Fcontrol

FXDM

Frequency inverter with integrated sine filter for 3 ~ fans

Operating Instructions

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Bewegung durch Perfektion | Movement by Perfection

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Esc

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Keep for reference!

Software version: D1333A from Version 2.37

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1 General notes

1.1 Structure of the operating instructions

Before installation and start-up, read this manual carefully to ensure correct use!

We emphasize that these operating instructions apply to specific units only, and are in no way valid for the complete system!

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

Keep these operating instructions together with the device. It must be ensured that all persons that are to work on the device can refer to the operating instructions at any time.

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.

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1.4 Copyright

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2 Safety instructions

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.

Any other use above and beyond this is considered not for the intended purpose unless agreed otherwise by contract. The manufacturer will not be liable for any damage resulting from this. The individual or company using it bears the sole risk.

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.

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⚠	**Attention!** General hazardous area. Death or severe injury or significant property damage can occur if the corresponding precautions are not taken!
⚡	**Danger due to electric current** Danger by dangerous, electric voltage! Death or severe injury can occur if the corresponding precautions are not taken!
ℹ	**Information** Important additional 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 out-side the device's technical specifications (☞ name plate and attachment / technical data) can lead to a defect in the device and additional damage!

ℹ **Information**
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/EC directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations. Personnel to be trained or instructed and apprentices are only permitted to work on the device under the supervision of an experienced person. This also applies to personnel undergoing general training. Comply with the legal minimum age.

2.5 Start-up and during operation

⚠ **Attention!**
- During commissioning, unexpected and hazardous conditions can arise in the entire installation due to defective adjustments, defective components or incorrect electrical connections. Remove all persons and objects from the hazardous area.
- During operation, the device must be closed or installed in a control cabinet. Fuses may only be replaced by new ones and must not be repaired or bypassed. The data for the maximum line fuse are to be considered absolutely (see 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.
- Pay attention to smooth, low vibration running of the motor/fan, the appropriate instructions in the drive documentation must be observed!

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2.6   Work on the device

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

Danger due to electric current
- It is generally forbidden to carry out work on electrical live parts. Protection class of the device when open is IP00! It is possible to touch hazardous voltages directly.
- The safe isolation from the supply must be checked using a **two-pole** voltage detector.
- Even after disconnecting the mains voltage, life-threatening charges can appear between the protective ground "PE" and the mains connection.
- The protective earth is conducting high discharge currents (dependent on the switching frequency, current-source voltage and motor capacity). Earthing in compliance with EN specifications shall therefore be observed even for testing and trial conditions (EN 50 178, Art. 5.2.11). Without earthing, dangerous voltages can be present on the motor housing.

Waiting period at least 3 minutes!
- Through use of capacitors, danger of death exists even after switching off the device through directly touching the energized parts or due to parts that have become energized due to faults.
- It is only permitted to remove the housing cover after waiting for 3 minutes once the line supply cable has been shut down. Should measurement or adjustment work be unavoidable on the opened unit while still powered, then this may only be performed by qualified personnel acquainted with the thereby associated hazards.

Attention!
Even after switching off, dangerous temperatures can still occur in and on the device.

Attention!
Automatically restart after a power failure or mains disconnection!

2.7   Modifications / interventions in the device

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

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

2.8   Operator's obligation of diligence
- The contractor or owner must also ensure that the electric systems and equipment are operated and maintained in accordance with electro-technical regulations.
- The owner is obliged to ensure that the device is operated in perfect working order only.
- The device may only be used as intended (see "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 device are never removed and remain legible.

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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 frequency inverter is designed for a stepless control of fans without additional (electromagnetic) motor noise.

Only suitable for drives with low set-off torque (e.g.: fans or pumps).

3.2 Functional description

The frequency inverters of these series generate their 3~ output with variable voltage and frequency from the three-phase mains on the input.

The devices are constructed in accordance with the general requirement in EN 61800-2 for adjustable speed electrical power systems and is intended for one-quadrantdrives.

Information

By using the integrated all-pole effective Sine filter (phase to phase and phase to ground), an absolute parallel control of fans without risk of damage for motors is possible. Screened motor cables not required!

3.3 Rating plate

The name plate carries the technical data valid for the delivered product.

Example for name plate

no.	Description	no.	Description
1	Type designation	4	Part no.
2	ZIEHL-ABEGG brand name	5	Confirmation number
3	Type of voltage	6	Production code
	Line voltage	7	DATA MATRIX Code confirmation number
	Mains frequency	8	European mark of conformity
	Rated current (output)	9	Eurasian mark of conformity
	Protection class		

3.4 Maintenance

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

The ventilation grilles on the bottom and on the top of the device must be free to ensure adequate cooling of the device. They can be cleaned with a vacuum cleaner, broom or brush.

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3.5 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.

3.6 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 prolonged storage; we recommend a maximum of one year (consult the manufacturer before starting if stored for longer).

3.7 Disposal / recycling

Disposal must be carried out professionally and in an environmentally friendly way in accordance with the respective national legal stipulations.
▷ Separate the materials by type and in an environmentally friendly way.
▷ If necessary, commission a specialist company with the waste disposal.

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! Start-up is not allowed in the case of transport damage!
- At a weight greater than 25 kg for men / 10 kg for women, the device should be lifted out by two persons (according to REFA). The values may differ from country to country.
- Wear safety shoes and gloves for handling!
- 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!
- A mounting on vibrating base is not permissible, if no data to the vibration strength is made (see Technical data)!
- When mounted onto lightweight walls, there must be no impermissibly high vibrations or shock loads. Any banging shut of doors that are integrated into these lightweight walls, can result in extremely high shock loads. Therefore, we advise you to decouple the devices from the wall.
- Do not allow drilling chips, screws and other foreign bodies to reach the device interior!
- Maintain the stated minimum clearances to ensure unobstructed cooling- air feed as well as unobstructed outgoing air discharge (☞ minimum space requirement)!
- The device should be installed in a location where it will not be disturbed, but at the same time can be easily accessed!
- 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 (see 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 (see Technical data). I.e., a correspondingly larger clearance or thermal shielding is required.

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v_mindestplatzbedarf.vsd
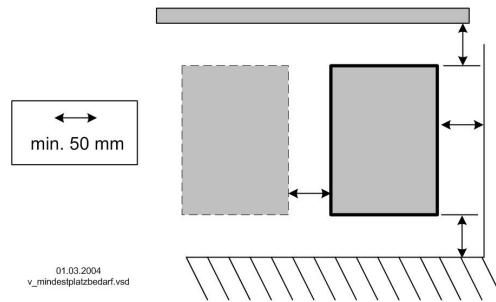
4.3   Fastening the device

The type of fastening and the number of fastening points are dependent on the housing design. All the fastening points available must be used for safe fastening.
Proceed as follows:

Type FXDM2.5AM

Fastening at 3 points

GM00006A_M
15.12.2015
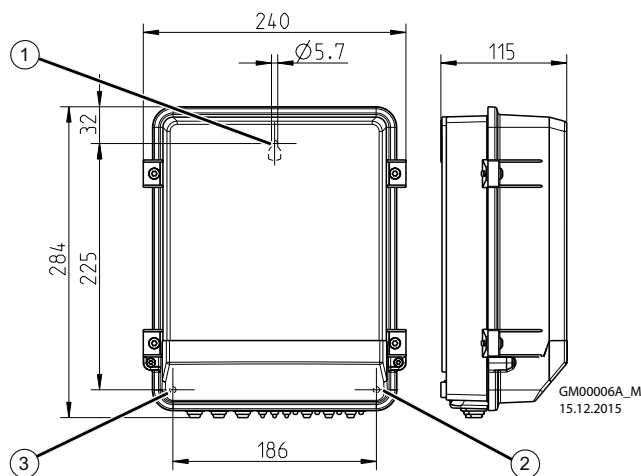
▷ Drill fastening point "1".
▷ Screw in flat-head screw up to a distance of approx. 2 mm and mount the device.
▷ Remove the terminal compartment cover.
▷ Align the device and mark the position of both lower fastening points "2" + "3".
▷ Remove the device and drill the fastening points "2" + "3".
▷ Remount the device and tighten the fastening point screws "2" + "3".

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Type FXDM5...18 (FXDM22)

Fastening at 4 points

GM00005A_M
15.12.2015
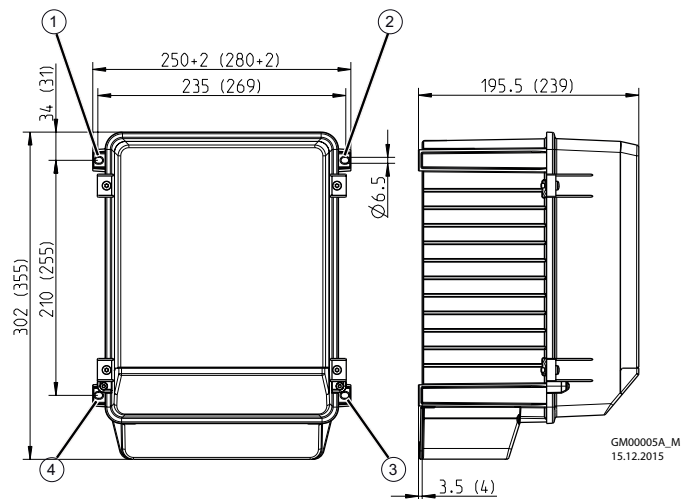
▷ Drill fastening points "1" - "4".
▷ Fasten device with screws.

Type FXDM32...50 (IP54 / IP65)

Fastening at 8 points

GM00002A_M
15.12.2015
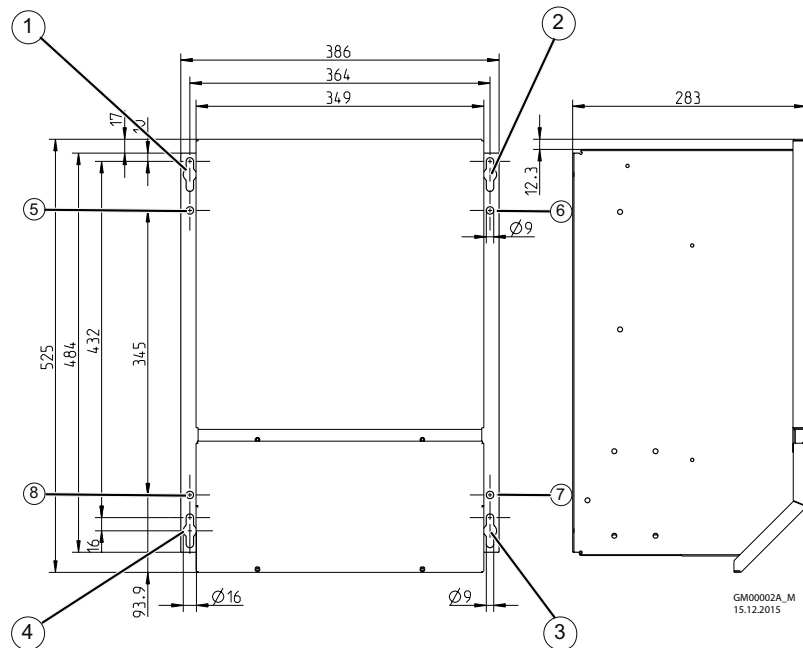
▷ Drill 8 fastening points.
▷ Screw in fastening point screws "1" - "4" up to a distance of approx. 5 mm and mount the device.
▷ Tighten fastening point screws "1" - "4".
▷ Screw in fastening point screws "5" - "8" and tighten.

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Type FXDM32...50 (IP20)
Fastening at 4 points

GM00001A_M
15.12.2015
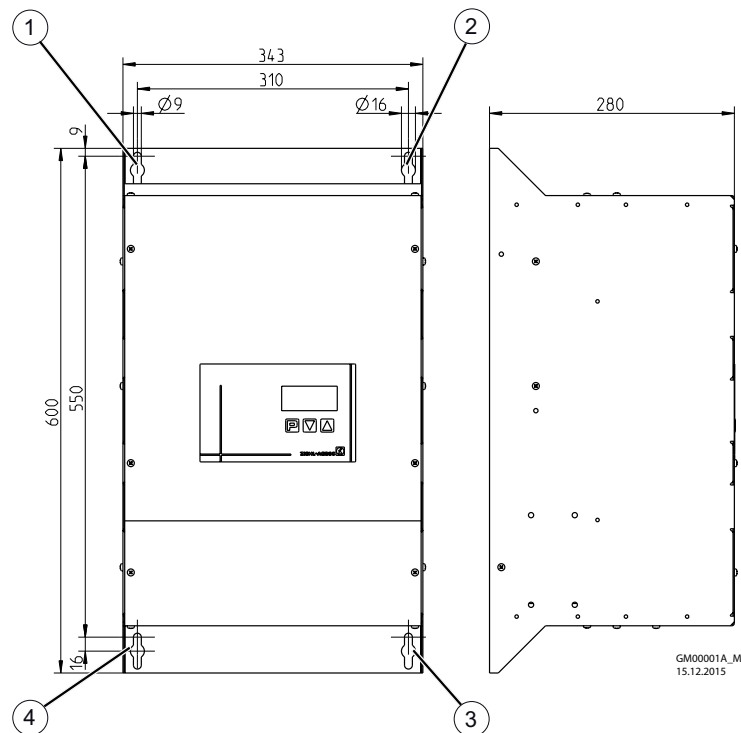
▷ Drill 4 fastening points.
▷ Screw in screws "1" - "4" up to a distance of approx. 5 mm and mount the device.
▷ Tighten fastening point screws "1" - "4".

4.4 Cable inlet

▷ Remove the terminal compartment cover.
▷ Depending on the housing model cut off necessary cable inlets respectively to the cable diameter.
  Or alternative use cable inlet for cable glands. Metal sheet housings are supplied with stoppers.
  Any cable ducts openings not used must be sealed!
▷ Strip and insert the cables properly.
▷ Attach cover for terminal compartment again carefully before start-up.

Housing with aluminum base plate

26.05.2014
v_kabeleinf_alugrundpl.vsd
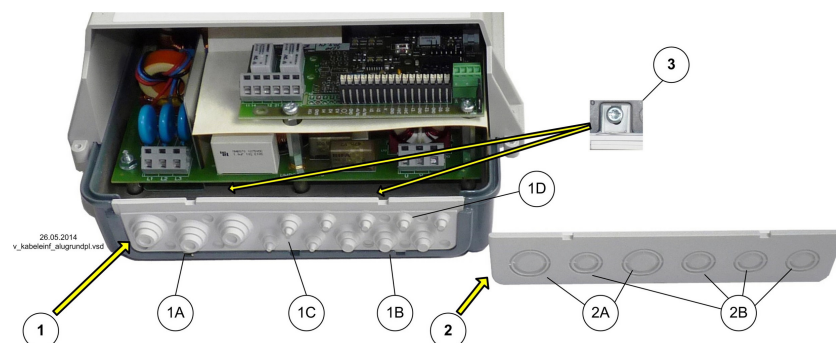
1   Cable inlet with step nozzles (factory installed)
1A   3 x max. 18 mm
1B   3 x max. 14 mm
1C   3 x max. 11 mm
1D   4 / 8 x max. 8 mm
2   attached cable inlet for cable glands
2A   17 / 21 mm
2B   12.5 / 17 mm
3   Fastening screws

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Sheet metal housing

IP54   IP20
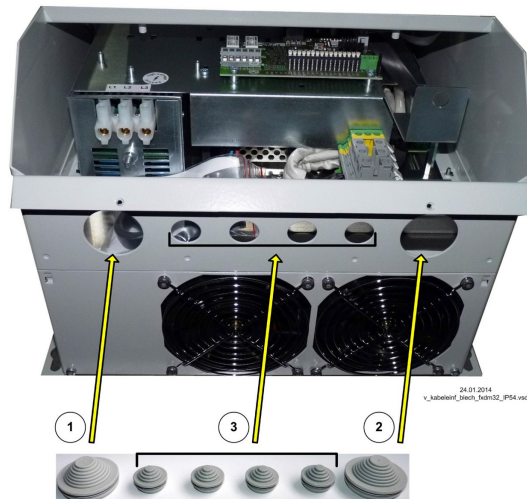
1 *Inlet mains connection (40 mm)*
2 *Inlet motor connection (40 mm)*
3 *Inlet control cables (20 mm)*
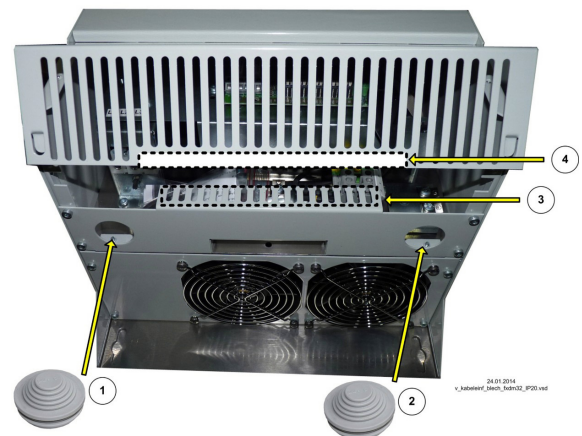
1 *Inlet mains connection (32 mm)*
2 *Inlet motor connection (32 mm)*
3 *Ridges for connecting the control cables*
4 *Cut-out for control cables in the cover*

Information
- Cable glands can be used alternatively (not included in delivery). The manufacturer's specifications for tightening torque and sealing area must be observed!
- Openings which are not needed must be sealed!

4.5 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!

4.6 Installation location for agriculture

When using for animal keeping, do not install the device directly in the stable but in a separate room with a lower pollutant load. This helps to avoid damages caused by pollutant gases (e.g. ammonia fumes, hydrogen sulphide fumes).

4.7 Temperature influences during commissioning

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

5 Electrical installation

5.1 Safety precautions

Danger due 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.
- The 5 electrical safety rules must be observed!
- It is forbidden to carry out work on electrically live parts. Even after disconnection, the dc-link is still live. Always wait at least 3 minutes.
- Cover neighbouring electrical equipment during installation work.
- Other measures may be necessary to achieve safe electrical isolation.
- A second person must always be present when working on energized parts or lines who disconnects in case of emergency.
- Inspect electrical equipment periodically: retighten loose connections – immediately replace damaged lines and cables.
- Always keep switch cabinets and all electrical supply facilities locked. Access is only allowed for

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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!
- The device owner is responsible for the EMC of the entire plant according to the locally applicable standards.
- 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   Terminal compartment

09.05.2014
v_fxdm_connection.vsd
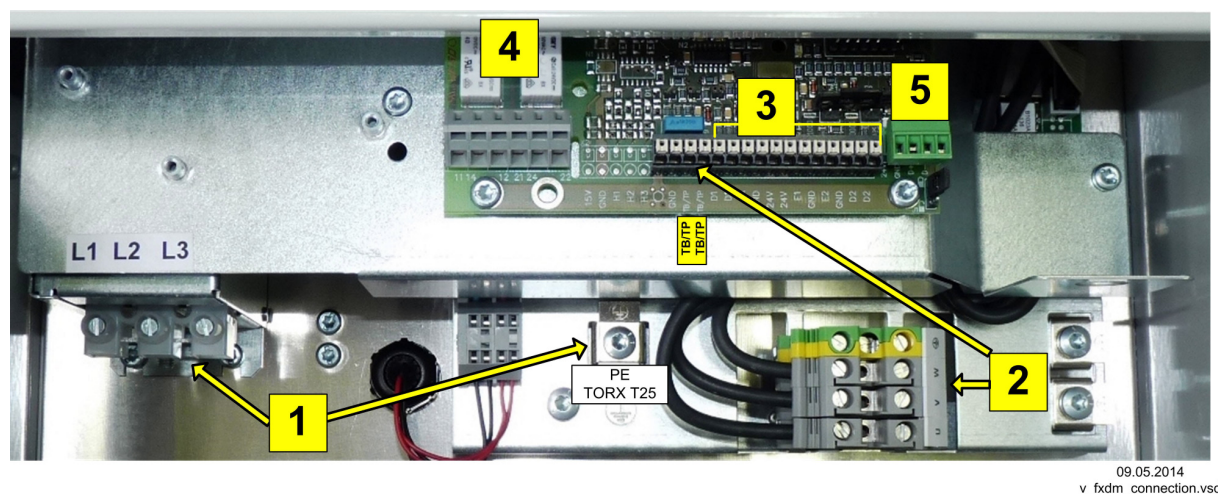
Example: Position of terminals for devices in sheet metal housing

1   Line
2   Motor
3   Modulation
4   Indication relays
5   MODBUS

Maximum cross sections of terminals for power section

Type	Line		Motor	
	rigid	flexible	rigid	flexible
FXDM2.5(A)M	2,5 mm^2	2,5 mm^2	2,5 mm^2	2,5 mm^2
FXDM5(A)M	2,5 mm^2	2,5 mm^2	2,5 mm^2	2,5 mm^2
FXDM8(A)M	2,5 mm^2	2,5 mm^2	2,5 mm^2	2,5 mm^2
FXDM10(A)M	2,5 mm^2	2,5 mm^2	2,5 mm^2	2,5 mm^2
FXDM14(A)M	4 mm^2	4 mm^2	4 mm^2	4 mm^2
FXDM18(A)M	4 mm^2	4 mm^2	4 mm^2	4 mm^2
FXDM22(A)M	6 mm^2	6 mm^2	6 mm^2	6 mm^2
FXDM32(A)M(E)	16 mm^2	10 mm^2	10 mm^2	6 mm^2
FXDM40(A)M(E)	25 mm^2	16 mm^2	16 mm^2	10 mm^2
FXDM50(A)M(E)	25 mm^2	16 mm^2	16 mm^2	10 mm^2

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Possible cross sections of terminals for control section

For all types	rigid	flexible
Modulation	0,25 - 1,5 mm^2	0,25 - 1,5 mm^2
Indication relays	0,08 - 2,5 mm^2	0,08 - 2,5 mm^2
MODBUS	0,14 - 1,5 mm^2	0,14 - 1,5 mm^2

5.3 EMC-compatible installation

5.3.1 Motor 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.

5.3.2 Control cables
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!).

5.3.3 Harmonics current for devices ≥ 4 and ≤ 16 A
According to EN 61000-3-2 these devices are to be classified as "professional" devices.
Connection to a low voltage supply (public networks) is allowed insofar as this has been clarified with the respective energy supply company responsible.

5.3.4 Harmonics current and line impedance for devices > 16 A and ≤ 75 A
Extract from EN 61000-3-12, valid for equipments with rated current > 16 A and ≤ 75 A, connected to public low-voltage systems.

