

Econtrol

EXDM

EC-Controller for electronic-motors for air conditioning technology

Operating Instruction



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1 General notes

1.1 Structure of the operating instructions

**Before installation and start-up, read this manual carefully to ensure correct use!
We emphasize that these operating instructions apply to specific units only, and are in no way valid for the complete system!**

Use these operating instructions to work safely with and on the device. They contain safety instructions that must be complied with as well as information that is required for failure-free operation of the device.

Keep these operating instructions together with the device. It must be ensured that all persons that are to work on the device can refer to the operating instructions at any time. In addition to the operating instructions, directives in the sense of the ordinance on industrial safety and health and the work equipment ordinance are also to be provided.

Keep the operating instructions for continued use. They must be passed-on to all successive owners, users and final customers.

1.2 Target group

The operating instructions address persons entrusted with planning, installation, commissioning and maintenance and servicing and who have the corresponding qualifications and skills for their job.

1.3 Exclusion of liability

Concurrence between the contents of these operating instructions and the described hardware and software in the device has been examined. It is still possible that non-compliances exist; no guarantee is assumed for complete conformity. To allow for future developments, construction methods and technical data given are subject to alteration. We do not accept any liability for possible errors or omissions in the information contained in data, illustrations or drawings provided.

Ziehl-Abegg AG is not liable for damage due to misuse, incorrect use, improper use or as a consequence of unauthorized repairs or modifications.

1.4 Copyright

These operating instructions contain copyright protected information. The operating instructions may be neither completely nor partially photocopied, reproduced, translated or put on data medium without previous explicit consent from Ziehl-Abegg AG. Infringements are liable for damages. All rights reserved, including those that arise through patent issue or registration on a utility model.

2 Safety information

This chapter contains instructions to prevent personal injury and property damage. These instructions do not lay claim to completeness. In case of questions and problems, please consult our company technicians.




2.1 Use as intended

The equipment is to be used solely for the purposes specified and confirmed in the order. Other uses which do not coincide with, or which exceed those specified will be deemed unauthorised unless contractually agreed. Damages resulting from such unauthorised uses will not be the liability of the manufacturer. The user will assume sole liability.

Reading these operating instructions and complying with all contained instructions – especially the safety notifications contained therein – are considered part of intended use. To consider is also the manual of attached components. Not the manufacturer, rather the operator of the device is liable for any personal harm or material damage arising from non-intended use!

2.2 Explanations of symbols

Safety instructions are highlighted with warning triangles and are depicted according to the degree of hazard as follows.

	<p>Attention! Hazardous area. Death or severe injury or significant property damage can occur if the corresponding precautions are not taken!</p>
	<p>Danger owing to electric current Danger owing to electric current or voltage.</p>
	<p>Information Important information and advice for user.</p>

2.3 Product safety

The device conforms to the state of the art at the time of delivery and is fundamentally considered to be reliable. The device and its accessories must only be used in a flawless condition and installed and operated in compliance with the operating instructions. Operating outside the device's technical specifications (☞ rating plate and attachment / technical data) can lead to a defect in the device and additional damage!

In the case of a malfunction or a failure of the equipment check all functions with alarms in order to prevent injury to persons or property. Note possibility of back-up operation. If used in intensive animal environments, any malfunctions in the air supply must be detected as soon as possible to prevent the development of a life-threatening situation for the animals. The design and installation of the system must comply with local regulations and directives. In Germany these include DIN VDE 0100, the animal protection and the keeping of working animals ordinance and the pig-keeping ordinance etc. Also note the instructions of AEL, DLG, VdS.

2.4 Requirements placed on the personnel / due diligence

Persons entrusted with the planning, installation, commissioning and maintenance and servicing in connection with the frequency inverter must have the corresponding qualifications and skills for these jobs.

In addition, they must be knowledgeable about the safety regulations, EU directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations. Personnel to be trained or instructed and apprentices are only permitted to work on the device under the supervision of an experienced person. This also applies to personnel undergoing general training. Comply with the legal minimum age.

2.5 Start-up and during operation



Attention!

During commissioning, unexpected and hazardous conditions can arise in the entire installation due to defective adjustments, defective components or incorrect electrical connections. Remove all persons and objects from the hazardous area.

During operation, the device must be closed or installed in a control cabinet. Fuses may only be replaced by new ones and must not be repaired or bypassed. The data for the maximum line fuse are to be considered absolutely (☞ Technical data). Use only fuses specified in schematic diagrams. Any faults detected in the electric system/modules/operating equipment must be corrected immediately. If these faults are not corrected, the device/system is potentially very dangerous. The device/system must therefore not be operated when it is faulty.

2.6 Working on device / Hazards through “residual voltage”



Information

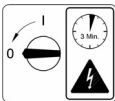
Installation, electrical connection, and start-up operation may only be carried out by an electrical specialist in accordance with electrotechnical regulations (e.g. DIN EN 50110 or DIN EN 60204).



Danger owing to electric current

It is forbidden to carry out work on electrically live parts. The enclosure rating of the device when open is IP 00! It is possible to inadvertently touch components carrying hazardous voltages!

The safe isolation from the supply must be checked using a **two-pole** voltage detector.



Waiting period at least 3 minutes!



Danger owing to electric current

- Through use of capacitors, danger of death exists even after switching off the device through directly touching the energized parts or due to parts that have become energized due to faults.
- It is only permitted to remove the housing cover after waiting for 3 minutes once the line supply cable has been shut down. Should measurement or adjustment work be unavoidable on the opened unit while still powered, then this may only be performed by qualified personnel acquainted with the thereby associated hazards.
- Even after disconnecting the mains voltage, life-threatening charges can appear between the protective ground “PE” and the mains connection.
- The protective conductor is routed over high discharge currents (irrespective of the clock frequency, current-source voltage and motor capacity). Earthing in compliance with VDE specifications shall therefore be observed even for testing and trial conditions (EN 50 178, Art. 5.2.11). Without earthing, dangerous voltages can be present on the motor housing.
- **When the motor runs independently due to air flowing through or if it continues to run down after being turned off, dangerous voltages of over 50 V can arise on the motor connections through operation of the generator. If the motor line is short-circuited during this process, short-circuit currents that arise can change or remove the magnetization of the motor magnets. In this case the motor will be permanently damaged, and repair is only possible in the manufacturer's factory.**



Attention!

Automatically restart after a power failure or mains disconnection!

2.7 Modifications / interventions in the device



Attention!

For reasons of safety, no unauthorized interventions or modifications may be made on the device. All planned modifications must be authorized by the manufacturer in writing.

Use only genuine spare parts / genuine wearing parts / genuine accessories from Ziehl-Abegg. These parts were specifically designed for the device. There is no guarantee that parts from non-original sources are designed and manufactured in correspondence with load and safety requirements. Parts and optional equipment not supplied by Ziehl-Abegg are not approved by Ziehl-Abegg for use.

2.8 Operator's obligation of diligence

- The contractor or owner must also ensure that the electric systems and equipment are operated and maintained in accordance with electro-technical regulations.
- The owner is obliged to ensure that the device are operated in perfect working order only.
- The device may only be used as intended (☞ "Application").
- You must periodically examine the safety equipment for their properly functioning condition.
- The operating instructions are always readily available at the location where the device is being used, are complete and are in legible condition.
- These persons are regularly instructed in all applicable questions regarding occupational safety and environmental protection and are knowledgeable regarding the operating instructions and, especially, are familiar with the safety instructions contained therein.
- All safety and warning notices attached to the frequency inverter are never removed and remain legible.

2.9 Employment of external personnel

Maintenance and service work are frequently carried out by external employees who often do not recognize the specific situations and the thus resulting dangers. These persons must be comprehensively informed about the hazards in their area of activity.

You must monitor their working methods in order to intervene in good time if necessary.

3 Product overview

3.1 Operational area

The EC-Controller is for the electronic commutation and speed control of EC-Motors. For electronic commutation are position indicators necessary, which record the rotor's position. In that way the switching commands for the commutation are derived.

3.2 Maintenance

The device must be checked for soiling and, if necessary, cleaned in periodic intervals.

3.3 Transport

- The device is packed ex works to suit the transport method previously agreed.
- Always use the original packaging materials when transporting the device.
- Avoid shocks and impacts to the device during the transport.
- During manual handling the human lifting and carrying restrictions must be observed and adhered to.

3.4 Storage

3.4.1 Storage conditions

- The device must be stored in its original packaging in a dry and weather-proof room.
- Avoid exposure to extreme heat and cold.
- Avoid over-long storage periods (we recommend a maximum of one year).

3.4.2 Period of storage + standstill period

The maximum permissible storage duration or standstill period without line supply is especially dependent on the electric capacitors, because the dielectric material in the capacitor degrades and the electrolyte evaporates.

Depending on the period without line supply, it must carry out a reformation of the internal capacitors before applying line voltage to the inverter.

Period without line supply	Action before start-up
under 1 Year	none
1 - 2 Years	Device for 1 hour without enable connected to line
longer than 2 years	Reformation (without enable) by adjustable voltage supply <ol style="list-style-type: none"> 1. For 1 hour of 30% of the line voltage 2. For 1 hour of 60% of the line voltage 3. For 2 hours of 85% of the line voltage 4. For 3 hours of 100% of the line voltage Line voltage [☞] Technical data, for wide voltage range = higher value of line voltage indication

3.5 Waste disposal / recycling

Disposal must be carried out professionally and environmentally friendly in accordance with the legal stipulations.

4 Mounting

4.1 General notes



Attention!

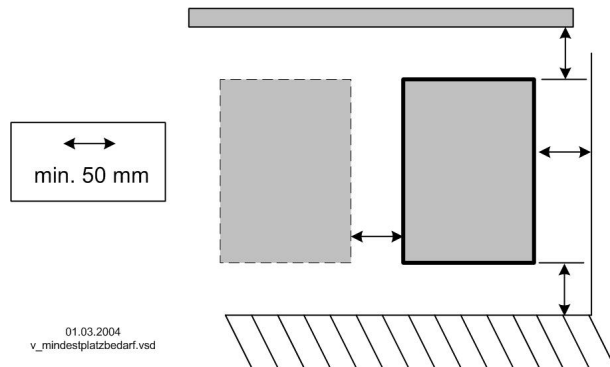
The following points must be complied with during the mechanical installation to avoid causing a defect in the device due to assembly errors or environmental influences:

- Before installation remove the device from the packing and check for any possible shipping damage!
- Assemble the device on a clean and stable base. Do not distort during assembly! Use the appropriate mounting devices for proper installation of the unit!
- When mounted onto lightweight walls, there must be no impermissibly high vibrations or shock loads. Any banging shut of doors that are integrated into these lightweight walls, can result in extremely high shock loads. Therefore, we advise you to decouple the devices from the wall.
- Do not allow drilling chips, screws and other foreign bodies to reach the device interior!
- Maintain the stated minimum clearances to ensure unobstructed cooling- air feed as well as unobstructed outgoing air discharge ([☞] minimum space requirement)!
- The plastic washers must be installed between the screw heads and the housing for models with mounting holes on the inside of the housing!
- The device should be installed in a location where it will not be disturbed, but at the same time can be easily accessed!
- Depending on the housing model cut off necessary cable inlets respectively to the cable diameter. Or alternative use cable inlet for cable glands. Metal sheet housings are supplied with stoppers. Any cable ducts openings not used must be sealed!
- Care must be taken to avoid direct radiation from the sun!
- The device is designed for vertical installation (cable inlet down). A horizontal or reclined installation is only permissible after technical release of the manufacturer!
- Be sure to observe proper heat dissipation ([☞] Technical data, heat dissipation).

4.2 Minimum space requirement

In order to ensure sufficient ventilation of the device, clearance on all sides of at least 50 mm has to be maintained to the housing walls, switch cabinet doors, wiring ducts, etc. The same clearance applies to the installation of several devices next to each other.

When installing several devices on top of each other, the danger of reciprocal heating exists. This layout is only then permissible when the air suctioned from the upper unit does not become warmer than the permissible ambient temperature (☞ Technical data). I.e., a correspondingly larger clearance or thermal shielding is required.



4.3 Outdoor installation

Outdoor installation is possible up to -20 °C when the controller supply is not switched off. Installation must be protected from the effects of weather as much as possible, including protection from direct sunlight!

4.4 Installation location for agriculture

In order to avoid damage caused by ammoniac vapours, the controller shall not be installed in the stable, but rather in an outhouse wherever possible.

4.5 Temperature influences during commissioning

Avoid condensation in the controller and hence functional faults attributable to condensation by storing the controller at room temperature!

5 Electrical installation

5.1 Safety precautions



Danger owing to electric current

- Work on electric components may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.
- It is forbidden to carry out work on electrically live parts. Even after disconnection, the dc-link is still live. Always wait at least 3 minutes.
- A second person must always be present when working on energized parts or lines who disconnects in case of emergency.
- Inspect electrical equipment periodically: retighten loose connections – immediately replace damaged lines and cables.
- Always keep switch cabinets and all electrical supply facilities locked. Access is only allowed for authorized persons using a key or special tool.
- Operating the device with the housing cover removed is prohibited because energized, exposed parts are present inside the device. Disregarding this regulation can lead to severe personal injury.
- The required protective earth connection is established using screws between the housing parts in metal terminal space covers and housing casings. Commissioning is only permissible after these screws have been properly attached!
- Metal screwed-connections are not permitted in plastic housing parts because there is no potential equalization.
- Never clean electrical equipment with water or similar liquids.



Information

The respective connections are represented in the enclosure of this manual (☞ Connection diagram)!

5.2 EMC-compatible installation

5.2.1 Interference emission and installation of cables

In order to prevent faults attributable to interference and to ensure compliance with the radio interference level, the connecting leads must be kept as short as possible both in the motor terminal box as well as in the controller. Spacing between supply cables, motor cable and signal cable should thereby be kept as large as possible.

The so-called “pig-tails” of the screen are to be avoided when connecting screened cables. The screen shall be laid close up to the terminals and taken from here to the protective conductor connection by the shortest possible route, laid flat (low induction) and without loops.

When installing the controller in a switching cabinet, attention shall be paid that “live” (interference) cables and interference-suppressed cables are not routed in the duct.

5.2.2 Motor feeder cable

The screening of the motor cables (U1, V1, W1, PE) must be two-fold (both ends), i.e. connected to the protective conductor at the controller and at the motor.

The use of a screened motor cable of max. 10 m in length will ensure compliance with the limiting value class B in accordance with EN 5501.

5.2.3 Cables for hall sensors and thermostats

The screening of the control cables for the hall sensors (+15 V, GND, H1, H2, H3) and the thermostats (TB, TB) may only be connected to the protective conductor at one end at the controller; use shielded clamp or connection for protective ground for this.

The control cable for the Hall sensors shall be connected to the screen terminal of the motor terminal box.



Information

Supply cables for the hall sensors and thermostats may not be routed in the same cable harness as the motor cables because of coupling unbalances.

5.2.4 Signal cable

Pay attention to sufficient distance from powerlines and motor wires to prevent interferences. The control cable may not be longer than 30 m. Screened control cables must be used when the cable length is longer than 20 m. When using a shielded cable connect the shielding to one side only, i.e. only to the control unit with the protective ground (keep cable short and with as little inductance as possible!).

5.3 Mains connection**5.3.1 Line voltage**

Power from the mains is connected to terminals: PE, L1, L2, L3 and N. Here, it must be strictly observed that the mains voltage lies within the allowable tolerance specifications (☞ Technical data and nameplate affixed to the side).

The neutral conductor connection "N" is only for the leakage current's reduction. It is of no significance for the function of the device. The connection is not applicable for power supply networks without a neutral conductor. Since higher leakage currents may arise by this across the protective-cable connection "PE", unwanted triggering by mistake may occur in systems with FI protection circuits.

**Information**

Not suitable for IT network!

During disconnection of the line voltage the necessary waiting period before renewed switching on amounts minimum 90 seconds!

5.3.2 Required quality attributes for the mains voltage**Danger owing to electric current**

The mains voltage must comply with the DIN EN 50160 quality characteristics and the defined standard voltages in IEC 60038!

5.3.3 Leakage current, securely attached, ground wire double up to 10 mm²**Danger owing to electric current**

In accordance with the defined networks in DIN EN 60990, the device has a leakage current > 3.5 mA so it must be permanently connected. The protective ground must be made double in accordance with EN 50178 Point 5.2.11 and 5.3.2.1 up to a cross section of at least 10 mm².

5.4 Residual-current-operated protective device**Danger owing to electric current**

For an installation of r.c.d. protection, it shall be observed that this must be of "universal-current sensitivity". In accordance with EN 50178, Section. 5.2. other types of current-operated protective devices may not be used. To ensure as high a degree of reliability as possible, we recommend a tripping current of 300 mA.

5.5 Connection EC-Controller output

5.5.1 Motor connection



Information

- The motor leads are connected to the terminals: **PE, U, V, W.**
- Connection hall-sensors (position indicators) to terminals: **+15V, GND, H1, H2, H3.**
- The maximum length of the motor cable is **10 m**, a longer cable is not permissible!
- For each Controller can be attached only one motor.
- Only the from Ziehl-Abegg given combination of controller and motor is permissible.



Attention!

- EC-motors **never use direct at the line.** A electronic commutation unit EC-Controller is necessary. Every EC-Motor needs a separate commutation unit.
- The unit's name shows the rated current, e.g. type EXDM2.7 ($I_R = 2.7A$). The unit's size shows the max. motor current (see documentation of fans and motor). The EC-Controller's rated current must be every time higher than the max. motor current of the fan.
- **When commissioning, you must set the motor to the rated current stated on the rating plate** (☞ Motorsetup).
- **It is essential to check the direction of rotation of the fan during the initial commissioning. To do this, note the direction of the arrow on the fan housing. We will not be responsible under any circumstances for warrantee for damage caused because the direction of rotation is wrong. A reversal of the direction of rotation could be programmed** (☞ Motorsetup).

5.5.2 Disconnection between controller and motor (repair switch)

Ideally, a repair switch should be installed **before the controller** (supply line disconnect).

In the case of complete disconnection (entire load) after the controller, the enable (controller OFF / ON) must be disconnected simultaneously. I.e., an additional control contact is needed. Switching on the motor while simultaneously issuing the enable (ON) achieves secure energizing with low saturation of the controller. For this a programming is necessary (☞ IO Setup Enable ON / OFF).



Attention!

When switching on the motor plus existing release: under certain circumstances, this can occur under full modulation of the controller.

5.6 Motor protection

Motor protection is possible by connecting thermostats "TB" (thermal contacts) or thermistors "TP" (PTC).

A maximum of six individual thermistors (DIN 44081 or DIN 44082) may be connected in series to a single device.

The unit switches off when a connected thermostat or thermistor has tripped the circuit (interruption between both terminals "TB/TP" or "TK/PTC". The unit then remains switched off. A programmed fault-indicating relay is triggering.



Display during motor fault

Possibilities for re-starting after the drive has cooled down terminals "TB/TP" or "TK/PTC" by:

- By switching the mains voltage off and then on again.
- By simultaneously depressing the three keys: **P, ▲, ▼** (if a fault is indicated).
- By digital input for remote (enable ON/OFF) or by Reset-input (☞ IO Setup - Digital Inputs).



Attention!

- **Use a separate screend connection cable for temperature monitoring.**
- **An outside voltage may never be connected to the terminals "TB/TP" and/or "TK/PTC"!**

5.7 Signal connection or sensor connection to analog inputs (Analog In 1, Analog In 2)

The unit has 2-analog inputs:

- E1 Analog In = terminals “E1” / “GND” (Analog In 1)
- E2 Analog In = terminals “E2” / “GND” (Analog In 2)

Ensure correct polarity when connecting; a 24 V DC power supply is integrated for sensors. For sensors in two-wire-technology (4 - 20 mA signal), the connection is made on the “+24 V” and “E1” or “E2” terminals (the GND terminal is omitted). The connection is independent of the programmed operating mode and from the sensor signal employed. Place the internal plug (jumper) for the external default signal in the correct position factory setting 0 - 10 V (☞ Jumper for Input signal).



Attention!

Never apply line voltage to analog inputs!

5.8 Output voltage 0 - 10 V (Analog Out)

The analog outputs 0 - 10 V can be allocated with various functions (☞ IO Setup: Analog output “A”). Connection to terminal “A” - “GND” = “Analog Out” (I_{\max} 10 mA).

It is not permissible to connect outputs of several devices to each other!

5.9 Voltage supply for external devices (+24 V, GND)

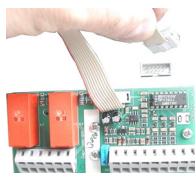
A voltage supply is integrated for external devices, e.g., for a sensor. “+24 V” Output voltage tolerance +/- 20 %. Max. load current 120 mA (for connection to an external “AXG..” terminal minus approx. 50 mA).

It is not permissible to connect outputs of several devices to each other!

During an overload or short-circuit (24 V - GND), the control voltage (and thus the device) is disconnected. Automatic start after elimination of the cause of error.

5.10 Add-on module type Z-Modul-B Part-No. 380052

The expansion module can be retrofitted. This could be necessary if the analog and digital inputs and outputs are not sufficient for certain applications. The board is easy to install into the device and is connected with the control device via a plug. Program the additional inputs and outputs in “IO Setup”.



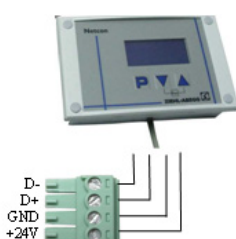
Add-on module type Z-Modul-B

- 1x analogue input 0-10 V ($R_i > 100 \text{ k}\Omega$) for external Set point
- 1x output 0 - 10 V (I_{\max} 10 mA)
- 3x digital-inputs, Activation via floating contacts
- 2x relay outputs (contact load 5 A 250 V AC)

5.11 Connection of external Terminal type AXG-1A(E)

An external terminal is required for starting-up and setting-up versions that do not have an integrated terminal.

- Model AXG-1A, Part-No. 349034 for wall mounting
- Model AXG-1AE, Part-No. 349008 for panel mounting



Connection terminal type AXG-1A(E)

The connection is made via a 4-strand line at the terminals of plug (D-, D+, GND and +24 V).

e.g., telephone flex e.g. J-Y (St) Y 2x2x0.6 (or similar), maximum line length ca. 250 m.

- Voltage supply: Terminal “24 V”, “GND”, (I_{\max} , for terminal approx. 50 mA)
- Signal “D+” and “D-” (RS 485)

If the Modbus® interface is used for network a “Z-Modul-A” (Part.-No. 380054) is necessary to use an external terminal at the same time.

5.12 Digital inputs (D1, D2)

Various functions can be allocated to the digital inputs “D1” and “D2” (☞ IO Setup: Functions summary of the digital inputs). Activation via floating contacts (a low voltage of ca. 24 V DC is connected).



Attention!

Never apply line voltage to the digital input!
It is not permissible to connect inputs of several devices to each other!

5.13 Relay outputs (K1, K2)

Various functions can be allocated to the relay outputs “K1” and “K2” (☞ IO Setup: function and inverting relays outputs). Max. contact rating ☞ technical data and connection diagram. Connection of the floating contacts of relay “K1” to the terminals 11, 14, 12. Connection of the floating contacts of relay “K2” to the terminals 21, 24, 22.

5.14 Communication

5.14.1 Networking via MODBUS-RTU

The device comes equipped with a RS-485 interface for networking via a MODBUS. Connection to terminals “D+”, “D-”, and “GND”.

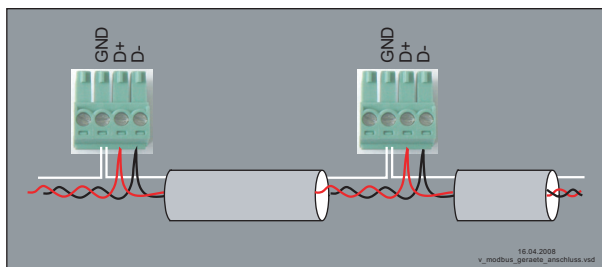
A maximum of 64 members can be directly connected to one another, and another 63 members via a repeater.

The address must be set in the “IO Setup” menu.

5.14.2 RS-485 - network design and interface parameter

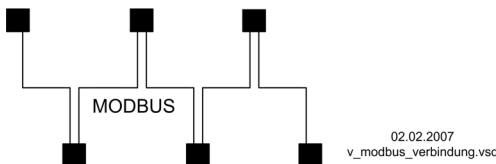
You must ensure correct connection; i.e. "D+" must also be connected on the following devices to "D+". The same applies to "D-".

In addition, a "GND" connection must be established, as dissimilar potential (over 10 V!) will lead to the destruction of the RS-485 interface (e.g. lightning).



general example for Modbus device connection

The data line must be conducted from one device to the next. No other type of wiring is allowed. Always use only two wires of one lead (twisted pair) for the connection.



