

Fcontrol

FSET4/6/10M(Q)

**Frequency inverter with integrated sine filter
for 1 ~ fans**

Operating Instructions



Software version: D1628A from Version 01

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1 General notes

Compliance with the following instructions is mandatory to ensure the functionality and safety of the product. If the following instructions given especially but not limited for general safety, transport, storage, mounting, operating conditions, start-up, maintenance, repair, cleaning and disposal / recycling are not observed, the product may not operate safely and may cause a hazard to the life and limb of users and third parties. Deviations from the following requirements may therefore lead both to the loss of the statutory material defect liability rights and to the liability of the buyer for the product that has become unsafe due to the deviation from the specifications.

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.

ZIEHL-ABEGG SE is not liable for damage due to misuse, incorrect use, improper use or as a consequence of unauthorized repairs or modifications.

1.4 Copyright

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

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.

	<p>Caution! General hazardous area. Death or severe injury or significant property damage can occur if the corresponding precautions are not taken!</p>
	<p>Danger due to electric current Danger by dangerous, electric voltage! Death or severe injury can occur if the corresponding precautions are not taken!</p>
	<p>Information Important additional information and advice for user.</p>

2.3 Product safety

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

**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

**Caution!**

- 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!

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.

**Caution!**

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

**Caution!**

Automatically restart after a power failure or mains disconnection!

2.7 Modifications / interventions in the device

**Caution!**

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.
- 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.

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 Application

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

Frequency inverters of these series generate their 1 ~ output with variable voltage and frequency from the 1 ~ AC mains network 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-quadrant drives.

The PFC (Power Factor Controller) makes the output voltage mostly independent of the mains voltage.



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 Maintenance

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

3.4 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.

3.5 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).

3.6 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

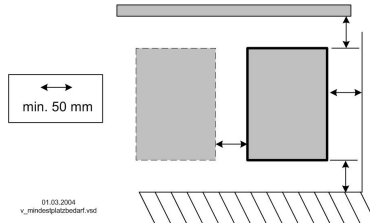
**Caution!**

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 (see 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!
- Depending on the housing model cut off necessary cable inlets respectively to the cable diameter. Or alternative use cable inlet for cable glands. Metal sheet housings are supplied with stoppers. Any cable ducts openings not used must be sealed!
- Care must be taken to avoid direct radiation from the sun!
- The device is designed for vertical installation (bottom cable inlet). 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.



4.3 Outdoor installation

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

4.4 Installation location for agriculture

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).

4.5 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.
- Electrical equipment must be checked regularly: Loose connections are to be re-tightened and damaged lines or cables must be replaced immediately.
- Always keep switch cabinets and all electrical supply facilities locked. Access is only allowed for authorized persons using a key or special tool.
- Operating the device with the housing cover removed is prohibited because energized, exposed parts are present inside the device. Disregarding this regulation can lead to severe personal injury.
- For metal cable inlets the necessary protective earth connection to the bottom of the housing is made by screws. The device may only be started up when these screws are fitted properly.
- The required protective earth connection is established using screws between the housing parts in metal terminal space covers and housing casings. Commissioning is only permissible after these screws have been properly attached!
- Metal screwed-connections are not permitted in plastic housing parts because there is no potential equalization.
- The device owner is responsible for the EMC of the entire plant according to the locally applicable standards.
- Never clean electrical equipment with water or similar liquids.

**Information**

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

5.2 EMC-compatible installation

5.2.1 Motor cable

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

5.2.2 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 Mains connection

5.3.1 Line voltage

The mains connection is made at the terminals: PE, L1 and N. In this regard, it is essential to ensure that the mains voltage lies within the allowable tolerance specifications (see technical data and rating plate affixed to the side).

A connection between two phase conductors is possible for 3 ~ 230 V supply networks.

**Caution!**

To activate the on current limitation, you must wait at least 90 seconds after switching off the line voltage before switching back on!

5.3.2 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!

