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3 Phase Electronic Voltage Controller

Installation and Wiring Instructions

Stock Ref.N°

444166
444167
444168

Vent-Axia®

IP54

C E

PLEASE READ INSTRUCTIONS IN CONJUNCTION WITH ILLUSTRATIONS.
PLEASE SAVE THESE INSTUCTIONS

Vent-Axia®

Content

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 insturctions 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.

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.

We accept no liability for damage caused by 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. 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   Intended use

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.

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

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 assembly instructions and/or 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.

This device is not intended to be used by people (including children) who have restricted mental, sensory or intellectual abilities or who have a lack of experience and/or knowledge.

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   Work on the device

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. Protection class 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.

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.

Only use the manufacturer's original spare parts / wearing parts / accessories. These parts are specially designed for this device. If parts from other sources are used, there is no guarantee that they are designed and produced for the proper loads and with the required level of safety.
Parts and special equipment not supplied by the manufacturer are not approved 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 assembly instructions and/or 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 assembly instructions and/or 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 controller described is used for continuous speed adjustment on variable voltage 3~ motors used to drive ventilators or pumps.

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 factory 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

- 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).

3.5   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!
- Do not mount equipment on vibrating base!
- 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!
- 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 use supplied stoppers for cable inlets, cut off necessary cable inlets respectively to the cable diameter. Or alternative use cable inlet for cable glands. 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.

min. 50 mm

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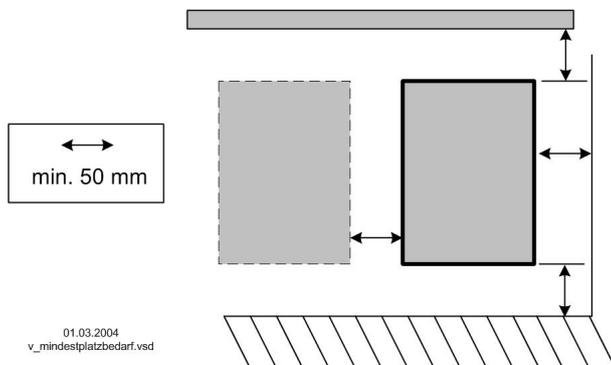
4.3   Outdoor installation

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.**
- **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 re-place 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   Motor feeder cable
The applicable standard for interference emissions is EN 61000-6-3. Compliance with this standard is achieved through the use of an unscreened motor feed cable.

5.2.2   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.

Attention
If the neutral conductor "N" is not connected and the "PE" connection is interrupted, touching can result in dangerously high leakage currents.
In this case, EN 50178 Section 5.3.2.1 for devices with leakage current above 3.5 mA must be observed.

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   Operationg in IT-Net

In the IT net the neutral point of voltage supply is not grounded; in the case of a short-circuit between a phase (e.g. "L1") and protective grounding "PE" becomes the protective grounding potential =" L1".
In order to ensure a trouble free operation in this case:

1. the "GND" potential of the control ports have to be connected with the protective grounding potential.
2. the "N" lead must not be connected.

As consequence of the connection between "GND" potential of the control ports with protective grounding potential, the following must be considered (exception folating relay contacts):

1. connection only with wires, suitable for mains voltage and surrounding area.
2. connection with suitable isolated amplifiers only.

5.4   Residual-current-operated protective device

Danger owing to electric current
Owing to possible leakage currents occurring when the device is switched on, it is advisable to use short-time-delayed current-operated circuit-breakers. This prevents any triggering by mistake.
Plants without neutral conductor connection ☞ Mains connection.

5.5   Motor connection

The motor leads are connected to the terminals: PE, U, V, W. Several fans can be connected to the controller-the maximum total current of all motors (maximum rated current for electronic control of the voltage) must not exceed the current rating for the controller.
If the maximum control current for electronic voltage regulation is not known, a supplementary of the rated motor current must be made.
Typical is this for 2- and 4-pole motors at approx. 25 %, for 6-pole motors at approx. 20 %, for 8- and 10-pole motors at approx. 15 % and higher pole motors at approx. 5 %.
When controlling motors from other manufacturers, the controllability and the maximum current for electronic voltage regulation should be requested from the manufacturer.

Information
It is recommended that a separate motor protection unit be foreseen for each fan.

5.5.1   Running noise

When controlling ventilators using electronic voltage regulators, motor noise can occur (due to the system), which can be troublesome.
On fast running ventilators with a high level of air noise, this noise is relatively low. On slow running ventilators with a low level of air noise, this noise may be dominant in the lower speed range due to the occurrence of resonance.
For systems where noise is critical, we recommend using our frequency inverters with integrated sinusoidal filter.

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5.6   Motor protection

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

- When several motors are connected ensure that the thermal contacts "TB" or PTC resistors "TP" are always connected in series. A maximum of six individual thermistors (DIN 44081 or DIN 44082) may be connected in series to a single device. Depending on the motor type, at least two or three individual sensors are built in.
- Monitoring of motors in Ex zones is not permissible. For systems of this type, an additional posistor tripping unit is required, with disconnection via a separate motor protection circuit.

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!
- **An outside voltage may never be connected to the terminals "TB/TP" and/or "TK/PTC"!**
- If a bypass circuit is installed, or in the "100%" position on devices with a main switch, the motor protection inside the controller has no function. In this case, additional motor monitoring may be required.

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 mode and from the sensor signal employed. Place the internal 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 analogoutputs 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".
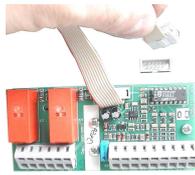
- 1x analogue input 0-10 V (R_i> 100 kΩ) for external Set point
- 1x output 0 - 10 V (I_{max} 10 mA)
- 3x digital-inputs, Activation via floating contacts
- 2x relay outputs (contact load 5 A 250 V AC)

Add-on module type Z-Modul-B

5.11   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!

5.12   Relay outputs (K1, K2)

Various functions can be allocated to the relay outputs "K1" and "K2" (☞ IO Setup: function and inverting relais 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.

5.13   Communication

5.13.1   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.

5.13.2   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).
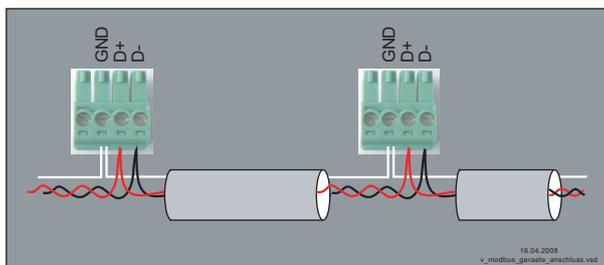
general example for Modbus device connection

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.

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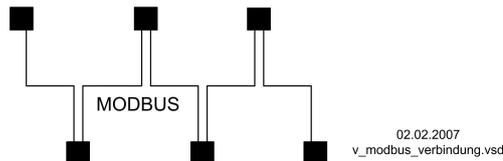
Examples for Modbus connection

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
Patity	=	Even (None, exception of devices agriculture)
Stop bits	=	1
Handshake	=	none

5.13.3   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.

5.14   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
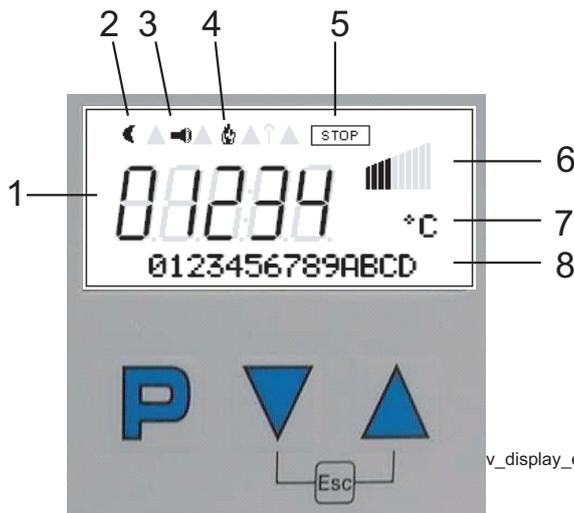
1. Numeric display 5 digit
2. Moon-Symbol for set point 2
3. Alarm-Symbol (fault indication)
4. Fire-Symbol (heating operation)
5. STOP-Symbol (enable)
6. Bargraph Fanlevel
7. Text line 3 figures (display unit, etc.)
8. Text line 16 figures (display text menu.)

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 / %

P↓ ↑ ESC

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

▲ ▼

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

PIN 0010
STOP

←←←← **User**   **Service** →→→→

Start		Info		Setting		Events		Base setup

P↓↑ESC   **P↓↑ESC**   **P↓↑ESC**   **P↓↑ESC**   **P↓↑ESC**

PIN input		Frequency (Hz)		Set Intern1 (%)		Motor fault (Err)		Mode

▲▼   ▲▼   ▲▼   ▲▼

Language (GB)		Set external1 (Hz)		Set Intern2			E1 Analog In (v)
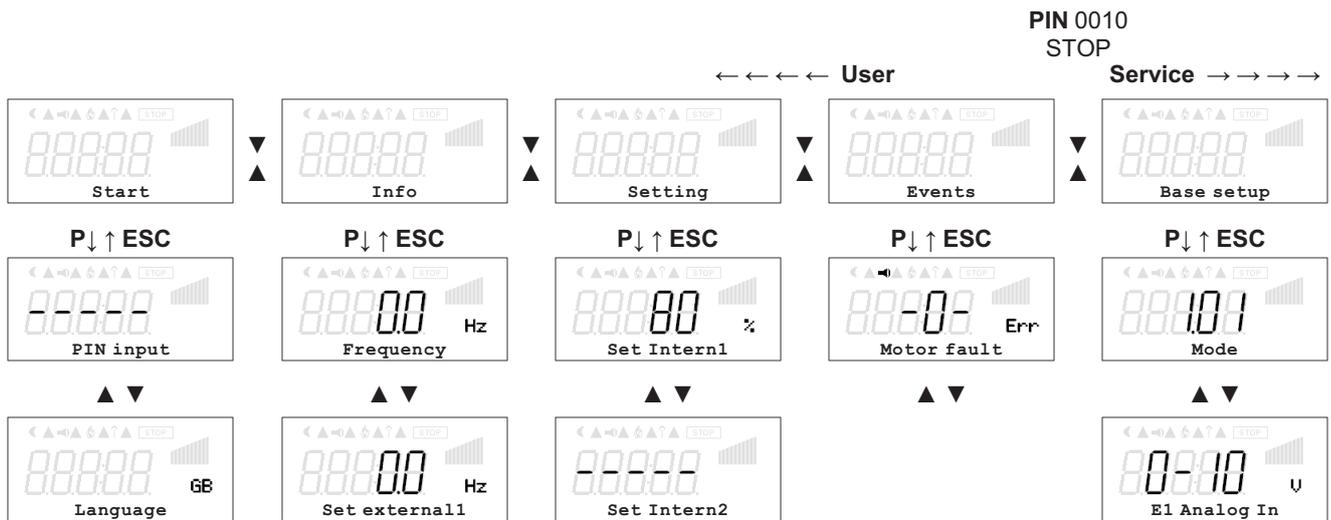
Menu dependent on device type

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.

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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"

1   2   3   4   5   6   7

Mode	P	Mode	▲	Mode	P	Mode
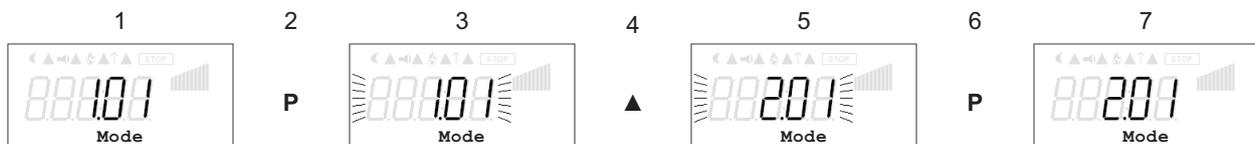
7　Base setup

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 savety 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)
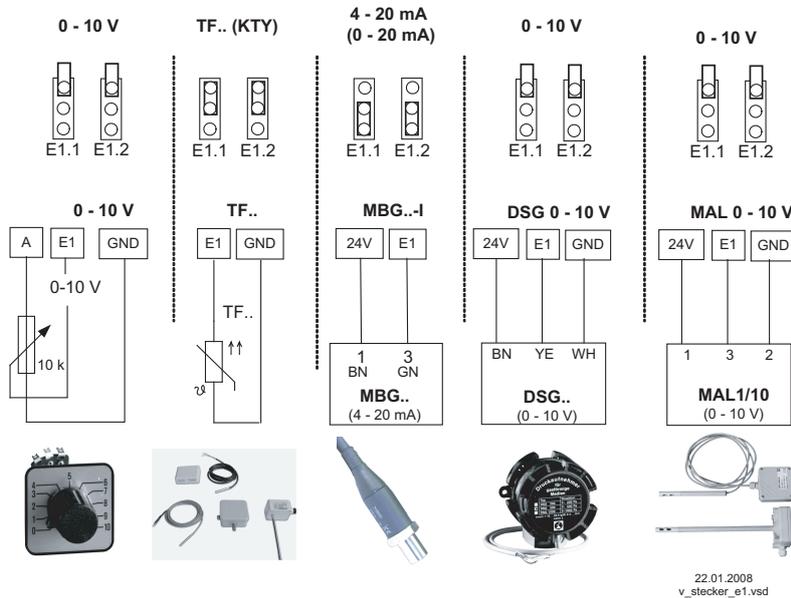
E2 Analog In for modes with two sensors
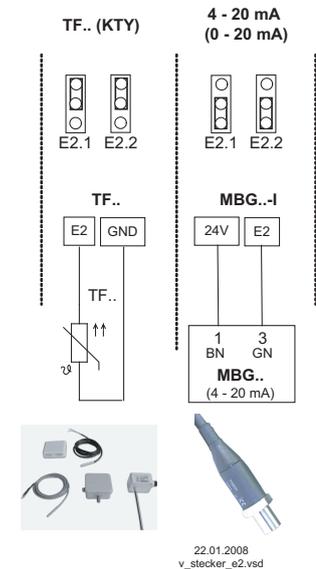
7.1.1　External Setpoint / External speed setting in manual operation