Examples for Modbus connection

Recommended wire types

1. CAT5 / CAT7 cables
2. J-Y (St) 2x2x0.6 (telephone wire)
3. AWG22 (2x2 twisted pair)

When using telephone flex with four cable cores, we recommend the following allocation:
“D+” = red, “D-” = black, “GND” = white

**Information**

- Pay attention to sufficient distance from powerlines and motor wires (min. 20 cm)
- Do not use wire shield
- Except the data link " D+" , " D-" and " GND" - connection may no further cable cores of the data line be used.
- Max. allowed wire length 1000 m (CAT5/7 500 m)

Default interface parameter

Baud rate	=	19200
Bits	=	8
Parity	=	Even (None, exception of devices agriculture)
Stop bits	=	1
Handshake	=	none

**Information**

If any matters are unclear, please contact our V-STE support department for control systems - ventilation technology. The information sheet "Network structure of Modbus" R-TIL08_01 contains detailed information about Modbus.

5.14.3 LON® Bus system is possible via add-on module

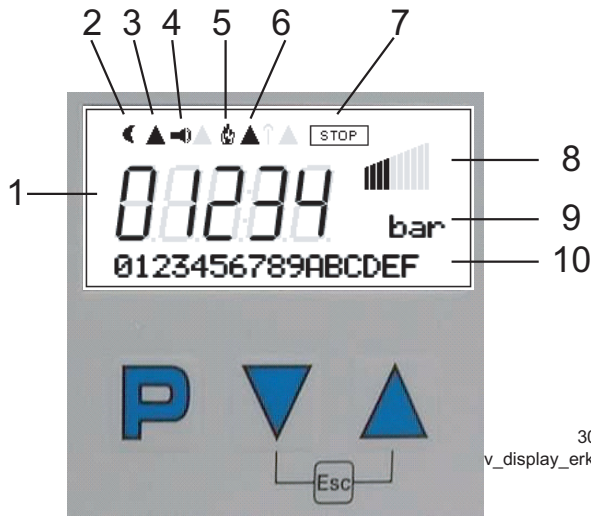
Connection to the LON® bus system is possible via add-on module type "Z-Modul-L" (Part-No. 380053). Communication to controller via the RS-485 interface, FTT-10A transceiver.

5.15 Potential at control voltage connections

The control voltage connections (< 50 V) relate to the joint GND potential (Exception: Relay contacts are potential free). There is a potential separation between the control voltage connections and the earthed conductor. It must be ensured that the maximum external voltage at the control voltage connections cannot exceed 50V (between "GND" terminals and "PE" earthed conductor). If necessary, a connection to the earthed conductor potential can be established, install bridge between "GND" terminal and the "PE" connection (terminal for screening).

6 Controls and Menu

6.1 Multipurpose LC display and keyboard



30.04.2008
v_display_erklaerung_econtrol.vsd

1. Numeric display 5 digit
2. Moon-Symbol for set point 2
3. Current derating active
4. Alarm-Symbol (fault indication)
5. Fire-Symbol (heating operation)
6. Derating (power reduction active)
7. STOP-Symbol (enable)
8. Bargraph Fanlevel
9. Text line 3 figures (display unit, etc.)
10. Text line 16 figures (display text menu.)

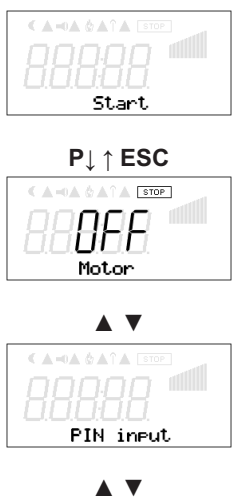
- P** Program key and open menu
- ▼** Menu selection, reduce value
- ▲** Menu selection, increase value
- ▼ + ▲** ESC-key combination, Escape = leave menu

6.2 Menu operation

Display after turning on the mains voltage.
description for menu language English = "GB" (delivery status).
Switch over between "Start" and *Actual value with Escape **[Esc]**.

Example for mode **1.01** (speed controller).

*actual value depending device type:
- Speed / rpm, - Frequency / Hz, - Fanlevel / %



By pushing the **P** key one reaches the menu item "START".

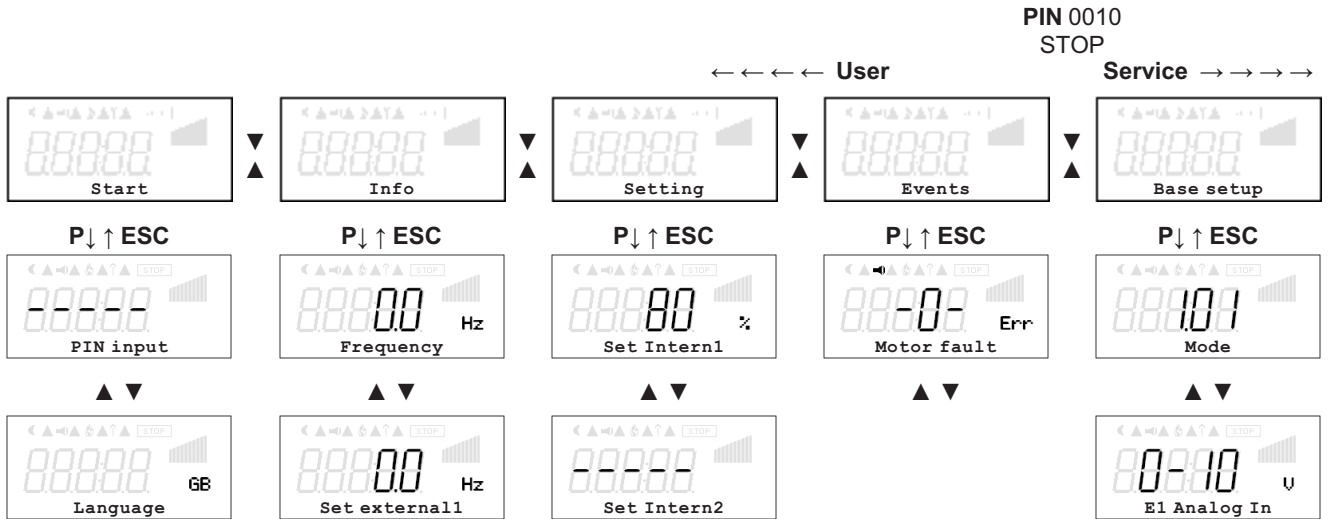
Motor OFF / ON

One moves up and down within the menu group using the arrow keys.



In the menu point “Language” display language can be selected.
One returns to the menu group “Start” using the ESC (▼ + ▲) shortcut keys.

6.3 Menu structure



Menu dependent on device type

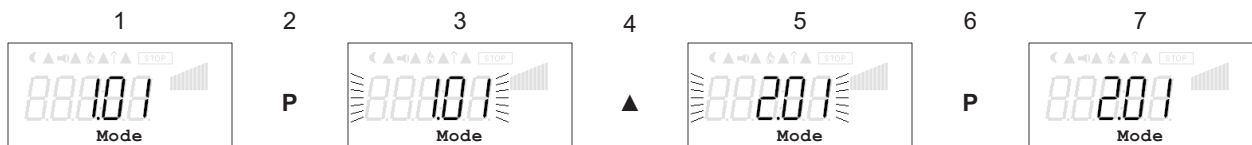
Selection of the menu group (e.g. Base setup) to the right through the ▼-key, to the left through the ▲-key.
 You can go to the menu items in the menu groups (e.g. mode of operation) by using the P key. Use the arrow keys to move up and down within the menu group.
 The menu groups consist of one area for the user (user menu) and one area for installation (service). The service area can be protected against unauthorized access by using a PIN.
 In order to simplify the initial start-up operation, the service level is enabled at first (i.e., not protected by the PIN 0010 (☞ see Controller Setup, PIN protection = OFF). If PIN protection is activated (ON), the service menu remains enabled after input of PIN 0010 as long as one is pressing keys. If no keys are pressed for ca. 15 minutes, the PIN is automatically erased, i.e. the service level is blocked.
 To make adjustments, press the P key after selecting the menu item. If the previously set value starts to flash, it can be adjusted with the ▼ + ▲ keys and then saved with the P key. To exit the menu without making any changes, use the “Esc” short-key, i.e., the originally set values remain.



Information

After installation of the device has been carried out, PIN protection should be activated (☞ Controller Setup)!

6.4 Example for programming mode **2.01** in “Base setup”

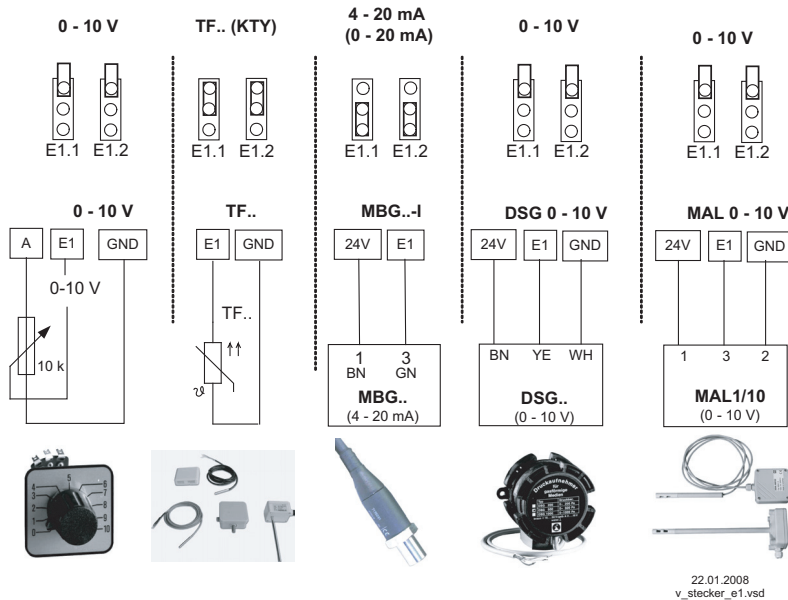


7 Base setup

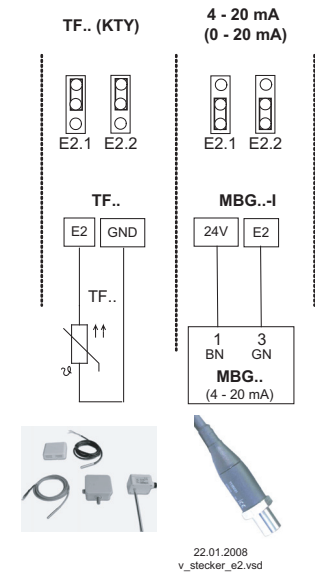
7.1 Jumper for the input signal

Jumper position factory setting for 0 - 10 V signal. For temperature sensors (TF..) or sensors with 4 - 20 mA bring the internal jumper for the external signal in the correct position. Caution- not under voltage! Observe the safety notices! When using “other sensors” bring the jumper in the correct position. The adjustment of the measuring range takes place in the Base setup of respective Mode.

E1 Analog In = (factory setting 0 - 10 V)



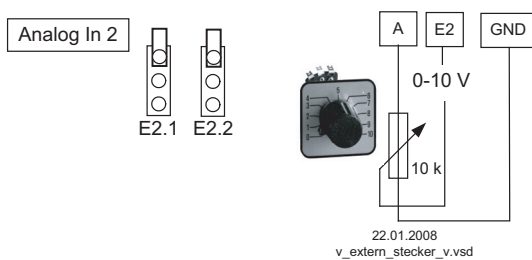
E2 Analog In for modes with two sensors



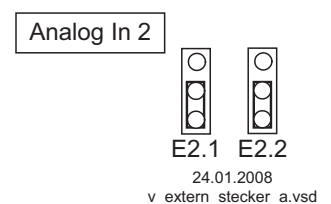
7.1.1 External Setpoint / External speed setting in manual operation

External Setpoint or external manual operation is possible by 0-10 V (0-20 mA, 4-20 mA) Signal at terminals “E2” and “GND”. Place internal Jumper “E2.1” and “E2.2” for “E2 Analog In” in correct position. “E2” Configuration in base setup. For Potentiometer AnalogOut1 (terminal “A”) program to function **1A** = “+10 V” (like factory setting IO Setup). If a second sensor is connected at input 2, external Setpoint or speed setting in manual operation is possible with additional modul “Z-Modul-B” (input E3 IO Setup).

E2 Analog In = factory setting 0 - 10 V



E2 Analog In = 0 - 20 mA / 4 - 20 mA



External Setpoint via external signal instead of “Setpoint 1”. The “external Setpoint” function must be activated in base setup **1E** for “E2 function”. The active external Setpoint value is displayed in the “info” menu group.

External speed setting in manual operation. The “external manual operation” function must be activated in the basic settings **2E** for “E2 function”. Switchover between settings on the device and external manual operation via the digital input (IO Setup: “Control / manual operation” **7D**).

7.2 Select operation mode



Information

Simple installation is possible through the selection of the preprogrammed mode of operation. This determines the basic function of the device; factory setting **1.01** = speed controller (activation via 0 - 10 V signal). The controller configuration is automatically carried out during selection of the application related mode of operation. The factory presets in accordance with the mode of operation are based on many years of experience, which is suitable for many applications. Under special circumstances, these can be individually adapted (☞ **Controller Setup: “Controller Configuration”**).

The purpose of the device is to reach and maintain the target values set. To accomplish this, the measured actual value (sensor value) is compared with the adjusted target value, and the controlled value (modulation) is deduced from this.

Mode	Signal or Sensor (input)	Function
1.01	Signal 0 - 10 V	Speed controller, two step operation (factory setting)
2.01	Sensor TF..(E1)	Temperature control airconditioning and refrigeration. (preset set-point 20.0 °C, P-band 5.0 K)
2.02	Sensor TF..(E2)	Temperature control depending on outdoor temperature (preset set-point 5.0 °C, - P-band 20.0 K)
2.03	Sensor TF..(E1)	Temperature control with additional functions (heating, shutter, temp. monitoring)
2.04	1x Sensor TF..(E1) 1x Sensor TF..(E2)	Temperature control with two sensors, comparison or average
2.05	1x Sensor TF..(E1) 1x Sensor TF..(E2)	Temperature control with two sensors differential temperature
3.01	Sensor MBG.. (E1)	Pressure control condensers (refrigeration)
3.02	Sensor MBG..(E1)	Pressure control for condensers with input for refrigerant
3.03	1x Sensor MBG..(E1) 1x Sensor MBG..(E2)	Pressure control for two circuit condensers
3.04	1x Sensor MBG..(E1) 1x Sensor MBG..(E2)	Pressure control for two circuit condensers with input for refrigerant
4.01	Sensor DSG..(E1)	Pressure control for ventilation systems
4.02	1x Sensor DSG..(E1) 1x Sensor TF..(E2)	Pressure control depending on outdoor temperature
4.03	1x Sensor DSG..(E1) 1x BUS RS 485	Pressure control depending on outdoor temperature, MODBUS for outdoor temperature and remote control by central operating device type AXE-200
5.01	Sensor DSG..(E1)	Volume control (constant) for ventilation systems
5.02	1x Sensor DSG..(E1) 1x Sensor TF..(E2)	Volume control with setpoint depending on outdoor temperature
6.01	Sensor MAL..(E1)	Air velocity control e.g. clean room

8 Start-up

8.1 Prerequisites for commissioning



Attention!

1. You must mount and connect the device in accordance with the operating instructions.
2. Check all connections for correctness once more.
3. The mains voltage must match the information on the rating plate.
4. The rated current on the rating plate will not be exceeded.
5. Make sure that no persons or objects are in the fan's hazardous area.

8.2 Procedure for commissioning

Depending on software version and type of device function Motor OFF / ON is in menu group Start.		
Display after first turning on the mains voltage.		
<p>In menu group Start the adjustment for Motor is “OFF” for factory setting. This prevents the system from inadvertently starting up before configuration is complete. Operation of the device after pressing the “Esc” hotkey combination.</p>		
	Switch-over between “OFF” and “Start” with the key shortcut for Escape ((Esc = ▼ + ▲).	
In menu group Start switch Motor to “ON” after setting.		

Sequence	Setting																										
1	<p>Menu language If necessary, set the menu language in Menu group “Start”. (Factory setting Englisch: “Language GB”)</p>																										
2	<p>Mode Set the operating mode in the “Base setup” menu group (factory settings 1.01 = Speed controllers). Attention! When saving the operating mode, the respective preset factory operating-mode setting is loaded. That means, the settings you have made, e.g., in “Motor setup” are lost. An exception: the menu language setting remains preserved.</p>																										
3	<p>The settings in the Motor setup depend on the type of motor connected</p> <p>3.1 Setting Rated speed (fan’s nameplate).</p> <p>3.2 Setting Polecount (fan’s nameplate): For 4-pole motors (type ____ - 4 K _ _ _ _ _) For 6-pole motors (type ____ - 6 K _ _ _ _ _)</p> <p>3.3 The correct Rolling direction depends on the type of fan. The factory preset is Rolling direction 1. Find the fan in the following table to determine the correct Rolling direction and to subsequently program.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Design Motor or fan</th> <th style="width: 40%;">Type</th> <th colspan="2" style="width: 30%;">Permissible Rolling direction</th> </tr> </thead> <tbody> <tr> <td>MK - Motor (direction of rotation when looking at the rotor)</td> <td>M K _ . _ . _ . _</td> <td style="text-align: center;">left</td> <td style="text-align: center;">right</td> </tr> <tr> <td>MW - Motor (direction of rotation when looking at the cable)</td> <td>M W _ . _ . _ . _</td> <td style="text-align: center;">right</td> <td style="text-align: center;">left</td> </tr> <tr> <td rowspan="3">Centrifugal fan with single inlet (direction of rotation when looking at the suction side)</td> <td>R _ _ K _ _ R / R _ _ K _ _ R</td> <td></td> <td style="text-align: center;">right</td> </tr> <tr> <td>R _ _ K _ _ L / R _ _ K _ _ L</td> <td style="text-align: center;">left</td> <td></td> </tr> <tr> <td>R _ _ N _ _ A / R _ _ N _ _ A</td> <td></td> <td style="text-align: center;">left</td> </tr> <tr> <td></td> <td>R _ _ N _ _ B / R _ _ N _ _ B</td> <td style="text-align: center;">right</td> <td></td> </tr> </tbody> </table>	Design Motor or fan	Type	Permissible Rolling direction		MK - Motor (direction of rotation when looking at the rotor)	M K _ . _ . _ . _	left	right	MW - Motor (direction of rotation when looking at the cable)	M W _ . _ . _ . _	right	left	Centrifugal fan with single inlet (direction of rotation when looking at the suction side)	R _ _ K _ _ R / R _ _ K _ _ R		right	R _ _ K _ _ L / R _ _ K _ _ L	left		R _ _ N _ _ A / R _ _ N _ _ A		left		R _ _ N _ _ B / R _ _ N _ _ B	right	
Design Motor or fan	Type	Permissible Rolling direction																									
MK - Motor (direction of rotation when looking at the rotor)	M K _ . _ . _ . _	left	right																								
MW - Motor (direction of rotation when looking at the cable)	M W _ . _ . _ . _	right	left																								
Centrifugal fan with single inlet (direction of rotation when looking at the suction side)	R _ _ K _ _ R / R _ _ K _ _ R		right																								
	R _ _ K _ _ L / R _ _ K _ _ L	left																									
	R _ _ N _ _ A / R _ _ N _ _ A		left																								
	R _ _ N _ _ B / R _ _ N _ _ B	right																									

			R - - - D - - - A / R - - - D - - - A R - - - D - - - B / R - - - D - - - B	right	left
		Centrifugal fan with double inlet (direction of rotation when looking at the suction cable side)	R - - - - R R - - - - L	right	left
		Setting Rolling direct.		1	0
3.4		Setting Motor rated current (☞ fan's nameplate).			

Additional settings as required (☞ Motor setup)

8.3 Menu overview Mode **1.01 (without add-on modules)**

Start	Info	Setting	Events	Base setup	Controller Setup	IO Setup	Limits	Motor Setup	Diagnostic
OFF Motor	0 rpm Speed	200 rpm Set Intern1	-0- Hall-IC	1.01 Mode	OFF PIN Protec- tion	1A A Function	OFF Level. Function	200 rpm Rated Speed	BZC 00012:56:- 15
---- PIN input	0.0 A Motor cur- rent	----- Set Intern2	-1- Overtem- perature	0 - 10 V E1 Analog In	OFF Set protec- tion	0.0 V A min.	---- Level min	4 Polecount	BZM 00010:56:- 11
GB Lan- guage	0 rpm Set exter- nal1	0 rpm Min. Speed	-2- ext. Fault	OFF E2 Func- tion	OFF Save User Setup	10.0 V A max.	---- Level max.	1 Rolling di- rect.	585 V DC-Voltage
OFF Reset		200 rpm Max. Speed	-3- Sensor 2	---- E2 Analog In	---- Limit	OFF A Inverting	---- Level Delay	6.0 A MotorRa- tedCurr.	32.4 °C Heatsink
1.01 Mode		ON Set exter- nal1			---- Group 2 ON value	OFF D1 Func- tion	OFF Lmt E1 Function	OFF Econtrol > 10A	29.5 °C Capacitor
1.15 Econtrol					---- nmin at Group2	---- D1 Invert- ing	---- Lmt E1 min	1 PI Mode	24.5 °C DC Choke

9 Programming

9.1 Speed controller **1.01**

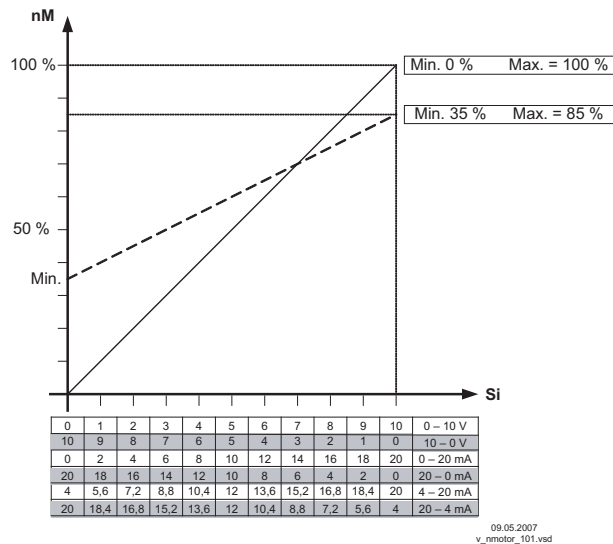
9.1.1 Base setup **1.01**

	Base setup
	Mode Factory setting Mode: 1.01
	E1 Analog In Selection: 0 - 20 mA, 4 - 20 mA, Bus (Inverting IO Setup) Factory setting: 0 - 10 V
	E2 Function (only for special applications) Analog input 2 “E2” factory set at “OFF”. For operation with a second signal and switch over via floating contact set function for “E2” to 1E (IO Setup: function 4D). For operation with a second signal and automatic control at the higher level. Set “E2” Function to 4E .
	E2 Analog In As long as no allocation has been carried out display: ----- Selection: 0 - 20 mA, 4 - 20 mA, Bus (Inverting IO Setup) Factory setting: 0 - 10 V

9.1.2 Setting for operation **1.01**

	Setting
	Set Intern1 Setting range Manual speed setting: 0...100 % Factory setting: 100 %
	Set Intern2 Setting “Set Intern2” e.g. reduced value for night operation. Switch over intern 1/2 by external contact (as long as no allocation is carried out: Display: ----- IO Setup)
	Minimal Speed Setting range: 0...100 % Factory setting: 0 %
	Maximal Speed Setting range: 100 % - “Min. Speed” Factory setting: 100 %
	Set external1 “ON” (factory setting) = speed setting by external Signal “OFF” = Setting “Set Intern1”

Diagram setting signal and output voltage (Idealized principle diagram)



nM Motor speed
Si Signal

9.1.3 Menu Speed controller **1.01**

Parameter	Factory setting	User Setting
Start		
Motor	OFF	
PIN input	-----	
Language	GB	
Reset	OFF	
Mode	1.01	
Econtrol	1.14	
SN:	xxx	
Info		
Speed	0.0 rpm	
Motor current	0.0 A	
Set external1	200 rpm	
Setting		
Set Intern1	200 rpm	
Set Intern2	-----	
Min. Speed	0 rpm	
Max. Speed	200 rpm	
Set external1	ON	
Events		
Base setup		
Mode	1.01	
E1 Analog In	0 - 10 V	
E2 Function	OFF	
E2 Analog In	-----	

(Menu dependent on device type available)

1.01 Speed controller






E2 Function

1E E1/E2 Switch over

<p>Further menus see chapters:</p> <ul style="list-style-type: none"> • Controller Setup • IO Setup • Limits • Motor Setup • Diagnostic 	<table border="1"> <tr> <td data-bbox="1007 138 1082 190">4E</td> <td data-bbox="1082 138 1495 190">E1/E2 automatic higher level</td> </tr> </table>	4E	E1/E2 automatic higher level
4E	E1/E2 automatic higher level		

9.2 Temperature control 2.01 .. 2.05





9.2.1 Basic setting 2.01... 2.05




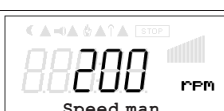
 <p>Base setup</p>	<p>Base setup</p>
 <p>Mode</p>	<p>Mode Mode selection e.g. 2.01</p>
 <p>E1 Analog In TF</p>	<p>E1 Analog In In all group 2 operating modes (2.01, 2.02, 2.03,) “E1 analogue In” factory set to “TF” (measuring range -27...+75 °C).</p> <p>Alternative selection Sensor: “MTG120V” Aktive sensor with 0 - 10 V output (⚙ jumper or switch for input signal) and proportional measuring range: -10...+120 °C.</p> <p>Alternative selection signal: 0 - 10 V, 0 - 20 mA, 4 - 20 mA (⚙ jumper and/or switches for input signal) accordingly inserted. The sensor measurement-range must be entered in order to correctly display the actual value. Example with a 0 - 10 V sensor and 0 - 100 °C measurement range: E1 Analog In = 0 - 10 V, E1 Min. = 0.0 °C, E1 Max. = 100.0 °C, E1 Decimally = 1, E1 Unit = °C</p>
 <p>E1 Offset K</p>	<p>E1 Offset Sensor calibration with calibrated comparison device</p>
 <p>E2 Function OFF</p>	<p>E2 Function</p> <ul style="list-style-type: none"> • Funktion 1E = External Setpoint via external signal (0 - 10 V) instead of “Setpoint1”. <ul style="list-style-type: none"> – For sensor type “E1 Analog In” = “TF”: 0 - 10 V Δ -27...+75.0 °C. – For sensors with active signal: 0 - 10 V Δ 0 - 100 % sensor measuring range. • Funktion 2E = External manual operation via external signal (0 - 10 V). Switch over between settings on the device and external manual operation via digital input (⚙ IO Setup). • Funktion 7E Measurement value = Measurement value e.g. for limit indication, display in Info menu “E2 Actual”.