5.3.3 Leakage current, securely attached, protective earth conductor

**Danger due to electric current**

The maximum leakage current depends on the type of device and the connected mains voltage (see Technical Data). With regard to fixed connection and the type of PE conductor connection, the specification for the leakage current must be observed under consideration of the locally valid standards (for Europe see EN 50178 Section 5.2.11 or 5.3.2.1 etc.).

Minimum cross-section for PE conductor for fixed connection = 1.5 mm²!

5.4 Residual-current-operated protective device

**Danger due to electric current**

To ensure as high a degree of reliability as possible we recommend a release current of 300 mA, where a residual current circuit breaker (type A) is used.



Residual current circuit breaker (type A)

Exception: All-current-sensitive fault current circuit breaker on the 3 ~ 230 V line

When connecting the device between two outer conductors, "all-current-sensitive" fault current circuit breakers must be used (see EN 50 178, Art. 5.2).

5.5 Inverter output

5.5.1 Motor connection

The motor leads are connected to the terminals: U1, U2. Several fans can be connected to the controller-the maximum total current of all motors must not exceed the current rating for the controller.

Change direction of rotation  wiring diagram fan!

**Information**

- It is recommended that a separate motor protection unit be foreseen for each fan.
- For motors with thermistors "TB" e.g. type S-ET10.

5.5.2 Disconnection between controller and motor (repair switch)

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

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



Caution!

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

5.6 Motor protection

The motor can be protected by connecting thermostats "TB".

When multiple motors are connected, it is essential to ensure that thermostats "TB" are always connected in series.

If a connected thermostat is tripped (break between the two terminals "TB"), the device is switched off and is not switched back on.

Relais "K2" is de-energized, terminals "21" - "22" bridged. The signal lamp flashes in code 2 (see Diagnostics / faults).

Possibilities for re-starting after the drive has cooled down (terminals "TB" bridged) by:

- By switching the mains voltage off and then on again.
- Via a digital input for remote control (ON / OFF enable).



Danger due to electric current

An outside voltage may never be connected to the terminals "TB"!

If a bypass circuit is installed, or in the "100 %" position on devices with a main switch, the motor protection inside the controller has no function. In this case, additional motor monitoring may be required.

5.7 Input 0 - 10 V / 10 - 0 V (E1)

The device has an analog input for setting fan speed.

Terminals “E1” / “GND” (Analog In 1).

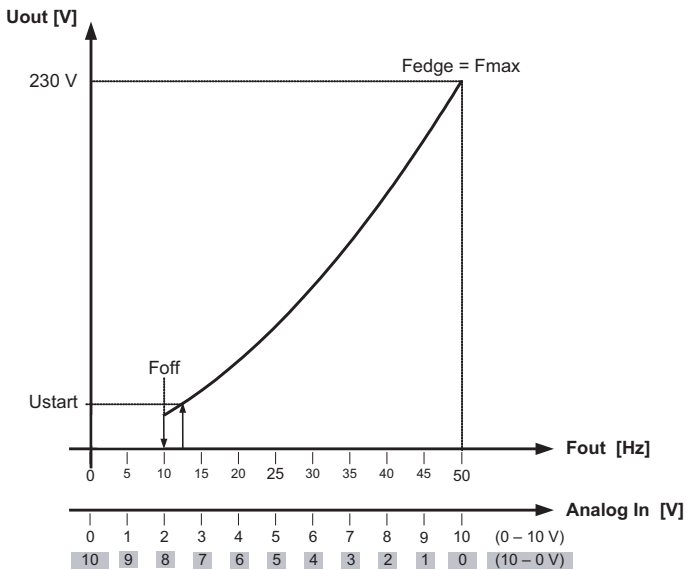
Ensure correct polarity!

Versions with input 0 - 10 V or 10 - 0 V (inverted) see technical data.



Caution!
Never apply line voltage to analog inputs!

Diagram setting signal and U/f curve



20.04.2010
 v_u_fset_0_10_0_v.vsd

Analog In Speed setting signal 0 - 10 V / 10 - 0 V

Error Output frequency

Uout Output voltage

Ustart Start-up voltage

Foff Shutdown Freq.

