ The function/language currently set is marked with an *asterisk*.



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



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



4.6 Configuration

The GMM step is configured with an appropriate number of potential-free contacts. Their assignments will differ depending on the configuration.

4.6.1 Configuration table

			GMM step basic			GMM step professional
	I/O	**Signal**	**2 steps**	**3 steps**	**4 steps**	**2#9 steps**
GR-CS.1	DI1	24V	Enable			
	DI2	24V	No function / External error / External manual mode			
	DI3	24V	Setpoint switchover or heating/cooling			
	AI1	4..20mA	Pressure / Slave			
	AI2	4..20mA/KTY	Pressure / Temperature / Slave			
	AI3	KTY	Temperature			
	AI4	0..10V	Slave			
	AO1	0..10V	Control value			
	AO2	0..10V	Subcooler			
	DO1	Relay	Fan 1 / Group A	Fan 1 / Group A	Fan 1 / Group A	Alarms priority 1
	DO2	Relay	Fan 2 / Group B	Fan 2 / Group B	Fan 2 / Group B	Alarms priority 2
	DO3	Relay	-	Fan 3 / Group C	Fan 3 / Group C	Thermocontact reset
	DO4	Relay	-	-	Fan 4 / Group D	Threshold value / Fan 9 / Group I
GIOD.1	DO1	Relay	-	-	-	Fan 1 / Group A
	DO2	Relay	-	-	-	Fan 2 / Group B
	DO3	Relay	-	-	-	Fan 3 / Group C
	DO4	Relay	-	-	-	Fan 4 / Group D
	DO5	Relay	-	-	-	Fan 5 / Group E
	DO6	Relay	-	-	-	Fan 6 / Group F
	DO7	Relay	-	-	-	Fan 7 / Group G

Table: Configuration table

			GMM step basic			GMM step professional
	I/O	Signal	2 steps	3 steps	4 steps	2#9 steps
	DO8	Relay	-	-	-	Fan 8 / Group H
	DI1	24V	-	-	-	Fan 1 / Group A OK *1)
	DI2	24V	-	-	-	Fan 2 / Group B OK *1)
	DI3	24V	-	-	-	Fan 3 / Group C OK *1)
	DI4	24V	-	-	-	Fan 4 / Group D OK *1)
	DI5	24V	-	-	-	Fan 5 / Group E OK *1)
	DI6	24V	-	-	-	Fan 6 / Group F OK *1)
	DI7	24V	-	-	-	Fan 7 / Group G OK *1)
	DI8	24V	-	-	-	Fan 8 / Group H OK *1)
	DI9	24V	-	-	-	Fan 9 / Group I OK *1)
	DI10	24V	-	-	-	-
	DI11	24V	-	-	-	-
	DI12	24V	-	-	-	-
	DI13	24V	-	-	-	-
	DI14	24V	-	-	-	-
	DI15	24V	-	-	-	-
	DI16	24V	-	-	-	Remote ac-knowledgement

Table: Configuration table

*1) 24V = Fan / group n OK
0 V / open = Fan / group n faulty

The GMM step professional variant requires additional hardware (GIOD.1, BAAN no. 5204183).

4.6.2 Command outputs

Fan / fan group:
This output switches one step to control a fan or fan group. The output is closed when the threshold for that step is exceeded. Two-way contact x1/x4 on the GRCS is closed while the output is active. The closer contact x3/x4 on the GIOD is closed while the output is active.

Alarm fault (only GMM step professional):
All messages on the “Alarm fault” output refer to malfunctions resulting in complete failure and standstill of the heat exchanger.
In an alarm situation, contact 11/12 is closed.

Alarm warning (only GMM step professional):
All messages on the “Alarm warning” output refer to events that do not result in complete failure of the heat exchanger. They warn that operation of the heat exchanger is impaired.
Contact 21/22 is closed when a warning is issued.

Threshold value:
In the Threshold function, exceeding the configured threshold values is signalled at this output.
See Threshold value, Page 51

Thermocontact reset
This output is activated for a period of two seconds when:

a) The thermocontact reset function is activated and a fault is present for one output
See Thermocontact reset, Page 68

b) A remote acknowledgement is made via digital input DI16 on the GIOD

4.7 Control inputs

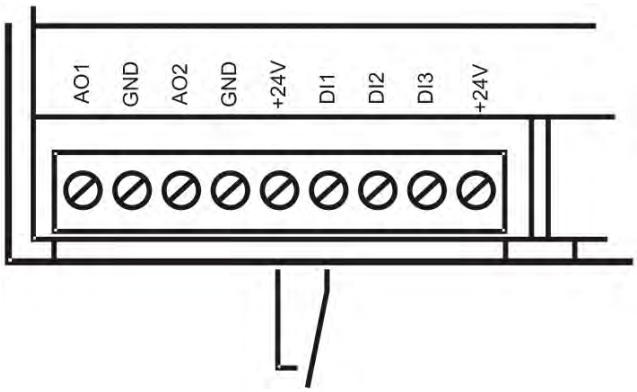
The control inputs are designed as a **low-voltage connection** and are connected via a potential-free contact (relay, contactor contact, switch etc.). The potential-free contact must be switched between the terminals **+24V** and the **DI1** or **DI2** or **DI3** control input. The function is activated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

4.7.1 Enabling of GMM step

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

*If they are not to be enabled externally, terminal **DI1** must be jumpered.*

This enabling jumper is always installed in the factory.



Connection of external enable contact +24V – DI1

ADVICE

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

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

4.7.2 External fault/External manual mode

An external fault report can be connected via terminal **DI2** . This function first has to be enabled in the IO menu.
The default is for it to be disabled.
Connection to +24V (high) signifies that there is currently **NO** fault pending (see Digital inputs, Page 82). An open input or one switched to 0 V signifies a fault. The source of this report may be for example the output of an auxiliary contact on a circuit breaker.
Each fault signalled here is recorded in the alarm history. An active fault also generates a priority 2 alarm message, which may also be signalled at the fault message output.

Alternatively, this input can be used to activate manual mode (see Digital inputs, Page 82).

Connection to +24V (high) signifies in this case that the manual mode control value set previously is output.

The input can also be assigned "no function".

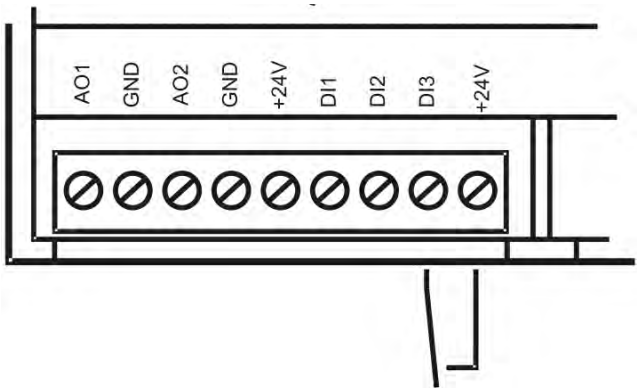
4.7.3 Switching to 2nd setpoint (or between heating and cooling mode)

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).

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



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

4.7.4 Control inputs on the GIOD

4.7.4.1 Fault report inputs

The digital inputs of the GIOD can be used to register fault reports from the fan steps.
Fault reports from the thermocontact evaluation are usually registered here.
The number of fault report inputs must be configured during the commissioning process.
Connecting the input to **+24V** signifies: **fan / fan group OK**
An **open input or connection to 0 V** signifies: **fan / fan group faulty**

Fault reports are assigned to the GIOD inputs DI1 up to at most DI9.

4.7.4.2 Remote acknowledgement

A manual thermocontact reset can be carried out via the GIOD.
While there is an active fault message, a change of level from low to high (0 V to +24 V) effects a single thermocontact reset.

4.8 Analogue inputs

The GMM has four sensor inputs:

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

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

4.8.1 Connecting a pressure sensor to AI1/AI2

One or two (two-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))

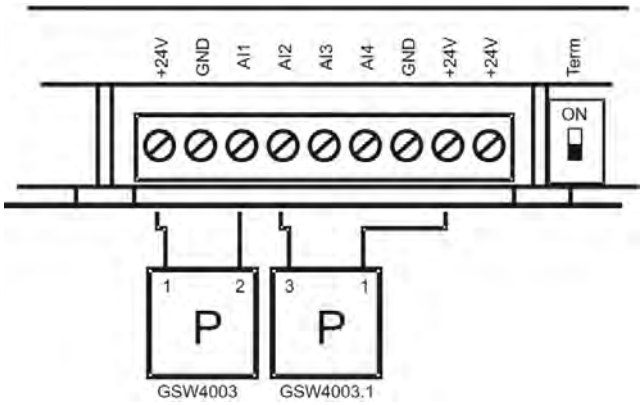
AI2 = 4-20mA signal from sensor 2 (GSW4003.1: blue(3), GSW4003: green(2))

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

ADVICE

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

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



Pressure transmitter connection

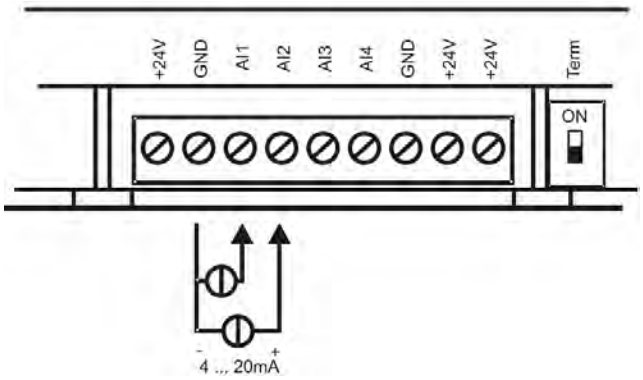
4.8.2 External power signal connection to AI1/AI2

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 4..20mA input signal is scaled 0-100% to a control signal and passed on to the fans.
A setpoint can also, for example, be specified externally via the 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

ADVICE

Make sure the current source polarity is correct!



Power source connection

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

4.8.3 Connecting a passive temperature sensor on AI2

The I/O configuration enables you to switch analogue input AI2 between current input and passive temperature sensor.
See Switchover input AI2, Page 80

In this case it is switched in the same way as input AI3

4.8.4 Connecting a temperature sensor on AI3

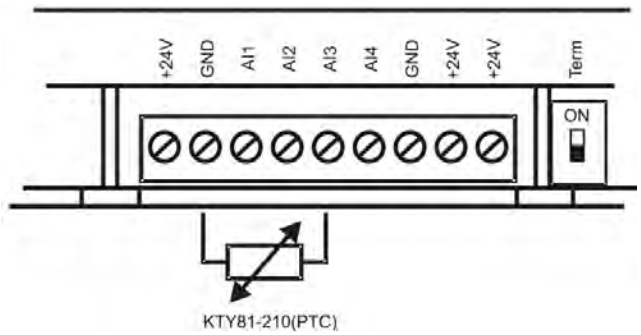
A temperature sensor is connected on the terminals

GND = Earth

AI3 = Signal input

There is no particular sequence for the cores.