	<p>Modes with two sensors</p> <p>The function is automatically jointly programmed in operating modes using 2 sensors. The second analog input is thus allocated and additional function allocations are not possible.</p> <ul style="list-style-type: none"> • 2.04 E2 Function at [4E] preprogrammed = comparison value with control to higher temperature. Alternative: average of 2 measuring points for this must be reprogrammed on function [3E] preprogrammed sensor type "TF". • 2.05 E2 Function at [5E] preprogrammed = regulation on difference temperature between sensor 1 and sensor 2. Preprogrammed sensor type "TF".
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9.2.2 Settings for operation modes 2.01...2.05

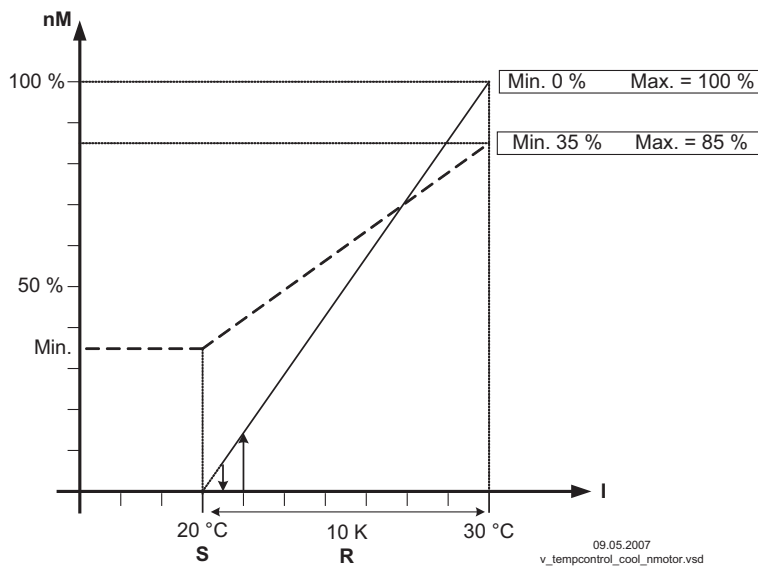
- 2.01** Temperature control simple
- 2.02** Temperature control depending on outdoor temperature (Special function: Sensor connection at "E2", display and setting under "E1").
- 2.03** Temperature control with pre-programmed additional functions (heating, shutter, temperature monitoring).
- 2.04** Temperature control with 2 sensors
 Comparison with control to higher value "E2 Function" set to comparison [4E]. Display during operation: "Control value"
 Alternative: Average calculation of 2 measuring places "E2 Function" set to [3E]. Display during operation: "Average E1 / E2."
- 2.05** Temperature control with 2 sensors, regulation on difference temperature.
 Display during operation: "Value of E1 - E2" in K, "E1" = reference temperatur, "E2" causes positiv (E2 < E1) or negative (E2 >E 1) difference.

 <p>Setting</p>	<p>Setting</p>
 <p>Setpoint1</p>	<p>Setpoint1</p> <p>Setting range: with passive sensor type "TF..": -27.0...75 °C Factory setting: 2.01, 2.03, 2.04 : 20.0 °C at 2.02 : 5.0 °C at 2.05 : 0.0 °C</p> <p>Setting range: at active sensor type "MTG-120V": -10.0 °C...+120.0 °C Factory setting: 2.01 - 2.05 : 55.0 °C</p>
 <p>Setpoint2</p>	<p>Setpoint2</p> <p>Setting "Setpoint 2" e.g. reduced value for night operation. Switch over Setpoint 1/2 by external contact (as long as no allocation is carried out: Display: [-----] IO Setup).</p>
 <p>Pband</p>	<p>Pband</p> <p>small control range = short control times big control range = longer control times and (higher controller stability)</p> <p>passive Sensor type "TF.." Setting range: 0-120.0 K (Kelvin) Factory setting: 5.0 K, (at 2.02: 20.0 K)</p> <p>active Sensor type "MTG-120V" Setting range: -10.0...+120.0 K Factory setting: 65.0 K</p>

	<p>Minimal Speed Setting range: 0...100 % Factory setting: 0 %</p>
	<p>Maximal Speed Setting range: 100 %... "Min. Speed" Factory setting: 100 %</p>
	<p>Manual mode "OFF" = automatic control as function of the set parameters (Factory setting) "ON" = automatic control without function, speed setting in menu "Speed manual"</p>
	<p>Speed manual Manual speed setting without influence by the external signal. Activation by menu "Manual mode" or external contact at digital input (IO Setup). Setting range: 0...100 % Factory setting: 100 % For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.</p>

9.2.3 Functional diagrams temperature control

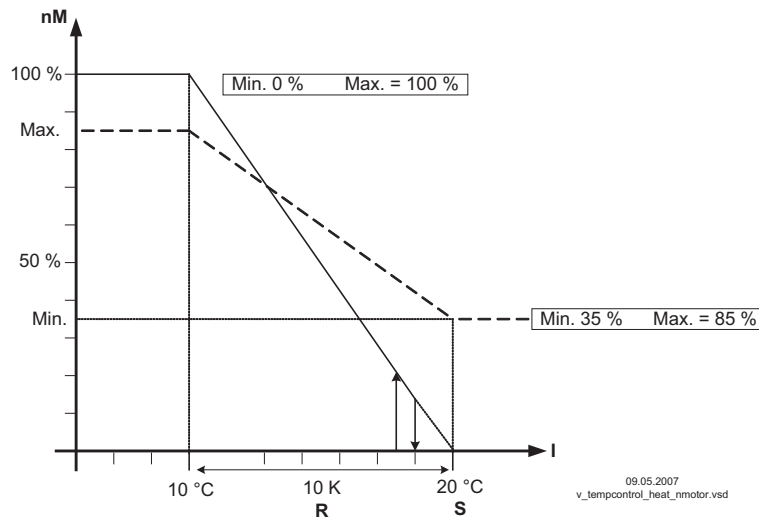
Example 1: Temperature control in factory setting "Cooling function" (Idealized principle diagram)



(Controller Setup: "Val > Set = n+" to "ON")

- nM* Motor speed
- S* Setpoint
- R* Pband
- I* Actual value

Example 2: Temperature control in “Heating function” (Idealized principle diagram)



(Controller Setup: “Val > Set = n+” to “OFF”)

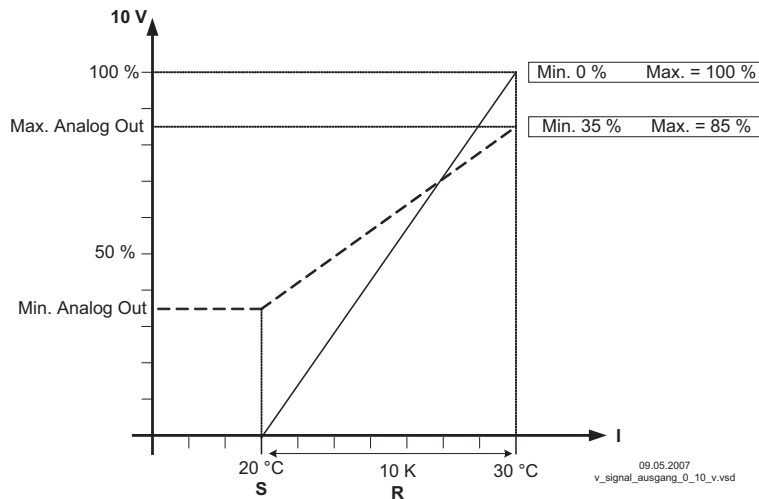
nM Motor speed
 S Setpoint
 R Pband
 I Actual value

9.2.4 Additional for mode 2.03: Signal output 0 - 10 V

The 0 - 10 V output signal can, e.g., be used for triggering a shutter or heating.

<p>Offset AnalogOut</p>	<p>Offset AnalogOut</p> <p>The target value for this output is the target value (Setpoint) for the ventilation “offset setting”.</p> <p>Adjustment: range +/- 10 K relative to the active Setpoint.</p> <p>Example for triggering a shutter servomotor: At factory setting “0 K” = synchronous operation.</p> <p>The analog output is factory set to increasing activation during increasing temperature. Reprogramming to “Heating function”, i.e., increasing modulation during decreasing temperature is possible (IO Setup).</p>
<p>Pband AnalogOut</p>	<p>Pband AnalogOut</p> <p>Pband AnalogOut = separately adjustable range of control (P-band) for 0 - 10 V output</p> <p>Setting range: 0...102.0 K</p> <p>Factory setting: 2.0 K</p>
<p>Min. AnalogOut</p>	<p>Min. AnalogOut</p> <p>Min. AnalogOut = Minimal output voltage</p> <p>Setting range: 0...100 % = 0 - 10 V</p> <p>Factory setting: 0 %</p>
<p>Max. AnalogOut</p>	<p>Max. AnalogOut</p> <p>Max. AnalogOut = Maximal output voltage,</p> <p>Setting range: 100...0 % = 10 - 0 V</p> <p>Factory setting: 0.0 K</p>

Example for signal out 0 - 10 V (IO Setup: "A function" = 6A)



Example: Setpoint ventilation 25.0°C, Offset -5.0 K, Pband 10.0 K

- S Setpoint Ventilation +/- Offset
- R Pband
- I Actual value

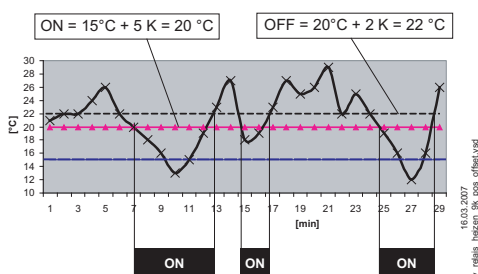
9.2.5 For mode 2.03: Relay output for Heating or Cooling

	<p>OffsetDigitalOut Offset Digital Out = Offset for relay output ("K2" is pre-programmed by the factory). The relay operating point deviates by the adjusted offset of the Setpoint of the ventilation (if relay "K2" not inverted, terminal "21"-"24" bridged). Setting range: -10.0...+10.0 K Factory setting: -1.0 K</p> <ul style="list-style-type: none"> • "0.0 K" set, i.e. heating "ON" when: actual value = Setpoint • During negative offset value heating "ON" when: actual value = Setpoint - offset • During positive offset value heating "ON" when: actual value = Setpoint + offset
	<p>Hyst.DigitalOut Switching hysteresis of the relay Setting range: 0...10 K, Factory setting: 1.0 K (Kelvin)</p>

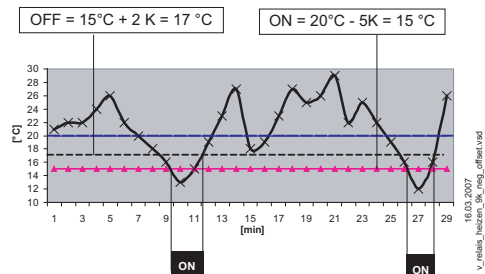
Temperature variation with factory setting 9K in IO Setup e. g. for controlling a Heating.

If the ambient temperature is lower than the set operating point, the heating remains switched on. If the ambient temperature exceeds the set operating point of the heating by 2 K (Kelvin), the heating is switched off. I.e., the release point is situated at the hysteresis value over the operating point.

Example:
 Setpoint 15.0 °C, Offset +5.0 K, Hysteresis 2.0 K



Example:
 Setpoint 20.0 °C, Offset -5.0 K, Hysteresis 2.0 K



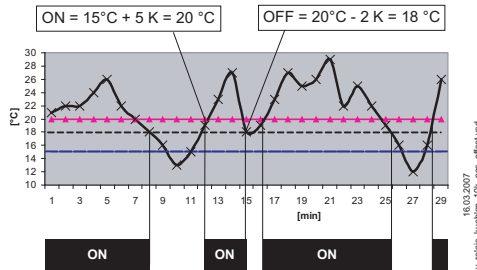


The activated heating is indicated over the fire symbol in the display.

Temperature variation with reprogramming to 10K for “K2” in IO Setup, e.g., for activation of the Cooling.

Example:

Setpoint 15.0 °C, Offset +5.0 K, Hysteresis 2.0 K



If the ambient temperature is higher than the set operating point, the cooling remains switched on. If the ambient temperature falls below the set operating point of the cooling by 2 K (Kelvin), it is switched off. I.e., the OFF point is situated at the hysteresis value under the ON point.

9.2.6 For mode 2.03 Relay output for temperature monitoring

If the set value for the “minimum alarm” is not reached or the set value for the “maximum alarm” is exceeded, a message is generated via the alarm symbol in the display. In addition, „Lmt E1 min“ is displayed alternately with the actual value for the minimum alarm and Lmt E1 max for the „Maximum alarm“. An external message follows via the factory-assigned “K1 relay”. (IO Setup: K1 function = 2K).

	<p>Alarm Minimum Setting range: OFF / -26.9...75.0 °C Factory setting: 0.0 °C</p>
	<p>Alarm Maximum Setting range: OFF / -26.9...75.0 °C Factory setting: 40.0 °C</p>



Example for display if falling below setting “Alarm Minimum” alternating to the actual value display.
Relay “K1” disengages (if not inverted).



Example for display if exceeding setting “Alarm Maximum” alternating to the actual value display
Relay “K1” disengages (if not inverted).

9.2.7 Menu for Temperature controller 2.01... 2.05







Parameter	Factory setting					User Setting
Start						
Motor	OFF	OFF	OFF	OFF	OFF	(Menu dependent on device type available)
PIN input	----	----	----	----	----	
Language	GB	GB	GB	GB	GB	
Reset	OFF	OFF	OFF	OFF	OFF	
Mode	2.01	2.02	2.03	2.04	2.05	
Econtrol	1.14	1.14	1.14	1.14	1.14	
SN:	xxx	xxx	xxx	xxx	xxx	

Info						
E1-E2 actual					-2.4 °C	
Control value				30.0°C		
E1 Actual	30.0 °C	30.0°C	30.0°C	30.0°C	30.0°C	
E2 Actual	-----	-----	-----	30.0°C	30.0°C	
Setpoint1	20.0 °C (55.0 °C)*	5.0 °C (55.0 °C)*	20.0 °C (55.0 °C)*	20.0 °C (55.0 °C)*	0.0 °C (55.0 °C)*	* (at active Sensor "" MTG-120V")
Speed	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	
Motor current	0.0 A	0.0 A	0.0 A	0.0 A	0.0 A	
Minimum speed cut off	OFF	OFF	OFF	OFF	OFF	
Setting						
Setpoint1	20.0 °C (55.0 °C)*	5.0 °C (55.0 °C)*	20.0 °C (55.0 °C)*	20.0 °C (55.0 °C)*	0.0 °C (55.0 °C)*	
Setpoint2	-----	-----	-----	-----	-----	
Pband	5.0 K (65.0)*	20.0 K (65.0)*	5.0 K (65.0)*	5.0 K (65.0)*	5.0 K (65.0)*	
Min. Speed	0 rpm	0 rpm	0 rpm	0 rpm	0 rpm	
Max. Speed	200 rpm	200 rpm	200 rpm	200 rpm	200 rpm	
Manual mode	OFF	OFF	OFF	OFF	OFF	2.01 Temperature control simple
Speed man.	200 rpm	200 rpm	200 rpm	200 rpm	200 rpm	
Offset AnalogOut			0.0 K			2.02 Temperature control depending on outdoor temperature
Pband AnalogOut			2.0 K			
Min. AnalogOut			0 %			2.03 Temperature control with additional functions: shutter and heating
Max. AnalogOut			100 %			
OffsetDigitalOut			-1.0 K			
Hyst.DigitalOut			1.0 K			
Alarm Minimum			0.0 K			2.04 Temperature control with two Sensors comparison with control to higher value average calculation of 2 measuring places
Alarm Maximum			40.0°C			
Events						
Base setup						
Mode	2.01	2.02	2.03	2.04	2.05	2.05 Temperature control with 2 sensors. Regulation on difference temperature.
E1 Analog In	TF	TF	TF	TF	TF	
E1 Min.	-----	-----	----	----	----	
E1 Max.	-----	-----	----	----	----	
E1 Decimals	-----	-----	-----	----	----	
E1 Unit	-----	-----	----	----	----	
E1 Offset	0.0 K	0.0 K	0.0 K	0.0 K	0.0 K	1E external Setpoint
E2 Function	OFF	OFF	OFF	4E	5E	2E external manual mode
E2 Analog In	-----	-----	----	TF	TF	3E Sensor average to E1
E2 Min.	-----	-----	----	----	----	
E2 Max.	-----	-----	----	----	----	4E Sensor comparison to E1
E2 Decimals	-----	-----	----	-----	----	
E2 Unit	-----	-----	----	----	----	5E Sensor difference to E1
E2 Offset	-----	-----	----	0.0 K	0.0 K	

<p>Further menus see chapters:</p> <ul style="list-style-type: none"> • Controller Setup • IO Setup • Limits • Motor Setup • Diagnostic 	<p>6E Sensor for Setpoint</p> <p>7E Measurement</p>
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9.3 Pressure control for condensers refrigeration 3.01...3.04




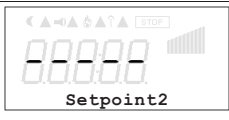





9.3.1 Base setup 3.01...3.04

	<p>Base setup</p>
	<p>Mode Mode selection e.g. 3.01</p>
	<p>E1 Analog In For all Modes in Group 3 (3.01, 3.02, 3.03, ...) “E1 Analog In” factory setting to “MBG-30I”. (measuring range 0..30 bar) proportional output 4 - 20 mA Selection sensor: MBG-30I, MBG-50I, DSF2-25 Alternative selection signal: 0 - 10 V, 4 - 20 mA, (⚡ jumper for input signal) accordingly inserted. The sensor measurement-range must be entered in order to correctly display the actual value. Example 0 - 10 V sensor and measuring range 0 - 20 bar: E1 Analog In = 0 - 10 V, E1 Min. = 0.0 bar, E1 Max. = 20.0 bar, E1 Decimals = 1, E1 Unit = bar</p>
	<p>E1 Offset Sensor calibration with calibrated comparison device</p>
	<p>E1 Refrigerant With 3.02 and 3.04 operating modes with input of the refrigerant, the device automatically calculates the corresponding temperature for the measured pressure. The settings for offset, target value and the controlling range are then carried out in °C or K. Calculation for relative pressure (differential measurement of pressure relative to ambient pressure). No further settings are necessary for pressure sensors model e.g. “MBG-30I” or “MBG-50I” (measurement range 0 - 30 bar or 0 - 50 bar). In the case of sensors with other measurement ranges, the “E1 Min. value” and the “E1 Max. Value” . Setting in “bar” although unit display is in “°C”!</p>
	<p>E2 Function(only for special applications)</p> <ul style="list-style-type: none"> • External setpoint = Function 1E by external signal (0 - 10 V) instead of “Setpoint1”. 0 - 10 V Δ 0 - 100 % sensor measuring range. • External manual operation via external signal (0 - 10 V) = Function 2E . Switch over between settings on the device and external manual operation via digital input (⚡ IO Setup). • Measurement value = function 7E e.g. for limit indication, display in Info menu “E2 Actual”. <p>Modes 3.03 and 3.04 with two sensors The function is automatically jointly programmed in operating modes using 2 sensors. The second analog input is thus allocated and additional function allocations are not possible. With 3.03 and 3.04 E2 Function at 4E preprogrammed = comparison value with control to higher value (two circuit condensers).</p>

Selection of the refrigerants:								
R12	R13	R13b1	R22	R23	R32	R114	R134a	R142B
R227	R401	R401A	R401B	R402	R402A	R402B	R404A	R407A
R407B	R407C	R410A	R500	R502	R503	R507	R717	

9.3.2 Setting for operation modes 3.01... 3.04

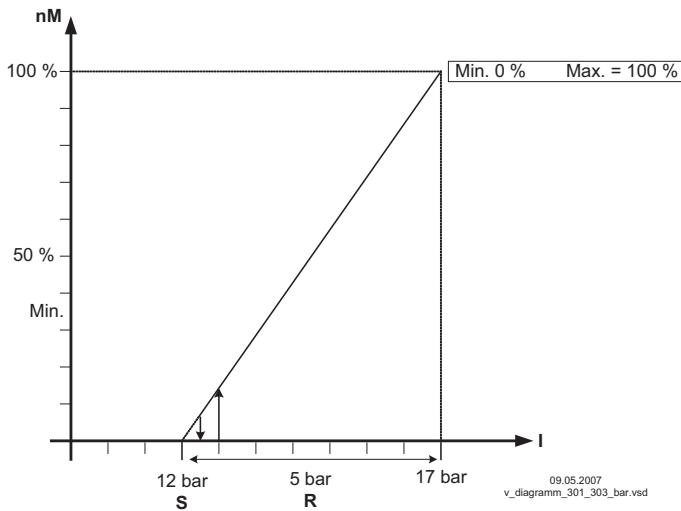
- 3.01** Pressure control condensers, setting Setpoint in bar
- 3.02** Pressure control for condensers with input for refrigerant, Setpoint in °C
- 3.03** Two sensors for dual circuit condenser. Automatic regulation to the highest pressure (selection amplifier integrated) operation display: “Control value”, Setpoint in bar
- 3.04** Two sensors for dual circuit condenser with input for refrigerant automatic regulation to the highest pressure (selection amplifier). Setpoint in °C , also for different refrigerants suitably there comparison of the temperatures. Display during operation: “Control value ”

	Setting
	Setpoint1 3.01 and 3.03 Setting range: in measuring range of sensor, factory setting: 12.0 bar 3.02 and 3.04 Setting range: dependent on the selected refrigerant, factory setting: 35.0°C
	
	Setpoint2 Setting “Setpoint 2” e.g. reduced value for night operation. Switch over Setpoint 1/2 by external contact (as long as no allocation is carried out: Display: <input type="checkbox"/> IO Setup).
	Pband small control range = short control times big control range = longer control times and (higher controller stability) 3.01 and 3.03 Setting range: in measuring range of sensor, factory setting: 5.0 bar 3.02 and 3.04 Setting range: dependent on the selected refrigerant and in measuring range of sensor, factory setting: 7.0 K
	
	Minimal Speed Setting range: 0...100 % Factory setting: 0 %
	Maximal Speed Setting range: 100 %... “Min. Speed” Factory setting: 100 %
	Manual mode “OFF” = automatic control as function of the set parameters (Factory setting) “ON” = automatic control without function, speed setting in menu “Speed manual”

	<p>Speed manual Manual speed setting without influence by the external signal. Activation by menu “Manual mode” or external contact at digital input (IO Setup). Setting range: 0...100 % Factory setting: 100 % For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.</p>
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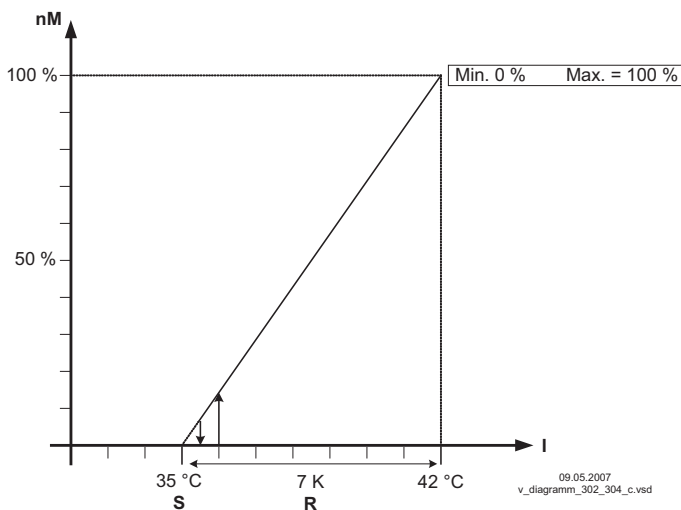
9.3.3 Functional diagrams pressure control condensers

Functional diagram for Mode **3.01** and **3.03** (Idealized principle diagram)



nM Motor speed
S Setpoint
R Pband
I Actual value

Functional diagram for Mode **3.02** and **3.04** (Idealized principle diagram)



nM Motor speed
S Setpoint
R Pband
I Actual value



Information

The factory default presets must be adapted to match the system conditions by a competent person.