This equipment complies with IEC 61000-3-12 provided that the short-circuit power S_{SC} is greater than or equal to R_{SCE} x S_{equ} at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power S_{SC} greater than or equal to R_{SCE} x S_{equ}.	
S_{SC}	Short-circuit power from line at the interface point between the user's supply and the public system
S_{equ}	Rated - apparent power for three phase devices: $S_{equ} = \sqrt{3}$ x U_l x I_{equ} (U_l = phase to phase voltage ☞ Technical data "Line voltage") (I_{equ} = rated current of the device ☞ Technical data "Rated current input")
R_{SCE}	Short-circuit ratio For this devices: $R_{SCE} ≥ 120$

5.4 Mains connection

5.4.1 Line voltage
Power from the mains is connected to terminals: PE, L1, L2, L3 and N (depending on type). 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 available for the device types with **22 A** rated current for the reduction of the leakage current. It is irrelevant for the device's functionality, for those supply networks without neutral conductors the connection is not required. Because however, higher leakage currents can flow through the "PE" conductor connection, undesirable erroneous activation may occur on systems equipped with FI circuit breakers.

Attention!
- Not suitable for IT system!
- Do not operate on Grounded Delta System!
- To activate the on current limitation, you must wait at least 90 seconds after switching off the line voltage before switching back on!

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5.4.2   Required quality attributes for the mains voltage

Danger due to electric current
The mains voltage must comply with the EN 50160 quality characteristics and the defined standard voltages in IEC 60038!

5.4.3   Leakage current, securely attached, ground wire double up to 10 mm²

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

5.5   Residual-current-operated protective device

Danger due to electric current
For an installation of r.c.d. protection, it shall be observed that this must be of "universal-current sensitivity" (Type B). In accordance with EN 50 178, Section. 5.2. other types of current-operated protective devices may not be used. To ensure as high a degree of reliability as possible , we recommend a tripping current of 300 mA.

5.6   Inverter output

5.6.1   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 must not exceed the current rating for the controller.

Information
- It is recommended that a separate motor protection unit be foreseen for each fan.
- For motors with thermistors "TP" (PTC thermistor) e.g. type U-EK230E
- For motors with thermostats "TB" (thermal contacts) e. g. type STDT16 or AWE-SK (☞Enclosure: Connection suggestion for several motors with motor protection unit type STDT.)

5.6.2   Disconnection between controller and motor (repair switch)
Ideally, a repair switch should be installed **before the controller** (supply line disconnect).
In the case of complete disconnection (entire load) after the controller, the enable (controller OFF / ON) must be disconnected simultaneously. I.e., an additional control contact is needed. Switching on the motor while simultaneously issuing the enable (ON) achieves secure energizing with low saturation of the controller. For this a programming is necessary (☞ IO Setup Enable ON / OFF).

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

5.7   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"). The unit then remains switched off. A programmed fault-indicating relay is triggering.

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 Display during motor fault

Possibilities for re-starting after the drive has cooled down terminals "TB/TP" bridged 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!
- 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.

5.8   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 (see Jumper for Input signal).
When triggering with a PWM signal (10 V) the ratio between the pull-up resistor and the internal resistance of the open collector output must be considered.

Attention!
Never apply line voltage to analog inputs!

5.9   Analog output (0 - 10 V) "A1"
The analogoutputs 0 - 10 V can be allocated with various functions (see IO Setup: Analog output "A").
Connection to terminal "A" - "GND" = "Analog Out" (I_{max} see technical data / connection diagram).
It is not permissible to connect outputs of several devices to each other!

5.10   Voltage supply for external devices (+24V, GND)
A voltage supply is integrated for external devices e.g. a sensor (max. current load see technical data).
In case of overload or short circuit (24 V – GND), the external power supply is shut down (multi-fuse). The device performs a "Reset" and continues operation.
- It is not permissible to connect voltage outputs of several devices to each other!
- It is not permissible to connect voltage outputs in the device to each other!

5.11   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".
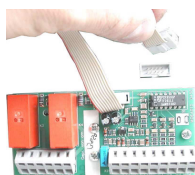
- 1x analogue input 0-10 V (R_i> 100 kΩ) for external Set point
- 1x output 0 - 10 V (I_{max} 10 mA)
- 3x digital-inputs, Activation via floating contacts
- 2x relay outputs (contact load 2 A 250 V AC)

Add-on module type Z-Modul-B

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5.12   Connection of external Terminal type AXG-1A(E)
An external terminal is required for starting-up and setting-up versions that do not have an integrated terminal.
- Model AXG-1A, Part-No. 349034 for wall mounting
- Model AXG-1AE, Part-No. 349008 for panel mounting

The connection is made via a 4-strand line at the terminals of plug (D-, D+, GND and +24 V).
e.g., telephone flex e.g. J-Y (St) Y 2x2x0.6 (or similar), maximum line length ca. 250 m.
- Voltage supply: Terminal "24 V", "GND", (I_{max}, for terminal approx. 50 mA)
- Signal "D+" and "D-" (RS 485)

Connection Terminal Type AXG-1A(E)

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

5.13   Digital inputs (D1, D2)
Different functions can be assigned to the digital inputs "D1"and "D2" (see IO Setup: Functional overview of digital inputs). Activation via floating contacts, a low voltage of approx. 24 V DC is connected.
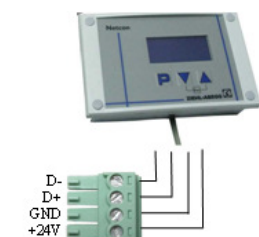
Danger due to electric current
Never apply line voltage to the digital input!
Note the input resistance (see technical data).

5.14   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.

Relays K1
- Connection of the floating contacts of relay "K1" to the terminals 11, 14, 12.
- "K1 Function" factory setting: 1K = **Operating indication**. I.e. energized for operation without fault, for enable "OFF" de-energized.

Relays K2
- Connection of the floating contacts of relay "K2" to the terminals 21, 24, 22.
- "K2 Function" factory setting: 2K = **Fault indication**. I.e. energized for operation without fault and for enable "OFF".

5.15   Communication

5.15.1   Networking via MODBUS-RTU
The device comes equipped with a RS-485 interface for networking via MODBUS. Conntection at: "A (D+)", "B (D-)" and "GND".
The address must be set in the "IO Setup"menu.

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

5.15.2   RS-485 - network design and interface parameter
Please ensure the correct connection; i.e. "A (D+)" must always be connected to "A (D+)" of the next devices. The same applies to "B (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).

ZIEHL-ABEGG
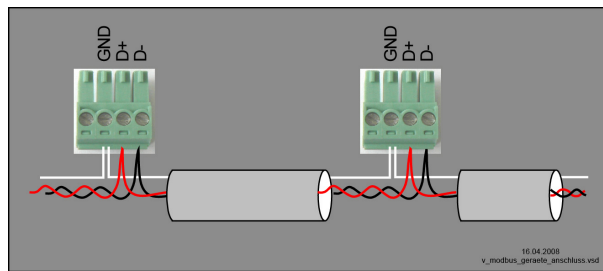
general example for MODBUS device connection

The data line must be connected 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.
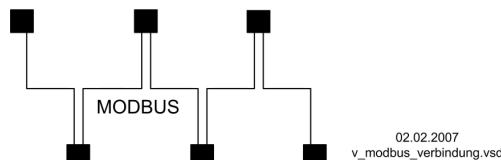
Example for MODBUS connection

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:
"A (D+)" = red, "B (D-)" = black, "GND" = white

Information
- Pay attention to sufficient distance from powerlines and motor wires (min. 20 cm).
- Except the data link "A (D+)", "B (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).

Shielding

The use of shielded cables is normally not demanded but offers high protection against electro-magnetic interferences, especially high frequencies. However, the effectiveness of the shield depends on careful installation of the line.

If shielded cables are used, the shield should be placed at "PE" on at least one side (preferably on the master connection). The occurrence of compensating currents may have to be considered if the shield is contacted on both sides.

Shield connection correct   Shield connection incorrect
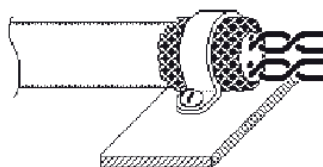
ZIEHL-ABEGG
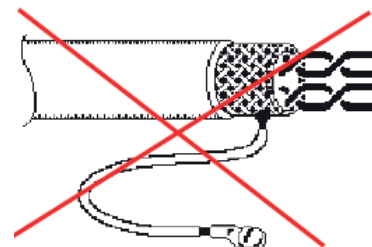
Default interface parameter

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

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

5.15.3 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.

5.16 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 protective earth. It must be ensured that the maximum external voltage at the control voltage connections cannot exceed 50 V (between "GND" terminals and "PE" protective earth). If necessary, a connection to the protective earth potential can be established, install bridge between "GND" terminal and the "PE" connection (terminal for screening).

5.17 Bypass circuit
Please observe the following during bypass switching (controller shunt with mains voltage):
• Mutual locking of mains contactor and bypass protection
• Time delay of at least 1 second during switching
• The controller "enable" (ON / OFF) must be simultaneously opened together with cut-off of the protection on the controller output; during connection it must be simultaneously closed again. For this a programming is necessary (☞ IO Setup Enable ON / OFF).
• By switching OFF necessary waiting period before renewed switching on amounts minimum 90 seconds! (☞ connection suggestion for bypass with the required time-delay)
• Never apply line voltage to the inverter output!

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5.18   Manual Bypass-Switch type S-D-25 and S-D-50

As accessories are manual main switches with bypass function available.
By switching OFF Frequency inverters necessary waiting period before renewed switching on amounts minimum 90 seconds!

Switch position

- $\boxed{0}$ = Switch OFF supply line (lockable)
- $\boxed{\text{AUTO}}$ = Operation Control
- $\boxed{100\ \%}$ = Operation Bypass (controller without supply)

Technical data

- Line voltage max. 690 V, 50/60 Hz
- Rated current
    - Type S-D-25 Part.-No. 349035: 25 A
    - Type S-D-50 Part.-No. 349040: 50 A
- Dimensions w x h x d [mm]
    - Type S-D-25: 115 x 115 x 163
    - Type S-D-50: 135 x 135 x 188
- Protection class IP65
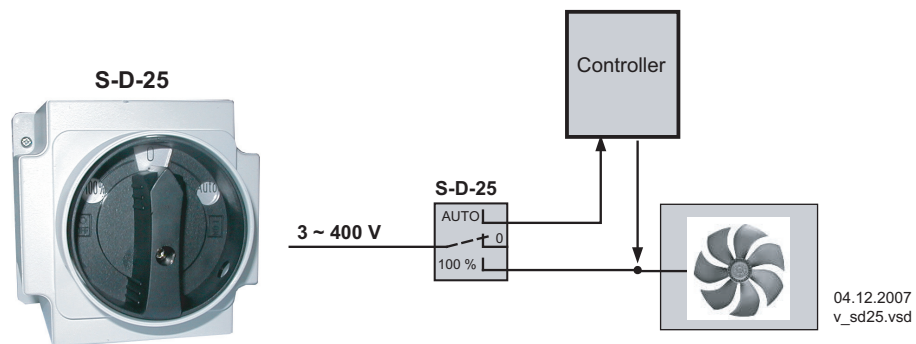
Manual Bypass-Switch type S-D-25 / S-D-50

ZIEHL-ABEGG

6   Controls and Menu

6.1   Multipurpose LC display and keyboard
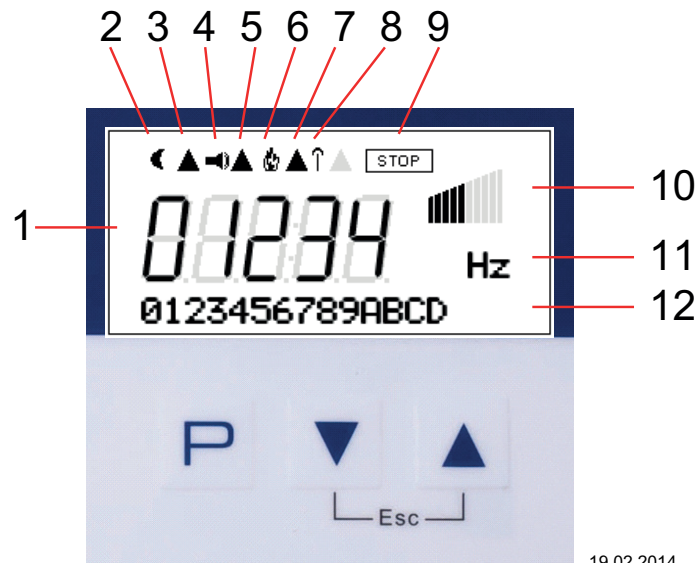
19.02.2014
v_display_erklaerung_fcontrol.vsd

1. Numeric display 5 digit
2. Moon-Symbol for set point 2
3. Current derating active
4. Alarm-Symbol (fault indication)
5. Brake motor or motor heating active
6. Fire-Symbol (heating operation)
7. Derating (power reduction active)
8. External switch over direction of rotation active
9. STOP-Symbol (enable)
10. Bargraph Fanlevel
11. Text line 3 figures (display unit, etc.)
12. 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

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6.2   Menu operation

Display after turning on the voltage supply.
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).

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

P↓ ↑ ESC

Motor OFF / ON

▲ ▼

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

▲ ▼

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

ZIEHL-ABEGG
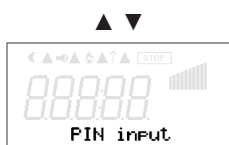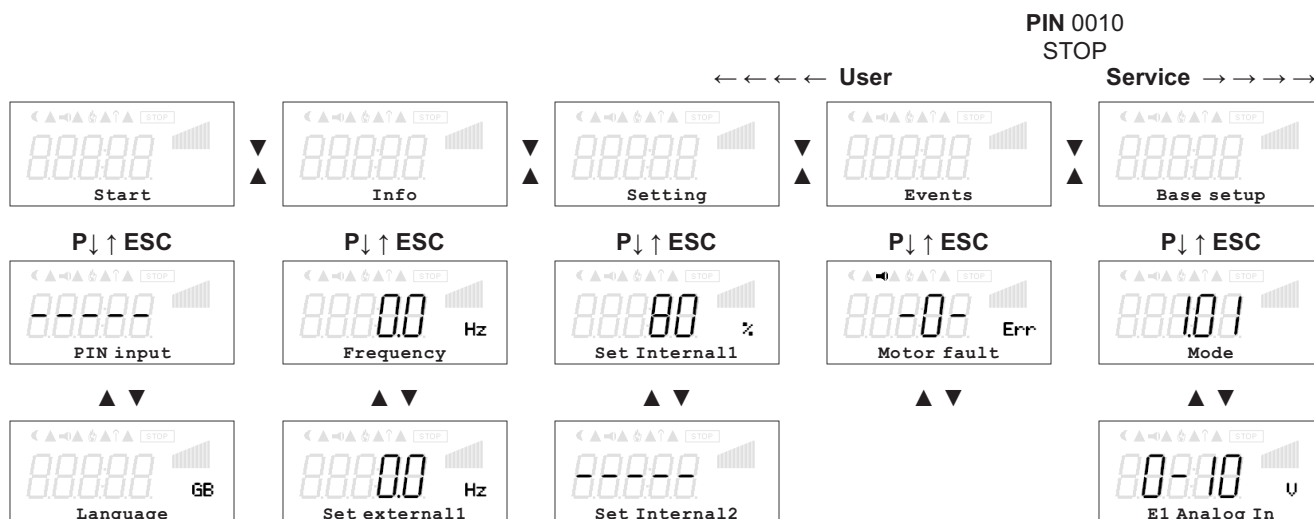
6.3 Menu structure

PIN 0010
STOP

← ← ← ← **User**   **Service** → → → →

Start	Info	Setting	Events	Base setup
P↓ ↑ ESC	**P↓ ↑ ESC**	**P↓ ↑ ESC**	**P↓ ↑ ESC**	**P↓ ↑ ESC**
PIN input	Frequency	Set Internal1	Motor fault	Mode
▲ ▼	**▲ ▼**	**▲ ▼**	**▲ ▼**	**▲ ▼**
Language	Set external1	Set Internal2		E1 Analog In

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 ash, it can be adjusted with the ▼ + ▲ keys and then saved with the **P** key. To exit the menu without making any changes, use the "Esc" short-key, i.e., the originally set values remain.

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

6.4 Example for programming mode `2.01` in "Base setup"

1   2   3   4   5   6   7

ZIEHL-ABEGG
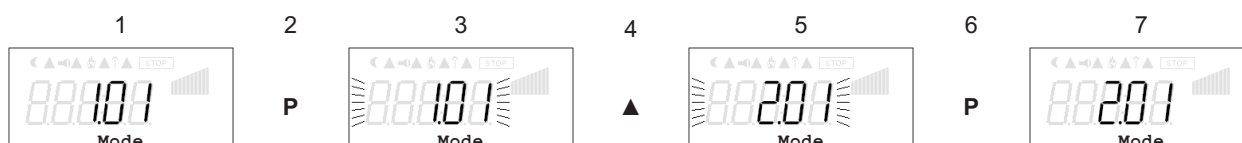
7 Base setup

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

04.05.2016
v_stecker_e1.vsd

22.01.2008
v_stecker_e2.vsd
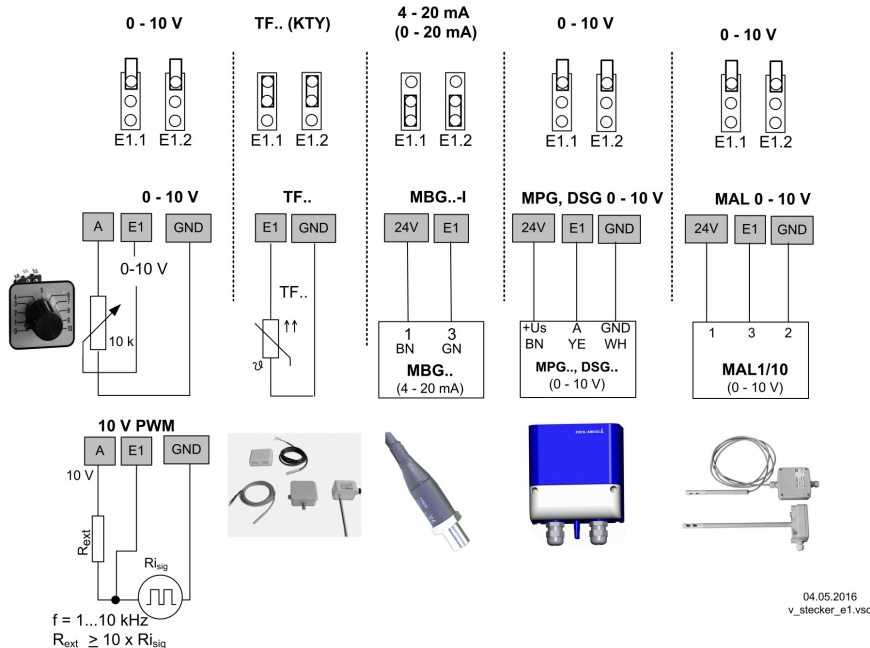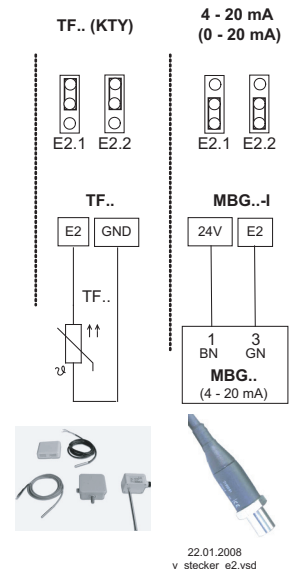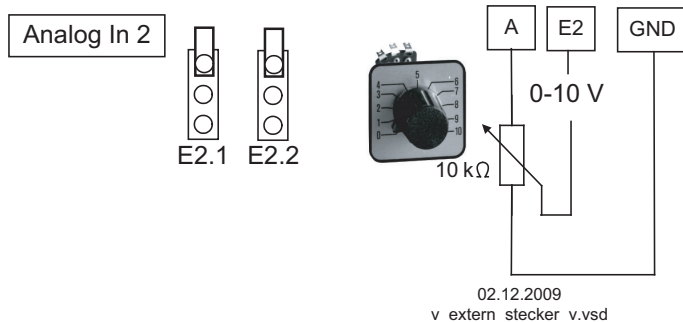
7.1.1 External Setpoint / External speed setting in manual operation

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 Analog Out1 (terminal "A") program to function $\boxed{1A}$ = "+10 V" (like factory setting see 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 see IO Setup).

E2 Analog In = factory setting 0 - 10 V

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

02.12.2009
v_extern_stecker_v.vsd

24.01.2008
v_extern_stecker_a.vsd
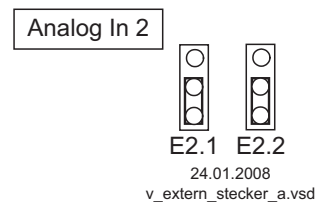
External Setpoint via external signal instead of "Setpoint 1". The "external Setpoint" function must be activated in base setup $\boxed{1E}$ for "E2 function". The active external Setpoint value is displayed in the "info" menu group.

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 (see 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 (see 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.

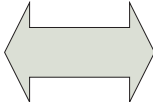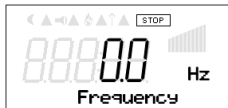| Mode	Signal or Sensor (input)	Function
1.01	Signal 0 - 10 V (PWM)	Speed controller, two step operation wih external switch over (factory setting)
1.02	-	Manual speed controller with direct setting by the ▼+▲ keys (0 - 100 % or in 1 - 5 steps)
2.01	Sensor TF..(E1)	Temperature control airconditioning 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 (shutter and heating)
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 with outdoor temperature-dependent setpoint adaptation and activation by MODBUS
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

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8 Start-up

8.1 Prerequisites for commissioning

Attention!
1. You must mount and connect the device in accordance with the operating instructions.
2. Double check that all connections are correct.
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 hazardous area.

8.2 Procedure for commissioning

Sequence	Setting
1	▷ Check if Thermostats or Thermistors of the motor are connected to input "TB/TP In". ▷ If the motor protection function of the device is not neccesary the both terminals "TB / TP" have to be bridged.
2	▷ Check connection and close housing carefully.
3	▷ Turn on mains voltage. Display after first turning on the mains voltage.
4	In the menu group **Start** the adjustment for **Motor** is **OFF** for factory setting => display: STOP . This prevents the system from inadvertently starting up before configuration is complete. Operation of the device after pressing the Esc hotkey combination. Switch-over between "OFF" and "Start" with the key shortcut for Escape ((Esc = ▼ + ▲).
5	Menu group: **Start** ▷ Set the menu language if necessary (factory setting English = Language GB).
6	Menu group: **Base setup** ▷ Setting the desired operation Mode (factory setting **1.01** = Speed controller see Selection Mode). ▷ Further settings depend on the selected mode and the sensor / setting signal used. **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.

The **Motorsetup** factory installed values are for variable voltage external rotor motors **400 V / 50 Hz**. After checking of the motor data the setting are to be adapted if necessary.

