

ECblue

Basic Version

EC-fans and motors with highest efficiency

Assembly instructions



Software version: D1583...87A from Version 1.00

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1 General notes

1.1 Structure of the assembly instructions

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

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

Use these assembly 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 assembly instructions together with the device. It must be ensured that all persons that are to use the device have access to these assembly instructions at any time.

Keep these assembly instructions for continued use. They must be passed on to all successive owners, users and operators.

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1.2 Target group

The assembly 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 assembly instructions and the described hardware and software in the device has been examined. It is still possible that non-compliances exist; no guarantee is assumed for complete conformity. To allow for future developments, construction methods and technical data given are subject to alteration.

We do not accept any liability for possible errors or omissions in the information contained in data, illustrations or drawings provided.

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

1.4 Copyright

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

1.5 FCC/IC Statements

In case that the AM-MODBUS-W module or the AM-PREMIUM-W module is installed in the ECblue, the following applies:

FCC Compliance (US)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Warning

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

IC Compliance (Canada)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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Note: If AM-MODBUS-W module or AM PREMIUM-W module is used and installed by the user, the FCC/IC label (AM-MODBUS-W inside label for AM-MODBUS-W module, EM-W inside label for AM-PREMIUM-W module) have to stick on the housing of the ECblue.



Sticking the AM-MODBUS-W inside label on the ECBlue housing.

Sticking the EM-W inside label on the ECBlue housing.

Note: The modules (AM-MODBUS-W and AM-PREMIUM-W) are strictly limited for the integration and usage with host devices manufactured by Ziehl-Abegg AG.

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



Attention!

- The fans are only intended for the conveyance of air or mixtures similar to air.
- Other uses which do not coincide with, or which exceed those specified will be deemed unauthorised unless contractually agreed. Damages resulting from such unauthorised uses will not be the liability of the manufacturer. The user will assume sole liability.
- They must not be used in hazardous areas for the transfer of gas, mist vapours or mixtures. Nor must they be used for the transfer of solid components in the transfer medium.
- Reading these document and complying with all contained instructions -especially the safety notifications contained therein -are considered part of intended use.
- To consider is also the documentation of attached components.

2.2 Improper use

Improper use / reasonably foreseeable misuse

- Conveyance of aggressive and explosive gaseous media.
- Use in an explosive atmosphere.
- Operation with iced up fan impeller.
- Conveyance of abrasive or adhesive media.
- Conveyance of flammable media.
- Use of the fan and add-on parts (e.g. safety grille) as a resting surface or climbing aid.
- Unauthorised connection of components to the fan.
- Operation of the fan as a safety component or for the performance of safety-related functions.
- Blocking or braking of the fan by inserting objects.
- Loosening of the impeller from the motor.
- All applications not listed in the intended use.

Not the manufacturer, rather the operator of the frequency inverter is liable for any personal harm or material damage arising from non-intended use.

2.3 Explanations of symbols

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

	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 Warning of dangerous voltage or dangerous current.

**Information**

Important additional information and advice for user.

2.4 Product safety

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

A separate fault and performance monitoring-system with an alarm signal function is necessary in order to prevent personal injuries and material damages during malfunctions and in case the device fails. Substitute operation must be taken into consideration! The design and installation of the system must comply with local regulations and directives.

2.5 Requirements placed on the user due diligence

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

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

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

2.6 In the Operation

**DANGER due to electric current**

- 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.
- Fuses must always be replaced only, never repaired or bridged. The specifications for maximum prefusing must always be adhered to (☞ Technical data). Only fuses cited in the electrical circuit diagram may be used.
- When opening cable glands on the fan / motor, check the condition of the threaded connections and seals. Always replace defective or brittle threaded connections and seals.



Attention, danger of being sucked in!

- **Danger of being sucked in:** Do not wear loose or hanging clothing, jewellery, etc., tie together long hair and cover it.

2.7 Working on device / Hazards through “residual voltage”



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 IEC 60073-1).

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Danger

- Due to electrical voltage generally forbidden to carry out work on electrical live parts. Protection class of the device is II. Protection class II means that the device is not to be touched hazardous voltages directly!
- The rotor is not protected against indirect contact neither by supplementary or reinforced insulation nor by connection to safety-earth in accordance with EN 60204-1, therefore the system constructor must provide protection by enclosure in accordance with EN 61140 before the motor is connected to a power source. This protection can be achieved for example by a guard grille (☞ Product overview: Application operational area and Installation: General).
- When the motor runs independently due to air flowing through or if it continues to run down after being turned off, dangerous voltages of over 50 V can arise on the motor internal connections through operation of the generator.
- 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 earth “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.
- Maintenance work may only be carried out by suitably qualified personnel.



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.

The controller housing may only be removed or opened when the power line has been switched off and a period of three minutes has elapsed since switching it off.

Attention, automatic restart!

- The fan / motor may switch on and off automatically for functional reasons.
- After power failure or mains disconnection an automatic restart of the fan takes place after voltage return!
- Wait for the fan to come to a complete standstill before approaching it!
- In the AC external rotor motor the external rotor turns during operation!

**Attention, hot surface!**

- Temperatures of above 85 °C can occur on the motor surfaces, especially on the controller housing!

**2.8 Modifications and alterations in the device****DRAFT****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.

2.9 Operator's obligation of diligence

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

2.10 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 operational area

The fans / motors are not ready-for-use products, but conceived as components for ventilation systems (type designation  type label). The fans may only then be operated when they are installed in accordance with their intended use, and safety has been secured through protective devices in accordance with DIN EN ISO 13857 (DIN EN ISO 12100) or other structural protective measures.

i **Information**

This assembly instructions describes the combination of motor and controller. Dependent on application, the following safety specifications are to be considered!

3.2 Functional description

ECblue stands for EC fans and motors with maximum efficiency. Highly efficient, electronically switched external rotor motors with permanent magnets are used the speed of which is controlled by the integrated controller.

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

ECblue fans and motors in different models and sizes are described in this assembly manual. Connection, structure and technical details depend partly on the motor size. The used motor sizes (**D** = 116, **G** = 152) are recognisable from the type designation.

Motors Type	Example for fans with motor size "D"	
MK116 - _ I _ . _ . _ . _	• Axial fans type: F _ _ _ _ _ I _ D _ _ _ _	Centrifugal fans type: • RH _ _ _ _ _ I _ D _ _ _ _
MK152 - _ I _ . _ . _ . _		• GR _ _ _ _ _ I _ D _ _ _ _ • ER _ _ _ _ _ I _ D _ _ _ _

3.3 Ziehl-Abegg design criteria for long service life

The service life of devices with power electronics is decisively dependent on the ambient temperatures. The longer electronic components are exposed to high ambient temperatures, the faster the deterioration and the more probable the failures.

The device is designed with a service life of at least 40,000 h when S1 operated at full power in the maximum permissible ambient-temperature environment.

In order to achieve this, the device protects itself by active temperature management.

3.4 Transport



Attention!

