

ECblue

Motor size B (IP54)

EC-fans and motors with highest efficiency

Assembly instructions



Keep for reference!

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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 Validity

This document is valid for motors and fans of the ECblue series.

Motor size: B (90), protection class of motor IP54.

The used motor size is recognisable from the type designation (☞ rating plate).

Examples for type designations with motor size B = 90		
Motor type	Axial fans type	Centrifugal fans type
MK090 - _ I _ . _ _ _ _ _ _____	F _ _ _ _ _ I _ . B _ . _ _ _ _ _____	RH _ _ _ _ _ I _ . B _ . _ _ _ GR _ _ _ _ _ I _ . B _ . _ _ _ ER _ _ _ _ _ I _ . B _ . _ _ _ _____

In the case of fans with the quality mark (see rating plate), please note the related specifications depending on the application location!

1.2 Meaning of the assembly instructions

Read these assembly instructions carefully before installation and start-up.

Please note that these assembly instructions only apply to a specific product and not to the complete system!

These assembly instructions help you to work safely on and with the device in question. The document contains safety instructions that must be complied with as well as information that is essential for fault-free operation of the product.

The assembly instructions must be kept on the product. It must be ensured that all persons who have to perform activities on the product can consult the assembly instructions at any time.

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

1.3 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.

2 Safety instructions

2.1 Intended use



Danger!

- The fans are only intended for the conveyance of air or mixtures similar to air.
- 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.
- Built-in fans with VDE approval (see rating plate) are designed to be installed inside devices and are not suitable for the direct mains connection.
- 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 areas at risk of explosion for conveying gas, mist, vapours or mixtures of the above.
- Transfer of solids or solids content in the transfer medium.
- Operation with iced up impellers.
- Conveyance of abrasive or adhesive media.
- Conveyance of liquid media.
- Operation of plug fans outside devices.
- Connect built-in fans to open flue pipes of gas and other firing devices.
- Use of the fan and add-on parts (e.g. guard grille) as a resting surface or climbing aid.
 - Fans are not designed for walking on even with an additive diffuser attachment (retrofit kit)! Do not climb onto fans without suitable aids.
- Unauthorised constructional modifications to the fan.
- Operation of the fan as a safety component or for the performance of safety-relevant functions in the sense of EN ISO 13849-1.
- Blocking or braking of the fan by inserting objects.
- Use with direct contact with foodstuffs or cosmetic and pharmaceutical products.
- Use of the fan as an independent household appliance.
- Use as a fire gas or smoke extraction fan (special application according to DIN EN 12101-3).
- Use with vibration loading by customer device. Resonant operation and operation with severe vibrations or oscillation.
- Loosening of fan blade, impeller, motor suspension and balancing weight.
- All applications not listed in the intended use.



Danger!

Not the manufacturer, rather the operator of the device 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.

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

2.4 Product safety

Only install and operate the product and its accessories in perfect condition and in compliance with the instructions. Operation outside of the technical specifications of the product, see rating plate and appendix/technical data, may lead to a defect and cause further damage!



Information

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 product fails. Substitute operation must be taken into consideration! The local provisions and regulations must be observed when planning and constructing the system.

2.5 Requirements placed on the personnel / due diligence

Persons entrusted with any planning, installation, start-up, maintenance and servicing in connection with the product must have the corresponding qualifications and skills for their job. In addition, they must be knowledgeable about the safety rules, directives, accident prevention regulations and the corresponding national, regional and in-house regulations. Personnel undergoing training, instruction, or on apprenticeship may only work on the product under the supervision of an experienced person. This also applies to personnel in general training. The legal minimum age 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!
- Only remove the lid from the terminal compartment (available depending on the model) with the line voltage switched off!
- Opening of the base lid is prohibited. Loosening the safety screws will void the guarantee!
 - Protection class of the device when complete open is IP00! It is possible to touch hazardous voltages directly.
 - Through use of capacitors, danger of death exists even after switching off the device!
- 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 motor/fan must be installed so that it is not touchable.
- 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 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.
- Maintenance work may only be carried out by suitably qualified personnel.



Attention, automatic restart!

- The motor may switch on and off automatically for functional reasons.
- Automatically restart after a power failure or mains disconnection!
- Wait until the motor has stopped before approaching.
- The exterior rotor turns during operation of the external rotor motor!



Danger of being sucked in!

Do not wear loose or hanging clothing, jewellery, etc., tie together long hair and cover it.



Attention, hot surface!

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

2.7 Modifications / interventions in the device



Danger!

For safety reasons, no unauthorised interventions or modifications may be made to the product. All planned modifications must be authorised by the manufacturer in writing.

Use only genuine spare parts/ genuine wearing parts and genuine accessories from ZIEHL-ABEGG. These parts are designed especially for the product. Parts acquired from other sources are not guaranteed to be designed and produced in accordance with the load and safety specifications.

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 product is operated in perfect working order only.
- The product may only be used for the intended purpose.
- You must periodically examine the safety equipment for their properly functioning condition.
- The assembly instructions and/or operating instructions must always be kept available at the place of use of the product in a 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.
- No safety and warning notices attached to the product may be removed and must 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 Area of application/Notes on use

Rather than being ready-to-use products, the fans/motors are designed as components for refrigeration, air conditioning, ventilation and venting systems and similar (see type designation on rating plate).

The fans may not be operated until they are installed in line with their intended use. The supplied and certified guard grille of ZIEHL-ABEGG fans is designed in accordance with DIN EN ISO 13857 Table 4 (from the age of 14 up). In the event of deviations, further structural protective measures must be taken for safe operation.