Fedge Edgefrequency

Fmax Maximum frequency



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.

5.8 Output 10 V (A2)

Constant voltage +10 V e.g. for external potentiometer. Connection to terminals "A2" - "GND" = "Analog Out 2" (I_{\max} 6 mA).

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

5.9 Enable, device ON / OFF (D1)

Electronic disconnection and Reset after motor fault via floating contact at terminals "D1" - "D1" (Digital In 1)

- Device "ON" for closed contact.
- Device "OFF" with opened contact.
- Relais "K2" remains energized, terminals 21 - 24 bridged. The signal lamp flashes in code [2] (☞Diagnostics / faults).

Activation via floating contacts, a low voltage of approx. 24 V DC is connected.



Caution!

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

Never apply line voltage to the digital input!

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

5.10 Relay outputs (K2)

An external fault indicator is available over the potential-free contacts of the built-in relay (max. contact rating see Technical data and connection diagram).

For operation the relay is energized, terminals "21" and "24" are bridged. For fault the relay is de-energized, terminals "21" and "22" are bridged (see Diagnostics / faults).

- Fault indicated for: broken controller-internal voltage supply, overload (sine filter to hot), overheating by the motor (thermostats "TB" connected).
- When switching off via enable (D1 = Digital In 1), the relay remains energized.

5.11 Potential at control voltage connections

The connections for the control voltage (< 30 V) relate to the common GND potential (exception: relay contacts are potential-free). There is a potential isolation between the connections for the control voltage and the PE conductor. It must be ensured that the maximum external voltage at the connections for the control voltage cannot exceed 30 V (between the "GND" and "PE" conductor terminals). A connection to the PE conductor potential can be made if required; fit a bridge between the "GND" terminal and the "PE" connection (terminal for shield).

5.12 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.

- When the contactor is switched off at the inverter output, the “enable” (ON / OFF) must also be opened and closed again when it is switched back on. When switching off, wait at least 90 seconds before switching back on!
- Never apply line voltage to the inverter output!

6 Operation

6.1 Prerequisites for commissioning



Caution!

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.

6.2 Main switch (only with ending “Q” in type designation)



- 0** Power stack (fan) is switched off
- Auto** Power stack in operation (standard position)
- 100 %** Ventilators are operated directly from the mains with no control.

Motor protection by thermostat connection input “TB” without function!

6.3 Brake function

The device has an automatic brake function. The brake function is always activated just before modulation will start after the modulation has returned to “0”.

The inverter supplies DC brake current for about 5sec. that will bring the motor to a complete stop.

The brake function can prevent over current disconnection to occur after modulation returns to a fast rotating motor.

Additionally the brake function can avoid that a fan, which is switched-off, be driven in the wrong direction (e.g. when a draft turn a fan, which is switched-off, in the wrong direction and continue to be driven in the wrong direction after it is switched-on).

In some cases where the fan is driven powerfully in the wrong direction, it might not be possible to start the fan to continue in the right rotating direction.

**Caution!**

- Safe starting of fans is not guaranteed if it is started in reverse. If the application demands safe starting, the machine manufacturer or owner must prevent reverse driving rotation by suitable measures.
- 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 (see motor protection).

6.4 Boost function

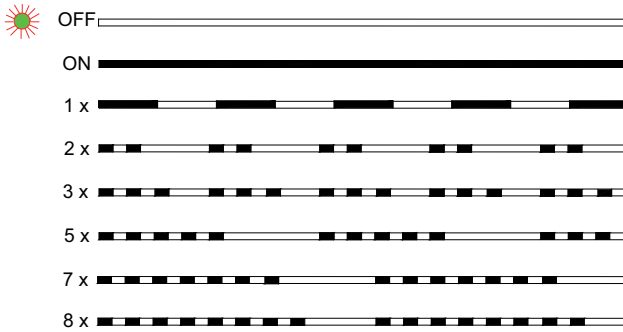
The Boost function provides an automatic increase in voltage. When the modulation of the output voltage is increased by 20 % it become out of proportion to the frequency. This results in more torque to the Motor so that the current does not increase too rapidly during acceleration. Just before reaching the modulation default value, the motor voltage that corresponds to the square characteristic curve is restored. The boost function is only used during substantially large modulation increases (starting from ca. 20 %).