Motor rated voltage (see Rating plate)	Setting **Edgefrequency**	Setting **Max. Frequency**
3 ~ 400 V, 50 Hz	**48.5 Hz**	**50 Hz**
3 ~ 400 V, 50/60 Hz	48.5 Hz	60 Hz
3 ~ 400 V, 60 Hz	57 Hz	60 Hz

(Sequence 7) Additional settings see Motor Setup.

Sequence	Setting
8	Menu group **Setting**: ▷ Set the parameters for the control operation
9	Menu group **Start**: ▷ Switch setting for **Motor** to **ON**.

Information
Settings for U/f characteristic can only be made when no motor modulation is present! This is the same also for the setting of Mode.

Switch Motor to ON in menu group "Start"
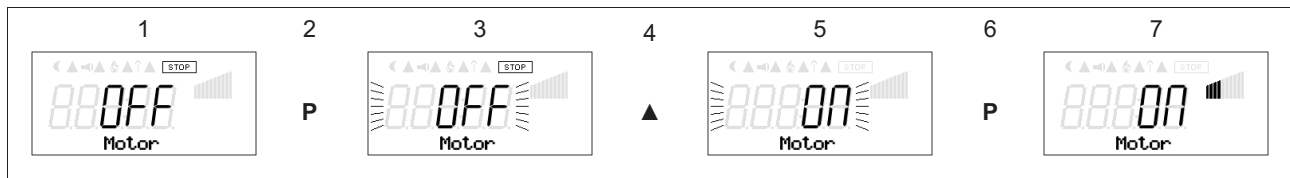
8.3   Menu Mode 1.01

Start	Info	Setting	Events	Base setup	Controller Setup	IO Setup	Limits	Motor Setup	Diagnostic
OFF Motor	0.0 Hz Frequency	50.0 Hz Set Internal1	-0- Motor fault	**1.01** Mode	OFF PIN Protection	1A A Function	OFF Controller function	8.0 A MotorRatedCurr.	OTC 00012:56:-15
- - - - PIN input	0.0 A Motor current	- - - - - Set Internal2	-1- Overtemperature	0 - 10 V E1 Analog In	OFF Set protection	0.0 V A min.	- - - - - Level min	**400 V** MotorRatedVolt.	OTM 00010:56:-11
GB Language	8 W Input power	0.0 Hz Min. Speed	-2- ext. Fault	OFF E2 Function	OFF Save User Setup	10.0 V A max.	- - - - - Level max.	**48.5 Hz** Edgefrequency	585 V DC-Voltage
OFF Reset	8 W Output power	50.0 Hz Max. Speed	-3- Sensor 2	- - - - - E2 Analog In	- - - - - Limit	OFF A Inverting	- - - - - Level Delay	**50.0 Hz** Max. Frequency	32.4 °C Heatsink
1.01 Mode	0.0 Hz Set external1	ON Set external1			- - - - - Group 2 ON value	OFF D1 Function	OFF Lmt E1 Function	40 sec Rampup time	29.5 °C Capacitor
2.28 Fcontrol					- - - - - nmin at Group2	- - - - - - D1 Inverting	- - - - - Lmt E1 min	40 sec Rampdown time	29.5 °C Filterchoke

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9 Programming

9.1 Speed controller `1.01`... `1.02`

9.1.1 Base setup `1.01`

Base setup	**Base setup**
Mode	**Mode** Factory setting Mode: `1.01`
E1 Analog In	**E1 Analog In** Selection: 0 - 20 mA, 4 - 20 mA, Bus (Inverting ☞ IO Setup) Factory setting: 0 - 10 V
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` . For operation with an external touch function, set to `7E` (function available depending on software version).
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`
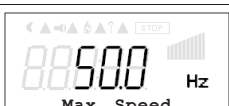
Setting	**Setting**
Set Internal1	**Set Internal1** Setting range manual speed setting: "Min. Speed" - "Max. Speed" Factory setting: 50.0 Hz (≙ Setting "Max. Speed")
Set Internal2	**Set Internal2** Setting "Set Intern2" e.g. reduced value for night operation. Switch over intern 1/2 by external contact (as long as no allocation is carried out: Display: `- - - - -` ☞ IO Setup).
Min. Speed	**Min. Speed** (basic speed only when needed) Setting range: `OFF` → "Shutdown Freq." (☞ Motor Setup) - "Max. Speed". Factory setting: `OFF`
Max. Speed	**Max. Speed** (speed limitation only when needed) Setting range: "Max. Frequency" (☞ Motor Setup) - "Min. Speed" Factory setting: 50.0 Hz
Set external1	**Set external1** "ON" (factory setting) = speed setting by external Signal "OFF" = Setting "Set Intern1"

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Diagram setting signal and output frequency
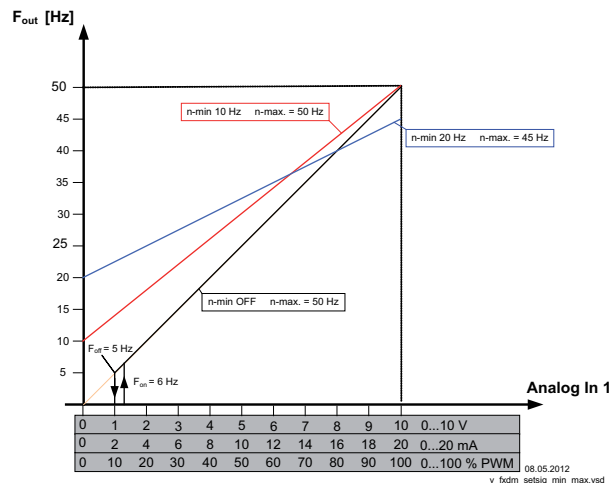
Fout: Output frequency
Analog In: Speed setting signal
n-min: Min. Speed
n-max: Max. Speed
Foff: Shutdown Freq.
Fon: Switch on Freq.

9.1.3 Touch function via external signal in mode `1.01`

The output frequency can be set gradually via an external signal at the analog inputs "E1" and "E2".

The following settings are required for this function:

- Base setup
  – Mode: `1.01`
  – E1 Analog In: 0 - 10 V, 0 - 20 mA, 4 - 20 mA (je nach externem Signal)
  – E2 Function: `7E`
  – E2 Analog In: 0 - 10 V, 0 - 20 mA, 4 - 20 mA (je nach externem Signal)

- IO Setup
  – E1 Mode: `3`
  – E1 Min.: 0 - 100 % (setting as required)
  – E1 Max.: 100 - 0 % (setting as required)
  – E2 Mode: `3`
  – E2 Min.: 0 - 100 % (setting as required)
  – E2 Max.: 100 - 0 % (setting as required)
  – Touch function.step: 0.00 - 100.00 % (setting as required)

Example: gradual setting via 0 - 10 V signal

ZIEHL-ABEGG
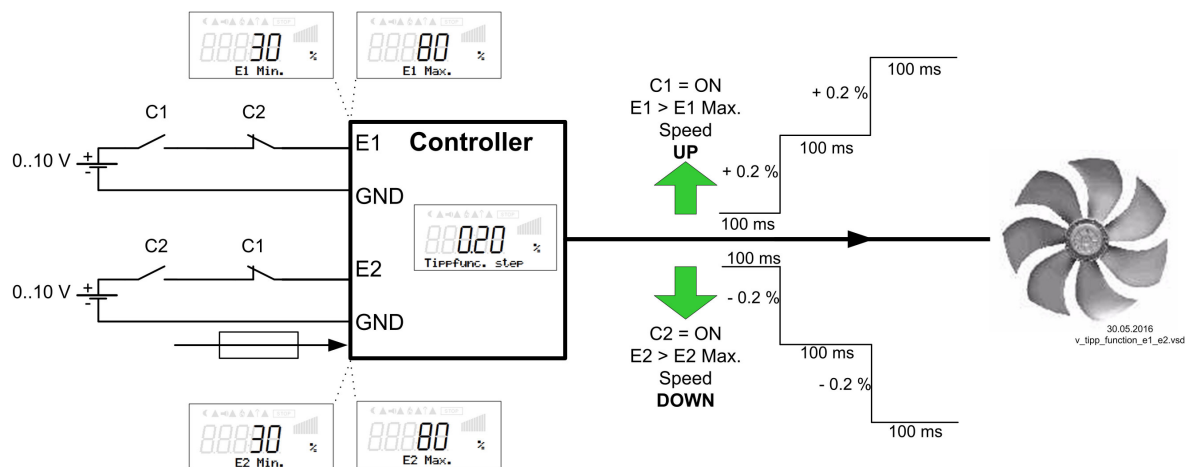
Functional description

Increase output frequency

In order to gradually increase the output frequency, the signal at input "E1" is switched on via contact "C1". The signal must be higher than set for "E1 Max." (i.e. over 8 V). The output frequency is now increased depending on the duration of the signal applied and the increment setting "Touch function.-step". For every 100 ms of the signal applied (interval not adjustable), the output frequency increases by 0.20 %.

Increasing output frequency is stopped if at "E1" the set value for "E1 Min." is not reached (i.e. is below 3 V).

Reduce output frequency

In order to gradually reduce the output frequency, the signal at input "E2" is switched on via contact "C2". The signal must be higher than set for "E2 Max." (i.e. over 8 V). The output frequency is now reduced depending on the duration of the signal applied and the increment setting "Touch function.-step". For every 100 ms of the signal applied (interval not adjustable), the output frequency decreases by 0.20 %.

Reducing the output frequency is stopped if at "E2" the set value for "E2 Min." is not reached (i.e. is below 3 V).

Information

Please note the following information to prevent undefined states:

- "Always set E1 Max." higher than "E1 Min." and always set "E2 Max." higher than "E2 Min.".
- Do not activate both inputs (E1 and E2) at the same time with increase and reduction signals (either lock "C1" or "C2").

Settings in IO Setup

Switching thresholds for increasing the output frequency (switching hysteresis)	
 E1 max	**E1 max** The output frequency is gradually increased if at "E1" the set value for "E1 Max." is exceeded. Setting range: 10 - 100 % Factory setting: 100 %
 E1 min.	**E1 min.** Increasing the output frequency is stopped if at "E1" the set value for "E1 Min." is not reached. Setting range: 0 - 100 % Factory setting: 0 %

Switching thresholds for reducing the output frequency (switching hysteresis)	
 E2 max.	**E2 max.** The output frequency is gradually reduced if at "E2" the set value for "E2 Max." is exceeded. Setting range: 0 - 100 % Factory setting: 0 %
 E2 min.	**E2 min.** Reducing the output frequency is stopped if at "E2" the set value for "E2 Min." is not reached. Setting range: 10 - 100 % Factory setting: 100 %

Increment setting per 100 ms	
 Touch function.step	**Touch function.step** Added increment if the respective switching thresholds for "E1" or "E2" are exceeded. The setting corresponds to the maximum possible frequency range (0 - 100 % ≙ 0 - 50 Hz @ 50 Hz. max. frequency). Adjustment range: 0.00 - 100.00 % Factory setting: 0,20 %

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9.1.4 Base setup `1.02`

Menu group "Base setup"

Base setup	**Base setup**
Mode	**Mode** Mode selection: `1.02`
Number steps	**Number steps** Selection: 0, 1, 2, 3, 4, 5 Factory setting: **0** **Number steps: 0** In the factory setting "0" (without steps) the output frequency can be set directly with the ▼ + ▲ keys (☞ setting in operation). **Number steps: 1, 2, 3, 4, 5** The frequency value can be assigned to each step. The desired step is set with the ▼ + ▲ keys (☞ setting in operation). The following menus become active depending on the selected step count. (Step not active = `- - - -`)
Step 1 value	**Step 1 value** Factory setting: `- - - -` Setting range: 5 Hz * - 50.0 Hz ** (or Step 2 value)
Step 2 value	**Step 2 value** Factory setting: `- - - -` Setting range: Step 1 value - 50.0 Hz ** (or Step 3 value)
Step 3 value	**Step 3 value** Factory setting: `- - - -` Setting range: Step 2 value - 50.0 Hz ** (or Step 4 value)
Step 4 value	**Step 4 value** Factory setting: `- - - -` Setting range: Step 3 value - 50.0 Hz ** (or Step 5 value)
Step 5 value	**Step 5 value** Factory setting: `- - - -` Setting range: Step 4 value - 50.0 Hz **

*   Minimal setting range depending on setting "Shutdown Freq." (☞ "Motor Setup").
**   Maximal setting range depending on setting "Max. Speed" (☞ "setting").

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Menu group "setting" (only when needed)

Setting	**Setting**
Setting direct	**Setting direct** (at Number steps: 0 ☞ "Base setup") If the setting is to be made during operation directly with the ▼ + ▲ keys, no setting is necessary here (☞ setting in operation **1.02**). Setting range: Min. Speed - Max. Speed Factory setting: 50.0 Hz (☞Max. Speed)
Setting Step	**Setting step** (at Number steps: 1 - 5 ☞ "Base setup") If the setting is to be made during operation directly with the ▼ + ▲ keys, no setting is necessary here (☞ setting in operation **1.02**). Setting range: 0 - setting nummber steps Factory setting: 0 When setting a "Minimal speed" > OFF the output is not switched off in step "0"!
Min. Speed	**Min. Speed** (basic speed only when needed) Setting range: OFF → "Shutdown Freq." (☞ Motor Setup) - "Max. Speed". Factory setting: OFF
Max. Speed	**Max. Speed** (speed limitation only when needed) Setting range: "Max. Frequency" (☞ Motor Setup) - "Min. Speed" Factory setting: 50.0 Hz

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9.1.5 Setting in operation `1.02`

After installation is completed, only the **"Setting direct"** or **"Setting Step"** setting is visible in the "Info" menu group. All other menus are protected by a PIN.

[Info display] **Info**	**Info**
	Only **"Setting direct"** or **"Setting Step"** is visible.
[Setting direct display 50.0 Hz] **Setting direct**	**Setting direct** (at Number steps: 0 ☞ "Base setup") Setting range: Min. Speed - Max. Speed Factory setting: 50.0 Hz (☞Max. Speed)
	The value set by the ▼ + ▲ keys is accepted and executed directly (**P** key without function).
[Setting Step display 5] **Setting Step**	**Setting step** (at Number steps: 1 - 5 ☞ "Base setup") Setting range: 0 - programmed number steps Factory setting: 0 When setting a "min. speed" > OFF the output is not switched off in step "0"!

Switching over to the protected "Info" menu group takes place automatically after approximately 15 minutes if no key is pressed.

Possibilities for early activation of PIN protection:
• Select the "Info" menu group and confirm with the **P** key.
• Press the Esc key combination several times until the "Setting direct" or "Setting Step" menu is displayed.
• Execute the "Reset" function in the "Start" menu group.
• By switching the mains voltage off and then on again.

Input PIN 0010 to exit the protected area

adjust PIN 0010

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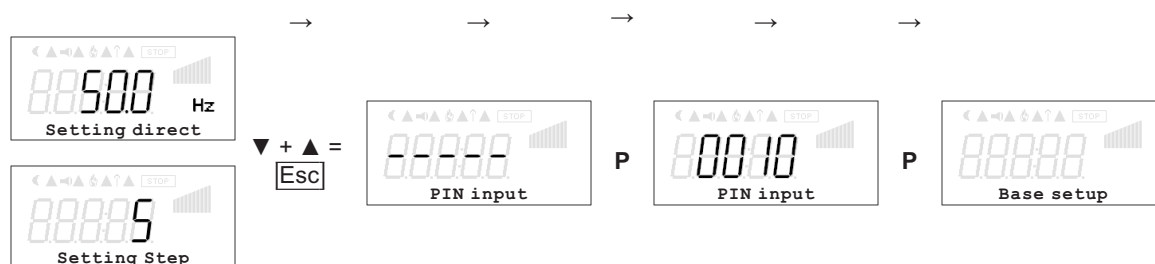
9.2   Temperature control `2.01` ... `2.05`

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

Base setup	**Base setup**
Mode	**Mode** Mode selection e.g. `2.01`
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
E1 Offset	**E1 Offset** Sensor calibration with calibrated comparison device

E2 Function	**E2 Function**
	• Funktion [1E] = External Setpoint via external signal (0 - 10 V) instead of "Setpoint 1".
	  – 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 [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 [7E] Measurement value = Measurement value e.g. for limit indication, display in Info menu "E2 Actual".

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

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...+120.0 °C Factory setting: `2.01` - `2.05` : 55.0 °C
Setpoint 2	**Setpoint 2** 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** Narrow control range = Short control times Wide control range = Longer control times and more stable control 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: -120.0...+120.0 K Factory setting: 65.0 K
Min. Speed	**Min. Speed** (basic speed only when needed) Setting range: `OFF` → "Shutdown Freq." (☞ Motor Setup) - "Max. Speed". Factory setting: `OFF`
Max. Speed	**Max. Speed** (speed limitation only when needed) Setting range: "Max. Frequency" (☞ Motor Setup) - "Min. Speed" Factory setting: 50.0 Hz
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 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... "Max. Frequency" (☞Motor Setup) Factory setting: 50.0 Hz For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.

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9.2.3   Functional diagrams temperature control

Example 1: Temperature control in factory setting "Cooling function" (Idealized principle diagram)
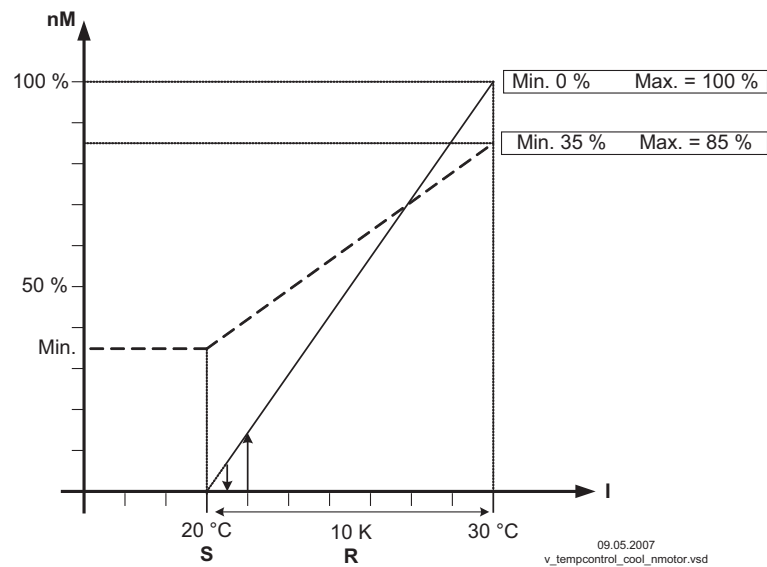
(Controller Setup: "Val > Set = n+" to "ON")
nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

Example 2: Temperature control in "Heating function" (Idealized principle diagram)
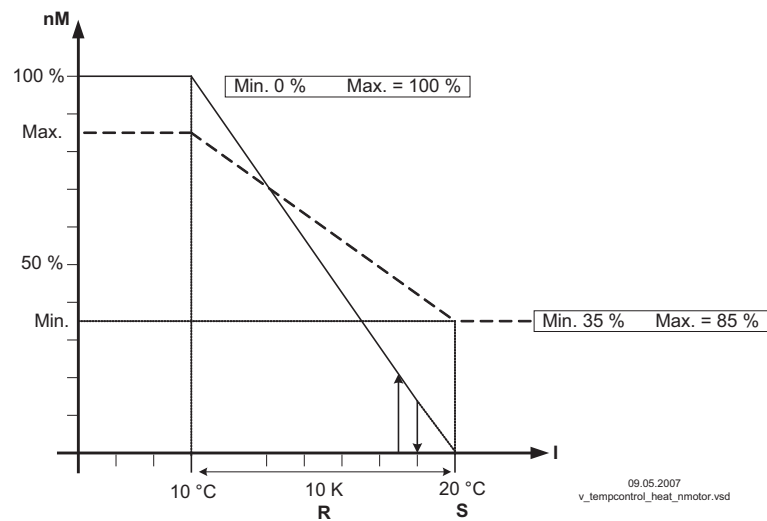
(Controller Setup: "Val > Set = n+" to "OFF")
nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

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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.

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).
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
0 % — Min. AnalogOut	**Min. AnalogOut** Min. AnalogOut = Minimal output voltage Setting range: 0...100 % = 0 - 10 V Factory setting: 0 %
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)
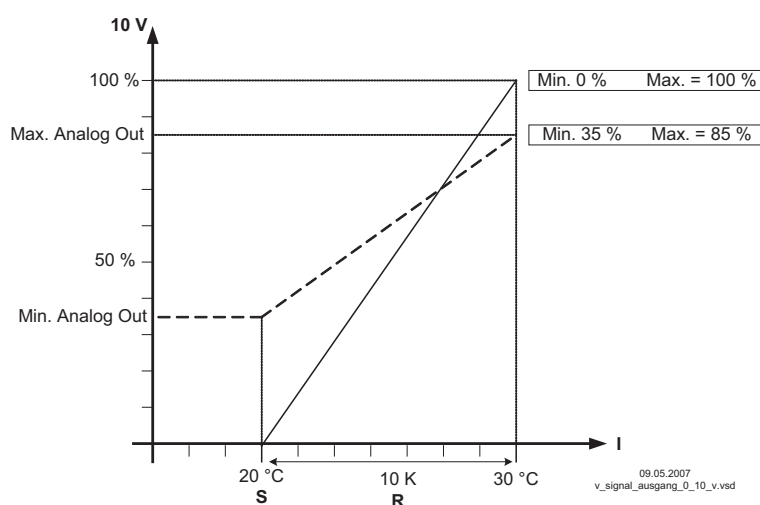
Example: Setpoint ventilation 25.0°C, Offset -5.0 K, Pband 10.0 K
S   Setpoint Ventilation +/- Offset
R   Pband
I   Actual value

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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 $\boxed{9K}$ **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
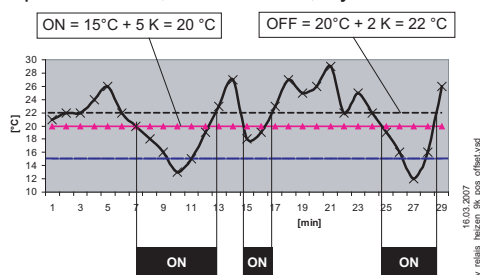
Example:
Setpoint 20.0 °C, Offset -5.0 K, Hysteresis 2.0 K
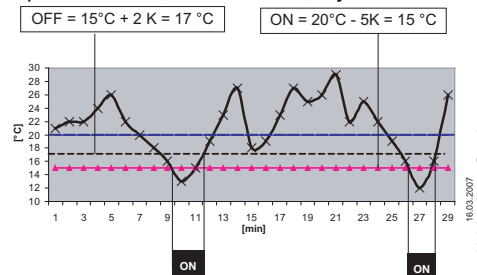
    The activated heating is indicated over the fire symbol in the display.