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 $\boxed{1A}$ = "+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
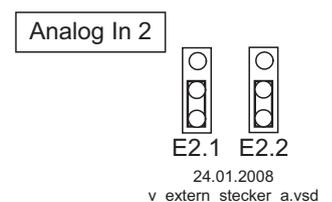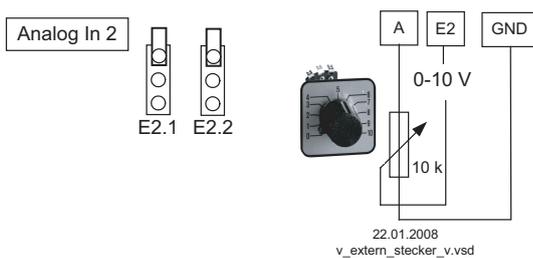
External Setpoint via external signal instead of "Setpoint 1". The "external Setpoint" function must be activated in base setup $\boxed{1E}$ for "E2 function". The active external Setpoint value is displayed in the "info" menu group.
External speed setting in manual operation. The "external manual operation" function must be activated in the basic settings $\boxed{2E}$ for "E2 function". Switchover between settings on the device and external manual operation via the digital input (☞ IO Setup: "Control / manual operation" $\boxed{7D}$).

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

Sequence	Setting
1	If necessary, set the menu language in **Menu group "Start"**. (Factory setting Englisch: **"Language GB"**)
2	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.
3	Setting CosPhi for optimal operation (☞ motor data)

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
- - - - - PIN input	0.0 % Modulation	80 % Set Intern1	-0- Motor fault	**1.01** Mode	OFF PIN Protec-tion	1A A Function	OFF Level. Function	0.80 CosPhi	OTC 00012:56:-15
GB Lan-guage	0 % Set exter-nal1	- - - - - Set Intern2	-1- Overload	0-10 V E1 Analog In	OFF Set protec-tion	0.0 V A min.	- - - - - Level min.	20 sec Rampup time	OTM 00010:56:-11
OFF Reset		0 % Min. Speed	-2- External error	OFF E2 Func-tion	OFF Save User Setup	10.0 V A max.	- - - - - Level max.	20 sec Rampdown time	27.4 °C Heatsink
1.01 Mode		100 % Max. Speed	-3- Sensor 2	- - - - - E2 Analog In	- - - - - Limit	OFF A Inverting	- - - - - Level Delay	OFF Suppres-sion1	32.4 °C Heatsink
1.13 Ucontrol		ON Set exter-nal1			OFF Group 2 ON value	OFF D1 Func-tion	OFF Lmt E1 Function	- - - - - Range1 min.	29.5 °C E1 - KTY
					- - - - - nmin at Group2	- - - - - D1 Invert-ing	- - - - - Lmt E1 min	- - - - - Range1 max.	0.00 mA E1-Current

Vent-Axia

9   Programming

9.1   Speed controller `1.01`

9.1.1   Base setup `1.01`

[display: Base setup]	**Base setup**
[display: 1.01 Mode]	**Mode** Factory setting Mode: `1.01`
[display: 0-10 V E1 Analog In]	**E1 Analog In** Selection: 0 - 20 mA, 4 - 20 mA, Bus (Inverting ☞ IO Setup) Factory setting: 0 - 10 V
[display: OFF E2 Function]	**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 .
[display: ----- E2 Analog In]	**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`

[display: Setting]	**Setting**
[display: 80 % Set Intern1]	**Set Intern1** Setting range Manual speed setting: 0...100 % Factory setting: 80 %
[display: Set Intern2]	**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)
[display: 0 % Min. Speed]	**Minimal Speed** Setting range: 0...100 % Factory setting: 0 %
[display: 100 % Max. Speed]	**Maximal Speed** Setting range: 100 % - "Min. Speed" Factory setting: 100 %
[display: ON Set external1]	**Set external1** "ON" (factory setting) = speed setting by external Signal "OFF" = Setting "Set Intern1"

Diagram setting signal and output voltage (Idealized principle diagram)

0	1	2	3	4	5	6	7	8	9	10	0 – 10 V
10	9	8	7	6	5	4	3	2	1	0	10 – 0 V
0	2	4	6	8	10	12	14	16	18	20	0 – 20 mA
20	18	16	14	12	10	8	6	4	2	0	20 – 0 mA
4	5,6	7,2	8,8	10,4	12	13,6	15,2	16,8	18,4	20	4 – 20 mA
20	18,4	16,8	15,2	13,6	12	10,4	8,8	7,2	5,6	4	20 – 4 mA
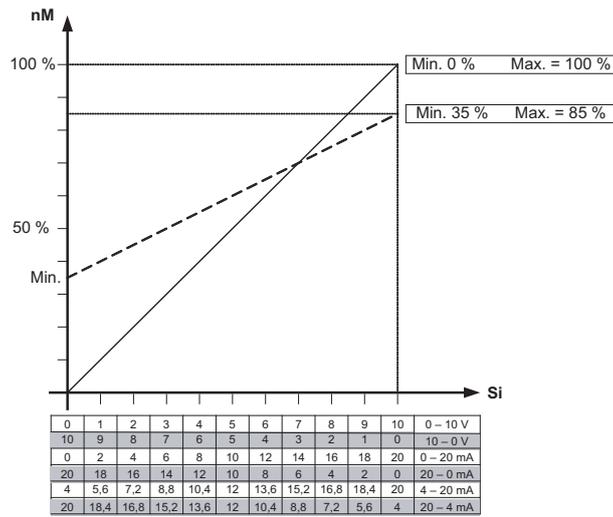
09.05.2007
v_nmotor_101.vsd

nM   Motor speed
Si   Signal

9.1.3   Menu Speed controller 1.01

Parameter	Factory setting	User Setting	
Start			
PIN input	- - - - -		
Language	GB		
Reset	OFF		
Mode	1.01		
Ucontrol	1.13		
Info			
Modulation	0 %		
Set external1	0 %		
Setting			
Set Intern1	80 %		
Set Intern2	- - - - -		
Min. Speed	0 %		
Max. Speed	100 %		
Set external1	ON		
Events			
Base setup			**1.01** Speed controller
Mode	**1.01**		
E1 Analog In	0 - 10 V		**E2 Function**
E2 Function	OFF		1E E1/E2 Switch over
E2 Analog In	- - - - -		
Further menus see chapters:			4E E1/E2 automatic higher level
• Controller Setup			
• IO Setup			
• Limits			
• Motor Setup			
• Diagnostic			

9.2   Temperature control `2.01`...`2.05`

9.2.1   Basic setting `2.01`...`2.05`

Base setup	**Base setup**
2.01 Mode	**Mode** Mode selection e.g. `2.01`
TF *E1 Analog In*	**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). Alternative selection Sensor: "MTG120V" Aktive sensor with 0 - 10 V output (☞jumper for input signal) and proportional measuring range: -10...+120 °C. Alternative selection signal: 0 - 10 V, 0 - 20 mA, 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 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
0.0 K E1 Offset	**E1 Offset** Sensor calibration with calibrated comparison device

OFF E2 Function	**E2 Function**
	• Funktion $\boxed{1E}$ = External Setpoint via external signal (0 - 10 V) instead of "Setpoint1".
	  – For sensor type "E1 Analog In" = "TF": 0 - 10 V ≜ -27...+75.0 °C.
	  – For sensors with active signal: 0 - 10 V ≜ 0 - 100 % sensor measuring range.
	
	• Function $\boxed{2E}$ = 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).
	• Function $\boxed{7E}$ Measurement value = Measurement value e.g. for limit indication, display in Info menu "E2 Actual".

	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. • `2.04` E2 Function at $\boxed{4E}$ preprogrammed = comparison value with control to higher temperature. Alternative: average of 2 measuring points for this must be reprogrammed on function $\boxed{3E}$ preprogrammed sensor type "TF". • `2.05` E2 Function at $\boxed{5E}$ preprogrammed = regulation on difference temperature between sensor 1 and sensor 2. Preprogrammed sensor type "TF".

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.

Setting	**Setting**
Setpoint1	**Setpoint1** 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 Setting range: at active sensor type "MTG-120V": -10.0 °C...+120.0 °C Factory setting: [2.01] - [2.05] : 55.0 °C
Setpoint2	**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: |- - - - -| ☞ IOSetup).
Pband	**Pband** small control range = short control times big control range = longer control times and (higher controller stability) passive Sensor type "TF.." Setting range: 0-120.0 K (Kelvin) Factory setting: 5.0 K, (at [2.02]: 20.0 K) active Sensor type "MTG-120V" Setting range: -10.0...+120.0 K Factory setting: 65.0 K
Min. Speed	**Minimal Speed** Setting range: 0...100 % Factory setting: 0 %
Max. Speed	**Maximal Speed** Setting range: 100 %... "Min. Speed" Factory setting: 100 %
Manual mode	**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 man.	**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.

9.2.3   Functional diagrams temperature control

Example 1: Temperature control in factory setting "Cooling function" (Idealized principle diagram)
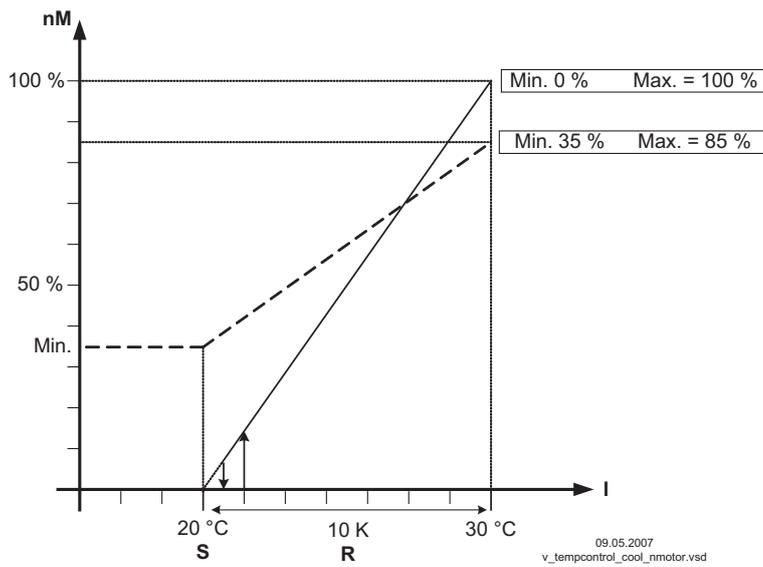
(Controller Setup: "Val > Set = n+" to "ON")

nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

Example 2: Temperature control in "Heating function" (Idealized principle diagram)
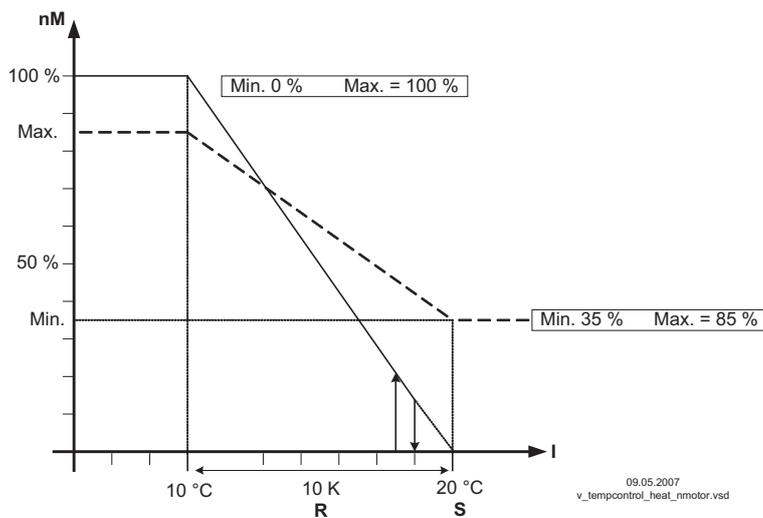
(Controller Setup: "Val > Set = n+" to "OFF")

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.