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



Temperature sensor connection

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

Impedance	Temperature	Impedance	Temperature
1040Ω	-50°C	2075Ω	30°C
1095Ω	-45°C	2152Ω	35°C
1150Ω	-40°C	2230Ω	40°C
1207Ω	-35°C	2309Ω	45°C
1266Ω	-30°C	2390Ω	50°C
1325Ω	-25°C	2472Ω	55°C
1387Ω	-20°C	2555Ω	60°C
1449Ω	-15°C	2640Ω	65°C
1513Ω	-10°C	2727Ω	70°C
1579Ω	-5°C	2814Ω	75°C

Table: Temperature / Impedance

Impedance	Temperature	Impedance	Temperature
1645Ω	0°C	2903Ω	80°C
1713Ω	5°C	2994Ω	85°C
1783Ω	10°C	3086Ω	90°C
1854Ω	15°C	3179Ω	95°C
1926Ω	20°C	3274Ω	100°C
2000Ω	25°C	3370Ω	105°C

Table: Temperature / Impedance

4.8.5 0-10V voltage signal connection to AI4

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

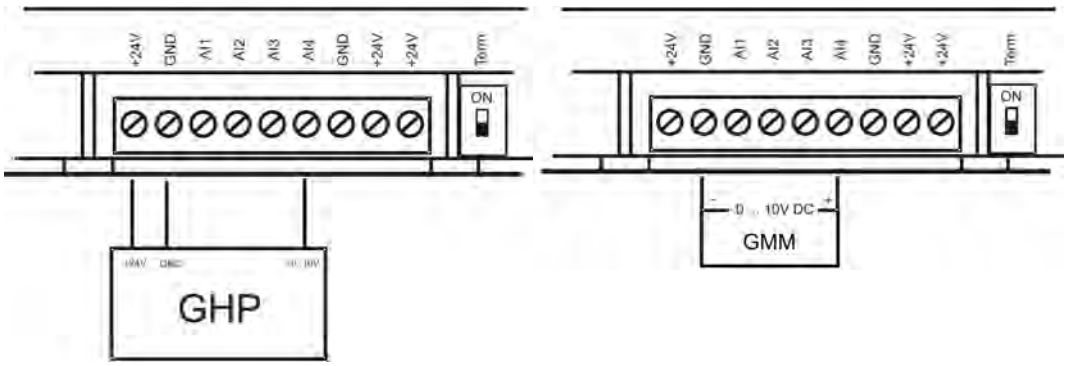
As an alternative, you can also connect a GHP manual potentiometer as a remote control. The connecting terminals on the GHP are labelled with either **1/2/3** or **x/-/Y** :

+ or **3** on **+24V**

– or **1** on **GND**

Y or **2** on **AI4**

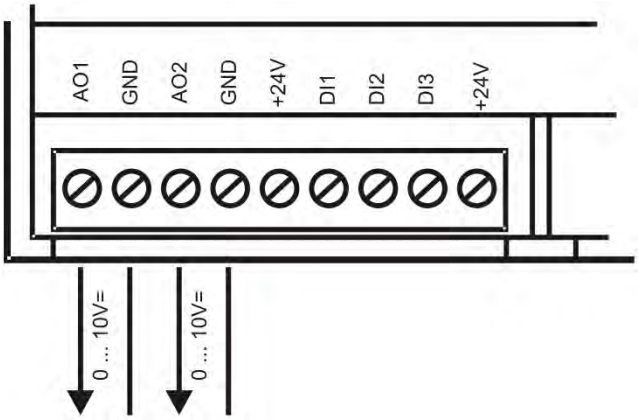
You can then use the speed controller purely as a speed adjuster and specify the fan speed yourself manually.



0-10V standard signal connection

4.9 Analogue outputs

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



Analogue outputs

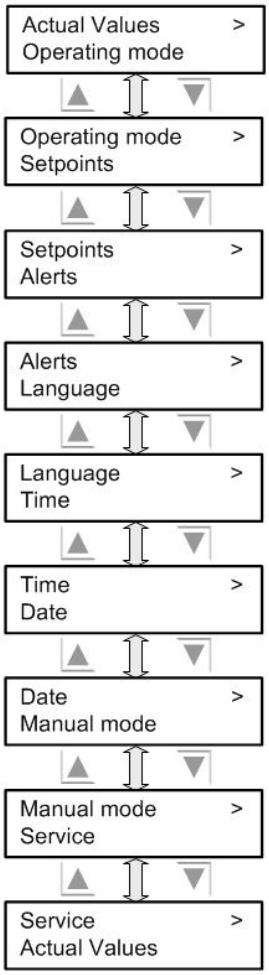
The **AO1** output issues the control signal (0..100%) scaled to 0..10V .

Output **AO2** 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 72

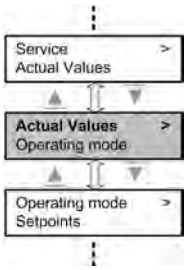
4.10 Operating menu

Structure of basic menu



4.10.1 Actual 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).

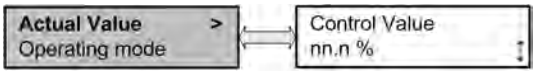
Condenser	No refrigerant	CDS press nn.n bar
Condenser	Refrigerant selected	CDS temp nn.n °C
Drycooler		Outlet temp nn.n °C
Slave	via 0..10V or 4..20mA	Control Value Master nn.n V

4.10.1.2 Ambient temperature

The current ambient temperature is shown.

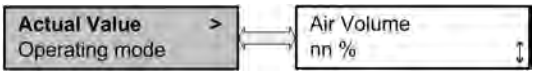
4.10.1.3 Control value

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



4.10.1.4 Air volume

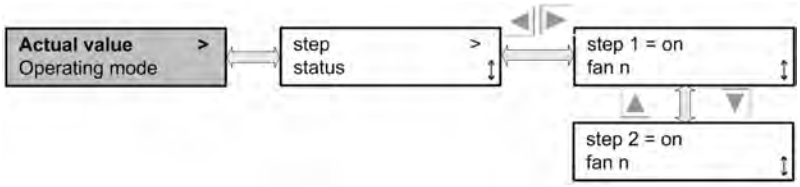
The average control value of all fans is shown here as a percentage.



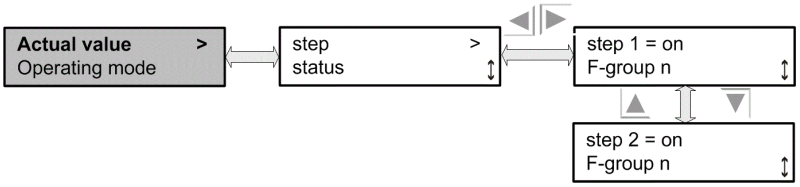
4.10.1.5 Steps

Here the system displays the current status of the step (on or off) and the corresponding digital output.

The length of the list depends on the number of configured steps.



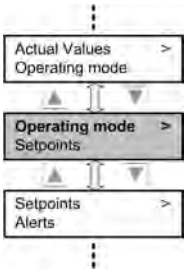
Menu: Individual fan control



Menu: Fan group control

4.10.2 Status

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



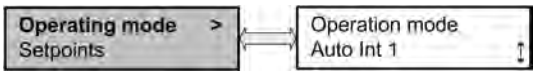
4.10.2.1 Operating mode

This shows the current operating mode.

There are:

Internal control	**Auto int. 1**	Setpoint 1 active	See Auto internal, Page 63
	Auto int. 2	Setpoint 2 active	See Auto internal, Page 63
	Auto ext. 1	Setpoint 1 active	See Auto external , Page 63
	Auto ext. 2	Setpoint 2 active	See Auto external , Page 63
	Auto ext. bus1	Setpoint 1 active via GCM*	See Auto external BUS, Page 64
	Auto ext. bus 2	Setpoint 2 active via GCM*	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 64
Manual mode	**Manual mode**		See Manual mode, Page 56

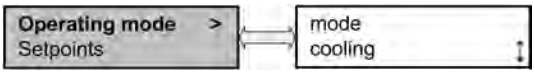
* GCM = Güntner Communication Module



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

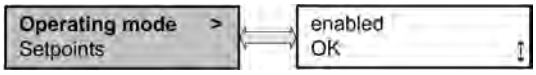
4.10.2.2 Mode

Set heating or cooling mode display.



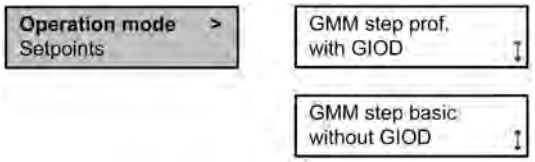
4.10.2.3 External release - Status

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



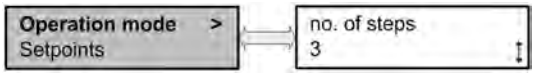
4.10.2.4 GMM type

The configured type is shown here. If a GIOD expansion module is attached, this shows GMM step professional (otherwise, GMM step basic).



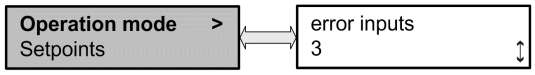
4.10.2.5 Number of steps

The number of steps is displayed here.



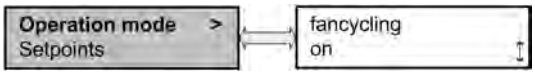
4.10.2.6 Number of error inputs

The number of error inputs is displayed here.



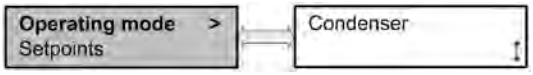
4.10.2.7 Fancycling

This shows whether fancycling is currently on or off



4.10.2.8 Heat exchanger

The heat exchanger type is displayed here.



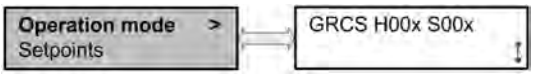
4.10.2.9 Refrigerant

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.

4.10.2.10 Hardware and software versions

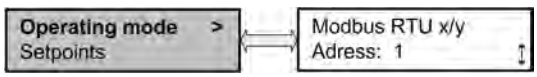
This shows information about the current hardware and software versions of the GMM.

GRCS	= step controller
H	= hardware version
S	= software version



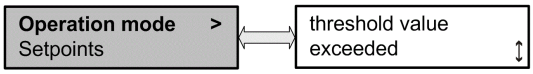
4.10.2.11 Bus module

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



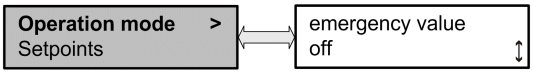
4.10.2.12 Threshold status

This shows whether a configured threshold value has been exceeded or is below.
See Threshold value, Page 51



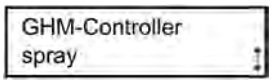
4.10.2.13 Emergency setting status

This shows whether a configured emergency setting is currently active.



4.10.2.14 GHM Controller

If a GHM spray controller is connected, this will be shown 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 current setpoint is displayed when the Setpoint 1 menu option is opened. What is displayed as the setpoint depends on the actual input value defined (voltage, temperature or pressure) and the operating mode (internal control or slave operation). As an example, setpoint 1 is displayed as the temperature.

Press the enter key to enter EDIT mode.

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

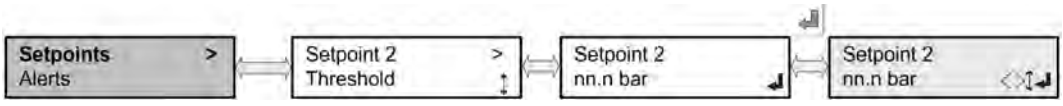
The minimum and maximum adjustment range is:

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

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

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 digital input **DI3**. Setpoint 2 is programmed the same way as **setpoint 1**.

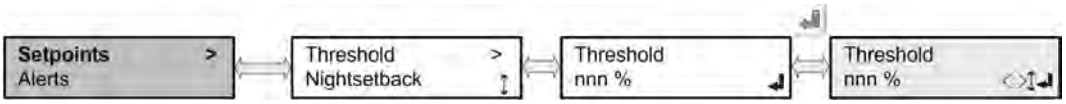


4.10.3.3 Threshold value

This function is available only for GMM step professional with from two to eight steps.

Here you can set the threshold values, violation of which will activate the threshold function. Appropriate threshold values for the configured system are offered in the Service menu (see Threshold value, Page 73).

The threshold relay DO4 trips when the threshold value is exceeded.