Temperature variation with reprogramming to $\boxed{10K}$ **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
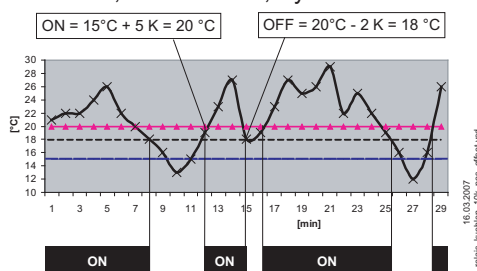
If the ambient temperature is higher than the set operating point, the cooling remains switched on. If the ambient temperature falls below the set operating point of the cooling by 2 K (Kelvin), it is switched off. I.e., the OFF point is situated at the hysteresis value under the ON point.

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

Lmt E1 min — display showing `-0-  A1`	Example for display if falling below setting "Alarm Minimum" alternating to the actual value display. Relay "K1" disengages (if not inverted).
Lmt E1 max. — display showing `-0-  A1`	Example for display if exceeding setting "Alarm Maximum" alternating to the actual value display Relay "K1" disengages (if not inverted).

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

9.3.1　Base setup `3.01`...`3.04`

Base setup	**Base setup**
Mode	**Mode** Mode selection e.g. `3.01`
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, MBG-7I, 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
E1 Offset	**E1 Offset** Sensor calibration with calibrated comparison device
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"!
E2 Function	**E2 Function** (only for special applications) • External setpoint = Function $\boxed{1E}$ by external signal (0 - 10 V) instead of "Setpoint 1". 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	

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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	**Setting**
12.00 bar Setpoint1	**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
35.0 °C Setpoint1	
Setpoint 2	**Setpoint 2** 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).
5.00 bar Pband	**Pband** Narrow control range = Short control times Wide control range = Longer control times and more stable control `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
7.0 K Pband	
OFF Min. Speed	**Min. Speed** (basic speed only when needed) Setting range: `OFF` → "Shutdown Freq." (☞ Motor Setup) - "Max. Speed". Factory setting: `OFF`
50.0 Hz Max. Speed	**Max. Speed** (speed limitation only when needed) Setting range: "Max. Frequency" (☞ Motor Setup) - "Min. Speed" Factory setting: 50.0 Hz
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"
50.0 Hz 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... "Max. Frequency" (☞Motor Setup) Factory setting: 50.0 Hz For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.

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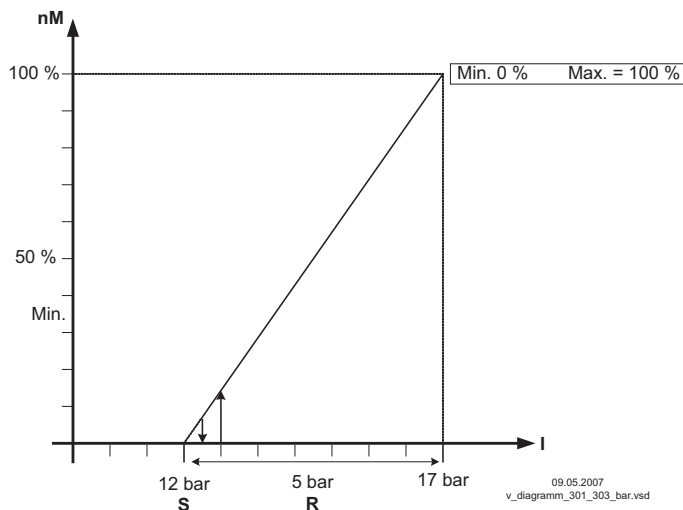
nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

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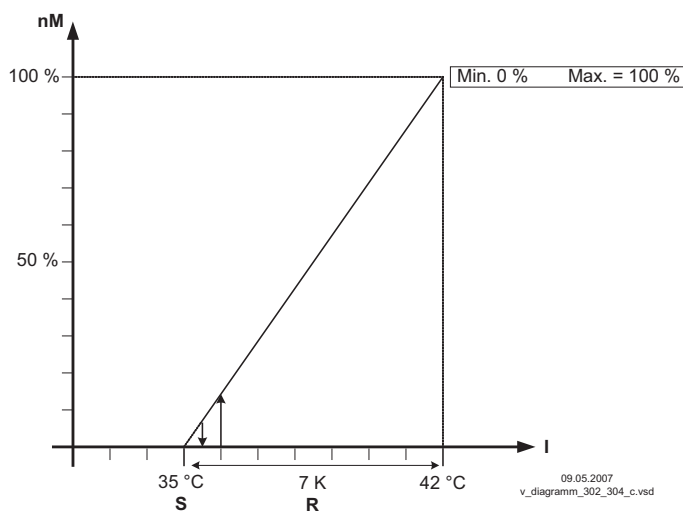
nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

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

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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**
`4.0.1` `Mode`	**Mode** Mode selection e.g. `4.01`
`200` `DSG` `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
`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 "Setpoint 1". 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	**Setting**
Setpoint1	**Setpoint1** Setting range: in measuring range of sensor Factory setting: 100 Pa
Setpoint 2	**Setpoint 2** 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** Narrow control range = Short control times Wide control range = Longer control times and more stable control Setting range: in measuring range of sensor Factory setting: 100 Pa
Min. Speed	**Min. Speed** (basic speed only when needed) Setting range: `OFF` → "Shutdown Freq." (☞ Motor Setup) - "Max. Speed". Factory setting: `OFF`
Max. Speed	**Max. Speed** (speed limitation only when needed) Setting range: "Max. Frequency" (☞ Motor Setup) - "Min. Speed" Factory setting: 50.0 Hz
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 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... "Max. Frequency" (☞Motor Setup) Factory setting: 50.0 Hz For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.

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

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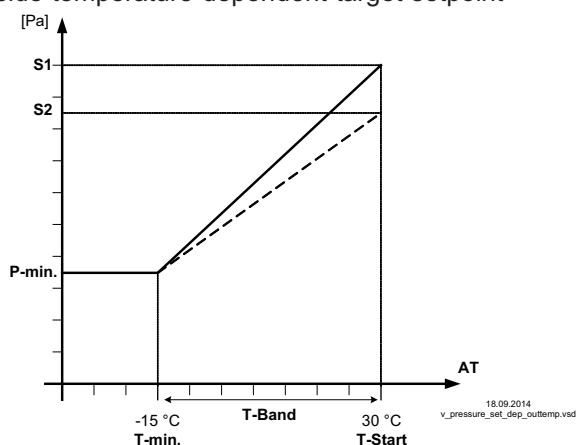
An outside temperature compensation can be activated (sensor connection "E2" = "Analog In 2") when being operated as a pressure regulation device.
An optimal building climate, e.g., can be achieved through this. Through this function, the set and active "Setpoint 1" or "Setpoint 2" is automatically changed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

S1   Setpoint1
S2   Setpoint 2
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

9.5   Volume control 5.01 ... 5.02

9.5.1   Basic setting 5.01 and 5.02

	Base setup
	Mode Mode selection e.g. 5.01
	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" .
	K Factor Input of the "K factor" dependent on the fan (inlet duct). setting range: 0...7.000 Factory setting: 75

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 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 "Setpoint 1". 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.

 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
 Setpoint 2	**Setpoint 2** 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).
 530 m3h Pband	**Pband** Narrow control range = Short control times Wide control range = Longer control times and more stable control Setting range: depending on measuring range of sensor and "K factor" Factory setting: 530 m³/h
 OFF Min. Speed	**Min. Speed** (basic speed only when needed) Setting range: ⌷OFF⌷ → "Shutdown Freq." (☞ Motor Setup) - "Max. Speed". Factory setting: ⌷OFF⌷
 50.0 Hz Max. Speed	**Max. Speed** (speed limitation only when needed) Setting range: "Max. Frequency" (☞ Motor Setup) - "Min. Speed" Factory setting: 50.0 Hz
 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"
 50.0 Hz 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... "Max. Frequency" (☞Motor Setup) Factory setting: 50.0 Hz For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.

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

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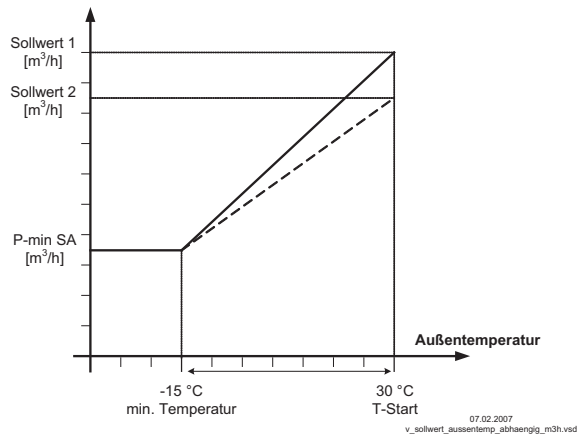
An outside temperature compensation can be activated (sensor connection "E2" to "Analog In 2") when being operated as a air volume regulation device.
An optimal building climate, e.g., can be achieved through this. Through this function, the set and active Setpoint 1/2 is automatically changed proportional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

S1   Setpoint1
S2   Setpoint 2
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
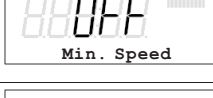
9.6   Air velocity control 6.01

9.6.1   Base setup 6.01
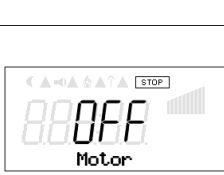
	Base setup
	Mode Mode selection 6.01
	E1 Analog In For mode 6.01 "E1 Analog In" factory setting to "MAL1" Selection sensor measuring range: MAL1, MAL10 Alternative selection signal: 0 - 10 V, 0 - 20 mA, 4 - 20 mA (☞ jumper for input signal). The sensor measurement range must be entered in order to display the actual value correctly. Example with a 0 - 10 V sensor and 0 - 5 m/s measurement range (proportional output signal). E1 Analog In = 0 - 10 V, E1 Min. = 0.0 m/s, E1 Max. = 5.0 m/s, E1 Decimals = 1, E1 Unit = m/s
	Sensor calibration with calibrated comparison device

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E2 Function	**E2 Function** (only for special applications) • External setpoint = Function 1E by external signal (0 - 10 V) instead of "Setpoint 1". 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"
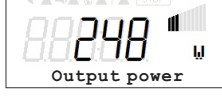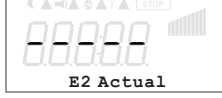
9.6.2   Settings for operation modes 6.01

Setting	**Setting**
Setpoint1	**Setpoint1** Setting range: in measuring range of sensor Factory setting: 0.50 m/s
Setpoint 2	**Setpoint 2** 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** Narrow control range = Short control times Wide control range = Longer control times and more stable control Setting range: in measuring range of sensor Factory setting: 0.50 m/s
Min. Speed	**Min. Speed** (basic speed only when needed) Setting range: OFF → "Shutdown Freq." (☞ Motor Setup) - "Max. Speed". Factory setting: OFF
Max. Speed	**Max. Speed** (speed limitation only when needed) Setting range: "Max. Frequency" (☞ Motor Setup) - "Min. Speed" Factory setting: 50.0 Hz
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 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... "Max. Frequency" (☞Motor Setup) Factory setting: 50.0 Hz For information about deactivated regulation the adjusted value for manual speed is indicated alternating with the actual value.

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9.7 Menu group Start

[display: Start]	**Start**
[display: OFF / Motor]	**Motor** (Menu dependent on device type available) In this menu point the modulation for the motor can be switched on and off (ON / OFF). Factory setting to OFF , this prevents the system from inadvertently starting up before configuration is complete. **Attention!** No disconnection (isolation) when switched off, in accordance with VBG4 §6)!
[display: 0010 / 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
[display: GB / Language]	**Language** Menu language by the factory set to English. In this menu different national languages can be selected (GB = English, D = German ...).
[display: OFF / Reset]	**Reset** Complete re-start of the device
[display: 1.01 / Mode]	**Mode** Query of the operating mode (e.g. 1.01 for speed controller)
[display: 2.19 / xxxxxxxx]	**Device name** Display of device name and software version
[display: SN: 000003CAF711]	Individual unit number (Menu dependent on device type available)
[display: d1334 B07 / 07/17/09]	Version number internal motor controller (Menu dependent on device type available)

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9.8   Menu group Info

	Menu group Info
Info	

	Info for mode speed controller `1.01`
0.0 Hz Frequency	Inverter output frequency.
0.0 A Motor current	Display of motor current (Metering precision approx. +/-10%)
248 W Input power	Input power display (display available depending on the software version)
248 W Output power	Output power display (display available depending on the software version)
48.5 Hz 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 % ≙ 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 "Internal1"	Menu "Set Intern1"
Set "Internal2"	Menu "Set Intern2"

	Info for mode controller `2.01` ... `6.01`
20.0 °C E1 Actual	Current actual value measured on the sensor 1. Depending sensor-type in: mbr, m^3/s, m/s, Pa, %, bar, m^3/h, °C, V, mA, etc.
E2 Actual	For operation with two sensors display for "2 actual". If function not active, display $\boxed{- - - - -}$
20.0 °C 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.
0.0 Hz Frequency	Inverter output frequency
0.0 A Motor current	Display of motor current (Metering precision approx. +/-10%)
248 W Input power	Input power display (display available depending on the software version)

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248 W Output power	Output power display (display available depending on the software version)
OFF % Min. speed cut off	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.

9.9 Controller Setup

9.9.1 PIN protection activate, PIN0010

OFF 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"

9.9.2 Set protection activate, PIN 1234

OFF 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!	

9.9.3 Save user settings restore with PIN 9090

OFF Save User Setup	The individually made device configurations (User Setting) can be saved here (corresponds to PIN 9091). 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!
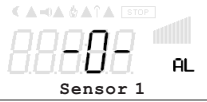
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9.9.4 Sensor Alarm ON / OFF

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

9.9.5 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.
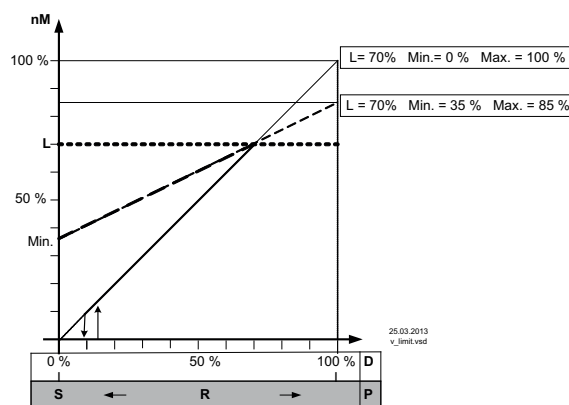
Limit (idealized principle diagram)
nM   Motor speed
L   Limit
S   Setpoint
R   Pband
D   Speed controller: setting signal
P   P-controller: control deviation

9.9.6 Minimum speed cut off

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

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.
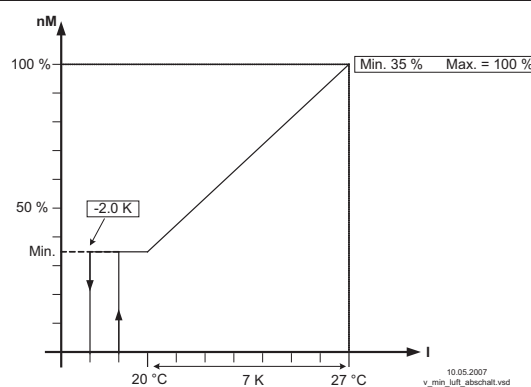
Minimum speed cut off (idealized principle diagram)
nM   Motor speed
S   Setpoint
R   Pband
I   Actual value

9.9.7 Group control

9.9.7.1 Control group 2 via 0 - 10 V output

50 % Group 2 ON value	**Group 2 ON value** Switch-on value for Group2 Setting range: 0 - 100 % Factory setting: 50 % *
45 % OFF Value Group2	**OFF Value Group2** Switch-off value for group2 Setting range: 0 - 100 % Factory setting: 45 % *
20 % nmin at Group2	**nmin at Group2** Minimum Value for Group2 Setting range: 0 - 100 % Factory setting: 20 % *

*   As long as in IO Setup "A Function" not programmed to 5A , display: - - - -

Function
- Group 1 continuously controlled by the device's "Master" power unit (☞ motor connection).
- Group 2 continuously controlled by a second "Slave" power unit, this is controlled by the "Master" by a 0 - 10 V signal. IO Setup: A Function = 5A (Group control).

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Example group 2 via 0 -10 V
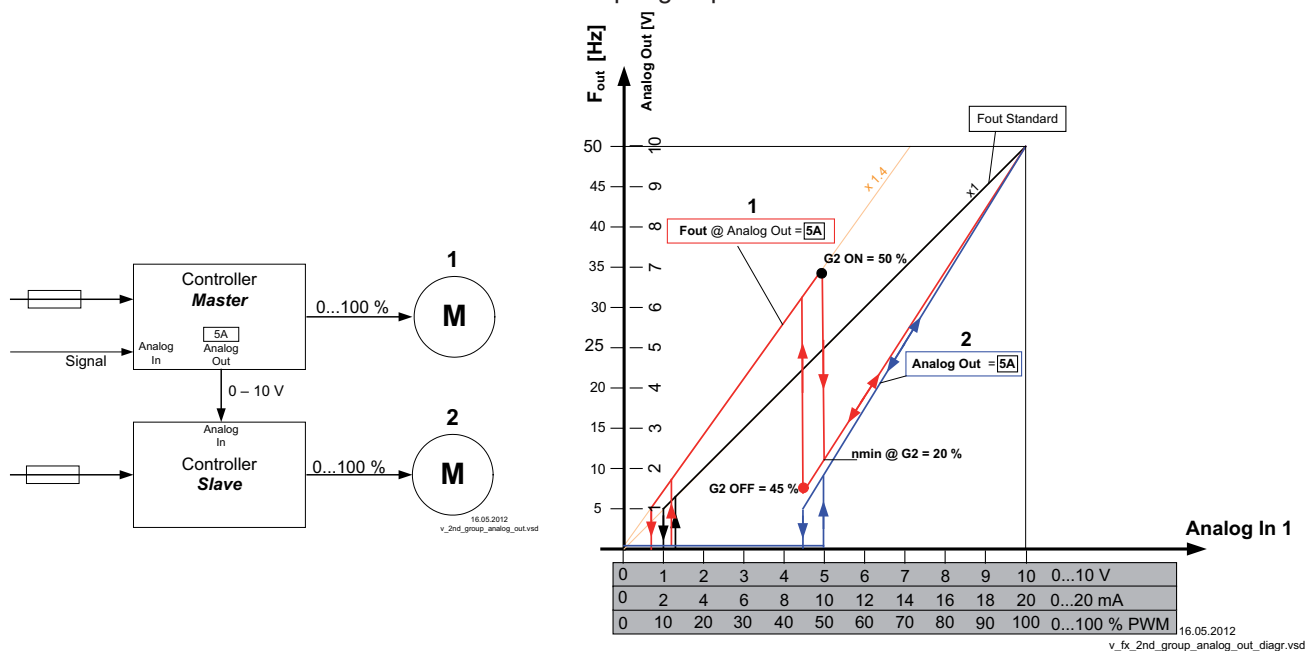
Fout: Output frequency
Analog Out: Analog output 0 - 10 V
Analog In: Input signal
G 2 ON: Group 2 ON value
G2 OFF: OFF Value Group2
nmin @ G2:   nmin at Group2
Fout Standard: Output diagram wihout group control

If the setting signal or the control deviation exceeds the switch-on point of group 2, group 1 is reduced to "n-min at Group2". From here on both groups run parallel at maximum power.
If group control is activated (A Function = 5A) the gradient of the output curve is automatically increased by factor 1.4 (gradient without group control = 1).

9.9.7.2 Control group 2/3/4 via relais

50 % Group 2 ON value	**Group 2 ON value** Switch-on value for Group2 Setting range: 0 - 100 % Factory setting: 50 % *
45 % OFF Value Group2	**OFF Value Group2** Switch-off value for group2 Setting range: 0 - 100 % Factory setting: 45 % *
20 % nmin at Group2	**nmin at Group2** Minimum Value for Group2 Setting range: 0 - 100 % Factory setting: 20 % *
When more than two groups add-on module necessary ☞ type Z-Modul-B (Part.-No. 380052).	
70 % Group 3 ON value	**Group 3 ON value** Switch-on value for Group3 Setting range: 0 - 100 % Factory setting: 70 % *
65 % OFF Value Group3	**OFF Value Group3** Switch-off value for group3 Setting range: 0 - 100 % Factory setting: 65 *
30 % nmin at Group3	**nmin at Group3** Minimum Value for Group3 Setting range: 0 - 100 % Factory setting: 30 % *

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	Group 4 ON value
	Switch-on value for Group4
Group 4 ON value	Setting range: 0 - 100 %
	Factory setting: 85 % *
	OFF Value Group4
	Switch-off value for group4
OFF Value Group4	Setting range: 0 - 100 %
	Factory setting: 80 % *
	nmin at Group4
	Minimum Value for Group4
nmin at Group4	Setting range: 0 - 100 %
	Factory setting: 40 % *

*   As long as in IO Setup "K Function" not programmed display: $\boxed{\text{- - - -}}$

Higher settings must be selected for following groups and the switch-off value of the group must be below the switch-on value.

Function

- Group 1 continuously controlled by the device's "Master" power unit (☞ motor connection).
- Other motors are switched directly to line voltage by contactors via the relay outputs "K1..K4". Depending on the additional groups count the function for the relays must be programmed (IO Setup / K.. Function: $\boxed{8K}$ = group 2, $\boxed{12K}$ = group 3, $\boxed{13K}$ = group 4). Keep the order!