- Ziehl-Abegg fans and motors are packed in the factory in accordance with the respective, agreed, form of transportation.
- Always observe the weight specifications and the permissible carrying loads of the means of transport.
- Transport the fan(s) either in their original packing or larger fans on the transport devices provided (axial fans: holes drilled in support arms, wall ring plates and motor block ; radial fans: holes drilled in the motor block, fastening brackets and support plates) with suitable means of transport. Observe the weight specifications on the rating plate.
Wear safety harnesses to avoid falls!
Do not transport the fan(s) by connecting the power cable!
Avoid shocks and impacts to the device during the transport.
Avoid extreme heat or cold (temperature range for storage and transport ↗
Technical data).
- Be on the alert for any damage to the packaging or the fan.
- Radial impellers or built-in fans type ER../GR.. are generally delivered on euro-pallets, and can be transported using lift trucks.
- Fix pallets during transport.
- Do not stack pallets.
- Only handle with suitable hoisting gear.
- **Construction ER../ GR..:** Fan unit may only be lifted and transported when using a suitable hoisting device (load spreader). Ensure sufficient cable or chain length.
- Position the lifting beam transversely to the motor axis. Pay attention to adequate width of the lifting beam.
- **Never stand underneath the suspended fan because defective transport equipment could cause death.**

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3.5 Storage

- Store the fan / motor in the original packaging in a dry area protected from the weather and protect it from dirt and weather until final installation.
- Do not stack pallets!
- Avoid extreme heat or cold (temperature range for storage and transport ↗
Technical data).
- Inspect the motor bearings for proper operation prior to installation.
- 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 environmentally friendly in accordance with the legal stipulations.

4 Mounting

4.1 General notes



Attention!

- Installation are only to be performed by trained service personnel. The system manufacturer or the machine builder and/or the user is responsible that the inherent installation and security information are harmonized with the valid standard and guidelines (DIN EN ISO 12100 / 13857).
- Lift the fan out of the packing with a hoisting unit (lifting beam). Only use the holes in the motor block and the fastening brackets of the fan and the hook or fastening bracket (depending on the design) as attachment points.
- The chain/rope may only be used when lifting with the lifting beam.
- Check the fan for damage, e.g. transport damage, cracks, dents or damage to the electric cables, before assembly.
- At a weight greater than 25 kg for men / 10 kg for women, the fan should be lifted out by two persons (according to REFA). The values may differ from country to country.
- Do not allow drilling chips, screws and other foreign bodies to reach the device interior!
- Prior to installing the fan, it is to be checked whether the safety zone as per DIN EN ISO 13857 and in household appliances as per DIN EN 60335 are met. If the installation height (danger zone) above the reference level is greater than or equal to 2700 mm and is not reduced by auxiliary means such as chairs, ladders, work platforms or bases on vehicles, a guard grille against accidental contact is not necessary at the fan.
- If the fan is located in danger zone, then the manufacturer or operator shall ensure that hazards shall be prevented by appropriate protective constructions which meet the requirements to DIN EN ISO 13857.
- Custom designs must suit the prevailing conditions.
- Tighten the fastenings with the specified torques.
- Any use below -10 °C is dependent on not being subjected to unusual, sudden or mechanical loads or stresses on the material (min. ambient temperature Technical data).

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4.2 Connection lead & terminal box



Information

In demanding environments (wet areas, open air installation) all connections must incorporate water drainage curves. To ensure that water cannot penetrate through to the controller housing from the connections install a terminal box lower than the fan.

4.3 Connection according UL and CSA in different applications

4.3.1 Connecting the conduit for NEC and CEC approval



Conduits

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Attention!

The fan type ECblue series MK116 and MK152 with integrated variable speed drives, for the North American economic region (noticeable on the rating plate) are approved as power conversion equipment according to UL508C.

Furthermore, the motors have environmental type rating class 3 according UL50(E) for outdoor use.

Compliance with the following specifications is mandatory for this:

- Metric to inches threaded adapters, used to connect the conduits, can be ordered from Ziehl-Abegg AG in a package of 3:
 - for MK116: part number 00297623
 - for MK152: part number 00297624
- These are to be used to connect the motor in accordance with the specifications of the NEC® (National Electrical Code, ANSI/NFPA 70) and UL508 corresponding to the circumstances onsite.
- The electrician / plant contractor is responsible for correct connection of the adapter and the conduits so that no damage can occur due to infiltrating moisture or water. When sealing the conduit connections make sure the supplied O-rings are used. When screwing the conduits into the thread adapters, use UL approved sealing tape (e.g., Teflon tape).
- The locking screws used within the MK116 and MK152 series are only for shipment. For installation the locking screws must be removed.
- It must be used a connection technology suitable for the environmental type rating of the drive!



If the connection of the conduits is not possible with the thread adapter due to a lack of installation space, Ziehl-Abegg recommends its customers use an UL514B approved flexible connection hose system.

As an example it can also be used on equipment and machines. However, applicable here is that the equipment / machine must be configured / approved in accordance with UL508.

Possible suppliers: - Anamet, - Flexa GmbH, - Thomas & Betts

Attention! Ziehl-Abegg cannot provide any warranty on the environmental type rating, class 3 for this.

Alternative: flexible connection

Independent of the type and manner of the conduit / tube connection, correct connection of the supply line(s), the safety of people and objects must be provided at all times.

4.3.2 Connection in NFPA 79 applications

In applications where the NFPA 79 (Electrical Standard for industrial machinery) applies the enclosed cable glands can be used.

The cable glands can be ordered additionally in packages of 3 from Ziehl-Abegg:

- for MK116: part number 00295308
- for MK152: part number 00296715

Attention!

- Independent of the type and manner of the conduit / tube connection, correct connection of the supply line(s), the safety of people and objects must be provided at all times.
- The locking screws used within the MK116 and MK152 series are only for shipment. For installation the locking screws must be removed.
- It must be used a connection technology suitable for the environmental type rating of the drive!

4.4 Installation of axial fans

4.4.1 Fan designs A, D, K, S and W (without nozzles)

For attachment to fixed motor flange use screws with property class 8.8 or A2-70 (stainless steel) to DIN EN ISO 4014 and provide with suitable screw locking.

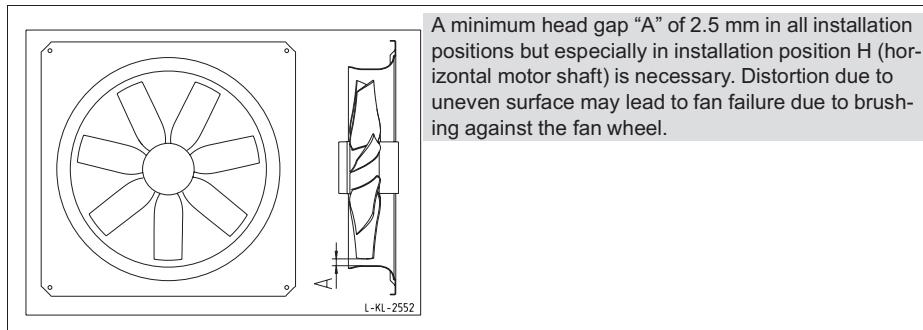
Permissible tightening torques M_A			
Motor size	D	D	G
Thread size	M6	M8	M10
Property class 8.8, friction coefficient μ (with 5-pitch)	0.12	0.12	0.12
Stainless steel A2-70, thickness t (in mm)	0.12	0.12	0.12
Screw length l (in mm)	7 Nm	17 Nm	33 Nm
	$\geq 1.5 \times d$	$\geq 1.5 \times d$	$\geq 1.5 \times d$

When using screws with different friction values or strength classes, different tightening torques may be necessary.