4.10.4 Alerts

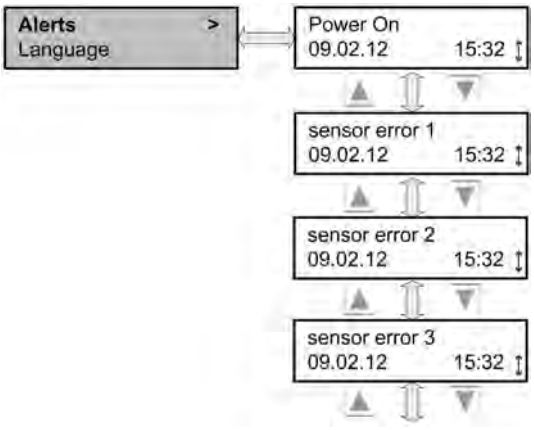
The last 85 alerts can be called up here.

4.10.4.1 Alert memory

The GMM has an alert memory that can accommodate up to 85 incident report, turn-on and reset times stored consecutively (cyclically). These incident reports consist of the fault and the time stamp, comprising the date and time when the fault occurred. For a list of error messages and warnings see Error messages and warnings , Page 96.

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

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

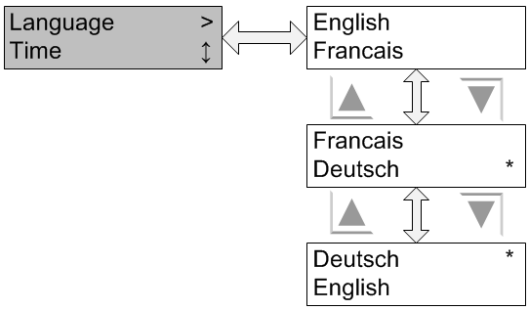


4.10.5 Language

The menu language can be selected here.

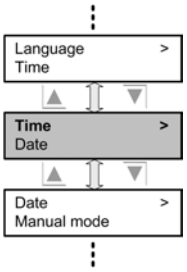
4.10.5.1 Language selection

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



4.10.6 Time

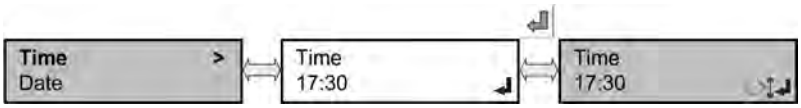
The time can be selected here.



4.10.6.1 Time setting

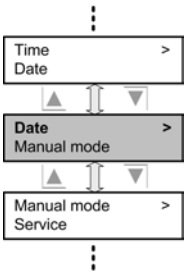
The set time is displayed and changed where required in the 24-hour clock.

The time is used to enter the alarm times in the alarm memory and for all timer functions.



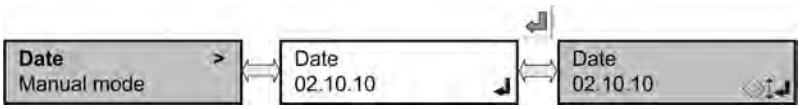
4.10.7 Date

The date can be set here.



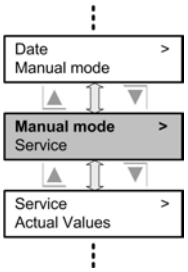
4.10.7.1 Set date

The date is used to enter the alarm times in the alarm memory and for all timer functions.



4.10.8 Manual mode

Manual mode is used to start up the heat exchanger fans by hand.
Manual mode does not depend on DI1 enabling.
Manual mode has the highest priority and switches off all other control types.
The fact that manual mode is active is recorded permanently. In other words, it will still be active after you have switched the system off and back on.



Manual mode can also be activated via digital input 2. The digital input has to be configured accordingly for this purpose in the Service menu (see Digital inputs, Page 82 or External fault/External manual mode, Page 37).
If the input is configured and connected with +24 Volt, the previously defined manual mode control value is output.

4.10.8.1 Manual mode settings

In order to set manual mode you first need to select the desired type of manual operation from the “Mode” menu.

Manual mode off:
Manual mode is inactive.

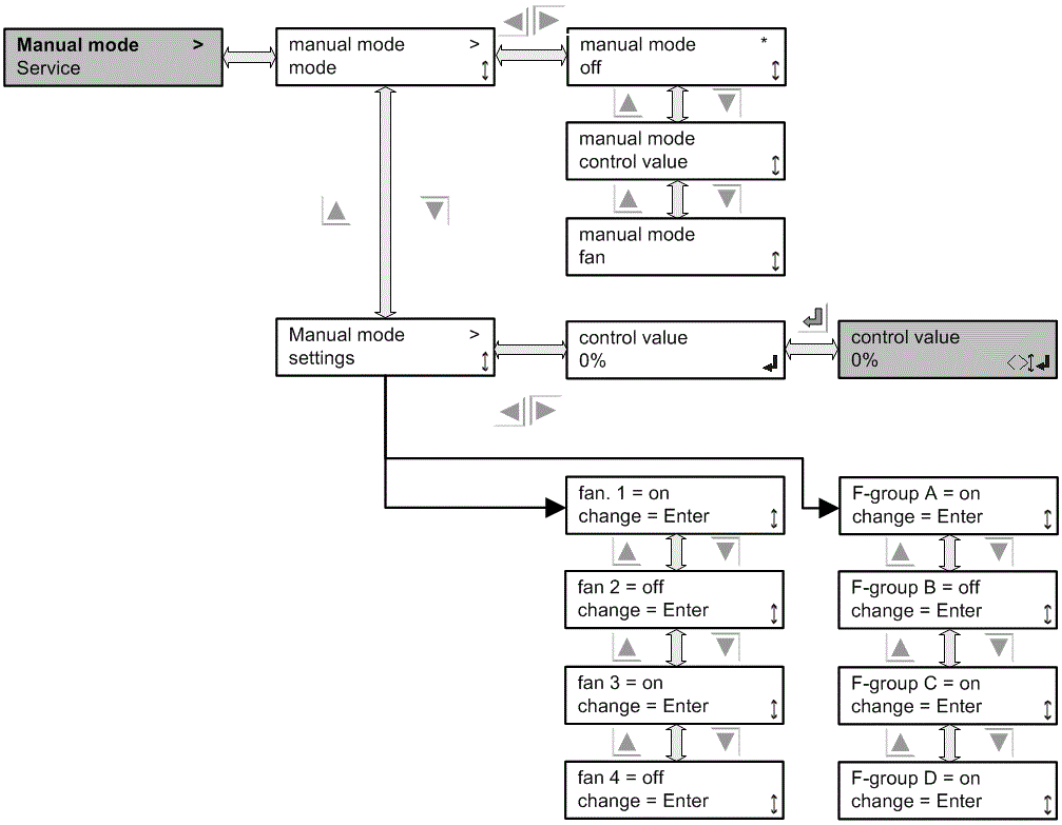
Manual mode control value:
Manual mode has been activated, the control values are prescribed by a parameter.

Manual mode fans:
Manual mode has been activated, each fan or fan group can be specifically switched on or off.

Manual mode settings:
When manual mode is active, this enables you to modify either the manual control value or the state of the relevant output.

ADVICE

The settings for manual mode are fail-safe. After switching the GMM step off and back on, the most recently specified manual mode is reactivated and again has higher priority than all other control types.



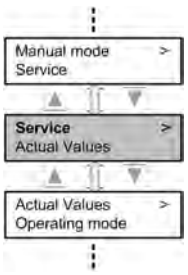
4.11 Service

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

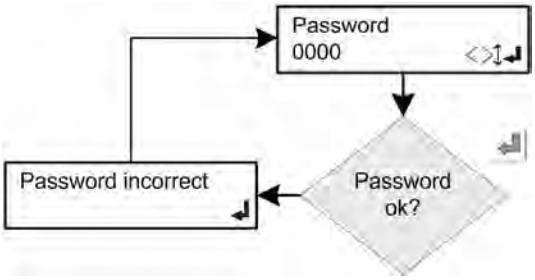
The password is **3795**.

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

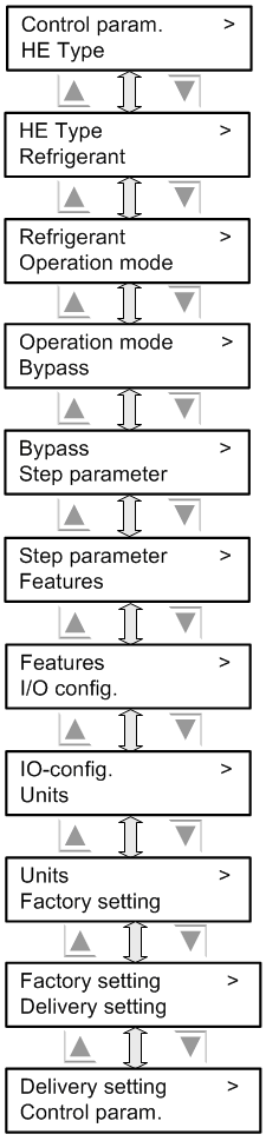
The password is valid for 15 minutes and will not be requested again during this time.



Password prompt

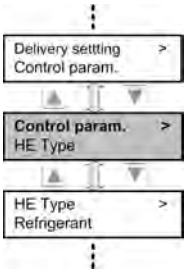


Service menu set-up

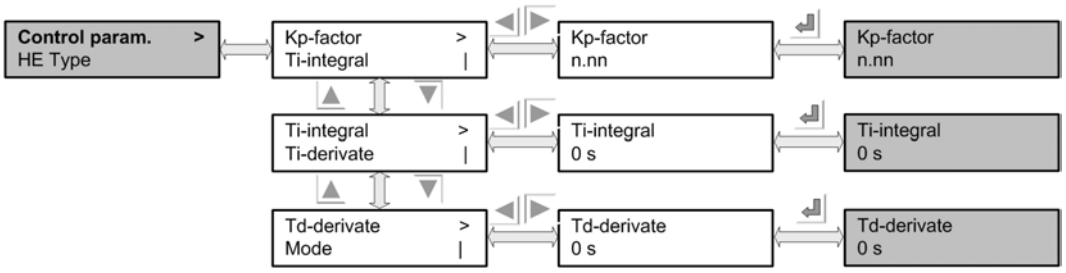


4.11.1 Control parameters

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



4.11.1.1 Control parameters Kp, Ti and Td

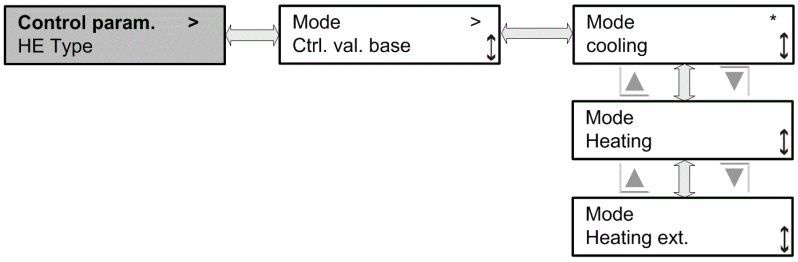


The Kp factor can be entered in a range from 0.1 to 100.0 to one decimal place. The Kp factor specifies the control amplification. It is the proportion of the control path following the input signal.

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

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

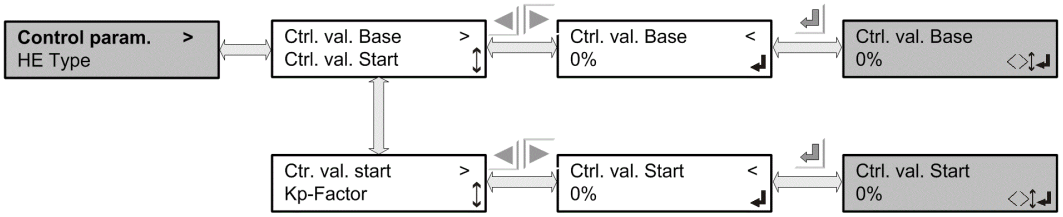
4.11.1.2 Cooling/heating control parameter mode



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** function is used to set a minimum speed.