- Any use below -10 °C is dependent on not being subjected to unusual, sudden or mechanical loads or stresses on the material (see minimal permissible ambient temperature).
- Corrosion is possible at the cutting edges on sendzimir galvanised parts.



Danger!

If the motor/fan is used in applications where a ignitable atmosphere can form in the event of a fault, e.g. due to leakage, the user must assess the risks of ignition and take appropriate precautions to prevent ignition.

3.2 Functional description

ECblue stands for EC fans and motors with maximum efficiency. Highly efficient, electronically commutated 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 EN 61800-2 for adjustable speed electrical power systems and is intended for one-quadrant drives.

3.3 Temperature management

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 power electronics protects itself against excessive temperatures by active temperature management (power reduction).

However, this cannot provide complete protection in all circumstances. Observe the rated data - particularly the maximum permitted ambient temperature - on the rating plate.

3.4 Note on the ErP directive

ZIEHL-ABEGG SE wishes to point out that, based on the directive (EU) no. 327/2011 of the Commission of 30th of March 2011 for enforcing directive 2009/125/EC (hereinafter referred to as ErP directive), the operational area of certain fans within the EU is bound by certain prerequisites. The fan may only be used within the EU when it meets the requirements of the ErP directive. If the said fan does not have a CE mark (cf. especially the rating plate), use of this product within the EU is not admissible.

All ErP-relevant information comprises measurements which are determined using a standardised measurement set-up. More details can be obtained from the manufacturer.

Further information about the ErP directive (Energy related Products-Directive) can be found on www.ziehl-abegg.de search key: "ErP".

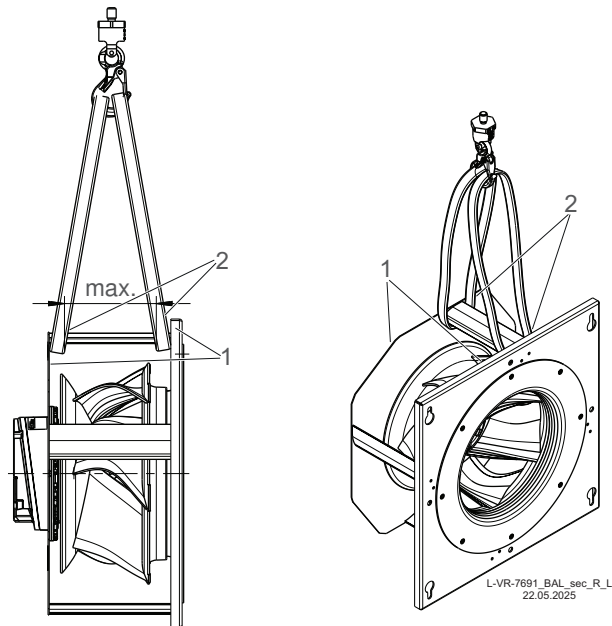
3.5 Transport, storage



Danger!

- Observe the weight specifications (see rating plate) and the permissible carrying loads of the means of transport.
 - Wear safety clothing / shoes and cut-resistant safety gloves when handling!
 - 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 transport the product by the connecting cable.
 - Avoid shocks and impacts to the device during the transport.
 - Avoid extreme humidity, heat or exposure to cold (see technical data).
 - Watch out for possible damage to the packaging or fan.
 - Secure pallets during transport.
 - Do not stack pallets.
 - Check the total weight and select the legally prescribed lifting gear.
 - 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.
-
- 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.
 - Avoid prolonged storage; we recommend a maximum of one year (consult the manufacturer before starting if stored for longer).
 - Inspect the bearing for proper operation prior to installation.
 - Recommendation: Turn the impeller evenly by hand to avoid jamming and damaging the bearing.
 - Transport the fan(s) either in the original packaging or, in the case of larger fans, on the dedicated transportation fixtures.
 - axial fans: holes drilled in support arms, wall ring plates and motor block
 - centrifugal fans depending on type: holes drilled in the housing flange, motor block, fastening brackets and support plates,
 - Radial impellers, fans with scroll RG.., RD.. or built-in fans type ER../GR.., WR.. are generally delivered on europallets, and can be transported using lift trucks.
 - The chain/rope may not touch the impeller and the possibly mounted frequency inverter when lifting with the lifting beam, otherwise damage is possible.
 - Lift the fan out of the packaging with a lifting gear (lifting beam). Attachment points are solely the holes on the housing flange, motor bed, support plate, motor suspensions, fastening brackets and any crane eyes of the fan (depending on the design of the fan).
 - **Design RG.. / RD.. / ER.. / GR../WR../HR..:** Fan unit may only be lifted and transported when using a suitable hoisting device(load spreader). Ensure sufficient cable or chain length.
 - Design WR: lifting several fan units mounted on top of one another or next one other is not permitted!

- **Design FV.. / DN..:** The fan must be fastened to 4 points during transport so the flanges do not warp.
- **ZApilotXL design:** Lift **ONLY** with rope slings (2) moved as far as possible towards the support plates (1). **DO NOT** lift with just one rope sling.



3.6 Disposal



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



Danger!