[Display: 0.0 K — Offset AnalogOut]	**Offset AnalogOut** The target value for this output is the target value (Setpoint) for the ventilation "offset setting". Adjustment: range +/- 10 K relative to the active Setpoint. Example for triggering a shutter servomotor: At factory setting "0 K" = synchronous operation. 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).
[Display: 2.0 K — Pband AnalogOut]	**Pband AnalogOut** Pband AnalogOut = separately adjustable range of control (P-band) for 0 - 10 V output Setting range: 0...102.0 K Factory setting: 2.0 K
[Display: 0 % — Min. AnalogOut]	**Min. AnalogOut** Min. AnalogOut = Minimal output voltage Setting range: 0...100 % = 0 - 10 V Factory setting: 0 %
[Display: 100 % — Max. AnalogOut]	**Max. AnalogOut** Max. AnalogOut = Maximal output voltage, Setting range: 100...0 % = 10 - 0 V Factory setting: 0.0 K

Example for signal out 0 - 10 V (IO Setup: "A function" = 6A)
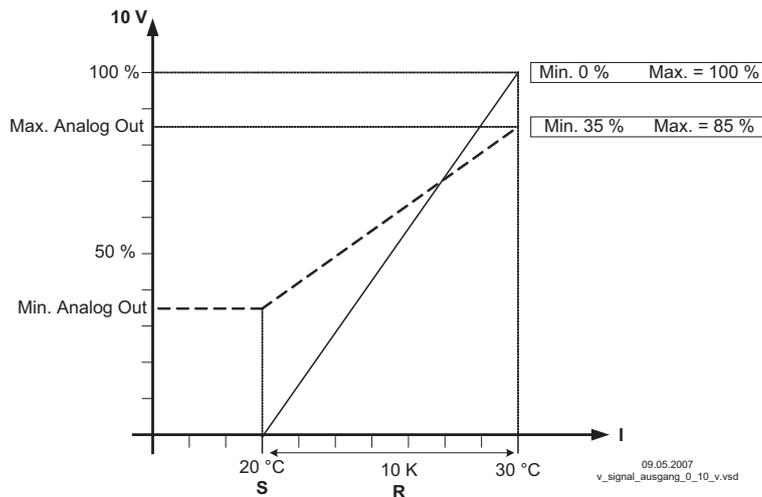
Example: Setpoint ventilation 25.0°C, Offset -5.0 K, Pband 10.0 K

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

9.2.5   For mode **2.03** : Relay output for Heating or Cooling

 OffsetDigitalOut	**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 • "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
 Hyst.DigitalOut	**Hyst.DigitalOut** Switching hysteresis of the relay Setting range: 0...10 K, Factory setting: 1.0 K (Kelvin)

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
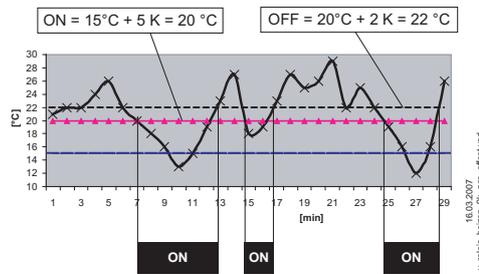
Example:
Setpoint 20.0 °C, Offset -5.0 K, Hysteresis 2.0 K
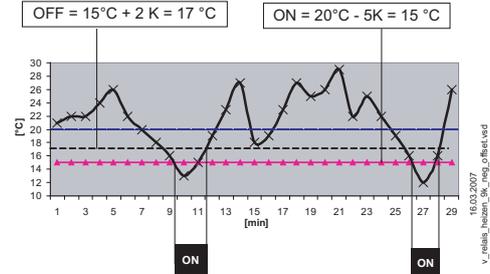
The activated heating is indicated over the fire symbol in the display.

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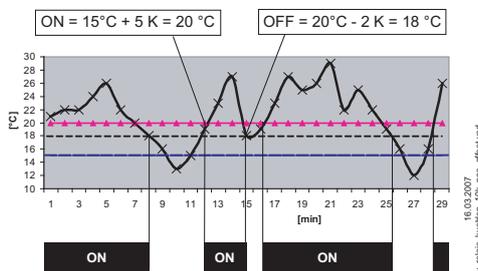
If the ambient temperature is higher than the set operating point, the cooling remains switched on. If the ambient temperature falls below the set operating point of the cooling by 2 K (Kelvin), it is switched off. I.e., the OFF point is situated at the hysteresis value under the ON point.

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`).

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

Lmt E1 min	Example for display if falling below setting "Alarm Minimum" alternating to the actual value display. Relay "K1" disengages (if not inverted).
Lmt E1 max.	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							
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`		
Ucontrol	1.13	1.13	1.13	1.13	1.13		
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")
Modulation	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %		
Msco	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 %	0 %	0 %	0 %	0 %		
Max. Speed	100 %	100 %	100 %	100 %	100 %		
Manual mode	OFF	OFF	OFF	OFF	OFF		`2.01` Temperature control simple
Speed man.	100 %	100 %	100 %	100 %	100 %		

Offset AnalogOut			0.0 K				
Pband AnalogOut			2.0 K				
Min. AnalogOut			0 %				
Max. AnalogOut			100 %				
OffsetDigitalOut			-1.0 K				
Hyst.DigitalOut			1.0 K				
Alarm Minimum			0.0 K				
Alarm Maximum			40.0 °C				
Events							
Base setup							
Mode	2.01	2.02	2.03	2.04	2.05	
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	
E2 Function	OFF	OFF	OFF	4E	5E	
E2 Analog In	- - - - -	- - - - -	- - - - -	TF	TF	
E2 Min.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E2 Max.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E2 Decimals	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E2 Unit	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E2 Offset	- - - - -	- - - - -	- - - - -	0.0 K	0.0 K	

Further menus see chapters:
- Controller Setup
- IO Setup
- Limits
- Motor Setup
- Diagnostic

2.02 Temperature control depending on outdoor temperature

2.03 Temperature control with additional functions: shutter and heating

2.04 Temperature control with two Sensors comparison with control to higher value average calculation of 2 measuring places

2.05 Temperature control with 2 sensors. Regulation on difference temperature.

E2 Function

1E external Setpoint

2E external manual mode

3E Sensor average to E1

4E Sensor comparison to E1

5E Sensor difference to E1

6E Sensor for Setpoint

7E Measurement

9.3   Pressure control for condensers refrigeration `3.01`...`3.04`

9.3.1   Base setup `3.01`...`3.04`

Base setup	**Base setup**
`301` Mode	**Mode** Mode selection e.g. `3.01`
`0-30` MBG E1 Analog In	**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
`0.0` bar E1 Offset	**E1 Offset** Sensor calibration with calibrated comparison device
`r503` E1 Refrigerant	**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"!
`OFF` E2 Function	**E2 Function** (only for special applications) • External setpoint = Function $\boxed{1E}$ by external signal (0 - 10 V) instead of "Setpoint1". 0 - 10 V ≜ 0 - 100 % sensor measuring range. • External manual operation via external signal (0 - 10 V) = Function $\boxed{2E}$. Switch over between settings on the device and external manual operation via digital input (☞ IO Setup). • Measurement value = function $\boxed{7E}$ e.g. for limit indication, display in Info menu "E2 Actual". **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 $\boxed{4E}$ preprogrammed = comparison value with control to higher value (two circuit condensers).

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: ` ----- ` ☞ 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"	
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.	
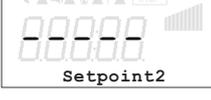
9.3.3 Functional diagrams pressure control condensers

Functional diagram for Mode **3.01** and **3.03** (Idealized principle diagram)
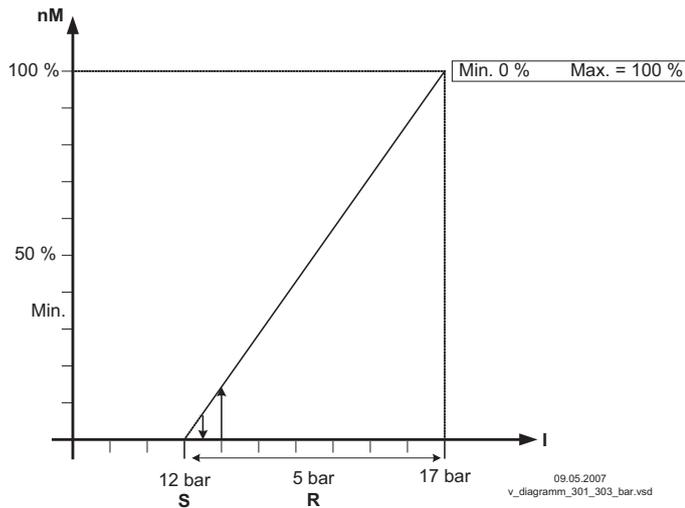
nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

Functional diagram for Mode **3.02** and **3.04** (Idealized principle diagram)
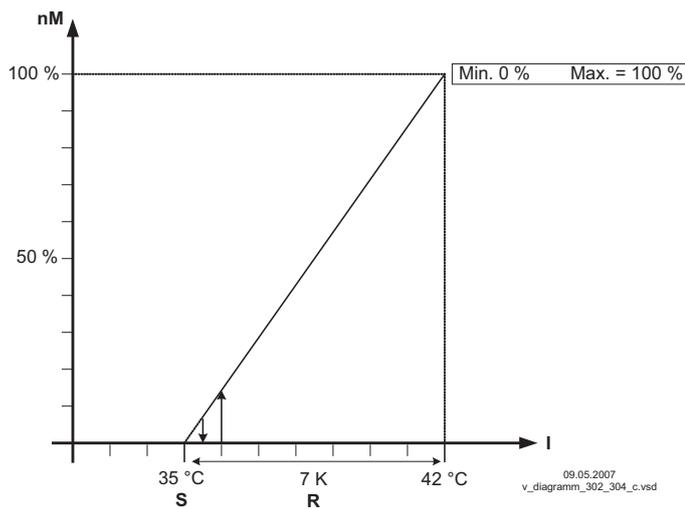
nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

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

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9.3.4   Menu pressure controller refrigeration `3.01` ... `3.04`

Parameter	Factory setting				User Setting
Start					
PIN input	- - - - -	- - - - -	- - - - -	- - - - -	
Language	GB	GB	GB	GB	
Reset	OFF	OFF	OFF	OFF	
Mode	3.01	3.02	3.03	3.04	
Ucontrol	1.13	1.13	1.13	1.13	
Info					
Control value			12.0 bar	22.6 °C	
E1 Actual	10.0 bar	19.5 °C	9.5 °C	19.4 °C	
E2 Actual	- - - - -	- - - - -	12.0 bar	22.5 °C	
Setpoint1	12.0 bar	35.0°C	12.0 bar	35.0°C	
Modulation	0.0 %	0.0 %	0.0 %	0.0 %	
Msco	OFF	OFF	OFF	OFF	
Setting					
Setpoint1	12.0 bar	35.0°C	12.0 bar	35.0°C	
Setpoint2	- - - - -	- - - - -	- - - - -	- - - - -	
Pband	5.0 K	7.0 °C	5.0 bar	7.0 K	
Min. Speed	0 %	0 %	0 %	0 %	
Max. Speed	100 %	100 %	100 %	100 %	
Manual mode	OFF	OFF	OFF	OFF	
Speed man.	100 %	100 %	100 %	100 %	
Events					
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	
E2 Refrigerant				R503	
E2 Min.	- - - - -	- - - - -	- - - - -	- - - - -	
E2 Max.	- - - - -	- - - - -	- - - - -	- - - - -	
E2 Decimals	- - - - -	- - - - -	- - - - -	- - - - -	
E2 Unit	- - - - -	- - - - -	- - - - -	0.0 K	
E2 Offset	- - - - -	- - - - -	0.0 bar	0.0 K	

Further menus see chapters:
- Controller Setup
- IO Setup
- Limits
- Motor Setup
- Diagnostic

`3.01` Pressure control condensers, Setpoint in bar

`3.02` Pressure control for condensers with input for refrigerant, Setpoint in °C

`3.03` 2 sensors for dual circuit condensers regulation to the highest actual value (selection amplifier integrated) Setpoint in bar.

`3.04` 2 sensors for dual circuit condensers with input for refrigerant. Regulation to the highest actual value Setpoint in °C .

E2 Function

`1E`   external Setpoint

`2E`   external manual mode

`3E`   Sensor average to E1

`4E`   Sensor comparison to E1

`5E`   Sensor difference to E1

`6E`   Sensor for Setpoint

`7E`   Measurement

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9.4   Pressure control airconditioning `4.01` ... `4.03`

9.4.1   Base setup `4.01` ... `4.03`

 Base setup	**Base setup**
 Mode	**Mode** Mode selection e.g. `4.01`
 E1 Analog In	**E1 Analog In** In all group 2 operating modes 4 (`4.01`, `4.02`, `4.03`, ...) "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" . For not preprogrammed measuring range the sensor measurement range must be entered in order to display the actual value correctly. 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 unit = Pa
 E1 Offset	**E1 Offset** Sensor calibration with calibrated comparison device

E2 Function
	E2 Function (only for special applications)
	  • External setpoint = Function ⌈1E⌉ by external signal (0 - 10 V) instead of "Setpoint1". 0 - 10 V ≙ 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."
	Modes `4.02` and `4.03` 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 `4.02` E2 Function at ⌈6E⌉ preprogrammed = sensor for setpoint lowering. Preprogrammed sensor type "TF.. "
	For `4.03` ⌈E2⌉ Function at ⌈6E⌉ preprogrammed = sensor for setpoint lowering.
	- preprogrammed sensor type "BUS"
	- measuring range -35.0...+65.0 °C
	In "IO Setup":
	For enable "ON" / "OFF" via Bus:
	- D1 function = ⌈1D⌉
	- D1 Busmode = "ON"
	For switch over setpoint 1 /2 via Bus:
	- D2 function = ⌈5D⌉ ,
	- D2 Busmode = "ON"

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

Setting	
Setpoint1 Setting range: in measuring range of sensor Factory setting: 100 Pa	
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).	
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	
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 (☞ 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.	