7 Diagnostics / Faults

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

Code	Relay K2	Explanation	Reaction of Controller
			Adjustment
OFF	de-energized terminals 21 - 22 bridged	No line voltage	In the event of a mains interruption the unit switches "OFF" and automatically "ON" when the voltage has been restored. Check line and internal controller fuse.
ON	energized terminals 21 - 24 bridged	Normal operation without fault	
1	energized terminals 21 - 24 bridged	no enable Terminals "D1" - "D1" (Digital In 1) not bridged.	Switch OFF by external contact (see digital input).
2	de-energized terminals 21 - 22 bridged	Motor fault Tripping of connected thermostat or break between terminals "TB".	The unit cuts out and does not switch on again. Check motor and connection then reset (see Motor protection).
3	energized terminals 21 - 24 bridged if max. derating value is reached de-energized terminals 21 - 22 bridged	Overload The device has integrated temperature monitoring to protect the device from damage caused by excessively high interior temperatures. In case of a temperature increase above the predetermined threshold value (for capacitors and heat sink 75 °C) the level-control is linearly reduced. To prevent a shut down during reduced operation by to high temperature of the entire system (in this operating mode, allowable for the controller), no switch off and no alarm indication "Overload occurs. "	At sinking temperature the controller restarts. Check cooling of the controller
5	de-energized terminals 21 - 22 bridged	Overcurrent The controller was switched off by the current limitation. Delay: 1.25 sec by continous overcurrent.Immediately switch of after 16th short (< 1.25s) overcurrent. If for 60seconds no short fault the fault counter goes back to 0 .Switch back time: 60 sec.	Controller turns the motor off. There is a renewed attempt to start after about one minute. Check motor

7	de-energized terminals 21 - 22 bridged	Earth fault Shortcut between one motor wire and PE	The unit cuts out and does not switch on again. Disconnect the device from mains. Check motor wires A permanent shortcut earth can damage the device!
8	-	Overvoltage DC overvoltage because of short-cut earth at switch-on.	The unit cuts out. Disconnect the device from mains. Check motor wires



04.01.2012
v_flash_explain1_8_VSD

8 Enclosure

8.1 Technical data

Type		FSET4M / FSET4MQ	FSET6M / FSET6MQ	FSET10M / FSET10MQ
Rated current output {1}	[A]	4	6	10
Rated current input {2}	[A]	4.2	6.3	10.8
Max. load limit integral of cut-in current {2}	[A ² s]	0.6	0.7	1.3
Max. leakage current according to the dened networks of DIN EN 60990 (depending on connected line voltage)	[mA]	2.5 mA (U _{typ} 230 V) 3.3 mA (U _{max} 305 V)	2.6 mA (U _{typ} 230 V) 3.5 mA (U _{max} 305 V)	3.0 mA (U _{typ} 230 V) 4.0 mA (U _{max} 305 V)
Max. line fuse {3}	[A]	16	16	16
Max. heat dissipation approx. {2}	[W]	65	103	187
Rated temperature	[°C]	35	40	50
Weight	[kg]	3.2 / 3.3	5,5 / 5,6	6.6 / 6.7

- 1 Rated current output $\hat{=}$ current indication name plate @ rated voltage, @ rated temperature
- 2 At rated voltage, values for different specifications on request
- 3 Max. supply side line fuse according to EN 60204-1 classification VDE0113 chapter 1

Line voltage*	1 ~ 208...277 V (-10...+10 %), 50/60 Hz
Rated voltage	230 V
Maximal output voltage	1 ~ 230 V The PFC (Power Factor Controller) makes it mostly independent of the mains voltage
Maximal output frequency	50 Hz
Edgefrequency	50 Hz
Shutdown Freq.	10 Hz
Startvoltage	approx. 30 V
U/f-characteristic curve	square
Power factor	> 0.9
Switching frequency	16 kHz
Input resistance for signal set for the rotational speed	at input 0 - 10 V / 10 - 0V: R _i > 100 kΩ
Power loss in standby operation	approx. 2.6 W
Output (10 V)	I _{max} 6 mA (short-circuit-proof)
Digital input "D1"	Input resistance: R _i approx. 4 kΩ
Max. contact rating of the internal relay	2 A / 250 V AC