- Mounting is only to be undertaken 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 (EN ISO12100 / 13857).
- Check the fan for damage, e.g. cracks, dents or damage to the electric cables, before assembly. Start-up is not allowed in the case of transport damage!
- Wear safety clothing / shoes and cut-resistant safety gloves when handling!
- Observe the instructions in the Transport and Storage chapter for information on removal from the packaging and handling.
- The custom designs must suit the prevailing conditions.
- Take into account easy access for cleaning and maintaining the fan.
- Before installing the fan, make sure the safety distances are maintained compliant with EN ISO 13857 or in household equipment according to EN 60335
 - If the mounting height (danger area) above the reference plane is greater than or equal to 2700 mm and is not reduced by auxiliary means such as chairs, ladders, working platforms or floor space on vehicles, a guard grille is not necessary on 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 EN ISO 13857.
- Tighten the fastenings with the specified torques.
- Drilling chips, screws and other foreign bodies must not be located inside the device! Before the first switch-on, remove any items that may be present (drilling chips, screws and other foreign objects) from the intake area - risk of injury from any objects that may fly out!
- For fans, the alignment must be adhered to during operation, e.g. if this is indicated by "Oben/Top".



⚠ WARNING

Parts of the rotor or the entire rotor coming loose in case of a fault (e.g. excessive vibrations) can result in personal injury and material damage.

- ▷ Use guard grilles or suitable design measures for critical applications (e.g. refrigerating systems with refrigerant subject to the ordinance on hazardous substances).

4.2 Connecting lead, position terminal compartment



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.

In vertical mounting (installation position "H" = motor shaft horizontal), install the fan for protection against penetrating moisture with the terminal compartment vertically downwards (up to max. 30° lateral inclination).

Optimum heat dissipation of the power loss resulting in the device is achieved in this position (☞ Diagnostic/ Faults / Temperature Management).

4.3 Version with separate junction box

For products supplied by ZIEHL-ABEGG with a separate junction box, note the following information.



1	Separate junction box made of plastic or metal		
	Lid screws		
2	Tightening torque: Plastic box 1.3 Nm/12 Lb In, metal box 2.6 Nm/23 Lb In		
3	Cable glands (see table below)		
4	Screw plugs, plastic/brass		
	Tightening torque: 2.5 Nm/22 Lb In		
Cable glands			
Thread size	Material	Tightening torques M _A	
M12x1.5	Plastic	1.5 Nm	13 Lb In
	Brass	4 Nm	35 Lb In
M16x1.5	Plastic	2.5 Nm	22 Lb In
	Brass	5 Nm	44 Lb In
M20x1.5	Plastic	4 Nm	35 Lb In
	Brass	6.5 Nm	58 Lb In
M25x1.5	Plastic	6.5 Nm	58 Lb In
	Brass	6.5 Nm	58 Lb In
M32x1.5	Plastic	6.5 Nm	58 Lb In

4.4 Assembly in a humid atmosphere



Information
If the device is not in use for longer periods in a humid atmosphere, it is recommended to operate the motor/fan for at least 2 hours every month at 80-100 % of maximum speed to remove any moisture that has penetrated inside.

4.5 Motorheating

A continuous power supply is required for safe operation down to the minimum permitted ambient temperature (see technical data).
If the motor is not operated with an existing power supply (no setting signal, switch off by enable), the motor heating switches on automatically at a controller inside temperature of -19 °C and back off when heated up to -15 °C.
Heating takes place via the motor winding whereby a current is induced which cannot cause rotation.

4.6 Installation of axial fans

4.6.1 Fans design 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 EN ISO 4014 and provide with suitable screw locking.

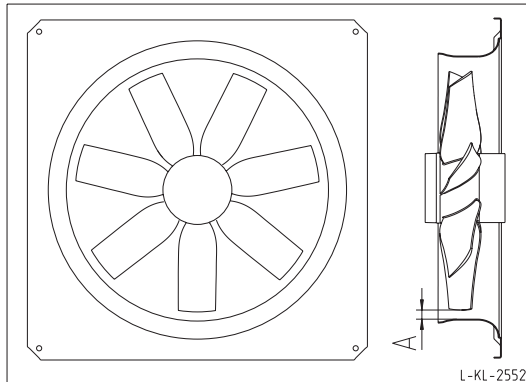
Permissible tightening torques M_A		
Thread size	M6	M8
Property class 8.8, friction coefficient $\mu_{ges} = 0.12$	9.5 Nm	23 Nm
Stainless steel A2-70, friction coefficient $\mu_{ges} = 0.12$	7 Nm	17 Nm
Screw penetration	$\geq 1.5 \times d$	$\geq 1.5 \times d$

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.
- An excess screw length of max. 3 mm is permissible.
- Every screwing case is different. The tightening torque adapted to it must be determined by the appropriate screw tests.
- In the case of a vertical motor axis, the respective lower drain hole must be open.
- Secure fan connection cable with cable fasteners or cable clips.



A minimum head gap "A" of 2.5 mm in all installation positions but especially in installation position "H" (horizontal motor shaft) is necessary. Distortion due to uneven surface may lead to fan failure due to brushing against the fan wheel.



Danger!

Avoid structural damage or stress with installation. Make sure the surface is flat and even.

4.6.2 Fans with wall ring plate and plastic housing

Procedure:

- Turn the rotor by hand and check for smooth action.
- The screw connection of plastic nozzles should be carried out with the largest possible contact surfaces and, if necessary, reduced tightening torques.
- If there is a cable cover, secure it against loss with 2 cable ties after connecting the motor.