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

Outside-temperature dependent target-setpoint
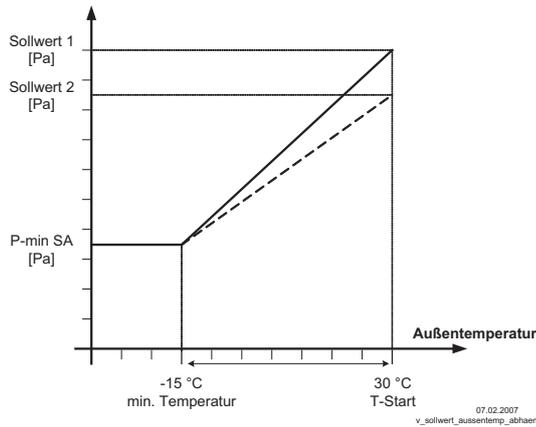
An outside temperature compensation can be activated (sensor connection "E2" = "Analog In 2") when being operated as a pressure regulation device.
An optimal building climate, e.g., can be achieved through this. Through this function, the set and active "Setpoint1" or "Setpoint2" is automatically changed 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

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

9.4.3 Menu for pressure control airconditioning 4.01 ... 4.03

Parameter	Factory setting			User Setting
Start				
PIN input	- - - - -	- - - - -	- - - - -	
Language	GB	GB	GB	
Reset	OFF	OFF	OFF	
Mode	**4.01**	**4.02**	**4.03**	
Ucontrol	1.13	1.13	1.13	
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	
Modulation	0 %	0 %	0 %	
Msco	OFF	OFF	OFF	
Setting				
Setpoint1	100 Pa	100 Pa	100 Pa	
Setpoint2	- - - - -	- - - - -	100 Pa	
Pband	100 Pa	100 Pa	100 Pa	
Min. Speed	0 %	0 %	0 %	
Max. Speed	100 %	100 %	100 %	
Manual mode	OFF	OFF	OFF	
Speed man.	100 %	100 %	100 %	
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	
Events				
Base setup				
Mode	**4.01**	**4.02**	**4.03**	
E1 Analog In	DSG200	DSG200	DSG200	
E1 Min.	- - - - -	- - - - -	- - - - -	
E1 Max.	- - - - -	- - - - -	- - - - -	
E1 Decimals	- - - - -	- - - - -	- - - - -	
E1 Unit	- - - - -	- - - - -	- - - - -	
E1 Offset	0.0 Pa	0.0 Pa	0.0 Pa	
E2 Function	OFF	6E	6E	
E2 Analog In	- - - - -	TF	Bus	
E2 Min.	- - - - -	- - - - -	-35.0 °C	
E2 Max.	- - - - -	- - - - -	65.0 °C	
E2 Decimals	- - - - -	- - - - -	- - - - -	
E2 Unit	- - - - -	- - - - -	°C	
E2 Offset	- - - - -	0.0 K	0.0 K	

Further menus see chapters:
- Controller Setup
- IO Setup
- Limits
- Motor Setup
- Diagnostic

4.01 Pressure control for ventilation systems

4.02 Pressure control depending on outdoor temperature

4.03 Pressure control depending on outdoor temperature, Modbus for outdoor temperature and remote control by central operating device type AXE-200

E2 Function

1E external Setpoint

2E external manual mode

3E Sensor average to E1

4E Sensor comparison to E1

5E Sensor difference to E1

6E Sensor for Setpoint

7E Measurement

9.5   Volume control 5.01 and 5.02

9.5.1   Basic setting 5.01 and 5.02

 Setting	**Base setup**
`5.01` **Base setup**	**Mode** Mode selection e.g. 5.01
`200` DSG **E1 Analog In**	**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" .
`75` **K Factor**	**K Factor** Input of the "K factor" dependent on the fan (inlet duct). setting range: 0...7.000 Factory setting: 75
`0.0` Pa **E1 Offset**	**E1 Offset** Sensor calibration with calibrated comparison device
`OFF` **E2 Function**	**E2 Function** (only for special applications) • External setpoint = Function 1E by external signal (0 - 10 V) instead of "Setpoint1". 0 - 10 V ≜ 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" **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".

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.

Display	Description
Setting	**Setting**
530 m3h **Setpoint1**	**Setpoint1** Setpoint in m³/h (m³/s) Setting range: depending on measuring range of sensor and "K factor" Factory setting: 530 m³/h
Setpoint2	**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).
530 m3h **Pband**	**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
0 % **Min. Speed**	**Minimal Speed** Setting range: 0...100 % Factory setting: 0 %
100 % **Max. Speed**	**Maximal Speed** Setting range: 100 %... "Min. Speed" Factory setting: 100 %
OFF **Manual mode**	**Manual mode** "OFF" = automatic control as function of the set parameters (Factory setting) "ON" = automatic control without function, speed setting in menu "Speed manual"
100 % **Speed man.**	**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.

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

Outside-temperature dependent target-setpoint

07.02.2007
v_sollwert_aussentemp_abhaengig_m3h.vsd
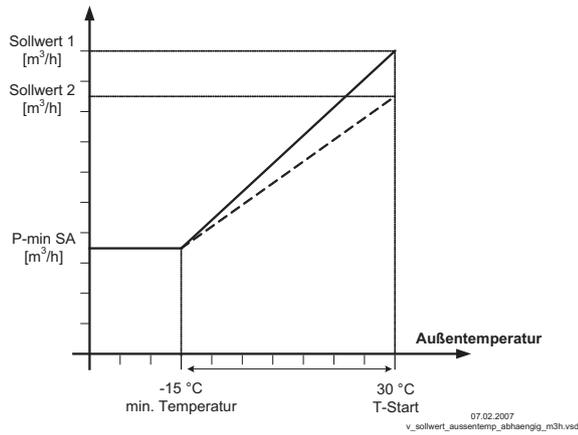
An outside temperature compensation can be activated (sensor connection "E2" to "Analog In 2") when being operated as a air volume regulation device.
An optimal building climate, e.g., can be achieved through this. Through this function, the set and active Setpoint 1/2 is automatically changed proportional to the measured outside temperature (☞ Info: "Setpoint control").

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

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

9.5.3   Menu for air volume control   **5.01** and **5.02**

Parameter	Factory setting	User Setting	
Start			
PIN input	- - - - -	- - - - -	
Language	GB	GB	
Reset	OFF	OFF	
Mode	5.01	5.02	
Ucontrol	1.13	1.13	
Info			
E1 Actual	712 m³h	712 m³h	
E2 Actual	- - - - -	21.0 °C	
Setpoint1	530 m³h	530 m³h	
Setpoint control		530 m³h	
Modulation	0 %	0 %	
Msco	OFF	OFF	
Setting			
Setpoint1	530 m³h	530 m³h	
Setpoint2	- - - - -	- - - - -	
Pband	530 m³h	530 m³h	
Min. Speed	0 %	0 %	
Max. Speed	100 %	100 %	
Manual mode	OFF	OFF	
Speed man.	100 %	100 %	
T-Band SA		30.0 K	
T-Start SA		15.0 °C	
P-Min SA		70.0 Pa	
Events			
Base setup			
Mode	**5.01**	**5.02**	
E1 Analog In	DSG200	DSG200	
E1 K-Factor	75	75	
E1 Min.	- - - - -	- - - - -	
E1 Max.	- - - - -	- - - - -	
E1 Decimals	- - - - -	- - - - -	
E1 Unit	- - - - -	- - - - -	
E1 Offset	0.0 Pa	0.0 Pa	
E2 Function	OFF	6E	
E2 Analog In	- - - - -	TF	
E2 Min.	- - - - -	- - - - -	
E2 Max.	- - - - -	- - - - -	
E2 Decimals	- - - - -	- - - - -	
E2 Unit	- - - - -	- - - - -	
E2 Offset	- - - - -	0.0 K	

Further menus see chapters:
- Controller Setup
- IO Setup
- Limits
- Motor Setup
- Diagnostic

5.01 Air volume control

5.02 Volume control with setpoint depending on outdoor temperature

E2 Function

1E   external Setpoint

2E   external manual mode

3E   Sensor average to E1

4E   Sensor comparison to E1

5E   Sensor difference to E1

6E   Sensor for Setpoint

7E   Measurement

9.6   Air velocity control `6.01`

9.6.1   Base setup `6.01`

Base setup (display) `Base setup`	**Base setup**
6.01 (display) `Mode`	**Mode** Mode selection `6.01`
`0-1` MAL (display) `E1 Analog In`	**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
`0.0` m/s (display) `E1 Offset`	Sensor calibration with calibrated comparison device
OFF (display) `E2 Function`	**Function Analog Input 2** • External setpoint = Function `1E` by external signal (0 - 10 V) instead of "Setpoint1". 0 - 10 V ≜ 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."
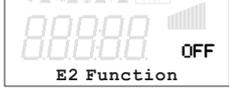
9.6.2   Settings for operation modes `6.01`

Setting (display) `Setting`	**Setting**
`0.50` m/s (display) `Setpoint1`	**Setpoint1** Setting range: in measuring range of sensor Factory setting: 0.50 m/s
(display) `Setpoint2`	**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: `-----` ☞ IOSetup).
`0.50` m/s (display) `Pband`	**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
`0` % (display) `Min. Speed`	**Minimal Speed** Setting range: 0...100 % Factory setting: 0 %

[display: 100 %, Max. Speed]	**Maximal Speed** Setting range: 100 %... "Min. Speed" Factory setting: 100 %
[display: OFF, Manual mode]	**Manual mode** "OFF" = automatic control as function of the set parameters (Factory setting) "ON" = automatic control without function, speed setting in menu "Speed manual"
[display: 100 %, Speed man.]	**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.

9.6.3   Menu for air velocity control **6.01**

Parameter	Factory setting	User Setting	
Start			
PIN input	- - - - -		
Language	GB		
Reset	OFF		
Mode	6.01		
Ucontrol	1.13		
Info			
E1 Actual	0.45 m/s		
E2 Actual	- - - - -		
Setpoint1	0.50 m/s		
Modulation	0 %		
Msco	OFF		
Setting			
Setpoint1	0.50 m/s		
Setpoint2	- - - - -		
Pband	0.50 m/s		
Min. Speed	0 %		
Max. Speed	100 %		
Manual mode	OFF		
Speed man.	100 %		
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	- - - - -		**E2 Function**
E1 Offset	0.0 m/s		1E external Setpoint
E2 Function	OFF		
E2 Analog In	- - - - -		2E external manual mode

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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				
• IO Setup			6E	Sensor for Setpoint
• Limits				
• Motor Setup			7E	Measurement
• Diagnostic				

9.7 Menu group Start

	Start
Start	
PIN input	**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.
	PIN 0010 Opening service menu, if PIN-protection activated
	PIN 1234 Opening "setting". if "set protection" = "ON" (☞ Controller Setup)
	PIN 9090 Restore user setting
	PIN 9091 Save user setting (corresponds function "Save user setup" = "ON"☞ Controller Setup)
	PIN 9095 Restore factory setting = delivery status
Language	**Language** Menu language by the factory set to English. In this menu different national languages can be selected (GB = English, D = German ...).
Reset	**Reset** Complete re-start of the device
Mode	**Mode** Query of the operating mode (e.g. **1.01** for speed controller)
xxxxxxxx	**Device name** Display of device name and software version
SN: 000003CAF711	Individual unit number (Menu dependent on device type available)

9.8   Menu group Info

 Info	**Menu group Info**

	Info for mode speed controller 1.01	
 Modulation	Device modulation. In addition to the bar chart, the level of the output voltage with the connected load is indicated as a percentage.	
 Set external1	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 % $\triangleq$ 0 - 10 V, 10 - 0 V, 0 - 20 mA, 20 - 0 mA, 4 - 20 mA, 20 - 4 mA	
	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"

	Info for mode controller 2.01 ... 6.01
 E1 Actual	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.
 E2 Actual	For operation with two sensors display for "2 actual". If function not active, display - - - - -
 Setpoint1	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.
 Modulation	Device modulation. In addition to the bar chart, the level of the output voltage with the connected load is indicated as a percentage.
 Msco.	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.
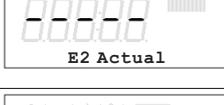
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9.9   Controller Setup

9.9.1   Menu overview Controller Setup

Controller Setup	Controller Setup

Parameter	Factory setting Mode			User Set-ting
	1.01	**2.01**...**2.05**, **3.01**...**3.04**	**4.01**...**4.03**, **5.01**...**5.02**, **6.01**	
PIN Protection		OFF		
Set protection		OFF		
Save User Setup		OFF		
Alarm sensors	0	OFF		
Limit		- - - -		
Msco.	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, PIN 0010

PIN Protection	The adjustments for the installation in the service level can be protected against unintentional modifications. To do this, activate the "PIN protection" = "ON". 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**.