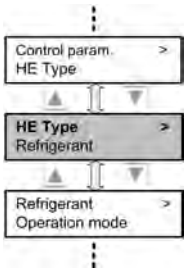
The **start control value** function is used to define a start point for issuing the control value.

Here are some setting examples:

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

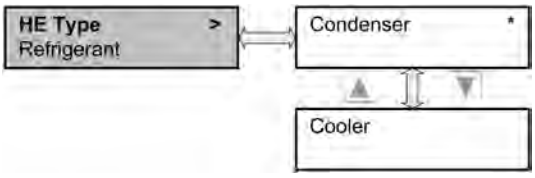
4.11.2 Heat exchanger

The heat exchanger type is selected here.



4.11.2.1 Heat exchanger type

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

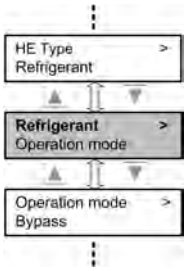


→ Select with ENTER.

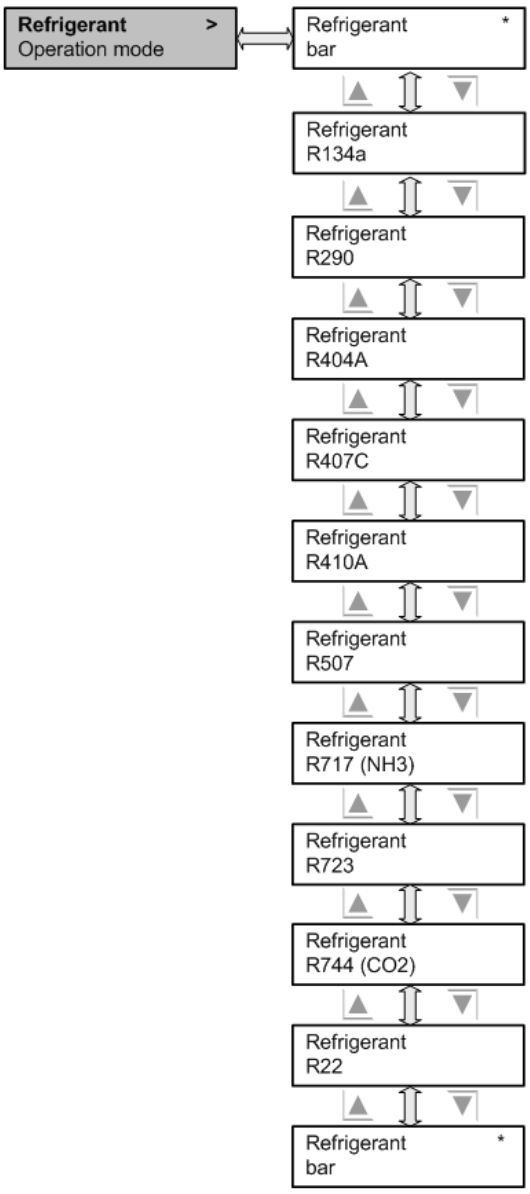
4.11.3 Refrigerant

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

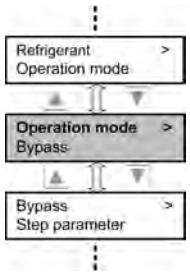


In this menu option you can select whether a refrigerant has been defined and whether the display of reference and current values with temperature should be converted accordingly, or whether no refrigerant has been defined (bar) and the setpoints and current values should be displayed as pressure.

The selected option is displayed with a *.

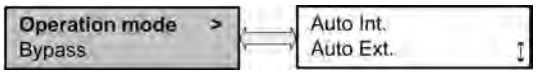
4.11.4 Operating mode

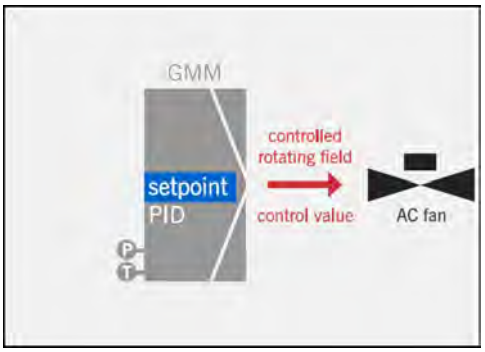
The operating mode can be set in this mode.
The active mode is shown with a *.



4.11.4.1 Auto internal

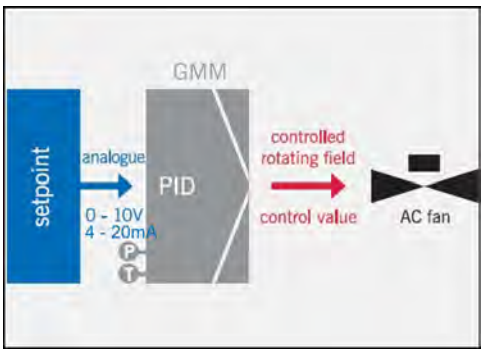
In this mode, control is automatic on the basis of the setpoint defined internally. This setpoint is entered in the **Setpoints** menu option.





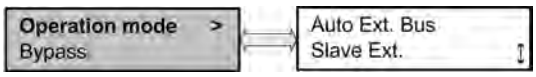
4.11.4.2 Auto external

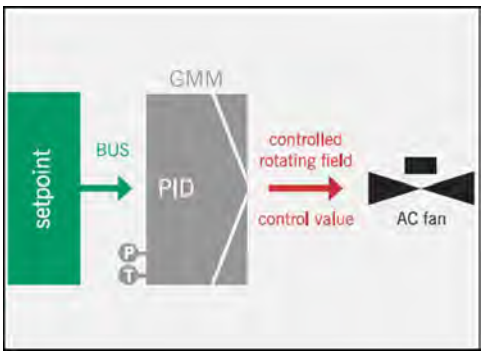
In this mode, control is automatic on the basis of the setpoint defined externally by the analogue input. Which input delivers the setpoint and which the actual value is defined in the IO configuration.



4.11.4.3 Auto external BUS

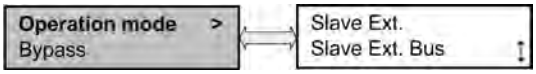
In this mode the setpoint is specified via BUS.
A Güntner Communication Module (GCM module) is required for this operating mode.

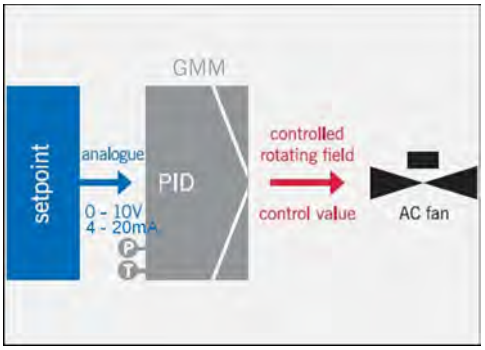




4.11.4.4 Slave external

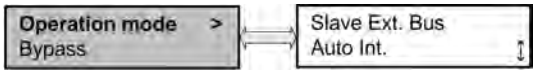
In this mode, there is no internal control. Instead the control value on the slave input is scaled and forwarded directly to the fans. Which input is to be used as the slave input is defined in the I/O configuration.

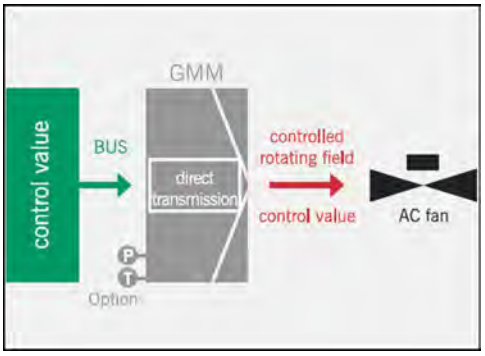




4.11.4.5 Slave external BUS

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

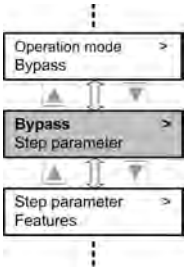




4.11.5 Bypass

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 in the event of a fault in a GMM component.



4.11.5.1 Software bypass (SW bypass)

In the event of a sensor failure, this configured control value will be output.
Default = 100%

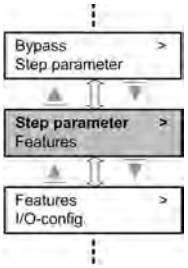
4.11.5.2 GIOD bypass

This function is available only in GMM step professional.

If the GRCS.1 should fail, a configurable number of outputs on the GIOD.1 will be activated. The number of outputs is set to zero by default.

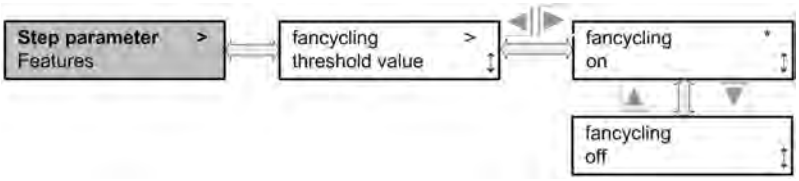
4.11.6 Step parameters

Here you can modify the parameters of the step generator.



4.11.6.1 Fancycling

When fancycling is active, the running times of all the fans will be balanced.
This ensures that, on average, all the fans are subjected to the same load.

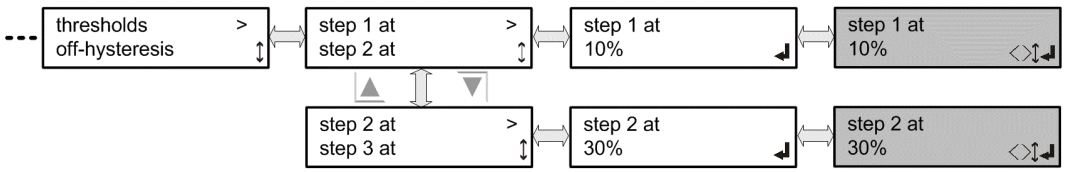


ADVICE

With active fancycling there is NO 1:1 correlation between active steps and outputs.

4.11.6.2 Threshold value

Here you can specify a threshold value for each step.
The step will then be switched active when the control value of the internal PID controller reaches this threshold.

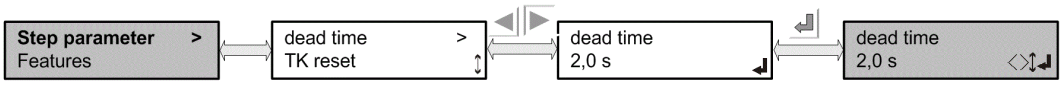


4.11.6.3 Off hysteresis

A hysteresis is defined to prevent a given step from being switched on and off too frequently.
This means that each stage switches off only when it reaches the corresponding threshold value minus the hysteresis.

4.11.6.4 Dead time

This is the time until the next higher step is switched in.
This prevents a number of steps from being switched in simultaneously.



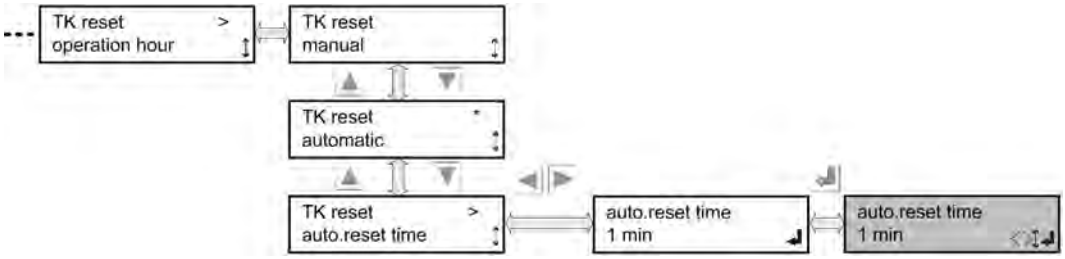
ADVICE

Switching the steps back down is carried out with no hold-off time.