Material	Diameter through hole	Thread size	Tightening torques M_A for property class 8.8, friction coefficient $\mu_{ges} = 0.12$
Plastic wall ring plate	8.4 - 10 mm	M8	10 Nm
	10.5 - 12 mm	M10	21 Nm
Plastic type ZAplus Type: SG., ZC., ZG., ZN., ZF..	8.4 - 10 mm	M8	12 Nm
	10.5 - 12 mm	M10	24 Nm
	13 - 14.5 mm	M12	40 Nm

Tightening torque guard grille fitting: 6 Nm



Information

- Since the concrete bolt or screw varies by customer unit, these recommendations must be checked for each respective situation.
- For design Q with a square rear wall removal of this square plastic plate is prohibited.

4.7 Mounting of centrifugal fans

4.7.1 Mounting of centrifugal fans design RE, RH, RM, RZ

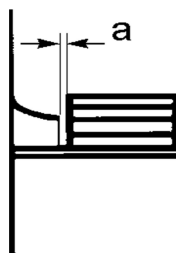
For attachment to fixed motor flange use screws with property class 8.8 to EN ISO 4014 and provide with suitable screw locking.

Permissible tightening torques M_A		
Motor size	B+D	G
Thread size	M8	M10
Property class 8.8, friction coefficient $\mu_{ges} = 0.12$	23 Nm	40 Nm
Screw penetration	$\geq 1.5 \times d$	$\geq 1.5 \times d$

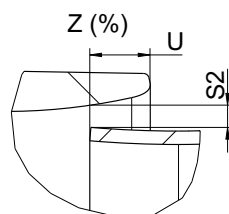
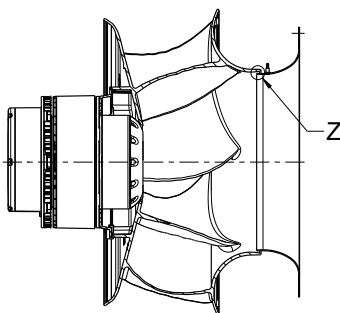
When using screws with different friction values or strength classes, different tightening torques may be necessary.

Attachment to motor fan wheel mounting according to device manufacturer's specifications.

- 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.
- In the case of a vertical motor axis, the respective lower drain hole must be open.



Ensure an even gap (a) see illustration. Distortion due to uneven surface may lead to fan failure due to impeller stripping.



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Align the inlet nozzle centrally to the impeller and maintain an even gap all the way around (S2).
Ensure that the coverage (U) is as specified in the dimension sheet.

4.7.2 Mounting of centrifugal fans design RG.. / RD..

Fastening depending on housing design on flange or fastening brackets.

**Information**

An additional bracket is required for fastening to the flange. This is available as an accessory.

**Danger!**

- Avoid structural damage or stress with installation. Flange and mounting bracket must be fixed flat on a level surface.
- Provide screwed connections with suitable screw locking.

4.7.3 Erecting the equipment: Design ER.. / GR.. / WR..

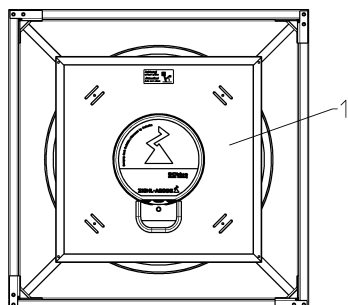
- To avoid the transference of disruptive vibrations, we recommend de-coupling the entire plug fan to avoid sounds transmitted through solids. (Spring and/or attenuation units are not a constituent part of the standard scope of delivery). Look at our catalogue for positioning the decoupling elements or request a dimensions sheet stating the type designation and Part.-No.
- 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 stopped in a moist environment. Avoid corrosion by suitable protective measures. Roofing is required.
- In the case of a vertical motor axis, the respective lower drain hole (if available) must be open.
- The GR design in position "H" (horizontal shaft) should be installed in the preferred direction. The cable guides should point downwards (angled sideways by approx. 30°). This is indicated by the "OBEN/TOP" warning sign on the device.
- Design ER.. / WR.. is only permissible with horizontal motor shaft.

**Danger!**

- All contact points must be fixed securely. If the fixing is inadequate there is a risk of the fan overturning.
- Making your own alterations/conversions on the fan module is unacceptable - safety risk.

Design WR: maximum permissible number for installing several fan units on top of one another

WR module size	External dimensions [mm]	Permissible number
1	607 x 607	5
2	760 x 760	5
3	912 x 912	5

Example for version with Optimizer

1 Optimizer

The Optimizer can be removed temporarily for better accessibility (e.g. for laying of cables or cleaning).

Depending on the version, the Optimizer is engaged or attached to the ventilation module with screws (tightening torque 5.4 Nm).

L-KL-3632 / 01.02.2017

**Danger!**

An external mechanical stress on the Optimizer, e.g. by holding on to it or attaching assembly elements is not permitted.

4.7.4 Installation distances for RH../ER../GR.. fans

Explanation

- For efficient operation of free running fans, the suction side clearance in front of the inlet nozzle and the pressure side clearance after the inlet nozzle are essential, see the following figures. Correct functioning of the fan is only guaranteed if the specified minimum clearances are observed.
- All specifications relate to a single fan. If several fans are operated in parallel, e.g. in a fan wall, observe the technical information L-TI-0632.
- The clearances are defined based on a factor and the fan size in mm, see rating plate.
- If the absolute allowed minimum clearance is not reached, the responsibility for safe operation lies with the planner and design engineer of the system.
- In installed state, it is advisable to use an inlet guide grille **ZAflow**.