9.3.4 Menu pressure controller refrigeration 3.01...3.04

Parameter	Factory setting				User Setting
Start					
Motor	OFF	OFF	OFF	OFF	(Menu dependent on device type available)
PIN input	-----	-----	-----	-----	
Language	GB	GB	GB	GB	
Reset	OFF	OFF	OFF	OFF	
Mode	3.01	3.02	3.03	3.04	
Econtrol	1.14	1.14	1.14	1.14	
SN:	xxx	xxx	xxx	xxx	
Info					
Control value			12.0 bar	22.6 °C	
E1 Actual	10.0 bar	19.5 °C	9.5 °C	19.4 °C	3.01 Pressure control condensers, Setpoint in bar
E2 Actual	----	----	12.0 bar	22.5 °C	
Setpoint1	12.0 bar	35.0 °C	12.0 bar	35.0 °C	
Speed	0 rpm	0 rpm	0 rpm	0 rpm	
Motor current	0.0 A	0.0 A	0.0 A	0.0 A	
Minimum speed cut off	OFF	OFF	OFF	OFF	3.02 Pressure control for condensers with input for refrigerant, Setpoint in °C
Setting					
Setpoint1	12.0 bar	35.0 °C	12.0 bar	35.0 °C	
Setpoint2	----	----	----	----	
Pband	5.0 K	7.0 K	5.0 bar	7.0 K	3.03 2 sensors for dual circuit condensers regulation to the highest actual value (selection amplifier integrated) Setpoint in bar.
Min. Speed	0 rpm	0 rpm	0 rpm	0 rpm	
Max. Speed	200 rpm	200 rpm	200 rpm	200 rpm	
Manual mode	OFF	OFF	OFF	OFF	
Speed man.	200 rpm	200 rpm	200 rpm	200 rpm	
Events					
					3.04 2 sensors for dual circuit condensers with input for refrigerant. Regulation to the highest actual value Setpoint in °C .
Base setup					
Mode	3.01	3.02	3.03	3.04	
E1 Analog In	0-30 MBG	0-30 MBG	0-30 MBG	0-30 MBG	
E1 Refrigerant		R503		R503	
E1 Min.	----	-----	-----	----	
E1 Max.	----	-----	-----	----	
E1 Decimals	----	-----	-----	----	
E1 Unit	----	-----	-----	----	
E1 Offset	0.0 bar	0.0 K	0.0 bar	0.0 K	
E2 Function	OFF	OFF	4E	4E	
E2 Analog In	----	-----	0-30 MBG	0-30 MBG	1E external Setpoint
E2 Refrigerant				R503	2E external manual mode
E2 Min.	----	-----	-----	----	3E Sensor average to E1
E2 Max.	----	-----	-----	----	4E Sensor comparison to E1
E2 Decimals	----	-----	-----	----	5E Sensor difference to E1
E2 Unit	----	-----	-----	0.0 K	6E Sensor for Setpoint
E2 Offset	----	-----	0.0 bar	0.0 K	7E Measurement

<p>Further menus see chapters:</p> <ul style="list-style-type: none"> • Controller Setup • IO Setup • Limits • Motor Setup • Diagnostic 	
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9.4 Pressure control airconditioning 4.01... 4.03

9.4.1 Base setup 4.01... 4.03



	<p>Base setup</p>
	<p>Mode Mode selection e.g. 4.01</p>
	<p>E1 Analog In</p> <p>In all group 2 operating modes 4 (4.01, 4.02, 4.03, ...) "E1 Analog In" factory setting "DSG200".</p> <p>Selection sensor measuring range: "DSG 50", "DSG100*", "DSG200", "DSG300*", "DSG500", "DSG1000", "DSG2000", "DSG4000", "DSG6000" (* no standard type).</p> <p>For sensors with 0 - 20 mA or 4 - 20 mA signal (⚡ jumper for input signal), select measuring range "DSG50"... "DSG6000".</p> <p>For not preprogrammed measuring range the sensor measurement range must be entered in order to display the actual value correctly.</p> <p>Example with a 0 - 10 V sensor and 0 - 400 Pa measurement range (proportional output signal): E1 Analog In = 0 - 10 V, E1 Min. = 0.0 Pa, E1 Max. = 400 Pa, E1 Dezimal = 1, E1 Einheit = Pa</p>
	<p>E1 Offset Sensor calibration with calibrated comparison device</p>

	<p>E2 Function(only for special applications)</p> <ul style="list-style-type: none"> • External setpoint = Function [1E] by external signal (0 - 10 V) instead of “Setpoint1”. 0 - 10 V Δ 0 - 100 % sensor measuring range. • External manual operation via external signal (0 - 10 V) = Function [2E] Switch over between settings on the device and external manual operation via digital input (☞ IO Setup). • Measurement value = function [7E] e.g. for limit indication, display in Info menu “E2 Actual.” <p>Modes 4.02 and 4.03 with two sensors</p> <p>The function is automatically jointly programmed in operating modes using 2 sensors. The second analog input is thus allocated and additional function allocations are not possible.</p> <p>For 4.02 E2 Function at [6E] preprogrammed = sensor for setpoint lowering. Preprogrammed sensor type “TF..”</p> <p>For 4.03 [E2] Function at [6E] preprogrammed = sensor for setpoint lowering.</p> <ul style="list-style-type: none"> - preprogrammed sensor type “BUS” - measuring range -35.0...+65.0 °C <p>In “IO Setup”:</p> <p>For enable “ON” / “OFF” via Bus:</p> <ul style="list-style-type: none"> - D1 function = [1D] - D1 Busmode = “ON” <p>For switch over setpoint 1 /2 via Bus:</p> <ul style="list-style-type: none"> - D2 function = [5D], - D2 Busmode = “ON”
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9.4.2 Setting for operation modes 4.01...4.03

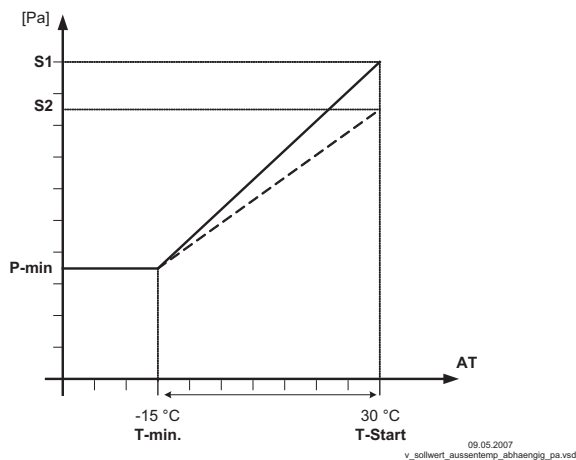
- **4.01** pressure control, setpoint in Pa
- **4.02** and **4.03** Pressure control for ventilation systems setpoint depending on outdoor temperature

	<p>Setting</p>
	<p>Setpoint1 Setting range: in measuring range of sensor Factory setting: 100 Pa</p>
	<p>Setpoint2 Setting “Setpoint 2” e.g. reduced value for night operation. Switch over Setpoint 1/2 by external contact (as long as no allocation is carried out: Display: [-----] ☞ IO Setup).</p>
	<p>Pband small control range = short control times big control range = longer control times and (higher controller stability) Setting range: in measuring range of sensor Factory setting: 100 Pa</p>
	<p>Minimal Speed Setting range: 0...100 % Factory setting: 0 %</p>
	<p>Maximal Speed Setting range: 100 %... “Min. Speed” Factory setting: 100 %</p>

	<p>Manual mode “OFF” = automatic control as function of the set parameters (Factory setting) “ON” = automatic control without function, speed setting in menu “Speed manual”</p>
	<p>Speed manual Manual speed setting without influence by the external signal. Activation by menu “Manual mode” or external contact at digital input (☞ IO Setup). Setting range: 0...100 % Factory setting: 100 % For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.</p>




Additional menu item for mode 4.02 and 4.03 with outside-temperature dependent target-setpoint.

Outside-temperature dependent target-setpoint



An outside temperature compensation can be activated (sensor connection “E2” to “Analog In 2”) when being operated as a pressure regulation device.
 An optimal building climate, e.g., can be achieved through this. Through this function, the set and active “Setpoint1” or “Setpoint2” is automatically changed proportional to the measured outside temperature (☞ Info: “Setpoint control”).

- S1 Setpoint1
- S2 Setpoint2
- P-Min SA Minimum pressure
- T-min Minimum temperature
- T-Start Setpoint reducing will start below this outside temperature
- AT Outdoor temperature

	<p>T-Band SA Temperature range in which the setpoint change continuously with outside temperature</p>
	<p>T-Start SA Setpoint reducing will start below this outside temperature</p>
	<p>P-Min SA Minimum pressure for very low outside temperature</p>







9.4.3 Menu for pressure control airconditioning 4.01...4.03

Parameter	Factory setting			User Setting
Start				
Motor	OFF	OFF	OFF	(Menu dependent on device type available)
PIN input	----	----	----	
Language	GB	GB	GB	
Reset	OFF	OFF	OFF	

SN:	xxx	xxx	xxx		
Info					
E1 Actual	88.7 Pa	88.7 Pa	88.7 Pa		
E2 Actual	----	21.0 °C	21.0 °C		
Setpoint1	100 Pa	100 Pa	100 Pa		
Setpoint control		100 Pa	100 Pa		
Speed	0 rpm	0 rpm	0 rpm		
Motor current	0.0 A	0.0 A	0.0 A		
Minimum speed cut off	OFF	OFF	OFF		
Setting					
Setpoint1	100 Pa	100 Pa	100 Pa		4.01 Pressure control for ventilation systems
Setpoint2	----	----	100 Pa		
Pband	100 Pa	100 Pa	100 Pa		
Min. Speed	0 rpm	0 rpm	0 rpm		
Max. Speed	200 rpm	200 rpm	200 rpm		4.02 Pressure control depending on outdoor temperature
Manual mode	OFF	OFF	OFF		
Speed man.	200 rpm	200 rpm	200 rpm		
T-Band SA		30.0 K	30.0 K		
T-Start SA		15.0 °C	15.0 °C		
P-Min SA		70.0 Pa	70.0 Pa		4.03 Pressure control depending on outdoor temperature, Modbus for outdoor temperature and remote control by central operating device type AXE-200
Events					
Base setup					
Mode	4.01	4.02	4.03		
E1 Analog In	DSG200	DSG200	DSG200		
E1 Min.	----	-----	----		1E external Setpoint
E1 Max.	----	-----	----		
E1 Decimals	----	-----	----		2E external manual mode
E1 Unit	----	-----	----		
E1 Offset	0.0 Pa	0.0 Pa	0.0 Pa		3E Sensor average to E1
E2 Function	OFF	6E	6E		
E2 Analog In	----	TF	Bus		4E Sensor comparison to E1
E2 Min.	----	-----	-35.0 °C		
E2 Max.	----	-----	65.0 °C		5E Sensor difference to E1
E2 Decimals	----	-----	----		
E2 Unit	----	-----	°C		6E Sensor for Setpoint
E2 Offset	----	0.0 K	0.0 K		
Further menus see chapters:					7E Measurement
<ul style="list-style-type: none"> • Controller Setup • IO Setup • Limits • Motor Setup • Diagnostic 					



9.5 Volume control 5.01...5.02





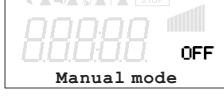

9.5.1 Basic setting 5.01 and 5.02

	<p>Base setup</p>
	<p>Mode Mode selection e.g. 5.01</p>
	<p>E1 Analog In In all group operating modes 5 (5.01 and 5.02) “E1 Analog In” factory setting “DSG200.” Selection sensor measuring range: “DSG 50”, * “DSG100”, “DSG200”, * “DSG300”, “DSG500”, “DSG1000”, “DSG2000”, “DSG4000”, “DSG6000” (* no standard type). For sensors with 0 - 20 mA or 4 - 20 mA signal (⚙ jumper for input signal), select measuring range “DSG50”... “DSG6000” .</p>
	<p>K Factor Input of the “K factor” dependent on the fan (inlet duct). setting range: 0...7.000 Factory setting: 75</p>
	<p>E1 Offset Sensor calibration with calibrated comparison device</p>
	<p>E2 Function(only for special applications)</p> <ul style="list-style-type: none"> • External setpoint = Function 1E by external signal (0 - 10 V) instead of “Setpoint1”. 0 - 10 V \triangleq 0 - 100 % setting range • External manual operation via external signal (0 - 10 V) = Function 2E Switch over between settings on the device and external manual operation via digital input (⚙ IO Setup). • Measurement value = function 7E e.g. for limit indication, display in Info menu “E2 Actual” <p>Modes 5.02 with two sensors Modes with two sensors The function is automatically jointly programmed in operating modes using 2 sensors. The second analog input is thus allocated and additional function allocations are not possible. For 5.02 E2 Function at 6E preprogrammed = sensor for setpoint lowering. Pre-programmed sensor type “TF”.</p>

9.5.2 Setting for operation modes 5.01...5.02

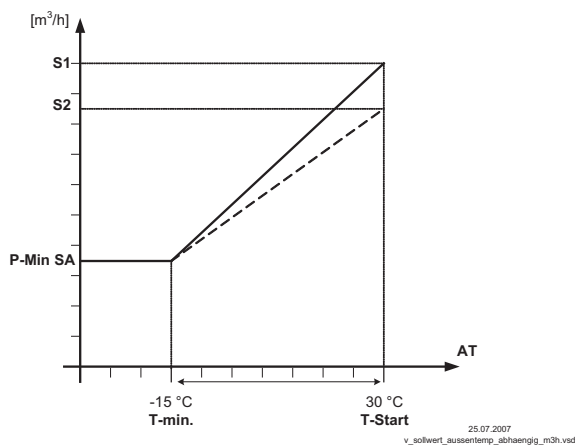
- **5.01** Volume control, Setpoint in m³/h
- **5.02** Volume control for ventilation systems setpoint depending on outdoor temperature.

	<p>Setting</p>
	<p>Setpoint1 Setpoint in m³/h (m³/s) Setting range: depending on measuring range of sensor and “K factor” Factory setting: 530 m³/h</p>

 <p>Setpoint2</p>	<p>Setpoint2 Setting "Setpoint 2" e.g. reduced value for night operation. Switch over Setpoint 1/2 by external contact (as long as no allocation is carried out: Display: - - - - IO Setup).</p>
 <p>Pband</p>	<p>Pband small control range = short control times big control range = longer control times and (higher controller stability) Setting range: depending on measuring range of sensor and "K factor" Factory setting: 530 m³/h</p>
 <p>Min. Speed</p>	<p>Minimal Speed Setting range: 0...100 % Factory setting: 0 %</p>
 <p>Max. Speed</p>	<p>Maximal Speed Setting range: 100 %... "Min. Speed" Factory setting: 100 %</p>
 <p>Manual mode</p>	<p>Manual mode "OFF" = automatic control as function of the set parameters (Factory setting) "ON" = automatic control without function, speed setting in menu "Speed manual"</p>
 <p>Speed man.</p>	<p>Speed manual Manual speed setting without influence by the external signal. Activation by menu "Manual mode" or external contact at digital input (IO Setup). Setting range: 0...100 % Factory setting: 100 % For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.</p>




Additional menu item for mode 5.02 with outside-temperature dependent target-setpoint

Outside-temperature dependent target-setpoint



- S1 Setpoint1
- S2 Setpoint2
- P-Min SA Minimum air volume
- T-min Minimum temperature
- T-Start Setpoint reducing will start below this outside temperature
- AT Outdoor temperature

An outside temperature compensation can be activated (sensor connection "E2" to "Analog In 2") when being operated as a air volume regulation device.
 An optimal building climate, e.g., can be achieved through this. Through this function, the set and active Setpoint 1/2 is automatically changed proportional to the measured outside temperature (Info: "Setpoint control").

 <p>T-Band SA</p>	<p>T-Band SA Temperature range in which the setpoint change continuously with outside temperature</p>
 <p>T-Start SA</p>	<p>T-Start SA Setpoint reducing will start below this outside temperature</p>
 <p>P-Min SA</p>	<p>P-Min SA Minimum pressure for very low outside temperature</p>






9.5.3 Menu for air volume control 5.01 and 5.02

Parameter	Factory setting	User Setting	
Start			
Motor	OFF	OFF	(Menu dependent on device type available)
PIN input	-----	-----	
Language	GB	GB	
Reset	OFF	OFF	
Mode	5.01	5.02	
Econtrol	1.14	1.14	
SN:	xxx	xxx	
Info			
E1 Actual	712 m ³ h	712 m ³ h	
E2 Actual	----	21.0 °C	
Setpoint1	530 m ³ h	530 m ³ h	
Setpoint control		530 m ³ h	
Speed	0 rpm	0 rpm	
Motor current	0.0 A	0.0 A	
Minimum speed cut off	OFF	OFF	
Setting			
Setpoint1	530 m ³ h	530 m ³ h	
Setpoint2	----	----	
Pband	530 m ³ h	530 m ³ h	
Min. Speed	0 rpm	0 rpm	
Max. Speed	200 rpm	200 rpm	
Manual mode	OFF	OFF	
Speed man.	200 rpm	200 rpm	
T-Band SA		30.0 K	
T-Start SA		15.0 °C	
P-Min SA		70.0 Pa	5.01 Air volume control
Events			
Base setup			
Mode	5.01	5.02	5.02 Volume control with setpoint depending on outdoor temperature
E1 Analog In	DSG200	DSG200	
E1 K-Factor	75	75	
E1 Min.	----	----	
E1 Max.	----	----	
			E2 Function
			1E external Setpoint

E1 Decimals	----	----	
E1 Unit	----	----	[2E] external manual mode
E1 Offset	0.0 Pa	0.0 Pa	
E2 Function	OFF	6E	[3E] Sensor average to E1
E2 Analog In	----	TF	
E2 Min.	----	----	[4E] Sensor comparison to E1
E2 Max.	----	----	
E2 Decimals	----	----	[5E] Sensor difference to E1
E2 Unit	----	----	
E2 Offset	----	0.0 K	[6E] Sensor for Setpoint
Further menus see chapters:			[7E] Measurement
<ul style="list-style-type: none"> • Controller Setup • IO Setup • Limits • Motor Setup • Diagnostic 			

9.6 Air velocity control **6.01**

9.6.1 Base setup **6.01**

	Base setup
	Mode Mode selection 6.01
	E1 Analog In For mode 6.01 "E1 Analog In" factory setting to "MAL1" Selection sensor measuring range: MAL1, MAL10 Alternative selection signal: 0 - 10 V, 0 - 20 mA, 4 - 20 mA (⚡ jumper for input signal). The sensor measurement range must be entered in order to display the actual value correctly. Example with a 0 - 10 V sensor and 0 - 5 m/s measurement range (proportional output signal). E1 Analog In = 0 - 10 V, E1 Min. = 0.0 m/s, E1 Max. = 5.0 m/s, E1 Decimals = 1, E1 Unit = m/s
	Sensor calibration with calibrated comparison device
	Function Analog Input 2 <ul style="list-style-type: none"> • External setpoint = Function [1E] by external signal (0 - 10 V) instead of "Setpoint1". 0 - 10 V \triangleq 0 - 100 % setting range • External manual operation via external signal (0 - 10 V) = Function [2E] Switch over between settings on the device and external manual operation via digital input (⚡ IO Setup). • Measurement value = function [7E] e.g. for limit indication, display in Info menu "E2 Actual."

9.6.2 Settings for operation modes 6.01


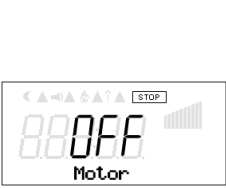
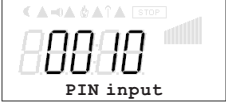




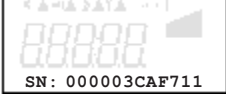

	Setting
	Setpoint1 Setting range: in measuring range of sensor Factory setting: 0.50 m/s
	Setpoint2 Setting "Setpoint 2" e.g. reduced value for night operation. Switch over Setpoint 1/2 by external contact (as long as no allocation is carried out: Display: <input type="checkbox"/> IO Setup).
	Pband small control range = short control times big control range = longer control times and (higher controller stability) Setting range: in measuring range of sensor Factory setting: 0.50 m/s
	Minimal Speed Setting range: 0...100 % Factory setting: 0 %
	Maximal Speed Setting range: 100 %... "Min. Speed" Factory setting: 100 %
	Manual mode "OFF" = automatic control as function of the set parameters (Factory setting) "ON" = automatic control without function, speed setting in menu "Speed manual"
	Speed manual Manual speed setting without influence by the external signal. Activation by menu "Manual mode" or external contact at digital input (<input type="checkbox"/> IO Setup). Setting range: 0...100 % Factory setting: 100 % For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.