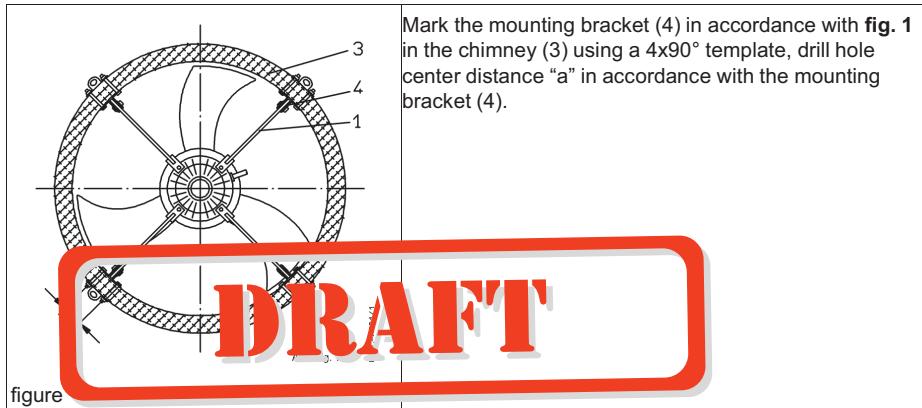


Information

- Pay attention to a sufficient screw-in length in the motor flange.
- Excess screw length not permissible and it may result in the rotor being brushed against or blocked.
- Every screwing case is different. The tightening torque adapted to it must be determined by the appropriate screw tests.
- Avoid structural damage or stress with installation. Make sure the surface is flat and even.
- In the case of a vertical motor axis, the respective lower condensation drain hole must be open.
- Fasten the fan connecting cable using cable ties to the guard grille or motor braces.



4.4.2 Installation in an exhaust air stack, design T



Fan size	Adjustable diameter area	
	min.	max.
F_063	640	660
F_071	725	745
F_080	815	835
F_091	915	935

Tighten the mounting bracket (4) and the support bracket (5) **fig. 2** with screws (6) only so far that the mounting bracket and support bracket do not dig into the chimney wall (3). Self-locking nuts (7) are used for securing the screws. The enclosed protective caps (8) are to be pushed onto the ends of the fan supports (1), **fig. 2**.

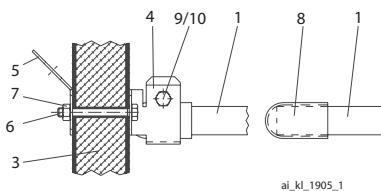


figure 2

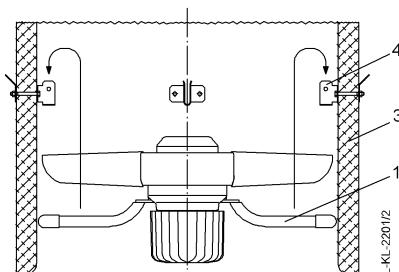


figure 3

Feed the fan (1) into the chimney in accordance with **fig. 3**, and center it in the mounting bracket (4). In addition, the support is to be secured in accordance with **fig. 2** by using bolts (9/10).

The four support clamps (5) are used as support eyelets for additional fixings (e.g. by standing ropes) in order to relieve the chimney of the weight of greater fans.

Installation set (Part.-No. 00291545)

Pos.	Naming	Each
1	Axial fan	-
3	Chimney	-
4	Mounting bracket	4
5	Support bracket	4
6	M8x70 screws DIN EN ISO 4017	8
7	M8 nuts DIN EN ISO 10 511 self-locking	8
7	8.4 washer DIN EN ISO 7089	8
8		4
9	M8x30 screws DIN EN ISO 4017	4
10	M8 nuts DIN EN ISO 10 511 self-locking	4
10a	8.4 washer DIN EN ISO 7089	4

All fastening elements made of stainless steel

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4.5 Mounting of centrifugal fans

4.5.1 Mounting of centrifugal fans, RH design

For attachment to fixed motor flange use screws with property class 8.8 to DIN EN ISO 4014 and provide with suitable screw locking.

Permissible tightening torques M_A			
Motor size	D	D	G
Thread size	M6	M8	M10
Property class 8.8, friction coefficient (with 5-pitch)	0.12	0.13	0.14
Screw penetration	$\geq 1.5 \times d$	$\geq 1.5 \times d$	$\geq 1.5 \times d$

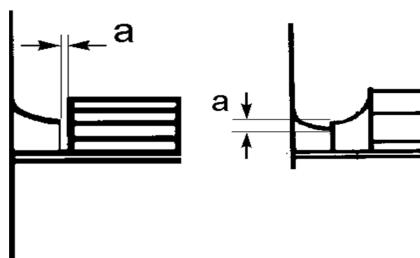
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When using screws with different friction values or strength classes, different tightening torques may be necessary.



Information

- Pay attention to a sufficient screw-in length in the motor flange.
- Excess screw length not permissible and it may result in the rotor being brushed against or blocked.
- Every screwing case is different. The tightening torque adapted to it must be determined by the appropriate screw tests.
- Avoid structural damage or stress with installation. Flange and mounting bracket must be fixed flat on a level surface.
- In the case of a vertical motor axis, the respective lower condensation drain hole must be open.
- The fan must be securely mounted, with vibration dampers if necessary.



Ensure that the clearance (gap) "a" see fig. between the fan impeller and the stationary housing section is constant. Distortion due to uneven surface may lead to fan failure.

4.5.2 Erecting the equipment: Design ER...-..N... / ER...-..K... / GR...

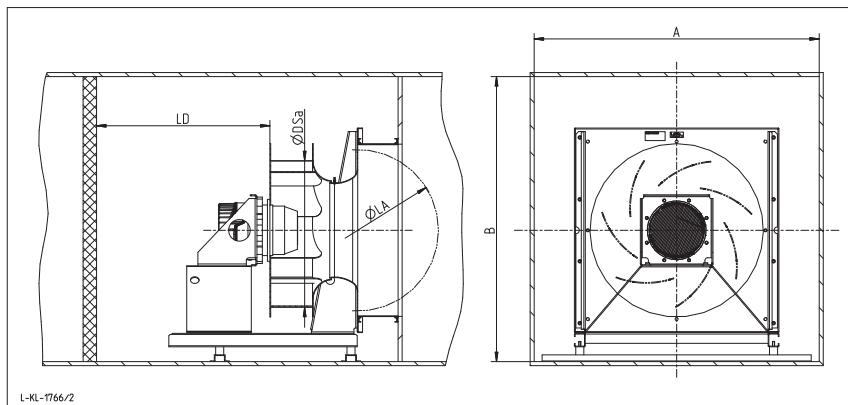
- To avoid the transference of disruptive vibrations, we recommend de-coupling the entire plug fan to avoid sounds transmitted through solids. (Spring and/or attenuation units are not a constituent part of the standard scope of delivery). Look at our catalogue for positioning the decoupling elements or request a dimensions sheet stating the type designation and Part.-No.
- **Attention: All contact points must be fixed securely. If the fixing is inadequate there is a risk of the fan overturning.**
- Erect in the open air only if this is expressly mentioned and confirmed in the ordering information. There is a risk of damage to the bearings if the fan remains

Roofing is required.

- Making your own connections to the fan module is unacceptable - safety risk.
- In the case of a vertical motor axis, the respective lower compensation drain hole

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4.5.3 Optimal installation distances according to for RH../ ER../ GR.. fans



- Distance on suction side: $LA \geq 0.5 \times DSA^*$
- Distance on the pressure side: $LD \geq 1 \times DSA$
- Impeller blade external-diameter : $\varnothing DSA$
- Housing wall distances: $A = 1.8 \times DSA$ ($A = B$)

* In the case of disturbance flow (per example curved pipe at the suction side, flaps etc.)
 $LA \geq 1 \times DSA$

4.6 Mounting of motors

EC-motors design MK

Fastening to fixed motor flange  assembly of axial fans / fans of design A, D .. and assembly of radial fans of design RH

- If the motor is used to drive fan impellers or other components, please note the maximum permissible speeds of the impeller or the component to be driven.
- The max. permissible mass of the impeller or the component to be driven must be inquired from and confirmed in writing by Ziehl-Abegg.