Example: Activation of 3 groups via relays
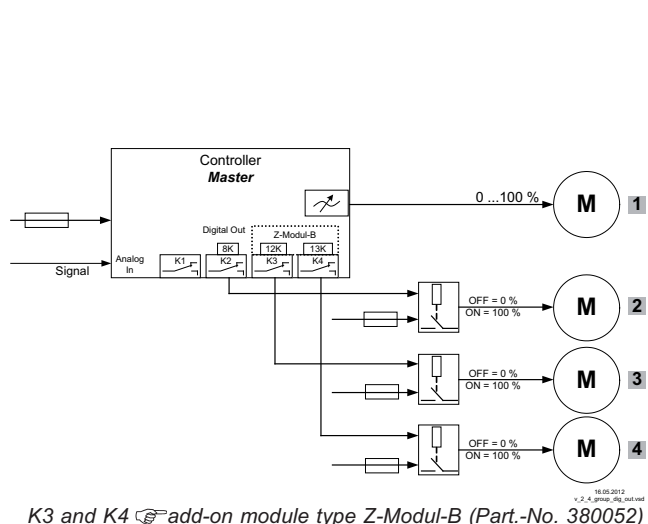
K3 and K4 ☞add-on module type Z-Modul-B (Part.-No. 380052)
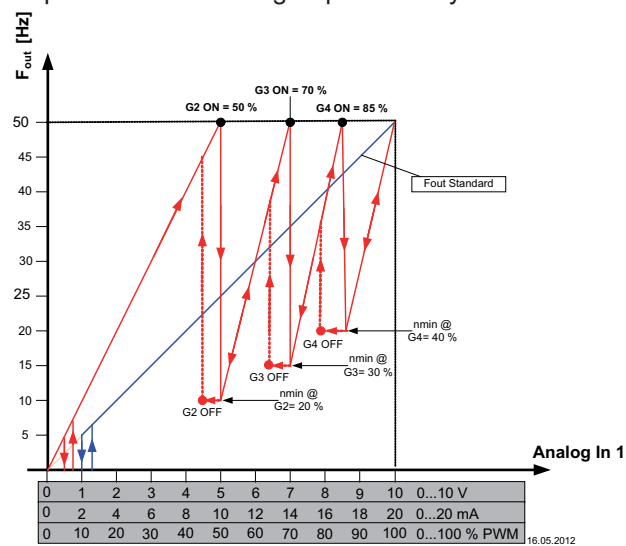
Fout: Output frequency
Analog In: Input signal
G2, G3, G4 ON: ON Value Group2, 3, 4
G2, G3, G4, OFF: OFF Value Group2, 3, 4
nmin@G 2, 3, 4:   nmin at Group2, 3, 4
Fout Standard: Output diagram wihout group control

If the setting signal or the control deviation exceeds the switch-on point "ON Value Group2", the relay for the second group switches on and the speed of the first group is reduced to an adjustable minimal value "nmin at Group2".
Then the speed of the first group increases to maximum within the remaining range.
If a third group is programmed up to switch-on point "ON Value Group3" etc.
Switch-off point "OFF Value Group2" at diminishing speed requirement.
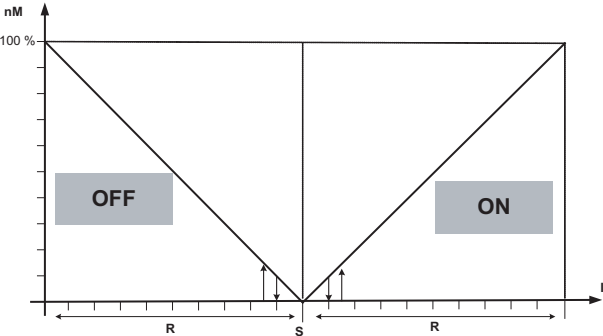
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9.9.8 Reverse action of the control function

`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	non	
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

9.9.9 Controller configuration

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

`P` `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.	
`50 %` `KP`	**P-component = reaction time** Setting range: 0 - 200 % smaller = more slowly bigger = faster
`50 %` `KI`	**I-component = accuracy, correction time** Setting range: 0 - 200 % bigger = faster smaller = more slowly

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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"
0 % TI	**Integration time = correction time** Setting range: 0 - 200 % smaller = faster bigger = more slowly

9.9.10 MODBUS communication watchdog

The MODBUS communication watchdog defines the behaviour in case of a communication fault.

0 Watchdog Mode	**Watchdog Mode** Watchdog Mode: 0: no function (Default) = OFF 1: Fault (K1 Function, h58) 2: Watchdog Speed (Frequency) 3: Fault + fixed speed 1 in the case of a communication fault (after watchdog time)
0 sec Watchdog Time	**Watchdog Time** If the device receives no message in the time window, a definable function is executed. Watchdog time in seconds. Setting range: 0 - 255 sec. Factory setting: 0 sec. = off
50.0 Hz Watchdog Speed	**Watchdog Speed** Setting Watchdog Frequency Setting range: 0 - Max. Speed Factory setting: 50 Hz = off

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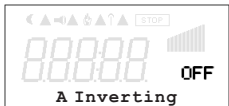
In direct reference to the acquired input and controlled variables, the maximum deviation to the target value is < ± 5 %. By activating the menu-assisted adjustment, the total control deviation can be reduced to a value of < ± 1 %.

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%.

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9.10 IO Setup

9.10.1 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	no 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).
9A	proportional output frequency (as of software version 2.41)

A1 Function "A min." and "A max."

A1 Function ⬚3A⬚ / ⬚4A⬚

16.03.2007
v_a1_funktion_amin_amax.vsd

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
-27	-16.8	-6.6	3.6	13.8	24	34,2	44.4	54.6	64.8	+75	TF.. (KTY)

16.03.2007
v_a1_funktion_3a_4a.vsd

ZIEHL-ABEGG
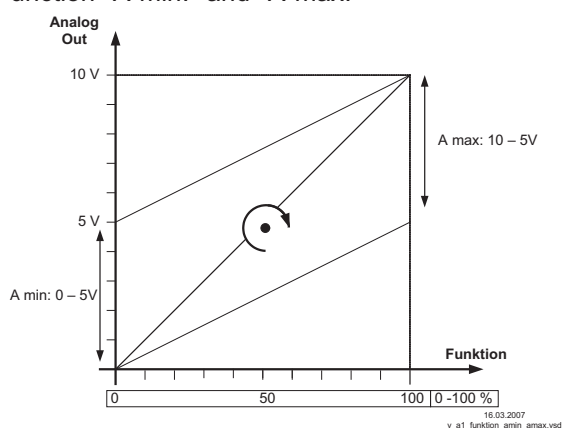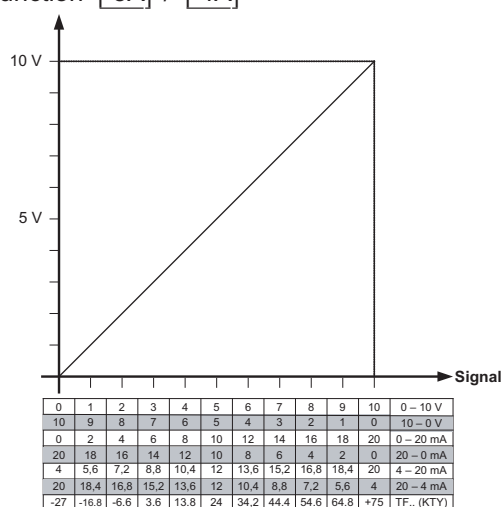
9.10.2 Digital inputs "D1" / "D2"

9.10.2.1 Menu overview

D1 Function — OFF	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 — OFF	Inverting "D1" and "D2" possible
D1 Busmode — ON	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 .
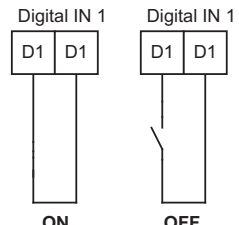
Attention!
Never apply line voltage to the digital input!

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 "Set Intern1" / "Set 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 for 1~ voltage controller)
13D	Reverse direction of rotation "right-hand" / "left-hand" (only for frequency inverter with 3 ~ output)
14D	"Freeze function" = maintain momentary modulation value

9.10.2.2 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)!

9.10.2.3 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 "
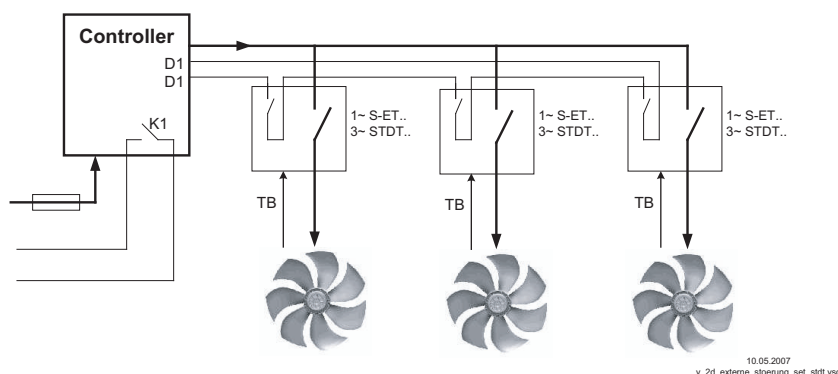
• Indication during closed contact (factory setting): "D1 Inverting" = "OFF "
• Indication during opened contact: "D1 Inverting" = "ON"

	Alarm symbol for indication "External fault"

9.10.2.4 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.

ZIEHL-ABEGG
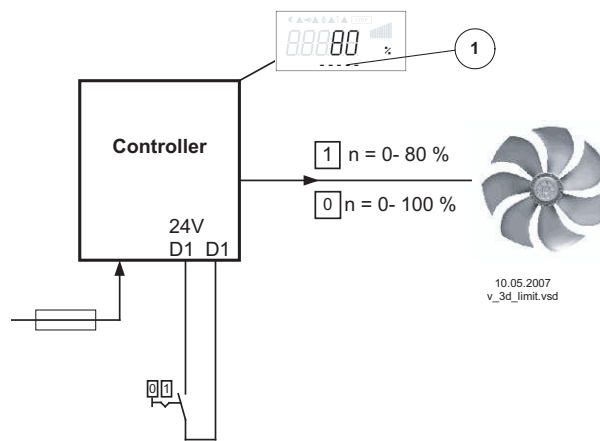
1   Setting "Limit" (depending on device type in: %, Hz, rpm)

9.10.2.5   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").
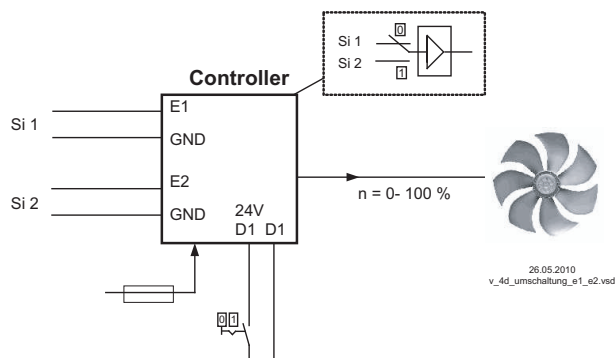
Si 1   Signal 1
Si 2   Signal 2

For mode speed controller (1.01) Base setup for "E2 Analog In": 1E necessary.

9.10.2.6   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.
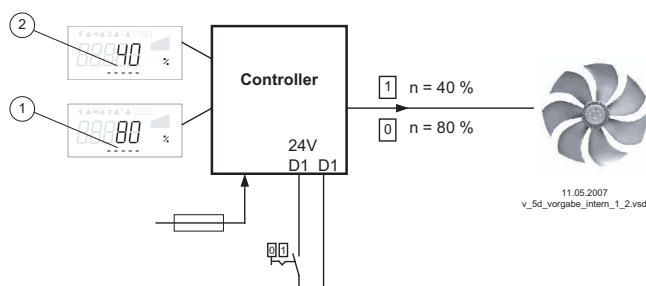
1   Setting "Set Intern1" (depending on device type in: %, Hz, rpm)
2   Setting "Set Intern2" (depending on device type in: %, Hz, rpm)
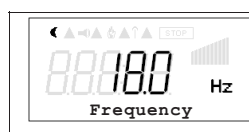
| | Operation with "Set Intern2" is signalized by the moon symbol for reduced operation. "Set extern1" under "settings" must be programmed to "OFF". |

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.
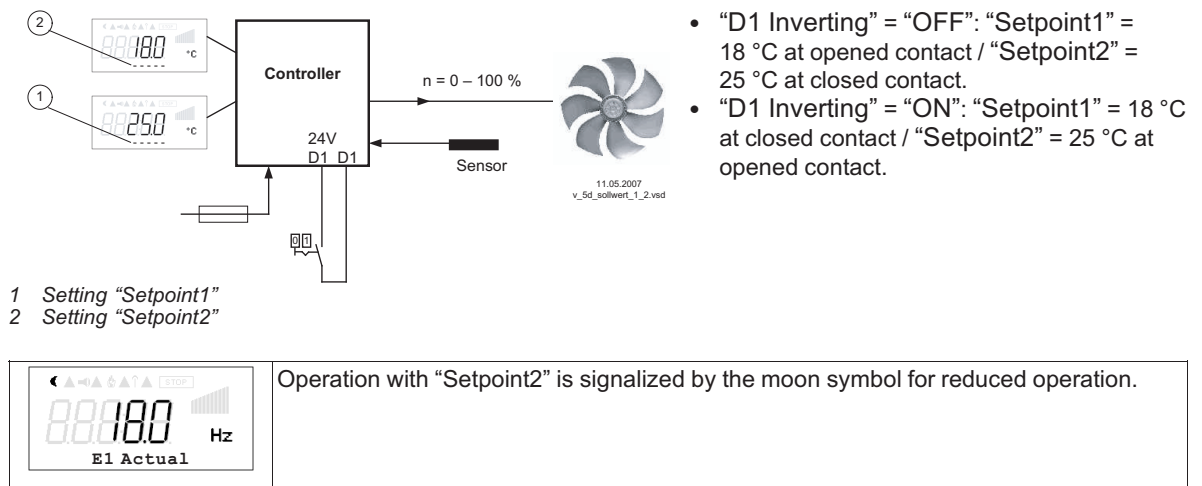
9.10.2.7 Intern / Extern Function [6D]

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)
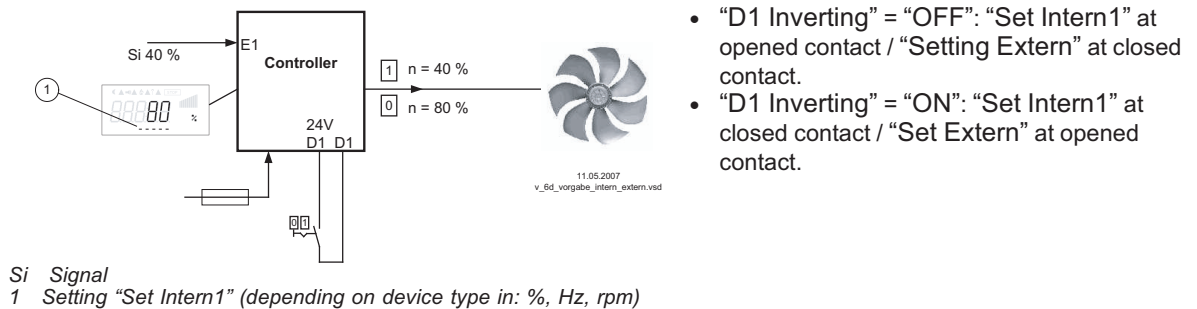
"Setpoint1" / "external Setpoint" (modes **2.01**)
Under Base setup "E2 function" programmed to function [1E] for "external setpoint" .
Contact at digital input e.g. "Digital In 1" = "D1" - "D1"

- "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
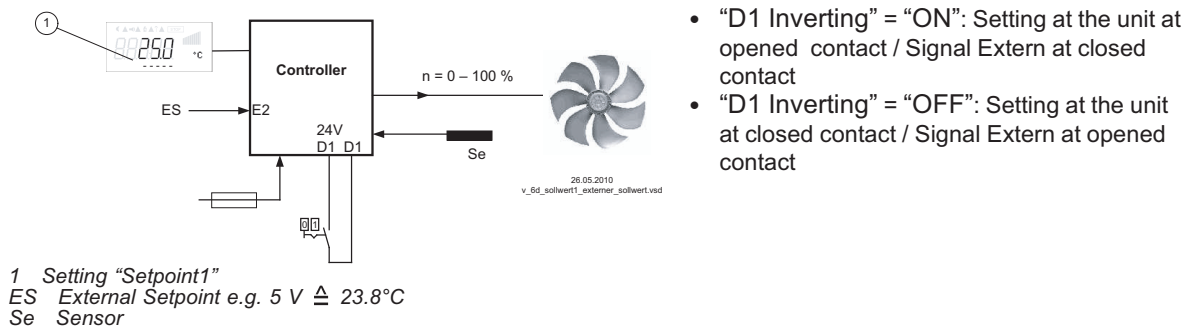
9.10.2.8 Automatic control / speed manual, Function [7D] (mode **2.01**)

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"

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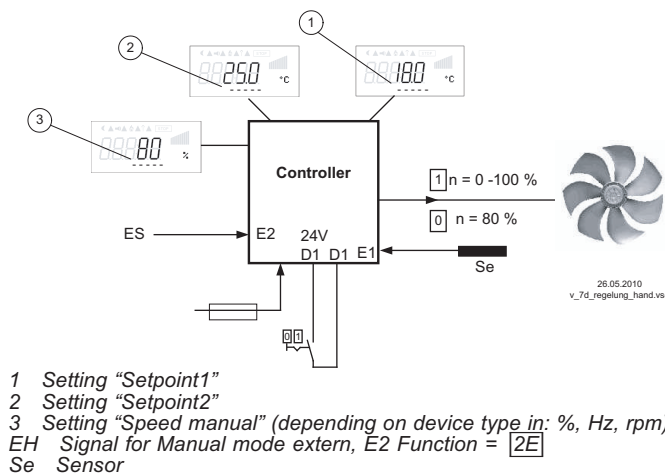
- "D1 Inverting" = "OFF" Automatic control at opened contact / manual operation at closed contact.
- "D1 Inverting" = "ON": Automatic control at closed contact / manual operation at opened contact.

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

9.10.2.9   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 as set there.

	Settings in Controller Setup

9.10.2.10   Reset, Function 10D

Reset via an external push-button in case of a motor fault or a malfunction of the controller.

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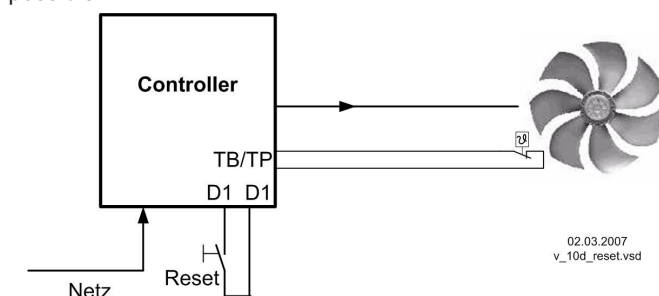
For "D1 Inverting" = "OFF" both terminals "D1"-"D1" in normal operation interrupted. Reset after fault by short close.(For"Inverting" = "ON" reverse function).

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

9.10.2.11   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").

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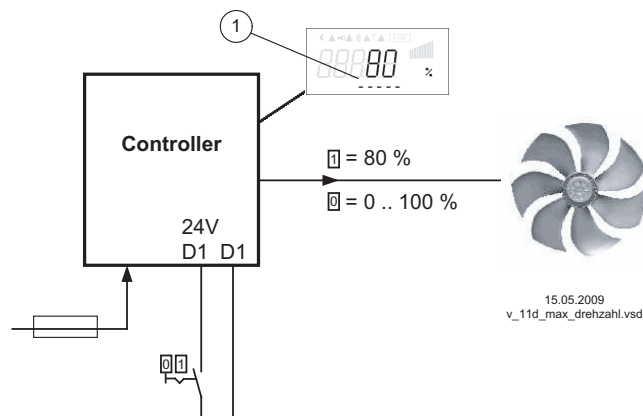
1   Setting "Max. Speed" (depending on device type in: %, Hz, rpm)

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

9.10.2.12   Motorheating ON / OFF, Function 12D

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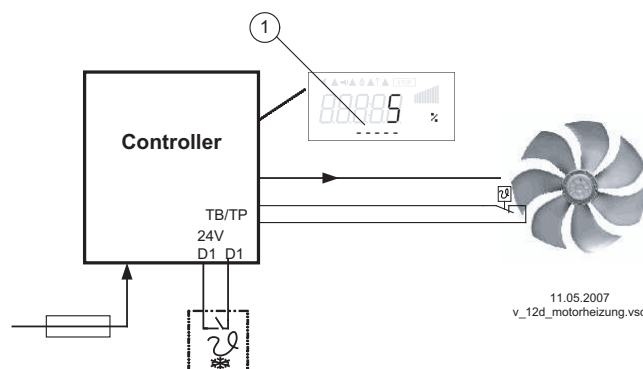
1   Setting "dc brake level"

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

The motor heating function corresponds to the braking function in which a direct current puts the motor into standstill. The height of the "brake level" is set in "Motor Setup".
Setting range: 1 - 50 %
Factory setting: 5 %
A current is impressed here, which does not permit any rotation of the fans. The value required to prevent any freezing depends on the ambient conditions and the connected motor's technical data. The setting effected is to be checked under real conditions. The higher the setting, the greater the heating output generated in the motor (heat dissipation). The motor heating or stationary heating can only become active, where there is no given modulation as a result of regulation.
To prevent any overheating, motor protection in the form of thermal protection installed in the motor is required (☞ motor protection). The heating function is switched off when the motor protection function of the regulating unit responds.

	The activated motor heating is indicated alternating with the actual value

9.10.2.13   Direction of rotation, Function 13D

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

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

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◀ ▲ ◀)▲ ⬖▲ ⬆▲ STOP **20.0** °C ▰▰▰ Actual value 1	The active switch over of direction is indicated by the antenna symbol in the display.

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

9.10.2.14 **"Freeze function" = maintain momentary modulation value, Function ⬚14D⬚**
The device continues to work so long independently of the control function with the momentary value of the modulation and/or speed as activated over the digital input.

◀ ▲ ◀)▲ ⬖▲ ⬆▲ STOP **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

9.10.3 **Configuration of analog inputs "E1"and "E2"**

9.10.3.1 **Signal adaption E1 and E2**
If required, an adaptation of the specification signal / speed characteristic curve is possible

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

◀ ▲ ◀)▲ ⬖▲ ⬆▲ STOP **0** ▰▰▰ E1 Modus	**E1 Modus** ⬚0⬚ = E1 min. / E1 max. without function (factory setting) ⬚1⬚ = Offset / turn ⬚2⬚ = signal range ⬚3⬚ = for activating the touch function see speed controller programming (function available depending on the software version)
◀ ▲ ◀)▲ ⬖▲ ⬆▲ STOP **10** % E1 Min.	**E1 Min.** Setting range: 0 - 100 % Factory setting: 0 %
◀ ▲ ◀)▲ ⬖▲ ⬆▲ STOP **100** % E1 max	**E1 max** Setting range: 0 - 100 % Factory setting: 100 %
◀ ▲ ◀)▲ ⬖▲ ⬆▲ STOP **0** ▰▰▰ E2 Mode	**E2 Mode** ⬚0⬚ = E2 min. / E2 max. without function (factory setting) ⬚1⬚ = Offset / turn ⬚2⬚ = signal range ⬚3⬚ = for activating the touch function see speed controller programming (function available depending on the software version)
◀ ▲ ◀)▲ ⬖▲ ⬆▲ STOP **10** % E1 Min.	**E2 min.** Setting range: 0 - 100 % Factory setting: 0 %
◀ ▲ ◀)▲ ⬖▲ ⬆▲ STOP **100** % E1 max	**E2 max.** Setting range: 0 - 100 % Factory setting: 100 %

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

Modus 1

1	E1 min. = 0 %, E1 max. = 100 %
2	E1 min. = 20 %, E1 max. = 100 %
3	E1 min. = 0 %, E1 max. = 80 %
4	E1 min. = 20 %, E1 max. = 80 %

24.09.2009
v_e1_modus_1_hz.vsd
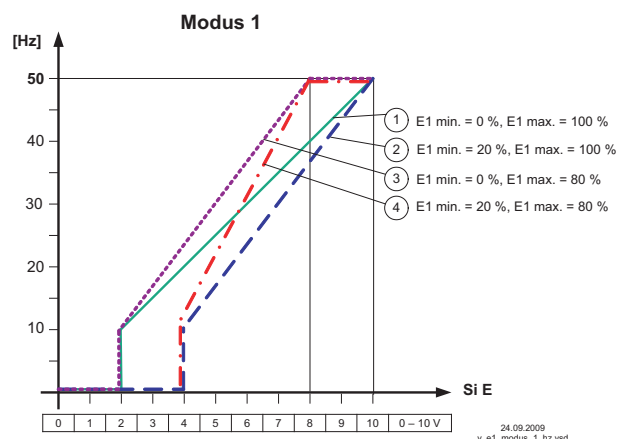
Modus 1
Example: "E1 min." = 20 %
The controller begins only at approx. 20% higher signal with minimal modulation.