9.6.3 Menu for air velocity control 6.01






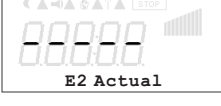




Parameter	Factory setting	User Setting	
Start			
Motor	OFF		(Menu dependent on device type available)
PIN input	-----		
Language	GB		
Reset	OFF		
Mode	6.01		
Econtrol	1.14		
SN:	xxx		
Info			
E1 Actual	0.45 m/s		
E2 Actual	----		
Setpoint1	0.50 m/s		

Speed	0 rpm	
Motor current	0.0 A	
Minimum speed cut off	OFF	
Setting		
Setpoint1	0.50 m/s	
Setpoint2	----	
Pband	0.50 m/s	
Min. Speed	0 rpm	
Max. Speed	200 rpm	
Manual mode	OFF	
Speed man.	200 rpm	
Events		
Base setup		
Mode	6.01	6.01 Air velocity control
E1 Analog In	0-1 MAL	
E1 Min.	----	
E1 Max.	----	
E1 Decimals	----	
E1 Unit	----	
E1 Offset	0.0 m/s	1E external Setpoint
E2 Function	OFF	E2 Function
E2 Analog In	----	2E external manual mode
E2 Min.	----	
E2 Max.	----	3E Sensor average to E1
E2 Decimals	----	
E2 Unit	----	4E Sensor comparison to E1
E2 Offset	----	
Further menus see chapters:		5E Sensor difference to E1
• Controller Setup		6E Sensor for Setpoint
• IO Setup		7E Measurement
• Limits		
• Motor Setup		
• Diagnostic		

9.7 Menu group Start


	<p>Start</p>
	<p>Motor(Menü abhängig von Geräteart vorhanden) Die Ansteuerung für den Motor kann in diesem Menüpunkt ein- und ausgeschaltet werden (ON / OFF). Factory setting to [OFF], this prevents the system from inadvertently starting up before configuration is complete.</p> <p>Attention! No disconnection (isolation) when switched off, in accordance with VBG4 §6)!</p>
	<p>PIN input The service menu for the installation can be protected against unintentional changes by a pin code. With further pin codes putting back to pre-setting is possible.</p> <p>PIN 0010 Opening service menu, if PIN-protection activated</p> <p>PIN 1234 Opening “setting”. if “set protection” = “ON” (☞ Controller Setup)</p> <p>PIN 9090 Restore user setting</p> <p>PIN 9091 Save user setting (corresponds function “Save user setup” = “ON”☞ Controller Setup)</p> <p>PIN 9095 Restore factory setting = delivery status</p>
	<p>Language Menu language by the factory set to English. In this menu different national languages can be selected (GB = English, D = German ...).</p>
	<p>Reset Complete re-start of the device</p>
	<p>Mode Query of the operating mode (e.g. 1.01 for speed controller)</p>
	<p>Device name Display of device name and software version</p>
	<p>Individual unit number (Menu dependent on device type available)</p>
	<p>Version number internal motor controller (Menu dependent on device type available)</p>

9.8 Menu group Info


	<p>Menu group Info</p>										
<p style="text-align: center;">Info for mode speed controller 1.01</p>											
	<p>Speed</p>										
	<p>Display of motor current (Metering precision approx. +/-10%)</p>										
	<p>Display of the currently active default signal. The percentage corresponds to the internal actuation of the power component under consideration of the settings “Min. speed” and “Max. speed”. 0 - 100 % \pm 0 - 10 V, 10 - 0 V, 0 - 20 mA, 20 - 0 mA, 4 - 20 mA, 20 - 4 mA</p>										
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Display:</td> <td>The device operates at:</td> </tr> <tr> <td>Set “external1”</td> <td>Signal to “E1” / “GND”</td> </tr> <tr> <td>Set “External2”</td> <td>Signal to “E2” / “GND”</td> </tr> <tr> <td>Set “Intern1”</td> <td>Menu “Set Intern1”</td> </tr> <tr> <td>Set “Intern2”</td> <td>Menu “Set Intern2”</td> </tr> </table>		Display:	The device operates at:	Set “external1”	Signal to “E1” / “GND”	Set “External2”	Signal to “E2” / “GND”	Set “Intern1”	Menu “Set Intern1”	Set “Intern2”	Menu “Set Intern2”
Display:	The device operates at:										
Set “external1”	Signal to “E1” / “GND”										
Set “External2”	Signal to “E2” / “GND”										
Set “Intern1”	Menu “Set Intern1”										
Set “Intern2”	Menu “Set Intern2”										
<p style="text-align: center;">Info for mode controller 2.01...6.01</p>											
	<p>Current actual value measured on the sensor 1. Depending sensor-type in: mbr, m³/s, m/s, Pa, %, bar, m³/h, °C, V, mA, etc.</p>										
	<p>For operation with two sensors display for “2 actual”. If function not active, display - - - - -</p>										
	<p>Display of the active target value at which the device operates. “Setpoint1” Menu “Setting” “Setpoint2” Menu “Setting” “Ext. Setpoint” = setting by external signal 0 - 10 V. With activated manual mode the display constantly changes between actual value and value for manual mode.</p>										
	<p>Speed</p>										
	<p>Display of motor current (Metering precision approx. +/-10%)</p>										
	<p>Momentarily status for minimum speed cut off “ON” = switch off, if Setpoint (+/- “Min. speed cut off”) is reached. “OFF” = no switch off that means operation with minimum rate of air.</p>										

9.9 Controller Setup

9.9.1 Menu overview Controller Setup

		Controller Setup				
Parameter	Factory setting Mode			User Setting		
	1.01	2.01... 2.05	3.01... 3.04		4.01... 4.03	5.01... 5.02
PIN Protection				OFF		
Set protection				OFF		
Save User Setup				OFF		
Alarm sensors	0			OFF		
Limit				----		
Msc.	0			OFF		
Group 2 ON value				----		
nmin at Group2				----		
Val>Set=n+	0	ON		OFF		
Type of control	0	P		PID		
KP	0	50 %		50 %		
KI	0	50 %		50 %		
KD	0	50 %		50 %		
TI	0	0 %		0 %		
---- = display as long as no allocation has been carried out 0 = Function not available						

9.9.2 PIN protection activate, PIN0010


	<p>The adjustments for the installation in the service level can be protected against unintentional modifications. To do this, activate the “PIN protection” = “ON”.</p> <p>In order to simplify the initial start-up operation, the service level in the factory setting is free = “OFF” i.e. accessible without PIN 0010.</p>
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Information

After installation of the device has been carried out, “PIN-Protection” should be activated = “ON”

9.9.3 Set protection activate, PIN 1234

	<p>The “Settings” menu for the user’s basic settings (Setpoint, default value, min, max ..) are freely accessible when using the factory settings (i.e. without “PIN”).</p> <p>If necessary, these can also be protected against unauthorized modifications by using a “PIN 1234”. For this, the settings protection must be programmed to “ON”. The settings menu is then no longer visible without inputting a PIN!</p>
Function only in combination with activated PIN-Protection!	

9.9.4 Save user settings restore with PIN 9090

	<p>The individually made device configurations (User Settings) can be saved and, with the corresponding PIN input (9091), can be reestablished. By entering PIN 9090 the individually made device configurations can be reestablished (☞ Start - PIN Input).</p>
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Information


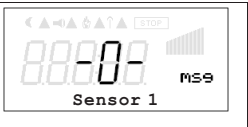

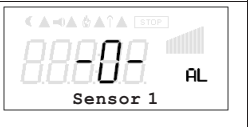
By entering “PIN 9095” in the “PIN” menu in the “start” menu-group, the device is entirely reset to the pre-delivery condition. Any changes that have been made to the settings are thus lost!

9.9.5 Sensor Alarm ON / OFF


Function only in controller mode **(2.01)**!

For “E1 Analog In” and if activated for sensor 2 “E2 Analog In”.

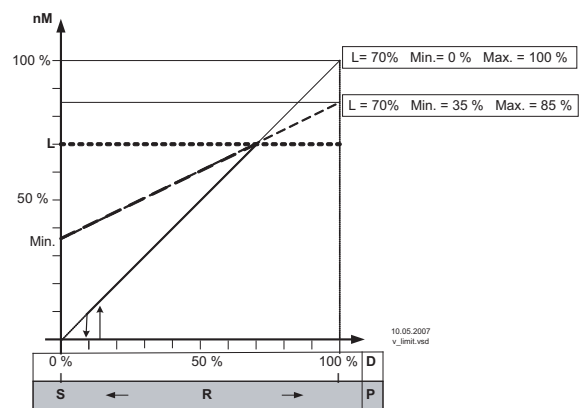
In case of an interruption or short-circuit in the sensor conductor, or in case of measured values that lie outside of the device’s measurement range, a time-delayed fault indication takes place.

	<p>With “Alarm Sensors” = “OFF” (factory setting). Indicated sensor disturbances are displayed as “Message” alternating to the actual value and stored in the menu of “Events”.</p>	
	<p>With “AlarmSensors” = “ON” are indicated sensor disturbances as “Alarm” alternating to the actual value and stored in the menu of “Events”. Indication via relays is possible (☞ IO Setup / function relay outputs).</p>	

9.9.6 Limit

	<p>After allocation of a digital input (☞ IO Setup) an adjustable limitation of the modulation can be activated via a digital input (“D1”, “D2”, ..). As long as no allocation has been carried out “IO Setup”. Display: <input type="text" value="---"/></p>
---	---

“Limit value” = max. possible modulation (e.g. speed reduction during night operation by time switch).
 Setting range: “Limit” = “n-max” up to “n-min”.
 Factory setting: 100 % $\hat{=}$ max. modulation, i. e. no limit.
 Setting depending on device tye in: % or rpm.



Limit (idealized principle diagram)
nM Motor speed
L Limit
S Setpoint
R Pband
D Speed controller: setting signal
P P-controller: control deviation

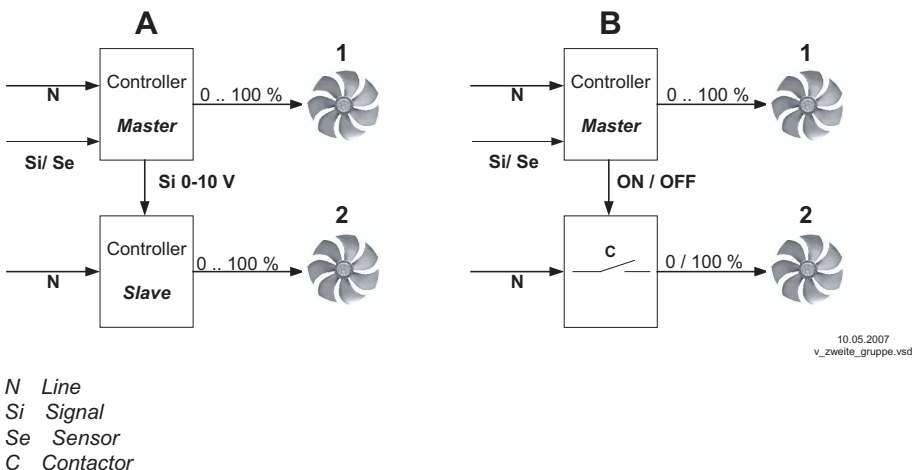
9.9.7 Minimum speed cut off

	<p>This function is primarily significant for installation of the device as a pure P Controller in refrigeration and air-conditioning technology. For operation mode speed controller 1.01 without function!</p>
--	---

<p>Msc0 = OFF (factory setting) If no “Min. speed” is adjusted, the fan stops with reaching the desired value. If “Min. speed” is adjusted (e.g. 20%), then no disconnection of the fan takes place. I.e., always a minimum ventilation is ensured (fan does not go under setting “Min. speed”).</p> <p>Msc0. e.g. -2.0 K It takes place a disconnection from setting “Min. speed” to “0”, if the given difference is reached related to the desired value. At a plus value (+) before reaching the desired value At a minus value (-) after falling below the desired value.</p>	<p>Minimum speed cut off (idealized principle diagram)</p> <p><i>nM</i> Motor speed <i>S</i> Setpoint <i>R</i> Pband <i>I</i> Actual value</p>
---	--

9.9.8 Second Group

	<p>Second group “indirectly controlled” (picture A) Analog output “AnalogOut 1” in IO Setup function 5 A = group control is programmed. This output is employed as the default signal for a speed controller. If the default signal or the regulation deviation exceeds the group 2 switch-on point, group 1 is reduced to “n-min group 2”. Starting here, both groups run parallel at maximum power.</p>
	<p>Second group “100 % energized” (picture B) Relay output (K1 or K2) in IO Setup function 8 K = group control is programmed. A contactor is triggered via this relay contact, which directly switches the fans of the second group to mains voltage. If the default signal or the regulation deviation exceeds the “Group 2 ON value” switch-on point, the relay for the second group switches on and the speed of the first group is lowered to an adjustable minimum value. After that, the speed of the first group increases back up to maximum.</p>



9.9.9 Reverse action of the control function

	<p>For the effect of the regulation there are two functions:</p> <ul style="list-style-type: none"> • ON for “Val > Set = n+” Δ increasing Fanlevel for increasing actual value over Setpoint • OFF for “Val > Set = n+” Δ increasing Fanlevel for decreasing actual value below Setpoint. <p>For special applications an external switch over of the control function is possible (☞ IO Setup).</p>
--	---

<p>Factory setting depending on selected mode</p>	<p>Example for temperature control (Idealized principle diagram)</p>														
<table border="1"> <thead> <tr> <th>Mode</th> <th>Controller function</th> </tr> </thead> <tbody> <tr> <td>1.01</td> <td>none</td> </tr> <tr> <td>2.01...</td> <td>ON</td> </tr> <tr> <td>3.01...</td> <td>ON</td> </tr> <tr> <td>4.01...</td> <td>OFF</td> </tr> <tr> <td>5.01...</td> <td>OFF</td> </tr> <tr> <td>6.01...</td> <td>OFF</td> </tr> </tbody> </table>	Mode	Controller function	1.01	none	2.01 ...	ON	3.01 ...	ON	4.01 ...	OFF	5.01 ...	OFF	6.01 ...	OFF	<p> <i>nM</i> Motor speed <i>R</i> Pband <i>S</i> Setpoint <i>I</i> Actual value OFF for Val > Set = n+ = heating function ON for Val > Set = n+ = cooling function </p>
Mode	Controller function														
1.01	none														
2.01 ...	ON														
3.01 ...	ON														
4.01 ...	OFF														
5.01 ...	OFF														
6.01 ...	OFF														

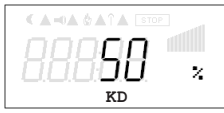

9.9.10 Controller configuration

The “controller configuration” is automatically carried out during selection of the application related mode of operation (Base setup). The factory presets in accordance with the mode of operation are based on many years of experience, which is suitable for many applications. Under special circumstances, these can be individually adapted (☞ Menu group “setting”).

	<p>The type of control determines the method with which the controlled value behaves in case of a difference between the target and current values. For this, the control technology has standard algorithms, which consist of a combination of three methods:</p> <p>Selection P, PID:</p> <ul style="list-style-type: none"> • P control (Proportional component, proportion of the absolute deviation) • I control (Integral component, proportion of the sum of all deviations) • D control (Differential component, proportion of the last difference)
--	--

With pure P controllers (controller type **P**), the following described settings do not have any function. If needed, the most suitable combination for the respective control system can be determined from these proportions.

	<p>P-component = reaction time Setting range: 0 - 200 % smaller = more slowly bigger = faster</p>
	<p>I-component = accuracy, correction time Setting range: 0 - 200 % bigger = faster smaller = more slowly</p>

	<p>D-component</p> <p>More “D-component” causes more stability by a clean actual value signal with shorter correction times</p> <p>By a actual value signal with a superposition should be done to attitude without “D-component” → 0 %</p> <p>Setting range: 0 - 200 %</p> <p>value smaller = less “D-component”</p> <p>value higher = more “D-component”</p>
	<p>Integration time = correction time</p> <p>Setting range: 0 - 200 %</p> <p>smaller = faster</p> <p>bigger = more slowly</p>

9.9.11 Data on the total control deviation

The total control deviation is comprised of the sum of the control deviations for performance quantities and work quantities combined and refers to the specified areas.


In direct reference to the acquired input and controlled variables, the maximum deviation to the target value is $< \pm 5\%$. By activating the menu-assisted adjustment, the total control deviation can be reduced to a value of $< \pm 1\%$.

For indirect reference of the acquired input value to the controlled variable, i.e., two physical variables still need to be converted, the deviation can be reduced to $< \pm 5\%$ through adjustment.

In the case of an internal default value through the integrated or external terminal, the control deviation remains at $< \pm 0.5\%$.

9.10 IO Setup





9.10.1 Menu overview “IO Setup”

	<p>IO Setup</p>
---	------------------------

Parameter	Factory setting	User Setting	
A Function	1A (6A**)		A / A2 Function
A min.	0.0 V		[1A] Constant voltage +10 V
A max.	10.0 V		[2A] proportional level control
A Inverting	OFF		[3A] proportional input E1
A2* Function	1A		[4A] proportional input E2
A2* min.	0.0 V		[5A] Group control
A2* max.	10.0 V		[6A] only 2.03 Cooling function
A2 Inverting	OFF		[7A] only 2.03 Heating function
D1 Function	OFF		[9A] proportionally to speed
D1 Inverting	----		
D1 Busmode	----		D1...D5 function
D2 Function	OFF		[1D] Enable ON / OFF
D2 Inverting	----		[2D] External error
D2 Busmode	----		[3D] Limit ON / OFF
D3* Function	OFF		[4D] Switch over Signal E1/E2
D3* Inverting	----		[5D] Setpoint1/2
D4* Function	OFF		[6D] Switch over: Intern/Extern
D4* Inverting	-----		[7D] Control / manual Intern
D5* Function	OFF		[8D] Switch over: actual Val > Set = n+ / n-
D5* Inverting	----		[10D] Reset
E1 Inverting	OFF		[11D] Setting Max. Speed ON / OFF

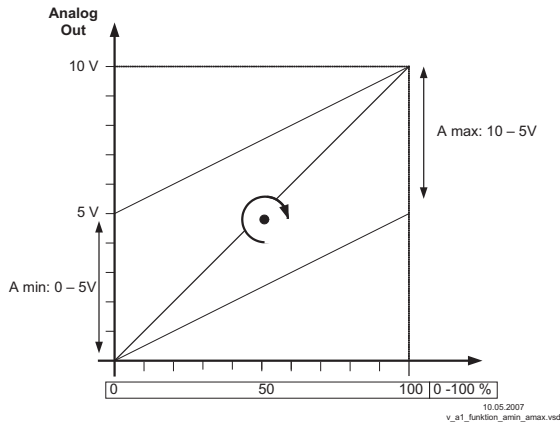
E3* Function	OFF		14D	“Freeze” function modulation value
E3* Inverting	----		E3 Function	
K1 Function	1K (2K**)		1E	0 - 10 V external Setpoint
K1 Inverting	OFF		2E	External Manual mode
K2 Function	2K (9K**)		K1...K4 function	
K2 Inverting	OFF		1K	Operating indication
K3* Function	OFF		2K	Fault indication
K3* Inverting	----		3K	External alarm indication
K4* Function	OFF		4K	Limit modulation
K4* Inverting	----		5K	Limit E1
Bus Address	247		6K	Limit E2
Addressing	OFF		7K	Setpoint Offset
* IO option Add-on module type Z-Modul-B			8K	Group control
** Deviating factory setting for mode 2.03			9K	only 2.03 Heating function
[---] = display as long as no allocation has been carried out			10K	only 2.03 Cooling function

9.10.2 Analog-Output “A”

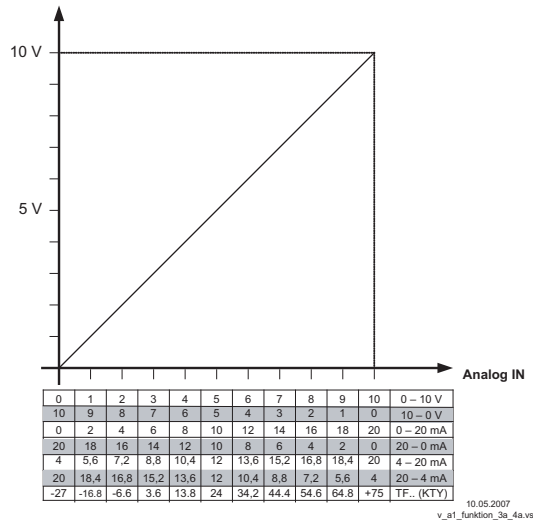
	The analog outputs 0 - 10 V can be allocated with various functions. Terminals “A” - “GND” = Analog Out (I _{max} 10 mA)
	With the attitudes “A min” and “A max” the characteristic of the output voltage can be adapted. Setting range: “A min.” = 0 - 5 V, “A max.” = 10 - 5 V Factory setting: “A min.” = 0 V, “A max.” = 10 V
	
	With the attitudes “A Inverting” the output voltage can be inverted. Factory setting: “A Inverting” = “OFF”

Function	Description
OFF	without function
1A	Constant voltage +10 V (factory setting)
2A	Proportional the internal control of modulation with consideration “Min. speed” and “Max. speed” setting. <ul style="list-style-type: none"> • for enable “OFF” it goes back to 0 V • for motor fault the output signal remains for a slave controller (“Master-Slave” combination).
3A	proportional input “E1”
4A	proportional input “E2”
5A	Group control (☞ Controller Setup - second group)
6A	Control output 2 increasing modulation at actual value > Set = cooling (only mode 2.03 temperature controller with additional functions).
7A	Control output 2 increasing modulation at actual value < Set (Heating) only mode 2.03 temperature controller with additional functions).
9A	Output speed ratio: actual speed / rated speed (for 10 V actual speed = rated speed)

A1 Function “A min.” and “A max.”



A1 Function **3A** / **4A**



9.10.3 Digital inputs “D1” / “D2”

9.10.3.1 Menu overview

	The digital inputs Digital In 1 (D1) and Digital In 2 (D2) can be allocated with various functions. Activation via floating contacts (a low voltage of approx. 24 V DC is connected).
	Inverting “D1” and “D2” possible
	With networking the digital inputs can be replaced by control over bus. With mode of operation 4.03 pre-setting of “D1” and “D2” is ON .



Attention!
Never apply line voltage to the digital input!


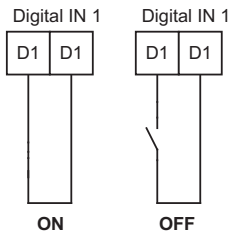
Function	Description
OFF	no function (factory setting)
1D	Enable (remote control) “ON” / “OFF”
2D	External error
3D	“Limit” ON / OFF
4D	Switch over “E1” / “E2”
For mode speed controller 1.01	
5D	Switch over “Setpoint Intern1” / “Setpoint Intern2”
6D	Switch over “Intern” / “Extern”
For modes as controller higher 2.01	
5D	Switch over “Setpoint1” / “Setpoint2”
6D	Switch over “Intern” / “Extern”
7D	Switch over “automatic control” / “Speed manual”
8D	Switch over control function (e.g. “heating” / “cooling”)

10D	“Reset”
11D	Setting Max. Speed “ON” / “OFF”
13D	Switch over direction of rotation “clockwise” / “counterclockwise” (only Fcontrol, lcontrol)
14D	“Freeze function” = maintain momentary modulation value

9.10.3.2 Enable ON/OFF function [1D]

Remote ON/OFF (electronic disconnection) and Reset after a motor malfunction via floating contact. The power section is electronically disconnected. Operation of the device is still possible after pressing the “ESC” hotkey combination in switched-off condition. Signal- in and outputs remain active.

- A programmed operating indicator relay (factory set “K1 function” = [1K]) reports the switch-off.
- A programmed alarm relay (factory set “K2 function” = [2K]) does not report the switch-off.

	<p>Display STOP for switch OFF</p> <ul style="list-style-type: none"> • Controller “ON” for closed contact (factory setting). • Controller “OFF” with opened contact <p>When inverting in reverse i.e. equipment “OFF” with closed contact.</p>	
<p>Contact at digital input e.g. “Digital In 1”</p>		



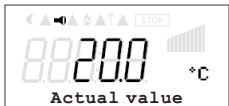
Attention!

No disconnection (isolation) when turned off, in accordance with VBG4 §6)!

9.10.3.3 External fault Function [2D]

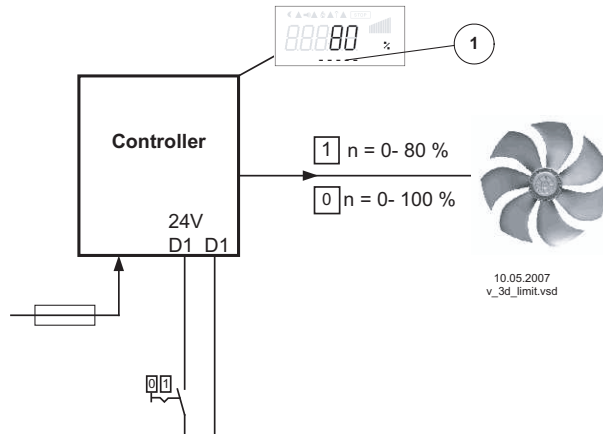
Connecting an external alarm indication (via floating contact). The device continues to work unchanged during an external indication to the digital input; the alarm symbol appears in the display. This indication can be issued via the relay contacts (K1, K2) (IO Setup function K1, K2).

- Indication during closed contact (factory setting): “D1 Inverting” = “OFF ”
- Indication during opened contact: “D1 Inverting” = “ON ”

	<p>Alarm symbol for indication “External fault”</p>
---	---

9.10.3.4 Limit ON / OFF, Function 3D

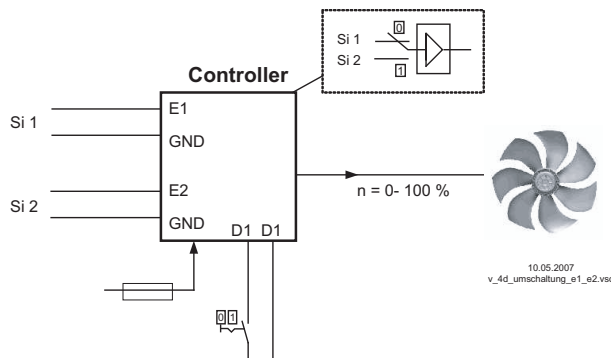
The value for “Limit” adjusted in the Controller Setup, is activated over a digital input. Contact e.g. at digital input “Digital In 1” (depending on device type at terminals “D1” - “D1” or “D1” - “24 V”). For “D1” Inverting “OFF”, limitation active at closed contact.



1 Setting “Limit” (depending on device type in: %, Hz, rpm)

9.10.3.5 Switch over Input signal “E1” / “E2”, Function 4D

Switch over between Input signal 1 (Analog In 1 terminal “E1”) and input signal 2 (Analog In 2 terminal “E2”). Contact at digital input e.g. “Digital In 1” = terminals “D1” - “D1”

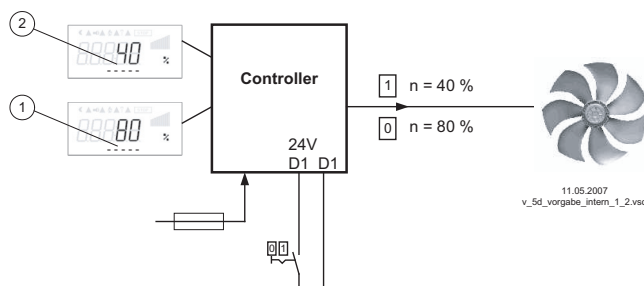


Si 1 Signal 1
Si 2 Signal 2

For mode speed controller (1.01) Base setup for “E2 Analog In”: [1E] necessary.
For modes controller (higher 2.01 ..) Base setup for “E2 Analog In”: [7E] necessary (as far as otherwise does not occupy).