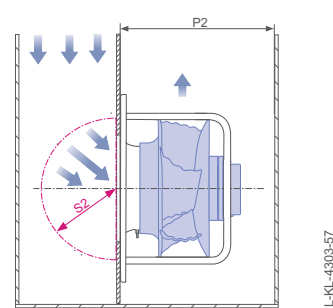
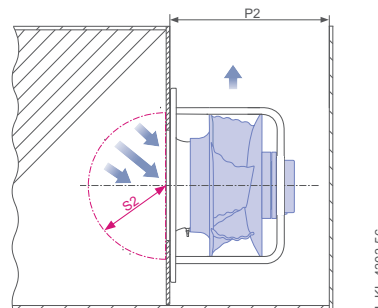
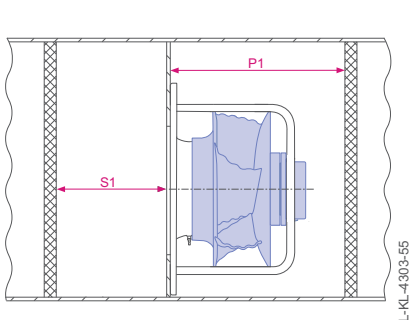
4.7.4.1 Clearances suction side S1, S2 and clearances pressure side P1, P2

Possible inflow and outflow

- Inflow suction side axial
- Outflow pressure side axial

- Inflow suction side directly before inlet nozzle radially deflected
- Outflow pressure side radially deflected

- Inflow suction side radially deflected
- Outflow pressure side radially deflected



S1 Clearance of suction-side components in the channel

S2 Radius of suction-side inflow area with radially deflected inflow in the channel

P1 Clearance of pressure-side components in the channel

P2 Clearance between the outflow area with a pressure-side channel deflection directly on the fan

Factors for determining the clearance specifications in mm

Clearance specifications Fan size x Factor	Evaluation	ZABluefin		C- / Cpro		ZAvblue2		ZAvblue		Vpro	
		s1	s2	s1	s2	s1	s2	s1	s2	s1	s2
		p1	p2	p1	p2	p1	p2	p1	p2	p1	p2
Recommended clearance	+++	1.00	1.30	1.00	1.20	1.00	1.40	1.00	1.30	1.00	1.20
		1.55	2.00	1.60	2.00	1.55	2.00	1.60	2.00	1.65	2.00
Minimum clearance with ZAflow	++	0.80	0.70	0.70	0.70	0.85	0.70	0.80	0.70	0.70	0.70
		--	--	--	--	--	--	--	--	--	--
Minimum clearance with other control devices	+	0.80	0.90	0.70	0.80	0.85	1.00	0.80	0.90	0.70	0.80
		--	--	--	--	--	--	--	--	--	--
Absolute minimum clearance	0	0.60	0.70	0.50	0.70	0.65	0.80	0.60	0.70	0.50	0.70
Must NOT be undershot!		1.35	1.50	1.40	1.50	1.35	1.50	1.40	1.50	1.45	1.50

s1, s2, p1, p2 Factors for calculating S1,S2, P1 ,P2

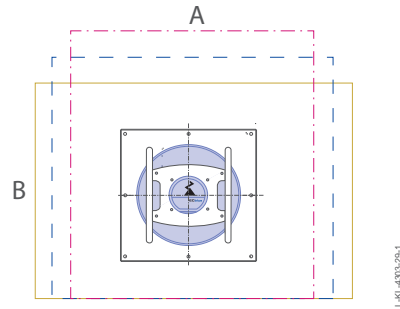
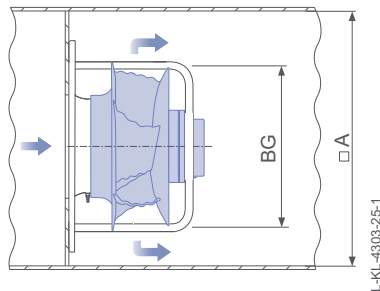
Example:

- ZAbbluefin, Type GR56I-____.____.____, Fan size 560
 - ▷ Recommended clearance S1 with suction side axial inflow = fan size x factor s1
 - ▷ **S1 = 560 mm x 1.00 = 560 mm**

4.7.4.2 Wall clearance □A pressure side

Size and housing wall clearance

Housing versions



BG Fan size

A Housing width

B Housing height

A □ Mean wall clearance pressure side = (A + B) / 2

- For a square housing with the same height and width, the specification □A corresponds to the side length A or B.
- For a rectangular housing, form the mean value of the side lengths: $\square A = (A + B) / 2$
 - minimum permissible length of the shorter side $\geq$ fan size x factor absolute minimum clearance

Factors for □A for determining the clearance specifications in mm

Clearance specifications Fan size x Factor	Evaluation	ZAbbluefin ZAvblue2 RH, GR, ER	C- / Cpro Vpro RH, GR, ER	ZAvblue RH, GR	Highly efficient HR	ZApilot ZApilotXL GR
Recommended clearance	+++	1.70	1.80	1.70	2.10	1.90
Critical dimension	+	< 1.55	< 1.60	< 1.55	< 1.95	< 1.75
Absolute minimum clearance* Must NOT be under-shot!	0	1.40	1.40	1.40	1.80	1.60

* If this value is undershot, the planner and design engineer of the system are responsible for safe operation

Examples:

- ZAbbluefin, Type GR56I-____.____.____, Fan size 560
- Recommended clearance $\square A$ = Fan size x factor = 560 x 1.7
 - ▷ $\square A = 560 \text{ mm} \times 1.7 = \mathbf{952 \text{ mm}}$
- Square housing
 - ▷ 952 mm $\hat{=}$ Side lengths A+B
- Rectangular housing with one housing width A = 1100 mm
 - ▷ Recommended housing height B = (2 x $\square A$) - A
 - ▷ B = (952 mm x 2) - 1100 mm = 804 mm
 - ▷ Minimum housing height B = Fan size x factor absolute minimum clearance
 - ▷ B = 560 mm x 1.4 = 784 mm