Example: "E1 max." = 80 %
The modulation rises linear to 100% modulation with 80% setting signal.

Modus 2

1	E1 min. = 0 %, E1 max. = 100 %
2	E1 min. = 0 %, E1 max. = 80 %
3	E1 min. = 40 %, E1 max. = 100 %
4	E1 min. = 30 %, E1 max. = 90 %

24.09.2009
v_e1_modus_2_hz.vsd
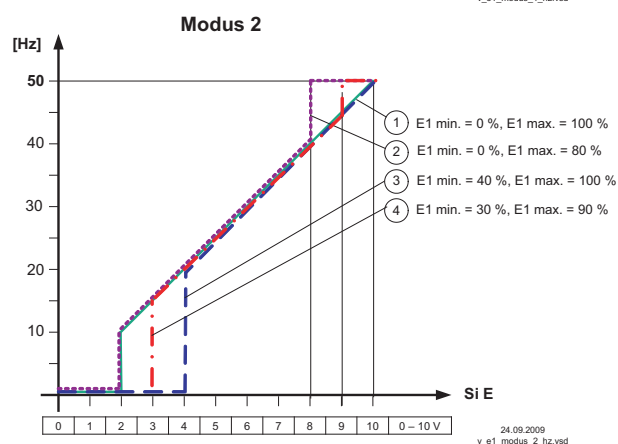
Modus 2
Example: "E1 min." = 30 %
Only with approx. 30 % setting signal the controller begins with approx. 30% modulation.

Example: "E1 max." = 80 %
Over 80 % setting signal the modulation is switched to 100 % modulation.

Idealized principle diagrams for setting:
 "Min. Speed" = 0.0 Hz and "Max. Speed" = 50.0 Hz

9.10.3.2   Inverting analog inputs "E1" / "E2"
After programming the signal or sensor type, an inversion of the inputs can be carried out.

E1 Inverting

Factory setting for Inverting inputs = "OFF" (if input activated) (signal: 0 - 10 V, 0 - 20 mA, 4 - 20 mA).
For activation using inverted default signals or sensors with inverted output signals proportional to the measurement range, switch inverting to "ON" (Signal: 10 - 0 V, 20 - 0 mA, 20 - 4 mA).

E2 Inverting

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Example: mode speed controller, setting by external signal

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

11.05.2007
v_invertierung_anlaog_eingaenge.vsd
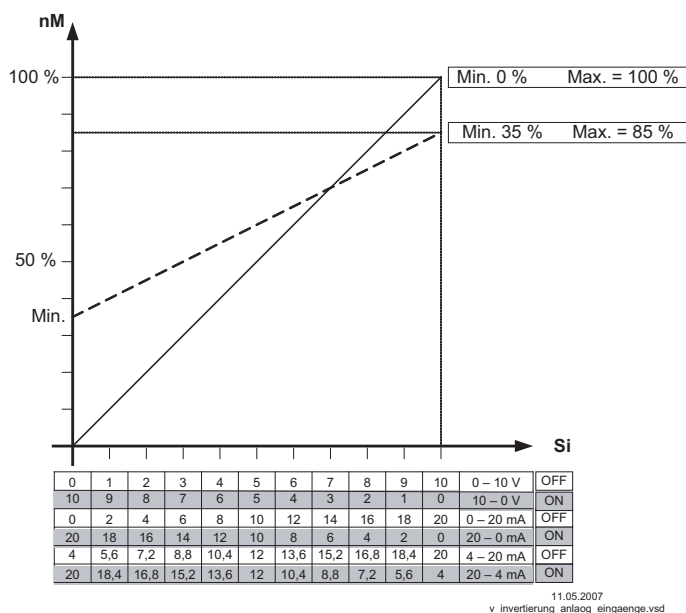
nM   Motor speed
Si   Signal
OFF   Inverting = OFF
ON   Inverting = ON

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

Various functions can be allocated to the relay outputs "K1" and "K2". In case of the same function allocation for "K1" and "K2", these work parallel.

The inversion of the relays "K1" and "K2" is set at the factory to "OFF" (when a function is programmed).

For switching inversion to "ON" (switching behaviour dependent on assigned function). The relays can only pull up basically when the voltage supply of the electronics is working. Three-phase current devices must have at least 2 line phases!

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 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"

8K	Group control (Group 2)	
	Switching on fans depending on modulation	
12K *	Group control (Group 3)	
	Switching on fans depending on modulation	
13K *	Group control (Group 4)	
	Switching on fans depending on modulation	
	For modes as controller higher `2.01`	
7K	Setpoint Offset	
	Deviation between actual value and setpoint to high	
	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	

*   *Function depending on the version of the software available*

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 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	Activation of second group	**1**	0
12K	Activation of third group	**1**	0
13K	Activation of fourth group	**1**	0

9.10.5   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").

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- 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	- - - -	

Z-Modul-B

max. Kontaktbelastung 5A/250VAC

| 31 | 34 | 32 | 41 | 44 | 42 | ⊥ | A2 | GND | E3 | GND | D3 | D4 | D5 | GND |

K3   K4

Eingang
0...10V (Ri>100k)

Ausgang
0...10V
(Imax=10mA)

04.04.2007
v_moea01k0.VSD

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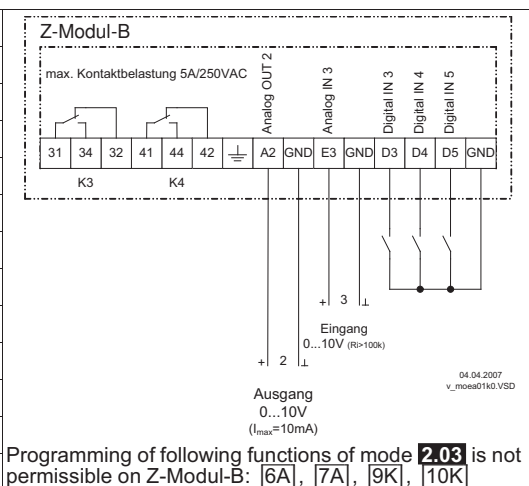
9.10.6 Networking via MODBUS

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

Bus Address	**Bus Address** The device address (Device-ID) is factory set to the highest available MODBUS address: 247 Thisaddressis reserved for operation with an external terminal and should not be occupied with anything else.
Addressing	**Addressing** Switch addressing to "ON" before setting "address".

Reading and writing parameters

The device supports reading and writing processes for MODBUS Holding Registers. The start address is **0**; 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.

9.10.7 Increment setting for touch function in mode **1.01**

In mode **1.01** the output voltage can be gradually set via an external signal (see Programming / Speed controller **1.01** ... **1.02**).

Increment setting per 100 ms

Touch function.step	**Touch function.step** Added increment when the contact is closed, i.e. with signal applied at "E1" or "E2," if the respective switching thresholds are exceeded. The setting corresponds to the maximum possible frequency range (0 - 100 % ≙ 0 - 50 Hz @ 50 Hz. max. frequency). Adjustment range: 0.00 - 100.00 % Factory setting: 0,20 %

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9.11   Limits

9.11.1   Limit indication depending on modulation

	Following functions can be allocated to the limit indication	
Controller function	OFF	no 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.	
Level min.	If the modulation exceeds the set "Modulation max" value, this is reported until the set value "Modulation min" has been undercut. Setting range "Modulation min.": "Min. Speed" - "Modulation max." Setting range "Modulation max.": "Modulation min." - "Max. Speed"	
Level max.	The indication is delayed by the time set in "Display delay".	
Level Delay	Time delay exceeding "Modulation 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
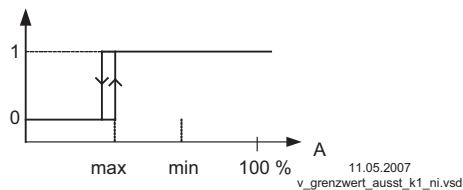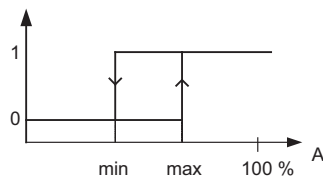
A   Modulation   *A   Modulation*

If "Level min." is higher than "Level max.", the "Level max." switching point is without hysteresi.
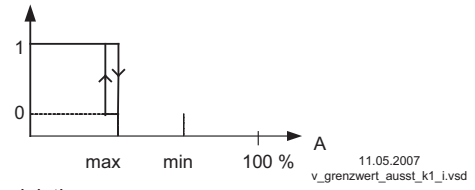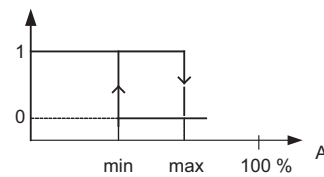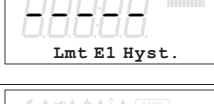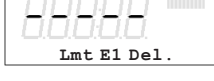
9.11.2   Limit indication depending on setting or sensor signal

	Following functions can be allocated to the limit indication	
Lmt E1 Function	OFF	no 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.	

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`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.
`Lmt E1 max.`	The same setting applies to "E2 Min." and "E2 Max.", described below for "E1". 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 "Modulation 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"
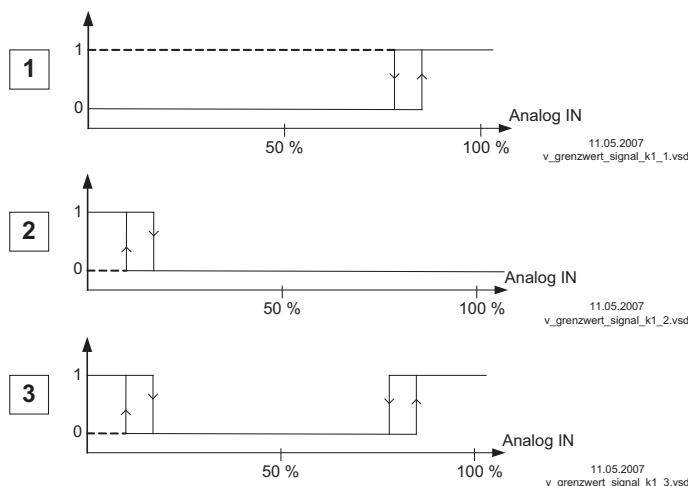
Settings:
- E1 Max.: 80 %
- E1 Min.: OFF
- switching hysteresis 5 % (from 100 %)

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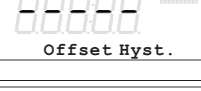
Settings:
- E1 Min.: 20 %
- E1 Max.: 80 %
- switching hysteresis 5 % (from 100 %)

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

9.11.3 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).

`Offset Function` `OFF`	Following functions can be allocated to the limit indication	
	OFF	no 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.	

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[Offset 1]	**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".
[Offset 2]	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
[Offset Hyst.]	**Offset Hysteresis** Hysteresis switch-on point: In temperature regulation + / - 10 K, otherwise sensors 10 % of measurement range
[Offset Delay]	**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
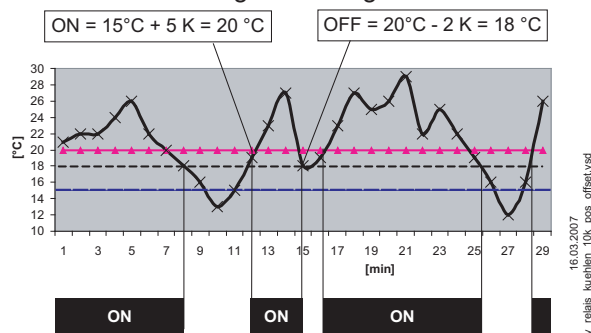
Offset 2 for alarm during undercutting

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

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9.12   Motor Setup
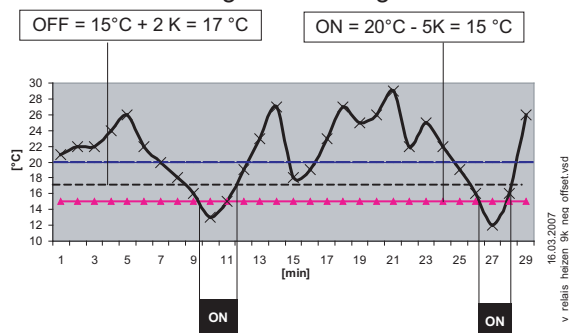
⟨▲◄)▲⟡▲îⓘ [STOP] *88.8.88* **Motor Setup**	**Menu group Motor Setup**

9.12.1   Setting motor rated current

⟨▲◄)▲⟡▲îⓘ [STOP] *888.0.0* ᴀ **MotorRatedCurr.**	**MotorRatedCurr.** Possible setting for the motor rated current. The setting for the "DC brake level" (☞ setting brake behaviour) refers to this setting. Setting range: 0.0...device rated current / A Factory setting: device rated current

9.12.2   Setting motor rated voltage

⟨▲◄)▲⟡▲îⓘ [STOP] *88.400* ᴠ **MotorRatedVolt.**	**MotorRatedVolt.** When commissioning, you must set the motor to the rated voltage stated on the rating plate. An adaptation can be made if the motor rated-voltage as the applied mains voltage is lower (e.g. 3 ~ 230 V motor on 3 ~ 400 V mains). Verify the output voltage using suitable measuring instruments. Setting range: 0...500 V Factory setting: 400 V

9.12.3   Adjustment of the U/f curve

ⓘ	**Information** The device comes supplied with a preprogrammed square characteristic curve for the operation of fans. In the case of voltage-controllable motors and square load torque-moments (e.g. fans and pump operation), an optimal speed control is generally achieved through this. In systems in which high dynamics are required, switchover to a linear characteristic must take place. Generally speaking, if the load characteristic is not known as a definite value, the linear characteristic should be set. In the case of linear characteristic curves, the motor achieves full torque throughout the entire speed range. For this, a thermal overload of the motor must be prevented through suitable measures (complete motor protection through using thermocontact or PTC thermistor-monitoring).

⟨▲◄)▲⟡▲îⓘ [STOP] *88.48.5* Hz **Edgefrequency**	**Edgefrequency** The maximum output voltage is attained during break edge frequency. Adjustment range: 10.0 - 150.0 Hz Factory setting: 48.5 Hz In the case of special settings with "Edge frequency" > "Maximum frequency", due to higher power losses it is possible that automatic power reduction, "derating", occurs.
⟨▲◄)▲⟡▲îⓘ [STOP] *88.50.0* Hz **Max. Frequency**	**Max. Frequency** Above the Edgefrequency, the frequency is merely increased up to the Maximum frequency. Setting range: 10.0 - 150 Hz **(For FXDM22 maximal 60 Hz permissible!)** Factory setting: 50.0 Hz
⟨▲◄)▲⟡▲îⓘ [STOP] *888.5.0* Hz **Shutdown Freq.**	**Shutdown Freq.** Below the Shutdown Freq. the output is switched off (hysteresis approx. 1.5 % setting "Max. Frequency") . Adjustment range: 5.0 - 150 Hz Factory setting: 5.0 Hz

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U_{out}

100 %

F_{max} = 50 Hz

F_{edge} = 48.5 Hz

L

Q

F_{off}

U_{start} = 10 %

U_{start} = 0 %

F_{on}

F_{out} [Hz]

0   5   10   15   20   25   30   35   40   45   50

Analog In 1

0.5	1	2	3	4	5	6	7	8	9	10	0...10 V
1	2	4	6	8	10	12	14	16	18	20	0...20 mA
5	10	20	30	40	50	60	70	80	90	100	0...100 % PWM

26.07.2012
v_u_f_dia_fcontr_d.vsd
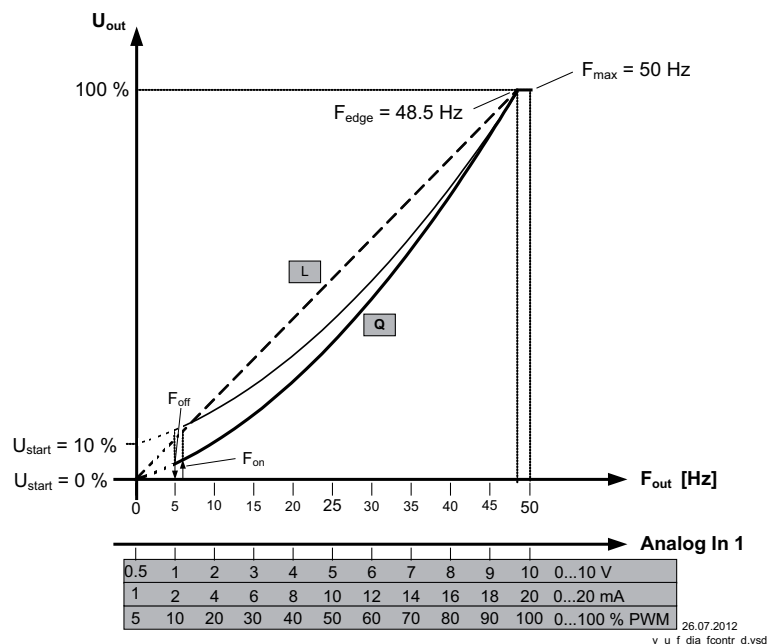
Uout   Output voltage
Fout: Output frequency
Analog In   Speed setting signal (0 - 10 V, 0...20 mA, 0...100 % PWM)
Ustart   Startvoltage
Foff   Shutdown Freq.
Fon: Switch on Freq.
Fedge   Edgefrequency
Fmax   Max. Frequency
L   linear
Q   Square (factory setting)

Due to technical reasons the output voltage amounts to approx. max. 95 % of the applied mains voltage.

In order to still be able to achieve the maximum airflow of the connected fans, an increase of the maximum frequency is possible for our motors. For this, a current increase must be included in the calculation. It is necessary to optimize monitoring of motor current, output voltage, and speed using suitable measuring instruments.

The factory set values are for voltage controllable external rotor motors with 400 V / 50 Hz.

After verification of the motor specifications, adjustments are to be adapted, if applicable.

Motor rated voltage (see Rating plate)	Setting "Edgefrequency"	Setting "Max. Frequency"
3 ~ 400 V, 50 Hz	48.5 Hz	50 Hz
3 ~ 400 V, 50/60 Hz	48.5 Hz	60 Hz
3 ~ 400 V, 60 Hz	57 Hz	60 Hz

Startvoltage (display)	**Startvoltage** The start voltage is used to apply enough torque to the motors to insure they will run at low speed. Attention! In order to prevent over current and unnecessarily high thermal load of the motor, do not select to high a setting. Adjustment range: 0 - 25 % (percentage of the maximum output voltage) Factory setting: 0 %
VF quadratic (display)	**VF quadratic** U/f curve linear or square Factory preprogrammed square characteristic curve "UF square" = "ON" for the operation of voltage controllable fans. For operation with linear curve "UF quadratic" = "OFF "

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9.12.4 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.

40 sec Rampup time	**Rampup time** Time setting in which the automatic controller output from 0 % to 100 % rises. Setting range: 0...250 sec. Factory setting: 10 / 20 / 30 / 40 sec. (depending on device type)
40 sec Rampdown time	**Rampdown time** Time setting in which the automatic controller output from 100 % to 0 % reduces. Setting range: 0...250 sec. Factory setting: 10 / 20 / 30 / 40 sec. (depending on device type)

09.05.2007
v_hochlaufzeit_ruecklaufzeit.vsd
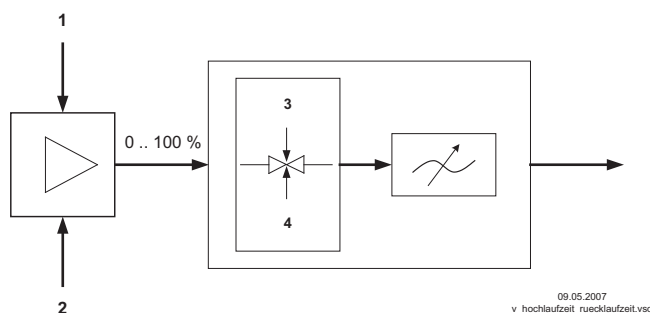
1 *external Signal*
2 *Setting*
3 *Rampup time*
4 *Rampdown time*

9.12.5 Setting Rolling direct.

Attention!
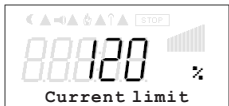
It is essential to check the direction of rotation of the fan during the initial commissioning. To do this, note the direction of the arrow on the fan housing. We will not be responsible under any circumstances for warrantee for damage caused because the direction of rotation is wrong!

When connected in accordance with the connection diagram, the standard rotary direction "RIGHT" = CW results under factory settings. A change of direction is feasible by exchanging the phase sequence in the motor connection or through reprogramming.