Design K (with rotor flange) or D (with offset rotor flange) as a drive for fans:

- During assembly of the fan impeller or other components, no inadmissible force may be applied to the fan impeller.
- Centre the fan impeller accurately and mount without tension on the rotor flange, 
- Use suitable screws for fastening the fan impeller on the rotor flange and fit as suitable screw lock.
- Every screwing case must be tested for suitability.
- The permissible area pressing of the steel flange may never be exceeded (depending on the contact surface).
- Too great a screw overhang is not permitted and can lead to scraping or blocking of the rotor on the fixed motor flange.
- Motors are not balanced as standard, a complete balancing with mounted fan impeller is necessary. The balancing must be done on the fan impeller. The pertinent regulations must be observed.

Permissible tightening torques M_A		
Motor size	D	G
Thread size	M6	M8
Property class 8.8, friction coefficient $\mu_{ges} = 0.12$	9.5 Nm	23 Nm
Screw penetration	$\geq 0.83 \times d$	$\geq 0.83 \times d$
Max. permissible screw overhang	1.0 mm	1.5 mm

4.7 Outdoor fans in a humid atmosphere



Information

If a fan is stationary for long periods in a humid atmosphere, it should be switched ON for minimum of two hours every month to remove any moisture that may have condensed within the motor.

4.8 Motorheating

To prevent a stationary ventilator in a cold environment from jamming or freezing, the Motorheating becomes automatically active at a controller interior temperature of -19 °C.

5 Electrical installation

5.1 Safety precautions



Danger due to electric current

- Work on electrical components must always be carried out by trained electricians or by persons who have been instructed by a trained electrician under the supervision of an electrician in accordance with the relevant 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.
- A second person must always be present when working on energized parts or lines who disconnects in case of emergency.
- Connect fan only to electrical circuits that can be disconnected with an all-pole isolating switch.
- The device owner is responsible for the EMC of the entire plant according to the locally applicable standards.
- Inspect electrical equipment periodically: retighten loose connections – immediately replace damaged lines and cables.

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5.2 Connection

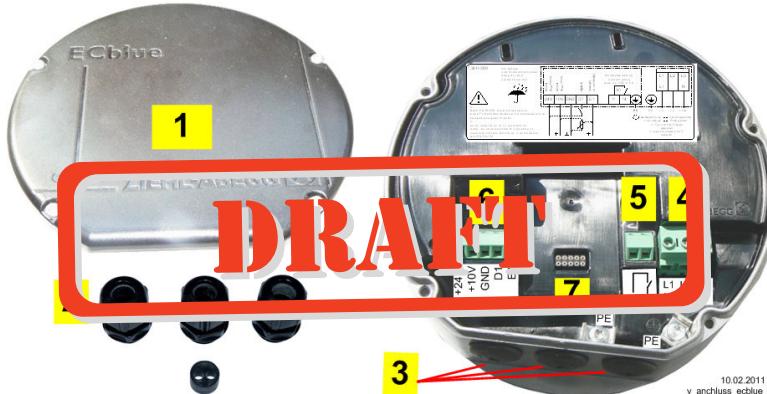


Information

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

5.2.1 Motor size "D" and "G"

Fans with connection box (type: _____ I _ . D _____), (type: F _____ I _ . G _____)



- 1 Cover of controller housing
- 2 Cable glands + seal insert for two cables (applicable only if necessary)
 - motor size "D": 3 x M16 + 1 x seal insert with two holes 5 mm
 - motor size "G": 3 x M20 + 1 x seal insert with two holes 6 mm
- 3 Cable entry points with plastic fastener
- 4 Mains connection
- 5 Connection alarm relay
- 6 Connection controls
- 7 Slot for add-on module

Procedure:

1. Remove the cover from the controller housing for the connection.
2. All 3 cable entry points are in a sealed condition at delivery. Remove plastic fastener if necessary, and insert enclosed cable glands, entry points that are not used must remain sealed!
3. When using the seal insert for two cables it is not permissible to use the corresponding cable gland with only one cable.
4. Insert and connect lines correctly.
5. Attach cover of controller housing again carefully in correct position before start-up.

Attention!

- Temperatures up to 80 °C can be present on the controller housing.
- To connect, always use heat resistant wires or, as an alternative, silicon tubes.
- Remants from installation and foreign object may not remain on the inside!

Permissible tightening torques M_A

	Thread size	Tightening torque M_A	Remark
Cable gland	M16	2.5 Nm	Sealing area for cable diameter 4...10 mm
Cable gland	M20	4 Nm	Sealing area for cable diameter 6...12 mm
Locking screw	M16 + M20	1.25 Nm	<input checked="" type="checkbox"/> screwdriver
Locking screw	M16 + M20	2.5 Nm	<input type="checkbox"/> screwdriver
Cover of controller housing	M4	2.3 Nm	
Protective earth connection	M4	1.5 Nm	
Mains supply terminals	M4	1.5 Nm	
Fastening add-on module	M4	1.2 Nm	

DRAFT**Max. cross section of terminals**

Mains connection: L1, N and/ or L1, L2, L3	max. 2.5 mm ² and/or AWG12
Connection control: +24 V, +10 V, GND, D1, E1, K1	max. 1.5 mm ² and/or AWG16
Add-on modules:	1.5 mm ² (0.75 mm ² with wire end sleeve) and/or AWG16

5.2.2 UL: note for cable entrances**Information**

According to UL the attached locking screws (made of plastic) are acceptable for transport.

According to UL the supplied cable glands can be used without conduit when they are being used in an installation according to **NFPA79**.

5.3 EMC-compatible installation of control lines

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 device with the protective earth (keep cable short and with as little inductance as possible!).

5.4 Mains connection**5.4.1 Line voltage for 1~ types**

Mains connection: PE, L1, and N. Here, it must be strictly observed that the mains voltage lies within the allowable tolerance specifications (refer to technical data).

Alternatively a supply of DC voltage is possible (☞ **Technical data**).

The polarities on "L1" and "N" are irrelevant.

DC supply not UL approved!

5.4.2 Line voltage for 3~ types

Mains connection: PE, L1, L2 and L3. Here, it must be strictly observed that the mains voltage lies within the allowable tolerance specifications (☞ **technical data**).

Alternatively a supply of DC voltage is possible (☞ **Technical data**).

Connect to any two terminal clips for "L1", "L2" and "L3", the polarity is irrelevant.

DC supply not UL approved!

5.4.3 Required quality of the mains voltage

 **Danger due to electric current**

The mains voltage must correspond to the quality characteristics and the defined standard voltages in IEC 60038!

5.4.4 Operating in IT-System



Information

- **3 ~ ECblue types** are only in special version "IT" for the employment in IT-System suitable! Special version "IT" not UL approved, line voltage (☞ **Technical data**).
- **1 ~ ECblue types** can be used in IT-System in standard version. These may only be used in 3 ~ IT-Systems if no higher voltage to the "PE" can occur than the specified mains voltage of the device even in case of a fault to earth of a mains phase which is not used by the device (of none of the two power supplies).

In order to ensure a trouble free operation in IT-System the "GND" potential of the control ports have to be connected with the protective earth potential.

As a consequence of these connection must be considered for the control ports (exception floating relay contacts):

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

Danger due to electric current

- In the IT-System the neutral point of voltage supply is not grounded; in the case of a short-circuit between a phase (e.g. "L1") and protective earth "PE" becomes the protective earth potential = L1.
- **Between the mains connection of the device and the protective earth "PE" is in no case a higher voltage permissible than the indicated line voltage of the device!**

5.4.5 UL: Short-circuit protection for branch circuits (UL508C)



Danger due to electric current

This power conversion equipment is suitable for connection to electric circuits that cannot supply more than 100 kA symmetrical current effective.

The fusing for the short-circuit protection must comply with the requirements in UL248 (further information Assembly instructions / Technical data).

5.5 Residual-current-operated protective device

For 1 ~ fan types

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Residual current circuit breaker (type A)

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.