4.11.6.5 Thermocontact reset

The thermocontacts of the fans are used to interrupt a self-maintaining actuation of the contactor.
An overheated fan is thus switched off. The thermocontact reset circuit can also be used to reactivate the self-maintaining function.
The thermocontact reset is a pulse of about two second duration and is output on digital output DO3 on the GRCS.

The function can be set up in this menu.
A thermocontact reset pulse is emitted by default when the controller is first switched on and one minute after any fault message.



4.11.6.6 Running times

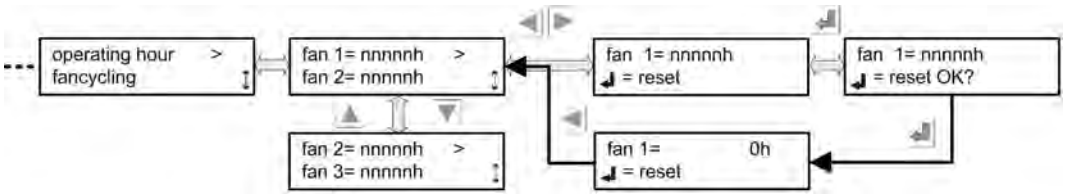
The **active** running times for each fan or fan group are established and can be displayed here. These times are cumulated from the initial commissioning. Each active second for a fan or fan group is recorded.

Among other things, the recorded running times of fans are used for the fancycling function, to enable fan operation to be balanced.

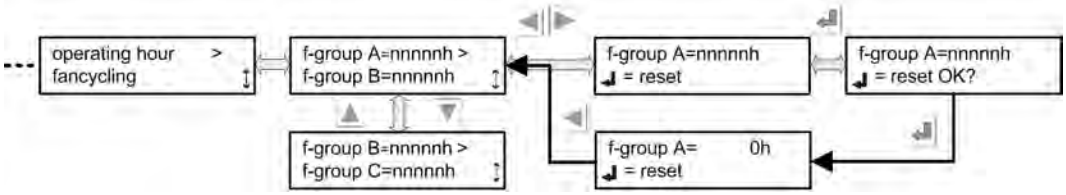
You can clear the running times for individual fans or fan groups. This will be appropriate e.g. when a fan has been replaced.

Resetting the controller to its factory or delivery settings does **not** clear the running times of fans or fan groups.

A maximum of 65535 hours running can be recorded for each fan or fan group. This is relatively unrealistic,
but if this value is ever reached, the running times of **all** the fans and fan groups will be zeroed.
An entry will also be made in the alarm history.



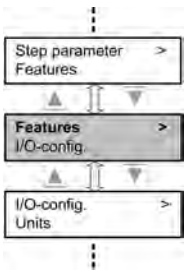
Menu: Individual fan control



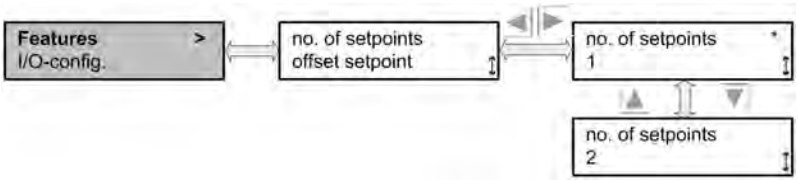
Menu: Fan group control

4.11.7 Features

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



4.11.7.1 Number of setpoints

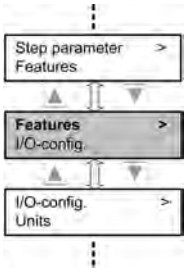


The number of setpoints is set here. The minimum number is 1 setpoint on which control is performed. If 2 setpoints are selected, switchover is via digital input **DI3**. If the input is open, setpoint 1 is used for control.

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

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

4.11.7.2 Offset setpoint



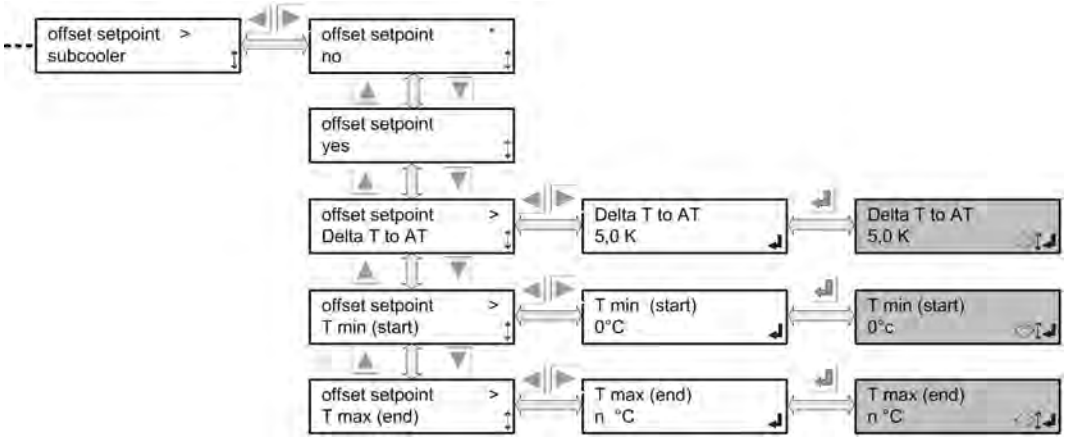
It is beneficial in order to ensure the optimum energy operation to displace the setpoint under certain circumstances, depending on the external temperature.

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

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

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

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



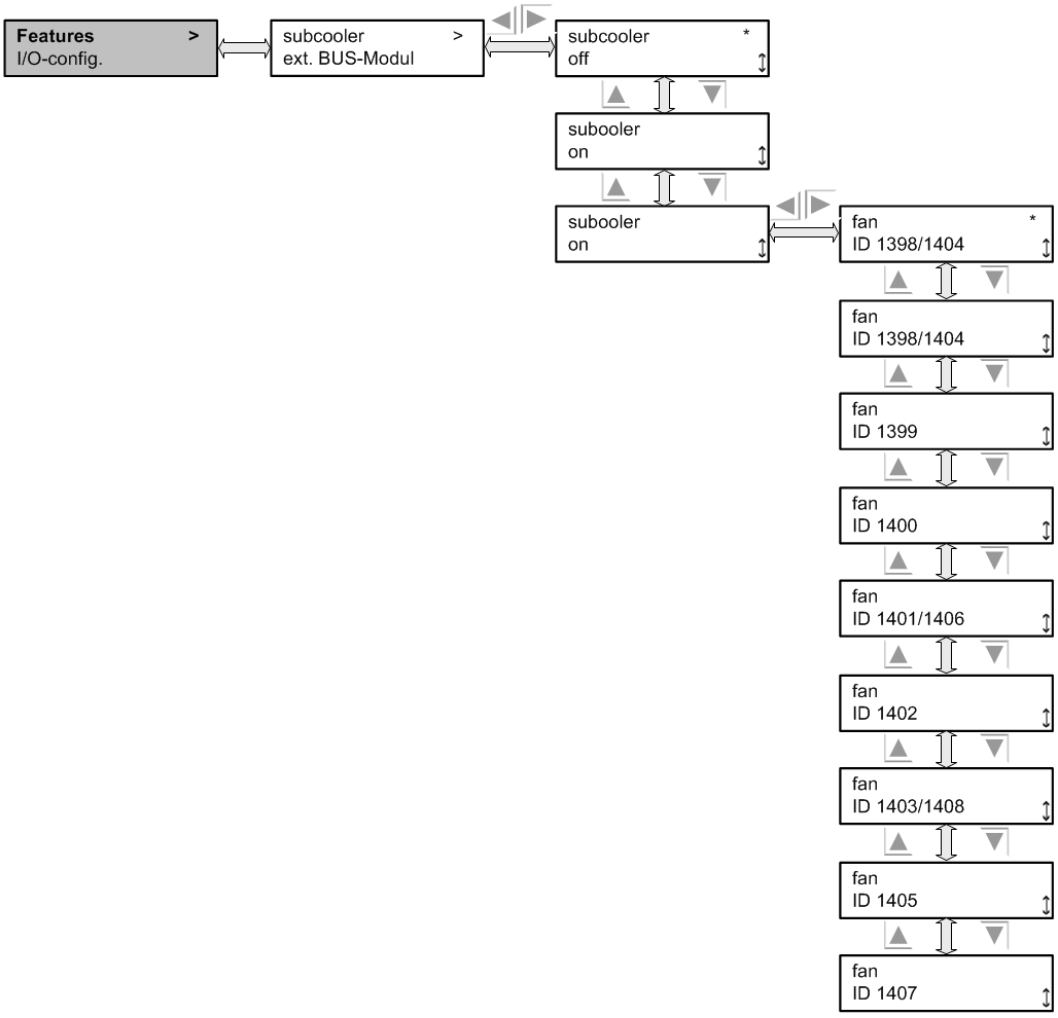
4.11.7.3 Subcooler function

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

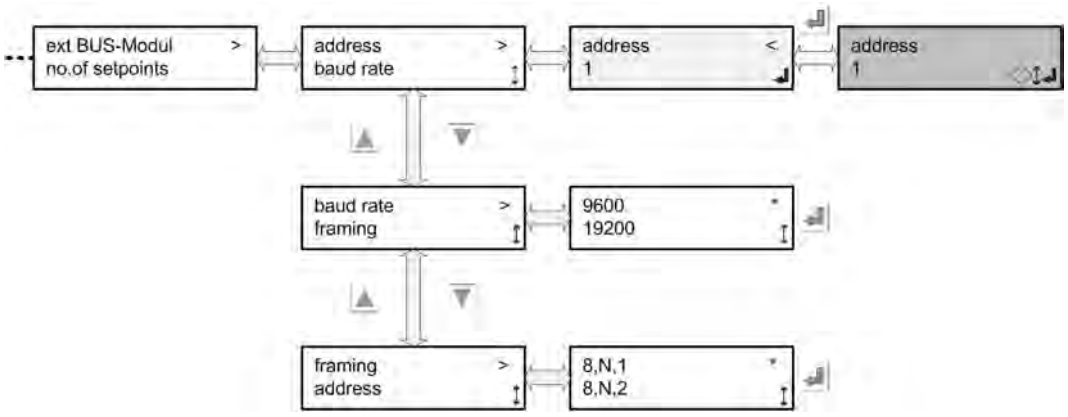
This subcooler runs constantly, independent of the regulation of the control unit with the set speed. It is activated like the regulated fans via the enable.

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

The fan type used is selected in the selection menu.