CW Rotat. Direction	By selection of the parameter "Direction of rotation" and following pressing the **P** key, the direction of rotation can changed to CCW for anti-"clockwise" = CCW direction of rotation. Pressing the **P** key causes the value that has been set to be accepted.	CCW Rotat. Direction

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

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9.12.6   Setting Current limit

120 % Current limit	As an additional safety function the device has a current limit, this can be adapted if necessary. The setting refers to the motor rated current of the device (100 % = setting: MotorRatedCurr.). On exceeding the percentage value set here, the modulation is reduced until the set current is set again. This prevents overloading of the motor. Setting range: 100...130 % Factory setting: 120 %
28.8 °C E1 Actual	Active current limit is signaled by a bright triangle in the display

9.12.7   Setting brake function

0 DC brake mode	**DC brake mode** Setting function of DC-brake for frequency inverters. For units that come with a factory engaged DC brake mode (if extant, ☞ DC brake mode setting), simultaneously activating the "DC brake mode " only makes sense in exceptional cases. **0** = no brake function (factory setting). **1** = brakes before start (before modulation is returnd) If, under certain circumstances, the modulation switches back on while the motor is still rotating fast, this can result in a re-supply of the inverter's "overcurrent disconnection". The brake function can be activated to prevent this. This is then always active for an adjustable period before triggering starts. I.e., the brake function is always initiated before modulation after has it returned to "0". The suitable adjustments depend on the centrifugal force of the motor and the conditions in the installation. **2** = Special function, brakes before stop (as soon as modulation "0"). The motor does not run out up to stop. The motor is braked actively, as soon as no modulation is present (Setpoint = "0" or Enable = "OFF") . Test required. The "min. speed" adjustment must be set to "0". Attention! With the frequently one behind the other following DC bracings it can come to strong heating up of the motor. To prevent any overheating, motor protection in the form of a temperature limiter installed in the motor is required (☞ motor protection).
5 sec DC brake time	**DC brake time** Maximal length of DC-brake for frequency inverters. If the braking is activated, the d.c. brake torque is active for this time. Setting range: 0...250 sec. factory setting: 5 / 10 sec. (depending on device type)
5 % DC brake level	**DC brake level** Direct-current level, generated for braking. The higher this value, the greater the braking effect. The setting "DC brake level" refers in % to the value set in "MotorRated Curr.". Setting range: 0...50 % / 25, 50, 75, 100 % (depending on device type) factory setting: 5 / 25 % (depending on device type) The setting is dependent on the size of the fan/motor. Attention! Too high values can lead to a considerable braking effect. Same setting affects also the function "Motorheating"(☞IO Setup).

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0.0 Hz Frequency	Active brake mode is signaled by a bright triangle in the display.

9.12.8 Boost function

The boost function5is an automatic voltage increase in case of dynamic demands on the control system. When using the square characteristic, the output voltage is increased to the value of the linear characteristic with the "Boost function" switched on. This induces more torque on the motor and the current therefore does not increase too much when accelerating. Just before reaching the setpoint of the modulation, the motor voltage corresponding to the square characteristic is switched back to. The boost process is only activated in case of a sufficiently large increase in modulation (from approx. 5 %).

In operation with linear characteristic ("UF square" = "OFF") the Boost function is not possible.

OFF Boost function	**Boost function** ON: automatic voltage increase switched on OFF: automatic voltage increase switched off (at factory)

9.12.9 Setting Derating Alarm

The device has integrated active "temperature management" to protect the device from damage caused by excessively high interior temperatures.

28.3 Hz Derating Alarm	In case of a temperature increase above the set limits (for capacitor temperature and heat sink temperature ☞ diagnostic menu) the modulation is linearly reduced until the stated limit temperatures are reached. To prevent a shut down of the entire system (in this operating mode, allowable for the controller), no alarm indication occurs during reduced operation until the preset threshold value "Derating Alarm" is reached. Active temperature management is signaled by a bright triangle in the display.

5 % Derating Alarm	Setting: **Derating Alarm** The factory preset for the "Derating Alarm" is 5 %. Setting range: 1...95 % (≙ 1...95 % of the maximal possible frequency)

A1 Overload 1	Indication: **Overload1** If the modulation (frequency) of the device only corresponds to the value set in "Derating Alarm" due to too high an internal temperature, the fault indication "Overload"is displayed. Behaviour of the relays "K1" and "K2" in case of factory setting (☞ IO Setup) The alarm relay "K2" drops out, the terminals 21-22 are bridged, the operation relay "K1" stays pulled up (terminals 11-14 bridged).

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

Example for suppression of 2 ranges (Idealized principle diagram)
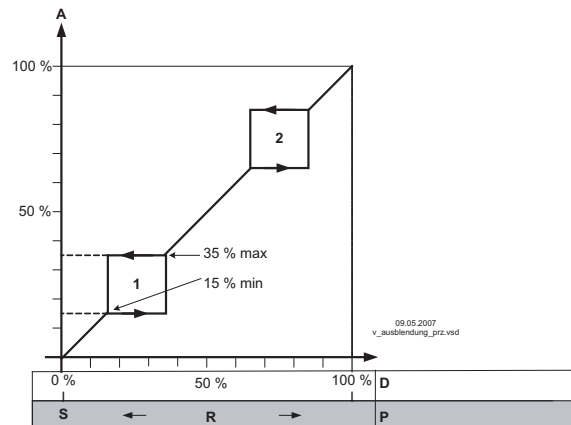
Setting depending on device type
in: %, Hz, rpm

A   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." Setting range: "Shutdown Freq." - "Range 1 max."	→	15 % Range1 min.
Range1 max.	→	Setting for "Range1 max." Setting range: "Range 1 max." - "Max. Frequency"	→	35 % Range1 max.
OFF Suppression2	→	Identical procedures for Suppression2 and Suppression3, as far as desired	→	etc.

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10 Menu tables

10.1 Menues of operating modes

Mode	1.01 1.02	2.01 2.03 2.04	2.02	2.05	3.01 3.02	3.03 3.04	4.01 4.02 4.03	5.01 5.02	6.01	User Setting
Parameter	Factory setting									
Start										
Motor	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
PIN input	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Language	GB	GB	GB	GB	GB	GB	GB	GB	GB	
Reset	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Mode	1.01 1.02	2.01 2.03 2.04	2.02	2.05	3.01 3.02	3.03 3.04	4.01 4.02 4.03	5.01 5.02	6.01	
Fcontrol	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	
SN:	000005-E45536	000005-E45536	000005-E45536	000005-E45536	000005-E45536	000005-E45536	000005-E45536	000005-E45536	000005-E45536	
d1333 B13	01/04/12	01/04/12	01/04/12	01/04/12	01/04/12	01/04/12	01/04/12	01/04/12	01/04/12	
Info										
Setting direct	1.02 = 50.0 Hz									
E1-E2 actual				-2.4 °C						
Control value		2.04 = 30.0 °C				12.0 bar 22.6 °C				
E1 Actual		30.0 °C	30.0 °C	30.0 °C	10.0 bar -88.7 °C	10.0 bar -88.7 °C	88.7 Pa	712 m^3h	0.45 m/s	
E2 Actual		- - - - - 2.04 = 30.0 °C	- - - - -	30.0 °C	- - - - -	10.0 bar -88.7 °C	- - - - - 4.02, 4.03 = 21.0 °C	- - - - - 5.02 = 21.0 °C	- - - - -	
Setpoint1		20.0 °C	5.0 °C	0.0 °C	12.0 bar 35.0°C	12.0 bar 35.0°C	100 Pa	530 m^3h	0.50 m/s	
Setpoint control							4.02, 4.03 = 100 Pa	5.02 = 530 m^3h		
Frequency	1.01 = 0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	
Motor current	1.01 = 0.0 A	0.0 A	0.0 A	0.0 A	0.0 A	0.0 A	0.0 A	0.0 A	0.0 A	
Input power	8 W	8 W	8 W	8 W	8 W	8 W	8 W	8 W	8 W	
Output power	0 W	0 W	0 W	0 W	0 W	0 W	0 W	0 W	0 W	
Set external1	1.01 = 0.0 Hz									
Msco		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Setting										
Set Internal1	1.01 = 50.0 Hz									
Set Internal2	1.01 = - - - - -									
Setting direct	1.02 = 50.0 Hz									
Setpoint1		20.0 °C	5.0 °C	0.0 °C	12.0 bar 35.0°C	12.0 bar 35.0°C	100 Pa	530 m^3h	0.50 m/s	

Mode	1.01 1.02	2.01 2.03 2.04	2.02	2.05	3.01 3.02	3.03 3.04	4.01 4.02 4.03	5.01 5.02	6.01	User Setting
Parameter	Factory setting									
Setpoint 2		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = 100 Pa	- - - - -	- - - - -	
Pband		5.0 K	20.0 K	5.0 K	5.0 bar 7.0 K	5.0 bar 7.0 K	100 Pa	530 m³h	0.50 m/s	
Min. Speed	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Max. Speed	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	
Set external1	1.01 = ON									
Manual mode		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Speed manual		50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	
Offset AnalogOut		2.03 = 0.0 K								
Pband AnalogOut		2.03 = 2.0 K								
Min. AnalogOut		2.03 = 0 %								
Max. AnalogOut		2.03 = 100 %								
OffsetDigitalOut		2.03 = -1.0 K								
Hyst.DigitalOut		2.03 = 1.0 K								
Alarm Minimum		2.03 = 0.0 °C								
Alarm Maximum		2.03 = 40.0 °C								
T-Band SA							4.02 + 4.03 = 30.0 K	5.02 = 30.0 K		
T-Start SA							4.02 + 4.03 = 15.0 °C	5.02 = 15.0 °C		
P-Min SA							4.02 + 4.03 = 70.0 Pa	5.02 = 700 m³h		
Events										
Base setup										
Mode	1.01 1.02	2.01 2.03 2.04	2.02	2.05	3.01 3.02	3.03 3.04	4.01 4.02 4.03	5.01 5.02	6.01	
E1 Analog In	1.01 = 0 - 10 V	TF	TF	TF	0-30 MBG	0-30 MBG	DSG200	DSG200	0-1 MAL	
Number steps	1.02 = 0									
Step 1 value	1.02 = - - - - -									
Step 2 value	1.02 = - - - - -									
Step 3 value	1.02 = - - - - -									
Step 4 value	1.02 = - - - - -									

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Mode	1.01 / 1.02	2.01 / 2.03 / 2.04	2.02	2.05	3.01 / 3.02	3.03 / 3.04	4.01 / 4.02 / 4.03	5.01 / 5.02	6.01	User Setting
Parameter	Factory setting									
Step 5 value	1.02 = - - - - -									
E1 Refrigerant					3.02 = R503	3.04 = R503				
E1 K-Factor								75		
E1 Min.		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E1 max		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E1 Decimals		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E1 Unit		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E1 Offset		0.0 K	0.0 K	0.0 K	0.00 bar 0.0 K	0.00 bar 0.0 K	0.0 Pa	0 m^3h	0.0 m/s	
E2 Function	1.01 = OFF	OFF 2.04 = 4E	OFF	5E	OFF	4E	OFF 4.02 + 4.03 = 6E	OFF 5.02 = 6E	OFF	
E2 Analog In	1.01 = - - - - -	- - - - - 2.04 = TF	- - - - -	TF	- - - - -	0-30 MBG	- - - - - 4.02 = TF 4.03 = Bus	- - - - - 5.02 = TF	- - - - -	
E2 Refrigerant					3.02 = - - - - -	3.04 = R503				
E2 K-Factor								- - - - -		
E2 Min.		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = - 35.0 °C	- - - - -	- - - - -	
E2 Max.		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = 65.0 °C	- - - - -	- - - - -	
E2 Decimals		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = 1	- - - - -	- - - - -	
E2 Unit		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = °C	- - - - -	- - - - -	
E2 Offset		- - - - - 2.04 = 0.0 K	- - - - -	0.0 K	- - - - -	0.00 bar 0.0 K	- - - - - 4.02 + 4.03 = 0.0 K	- - - - - 5.02 = 0.0 K	- - - - -	
Controller Setup										
PIN Protection	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Set protection	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Save User Setup	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Alarm sensors		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Limit	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Min. speed cut off		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Group 2 ON value	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
OFF Value Group2	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
nmin at Group2	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Group 3 ON value	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
OFF Value Group3	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
nmin at Group3	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	

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Mode	1.01 1.02	2.01 2.03 2.04	2.02	2.05	3.01 3.02	3.03 3.04	4.01 4.02 4.03	5.01 5.02	6.01	User Setting
Parameter					**Factory setting**					
Group 4 ON value	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
OFF Value Group4	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
nmin at Group4	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Val > Set=n+		ON	ON	ON	ON	ON	OFF	OFF	OFF	
Type of control		P	P	P	P	P	Pid	Pid	Pid	
KP		50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	
KI		50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	
KD		50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	
TI		0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	
Watchdog Mode	0	0	0	0	0	0	0	0	0	
Watchdog Time	0 sec	0 sec	0 sec	0 sec	0 sec	0 sec	0 sec	0 sec	0 sec	
Watchdog Speed	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	
					IO Setup					
A Function	1A	1A (2.03 = 6A)	1A	1A	1A	1A	1A	1A	1A	
A min.	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	
A max.	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	
A Inverting	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
A2* Function	1A	1A	1A	1A	1A	1A	1A	1A	1A	
A2* min.	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	
A2* max.	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	10.0 V	
A2* Inverting	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
D1 Function	OFF	OFF	OFF	OFF	OFF	OFF	OFF 4.03 = 1D	OFF	OFF	
D1 Inverting	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = OFF	- - - - -	- - - - -	
D1 Busmode	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = ON	- - - - -	- - - - -	
D2 Function	OFF	OFF	OFF	OFF	OFF	OFF	OFF 4.03 = 5D	OFF	OFF	
D2 Inverting	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = OFF	- - - - -	- - - - -	
D2 Busmode	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - - 4.03 = ON	- - - - -	- - - - -	
D3* Function	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
D3* Inverting	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
D4* Function	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
D4* Inverting	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
D5* Function	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
D5* Inverting	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E1 Modus	0	0	0	0	0	0	0	0	0	
E1 Min.	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	
E1 max	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	
E1 Inverting	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	

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Mode	1.01 / 1.02	2.01 / 2.03 / 2.04	2.02	2.05	3.01 / 3.02	3.03 / 3.04	4.01 / 4.02 / 4.03	5.01 / 5.02	6.01	User Setting
Parameter					**Factory setting**					
E2 Mode	- - - - -	- - - - - 2.04 = 0	- - - - -	0	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E2 min.	- - - - -	- - - - - 2.04 = 0 %	- - - - -	0 %	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E2 max.	- - - - -	- - - - - 2.04 = 100 %	- - - - -	100 %	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
E2 Inverting	- - - - -	- - - - - 2.04 = OFF	- - - - -	OFF	- - - - -	OFF	- - - - - 4.02 + 4.03 = OFF	- - - - - 5.02 = OFF	OFF	
E3* Function	- - - - -	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
E3* Inverting	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
K1 Function	1K	1K (2.03 = 2K)	1K	1K	1K	1K	1K	1K	1K	
K1 Inverting	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
K2 Function	2K	2K (2.03 = 9K)	2K	2K	2K	2K	2K	2K	2K	
K2 Inverting	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
K3* Function	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
K3* Inverting	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
K4* Function	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
K4* Inverting	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Bus Address	247	247	247	247	247	247	247	247	247	
Addressing	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Touch function.step	0.20 %	0.20 %	0.20 %	0.20 %	0.20 %	0.20 %	0.20 %	0.20 %	0.20 %	
					Limits					
Level Function	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Level min.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Level max.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Level Delay	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Lmt E1 Function	OFF	OFF 2.03 = 1L	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Lmt E1 min	- - - - -	- - - - - 2.03 = 0.0 °C	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Lmt E1 max.	- - - - -	- - - - - 2.03 = 40.0 °C	- - - - -	- - - - -	- - - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Lmt E1 Hyst.	- - - - -	- - - - - 2.03 = 1.0 K	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Lmt E1 Del.	- - - - -	- - - - - 2.03 = 2 sec.	- - - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Lmt E2 Function	- - - - -	- - - - - 2.04 = OFF	- - - - -	OFF	- - - - -	OFF	- - - - - 4.02,03 = OFF	- - - - - 5.02 = OFF	- - - - -	
Lmt E2 min.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Lmt E2 max.	- - - - -	- - - - -	- - - - -	- - - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	

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Mode	1.01 1.02	2.01 2.03 2.04	2.02	2.05	3.01 3.02	3.03 3.04	4.01 4.02 4.03	5.01 5.02	6.01	User Setting
Parameter					Factory setting					
Lmt E2 Hyst.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Lmt E2 Delay	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Offset Function		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Offset 1		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Offset 2		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Offset Hyst.		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Offset Delay		- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
				Motor Setup						
MotorRatedCurr.	5.0 A	5.0 A	5.0 A	5.0 A	5.0 A	5.0 A	5.0 A	5.0 A	5.0 A	
MotorRatedVolt.	400 V	400 V	400 V	400 V	400 V	400 V	400 V	400 V	400 V	
Edgefrequency	48.5 Hz	48.5 Hz	48.5 Hz	48.5 Hz	48.5 Hz	48.5 Hz	48.5 Hz	48.5 Hz	48.5 Hz	
Max. Frequency	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz	
Shutdown Freq.	5.0 Hz	5.0 Hz	5.0 Hz	5.0 Hz	5.0 Hz	5.0 Hz	5.0 Hz	5.0 Hz	5.0 Hz	
Startvoltage	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	
VF quadratic	ON	ON	ON	ON	ON	ON	ON	ON	ON	
Rampup time	40 sec	40 sec	40 sec	40 sec	40 sec	40 sec	40 sec	40 sec	40 sec	
Rampdown time	40 sec	40 sec	40 sec	40 sec	40 sec	40 sec	40 sec	40 sec	40 sec	
Rotat. Direction	R	R	R	R	R	R	R	R	R	
Current limit	120 %	120 %	120 %	120 %	120 %	120 %	120 %	120 %	120 %	
DC brake mode	0	0	0	0	0	0	0	0	0	
DC brake time	5 sec	5 sec	5 sec	5 sec	5 sec	5 sec	5 sec	5 sec	5 sec	
DC brake level	5 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %	
Boost function	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Derating Alarm	5 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %	
Suppression1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Range1 min.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Range1 max.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Suppression2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Range2 min.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Range2 max.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Suppression3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Range3 min.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
Range3 max.	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	
				Diagnostic						
OTC	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	
OTM	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	000056:-46:13	
DC-Voltage	415 V	415 V	415 V	415 V	415 V	415 V	415 V	415 V	415 V	
Heatsink	28.8 °C	28.8 °C	28.8 °C	28.8 °C	28.8 °C	28.8 °C	28.8 °C	28.8 °C	28.8 °C	
Capacitor	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	
Filterchoke	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	
E1-KTY	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	
E1-Current	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	
E1-Voltage	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	
E2-KTY	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	20.0 °C	
E2-Current	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	0.00 mA	
E2-Voltage	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	

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Mode	1.01 1.02	2.01 2.03 2.04	2.02	2.05	3.01 3.02	3.03 3.04	4.01 4.02 4.03	5.01 5.02	6.01	User Setting
Parameter	Factory setting									
E3*	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	0.00 V	
D1	ON	ON	ON	ON	ON	ON	ON	ON	ON	
D2	ON	ON	ON	ON	ON	ON	ON	ON	ON	
D3*	ON	ON	ON	ON	ON	ON	ON	ON	ON	
D4*	ON	ON	ON	ON	ON	ON	ON	ON	ON	
D5*	ON	ON	ON	ON	ON	ON	ON	ON	ON	
K1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
K2	ON	ON	ON	ON	ON	ON	ON	ON	ON	
K3*	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
K4*	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
* IO option Add-on module type Z-Modul-B										

10.2 Possible allocation of the IOs, PINs

Analog outputs A / A2

Function	Description function A / A2
1A	Constant voltage +10 V
2A	proportional level control
3A	proportional input E1
4A	proportional input E2
5A	Group control
6A	only 2.03 Cooling function (not for Z-Modul-B)
7A	only 2.03 Heating function (not for Z-Modul-B)
9A	proportional output frequency (as of software version 2.41)

Digital inputs D1..D5

Function	Description function D1..D5
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 "Set Intern1" / "Set Intern2"
6D	Switch over "Intern" / "Extern"
	For modes as controller from 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")
	For all modes
10D	"Reset"
11D	Setting Max. Speed "ON" / "OFF"
12D	Motorheating ON / OFF (not Acontrol)
13D	Reverse direction of rotation "right-hand" / "left-hand" (only for frequency inverter with 3 ~ output)
14D	"Freeze function" = maintain momentary modulation value

Analog inputs E2 / E3

Function	Description Function E2
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 For mode 1.01 with external touch function (function available depending on software version).

Function	Description Function E3
1E	0 - 10 V external Setpoint

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Function	Description Function E2
2E	External Manual mode

Digital outputs K1..K4

Function	Description function K1, K2 ,K3*, K4*
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 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"
8K	Group control (Group 2) Switching on fans depending on modulation
12K *	Group control (Group 3) Switching on fans depending on modulation
13K *	Group control (Group 4) Switching on fans depending on modulation
	For modes as controller from 2.01
7K	Setpoint Offset Deviation between actual value and setpoint to high
	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

*   *Function depending on the version of the software available*
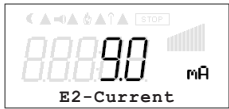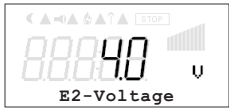
Limits GW E1, GW E2
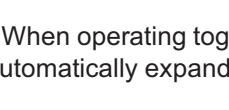
Function	Description function GW E1, GW E2
OFF	no function
1L	Indication with the centralized fault of a programmed relay (IO allocation Function 2K). Warning symbol in display, "AL" code in events memory.
2L	Is merely displayed in the events menu as message "msg".

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PINs

PIN	Function
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

11   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
585 V **DC-Voltage**	The intermediate circuit voltage without load is the peak value of the input voltage. In a three-phase supply network with 400 V, an intermediate circuit voltage of ca. 565 V results. This voltage sinks slightly under load.
32.0 °C **Heatsink**	Display of the internal temperature of the power semiconductor. During impermissibly high levels (at 90 °C), the output power is automatically reduced. At 105 °C switch off.
32.0 °C **Capacitor**	Display of DCLink Elco temperature. During impermissibly high levels (from 75 °C on), the output power is automatically reduced. At 90 °C switch off.
32.0 °C **Filterchoke**	Display of sine filter choke temperature. In case of temperature increase above predetermined threshold value the modulation is switched off. Restart when cooled down!
20.0 °C **E1-KTY**	
9.0 mA **E1-Current**	Signal height at analog input E1 (Analog In 1)
4.0 V **E1-Voltage**	

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Display	Description
20.0 °C — E2-KTY	
9.0 mA — E2-Current	Signal height at analog input E2 (Analog In 2)
4.0 V — E2-Voltage	
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

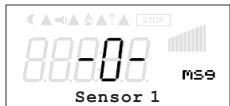* When operating together with the "Z-Modul-B" type expansion module, the diagnosis menu is automatically expanded to include the additional inputs and outputs.

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11.1 Current measurements

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

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

12 Events / Fault signals

12.1 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:
Msg **Sensor 1**	1. Messages with code Msg Message sensor fault for information, for Alarm sensor deactivated.
Al **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).
Err **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).

Err
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**.