9.10.3.6 Set 1/2 or Setpoint 1/2, Function 5D

Switch over between “Set Intern1” and “Set Intern2” (for speed controller 1.01) Contact e.g. at digital input “Digital In 1” (depending on device type at terminals “D1” - “D1” or “D1” - “24 V”).



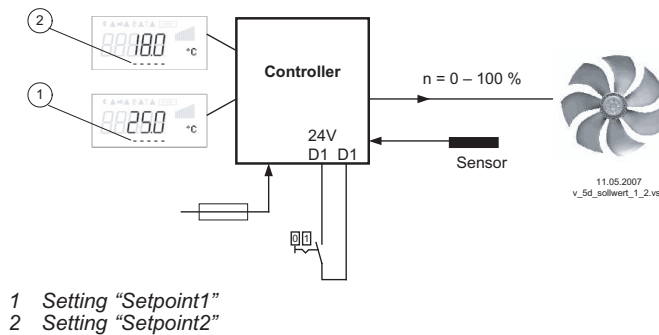
1 Setting “Set Intern1” (depending on device type in: %, Hz, rpm)
2 Setting “Set Intern2” (depending on device type in: %, Hz, rpm)

- “D1 Inverting” = “OFF”: “Set Intern1” at opened contact / “Set Intern2” at closed contact.
- “D1 Inverting” = “ON”: “Set Intern1” at closed contact / “Set Intern2” at opened contact.


	<p>Operation with “Set Intern2” is signaled by the moon symbol for reduced operation. “Set extern1” under “settings” must be programmed to “OFF”.</p>
---	--

Switch over between “Setpoint1” and “Setpoint2” (for modes as controller higher **2.01**)

Contact e.g. at digital input “Digital In 1” (depending on device type at terminals “D1” - “D1” or “D1” - “24 V”).



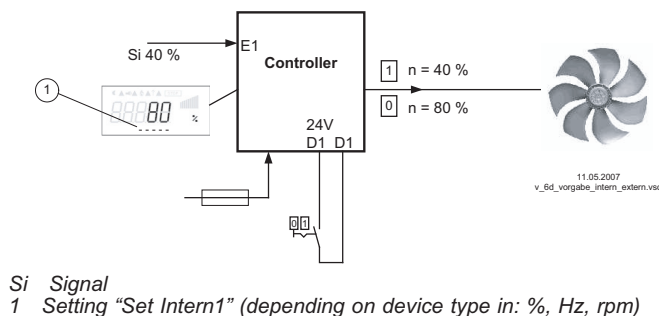
- “D1 Inverting” = “OFF”: “Setpoint1” = 18 °C at opened contact / “Setpoint2” = 25 °C at closed contact.
- “D1 Inverting” = “ON”: “Setpoint1” = 18 °C at closed contact / “Setpoint2” = 25 °C at opened contact.

	<p>Operation with “Setpoint2” is signaled by the moon symbol for reduced operation.</p>
---	---

9.10.3.7 Intern / Extern Function [6D]

Switch over between Set Intern and Set Extern (for mode speed controller **1.0**). “Set extern1” under settings must be programmed to “OFF”.

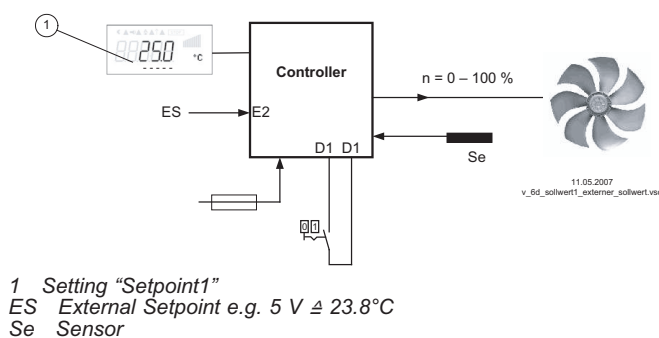
Contact e.g. at digital input “Digital In 1” (depending on device type at terminals “D1” - “D1” or “D1” - “24 V”).



- “D1 Inverting” = “OFF”: “Set Intern1” at opened contact / “Setting Extern” at closed contact.
- “D1 Inverting” = “ON”: “Set Intern1” at closed contact / “Set Extern” at opened contact.

“Setpoint1” / “external Setpoint” (modes **2.01**)

Under Base setup “E2 function” programmed to function **[1E]** for “external setpoint” .
 Contact at digital input e.g. “Digital In 1” = “D1” - “D1”



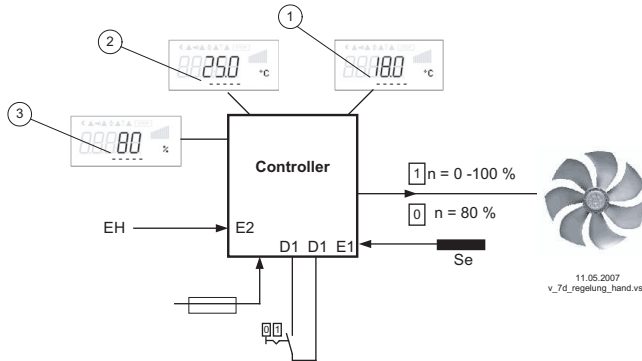
- “D1 Inverting” = “ON”: Setting at the unit at opened contact / Signal Extern at closed contact
- “D1 Inverting” = “OFF”: Setting at the unit at closed contact / Signal Extern at opened contact

9.10.3.8 Automatic control / speed manual, Function 7D (mode 2.01)

Switch over between automatic control to set target value (depending on the activation: “Setpoint1”, “Setpoint2”) and the default for “manual operation” set at the device.

If for Analog In 2 “E2 function” is programmed to 2E switch over between “Setpoint1” or “Setpoint2” and external manual operation. With activated manual mode the display constantly changes between “actual value” and value for “manual mode”.

Contact at digital input e.g. “Digital In 1”



- 1 Setting “Setpoint1”
- 2 Setting “Setpoint2”
- 3 Setting “Speed manual” (depending on device type in: %, Hz, rpm)
- EH Signal for Manual mode extern, E2 Function = 2E
- Se Sensor

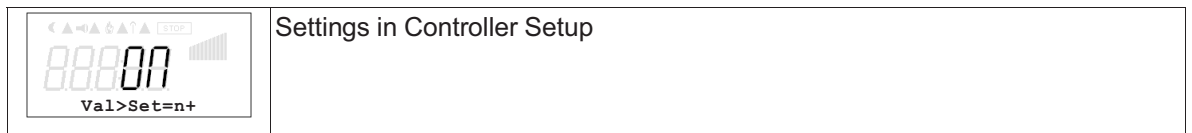
- “D1 Inverting” = “OFF” Automatic control at opened contact / manual operation at closed contact.
- “D1 Inverting” = “ON”: Automatic control at closed contact / manual operation at opened contact.

9.10.3.9 Reverse action of control function (2.01), Function 8D

Switchover between: Increasing modulation during increasing actual-value and increasing modulation during sinking actual-value.

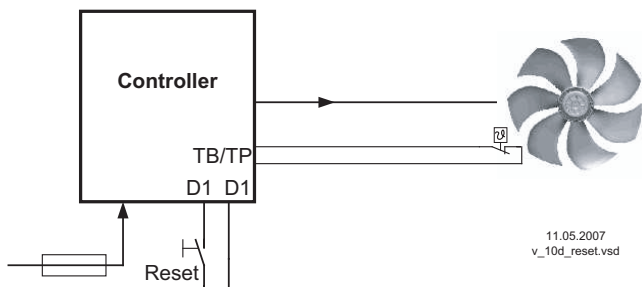
The factory presets for the “Control function” are dependent on the selected mode of operation (☞ Controller Setup - reverse operation of the control function).

When switching over via a digital input, the device works with the opposite function than the one set there!



9.10.3.10 Reset, Function 10D

Reset after motor fault by using an non-locking reset key. The unit switches off when interruption between both “TB/TP” or “TK/PTC” terminals, the unit then remains switched off (“motor fault” see ☞ motor protection). Re-starting after the drive has cooled down (terminals “TB/TP”- or “TK/PTC” bridged) by non-locking reset key possible.

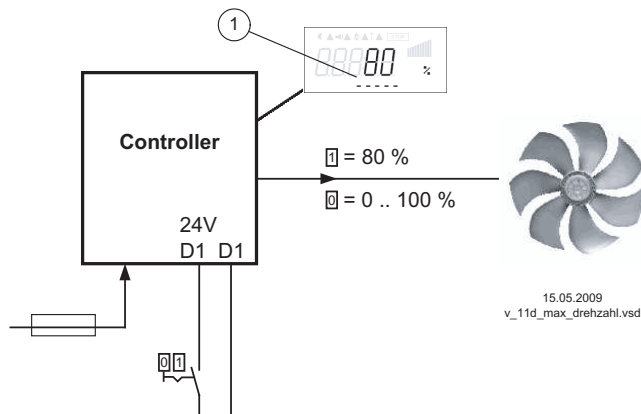


Contact at digital input e.g. “Digital In 1”

- For “D1 Inverting” = “OFF” both terminals “D1”- “D1” in normal operation interrupted. Reset after fault by short close.(For“Inverting” = “ON” reverse function).

9.10.3.11 Setting Max. Speed ON / OFF function [11D]

The value for “Max Speed” adjusted in menu “Settings”, is activated over a digital input. I.e. the unit works independently of the controller function firm with this value.
 Contact e.g. at digital input “Digital In 1” (depending on device type at terminals “D1” - “D1” or “D1” - “24 V”).



- “D1 Inverting” = “OFF”: “Max. Speed” active at closed contact
- “D1 Inverting” = “ON”: “Max. Speed” active at opened contact

1 Setting “Max. Speed” (depending on device type in: %, Hz, rpm)

9.10.3.12 Direction of rotation, Function [13D]

Switch over “clockwise” rotation and “counterclockwise” rotation. When switching over via a digital input, the device works with the opposite function than the one set in motorsetup.



Information

If the rotary direction is reversed with an available modulation, it is initially reduced to “0” (disconnected) and subsequently increased back to the default value.

	The active switch over of direction is indicated by the antenna symbol in the display.
--	--

Contact e.g. by digital input “Digital In 1” for factory setting “ clockwise rotation.”
 “D1 Invertierung” = “OFF”: “Clockwise” at opened contact / “Counterclockwise” at closed contact.
 “D1 Invertierung” = “ON ”: “Counterclockwise” at opened contact / “Clockwise” at closed contact.

9.10.3.13 “Freeze function” = maintain momentary modulation value, Function [14D]

The device continues to work so long independently of the controller function with the momentary value of the modulation and / or speed as activated over the digital input.

	Message indicated alternating with the active value “Freeze Function”
--	---

Contact at digital input e.g. “Digital In 1”
 “D1 Inverting” = “OFF”: “Freeze function” at closed contact activ
 “D1 Inverting” = “ON”: “Freeze function” at opened contact activ

9.10.4 Configuration of analog inputs “E1” and “E2”







9.10.4.1 Signal adaption E1 and E2

If required, an adaptation of the specification signal / speed characteristic curve is possible

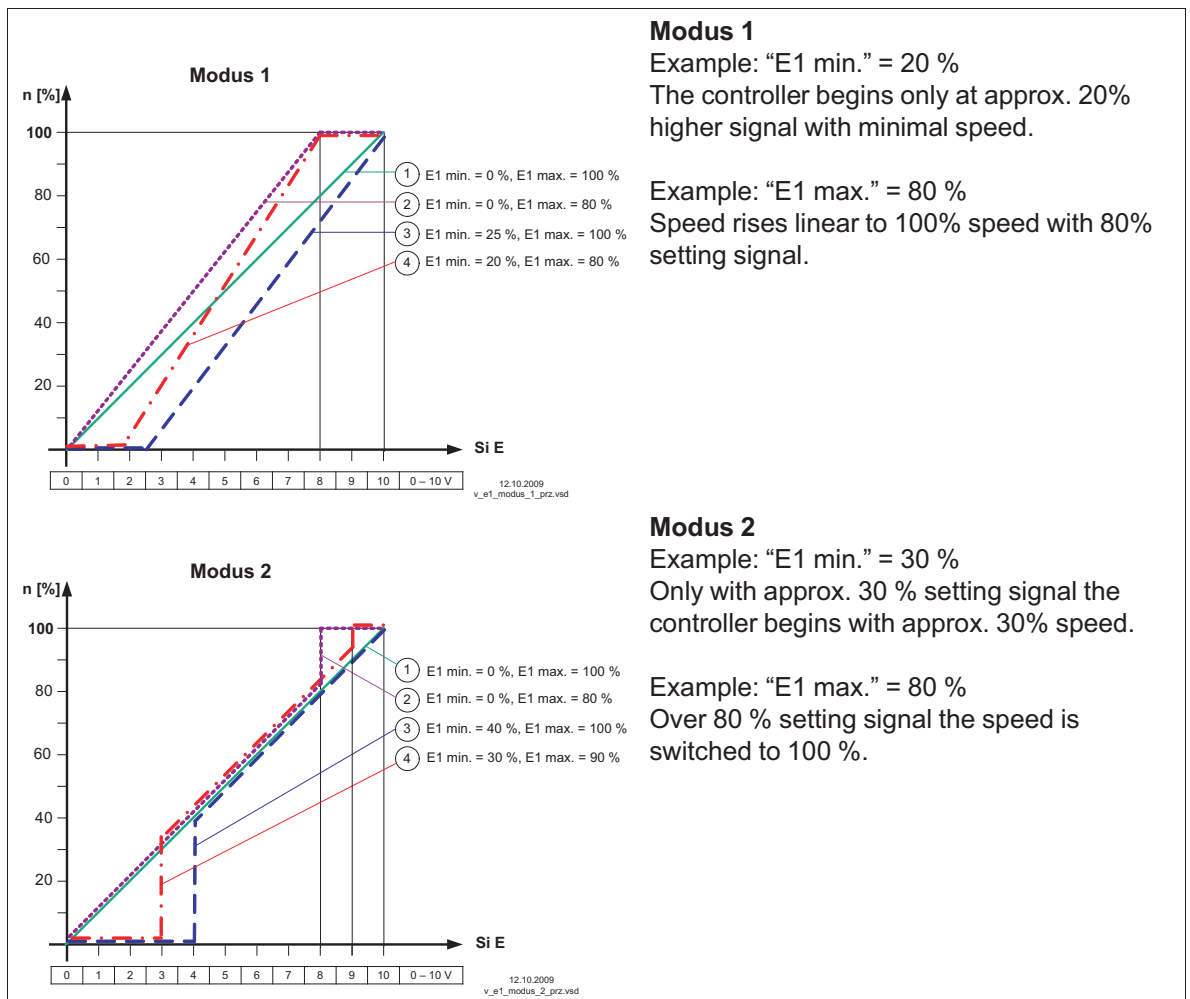


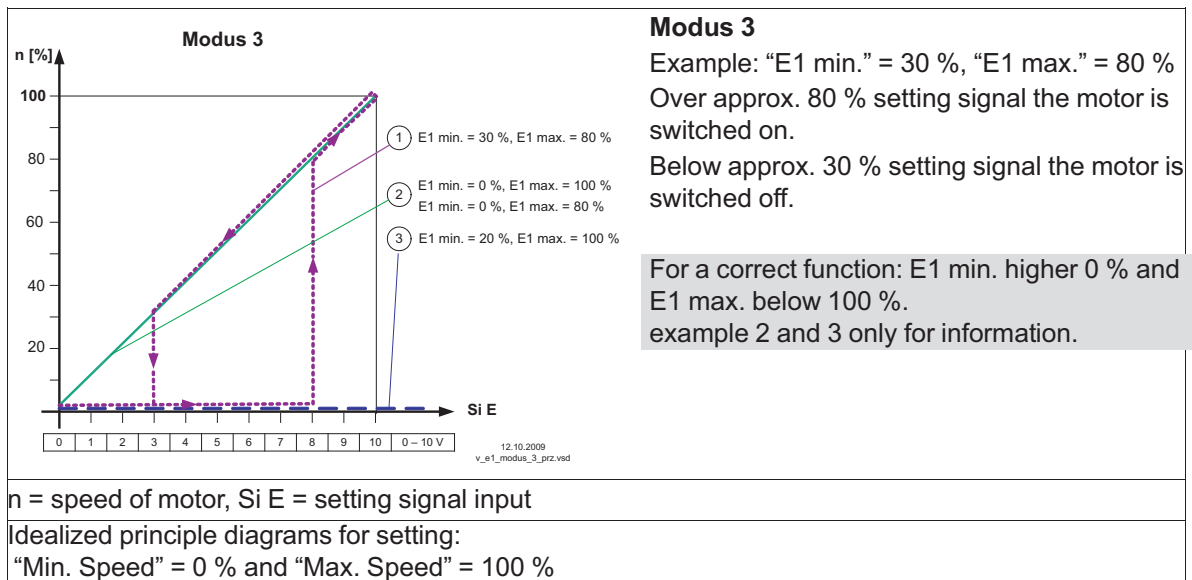
Information

These settings are mostly practical for the operating mode **1.01** with rotational speed specification over an external signal. In operating modes (as of 2.01) this setting is not suited for influencing the regulation process.

	<p>E1 Modus</p> <p>0 = E1 min. / E1 max. without function (factory setting) 1 = Offset / turn 2 = signal range 3 = Hysteresis setting On / Off</p>
	<p>E1 Min.</p> <p>Setting range: 0 - 100 % Factory setting: 0 %</p>
	<p>E1 max.</p> <p>Setting range: 0 - 100 % Factory setting: 100 %</p>
	<p>E2 Mode</p> <p>0 = E2 min. / E2 max. without function (factory setting) 1 = Offset / turn 2 = signal range</p>
	<p>E2 min.</p> <p>Setting range: 0 - 100 % Factory setting: 0 %</p>
	<p>E2 max.</p> <p>Setting range: 0 - 100 % Factory setting: 100 %</p>

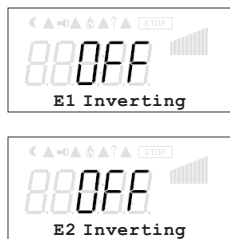
Example for Mode “1.01” with speed setting signal 0 - 10 V





9.10.4.2 Inverting analog inputs “E1” / “E2”

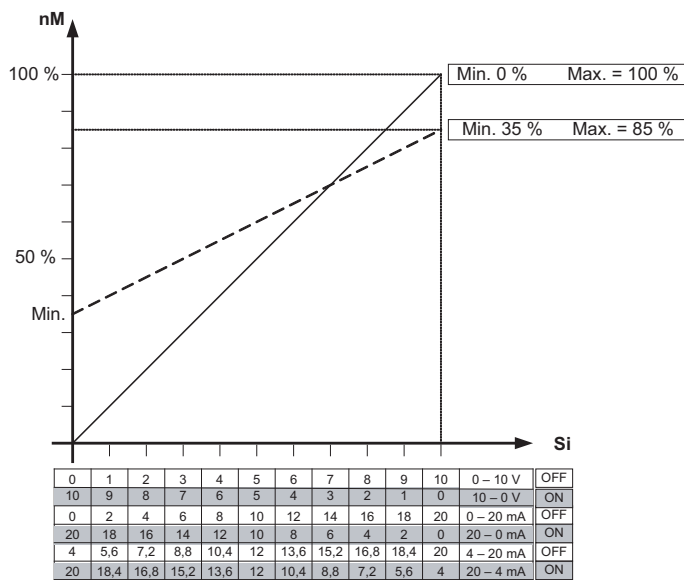
After programming the signal or sensor type, an inversion of the inputs can be carried out.



Factory setting for Inverting inputs = “OFF” (if input activated) (signal: 0 - 10 V, 0 - 20 mA, 4 - 20 mA).

For activation using inverted default signals or sensors with inverted output signals proportional to the measurement range, switch inverting to “ON” (Signal: 10 - 0 V, 20 - 0 mA, 20 - 4 mA).

Example: mode **1.01** speed controller, setting by external signal

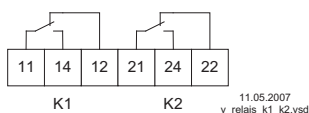


nM Motor speed
 Si Signal
 OFF Inverting = OFF
 ON Inverting = ON

9.10.5 Function and inverting for relay outputs “K1” and “K2”

	<p>Various functions can be allocated to the relay outputs “K1” and “K2”. In case of the same function allocation for “K1” and “K2”, these work parallel. The factory preset is the inversion of relay “K1” and “K2” to “OFF” (if a function has been programmed).</p>
	<p>Switch to “ON” for inversion (switch-time response depends on the allocated function). Fundamentally, the relays can only become operative if the electronic’s voltage supply is functioning. At least 2 current phases must be present!</p>

Function	Description
OFF	Without function Relays remain always de-energized
1K	Operating indication (factory setting for “K1”, non inverting). Operation without fault, reports enable “OFF”
2K	Fault indication (factory setting for “K2”, non inverting). Energized for operation without fault, for enable “OFF” not energized. De-energized at line, motor and controller fault, Sensor fault dependent on programming, external fault at digital input.
3K	External fault separate with message at digital input (factory setting if terminals bridged)
4K	Limit modulation Over or falling below limits for modulation
5K	Limit “E1” When over or falling below limits for input signal “E1”
6K	Limit “E2” When over or falling below limits for input signal “E2”
For modes as controller higher 2.01	
7K	Setpoint Offset Deviation between actual value and setpoint to high
8K	Group control Switching on fans depending on modulation
For modes as temperature controller with additional functions 2.03	
9K	Heating function Switch ON point: temperature = Setpoint +/- Offset Switch OFF point: Temperature around hysteresis over switch ON point
10K	Cooling function Switch ON point: temperature = Setpoint +/- Offset Switch OFF point: Temperature around hysteresis below switch ON point



- K1** 1= energized, terminals 11-14 bridged
 0 = de-energized, terminals 11-12 bridged
- K2** 1= energized, terminals 21-24 bridged
 0 = de-energized, terminals 21-22 bridged

Function	Controller status	K1/ K2	
		1 = energized 0 = de-energized	
		Inverting	
		OFF	ON
1K	Operation without fault, line supply okay	1	0
2K	Fault with indication by relay	0	1
3K	Ext. Fault at digital input for external fault	1	0
4K	Over or falling below limits for modulation	1	0
5K	over or falling below limits for input signal "E1"	1	0
6K	over or falling below limits for input signal "E2"	1	0
7K	setpoint deviation to high	1	0
8K	Switching on second group	1	0

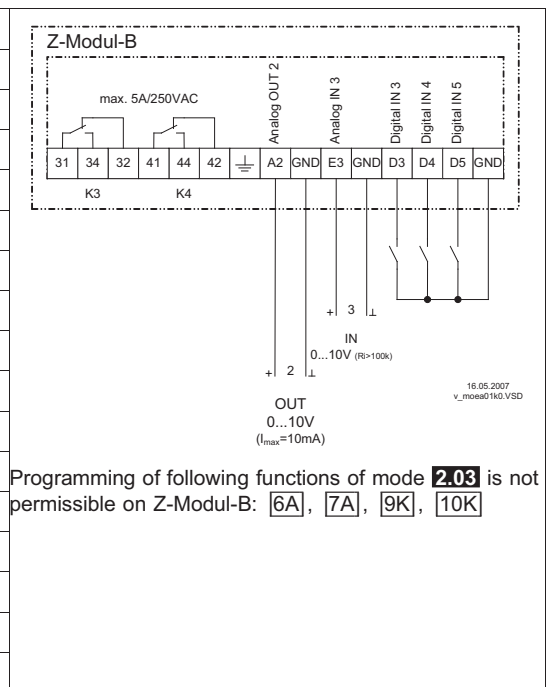
9.10.6 Programming Add-on module type Z-Modul-B

Program the additional inputs and outputs likewise in "IO Setup".

After connecting the module, the settings menus are automatically expanded to include the additional inputs and outputs.

- 1 x analog input 0 - 10 V. For mode **1.01** without function, starting from **2.01** funktion **1E** or **2E** possible.
 - Function **1E** for external target value function.
 - Function **2E** for external manual operation.
- 1 x output 0 - 10 V (A2 / GND), Function programmable, e.g., for: Fixed voltage, proportional level control, proportional input signal, group control, drive 2.
- 3x digital inputs (D3 / GND, D4 / GND, D5 / GND) function programmable, e.g.: Enable (ON / OFF), external malfunction, output limitation, input 1/2, target value 1/2, internal/external preset, controller / manual operation, control-function reversal ("heating" / "cooling").
- 2 x relay outputs ("K3" and "K4") Function programmable, e.g., for: Status signals, alarm indications, external malfunctions at the digital input, level-control threshold, input signal threshold, offset threshold (deviation between current and target value), group control.