Danger due to electric current

Exception: Mains connection between two phase conductors for supply networks 3 ~ 230 V

For an installation of r.c.d. protection, it shall be observed that this must be of "universal-current sensitivity". In accordance with EN 50 178, Section. 5.2. other types of current-operated protective devices may not be used.

For 3 ~ fan types

Residual current circuit breaker (type B)



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". 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 Motor protection

Integrated overload protection, preceding motor protection device unnecessary (max. prefusing Technical details).

5.7 Analog input (0...10 V) for setting fan speed

The unit has an analog input 0...10 V for setting fan speed.

Connection "GW E1 Viive" / "GND" (Analog In 1).

Alternatively speed setting with a PWM-signal is possible.

**Attention!**

Ensure correct polarity!

Never apply line voltage to analog inputs!**Possibilities for speed setting**

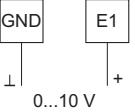
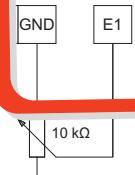
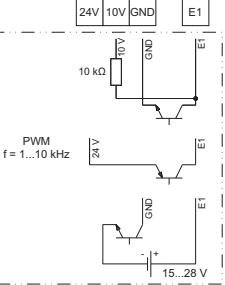
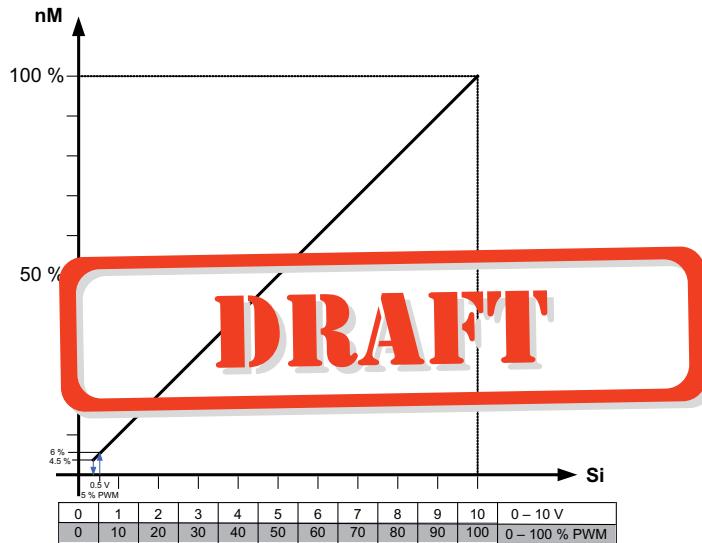
	<ul style="list-style-type: none"> Control via external setting signal 0...10 V By external wiring with a resistor (499 Ω / 0,25 W) between the terminals "E1" and "GND" parallel to the input signal, activation with a 0...20 mA signal is possible. The "AM-MODBUS" communication module enables a inverted set-point signals to be programmed (10...0 V).
	<ul style="list-style-type: none"> Speed setting by 10 kΩ potentiometer terminals "+10 V" and "E1".
	<ul style="list-style-type: none"> Control by external setting signal PWM (connection "24 V" only for motor sizes "D" and "G" available).

Diagram Setting signal and fan speed (Idealized principle diagram)



14.09.2011
v_nmotor@0_10v_pwm.vsd

nM Fan speed

100 % Rated Speed

6 % height of start speed

4.5 % height of stop speed

0.5 V / 5 % PWM value start analog input

Si Speed setting signal 0...10 V / 0...100 % PWM

5.8 Output voltage +10 V

Voltage supply e.g. for speed setting by external potentiometer.

Connection: "DC Out" - "GND" (I_{max} 10 mA).

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

5.9 Voltage supply for external devices, only motor sizes "D", "G" (+24 V, GND)

Integrated voltage supply for external devices. Terminals "+ 24 V" (see Technical data).

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

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

5.10 Enable, device ON / OFF (Digital In 1 = D1)

Electronic ON / OFF control via floating contact at terminals “D1” - “+24V” / “+10V”

- Device “ON” for closed contact.
- Device “OFF” with opened contact.

Relay “K1” remains energized, connections 11 - 14 bridged.
Status Out with flash code: 1 (☞ Diagnostics / Faults).



Attention!

- No disconnection (isolation) when turned off by remote, in accordance with VDE 0100.
- Never apply line voltage to the digital input!
- It is not permitted to connect inputs of several devices to each other!

DRAFT

5.11 Relay output (K1)

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

For operation the relay is energized, connections “11” and “14” are bridged. For fault the relay is de-energized (☞ Diagnostics / faults).

When switching off via enable (D1 = Digital In 1), the relay remains energized.

5.12 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 50V (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).

5.13 Add-on modules

The assembly instructions and/or operating instructions available here describe the “Basic Version”.

If required, an auxiliary module can be retrofitted to the designated slot for motor size “D”, “G”. The auxiliary module is installed automatically. Manual installation or parameterisation is not required!

The extended scope of function is specified in the documentation for the auxiliary module.

The range of additional modules is constantly being extended and adapted to market requirements. The currently available additional modules can be requested from Ziehl-Abegg.

Examples for currently available additional modules

Type	Part.-No.	Function
AM-MODBUS (for motor size "D" and "G")	349045	Communication module Over the "AM-MODBUS" module can be communicated with the controller of the fan. The module can be put in temporarily for programming of desired functions during start-up or for diagnostics. The connection to the control terminal is made by a connecting cable or wirelessly by means of radio. The module is left in the slot if it is to be integrated into a building automation system or to control several devices. The addressing of ECblue fans takes place automatically, i.e. it is not necessary to manually enter individual network addresses for each fan.
AM-PREMIUM (for motor size "D" and "G")	349046	Communication module When the "AM-PREMIUM" module is integrated into the controller in the fan is extended to become a full-grade multipurpose controller. The "Premium module" provides not only an integrated MODBUS interface, it also enables sensors to be connected straight to the fan. The module also comes with two analogue inputs and one analogue output.

6 Start-up

6.1 Prerequisites for commissioning

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.



Attention!

- **Check before first-time start-up:**

1. Installation and electrical connection have been properly completed?
 - Has any leftover installation material and other foreign material been removed from the fan housing?
 - That safety elements (e.g. safety chain) are mounted (EN ISO 13857)?
 - The impeller is mounted correctly?
 - Are the condensation water drains holes open and are they fully closed according to the suitable installation position?
6. Connection data complies with the specifications on the type plate?

- **Commissioning may only take place if all safety instructions have been checked and danger can be excluded.**

- Check the direction of rotation (☞ rotation direction arrow on the fan blade, impeller base plate or on the fan housing).
- Check for quiet, low vibration operation. Strong vibrations due to erratic operation (unbalanced), e.g. caused by transportation damage or improper use, can lead to failure.
- A-rated sound power levels of over 80 dB(A) are possible, see product catalogue.
- Check for mechanical vibrations after installation into the system. If the tolerances according to ISO 10816-1 are exceeded, it is possible to exclude certain speed ranges (☞ Motor Setup or add-on module).