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

9.9.3   PIN protection activate, PIN 1234

Set protection	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"). 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!
Function only in combination with activated PIN-Protection!	

9.9.4   Save user settings restore with PIN 9090

OFF Save User Setup	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).

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.

OFF Alarm sensors	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".	-0- MSG Sensor 1
ON Alarm sensors	With "AlarmSensors" = "ON" areindicated 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).	-0- AL Sensor 1

9.9.6   Limit

100 % Limit	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: - - - -

"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 % ≜ max. modulation, i. e. no limit.
Setting depending on device tye in: % or rpm.

L= 70%   Min.= 0 %   Max. = 100 %
L = 70%   Min. = 35 %   Max. = 85 %

10.05.2007
v_limit.vsd
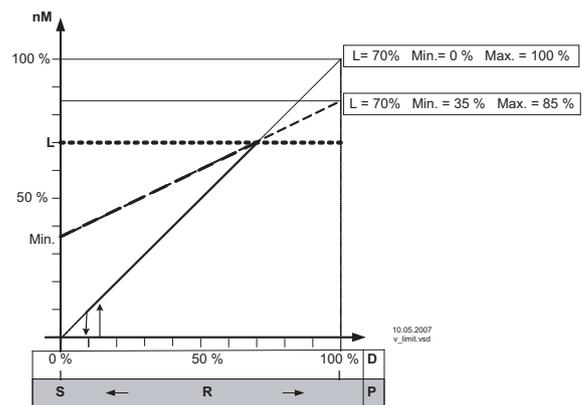
Limit (idealized principle diagram)

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

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

Msco = 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").

Msco. 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.
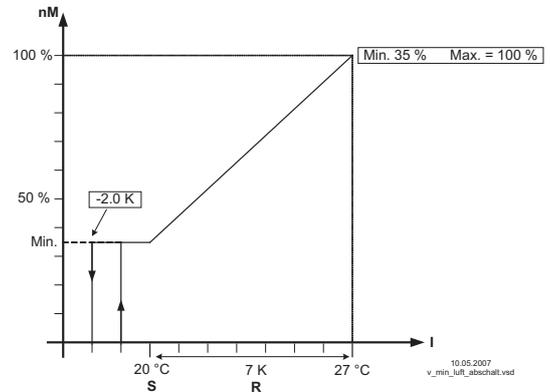
Minimum speed cut off (idealized principle diagram)

nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

9.9.8   Second Group

Group 2 ON value	**Second group "indirectly controlled" (picture A)** Analog output "AnalogOut 1" in IO Setup function $\boxed{5\ A}$ = 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.
nmin at Group2	**Second group "100 % energized" (picture B)** Relay output (K1 or K2) in IO Setup function $\boxed{8\ K}$ = 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.
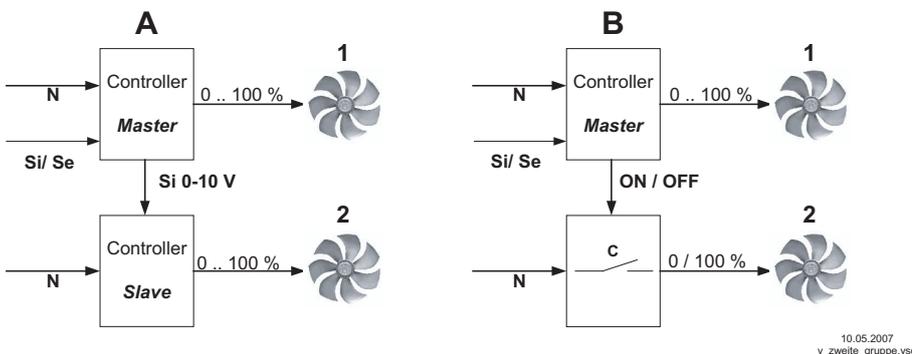
N   Line
Si   Signal
Se   Sensor
C   Contactor

9.9.9   Reverse action of the control function

◄ ▲ ◄》 ▲ ⇧ ▲ ⇧ ▲ STOP **ON** Val>Set=n+	**For the effect of the regulation there are two functions:** • **ON** for "Val > Set = n+" ≙ increasing Fanlevel for increasing actual value over Setpoint • **OFF** for "Val > Set = n+" ≙ increasing Fanlevel for decreasing actual value below Setpoint. For special applications an external switch over of the control function is possible (☞ IO Setup).

Factory setting depending on selected mode		Example for temperature control (Idealized principle diagram)
Mode	**Controller function**	
1.01	none	
2.01...	ON	
3.01...	ON	
4.01...	OFF	
5.01...	OFF	
6.01...	OFF	

nM   Motor speed
R   Pband
S   Setpoint
I   Actual value
OFF   for Val > Set = n+ = heating function
ON   for Val > Set = n+ = cooling function

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").

◄ ▲ ◄》 ▲ ⇧ ▲ ⇧ ▲ STOP P Type of control	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: **Selection P, PID:** • **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.

◄ ▲ ◄》 ▲ ⇧ ▲ ⇧ ▲ STOP **50** % KP	**P-component = reaction time** Setting range: 0 - 200 % smaller = more slowly bigger = faster
◄ ▲ ◄》 ▲ ⇧ ▲ ⇧ ▲ STOP **50** % KI	**I-component = accuracy, correction time** Setting range: 0 - 200 % bigger = faster smaller = more slowly
◄ ▲ ◄》 ▲ ⇧ ▲ ⇧ ▲ STOP **50** % KD	**D-component** More "D-component" causes more stability by a clean actual value signal with shorter correction times By a actual value signal with a superposition should be done to attitude without "D-component" → 0 % Setting range: 0 - 200 % value smaller = less "D-component" value higher = more "D-component"

	Integration time = correction time
◀ ▲ ◄» ▲ ◇ ▲ ↑ ▲ STOP $\blacksquare$ ||||| ⌁ 0 % TI	Setting range: 0 - 200 % smaller = faster bigger = more slowly

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 < ± 5 %. By activating the menu-assisted adjustment, the total control deviation can be reduced to a value of < ± 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 < ± 5 % through adjustment.

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

9.10   IO Setup

9.10.1   Menu overview "IO Setup"

◀ ▲ ◄» ▲ ◇ ▲ ↑ ▲ STOP ||||| IO Setup	**IO Setup**

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				
D1 Inverting	- - - -				**D1...D5 function**
D1 Busmode	- - - -			1D	Enable ON / OFF
D2 Function	OFF			2D	External error
D2 Inverting	- - - -			3D	Limit ON / OFF
D2 Busmode	- - - -			4D	Switch over Signal E1/E2
D3* Function	OFF			5D	Setpoint1/2
D3* Inverting	- - - -			6D	Switch over: Intern/Extern
D4* Function	OFF			7D	Control / manual Intern
D4* Inverting	- - - - -			8D	Switch over: actual Val > Set = n+ / n-
D5* Function	OFF			10D	Reset
D5* Inverting	- - - -			11D	Setting Max. Speed ON / OFF
E1 Inverting	OFF			12D	Motorheating (not Acontrol)
E2 Inverting	- - - -			13D	Change over Rolling direction (only Fcontrol, Icontrol)
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"

A Function	The analog outputs 0 - 10 V can be allocated with various functions. Terminals "A" - "GND" = Analog Out (I_{max} 10 mA)
A min. A max.	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
A Inverting	With the attitudes "A Inverting" the output voltage can 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. • 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 incresing modulation at actual value < Set (Heating) only mode **2.03** temperature controller with additional functions).

A1 Function "A min." and "A max."
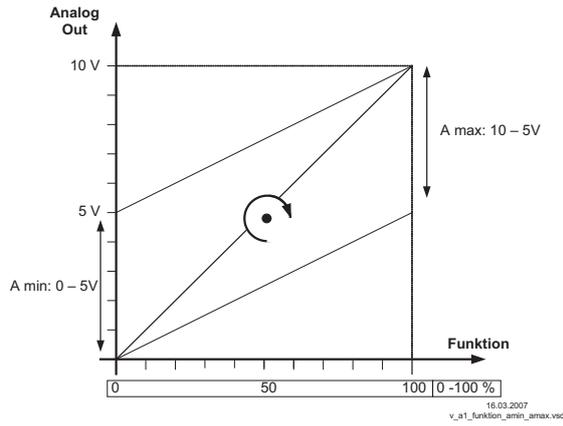
A1 Function 3A / 4A
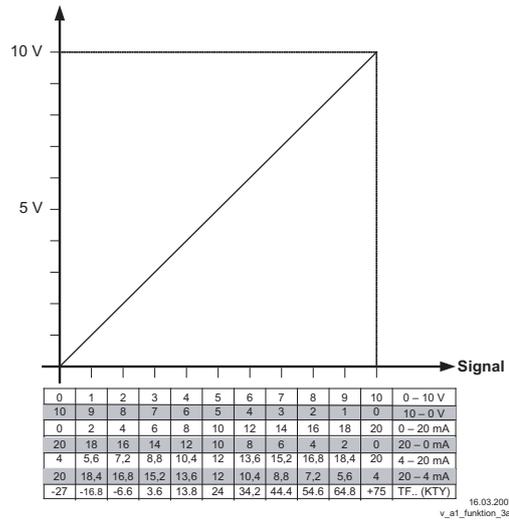
9.10.3   Digital inputs "D1" / "D2"

9.10.3.1   Menu overview

D1 Function	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).
D1 Inverting	Inverting "D1" and "D2" possible
D1 Busmode	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"
12D	Motorheating ON / OFF (not Acontrol)
13D	Switch over direction of rotation "clockwise" / "counterclockwise" (only Fcontrol, Icontrol)
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" = 2 K) does not report the switch-off.

	Display STOP for switch OFF	
	• Controller "ON" for closed contact (factory setting). • Controller "OFF" with opened contact When inverting in reverse i.e. equipment "OFF" with closed contact.	 Contact at digital input e.g. "Digital In 1"

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). Example for connecting an external alarm indication e.g. to digital input "Digital In 1 "
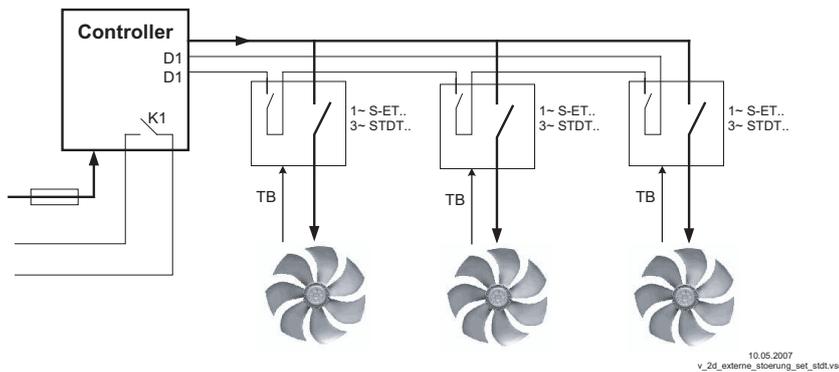

- Indication during closed contact (factory setting): "D1 Inverting" = "OFF "
- Indication during opened contact: "D1 Inverting" = "ON "

	Alarm symbol for indication "External fault"

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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 ditgital 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.
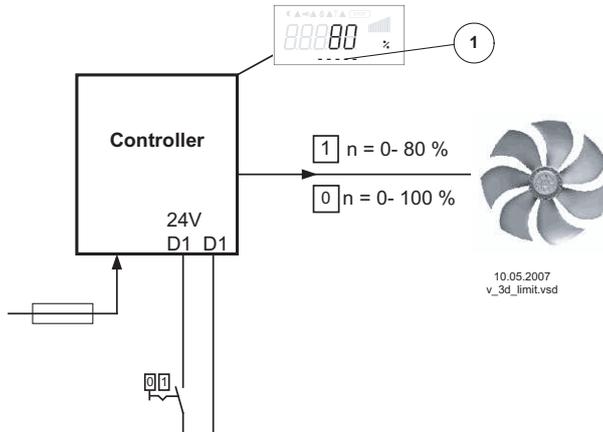
1   Setting "Limit" (depending on device type in: %, Hz, rpm)

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 e.g. at ditgital input "Digital In 1" (depending on device type at terminals "D1" - "D1"or "D1" - "24 V").
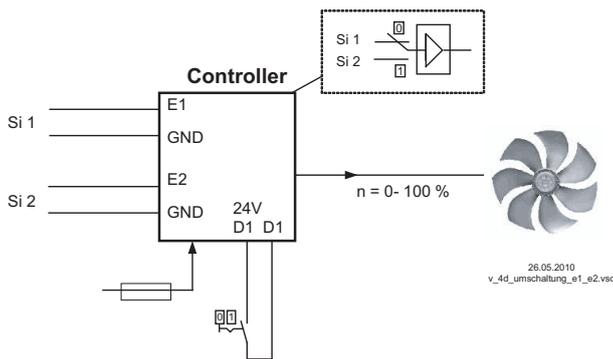
Si 1   Signal 1
Si 2   Signal 2

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 ditgital input "Digital In 1" (depending on device type at terminals "D1" - "D1"or "D1" - "24 V").