Parameter	Factory setting	User Setting
A2 Function	1A	
A2 min.	0.0 V	
A2 max.	10.0 V	
A2 Inverting	OFF	
D3 Function	OFF	
D3 Inverting	----	
D4 Function	OFF	
D4 Inverting	----	
D5 Function	OFF	
D5 Inverting	----	
E3 Function	OFF	
E3 Inverting	----	
K3 Function	OFF	
K3 Inverting	----	
K4 Function	OFF	
K4 Inverting	----	



Programming of following functions of mode **2.03** is not permissible on Z-Modul-B: **6A**, **7A**, **9K**, **10K**

9.10.7 Network by MODBUS®

It is possible to network several devices with each other. The device uses the MODBUS-RTU as the protocol for the RS-485 interface.

The device address (Device-ID) is factory set to the highest available MODBUS address: 247

This address is reserved for operation with an external terminal model AXG.. and should not be occupied with anything else.

	<p>Bus Address The addresses of the individual units must be continuously numbered beginning with "1". No address may be allocated twice. MODBUS address adjustable from 1-247. Address 247 = preprogrammed for an external terminal.</p>
	<p>Addressing Switch addressing to "ON" before setting "address"</p>

Reading and writing parameters

The device supports reading and writing processes for Modbus® Holding Registers (3). The start address is 1,; the number of registers depends on the device. If the allowable start address or number is exceeded, the device answers with an exception code. The description of the register is device dependent and can be requested from service for the device/version concerned.





9.11 Limits

9.11.1 Menu overview "Limits"

	<p>Menu group Limits</p>
--	---------------------------------

Parameter	Factory setting	User Setting
Level. Function	OFF	
Level min.	----	
Level max.	----	
Level Delay	----	
Lmt E1 Function	OFF (1L*)	
Lmt E1 min	---- (0.0 °C*)	
Lmt E1 max.	---- (40.0 °C*)	
Lmt E1 Hyst.	---- (1.0 K*)	
Lmt E1 Del.	---- (2 sec*)	
Lmt E2 Function	---- / OFF	
Lmt E2 min.	----	
Lmt E2 max.	----	
Lmt E2 Hyst.	----	
Lmt E2 Del.	----	
Offset Function	OFF	
Offset 1	----	
Offset 2	----	
Offset Hyst.	----	
Offset Del.	----	
* Deviating factory setting for mode 2.03		
[- - -] = display as long as no allocation has been carried out		

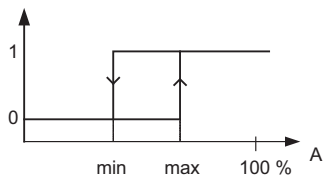
9.11.2 Limit indication depending on modulation

	Following functions can be allocated to the limit indication	
	OFF	without function
	1L	Indication with the centralized fault of a programmed relay (IO allocation Function 2K). Warning symbol in display, "AL" code in events memory.
	2L	Is merely displayed in the events menu as message "msg".
In the IO setup, a separate relay can be allocated independent of these settings.		
	If the modulation exceeds the set "Level max" value, this is reported until the set value "Level min" has been undercut. The indication is delayed by the time set in "Display delay".	
		
	Time delay exceeding "Level max." up to indication by relay and alarm symbol. Setting range: 0 - 120 sec. Factory setting: 2 sec.	

Example indication by relay "K1":

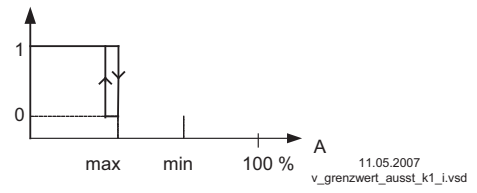
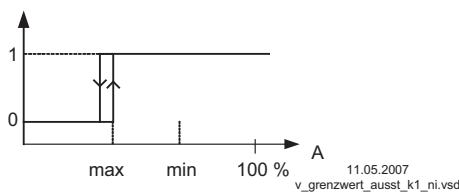
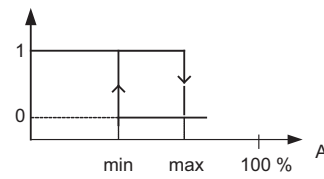
not inverted

IO Setup: K1 Function = 4K
 IO Setup: K1 Inverting = OFF



Inverting

IO Setup: K1 Function = 4K
 IO Setup: K1 Inverting = OFF


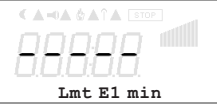

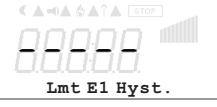



A Fanlevel

A Fanlevel

If "Level min." is higher than "Level max.", the "Level max." switching point is without hysteresis!

9.11.3 Limit indication depending on setting or sensor signal

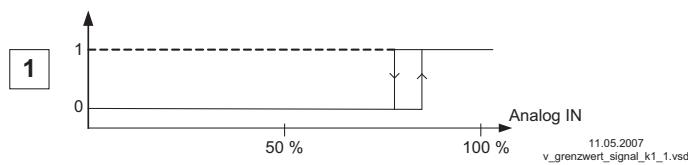
	<p>Following functions can be allocated to the limit indication</p> <table border="1"> <tr> <td>OFF</td> <td>without function</td> </tr> <tr> <td>1L</td> <td>Indication with the centralized fault of a programmed relay (IO allocation Function [2K]). Warning symbol in display, “AL” code in events memory.</td> </tr> <tr> <td>2L</td> <td>Is merely displayed in the events menu as message “msg”.</td> </tr> </table> <p>In the IO setup, a separate relay can be allocated independent of these settings.</p>	OFF	without function	1L	Indication with the centralized fault of a programmed relay (IO allocation Function [2K]). Warning symbol in display, “AL” code in events memory.	2L	Is merely displayed in the events menu as message “msg”.
OFF	without function						
1L	Indication with the centralized fault of a programmed relay (IO allocation Function [2K]). Warning symbol in display, “AL” code in events memory.						
2L	Is merely displayed in the events menu as message “msg”.						
	<p>Both values for E1 (“E1 min” and “E1 max”) can be set independent of each other and act on a relay together if correspondingly programmed. If a function is activated or if a relay is allocated, both settings (“min” and “max”) are initially at “OFF”.</p>						
	<p>Work can be carried out with one as well as with both limit indicators. The same setting applies to “E2 Min.” and “E2 Max.”, described below for “E1”.</p> <p>Undercutting the signal (“E1 min”). If the signal undercuts the set value “E1 min”, this is reported until the set value (plus adjustable hysteresis) has been exceeded once again.</p> <p>Exceeding the signal (“E1 max”). If the signal exceeds the set value “E1 max”, this is reported until the set value (minus hysteresis) has been undercut once again.</p>						
	<p>E1 Hysteresis Hysteresis adjustment in the unit of measure of the programmed input signal.</p>						
	<p>E1 Delay Time delay exceeding “Level max.” up to indication by relay and alarm symbol. Setting range: 0 - 120 sec. Factory setting: 2 sec.</p>						



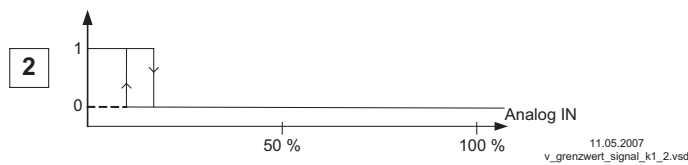
Information

Always adjust the value for the maximum input signal higher than the value for the minimum input signal!
E1 Max. > E1 Min.

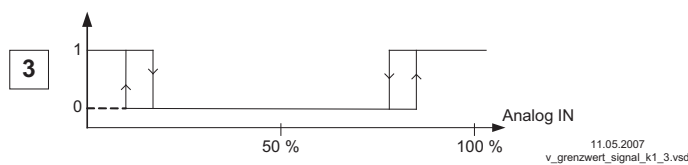
Example for a limit indication of default signal or sensor signal to “Analog In 1”



Settings:
- E1 Max.: 80 %
- E1 Min.: OFF
- switching hysteresis 5 % (from 100 %)



Settings:
- E1 Min.: 20 %
- E1 Max.: OFF
- switching hysteresis 5 % (from 100 %)








Settings:
- E1 Min.: 20 %
- E1 Max.: 80 %
- switching hysteresis 5 % (from 100 %)

Terminal “E1” and “GND” alarm via relay “K1” (non-inverted) IO Setup → K1 function: **[5K]** = limit indicators

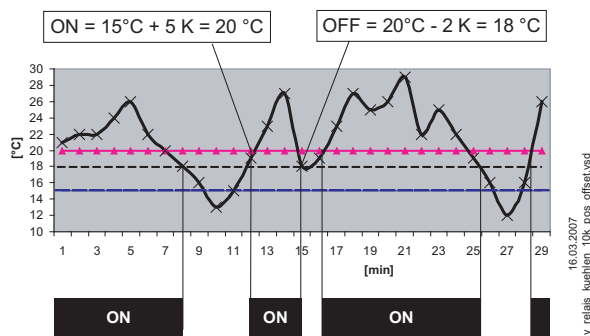
9.11.4 Limit indication depending on (offset) to Setpoint

In operating modes as a controller (via **2.01**), two limit indicators can be carried out based on the set target value (Setpoint) and measured actual value (on E1).

	<p>Following functions can be allocated to the limit indication</p> <table border="1"> <tr> <td>OFF</td> <td>without function</td> </tr> <tr> <td>1L</td> <td>Indication with the centralized fault of a programmed relay (IO allocation function $\boxed{2K}$) warning symbol in display, "AL" code in events memory.</td> </tr> <tr> <td>2L</td> <td>Is merely displayed in the events menu as message "msg".</td> </tr> </table> <p>In the IO setup, a separate relay can be allocated independent of these settings.</p>	OFF	without function	1L	Indication with the centralized fault of a programmed relay (IO allocation function $\boxed{2K}$) warning symbol in display, "AL" code in events memory.	2L	Is merely displayed in the events menu as message "msg".
OFF	without function						
1L	Indication with the centralized fault of a programmed relay (IO allocation function $\boxed{2K}$) warning symbol in display, "AL" code in events memory.						
2L	Is merely displayed in the events menu as message "msg".						
	<p>Offset 1, Offset 2</p> <p>Both values for Offset 1 and Offset 2 can be set independent of each other and act on a relay together if correspondingly programmed. If a function is activated or if a relay is allocated both settings (Offset 1 and Offset 2) are initially at "OFF".</p> <p>Work can be carried out with one as well as with both limit indicators.</p> <p>"Offset 1" for alarm in case of an exceeding of the max. deviation between actual and target. Switch ON point: actual value = Setpoint +/- offset Switch OFF point: Actual value by hysteresis under the switch-on point</p> <p>"Offset 2" for alarm in case of an undercutting of the max. deviation between actual and target Switch ON point: actual value = Setpoint +/- offset Switch OFF point: Actual value by hysteresis over the switch-on point</p>						
	<p>"Offset 1" for alarm in case of an exceeding of the max. deviation between actual and target. Switch ON point: actual value = Setpoint +/- offset Switch OFF point: Actual value by hysteresis under the switch-on point</p> <p>"Offset 2" for alarm in case of an undercutting of the max. deviation between actual and target Switch ON point: actual value = Setpoint +/- offset Switch OFF point: Actual value by hysteresis over the switch-on point</p>						
	<p>Offset Hysteresis</p> <p>Hysteresis switch-on point: In temperature regulation + / - 10 K, otherwise sensors 10 % of measurement range</p>						
	<p>Offset Delay</p> <p>Time delay until indication through relay and alarm symbol. Setting range: 0 - 120 sec. Factory setting: 2 sec.</p>						

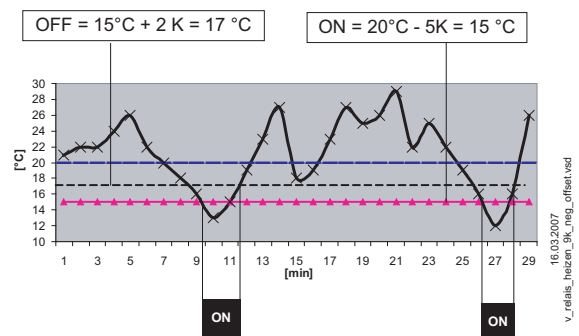
Example for temperature regulation; for other modes of operation settings in corresponding sensor unit.

Offset 1 for alarm during exceeding



Example: Setpoint 15.0 °C, Offset +5.0 K, Hysteresis 2.0 K

Offset 2 for alarm during undercutting



Example: Setpoint 15.0 °C, Offset -5.0 K, Hysteresis 2.0 K

9.12 Motor Setup

9.12.1 Menu “Motorsetup”

 <p>Motor Setup</p>	<p>Menu group Motorsetup</p>
--	-------------------------------------

Parameter	Factory setting	User Setting
Rated Speed	200 rpm	
Polecount	4	
Rolling direct.	1	
MotorRatedCurr.	6.0 A	
Econtrol > 10A	OFF	
PI Mode	1	
Rampup time	20 sec	
Rampdown time	20 sec	
Derating Alarm	5 %	
Suppression1	OFF	
Range1 min.	----	
Range1 max.	----	
Suppression2	OFF	
Range2 min.	----	
Range2 max.	----	
Suppression3	OFF	
Range3 min.	----	
Range3 max.	----	

9.12.2 Setting motor rated speed




Attention!

Maximum speed limiting , important setting!

For EC-Motors a limiting to the maximum permissible speed is required under all circumstances (refer to the rated speed given on the fan’s nameplate).

Overloading can occur if the speed is not limited, and this can lead to damage to the motor or to the EC-Controller!

 <p>Rated Speed</p>	<p>Rated Speed Setting range: 0...6000 rpm Factory setting: 200 rpm</p> <p>For reasons of safety, the maximum speed is preprogrammed in the factory to only 200 rpm!</p>
--	--

9.12.3 Setting Polecount



Attention!

Before commissioning, it is absolutely essential to enter the number of poles of the motor that is connected.

If the number of poles is set incorrectly, it is possible that the motor will be overloaded by too high a rotational speed, thus resulting in damage to the motor.

	<p>Polecount Setting range: 2...16 factory setting 4 (i.e. motors with 4 poles)</p>
--	--

Examples for the number of poles in the type description of the fan:

- For 4-pole motors (type _____ - **4** K _ _ _ _)
- For 6-pole motors (type _____ - **6** K _ _ _ _)

9.12.4 Rolling direct.



Attention!

It is essential to check the direction of rotation of the fan during the initial commissioning.

To do this, note the direction of the arrow on the fan housing. We will not be responsible under any circumstances for warranty for damage caused because the direction of rotation is wrong!

	<p>The correct rotary direction depends on the type of fan. The factory preset is rotary direction 1. Find the fan in the following table to determine the correct rotary direction and to subsequently program. In motors (MK.. or MW..), the rotational direction to be programmed depends on the installation.</p>	
--	---	--

Design Motor or fan	Type	Permissible Rolling direction	
		left	right
MK - Motor (direction of rotation when looking at the rotor)	M K _ _ . _ . _ . _	left	right
MW - Motor (direction of rotation when looking at the cable)	M W _ . . _ . _ . _	right	left
Centrifugal fan with single inlet (direction of rotation when looking at the suction side)	R _ - K _ . _ R / R _ - K _ . _ R		right
	R _ - K _ . _ L / R _ - K _ . _ L	left	
	R _ - N _ . _ A / R _ - N _ . _ A		left
	R _ - N _ . _ B / R _ - N _ . _ B	right	
	R _ - D _ . _ A / R _ - D _ . _ A		left
	R _ - D _ . _ B / R _ - D _ . _ B	right	
Centrifugal fan with double inlet (direction of rotation when looking at the suction cable side)	R _ - _ . . _ R	right	
	R _ - _ . . _ L		left
Setting Rolling direct.		1	0



Information

If the direction of rotation is to be reversed and the speed of the motor is still greater than 30 rpm, the brakes attempt to reduce the speed. If, after 60 sec, the speed is still greater than the threshold value, braking is aborted and the error “Generator operation” is triggered. Also, the request for direction-rotation reversal is deleted (and the parameter is overwritten with its old value).

9.12.5 Setting rated current



Attention!

When commissioning, you must set the motor to the rated current stated on the rating plate.

	<p>MotorRatedCurr. Setting range: 0.0...100.0 A Factory setting: 6.0 A</p>
	<p>When the adjusted value is exceeded, the modulation is reduced as far as necessary until it has readjusted itself. Active current limit is signaled by a bright triangle in the display</p>

9.12.6 Setting current display (only for controllers in sheet metal housing)

	<p>Econtrol > 10 A Only for controllers in sheet metal housing with 10 A and 14 A switch current display to “ON”.</p>
--	--

9.12.7 Setting PI Mode

Over the hall sensors built in the motor the speed is measured and is supplied to the drive logic. Dependent on the difference between measured actual speed and by the electronic given target speed the modulation is affected.

Over the setting “PI Mode” the control mode can be adapted to the size of impeller. For heavy fan impellers it can come with to fast rampup to overcurrent messages.

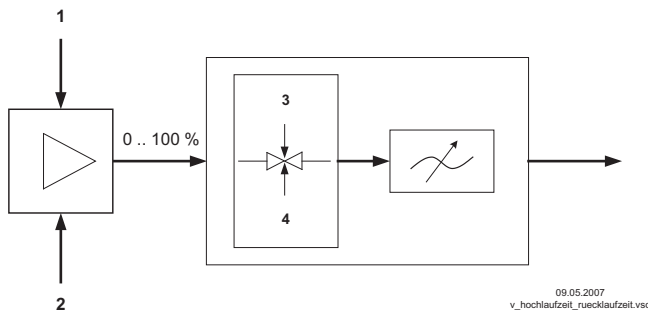
	<ul style="list-style-type: none"> • Setting 0: Operation without speed control, only for special applications • Setting 1: factory setting, for slow rampup of relativ heavy fan impellers. • Setting 2: for middle rampup (for lighter fan impellers). • Setting 3: for fast rampup (for light fan impellers).
--	---

9.12.8 Setting for Rampup time and Rampdown time

By separate menus for Rampup time and Rampdown time an adjustment is possible to individual system conditions.

This function is switched behind the actual controller function.

	<p>Rampup time Time setting in which the automatic controller output from 0 % to 100 % rises. Setting range: 2...250 sec. factory setting: 20 / 40 sec. (depending on device type)</p>
	<p>Rampdown time Time setting in which the automatic controller output from 100 % to 0 % reduces. Setting range: 2...250 sec. factory setting: 20 / 40 sec. (depending on device type)</p>



- 1 external Signal
- 2 Setting
- 3 Rampup time
- 4 Rampdown time

9.12.9 Setting Derating Alarm and Temperaturemonitoring

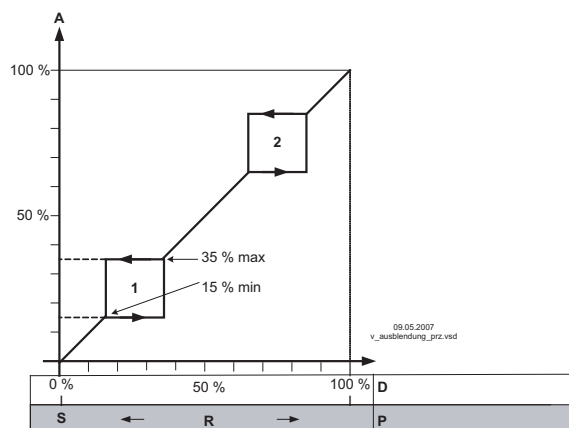
The device has integrated temperature monitoring to protect the device from damage caused by excessively high interior temperatures. In case of a temperature increase above the predetermined threshold value the level-control is linearly reduced until the stated threshold temperatures are reached. To prevent a shut down of the entire system (in this operating mode, allowable for the controller), no alarm indication occurs via the relay contacts until the preset threshold value (due to an excessively high interior temperature) is reached during reduced operation!

	<p>Derating Alarm</p> <p>The factory preset for the “Derating Alarm” is 5 %. I.e. the device level-control due to excessive interior temperatures only amounts to 5 % of the maximum possible. Therefore a message is issued via the programmed operational or indicator relay. Setting range: 1...95 %</p>
--	--

9.12.10 Suppression of speeds








Suppression of up to three speed ranges. Under certain circumstances, it is possible to prevent disturbing noises that can arise at certain speeds due to resonances.

Example for suppression of 2 ranges (Idealized principle diagram)












Setting depending on device type in: %, Hz, rpm

- A Fanlevel
- S Setpoint
- R Pband
- D Speed controller: setting signal
- P P-controller: control deviation

	→	Factory setting no suppression active = "OFF"	→	
	→	Setting for "Range1 min."	→	
	→	Setting for "Range1 max."	→	
	→	Identical procedures for Suppression2 and Suppression3, as far as desired	→	etc.

10 Diagnostics menu

	The diagnostics menu supplies information about the momentary operating condition of the device.
	O = Operation, T = Time, C = Controller The time counting runs, as soon as mains voltage is connected (without fault). If events step on (Motor fault, External Error, etc.), the period of operation is stored at this time (🔌 Events).
	O = Operation, T = Time, M = Motor The time counting runs as soon as a modulation of the controller is present
	The intermediate circuit voltage without load is the peak value of the input voltage. In a three-phase supply network with 400 V, an intermediate circuit voltage of ca. 565 V results. This voltage sinks slightly under load.
	Display of the internal temperature of the power semiconductor. During impermissibly high levels (at 75 °C), the output power is automatically reduced. At 90 °C switch off.
	Display of DCLink Elco temperature. During impermissibly high levels (from 75 °C on), the output power is automatically reduced. At 90 °C switch off.
	Signal height at analog input E1 (Analog In 1)
	
	

	Signal height at analog input E2 (Analog In 2)
	Signal height at analog input E3 (Analog In 3*)
	Status digital input 1 (Digital In 1) OFF = terminals D1 - D1 bridged ↔ ON = terminals D1 - D1 not bridged
	Status digital input 2 (Digital In 2) OFF = terminals D2 - D2 bridged ↔ ON = terminals D2 - D2 not bridged
	Status digital input 3 (Digital In 3*) OFF = terminals D3 - GND bridged ↔ ON = terminals D3 - GND not bridged
	Status digital input 4 (Digital In 4*) OFF = terminals D4 - GND bridged ↔ ON = terminals D4 - GND not bridged
	Status digital input 5 (Digital In 5*) OFF = terminals D5 - GND bridged ↔ ON = terminals D5 - GND not bridged
	OFF = relay K1 de-energized: terminals 11 - 12 bridged ON = relay K1 energized: terminals 11 - 14 bridged
	OFF = relay K2 de-energized: terminals 21 - 22 bridged ON = relay K2 energized: terminals 21 - 24 bridged
	OFF = relay K3* de-energized: terminals 31 - 32 bridged ON = relay K3* energized: terminals 31 - 34 bridged
	OFF = relay K4* de-energized: terminals 41 - 42 bridged ON = relay K4* energized: terminals 41 - 44 bridged

* When operating together with the “Z-Modul-B” type expansion module, the diagnosis menu is automatically expanded to include the additional inputs and outputs.

10.1 Special features for measurements at the EC-Controller and motor

10.1.1 Measuring arrangement

Pulse-width-modulated voltages can cause malfunctions and measurement errors by capacitive unbalances. Such types of errors can be avoided, or at least be considerably reduced, if a number of basic rules are observed:

1. Spatial separation of control cables from motor current and lines cables.
2. Spatial separation of line and motor cables.
3. Screening of the control cables.
4. Screening of the motor cables.
5. Use only screening measuring cables with the probe. Do not configure these parallel to motor cables

10.1.2 Voltage measurements

Voltage measurements can be made without restrictions only on the the mains side of the frequency inverter or EC controller.

Due to the content of the harmonic frequencies, on the motor side meaningful measurements are only possible when using measuring equipment that is capable of measuring the fundamental voltage.

10.1.3 Current measurements

Current measurements can be made without restrictions only on the motor side of the frequency inverter or EC controller.

Line side measurements of the current may only be performed using true r.m.s. measuring equipment. The line current cannot be measured with sufficient accuracy using customary measuring equipment (for sinusoidal currents of corrected arithmetic mean).

10.1.4 Checking the motor magnets

The motor magnets can be tested on-site.

With the incoming line disconnected from the terminals, the motor is rotated manually with the flywheel. An alternating voltage is measured on terminals U1, V1 proportionate to the rotational speed.

If the motor magnets are intact, the ratio: $\text{speed} / \text{rated speed} = \text{measured voltage} / \text{rated voltage}$.