Err
00009:01:08

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12.2 Messages and trouble shooting
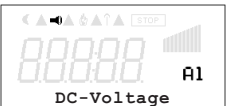
A momentary pending alarm or error message is indicated by a blinking indicator and appears alternately with the standard display.
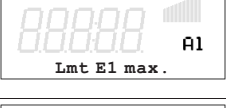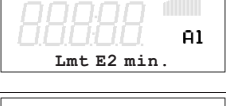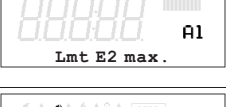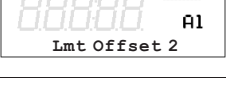
Operating conditions are indicated by the status LED with flashing code.

internal State LED
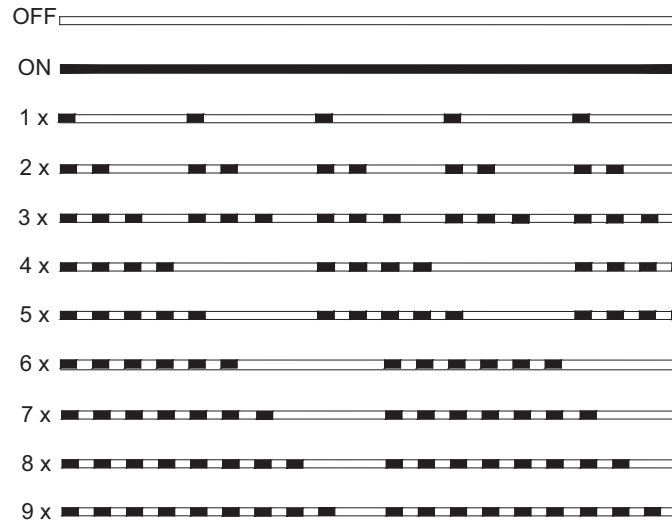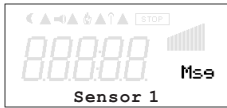
11.02.2009
v_flash_explain.VSD

Display	Code*	LED Code	Relais switches **		Possible cause	Reaction of Controller
		internal	Opera-tion	Failure		Adjustment
8.8.8.8.8.		OFF				Line voltage available? Unit switch OFF and automatically ON when the voltage has been restored
OFF		1	1	0	No enable	Switch OFF by external contact (function 1D = enable programmed for Digital In)
8.8.8.8.8. A1 Factory sett.	AL	-	0	1	Controller did a factory setting automatically (e.g. in case of faulty parameter data).	Warning message: Operation with factory setting
8.8.8.8.8. A1 EEP error	AL	-	0	1	fault EEP damaged	Operation with factory setting
8.8.8.8.8. A1 EEP Corruption	AL	-	0	1	EEP data incorrectly	controller runs with the read settings
8.8.8.8.8. A1 MC Bootload	AL	-	0	1	Fault bootload process of the motor controller. I.e. the motor controller program could not be loaded or started.	Fault indication, cold start (reset) of the control unit
8.8.8.8.8. A1 MC Communication	AL	-	1	1	Communication fault between control unit and power unit	Fault indication, cold start (reset) of the control unit
8.8.8.8.8. A1 Dataset error	AL	-	0	1	Error in the protocol memory (event log)	Only warning message

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Display	Code*	LED Code	Relais switches **		Possible cause	Reaction of Controller
		internal	Opera-tion	Failure		Adjustment
A1 MC User Setup	AL	-	0	1	Controller loaded the User Setup automatically (if available). E.g. in case of faulty parameter data.	Warning message, operation with User Setup
A1 MC Stackoverflow	Err	-	1	1	Program sequence faulty, software error.	Motor off, shut-off, locking
A1 Error DS2502	Err	-	1	1	Board data memory, motor data memory illegible	Fault indication, shut-off
A1 case of an error	Err	-	1	1	Undefined error	No reaction
A1 Overload 1	AL	3	0	1	The device has integrated active temperature management to protect the device from damage caused by excessively high interior temperatures. In case of a temperature increase above the predetermined limits the modulation is linearly reduced. Indication if modulation (frequency) only corresponds to the set value (☞"setting Derating Alarm").	At sinking temperature the controller restarts. Check the temperature in the device via diagnostic menu. Check cooling of the controller
A1 Overload 2	AL	-	0	1	DC input chocke overheating or Capacitor / interior overheating	Warning message temperature management Check cooling of the controller
A1 DC-Voltage	AL	-	1	1	Overvoltage in the DC intermediate circuit (limit depends on the power unit)	Detection leads to immediate motor shutdown. At continuous overvoltage error message after 75 s. Automatic restart when voltage is back within the limit.
A1 Output filter	AL	-	1	1	Sine filter to hot (only in version with integrated sine filter)	Switch OFF at 150 °C, switch ON when cooled down to 70 °C. Check temperature in controller, Check cooling of the controller
A1 IGBT Fault	AL	5	1	1	The controller was switched off by the current limitation. Switch back time: 60 sec	Inverter switches off motor. New start-up attempt after about one minute (4x error then lock). Check motor and brake function. Reset necessary if device is locked.
A1 Earth fault	AL	5	1	1	Short-circuit at motor connection to earth (U, V, W)	Inverter switches off motor. Check motor and connection then reset

Display	Code*	LED Code internal	Relais switches ** Opera-tion	Relais switches ** Failure	Possible cause	Reaction of Controller Adjustment
Line Fault	Err	**4**	0	1	The device is provided with a built-in phase-monitoring function for the mains supply. In the event of a mains interruption (failure of a fuse or mains phase) the unit switches off after a delay (approx. 60 ms).	If the voltage supply returns within 5 s, the device automatically switches itself back on. In the case3of mains interruptions over 10 sec. the error message "Line fault" appears. A startup attempt takes place approximately every 60 sec. until all three mains phases are available. Check power supply
Motor fault	Err	**2**	1	1	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
on Motorheating	Msg		0	0	The motor heating was activated via digital input.	Informational message
External NTC error	AL		0	1	wire failure NTC	only warning message
External error	AL		0	selecta-ble	Alarm from external contact	Device continues working unchanged check contacts
Modulation	AL	-	0	selecta-ble	Set limit for modulation exceeded	Device continues working unchanged
Lmt E1 min	AL	-	0	selecta-ble	Set limit for input signal "E1" dropped below	Device continues working unchanged Check setting and input signal
Lmt E1 max.	AL	-	0	selecta-ble	Set limit for input signal "E1" exceeded	
Lmt E2 min.	AL	-	0	selecta-ble	Set limit for input signal "E2" dropped below	Device continues working unchanged Check setting and input signal
Lmt E2 max.	AL	-	0	selecta-ble	Set limit for input signal "E1" exceeded	
Lmt Offset 1	AL	-	0	selecta-ble	Actual value exceeds setpoint	Device continues working unchanged Check setting and sensor
Lmt Offset 2	AL	-	0	selecta-ble	Actual value drops below setpoint and set offset	

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| Display | Code* | LED Code | Relais switches ** | | Possible cause | Reaction of Controller |
		internal	Opera-tion	Failure		Adjustment
Sensor 1 Msg Sensor 2 Msg	Msg or. AL*	**6**	0	selecta-ble	For Sensor 1 / Sensor 2 Interruption / short circuit in the sensor leads or sensor values measured are outside measuring range	The device works with minimal or maximum modulation depending on whether there is a short-circuit or an interruption, and on the programmed mode of operation. Check sensor

*Code: Err = Error Al = Alarm Msg = Message

** Relay function in factory setting
0 = switching status retained
1 = switching status changes

13   Function extension and version of software

Software D1333A, display version, see menu group Start under Fcontrol

Version	Date	Function from new version
2.25	19.02.09	**Setting**: change from "%" to "Hz" for following settings: Set Intern 1/2, Min. Speed, Max. Speed, Speed manual.
2.27	01.04.09	**Motor Setup**: Ouench mode removed
2.28	03.09.09	**Start**: Motor OFF / ON, version nummer internal motor controller **MODBUS**: readout serial number via MODBUS possible.
2.31	12.01.10	**Start**: menu language Czech
2.37	15.05.12	**Base setup**: Mode `1.02` **Setting**: limitation "Min. Speed" - "Max. Speed" **Controller Setup**: Group control 3 and 4 via relay **IO Setup**: function `12K`, `13K` for K1...K4
2.43	25.02.16	**Start**: Menu language Polish **Info**: Input power, output power **Controller Setup**: Watchdog Function **IO Setup**: Function `9A` = proportional output frequency for analog output A **IO Setup**: E1 mode 3 and E2 mode 3 for touch function **IO Setup**: Touch function Step **Motor Setup**: Boost value => Boost function

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14 Enclosure

14.1 Technical data

Type (Part-No.)	Rated current Output {1} [A]	Rated current (I fundamental component @ 50 Hz) Input {2} [A]	Rated temperature [°C]	max. line fuse {3} [A]	Max. heat dissipation approx. {2} [W]	Noise approx. {4} [dB]	Weight [kg]	Housing protection IP
FXDM2.5AM (308099)	2.5	2.5 (2.3)	40	6	50	-	3.3	54
FXDM5AM (308138)	5	4.8 (4.4)	50	10	100	54.6	7.2	54
FXDM5M (308137)	5	4.8 (4.4)	50	10	100	54.6	7.0	54
FXDM8AM (308140)	8	7.0 (6.5)	50	10	150	54.6	7.9	54
FXDM8M (308139)	8	7.0 (6.5)	50	10	150	54.6	7.7	54
FXDM10AM (308142)	10	9.4 (8.6)	55	16	210	54.6	8.2	54
FXDM10M (308141)	10	9.4 (8.6)	55	16	210	54.6	8.0	54
FXDM14AM (308144)	14	13.5 (12.3)	40	16	310	54.6	8.7	54
FXDM14M (308143)	14	13.5 (12.3)	40	16	310	54.6	8.5	54
FXDM18AM (308174)	18	16.7 (15.5)	40	20	400	-	9.1	54
FXDM18M (308173)	18	16.7 (15.5)	40	20	400	-	8.9	54
FXDM22AM (308108)	22	19.2 (17.7)	40	25	520	-	14.5	54
FXDM22M (308115)	22	19.2 (17.7)	40	25	520	-	14.3	54
FXDM32AM (308009)	32	27.6 (25.7)	50	35	700	65.7	29.6	54
FXDM32AM (308225)	32	27.6 (25.7)	50	35	700	65.7	29.6	65
FXDM32M (308096)	32	27.6 (25.7)	50	35	700	65.7	29.6	54
FXDM32AME (308008)	32	27.6 (25.7)	50	35	700	65.7	33.1	20
FXDM32ME (308007)	32	27.6 (25.7)	50	35	700	65.7	33.1	20
FXDM40AM (308177)	40	34.0 (31.5)	50	50	790	65.7	29.6	54
FXDM40AM (308226)	40	34.0 (31.5)	50	50	790	65.7	29.6	65
FXDM40M (308178)	40	34.0 (31.5)	50	50	790	65.7	29.6	54
FXDM40AME (308176)	40	34.0 (31.5)	50	50	790	65.7	33.1	20

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Type (Part-No.)	Rated current Output {1} [A]	Rated current (**I** fundamental component @ 50 Hz) Input {2} [A]	Rated temperature [°C]	max. line fuse {3} [A]	Max. heat dissipation approx. {2} [W]	Noise approx. {4} [dB]	Weight [kg]	Housing protection IP
FXDM40ME (308175)	40	34.0 (31.5)	50	50	790	65.7	33.1	20
FXDM50AM (308183)	50	47.5 (43.2)	50	63	910	65.7	32.8	54
FXDM50AM (308227)	50	47.5 (43.2)	50	63	910	65.7	32.8	65
FXDM50M (308184)	50	47.5 (43.2)	50	63	910	65.7	32.8	54
FXDM50AME (308182)	50	47.5 (43.2)	50	63	910	65.7	36.7	20
FXDM50ME (308181)	50	47.5 (43.2)	50	63	910	65.7	36.7	20

{1} Rated current output ≙ current indication rating plate @ rated voltage, @ rated temperature (cos φ 0.8 at the output).
{2} At rated voltage (cos φ 0.8 at the output), values for different specifications on request.
{3} Max. line fuse on site (line protection fuse) according to EN 60204-1 Classification VDE0113 Part 1
{4} Sound power level A-weighted by internal fan (- no indication)

Line voltage*	3 ~ 208...480 V (-15 up to +10 %), 50/60 Hz
Nominal voltage	400 V
Maximal output voltage	95 % of U_{Line}
Maximal output frequency	150 Hz (for FXDM22 max. 60 Hz permissible!)
Power factor	> 0.9
Switching frequency	16 kHz
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)
Digital inputs "D1" and "D2"	Input resistance: R_i approx. 4 kΩ
Max. contact rating of the internal relay	2 A / 250 VAC
Max. permissible ambient temperature for operation	55 °C
Min. permissible ambient temperature for operation	0 °C (if mains voltage is not switched off up to -20 °C) To avoid condensation the device must be continuously energized due to the application of heat, with interruptions such that cooling to the point of condensation does not occur.
Permissible temperature range for storage and transport	-30...+80 °C (FXDM22: -30... +70 °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	For devices < 4 A according EN 61000-3-2
	For devices ≥ 4 A and ≤ 16A accoording EN 61000-3-2 (see Operating Instructions / Electrical installation / harmonics current for devices ≥ 4 and ≤ 16 A)

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	For devices > 16A and ≤ 75A according to EN61000-3-12 (see Electrical Installation / Harmonics current and line impedance)
	Please ask manufacturer for the individual harmonic oscillation levels of the current as a percentage of the fundamental oscillation of the rated current.
Vibratory strength (for vertical installation, i.e. cable inlet down).	FXDM2.5(A)M...22(A)M and FXDM32(A)ME...50(A)ME Broadband noise (simulated life-endurance test) in accordance with EN 61373, category 1 class B. Shock test according to EN 61373, category 1

*   *Regarding the mains connection, these devices are to be classified as category "C2" devices according to the relevant DIN EN 61800-3. The increased requirements placed on electrical interference > 2 kHz for category "C1" devices are complied with in addition.*

14.1.1   Versions type-lines Fcontrol

In IP54 for wall mounting
*   **FXDM..** external terminal type AXG-1A(E), for start-up and setting necessary.
*   **FXDM..A** internal LCD-Multifunction display with plain language text.

In IP20 for switch cabinet mounting
*   **FXDM..E** external terminal type AXG-1A(E), for start-up and setting necessary.
*   **FXDM..AE** internal LCD-Multifunction display with plain language text.

14.1.2   Max. load dependent on ambient temperature and line voltage.

The maximum permissible temperature for the rated current at rated voltage is specified as rated temperature.
Since the dissipation of the power loss (heat development) in the device is decisively dependent on the ambient temperature, the max. load must be reduced at an ambient temperature above the rated temperature (see following table)!
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!
Since the power loss in the device increases with rising line voltage, the following table must be observed.

Type	Maximal load depending on line voltage and ambient temperature					
	208 V (-15 %)...415 V (+6 %)			over 415 V (+6 %)...480 V (+10 %)		
	40 °C	**50 °C**	**55 °C**	**40 °C**	**50 °C**	**55 °C**
FXDM2.5(A)M	2.5 A	2.0 A	1.5 A	2.2 A	1.5 A	1.2 A
FXDM5(A)M	5.0 A	5.0 A	4.2 A	5.0 A	5.0 A	4.0 A
FXDM8(A)M	8.0 A	8.0 A	7.5 A	8.0 A	8.0 A	7.0 A
FXDM10(A)M	10.0 A	10.0 A	10.0 A	10.0 A	10.0 A	10.0 A
FXDM14(A)M	14.0 A	12.0 A	11.0 A	14.0 A	12.0 A	10.5 A
FXDM18(A)M	18.0 A	16.0 A	12.0 A	18.0 A	15.0 A	11.5 A
FXDM22(A)M	22.0 A	18.0 A	15.3 A	22.0 A	17.0 A	14.5 A
FXDM32(A)M(E)	32.0 A	32.0 A	30.0 A	32.0 A	32.0 A	30.0 A
FXDM40(A)M(E)	40.0 A	40.0 A	37.0 A	40.0 A	40.0 A	35.0 A
FXDM50(A)M(E)	50.0 A	50.0 A	48.0 A	50.0 A	50.0 A	46.0 A

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14.2   Connection diagram

Fcontrol FXDM...(A)M

1 Line 3 ~ 208...480 V, 50/60 Hz ("N" - connection only available for FXDM22)
2 Only in special version suitable for IT-System!
3 3 ~ Motor with internal thermostats
4 Output 0...10 V (I_{max} = 10 mA)
5 Input 1: 0...10 V, 0...20 mA, 4...20 mA, TF..(KTY)
6 Input 2: 0...10 V, 0...20 mA, 4...20 mA, TF.. (KTY)
7 Addressing, normal lock closed
8 Contact rating max. 2A / 250 V AC

UMPO02K1
20.11.2012

| 0 - 10 V | TF.. | MBG..-I | MPG.., DSG.. | MAL.. |

v_sensoren_e1_anschlplan_q.vsd
04.05.2016

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14.2.1 Connection suggestion for several motors with motor protection unit type STDT

- Total motor protection: Automatic cut-off by thermocontact actuation motor overtemperature. Button for Reset after malfunction.
- Line protection: A thermal over current sensor and a magnetic short circuit releasing elements are the parts of the integral line protection. Adjustment to the thermal overcurrent sensor to the max. permissible current of the connected cable (max. line fuse 80 A).
- No cut-off if the mains supply is interrupted
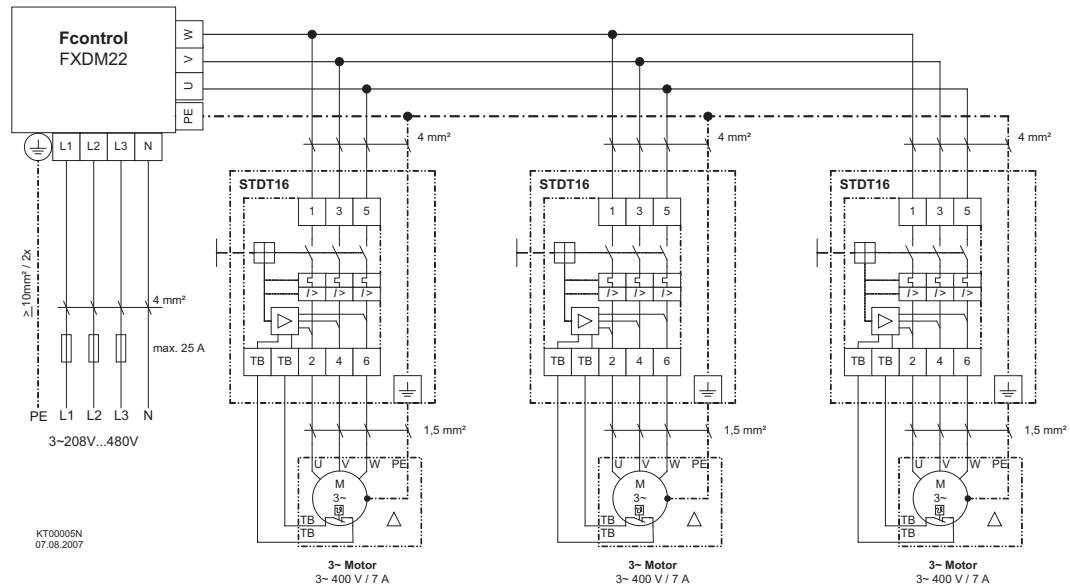
14.2.2 Connection suggestion for Bypass with necessary time delay

Fcontrol Schaltungsvorschlag für Bypass mit erforderlicher Zeitverzögerung/
Example of connection for Bypass with necessary time delay
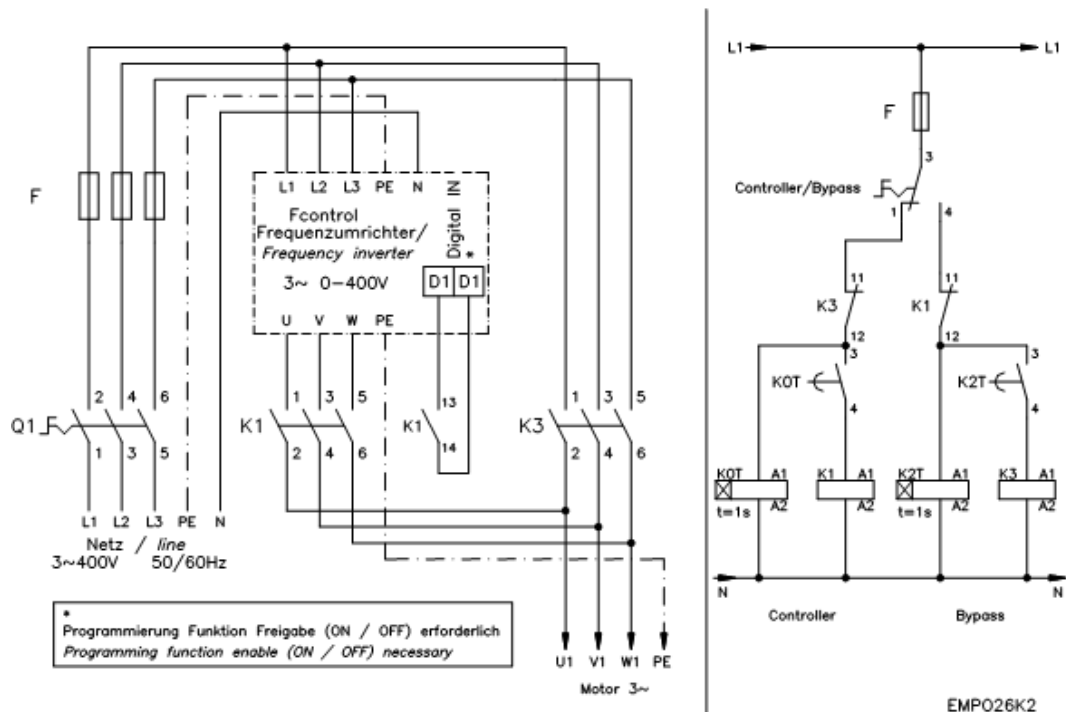
* Programming function enable (ON / OFF) necessary

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14.3   Dimensions [mm]

FXDM2.5AM
(IP54)

GM00006A
08.02.2010

FXDM5...18 (FXDM22)
(IP54)

GM00005A
17.08.2009

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FXDM32...50
(IP54 / IP65)

GM00002A
10.01.2012

FXDM32...50E
(IP20)

GM00001A
16.04.2009

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14.4   Index

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14.5   Manufacturer reference C E

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

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74653 Künzelsau
Telephone: +49 (0) 7940 16-0
Telefax: +49 (0) 7940 16-504
info@ziehl-abegg.de
http://www.ziehl-abegg.de

14.6   Service information

If you have any technical questions while commissioning or regarding malfunctions, please contact our technical support for control systems - ventilation technology.
phone: +49 (0) 7940 16-800
Email: fan-controls-service@ziehl-abegg.de

Our worldwide contacts are available in our subsidiaries for deliveries outside of Germany, see www.ziehl-abegg.com.
If you make returns for inspections or repairs we need certain information in order to facilitate focused trouble shooting and fast repair. Please use our repair ticket for this. It is provided to you after you have consulted our support department.
In addition, you can download it from our homepage. Support - Downloads - General documents.

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