Max. permissible ambient temperature for operation	55 °C
Min. permissible ambient temperature	0 °C (if mains voltage is not switched off up to -20 °C)
Permissible installation height	0...4000 m amsl ≤ 1000 m: no limitation > 1000 m: max. permissible output current = current indication name plate minus 5 % / 1000 m > 2000 m: max. permissible line voltage = max. voltage indication name plate minus 1.29 % / 100 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	Active power factor adjustment for sinusoidal input current (PFC = Power Factor controller), harmonic current in accordance with EN 61000-3-2 are guaranteed
Vibratory strength (for vertical installation, i.e. cable inlet down).	Broadband noise (simulated life-endurance test) in accordance with EN 61373, category 1 class B. Shock test according to EN 61373, category 1
Housing protection	IP54

* Regarding the mains connection, the Fcontrol 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.

Versions type-lines Fcontrol FSET..M(Q)

Fcontrol FSET..M			
Input 0 - 10 V		Input 10 - 0 V	
Type	Part-No.	Type	Part-No.
FSET4M	308128	FSET4M	308158
FSET6M	308156	FSET6M	308159
FSET10M	308130	FSET10M	308160
Fcontrol FSET..MQ (with Main switch)			
Input 0 - 10 V		Input 10 - 0 V	
Type	Part-No.	Type	Part-No.
FSET4MQ	308154	FSET4MQ	308248
FSET6MQ	308155	FSET6MQ	308249
FSET10MQ	308187	FSET10MQ	308250

8.1.1 Performance reduction during elevated ambient temperatures

The maximum permissible temperature for the rated current at rated voltage is specified as rated temperature.

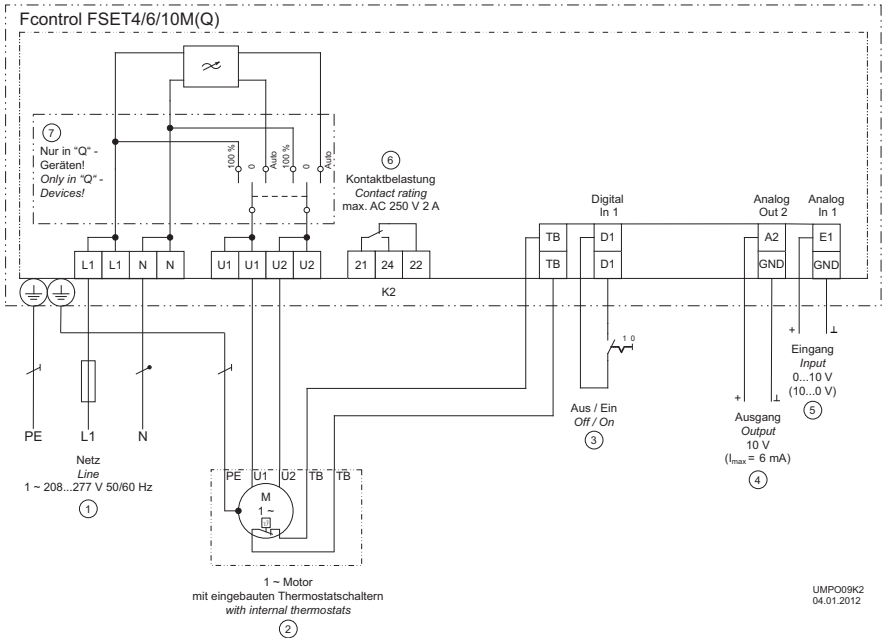
Since the dissipation of the power loss (heat development) in the device is decisively dependent on the ambient temperature, the max. load must be reduced at an ambient temperature above the rated temperature (see following table)!