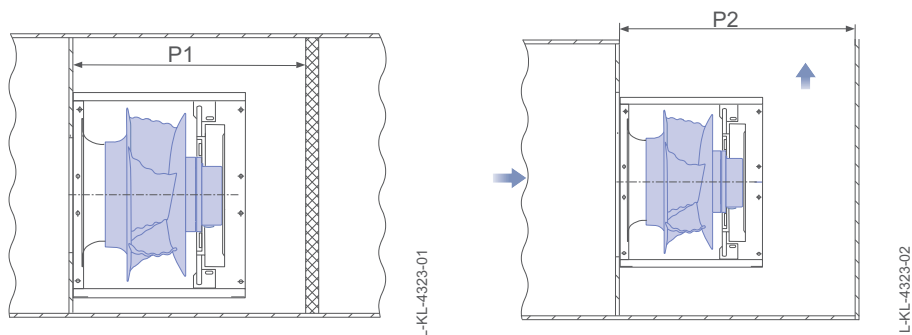
4.7.5 Installation clearances for WR. Fans

Explanation

- The front, i.e. the circumferential frame of the square WR. Use the module as a reference plane.
- All specifications relate to a single fan. For a fan wall, i.e. for parallel operation of several fans, refer to the technical information L-TI-0632.
- The clearances are defined based on a factor and the fan size in mm, see rating plate.
 - For the suction side inflow deflected axial or radially, observe the clearance specifications in the previous chapter, see: Optimum installation clearances for RH.. / ER.. / GR.. Fans.
 - For the pressure-side outflow, either axially or radially, the stipulated specifications must be observed.
- If the absolute allowed minimum clearance is not reached, the responsibility for safe operation lies with the planner and design engineer of the system.

Possible inflow and outflow

- Inflow suction side axial
- Outflow pressure side axial
- Inflow suction side axial
- Outflow pressure side radially deflected



P1 Clearance of pressure-side components in the channel

P2 Clearance between the outflow area with a pressure-side channel deflection directly on the fan

Factors for P1 and P2 for determining the clearance specifications in mm for ZAcube WR

BG 315		BG 355		BG 400		BG 450		BG 500		BG 560	
0	+++	0	+++	0	+++	0	+++	0	+++	0	+++
2.00	2.30	1.90	2.20	2.00	2.30	1.80	2.10	1.70	2.00	1.50	1.80

BG Fan size

+++ Recommended clearance

0 Absolute minimum clearance, must NOT be undershot!

Examples:

- ZAcube, type WR56I-____, fan size 560
 - ▷ Recommended clearance P1 with pressure side axial outflow = fan size x factor +++
 - ▷ **P1 = 560 mm x 1.80 = 1008 mm**
- ZAcube type WR40I-____, fan size 400
 - ▷ Absolute minimum clearance P2 for pressure side outflow radially deflected = Fan size x factor 0
 - ▷ **P2 = 400 mm x 2.00 = 800 mm**

4.8 Mounting the motor

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.
- 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.

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

- During assembly of the fan impellers or other components, no inadmissible force may be applied to the motor bearing.
- Centre the fan impeller accurately and mount without tension on the rotor flange, the fan wheel must lie flat.
- 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 rotor 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	
Thread size	M6
Property class 8.8, friction coefficient $\mu_{ges} = 0.12$	9.5 Nm
Screw penetration	$\geq 1.0 \times d$
Max. permissible screw overhang	1.0 mm

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.
- Cable glands made out of metal are not allowed in plastic terminal boxes due to lack of potential equalisation.
- Other measures may be necessary to achieve safe electrical isolation.
- Connect the fan only to electrical circuits that can be disconnected with an all-pole isolating switch.
- Operating the device with the housing cover removed is prohibited because energized, exposed parts are present inside the device. Disregarding this regulation can lead to severe personal injury.
- The final application must ensure that the fundamental health and safety requirements are met.
- The device owner is responsible for the EMC of the entire plant according to the locally applicable standards.
- Electrical equipment must be checked regularly: Loose connections are to be re-tightened and damaged cables must be replaced immediately.

5.2 Version without connection cables



- 1 Cover for terminal compartment
- 2 Cable glands (2 x M16x1.5)
seal insert with two holes 5 mm for two cables applicable if necessary
- 3 Do not loosen the safety screws from the housing!
- 4 Connection control system
- 5 Connection alarm relay and voltage supply
- 6 Status LED

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v_anchluss_ecblue_B.vsd

Procedure:

1. Remove the cover from the terminal compartment for the connection.
2. Both cable entry points are in a sealed condition at delivery.
 - Turn in cable gland until seal breaks.
 - Unused entry points must be sealed!
3. Insert and connect cables properly and ensure tightness of the cable glands.
4. Attach connection cover again carefully in correct position before start-up.



Information

The seal of the end cap can adopt the contour of the housing in time.
Therefore mount the cover on the same motor that it was removed from to achieve maximum tightness.



Danger!

- 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.
- Only use lines which can guarantee a permanent seal around the cable glands (pressure-resistant, dimensionally-stable, round-centred jacket; e.g. by means of gusset filling)! Lines with filling fleece are not permissible because moisture can penetrate due to the capillary effect!
- Two lines may only be fed through one cable gland with a sealing insert for two lines.
- When using the seal insert for two cables it is not permissible to use the corresponding cable gland with only one cable.
- Make absolutely sure that different connections do not come into contact (e.g. by splaying or loose connecting wires).
- Remnants from installation and foreign object may not remain on the inside!