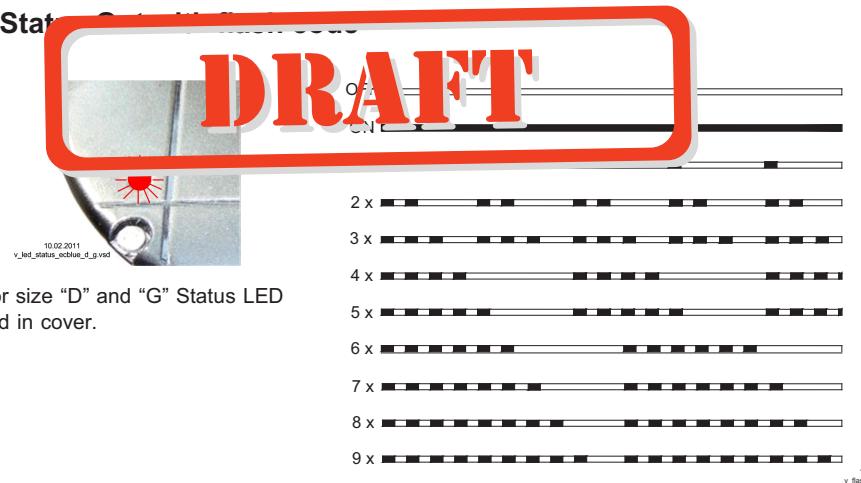
7 Diagnostics / Faults

7.1 Trouble shooting

Type of error	Possible cause	Remedial measures
Fan does not run (anymore)	Failure line voltage Failure of one phase Under - or overvoltage Earth fault	Check line voltage Check motor connection and line voltage
	Thermal motor protection has triggered (motor overheated)	Replace fan Check for free air passages; remove foreign bodies if necessary "Fan does not run"  Check temperature of supply air
	Impeller blocked or dirty	Check voltage - Switch off power to the motor and secure against switching back on - Check safe isolation from supply - Remove safety grille - Remove foreign bodies or soiling - Remount the safety grille - Further procedure as in the chapter "Start-up"
Fan will not start	Temperature too low for bearing grease	Insert bearing with cold greasing
	Air stream wrong direction (Motor turns in wrong direction at high speed)	Check air stream  "Behaviour in rotation by air current in reverse direction"
	 "Fan does not run"	
Fan turns too slowly	Impeller / blade scrapes / brushes	When indicated clear foreign bodies / dirt from the fan
	Active temperature management effective (Motor or electronics overheated)	Check for free air passages; remove foreign bodies if necessary  "Impeller blocked or dirty" Check temperature of supply air Check installation space (air speed over heat sink)
Air flow too low	Fan turns too slowly	 "Fan turns too slowly"
	Airways blocked	Check for free air passages (supply/exhaust air vents, filters)  "Impeller blocked or dirty"
	Pressure loss different to planned	Check fan selection
Vibrations	Imbalance	Check blades for damage, soiling or ice  "Impeller blocked or dirty"
	No or wrong vibration dampers (only in radial)	Install correct vibration dampers
Unusual noises	Bearing damaged / worn	Change bearings

Type of error	Possible cause	Remedial measures
	Impeller / blade scrapes / brushes	When indicated clear foreign bodies / dirt from the fan  "Impeller blocked or dirty"
	Operation beyond stall point (for axial fans)	Check for free air passages (supply/exhaust air vents, filters)
	Wrong overlap on nozzle (for centrifugal fans)	Observe the installation instructions

7.2 Status Codes



For motor size "D" and "G" Status LED integrated in cover.

LED Code	Relays K1*	Cause Explanation	Reaction of Controller Adjustment
OFF	de-energized, 11 - 14 interrupted	no line voltage	Line voltage available? Unit switch OFF and automatically ON when the voltage has been restored
ON	energized, 11 - 14 bridged	Normal operation without fault	
1 x	energized, 11 - 14 bridged	no enable = OFF Terminals "D1" - "24 V / 10 V" (Digital In 1) not bridged.	Switch OFF by external contact ( digital input).

LED Code	Relays K1*	Cause Explanation	Reaction of Controller Adjustment
2 x	energized, 11 - 14 bridged	<p>Active temperature management The device has an active temperature management to protect it from damage due to too high inside temperatures. In case of a temperature rise above the fixed limits, the modulation is reduced linearly. To prevent the complete system being switched off automatically, the device has a built-in safety function (see table below).</p> <p>missible for the controller) in case of active temperature management in order to prevent a fault message being issued with the following fault codes:</p> <p>DRAFT</p>	With a drop in temperature the modulation rises again linearly. Check cooling of the controller
3 x	de-energized, 11 - 14 interrupted	<p>HALL-IC</p> <p>Incorrect signal from the Hall-ICs, error in the commutation. Internal plug connection faulty.</p>	The EC-Controller switches the motor off. Automatic restart if no faults are recognised. Replace fan / motor
4 x	de-energized, 11 - 14 interrupted	<p>Line failure (only for 3 ~ types) 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. 200 ms). Only functioning with an adequate load for the controller.</p>	Following a shutoff, a startup attempt is made after approximately 15 seconds, if the voltage supply is high enough. This keeps occurring until all 3 supply phases are available again. Check power supply
5 x	de-energized, 11 - 14 interrupted	<p>Motor blocked If after 8 seconds of commutation no speed is measured > 0, the fault "Motor blocked" is released.</p>	EC-Controller switches off, renewed attempt to start after about 2.5 sec. Final shutoff, when fourth starting test fails. It is then necessary to have a reset by disconnecting the line voltage. Check if motor is freely rotatable.
6 x	de-energized, 11 - 14 interrupted	<p>IGBT Fault Short circuit to earth or short circuit of the motor winding.</p>	EC-Controller switches off, renewed attempt to start after about 60 sec. ☞ Code 9. Final shutoff, if - following a second starting test - a second fault detection is detected within a period of 60 seconds. It is then necessary to have a reset by disconnecting the line voltage.

LED Code	Relays K1*	Cause Explanation	Reaction of Controller Adjustment
7 x	de-energized, 11 - 14 interrupted	DC undervoltage If the DC-link voltage drops below a specified limit the device will switch off.	If the DC-link voltage rises above the limit within 75 seconds, then the controller will attempt to start. Should the DC-link voltage stay for more than 75 seconds below the limit, the device will switch off with a fault message.
8 x	energized, 11 - 14 interrupted	DC overvoltage above a specified limit the motor will stop. The device will then switch off with a fault message.	If the DC-link voltage drops below the limit within 75 seconds, then the controller will attempt to start. Should the DC-link voltage stay above the limit for more than 75 seconds, the device will switch off with a fault message.
9 x	energized, 11 - 14 bridged	IGBT cooling down period	IGBT cooling down period for approx. 60 sec. Final shutoff after 2 cooling-off intervals  Code 6.

* K1: programmed function at factory: Fault indication not inverted

7.3 Behaviour in rotation by air current in reverse direction

In the STOP state (no release, no preset signal, no voltage supply) the motor controller does not intervene when the fan turns in the wrong direction (e.g. due to a draught).

If the fan is started while being driven in the opposite direction to that set, the speed is reduced controlled to "0" and restarted in the set direction of rotation.

The higher the speed to be reduced, the longer this process lasts.

In cases in which the fan is driven very powerfully in the wrong direction, it may not be possible to start the fan with the set direction of rotation.



Information

- Do not switch off line voltage that the fan can start again!
- 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.

8 Service work

8.1 Repairs / maintenance



Attention!

- Allow maintenance work to be carried out by trained specialists only.
- Please observe the safety regulations and the worker's protection rules by all maintenance and service work (DIN EN 50 110, IEC 364).
- Before working on the fan, this must be disconnected from the power supply and secured against switching back on!
- **Keep the airways of the fan free - danger because of objects dropping out!**
- **No maintenance or cleaning of the fan!**
- Watch out for the fan's rotating direction!
- Depending on the application and the transfer medium the impeller has a natural wear. Deposits on the impeller can lead to imbalance and lead to damages (danger or endurance fracture). The impeller can disintegrate!
- Maintenance interval in accordance with the degree of contamination of the impeller!
- In case of imbalance: Rebalance the impeller.
- Check the impeller, in particular the weld-seams, for possible cracks.
- Repair, e.g. by welding is prohibited!
- The fan or motor is maintenance-free due to the use of ball bearings with "life-long lubrication". At the end of the grease life (☞ Technical Data) it is necessary to change the bearing. Please consult our Service Department in this case as for all other damage (e.g. to the coil or electronics).
- Bolted-on wheels and/or wings may only be replaced by authorised Ziehl-Abegg AG staff. The manufacturer shall not be liable for damage caused through improper repair work.
- Regular inspection, and cleaning is necessary to prevent imbalance due to ingress of dirt.