4.11.7.4 External BUS module



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

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

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

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

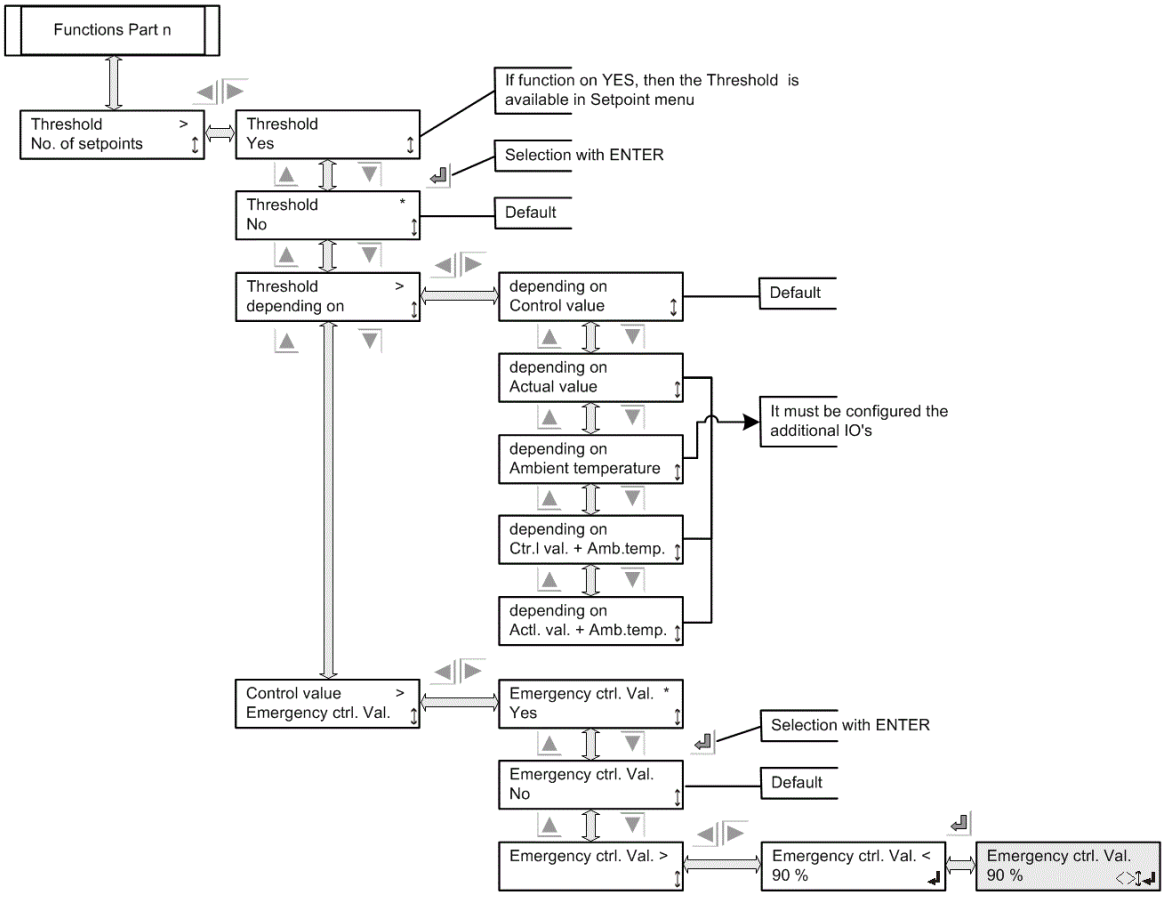
ADVICE

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

4.11.7.5 Threshold value

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

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



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

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

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

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

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

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

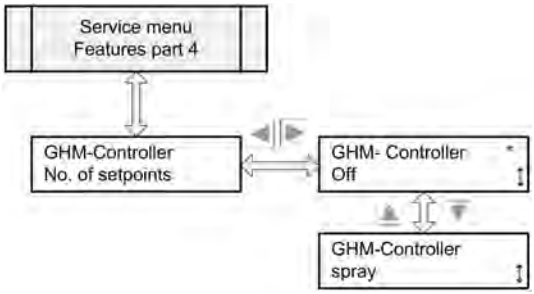
Emergency control value Yes/No/Emergency control value:
The emergency control value is issued as a control value when the following conditions are satisfied:
- Threshold value function is active
- Threshold value condition(s) exceeded
- Emergency control value function is active
- Emergency control value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

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

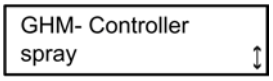
4.11.7.6 GHM Controller

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

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

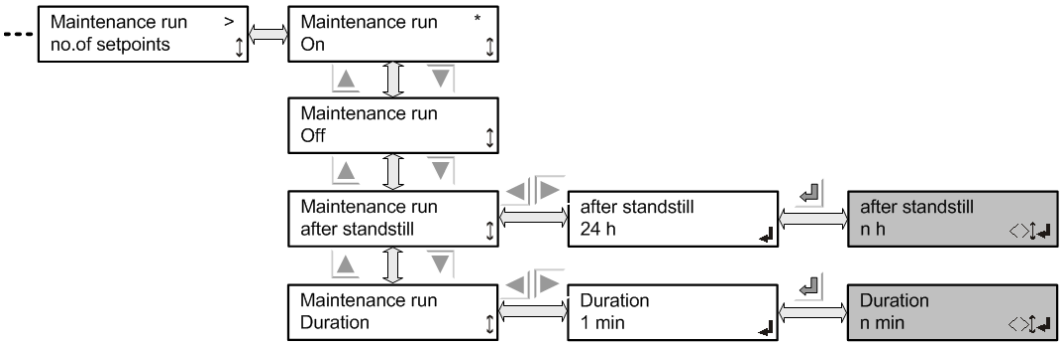


If the GHM spray function is activated, this will be displayed in the status menu:



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

4.11.7.7 Maintenance run



A maintenance run is activated in response to the length of time the fans have been stationary. Its purpose is to prevent them from becoming jammed.

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

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

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

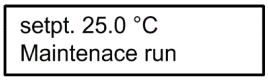
A maintenance run is carried out at full speed, but this will be reduced by an active night limit.

The following parameters can be set up:

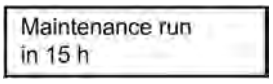
“Maintenance run On/Off”:
Default = **On**
This is used to turn the function on or off.

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

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



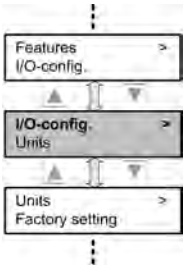
The Info menu display “**Maintenance run**” flashes while a maintenance cycle is in operation.



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

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

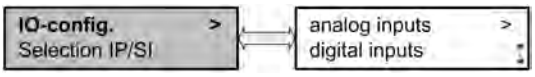
The analogue inputs are measurement inputs for recording temperature or pressure values.

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

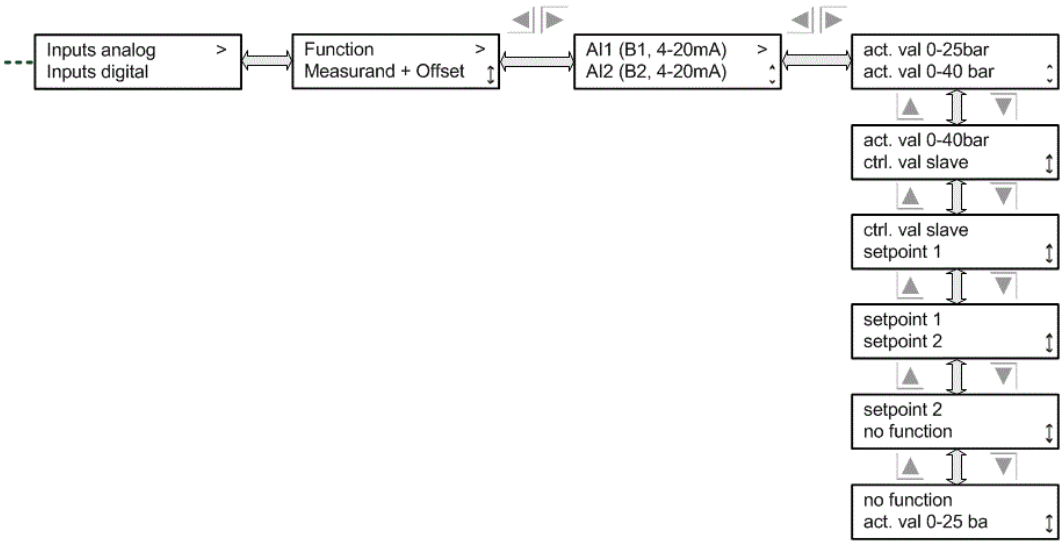
Terminals **AI1** and **AI2** are two current inputs (4-20mA).

Input **AI2** can be switched over to serve 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** .



4.11.8.1.1 Current inputs AI1



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

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

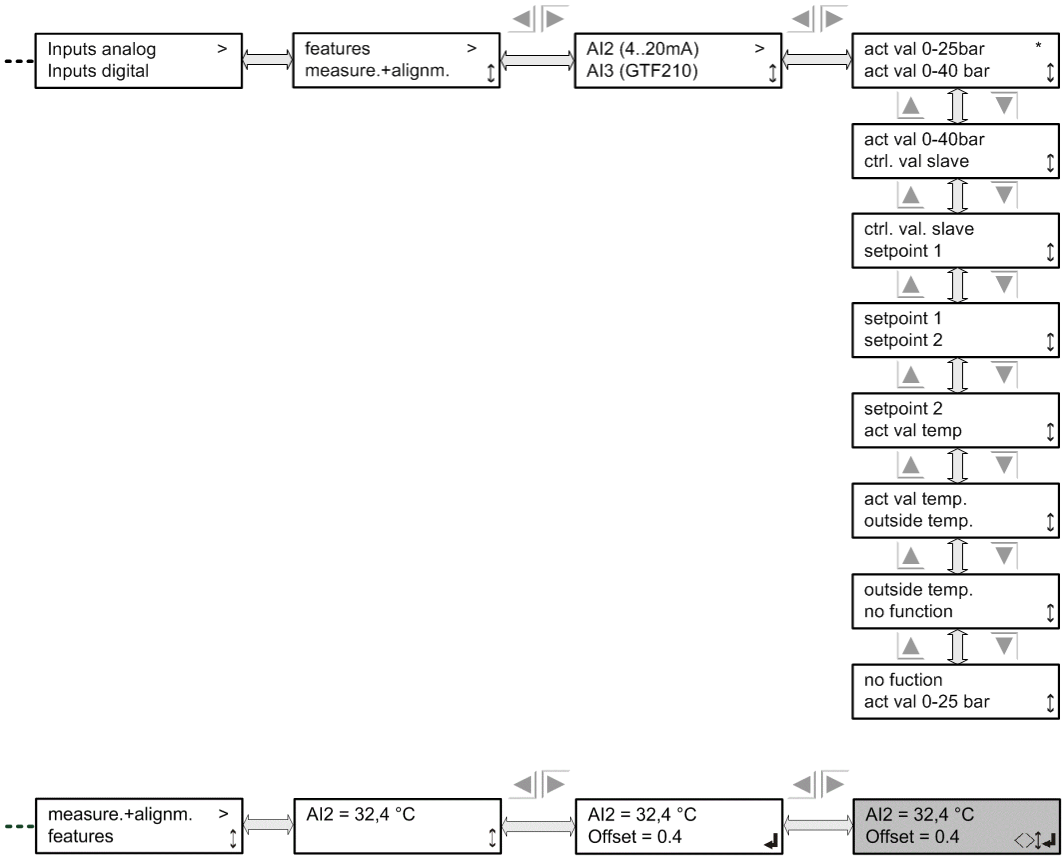
Setpoint 1 means that setpoint 1 on which internal control is performed is specified via the current input. The current input is scaled to the set actual value (see table Error messages and warnings , Page 96). The origin of the actual value still has to be configured. Make sure that the "Auto ext" mode has been selected in the Operating mode menu.

Setpoint 2 is offered only if the number of setpoints has been configured as **2** (see Number of setpoints, Page 70). If setpoint 2 is configured, the same applies as described with **Setpoint 1** .

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

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

4.11.8.1.2 Switchover input AI2



ADVICE

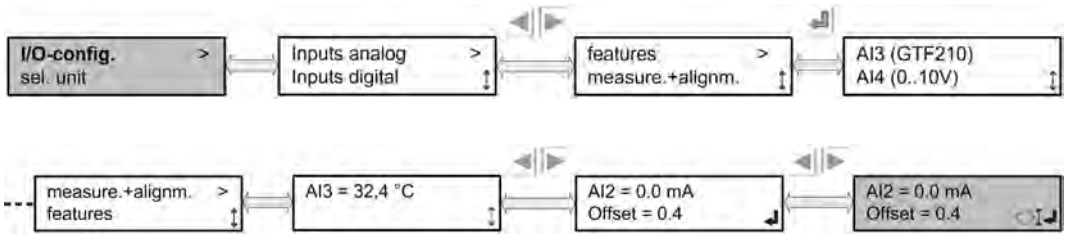
The Service menu enables you to adjust the temperature sensors by specifying an offset for the configured temperature inputs AI2 and AI3.