Connection data of terminals

Terminal	Line, relay	modulation
Stripping length	10 mm	10 mm
Conductor cross-section rigid min.	0.2 mm ²	0.2 mm ²
Conductor cross-section rigid max.	4 mm ²	1,5 mm ²
Conductor cross-section flexible min.	0.2 mm ²	0.2 mm ²
Conductor cross-section flexible max.	2.5 mm ²	1,5 mm ²
Conductor cross section flexible with wire end ferrule without plastic sleeve min.	0.25 mm ² (stripping length 8 mm)	0.25 mm ² (stripping length 8 mm)
Conductor cross section flexible with wire end ferrule without plastic sleeve max.	2.5 mm ² (stripping length 8 mm)	1.5 mm ² (stripping length 8 mm)
Conductor cross section flexible with wire end ferrule with plastic sleeve min.	0.25 mm ² (stripping length 8 mm)	0.25 mm ² (stripping length 8 mm)
Conductor cross section flexible with wire end ferrule with plastic sleeve max.	1.5 mm ² (stripping length 8 mm)	0.75 mm ² (stripping length 8 mm)
Conductor cross-section AWG/kcmil min.	24	24
Conductor cross-section AWG/kcmil max.	12	16
The data refer to the connection possibilities of the terminals. The necessary conductor cross section must be dimensioned according to the respective prevailing conditions.		

Push-In Terminals



Rigid conductors and conductors with wire end ferrules can be plugged directly into the terminal without tools.

Permissible tightening torques M_A

	Thread size	Tightening torque M_A		Remark
		[Nm]	[Lb In]	
Cable glands	M16x1.5	2.5	22	Sealing area for cable diameter 4...10 mm
Cover for terminal compartment *	4.0	2.5	22	

* Recommended tightening speed maximum 400 min⁻¹

5.3 Version with connection cables



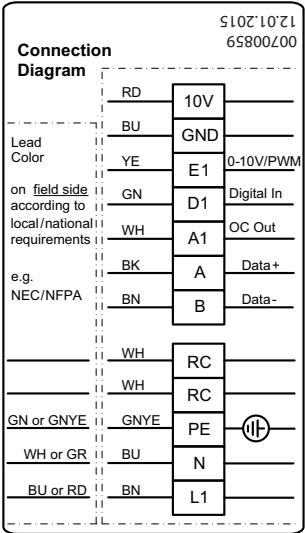
Information

- In versions with connecting leads the connection is made to the colour coded wires. Note the cable bands on the connecting leads and the respective connection diagram.
- The type, length, colour coding and connection assignment of the connecting leads may vary depending on the version.
- Read the following chapter “Version without connection cables” for a new connection to the terminals in the terminal compartment.

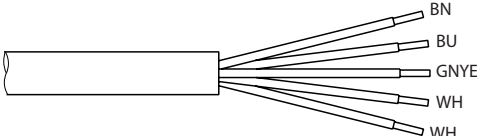
Examples

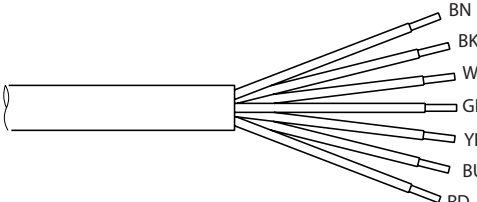


Do not loosen the safety screws from the housing!



The bands around the cables show national colour codes which may be available on the field side.

For line and relay: hose cable 5 x 1.0 mm ² (18 AWG) comparable LiYY-JB			
 length approx. 0.6 m *	brown	L1	Voltage supply
	blue	N	
	green-yellow	PE	
	White	11	Relay
	White	14	K1

For control: hose cable 7 x 0.34 mm ² (22 AWG) comparable LiYY-OB			
 length approx. 0.6 m *	brown	B (D-)	MODBUS (RS-485)
	black	A (D+)	MODBUS (RS-485)
	White	A1	OC Out Status (Tacho)
	green	D1	Digital In 1
	yellow	E1	Analog In 1
	blue	GND	
	red	10V	DC Out

* The lead length can vary according to the version.

5.4 Version with connection via M12 connector



Information

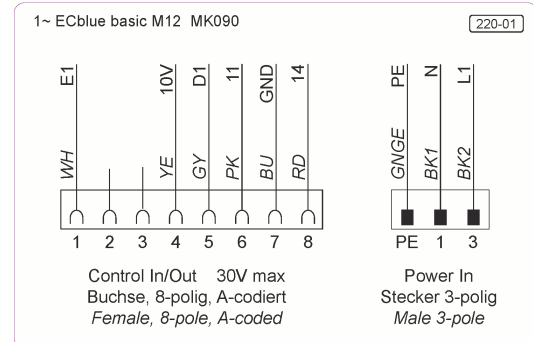
- When assembling the connecting cables with M12 connectors, refer to the connection diagrams with pin assignment supplied and the connection diagram contained in the instructions.
- The type, count, coding and pin assignment of the plug connections may vary depending on the version.
- Tighten the ring nut on the side of the connecting cable hand tight to lock the plug connection.
- **It is not necessary to remove the lid for the connection.**

Examples



- 07.06.2021
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- 1 Mains voltage
2 modulation

Pin assignment of plug connections



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

5.6 Voltage supply

5.6.1 Mains voltage



Danger due to electric current

- It must be strictly observed that the line voltage complies with specified on the rating plate and lies within the allowable tolerance specifications (see technical data).
- Between the voltage supply of the device and the protective earth "PE" is in no case a higher voltage permissible than the indicated line voltage of the device!
- Mains connection to: PE, L1 and N.
- **Danger!**
 - To activate the on current limitation, you must wait at least 90 seconds after switching off the line voltage before switching back on!