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8.2 Cleaning



Danger due to electric current

Voltage supply for motor must be interrupted and secured against restoration!



Attention!

- **Do not use any aggressive, paint solvent cleaning agents when cleaning.**
- **Cleaning with a water jet:**
 - Make sure that no water gets into the inside of the motor and electronics, note protection class (IP).
 - Do not hold the jet spray directly on the motor openings and seals.
 - During cleaning work using a jet spray, no guarantee is assumed regarding corrosion formation / paint adhesion for unpainted / painted fans.

- After the cleaning process, the fan must be operated for 30 minutes at 80 to 100 % of maximum speed for drying purposes!

9 Enclosure

9.1 Technical data

Line voltage*	AC: 1 ~ 200...277 V (+/- 10 %)	DC: 280...400 V (+/- 10 %)
(Rating-plug)	30/300 Hz	
	DC: 300...380 V (+/- 10 %), 50/60 Hz	DC: 280...380 V (+/- 10 %)
	DC: 300...380 V (+/- 10 %), 50/60 Hz	DC: 500...680 V (+/- 10 %)
	DC supply not UL approved!	
	Special version for IT-System (not UL approved!)	
Maximal line fuse	AC: 3 ~ 400 V (-15 up to +10 %), 50/60 Hz in TN-System or TT-System for this version	
Max. cut-in current	AC: 3 ~ 380...480 V (+/- 10 %), 50/60 Hz	
Max. load limit integral of cut-in current	1.22 A ² s	
Switching Freq.	16 kHz	
Input resistance for signal set for the rotational speed	R _i > 100 kΩ	
Specification speed setting signal PWM	Voltage: 15...28 VDC Switching Frequency: 1...10 kHz On-off ratio: 0...100 %	
Voltage supply for external devices	+ 10 V, I _{max} 10 mA (short-circuit-proof) +24 V ±20 %, I _{max} 70 mA (only for motor size "D", "G")	
Permissible minimal and maximal ambient temperature for operation	-25 °C...60 °C (up to 70 °C **) Please see the technical documentation of the product for the minimum and maximum ambient temperature valid for the respective fan; These may deviate from the specified permissible ambient temperatures. To avoid condensation the drive must be continuously energized due to the application of heat, with interruptions such that cooling to the point of condensation does not occur.	
Max. permissible installation height	height 1000 m amsl without derating	
Permissible rel. humidity	85 % no condensation	
Permissible temperature range for storage and transport	Motor size "D" and "G": -40...+80 °C	

Electromagnetic compatibility for the standard voltage 230 / 400 V according to IEC 60038	Interference emission EN 61000-6-3 (domestic household applications) By special version for IT-System according to EN 61000-6-4 (industrial applications)
	Interference immunity EN 61000-6-2 (industrial applications)
Harmonics current according	<p>For 1 ~ types Active power factor adjustment for sinusoidal input current (PFC = Power - Factor - controller), harmonic current in accordance with EN 61000-3-2 are guaranteed.</p> <p>For 3 ~ types EN 61000-3-2 for a "professional unit"</p>
Contact rating of the internal relay	<p>Please ask Ziehl-Abegg for the individual harmonic oscillation levels of the current as generated by the fundamental oscillation of the rated current.</p> <p>AC 250 V / 10 A</p>
Max. leakage current according to the defined networks of EN 60990	< 3.5 mA
dB(A) values	 product catalog
Ball bearings grease service-life	during standard usage ca. 30 - 40,000 h
Protection class of motor according to EN 60529	IP54

- * Regarding the mains connection, the devices are to be classified as category "C2" devices according to the relevant DIN EN 61800-2. The increased requirements placed on electrical interference for category "C1" devices are complied with in addition.
- ** In case of a temperature increase above the predetermined threshold values modulation is linearly reduced by active temperature management.

Authorization:	FILE No. E213826	UL 508c
		Power Conversion Equipment 62BN
Environment type rating: 3		

9.1.1 UL: Ratings and dimensions:

Model	input:	output:	Dimensions (Ø x length) [mm]
MK16-#I#.07.#A	3 x 380 - 480 Vac 2500 W, 4.0 - 3.2 A 50/60 Hz	2400 W / 16 kHz 4.7 A 460 Vac (rms)	200 x 167.7
MK116-#I#.11.#A			200 x 185.7
MK116-#I#.07.#B	3 x 200 - 240 Vac 2400 W, 6.0 A	2250 W / 16 kHz 7.7 A	200 x 167.7
MK116-#I#.11.#B		230 Vac (rms)	200 x 185.7
MK116-#I#.07.#C	1 x 200 - 277 Vac 1000 W, 3.7 A 50/60 Hz	920 W / 16 kHz 2.3 A 340 Vac (rms)	200 x 167.7
MK116-#I#.11.#C			200 x 185.7
MK152-#I#.11.#A	3 x 380 - 480 Vac 50/60 Hz	3950 W / 16 kHz 460 Vac (rms)	275 x 220.8
MK152-#I#.17.#A			275 x 249.8
MK152-#I#.11.#B	3 x 200 - 240 Vac 3800 W, 9.7 A 50/60 Hz	3600 W / 16 kHz 11.6 A 230 Vac (rms)	275 x 220.8
MK152-#I#.17.#B			275 x 249.8
MK116 ambient temperature: 40 °C			
MK152 ambient temperature: 50 °C			

Model	input:	output:	Dimensions (Ø x length) [mm]
MK116-#I#.07.#A	3 x 380 - 480 Vac 2500 W, 3.2 - 3.6 A 50/60 Hz	2350 W / 16 kHz 4.4 A 460 Vac (rms)	200 x 167.7
MK116-#I#.11.#A			200 x 185.7
MK116-#I#.07.#B	3 x 200 - 240 Vac 1420 W, 3.6 A 50/60 Hz	1360 W / 16 kHz 4.4 A	200 x 167.7
MK116-#I#.11.#B		230 Vac (rms)	200 x 185.7
MK116-#I#.07.#C	1 x 200 - 277 Vac 1000 W, 3.7 A 50/60 Hz	920 W / 16 kHz 2.3 A 340 Vac (rms)	200 x 167.7
MK116-#I#.11.#C			200 x 185.7
MK152-#I#.11.#A	3 x 380 - 480 Vac 4100 W, 6.6 - 5.2 A 50/60 Hz	3950 W / 16 kHz 7.2 A 460 Vac (rms)	275 x 220.8
MK152-#I#.17.#A			275 x 249.8
MK152-#I#.11.#B	3 x 200 - 240 Vac 2900 W, 7.4 A 50/60 Hz	2750 W / 16 kHz 8.9 A 230 Vac (rms)	275 x 220.8
MK152-#I#.17.#B			275 x 249.8
Ambient temperature: 60 °C			

Model	input:	output:	Dimensions (Ø x length) [mm]
MK116-#I#.07.#A	3 x 380 - 480 Vac 190 W, 0.24 A 50/60 Hz	180 W / 16 kHz 0.3 A 460 Vac (rms)	200 x 167.7 200 x 185.7
MK116-#I#.11.#A			
MK116-#I#.07.#B	3 x 380 - 240 Vac 95 W, 0.24A 50/60 Hz	90 W / 16 kHz 0.3 A 230 Vac (rms)	200 x 167.7 200 x 185.7
MK116-#I#.11.#B			
MK116-#I#.07.#C	1 x 200 - 277 Vac 135 W, 0.49 A 50/60 Hz	124 W / 16 kHz 0.31 A 460 Vac (rms)	200 x 167.7 200 x 185.7
MK116-#I#.11.#C			
MK152-#I#.11.#A	3 x 200 - 480 Vac 910 W, 2.3 A 50/60 Hz	870 W / 16 kHz 2.8 A 230 Vac (rms)	275 x 220.8 275 x 249.8
MK152-#I#.17.#A			
MK152-#I#.11.#D	3 x 200 - 240 Vac 910 W, 2.3 A 50/60 Hz	870 W / 16 kHz 2.8 A 230 Vac (rms)	275 x 220.8 275 x 249.8
MK152-#I#.17.#B			
Ambient temperature: 70 °C			

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#: Placeholder  Ziehl-Abegg Nomenclature

Power data of the motor in the fan standing nearby the above data on the rating-plate.
For further information to UL types  connection diagram.