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

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

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

4.11.8.1.3 AI3 input temperature sensor



ADVICE

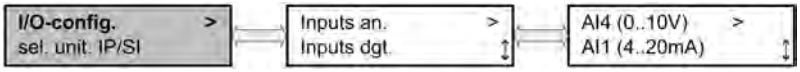
The Service menu enables you to adjust the temperature sensors by specifying an offset for the configured temperature inputs AI2 and AI3.

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

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

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

4.11.8.1.4 0..10V AI4 input



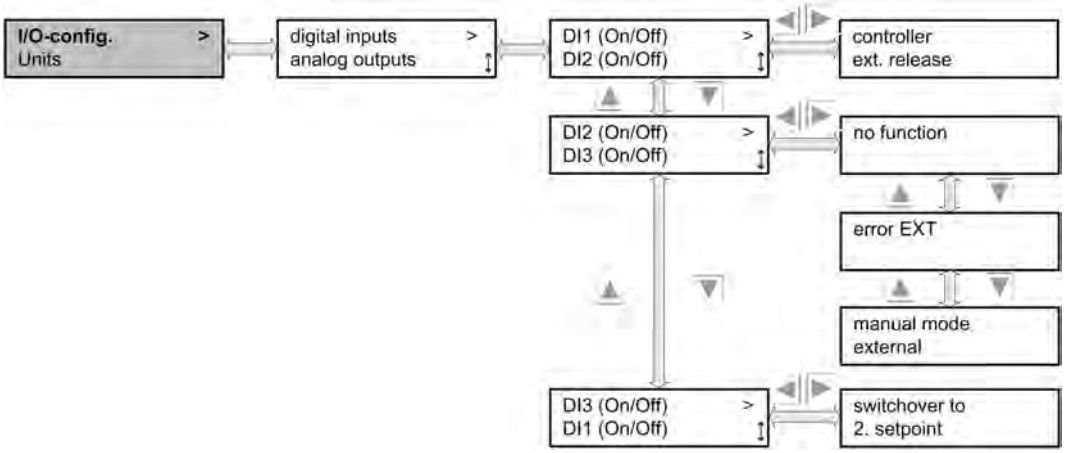
act. val 0.10V means that the current value (0-10V) for the controller should be connected to this input. Make sure that the **mode** “Auto Int” has been selected from the Operating mode menu.

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

setpoint 2 is offered only if the number of setpoints has been configured as **2** (see Number of setpoints, Page 70). If setpoint 2 is configured, the same applies as described for **Setpoint 1** .

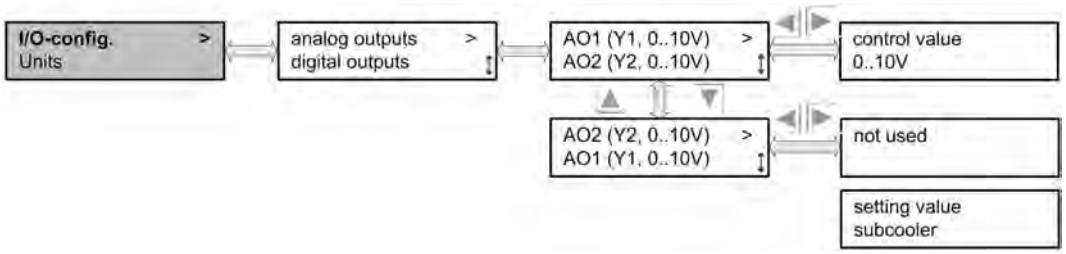
4.11.8.2 Digital inputs

The digital inputs on terminals **DI1**, **DI2** and **DI3** are control inputs.



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

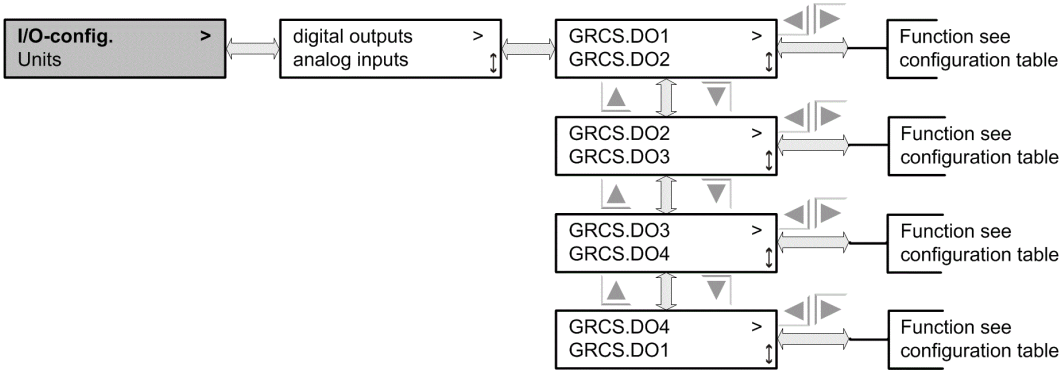
4.11.8.3 Analogue outputs



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

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

4.11.8.4 Digital outputs



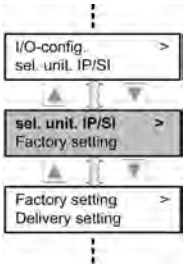
The digital outputs are relay contacts. Each output has a 250V/1A two-way contact. The alarm outputs Prio 1 and Prio 2 are **connected as failsafe** contacts, i.e. the contact is closed when there is no current.

Fixed functions are assigned to the digital outputs.

For information about the function, see Configuration table, Page 33.

4.11.9 SI/IP selection

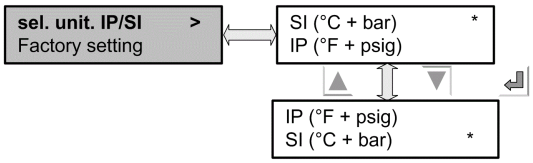
The units system can be selected here.



4.11.9.1 SI/IP units system

Unit selection for pressure and temperature.

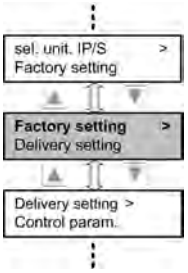
International units →	**SI** (**S**ystème **i**nternational d´ unités)
Anglo-American units →	**IP** (**Imp**erial System)



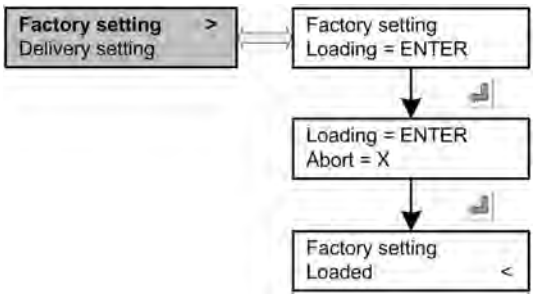
The selected unit of measurement is marked with a *****.

4.11.10 Factory setting

The control can be reset to factory settings here.



4.11.10.1 Control reset (factory setting)



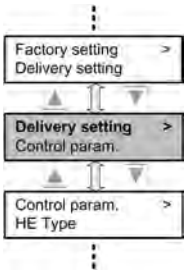
ADVICE

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

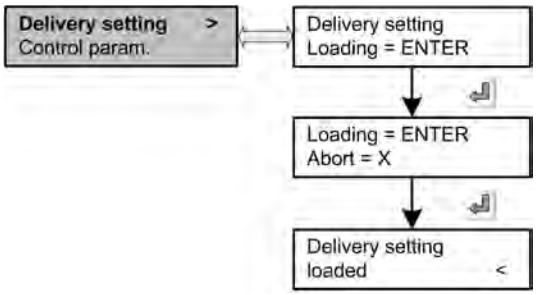
See Factory setting, Page 94

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)



ADVICE

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

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 **X**).

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

• If the message “Equipment failure” is displayed, there is a fault pending at all outputs.

• For other error messages see Table Error messages and warnings , Page 96

TEST POINT 2:

Mains connection:

• Are all phases present?

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:

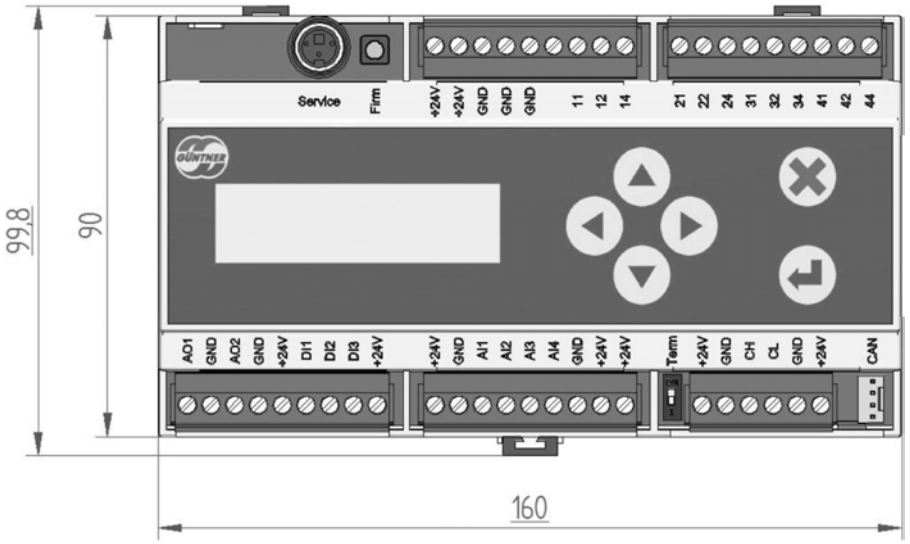
• Is the fuse on the controller supply OK?