- "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.
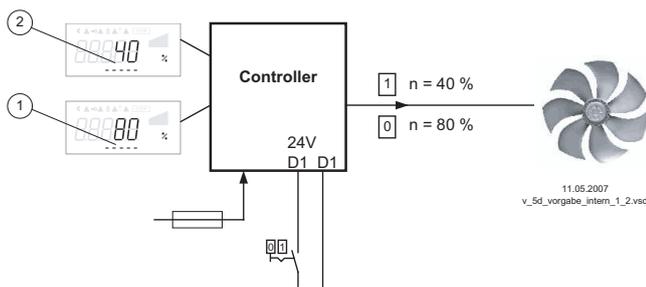
1   Setting "Set Intern1" (depending on device type in: %, Hz, rpm)
2   Setting "Set Intern2" (depending on device type in: %, Hz, rpm)

Operation with "Set Intern2" is signalized by the moon symbol for reduced operation. "Set extern1" under "settings" must be programmed to "OFF".

Switch over between "Setpoint1" and "Setpoint2" (for modes as controller higher **2.01**)
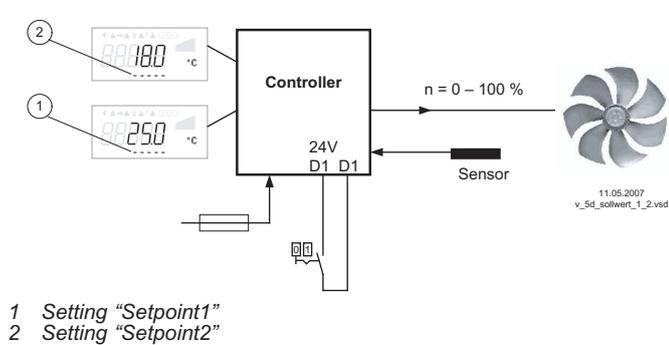Contact e.g. at ditgital input "Digital In 1" (depending on device type at terminals "D1" - "D1"or "D1" - "24 V").
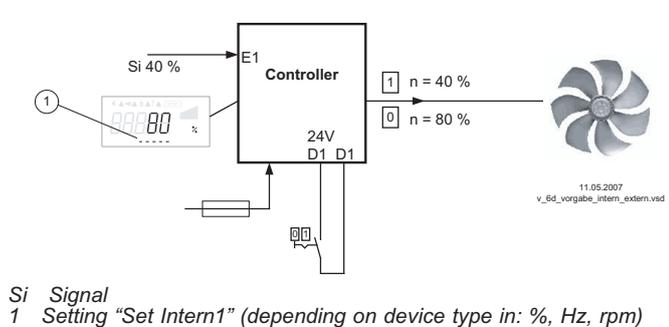

- "D1 Inverting" = "OFF": "Setpoint1" = 18 °C at opened contact / "Setpoint2" = 25 °C at closed contact.
- "D1 Inverting" = "ON": "Setpoint1" = 18 °C at closed contact / "Setpoint2" = 25 °C at opened contact.

1 Setting "Setpoint1"
2 Setting "Setpoint2"

Operation with "Setpoint2" is signalized by the moon symbol for reduced operation.

9.10.3.7   Intern / Extern Function 6D
Switch over between Set Intern and Set Extern (for mode speed controller **1.01**). "Set extern1" under settings must be programmed to "OFF".
Contact e.g. at ditgital 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.

Si   Signal
1 Setting "Set Intern1" (depending on device type in: %, Hz, rpm)

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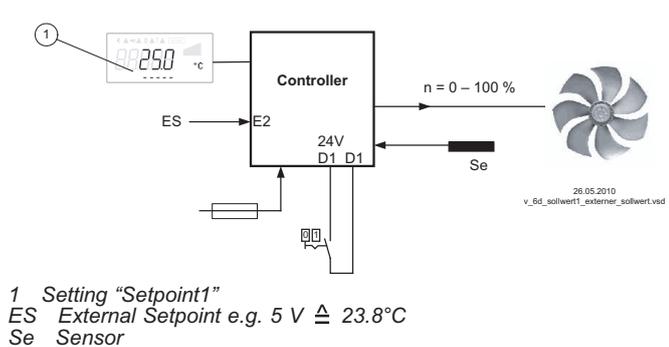
- "D1 Inverting" = "ON": Setting at the unit at opened contact / Signal Extern at closed contact
- "D1 Inverting" = "OFF": Setting at the unit at closed contact / Signal Extern at opened contact

1 Setting "Setpoint1"
ES   External Setpoint e.g. 5 V ≙ 23.8°C
Se   Sensor

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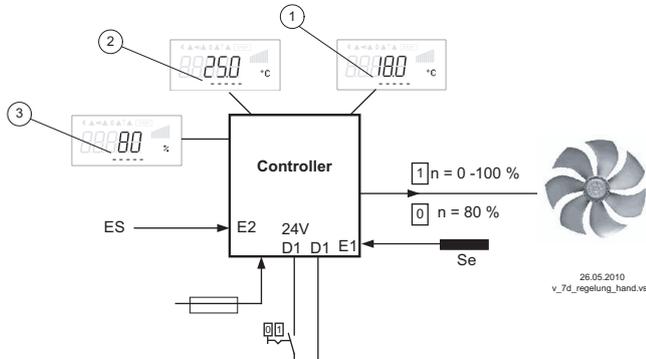
- "D1 Inverting" = "OFF" Automatic control at opened contact / manual operation at closed contact.
- "D1 Inverting" = "ON": Automatic control at closed contact / manual operation at opened contact.

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

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!

ON Val>Set=n+	Settings in Controller Setup
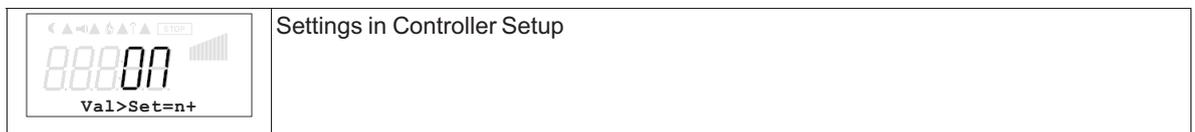
9.10.3.10   Reset, Function ⏍10D⏎

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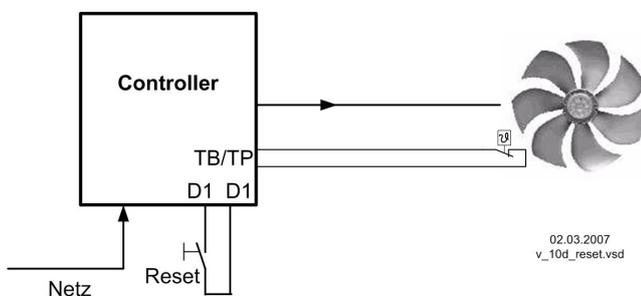
- For "D1 Inverting" = "OFF" both terminals "D1"- "D1" in normal operation interrupted. Reset after fault by short close.(For"Inverting" = "ON" reverse function).

Contact at digital input e.g. "Digital In 1"

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 ditgital input "Digital In 1" (depending on device type at terminals "D1" - "D1"or "D1" - "24 V").
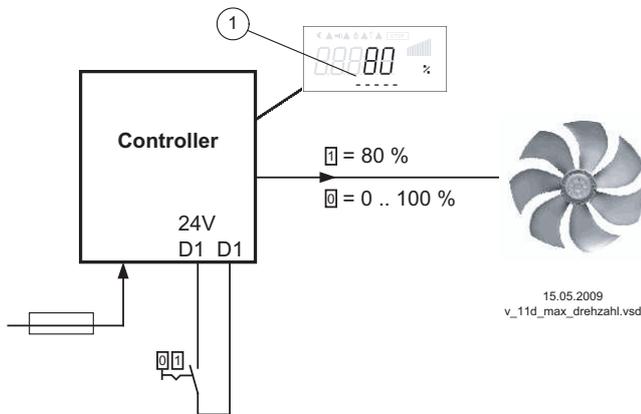
- "D1 Inverting" = "OFF": "Max. Speed" active at closed contact
- "D1 Inverting" = "ON": "Max. Speed" active at opened contact

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

9.10.3.12 Motorheating ON / OFF, Function 12D
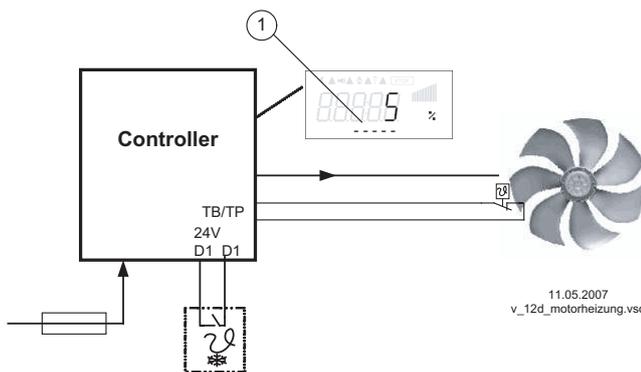
The motor heating can be activated over a digital input.

E.g. over a freeze protection thermostats at digital input "Digital In 1" (depending on device type at terminals "D1" - "D1"or "D1" - "24 V").

1 Setting "Motorheating"

Motor heating automatically active at closed contact, if no modulation of the controller is present (for "D1" = Inverting "OFF").

The height of the "heating voltage" is set in "Motor Setup".

Setting range: 5...50 %

Factory setting: 5 %

	The activated motor heating is indicated alternating with the actual value.

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.

ON Freeze	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

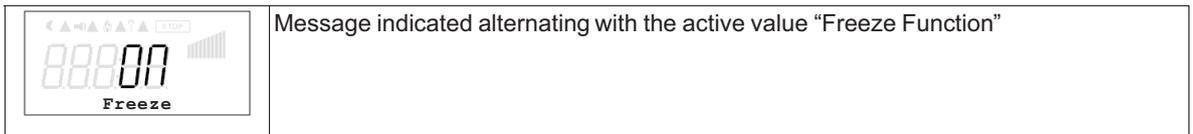### 9.10.4 Inverting analog inputs "E1" / "E2"

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

OFF E1 Inverting	Factory setting for Inverting inputs = "OFF" (if input activated) (signal: 0 - 10 V, 0 - 20 mA, 4 - 20 mA).
OFF E2 Inverting	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

0	1	2	3	4	5	6	7	8	9	10	0 – 10 V
10	9	8	7	6	5	4	3	2	1	0	10 – 0 V
0	2	4	6	8	10	12	14	16	18	20	0 – 20 mA
20	18	16	14	12	10	8	6	4	2	0	20 – 0 mA
4	5,6	7,2	8,8	10,4	12	13,6	15,2	16,8	18,4	20	4 – 20 mA
20	18,4	16,8	15,2	13,6	12	10,4	8,8	7,2	5,6	4	20 – 4 mA

Invertierung   OFF
Invertierung   ON
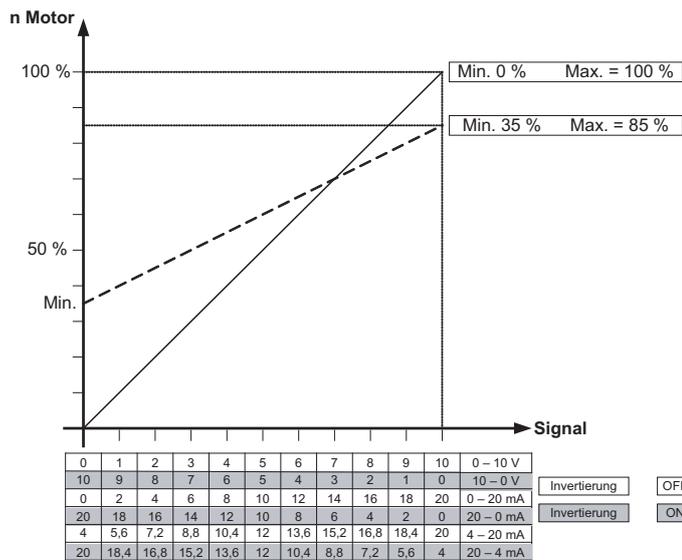
15.03.2007
v_invertierung_anlaog_eingaenge.vsd

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

9.10.5 Function and inverting for relay outputs "K1" and "K2"

K1 Function	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.
OFF **K1 Inverting**	The factory preset is the inversion of relay "K1" and "K2" to "OFF" (if a function has been programmed).
2K **K2 Function**	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!
OFF **K2 Inverting**	

| Function	Description
OFF	No 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

| 11 | 14 | 12 | 21 | 24 | 22 |

K1   K2   11.05.2007
                        v_relais_k1_k2.vsd
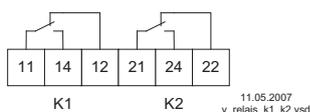
K1 **1** = energized, terminals 11-14 bridged
        0 = de-energized, terminals 11-12 bridged

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

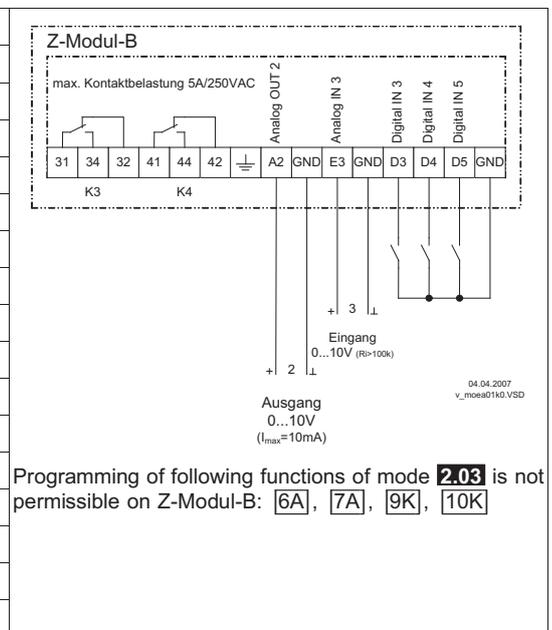### 9.10.6 Programming Add-on module type Z-Modul-B

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.