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!

Maximal motor current depending on ambient temperature

Type	35 °C	40 °C	45 °C	50 °C	55 °C
	[A]	[A]	[A]	[A]	[A]
FSET4M(Q)	4	3.5	3.0	2.0	1.6
FSET6M(Q)	6	6.0	5.5	4.5	4.0
FSET10M(Q)	10	10.0	10.0	10.0	9.0

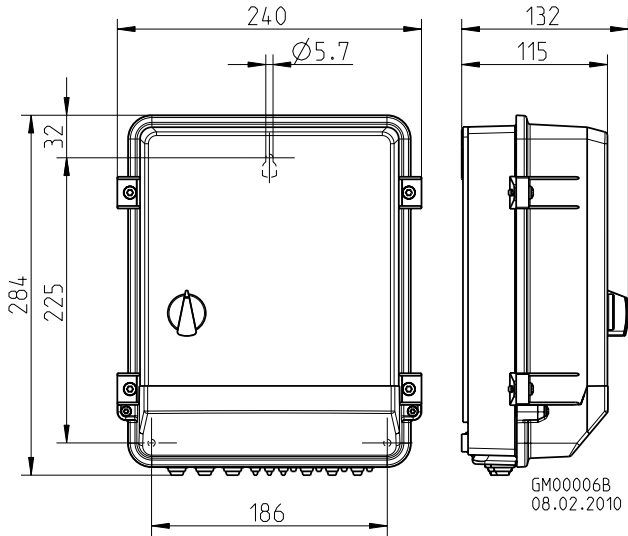
8.2 Connection diagram



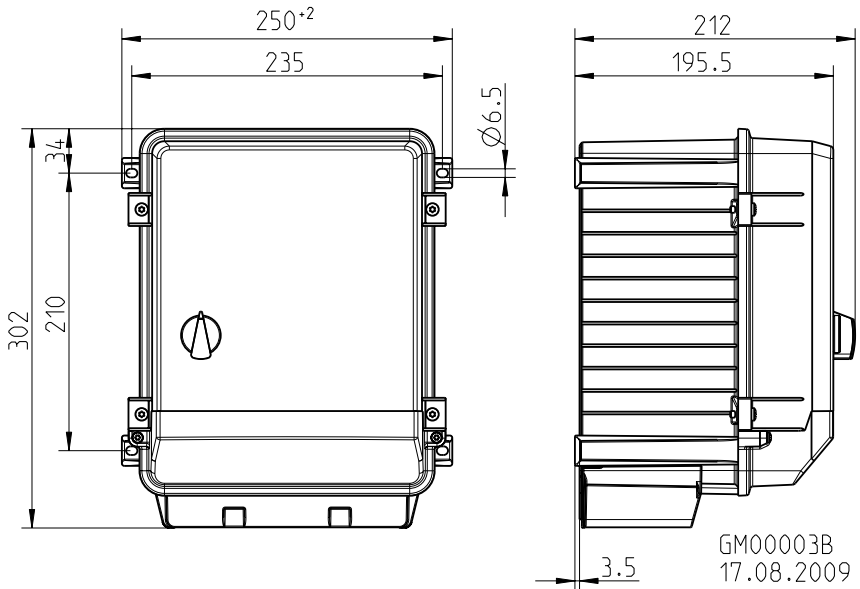
- 1 Line 1 ~ 208...277 V, 50/60 Hz
- 2 1 ~ Motor with internal thermostats
- 3 Enable off / on
- 4 Output 10 V ($I_{max} = 6 \text{ mA}$)
- 5 Input: 0...10 V (alternative 10...0 V)
- 6 Contact rating max. AC 250 V 2 A
- 7 Only in "Q" - devices

8.3 Dimensions [mm]

FSET4(Q)



FSET6/10(Q)



8.4 Manufacturer reference

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

ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
74653 Künzelsau
Telephone: +49 (0) 7940 16-0
Telefax: +49 (0) 7940 16-504
info@ziehl-abegg.de
<http://www.ziehl-abegg.de>

8.5 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.