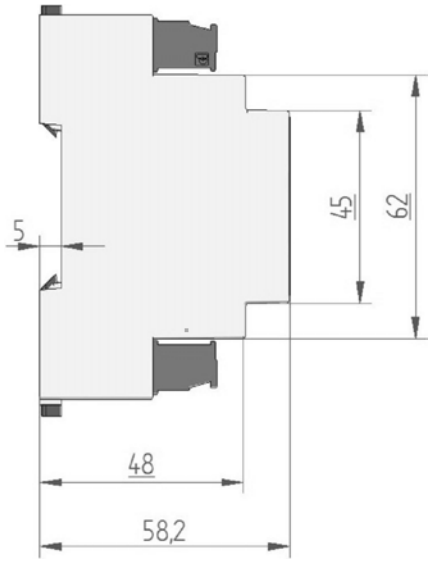
6 Technical data

6.1 Component dimensions - Dimensions / Weight

Dimensions of GRCS.1

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



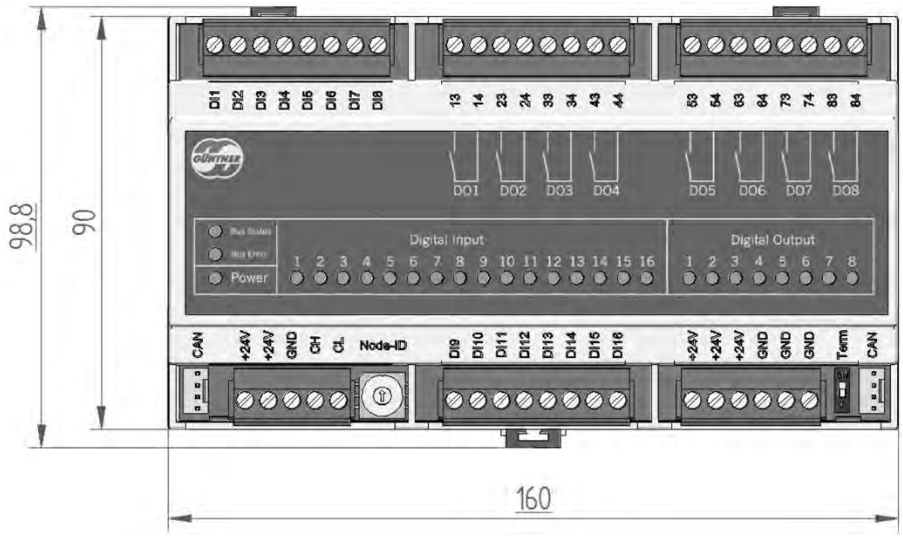


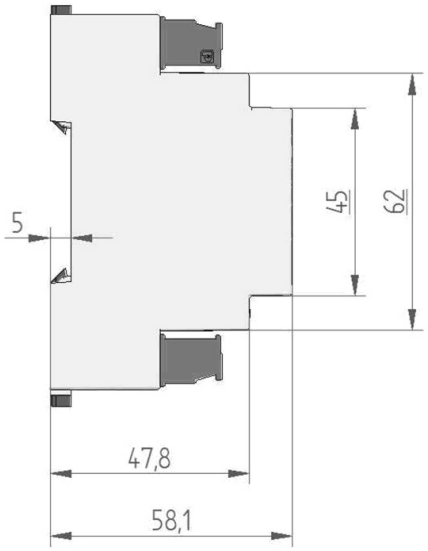
Casing dimensions of GRCS.1

Weight:
ca. 340g

Dimensions of GIOD.1

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





Dimensions of casing of GIOD.1

Weight:
ca. 340g

7 Electrical properties of the components

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

Table: Electrical properties of GRCS.1

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

Table: Electrical properties of GRCS.1

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

2. Of the appropriate range

Electrical properties of GIOD.1				
	Min	**Type**	**Max**	**Unit**
Power supply DC	21	24	30	V
Current consumption		100	250	mA
Digital inputs				
High level	15	24	30	V
Low level	-3	0	5	V
Relay outputs				
Power supply DC		24	30	V
Voltage AC			250	V
Current resistive load 24V DC/250V AC			1	A
Current inductive load 24V DC/250V AC			1	A
Switch cycles, mechanical	$1*10^6$			Switching cycles
Switch cycles, electrical	$1*10^5$			Switching cycles
CAN bus				
Dielectric strength	-24		24	V
Transmission rate		125		kbit/s

Table: Electrical properties of GIOD.1

8 External control value scaling

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

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

Table: External control value scaling

9 Factory setting

	Dry cooler		Condenser with refrigerant		Condenser without refrigerant	
Units	**SI**	**IP**	**SI**	**IP**	**SI**	**IP**
Language	English					
Setpoint 2 present	No					
Setpoint displacement	No					
Kp	10.0	10.0	10.0	10.0	20.0	20.0
Ti	25 sec.	25 sec.	25 sec.	25 sec.	40 sec.	40 sec.
Td	25 sec.	25 sec.	25 sec.	25 sec.	40 sec.	40 sec.
Base control value	0%					
Start control value	0%					
Setpoint 1 (2)	30°C	80°F	40°C (25°C CO2)	104°F (77°F CO2)	12.5 bar	181 psig
Threshold value	No					
Manual mode	Off					
Manual mode control value	0%					
Setpoint displace-ment Δ T	5 K					
External temperature displacement min.	0°C	32°F	0°C	32°F	0°C	32°F
External temperature displacement max.	50°C	122°F	50°C	122°F	50°C	122°F
Depends on external temperature disp.	Off					
Subcooler function	Off					
Heating function	Off					
Fancycling	On					
Thresholds of steps	Defaults (depending on the number of steps)					
Hold-off time	2 sec.					
Off hysteresis	Depending on the number of steps					
Function of digital input DI2	Ext. error Off					
SW bypass	100%					

Table: Factory setting

	Dry cooler		Condenser with refrigerant		Condenser without refrigerant	
Units	**SI**	**IP**	**SI**	**IP**	**SI**	**IP**
GIOD bypass (only with GMM step prof.)	Off (0 steps)					
TC reset	Automatic					
Auto reset time	1 min					
Maintenance run function	On					
Duration of maintenance run	1 min					
Maintenance run after stop	24 h					

Table: Factory setting

10 Error messages and warnings

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

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

Messages / warnings on the display	**PRIO 1** GMM step prof.	**PRIO 2** GMM step prof.	
Display dark, GMM step OFF	X	X	**Displayed where?** - **Explanation:** GMM has no supply voltage **Possible cause:** Main switch off, power pack has no power supply, power pack defective, display defective **Measure:** Check the power supply and the fuses
No sensor selected			**Displayed where?** Info menu **Explanation:** No sensor activated in the I/O configuration **Possible cause:** Error in the I/O configuration **Measure:** Choose the appropriate assignment in the I/O configuration
not enabled	-	–	**Displayed where?** Info menu **Explanation:** DI1 (enable) not switched (open or 0 V) **Possible cause:** Enable input DI1 on the GRCS is not switched; no enable from a higher-level controller; jumper between +24V and DI1 not in place **Measure:** Check the wiring; if appropriate check the signal from a higher-level control unit or controller

Table: Error messages / warnings on the display

Messages / warnings on the display	PRIO 1 GMM step prof.	PRIO 2 GMM step prof.	
error EXT	-	X	**Displayed where?** Info menu + alarm memory **Explanation:** Input DI2 is configured as an external error input (see IO configuration / digital input) and is not switched (open or 0 V) **Possible cause:** Thermocontact of a fan has triggered, one output is not OK (motor circuit breaker has triggered), one fan output has been switched off, something else is switched incorrectly **Measure:** Check whether the input is used as an error input, if appropriate deactivate it in the IO configuration; check whether there is a fan fault; check the circuit breaker; if this error occurs frequently the fan may be defective and should be replaced
error EXT OK	-	–	**Displayed where?** Alarm memory **Explanation:** The error status has been resolved, input DI2 is switched (+24V) **Possible cause:** The thermocontact of a fan has closed again; an output is OK again; circuit breaker has been switched on. Some other fault message has been resolved. **Measure:** None required
Setpoint 2	-	-	**Displayed where?** Info menu **Explanation:** Control is on setpoint 2, DI3 is connected (+24 V) **Possible cause:** This is generally due to a specific action from the customer interface **Measure:** None required
Sensor fault 1	-	X	**Displayed where?** Info menu + alarm memory **Explanation:** The sensor on input AI1 is defective or the signal is out of range (4 ... 20 mA). **Possible cause:** Cable break, sensor not connected or defective **Measure:** Check the I/O configuration; check the connections and wiring; check the input current, which must lie in the range 4 to 20 mA, values below 2 mA will trigger the fault; replace the sensors

Table: Error messages / warnings on the display

Messages / warnings on the display	PRIO 1 GMM step prof.	PRIO 2 GMM step prof.	
Sensor fault 2	-	X	**Displayed where?** Info menu + alarm memory **Explanation:** The sensor on the switchable input AI2 is defective or the signal is out of range (4 ... 20 mA or KTY). **Possible cause:** Cable break, sensor not connected or defective **Measure:** Check the I/O configuration; check the connections and wiring; check the input current, which must lie in the range 4 to 20 mA, values below 2 mA will trigger the fault; replace the sensors, if a KTY sensor is connected, check the value of the resistance
Sensor fault 3	-	X	**Displayed where?** Info menu + alarm memory **Explanation:** The sensor on input AI3 is defective or the signal is out of range (KTY). **Possible cause:** Cable break, sensor not connected or defective **Measure:** Check the I/O configuration; check the connections and wiring; replace the sensors
Sensor fault 4	-	X	**Displayed where?** Info menu + alarm memory **Explanation:** The signal is out of range (0...10 V) **Possible cause:** Voltage is higher than 12V **Measure:** Check the I/O configuration; check the voltage of the power source, which must lie between 0 and 10 V. You may have +24 V connected to this input.
GIOD NOK	X	-	**Displayed where?** Info menu + alarm memory **Explanation:** The GIOD expansion module has a fault status. **Possible cause:** No communication to GIOD, CAN connection down (cable not OK or not plugged in, GIOD without power or defective, the rotary code switch on the GIOD is not set to address 1 **Measure:** Check that the GIOD is receiving power; check the CAN connection between the GRCS controller and the GIOD, it may be missing or plugged in correctly; check the cable connection; set the rotary node ID switch on the GIOD to address 1 and switch the GMM step off and back on

Table: Error messages / warnings on the display

Messages / warnings on the display	PRIO 1 GMM step prof.	PRIO 2 GMM step prof.	
GIOD OK	-	-	**Displayed where?** Alarm memory **Explanation:** The GIOD expansion module has started operation correctly. **Possible cause:** OK message after switching on the power supply to GMM step or after GIOD has successfully logged itself on afresh **Measure:** None required
GIOD PRE_OPERA	-	-	**Displayed where?** Alarm memory **Explanation:** The GIOD expansion module has taken on CANopen status PRE_OPERATIONAL. **Possible cause:** This is a CANopen-specific reaction from the GIOD caused by incorrect or missing communication **Measure:** Usually no measures are necessary. If this message occurs frequently you may have a serious disruption of the CAN connection.
GIOD REBOOT	-	-	**Displayed where?** Alarm memory **Explanation:** Because of a reboot, the GIOD expansion module has taken on CANopen status PRE_OPERATIONAL. **Possible cause:** This is a CANopen-specific reaction from the GIOD caused by powering on or a CAN error. The GIOD goes operational automatically. **Measure:** Usually no measures are necessary. If this message occurs frequently you may have a serious disruption of the CAN connection.
GIOD STOPPED	-	-	**Displayed where?** Alarm memory **Explanation:** The GIOD expansion module has taken on CANopen status STOPPED. **Possible cause:** This is a CANopen-specific status that occurs only by specific command of the CAN master. It does not generally occur on GMM step. **Measure:** Usually no measures are necessary. If this message occurs frequently you may have a serious disruption of the CAN connection.

Table: Error messages / warnings on the display

Messages / warnings on the display	PRIO 1 GMM step prof.	PRIO 2 GMM step prof.	
Fan n NOK / F-group n NOK		X	**Displayed where?** Info menu + alarm memory **Explanation:** There is an error report for fan n or fan group n. The error input on GIOD is not switched (open or 0 V). **Possible cause:** One fan or group is not OK; the thermocontact of a fan or a motor circuit breaker has triggered; 24V for error messages is faulty **Measure:** Check whether there is a fan fault; check the circuit breakers; if this error occurs frequently the fan may be defective and should be replaced
Fan n OK / F-group n OK	-	-	**Displayed where?** Alarm memory **Explanation:** Error message for fan or group n cancelled. The error input on GIOD is switched (+24V). **Possible cause:** One fan or group is OK again; the thermocontact of a fan has closed again; a circuit breaker has been switched on; reaction following a manual or automatic thermocontact reset; OK message after switching on the power supply to the GMM step **Measure:** None required
Unit fault	X	X	**Displayed where?** Info menu + alarm memory **Explanation:** A fault message is pending at all outputs **Possible cause:** Malfunction of all the outputs **Measure:** Check the power supply to the fans and all the motor circuit breakers.

Table: Error messages / warnings on the display

11 Troubleshooting tips

Errors	Possible cause, suggested solution
Fans are not turning	If when the controller is switched on and in the Info menuas , 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 shown does not match the set setpoint, check the mode for any setpoint that may have been set externally. (See Operating mode, Page 63) • 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.

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