247 Bus Address	**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.
OFF Addressing	**Addressing** Switch addressing to "ON" before setting "address".

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"

88888 Limits	**Menu group Limits**

| 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

Level. Function	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 $\boxed{2K}$). 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.	
Level min. Level max.	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".	
Level 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":

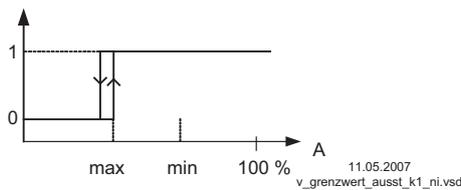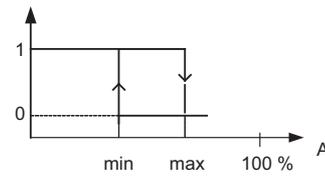**not inverted**
IO Setup: K1 Function = 4K
IO Setup: K1 Inverting = OFF
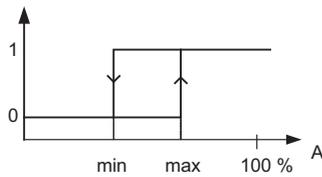
Inverting
IO Setup: K1 Function = 4K
IO Setup: K1 Inverting = OFF

11.05.2007
v_grenzwert_ausst_k1_ni.vsd

11.05.2007
v_grenzwert_ausst_k1_i.vsd
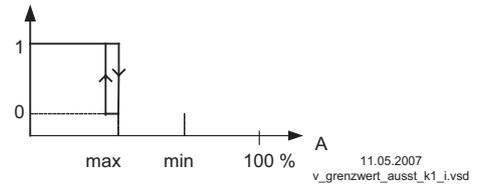
A Modulation   *A Modulation*

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

### 9.11.3   Limit indication depending on setting or sensor signal

Lmt E1 Function	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.
Lmt E1 min	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". 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".
Lmt E1 max	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.
	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.
Lmt E1 Hyst.	**E1 Hysteresis** Hysteresis adjustment in the unit of measure of the programmed input signal.
Lmt E1 Del.	**E1 Delay** Time delay exceeding "Level max." up to indication by relay and alarm symbol. Setting range: 0 - 120 sec. Factory setting: 2 sec.

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"

1
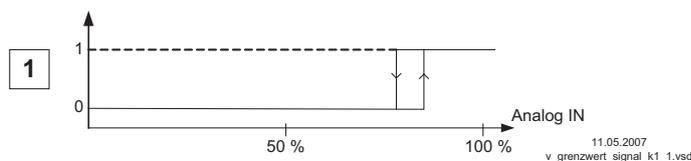
Settings:
- E1 Max.: 80 %
- E1 Min.: OFF
- switching hysteresis 5 % (from 100 %)

2
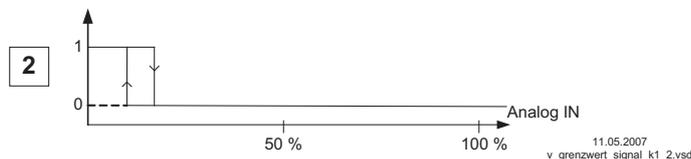
Settings:
- E1 Min.: 20 %
- E1 Max.: OFF
- switching hysteresis 5 % (from 100 %)

3
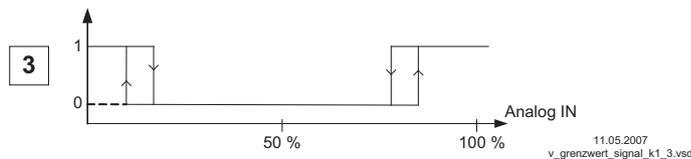
Settings:
- E1 Min.: 20 %
- E1 Max.: 80 %
- switching hysteresis 5 % (from 100 %)

Terminal "E1" and "GND" alarm via relay "K1" (non-inverted) IO Setup → K1 function: 5 K = 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).

88888 OFF Offset Function	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.
OFF Offset 1 OFF Offset 2	**Offset 1, Offset 2** 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". Work can be carried out with one as well as with both limit indicators. "Offset 1" for alarm in case of an exceeding of the max. deviation between actual and target. Switch ON point: actual value = Setpoint +/- offset Swtich OFF point: Actual value by hysteresis under the switch-on point "Offset 2" for alarm in case of an undercutting of the max. deviation between actual and target Switch ON point: actual value = Setpoint +/- offset Swtich OFF point: Actual value by hysteresis over the switch-on point
88888 Offset Hyst.	**Offset Hysteresis** Hysteresis switch-on point: In temperature regulation + / - 10 K, otherwise sensors 10 % of measurement range
88888 Offset Del.	**Offset Delay** Time delay until indication through relay and alarm symbol. Setting range: 0 - 120 sec. Factory setting: 2 sec.

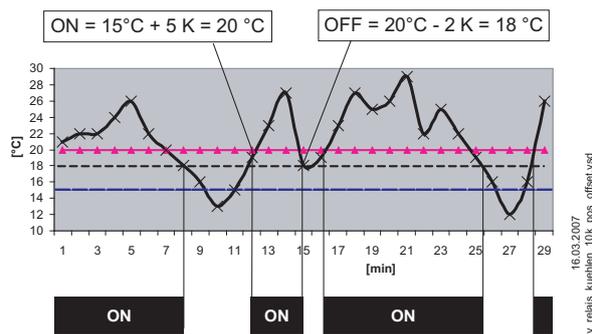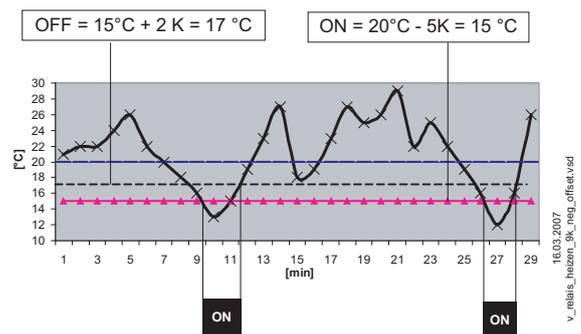Example for temperature regulation; for other modes of operation settings in corresponding sensor unit.

Offset 1 for alarm during exceeding

ON = 15°C + 5 K = 20 °C   OFF = 20°C - 2 K = 18 °C

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

Offset 2 for alarm during undercutting

OFF = 15°C + 2 K = 17 °C   ON = 20°C - 5K = 15 °C

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

9.12   Motor Setup

9.12.1   Menu "Motorsetup"

	Menu group Motorsetup
Motor Setup	

Parameter	Factory setting	User Setting
CosPhi	0.80	
Rampup time	20 sec	
Rampdown time	20 sec	
Suppression1	OFF	
Range1 min.	- - - - -	
Range1 max.	- - - - -	
Suppression2	OFF	
Range2 min.	- - - - -	
Range2 max.	- - - - -	
Suppression3	- - - - -	
Range3 min.	OFF	
Range3 max.	- - - - -	
Motorheating	- - - - -	

9.12.2   Adjusting of CosPhi for motor
The control device is set to CosPhi = 0.80 at the factory. For optimal control response, the CosPhi of the installed motor must be entered (☞ specification on the type identification tag of the motor).

	CosPhi
CosPhi	The output voltage of the unit depends on the inductance of the motor (CosPhi).
	If the CosPhi of the motor is smaller than the set value, the maximum output voltage is reached in speed controller mode below the maximum input signal (<10 V / 20 mA). For mode as controller (P-controler) at a system control deviation which is too low.
	If the CosPhi of the motor is significantly greater than the set value, the maximum output voltage may not be reached under certain circumstances. If a noise filter is connected at the output of the control device, calibration takes place by means of the associated noise filter condensers (CosPhi almost "1"). Setting of CosPhi for operation with noise filter: recommendation 0.95
	Setting range: 0.00...1.00
	Factory setting: 0.80

9.12.3   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.

	Rampup time
Rampup time	Time setting in which the automatic controller output from 0 % to 100 % rises.
	Setting range: 2...250 sec.
	Factory setting: 10 / 20 / 40 sec. (depending on device type)
	Rampdown time
Rampdown time	Time setting in which the automatic controller output from 100 % to 0 % reduces.
	Setting range: 2...250 sec.
	Factory setting: 10 / 20 / 40 sec. (depending on device type)

Vent-Axia

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v_hochlaufzeit_ruecklaufzeit.vsd
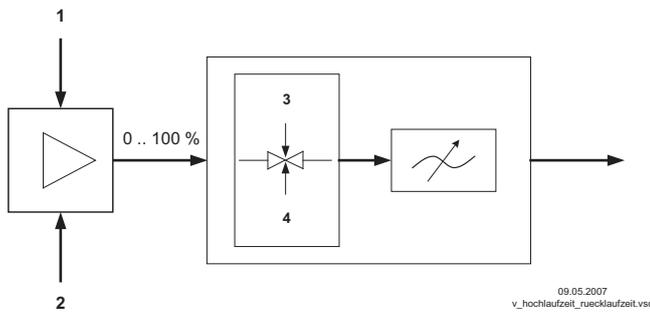
1   external Signal
2   Setting
3   Rampup time
4   Rampdown time

9.12.4   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)

09.05.2007
v_ausblendung_prz.vsd
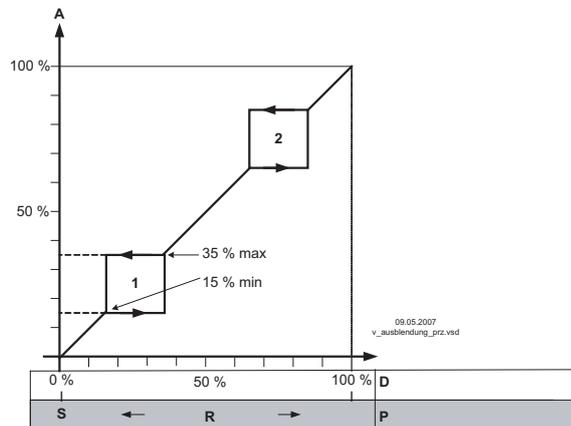
Setting depending on device type in: %, Hz, rpm

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

OFF Suppression1	→	Factory setting no suppression active = "OFF"	→	On Suppression1
Range1 min.	→	Setting for "Range1 min."	→	15 % Range1 min.
Range1 max.	→	Setting for "Range1 max."	→	35 % Range1 max.
OFF Suppression2	→	Identical procedures for Suppression2 and Suppression3, as far as desired	→	etc.

9.12.5   Motorheating

In order to avoid a sticking or a freezing of standing fans in cold environment, the "motor heating system" can be switched on.

Set the voltage in % that is applied to the 2 phases when the heating function is active.

Setting range: 5...50 %

Factory setting: 5 %

This impresses a current that cannot cause the fan to rotate. The required voltage to prevent freezing depends on the ambient conditions and the technical data of the connected motors. Test the settings you have made under realistic conditions. The higher the output voltage adjustment, the greater the arising heating output (power loss) in the motor. The „motor heating" or „standstill motor heating " can only be active if no modulation is present due to closed-loop control. The motor heating can also be activated through the enable function (function ⏐1D⏐ for a digital input) during shutdown. To exclude overheating, motor protection is required through the temperature monitor integrated in the motor (☞ Motor protection). The heating function is shut down if the motor protection function in the controller is activated.