If the motor is designed for a 400 V power supply, for example, at $n = 2.000 \text{ min}^{-1}$, then about 20 V will be induced at 100 min^{-1} .

10.1.5 Checking synchronisation

For an incorrectly connected motor feeder cable U, V, W, or the position sensors H1, H2, H3, the motor will run either “intermittently” or not at all because H1, H2, H3 are not in synchronisation with U, V, W.

The connections and terminal designations should be carefully checked if these symptoms occur.




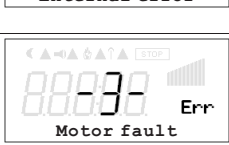
Synchronisation can be established by exchanging $H1 \leftrightarrow H2$ and further by $H2 \leftrightarrow H3$ etc. if necessary (there is a total of six possibilities!).

The drive must be absolutely circular and vibration-free.

For correct synchronisation, the motor current is almost proportional to the given motor torque. I.e. for applications where the load characteristic is square-wave (e.g. fans and pumps). approx. 1/4 of the nominal current is still flowing at half the designed speed. The current flowing is already considerably higher at lower rotational speeds in the case of an incorrect connection.

11 Events / Fault signals

11.1 Display and query of events and malfunctions

	<p>Events during operation can lead to a malfunctioning of the device. The last 10 (0 - 9) events and malfunctions are stored in the “Events” menu group (position “0” = most recent event).</p>
<p>Essemple for possible events</p>	<p>The device differentiates between 3 types of events:</p> <ol style="list-style-type: none"> 1. Messages with code [Msg] Message sensor fault for information, for Alarm sensor deactivated. 2. Alarms with code [AL] Events during which the device automatically restarts operation after the cause of the malfunction has been remedied (e.g. mains failure), or remains in operation (e.g. externally-trunked centralized fault). 3. Error with code [Err] Events that lead to a disconnection of the controlled output (e.g. excess motor temperature). Restarting is only possible after a reset (locked).
	
	
	



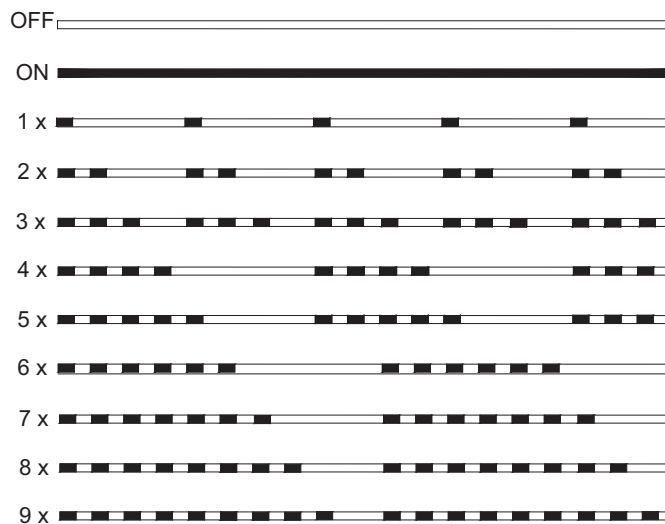
Controllers period of operation at time of message:
 With the **P** key can be switched between description of the message and the Controllers period of operation at this time.
 E.G. on place 3 which is past message **motor fault**



11.2 Messages and trouble shooting

A momentary pending alarm or error message is indicated by a blinking indicator and appears alternately with the standard display.


Operating conditions are indicated by the internal status LED with flashing code.
 internal State LED



11.02.2009
 v_flash_explain.VSD


Display	Code*	LED Code	Relais switches**		Cause	Reaction of Controller
			internal	Operation		
		OFF				Adjustment Line voltage available? Unit switches OFF and automatically ON when the voltage has been restored
		1	X		No enable	Switch OFF by external contact (function [1D] = enable programmed for Digital In)
	AL	-	-	-	fault in Eprom	works with defaults
	AL	-	-	X	fault EEP damaged	works with defaults
	AL	-		X	EEP data incorrectly	controller runs with the read settings
 	AL	3		X	The device has integrated temperature monitoring to protect the device from damage caused by excessively high interior temperatures. In case of a temperature increase above the predetermined threshold value (for capacitors and heat sink 75 °C) the level-control is linearly reduced. To prevent a shut down during reduced operation by to high temperature of the entire system (in this operating mode, allowable for the controller), no switch off and no alarm indication "Overload occurs." (☞ "Setting Derating Alarm")	At sinking temperature the controller restarts. Check the temperature in the device via diagnostic menu. Check cooling of the controller
	AL	5	X	X	The controller was switched off by the current limitation. Delay: 1.25 sec by continuous overcurrent. Immediately switch of after 16th short (< 1.25s) overcurrent. If for 60seconds no short fault the fault counter goes back to 0 .Switch back time: 60 sec.	Controller turns the motor off. There is a renewed attempt to start after about one minute. Check motor and brake function

Display	Code*	LED Code	Relais switches**		Cause	Reaction of Controller	
			internal	Operation			Fault
	Err	-		X	X	While the device was being turned on, a ground fault was detected on the output of the device.	Adjustment Controller switches off. Switch ON again after line interruption. Check the line to the motor and the motor to determine if there is a ground fault
	Err	4		X	X	The device is provided with a built-in phase-monitoring function for the mains supply. In the event of a mains interruption (failure of a fuse or mains phase) the unit switches off after a delay (approx. 60 ms).	If the voltage supply returns within 5 s, the device automatically switches itself back on. In the case of mains interruptions over 3 min., the error message "Line fault" appears. A startup attempt takes place approximately every 60 s, until all three mains phases are available. Checking power supply
	Err	2		X	X	A connected thermostat or thermistor has tripped the circuit or interruption between both terminals "TB/TP" or "TK/PTC"	The unit then remains switched off. A programmed operating and fault-indicating relay is triggering Check motor and connection then reset
	AL	-			X	Incorrect signal from the Hall-ICs, error in the commutation. Hall fault is detected when: H1, H2, H3 = 0, 0, 0 or H1, H2, H3 = 1, 1, 1. By turning motor detection if one signal is incorrect. When motor is standing still fault detection only when all three signals on same level.	EC-Controller turns the motor off. There is a renewed attempt to start after about one minute. Check the hall signal lines (+15 V, GND, H1, H2, H3).
	AL	-			X	If after 30 seconds commutation no speed is measured (>0 rpm), the fault "Motor blocked" is released	EC-Controller switches off. There is a renewed attempt to start after about one minute. Check if motor is freely rotatable.
	AL	-			X	Motor is activated in the wrong direction by a current of air (>250 rpm). 60 s long is tried to brake the motor down. If this is not successful, the error "Direction" is released	EC-Controller switches off. Prevent air current.
	AL	-			selectable	Alarm from external contact	Device continues working unchanged check contacts
	AL	-			selectable	Limit indication minimum Actual value below setting "Alarm Minimum" (Input "E1")	Device continues working unchanged
	AL	-			selectable	Limit indication maximum Actual value above setting "Alarm Maximum" (Input "E1")	Check setting and sensor

Display	Code*	LED Code	Relais switches**		Cause	Reaction of Controller
			Operation	Fault		Adjustment
	Msg or. AL*	6	selectable	selectable	Interruption / short circuit in the sensor leads or sensor values measured are outside measuring range	The device works with minimal or maximum modulation depending on whether there is a short-circuit or an interruption, and on the programmed mode of operation. Check sensor

*Code: Err = Error AI = Alarm Msg = Message
 ** Relais switches dependent on programmed function

12 Software history

Software D1228A, D1765A, D1351A, display version  menu group Start under Econtrol		
Version	Date	Software revision from new version
1.11	15.11.05	IO Setup: function 9A (0 - 10 V output speed)
1.12	15.11.06	Motorsetup: PI Modus 1,2,3
1.13	03.07.07	Base setup: sensors MBG50, MTG120, refrigerant R410A IO Setup: E1, E2 Modus
1.14	21.04.08	Display: current limit, brake, derating
1.15	17.09.09	Start: Motor OFF / ON Modbus: readout serial number via Modbus possible.

13 Enclosure

13.1 Technical data

Type (Part-No.)	Rated current* Output {1} [A]	Rated current (I fundamental component @ 50 Hz) Input {1} [A]	Max. line fuse {2} [A]	Max. heat dissipation approx. {1} [W]	Noise approx. {3} [dB]	Weight [kg]	Housing protection IP
EXDM2.7 (306565)	2.7	2.7 (2.2)	10	80	45.9	3.1	54
EXDM2.7A (306566)	2.7	2.7 (2.2)	10	80	45.9	3.3	54
EXDM2.7E (306567) ^x	2.7	2.7 (/)	10	80	/	3.1	20
EXDM2.7AE (306568) ^x	2.7	2.7 (/)	10	80	/	3.2	20
EXDM4 (306561) ^x	4	4 (/)	10	110	/	7.2	54
EXDM4 (306607)	4	4 (3.4)	10	100	/	7,1	54
EXDM4A (306562) ^x	4	4 (/)	10	110	/	7.3	54
EXDM4A (306606)	4	4 (3.4)	10	100	/	7.3	54
EXDM4E (306569) ^x	4	4 (/)	10	110	/	7.2	20
EXDM4AE (306570) ^x	4	4 (/)	10	110	/	7.3	20
EXDM6 (306563) ^x	6	6 (/)	10	140	54.6	7.4	54
EXDM6 (306610)	6	6 (5.9)	10	130	/	7.3	54
EXDM6A (306564) ^x	6	6 (/)	10	140	54.6	7.5	54
EXDM6A (306609)	6	6 (5.9)	10	130	/	7.5	54
EXDM6E (306571) ^x	6	6 (/)	10	140	54.6	7.4	20
EXDM6AE (306572) ^x	6	6 (/)	10	140	54.6	7.5	20
EXDM10 (306573) ^x	10	10 (/)	16	200	54.6	7.5	54
EXDM10 (306613)	10	10 (9.9)	16	160	/	7.4	54
EXDM10A (306574) ^x	10	10 (/)	16	200	54.6	7.6	54
EXDM10A (306612)	10	10 (9.9)	16	160	/	7.6	54
EXDM10E (306575) ^x	10	10 (/)	16	200	54.6	7.5	20

Type (Part-No.)	Rated current* Output {1} [A]	Rated current (I fundamental component @ 50 Hz) Input {1} [A]	Max. line fuse {2} [A]	Max. heat dissipation approx. {1} [W]	Noise approx. {3} [dB]	Weight [kg]	Housing protection IP
EXDM10AE (306576)*	10	10 (/)	16	200	54.6	7.6	20
EXDM14 (306600)*	14	14 (/)	16	300	/	12.2	54
EXDM14 (306616)	14	14 (12.3)	16	240	/	7.5	54
EXDM14A (306601)*	14	14 (/)	16	300	/	12.2	54
EXDM14A (306615)	14	14 (12.3)	16	240	/	7.7	54
EXDM14E (306602)*	14	14 (/)	16	300	/	12.2	20
EXDM14AE (306603)*	14	14 (/)	16	300	/	12.2	20

* = device will be replaced by a new version
(/) = no indication

* The name plate data for rated current refer to a maximum ambient temperature of 40 °C. For higher temperatures note details for operation with higher ambient temperature, these are available on request of the manufacturer.

{1} for mains voltage 400 V / 50 Hz, values for different specifications on request

{2} Max. supply side line fuse according to DIN EN 60204-1 classification VDE0113 chapter 1

{3} Sound power level A-weighted by internal fan, (/ no fan), (- no indication)

Line voltage*	3 ~ 208...480 V (-15 up to +10 %), 50/60 Hz
Power factor	> 0.9
Clock frequency	16 kHz
Input resistance for sensor or signal set for the rotational speed	for 0 - 10 V input: $R_i > 100 \text{ k}\Omega$ for 4 - 20 mA input: $R_i = 100 \Omega$
Voltage supply e.g. for sensors	+24 V \pm 20 %, I_{max} 120 mA (for connection to an external AXG terminal minus approx. 50 mA)
Output (0 - 10 V)	I_{max} 10 mA (short-circuit-proof)
max. contact rating of the internal relay	2 A / 250 VAC
Max. permissible ambient temperature	40 °C (up to 55 °C with derating)
Min. permissible ambient temperature	0 °C (if mains voltage is not switched off up to -20 °C)
Max. permissible installation height	above 0...4000 m amsl. Above 1000 m amsl the rated current is to be reduced by 5 % / 1000 m
Permissible rel. humidity	85 % no condensation
Electromagnetic compatibility for the standard voltage 230 / 400 V according to DIN IEC 60038	Interference emission EN 61000-6-3 (domestic household applications) Interference immunity EN 61000-6-2 (industrial applications)

Harmonics current according (for $R_{SCE} \geq 120$)	EN 61000-3-2 for a "professional unit". Please ask Ziehl-Abegg for the individual harmonic oscillation levels of the current as a percentage of the fundamental oscillation of the rated current.
Vibratory strength (for vertical installation, i.e. cable inlet down).	Broadband noise (simulated life-endurance test) in accordance with EN 61373, category 1 class B Shock test according to EN 61373, category 1

* Regarding the mains connection, the devices are to be classified as category "C2" devices according to the relevant DIN EN 61800-2. The increased requirements placed on electrical interference for category "C1" devices are complied with in addition.

13.1.1 Versions type-lines Econtrol

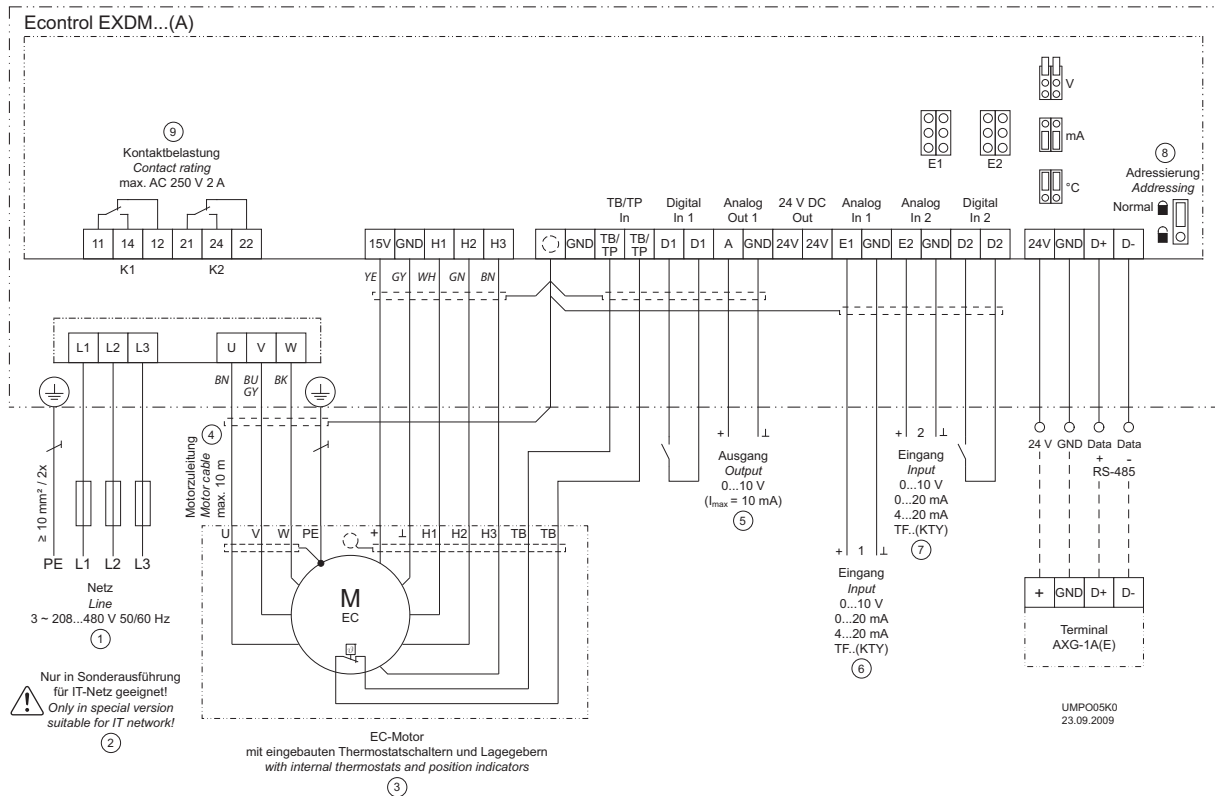
In IP54 for wall mounting

- **EXDM..E** external terminal type AXG-1A(E), for start-up and setting necessary.
- **EXDM..A** internal LCD-Multifunction display with plain language text.

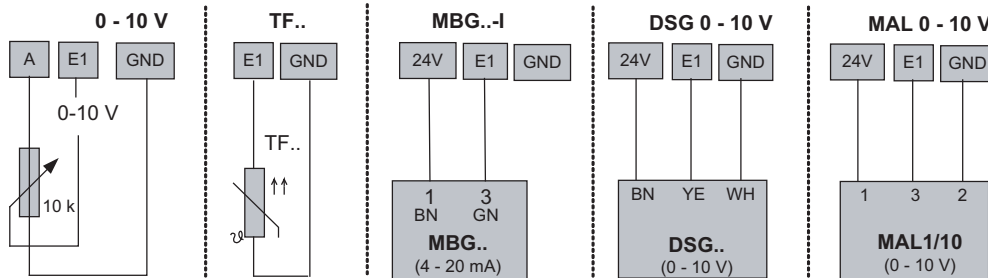
In IP20 for switch cabinet mounting

- **EXDM..E** external terminal type AXG-1A(E), for start-up and setting necessary.
- **EXDM..AE** internal LCD-Multifunction display with plain language text.

13.2 Connection diagram



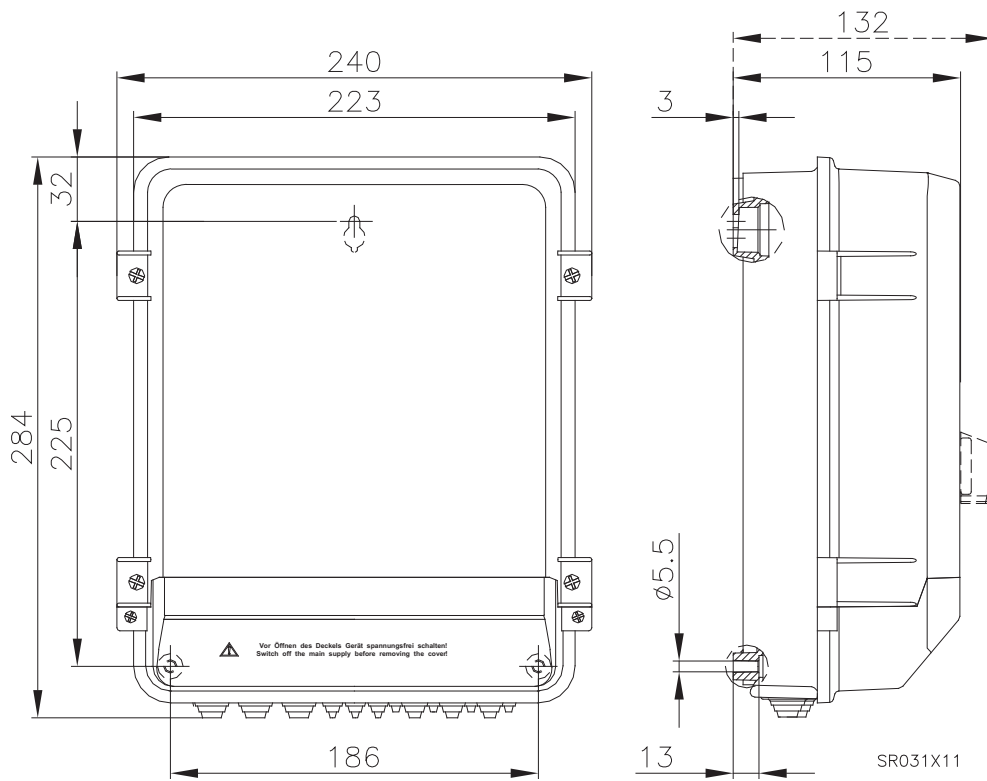
- 1 Line 3 ~ 208...480 V
- 2 Only in special version suitable for IT network!
- 3 EC-motor with internal thermostats and position indicators
- 4 Motor cable max. length 10 m
- 5 Output 0...10 V ($I_{max} = 10 \text{ mA}$)
- 6 Input 1: 0...10 V, 0...20 mA, 4...20 mA, TF..(KTY)
- 7 Input 2: 0...10 V, 0...20 mA, 4...20 mA, TF.. (KTY)
- 8 Addressing, normal lock closed
- 9 Contact rating max. 2A / 250 V AC



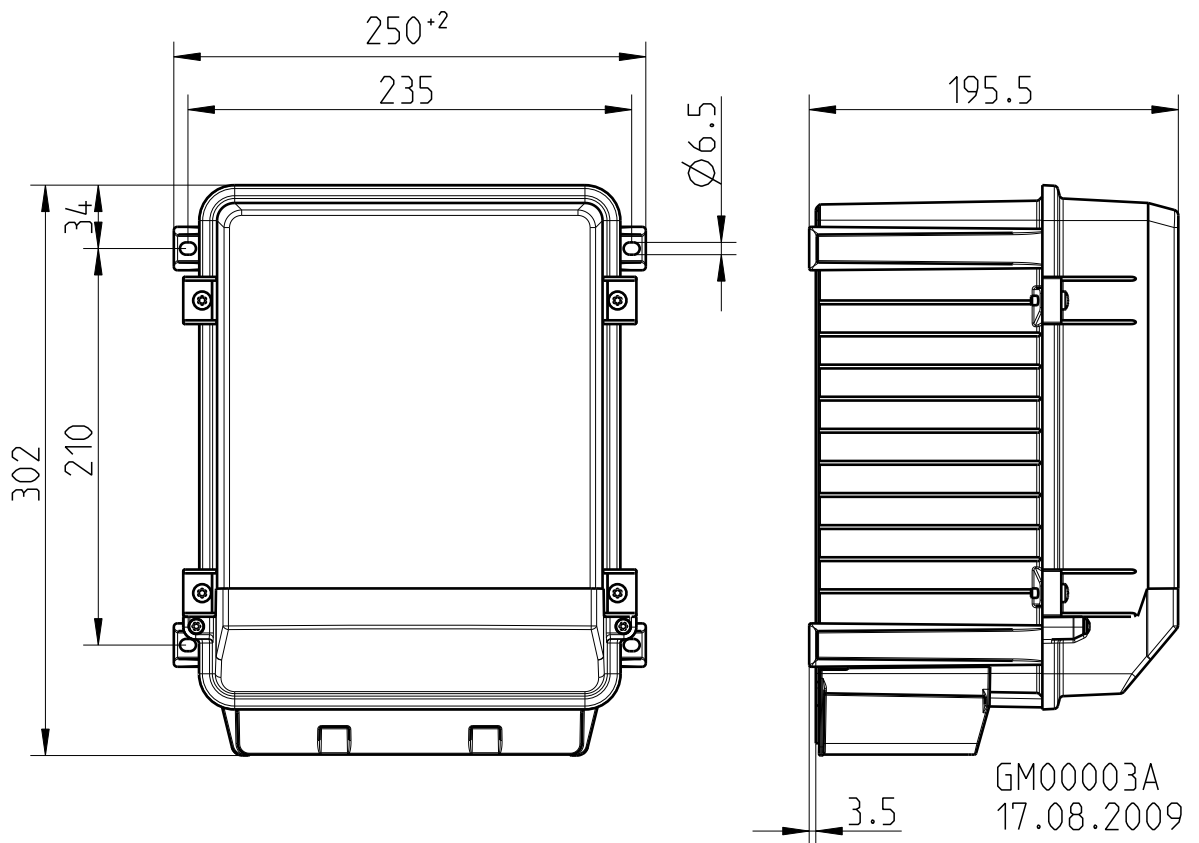
03.09.2008
v_sensoren_e1_anschplan_q.vsd

13.3 Dimensions [mm]

EXDM2.7(A)



EXDM4..14(A)



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13.5 **Manufacturer reference**

Our products are manufactured in accordance with the relevant international regulations. If you have any questions concerning the use of our products or plan special uses, please contact:

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Telefax: +49 (0) 7940 16-504
info@ziehl-abegg.de
http://www.ziehl-abegg.de

13.6 **Service information**

If you have any technical questions while commissioning or regarding malfunctions, please contact our V-STE support department for control systems - ventilation technology.

Our worldwide contacts are available in our subsidiaries for deliveries outside of Germany. 
www.ziehl-abegg.com.

If you make returns for inspections or repairs we need certain information in order to facilitate focused trouble shooting and fast repair. Please use our repair tickets for this. It is provided to you after you have consulted our support department.

In addition, you can download it from our homepage. Download - Ventilation Technology - Topic: Control Engineering - Document type: General documents.