9.1.2 UL: Overload protection

The integrated variable speed drives are equipped with a solid state motor overload protection and a solid state short circuit protection.

The solid state motor overload protection protects the motor under overload conditions by reducing current flow to the internal motor output terminals. This protection is achieved through algorithms based on I^2t of the current of the motor.

The overload protection circuitry is optimally configured to the specific motor and the specific final application of the integrated variable speed drive.

This is typically 100 % of the full-load current of the motor. Changing the settings of the solid state motor overload protection needs further discussion with Ziehl-Abegg AG. Changing the settings without written permission of Ziehl-Abegg AG is not allowed.

The solid state short circuit protection acts to suspend current flow to the internal motor output terminals upon sensing output current to the motor and bus voltage. The protection of the motor is comprised of hardware and firmware.

9.1.3 UL: Short Circuit Current Rating

The integrated variable speed drives are suitable to be used on a circuit capable of delivering no more than 100 kA RMS symmetrical. Details can be found in the following table.

The fusing for the short-circuit protection must comply with the requirements in UL248.

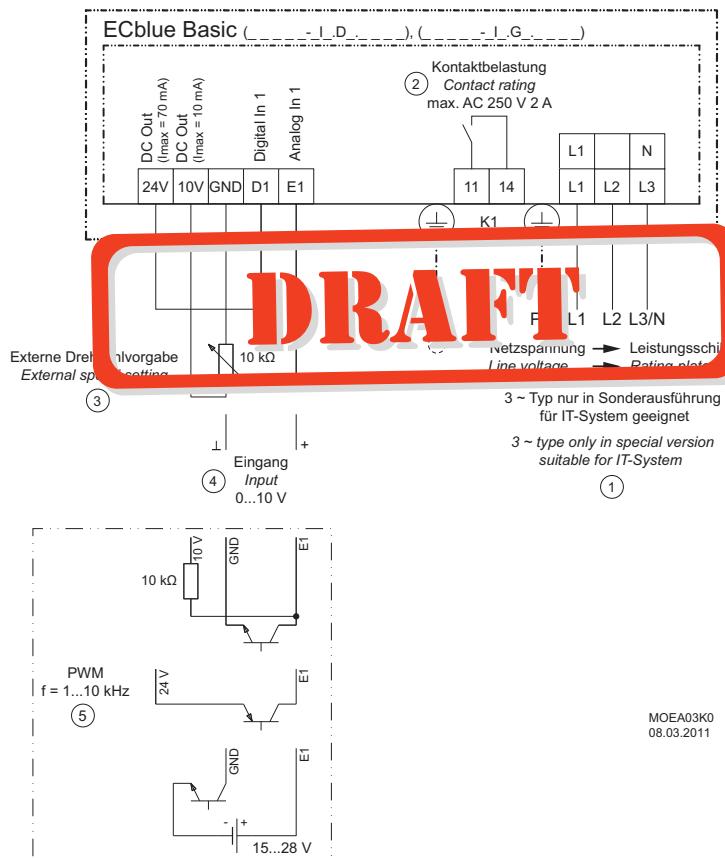
Tests were made with RK fuses without semiconductor protection:

Class fuses	Maximum AC Voltage	Rating of Fuse	used motor type
RK1		25 A / 300 V (e.g. Ferraz Shawmut / TR15R)	MK116- #I#.##.C
RK5	240 V	50 A / 300 V (e.g. Ferraz Shawmut / TR5R)	MK116- #I#.##.B
RK5	240 V	50 A / 250 V (e.g. Ferraz Shawmut / TR50R)	MK152- #I#.##.B
RK5	480 V	15 A / 600 V (e.g. Ferraz Shawmut / TR15R)	MK116- #I#.##.A
RK5	480 V	30 A / 600 V (e.g. Ferraz Shawmut / TR30R)	MK152- #I#.##.A

Integrated solid state short circuit protection does not provide branch circuit protection.

Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes, or the equivalent.

9.2 Connection diagram



- 1 Line voltage rating plate (3 ~ type only in special version suitable for IT-System)
- 2 Contact rating max. AC 250 V 2 A
- 3 External speed setting
- 4 Input 0...10 V
- 5 PWM input, $f = 1\ldots10\text{ kHz}$

UL: Input (Line)

- Cu connection leads with the following specifications must be employed:
 - Minimum insulation temperature of 80 °C
 - Terminal tightening torque for field block (L1, N, and/or L1, L2, L3) of 5 - 7 Lb In. (Exception: spring-cage terminal for motor size "G" @ line voltage 3 ~ 200...240 V)
 - Terminal tightening torque of 4.5 Lb In. for field block (K1)
 - terminal tightening torque of 4.5 Lb In. for all other field blocks
 - terminal tightening torque of 2.2 Lb In. for add-on modules

9.3

EC Declaration of Incorporation

as defined by the EC Machinery Directive 2006/42/EC,
Annex II B

ZA87-GB-12/09 Index 000
00296702-GB

The design of the incomplete machine:

- Axial fan FA.., FB.., FC.., FE.., FS.., FT.., FH.., FL.., FN.., VR.., VN..
- Centrifugal fan RA.., RD.., RE.., RF.., RG.., RH.., RK.., RM.., RR.., RZ.., GR.., ER..
- Cross-flow fan QK.., QR.., QT.., QD.., QG..

Motor type:

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- Induction internal or external rotor motor (also with integrated frequency inverter)
- Electronically commutated internal or external rotor motor (also with integrated EC controller)

complies with the requirements in Appendix I, Articles 1.1.2, 1.1.5, 1.4.1, 1.5.1 in EC Machinery Directive 2006/42/EC.

The manufacturer is the

Ziehl-Abegg AG

Heinz-Ziehl-Strasse

D-74653 Kuenzelsau

The following standards are applied:

EN 60204-1:2006 Safety of machinery; electrical equipment of machines; Part 1: General requirements

EN ISO 12100:2003 Safety of machinery; basic concepts, general principles for design

EN ISO 13857:2008 Safety of machinery; safety distances to prevent danger zones being reached by the upper limbs

Note: The maintenance of the EN ISO 13857:2008 relates only to the installed accidental contact protection, provided that it is part of the scope of delivery.

The specific technical documentation in accordance with Appendix VII B has been written and is available in its entirety.

The person authorised for compiling the specific technical documentation is: Dr. O. Sadi, address see above.

The specific documentation will be transmitted to the official authorities on justified request. The transmission can be electronic, on data carriers or on paper. All industrial property rights remain with the above-mentioned manufacturer.

It is prohibited to commission this incomplete machine until it has been secured that the machine into which it was incorporated complies with the stipulations of the EC Machinery Directive.

Künzelsau, 29-Dec-2009 Dr. O. Sadi - Technical Manager Ventilation Technology

i.V.



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9.5 Manufacturer reference

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

Ziehl-Abegg AG
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>

9.6 Service information

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

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

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

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