10   Diagnostics menu

 Diagnostic	The diagnostics menu supplies information about the momentary operating condition of the device.
 OTC 00056:46:13	**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).
 OTM 00056:46:13	**O** = Operation, **T** = Time, **M** = Motor The time counting runs as soon as a modulation of the controller is present
 32.0 °C Heatsink	Display of the internal temperature of the power semiconductor. At a temperature of approx. 95° C, the device switches off and switches back on after cooling off to approx. 65° C.
 20.0 °C E1-KTY	
 9.0 mA E1-Current	Signal height at analog input E1 (Analog In 1)
 4.0 V E1-Voltage	
 20.0 °C E2-KTY	
 9.0 mA E2-Current	Signal height at analog input E2 (Analog In 2)
 4.0 V E2-Voltage	

Display	Description
0.0 V E3	Signal height at analog input E3 (Analog In 3*)
OFF D1	Status digital input 1 (Digital In 1) OFF = terminals D1 - D1 bridged ↔ ON = terminals D1 - D1 not bridged
OFF D2	Status digital input 2 (Digital In 2) OFF = terminals D2 - D2 bridged ↔ ON = terminals D2 - D2 not bridged
OFF D3	Status digital input 3 (Digital In 3*) OFF = terminals D3 - GND bridged ↔ ON = terminals D3 - GND not bridged
OFF D4	Status digital input 4 (Digital In 4*) OFF = terminals D4 - GND bridged ↔ ON = terminals D4 - GND not bridged
OFF D5	Status digital input 5 (Digital In 5*) OFF = terminals D5 - GND bridged ↔ ON = terminals D5 - GND not bridged
OFF K1	OFF = relay K1 de-energized: terminals 11 - 12 bridged ON = relay K1 energized: terminals 11 - 14 bridged
OFF K2	OFF = relay K2 de-energized: terminals 21 - 22 bridged ON = relay K2 energized: terminals 21 - 24 bridged
OFF K3	OFF = relay K3* de-energized: terminals 31 - 32 bridged ON = relay K3* energized: terminals 31 - 34 bridged
OFF K4	OFF = relay K4* de-energized: terminals 41 - 42 bridged ON = relay K4* energized: terminals 41 - 44 bridged
6666 ms T L1-L2	Display of measured period length (supply frequency) between L1 - L2
6666 ms T L2-L3	Display of measured period length (supply frequency) between L2 - L3
6666 ms T L3-L1	Display of measured period length (supply frequency) between L3 - L1
20.000 ms T L1	Display of measured period length (supply frequency)

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

11   Events / Fault signals

11.1   Display and query of events and malfunctions

Events	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).
Essemple for possible events	The device differentiates between 3 types of events:
Sensor 1	1. Messages with code Msg Message sensor fault for information, for Alarm sensor deactivated.
External error	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).
Motor 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).

Motor fault	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**.	00009:01:08

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. Additionally a message is made by the internal LEDs. Depending on type 3 colored LEDs or an LED with flashing code are on the pcb.

Display	Code*	LED internal	Relais switches ** Opera-tion	Fault	Cause	Reaction of Controller / Adjustment
						Line voltage available?
						Unit switches OFF and auto-matically ON when the voltage has been restored
						check internal controller fuse (so far available)
Line Fault	Err	yellow + red shining	X	X	Failure by a line phase un-stable mains supply	Unit switches OFF and auto-matically ON when the voltage has been restored
						check line supply and internal controller fuse (so far available)
		green flashes	X	-	No enable	Switch OFF by external contact (function 1D = enable pro-grammed for Digital In)
Factory sett.	AL	-	-	-	fault in Eprom	works with defaults
EEP error	AL	all flash	-	X	fault EEP damaged	works with defaults

Vent-Axia.

Display	Code*	LED	Relais switches **		Cause	Reaction of Controller
		internal	Opera-tion	Fault		Adjustment
88888 Al EEP Corruption	AL	all flash	X	X	EEP data incorrectly	controller runs with the read settings
88888 Al Overload	AL	all flash		X	power semiconductor too hot	Switch OFF at 95°C, switch ON when cooled down to 65°C. Check temperature in controller, Check cooling of the controller
88888 Al External error	AL	all flash	-	selecta-ble	Alarm from external contact	Device continues working unchanged check contacts
88888 Al Lmt E1 min	AL	-	-	selecta-ble	Limit indication minimum Actual value below setting "Alarm Minimum" (Input "E1")	Device continues working unchanged
88888 Al Lmt E1 max.	AL	-	-	selecta-ble	Limit indication maximum Actual value above setting "Alarm Maximum" (Input "E1")	Check setting and sensor
88888 Msg Sensor 1	Msg or. AL*	yellow + green	selecta-ble	selecta-ble	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
88888 Err Motor fault	Err	red	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

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

Vent-Axia®

12   Enclosure

12.1   Technical data

The information on the rating plate is valid for a maximum ambient temperature of 40 °C.

Type	Part.-No.	Rated current for 40 °C {1}	max. line fuse {2}	Integrated semi-conductor fuse {3}	max. heat dis-sipation {1}	Weight
		[A]	[A]		[W]	[kg]
edvc 3/5	444166 (304564-30)	5	10	FF20 A 6x32 mm	25	2.4
edvc 3/10	444167 (304565-30)	10	16	FF20 A 6x32 mm	50	2.7
edvc 3/15	444168 (304566-30)	15	20	FF30 A 10x38 mm	70	4.8

{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}   Integrated semiconductor fuse in device (no line safety switch)

Maximum cross section for line and motor connection	2.5 mm^2
Stepless controlled output voltage	approx. 20...100 % of connected line voltage
Min. motor current	for edvc 3/5, 3/10: 0.2 A, for edvc 3/15: 0.5 A
Input resistance for sensor or signal set for the rotational speed	for 0 - 10 V input: R_i >100 kΩ
	for 4 - 20 mA input: R_i = 100 Ω
Voltage supply e.g. for sensors	+24 V ± 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)
Contact rating of the internal relay	max. AC 250 V 5 A
Max. permissible ambient temperature depending on version	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	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	EN 61000-3-2 for a "professional unit".
	Please ask manufacturer for the individual harmonic oscillation levels of the current as a percentage of the fundamental oscillation of the rated current.
	Up to a maximum current of 4 A, the limits are adhered to with no restrictions.
Housing protection	IP54

12.1.1　Performance reduction during elevated ambient temperatures

The maximum permissible ambient temperature for the devices is 40 °C. Up to this temperature, loading (maximum continuous current) with the specified rated current is possible.

The removal of heat in the unit due to power dissipation is dependent on the ambient temperature, so the maximum load has to be reduced if the ambient temperature is higher than 40 °C! For each degree higher the load has to be reduced approx. 2.2 %.

The average value measured during a 24 h period must be 5 K under the max. ambient temperature.

For installation in a switch cabinet, the device's dissipation and its possible affect on the ambient temperature must be taken into consideration (☞Technical data)!

Maximum load for ambient temperatures higher 40 °C for versions with internal fuses

| Type	Part.-No.	Rated current for 40 °C	max. current load for 45 °C	max. current load for 50 °C	max. current load for 55 °C
		[A]	[A]	[A]	[A]
edvc 3/5	444166 (304564-30)	5	4.5	3.9	3.4
edvc 3/10	444167 (304565-30)	10	8.9	7.8	6.7
edvc 3/15	444168 (304566-30)	15	13.4	11.7	10.1

12.2   Connection diagram
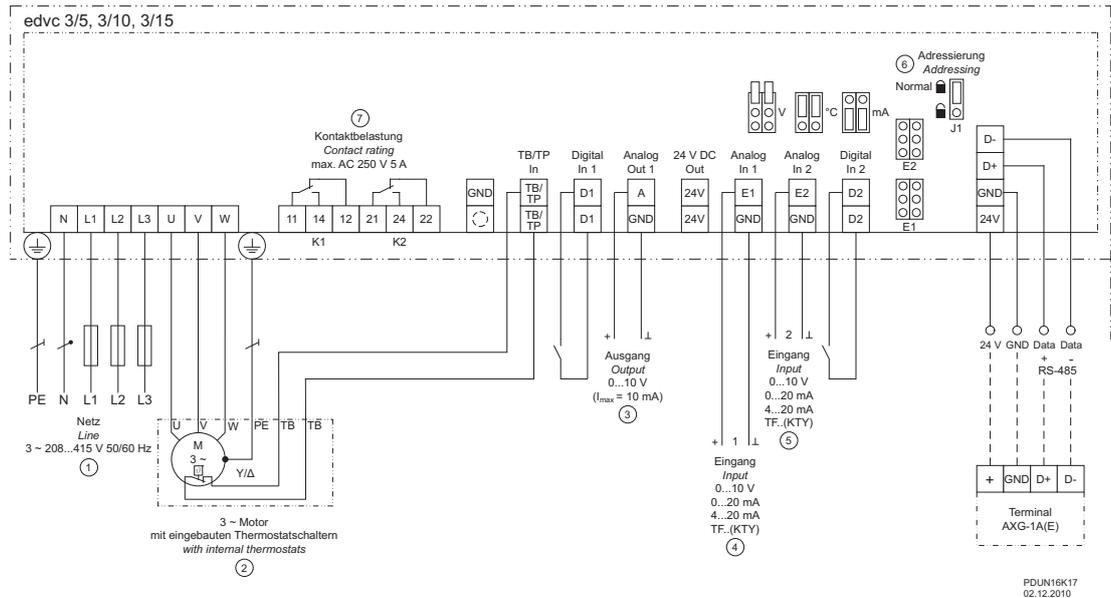
1   Line 3 ~ 208...415 V, 50/60 Hz
2   3~ Motor with internal thermostats
3   Output 0...10 V (I_{max} = 10 mA)
4   Input 1: 0...10 V, 0...20 mA, 4...20 mA, TF...(KTY)
5   Eingang 2: 0...10 V, 0...20 mA, 4...20 mA, TF...(KTY)
6   Addressing, normal lock closed
7   Contact rating max. AC 250 V 5 A

12.3   Dimensions [mm]

edvc 3/5, 3/10 (edvc 3/15)
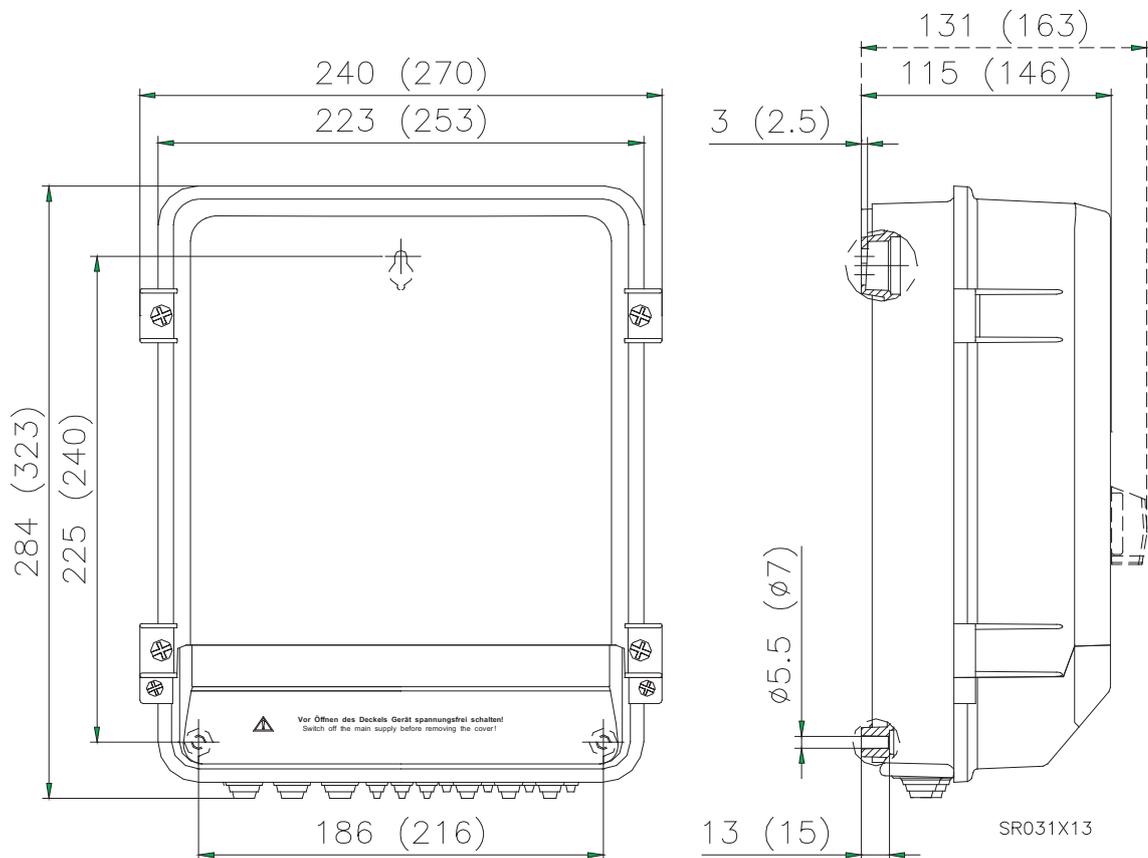
The **Vent-Axia**. Guarantee

Applicable only to products installed and used in the United Kingdom. For details of guarantee outside the United Kingdom contact your local supplier.

Vent-Axia guarantees its products for two years from date of purchase against faulty material or workmanship. In the event of any part being found to be defective, the product will be repaired, or at the Company's option replaced, without charge, provided that the product:-

- Has been installed and used in accordance with the instructions given with each unit.
- Has not been connected to an unsuitable electricity supply. (The correct electricity supply voltage is shown on the product rating label attached to the unit).
- Has not been subjected to misuse, neglect or damage.
- Has not been modified or repaired by any person not authorised by the company.

IF CLAIMING UNDER TERMS OF GUARANTEE

Please return the complete product, carriage paid to your original supplier or nearest Vent-Axia Centre, by post or personal visit. Please ensure that it is adequately packed and accompanied by a letter clearly marked "Guarantee Claim" stating the nature of the fault and providing evidence of date and source of purchase.

The guarantee is offered to you as an extra benefit, and does not effect your legal rights

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