5.6.2 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!

5.6.3 Line protection fuse

The connection must be fused depending on the used cable, the type of routing, the operating conditions and according to the standards applicable on site. The specification for the maximum admissible line fuse of the device must be observed (see technical data).

Possible components for the line protection (recommendation):

- Safety fuses of operating class gG (whole range fuse cartridges for general applications according to EN 60269-1).
- Line protection switch with characteristic C (according to EN 60898-1).

5.6.4 Operating in IT-System



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 = phase.
- Between the connection of the voltage supply of the device and the protective earth "PE" is in no case a higher voltage permissible than the indicated line voltage of the device!

1 ~ 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.

5.7 Systems with residual current protective devices

Whether the use of a residual current protective device (RCD) is necessary or allowed depends on the design of the low-voltage system on which the device is to be operated.

The assessment whether or which residual current protective device should be used is the responsibility of the system operator or electrician commissioned by it.



Danger due to electric current

When selecting the tripping characteristics of the residual current protective device, the possible residual current form of the power electronics (system with semiconductors) must be observed in conjunction with the standards and regulations applicable at the place of use.

Design of the power electronics

- The design of the power electronics corresponds to a frequency inverter with two-pulse bridge circuit and PFC (power factor correction).



Information

To prevent false tripping due to pulse-like charging currents of the integrated EMC filter, we recommend a rated differential current of 300 mA for reasons of operational reliability in the case of fixed connection and use of a residual current protective device.

5.8 Motor protection

Integrated overload protection, preceding motor protection device unnecessary (max. line fuse see Technical data).

5.9 Analog input "E1" for setting speed

The device has an analog input for setting the motor speed. Connection "E1" / "GND" (for further specifications see technical data).

If the analogue input "E1" is not required for specifying the speed, this can reprogrammed as a digital input.



Danger due to electric current

- Ensure correct polarity!
- Never apply line voltage to analog inputs!

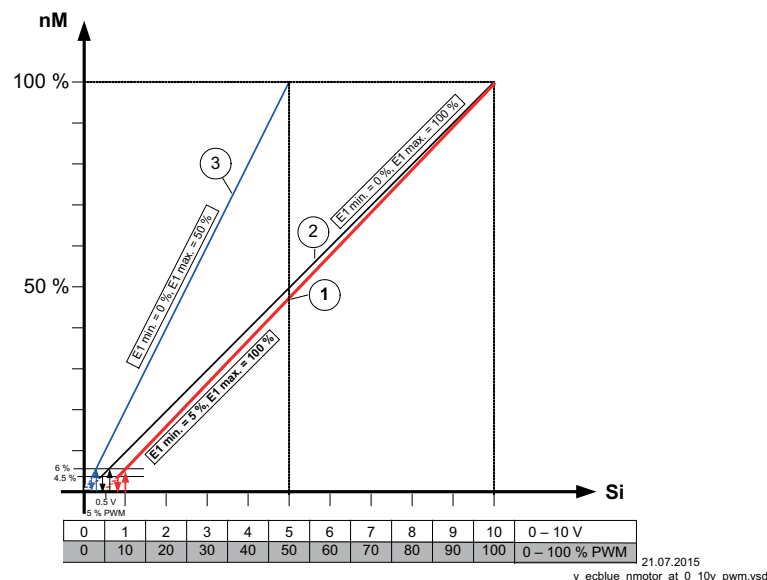
Possibilities for speed setting

	• Control via external setting signal 0...10 V or 0...100 % PWM. • 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.
	• Speed setting by 10 kΩ potentiometer at terminals “+10 V” and “GND” pick-off at terminals “E1”.

The motor always starts with at least 6 % of the rated speed and stops below 4.5 % of the rated speed (providing that the “Min. Speed” setting is “0”).

With the settings “E1 min.” and “E1 max.” it is possible to adapt the setting signal / speed characteristic, e.g. for setting signal: 0...5 V, 2...10 V.

Diagram setting signal and motor speed



nM Motor speed
 100 % Rated speed
 6 % Height of start speed
 4.5 % Height of stop speed
 0.5 V / 5 % PWM Value start analog input (factory setting)
Si Speed setting signal 0...10 V / 0...100 % PWM

1	Factory setting: E1 min. = 5 %, E1 max. = 100 % 0.5...10 V $\triangleq$ 0...100 % speed setting I.e. the motor starts with 6 % of the rated speed at a setting signal of approx. 1 V.
2	Example: E1 min. = 0 %, E1 max. = 100 % 0...10 V $\triangleq$ 0...100 % speed setting
3	Example: E1 min. = 0 %, E1 max. = 50 % 0...5 V $\triangleq$ 0...100 % speed setting

5.10 Voltage supply “10 V DC”

Voltage supply for activation of the digital input and external components, e.g. for a potentiometer for speed setting (PELV current source according to EN 60204-1).

Connection: “10 V” - “GND” (max. load  Technical data und connection diagram).

During an overload or short-circuit (10 V - GND), the control voltage (and thus the device) is disconnected. Automatic start after elimination of the cause of error.

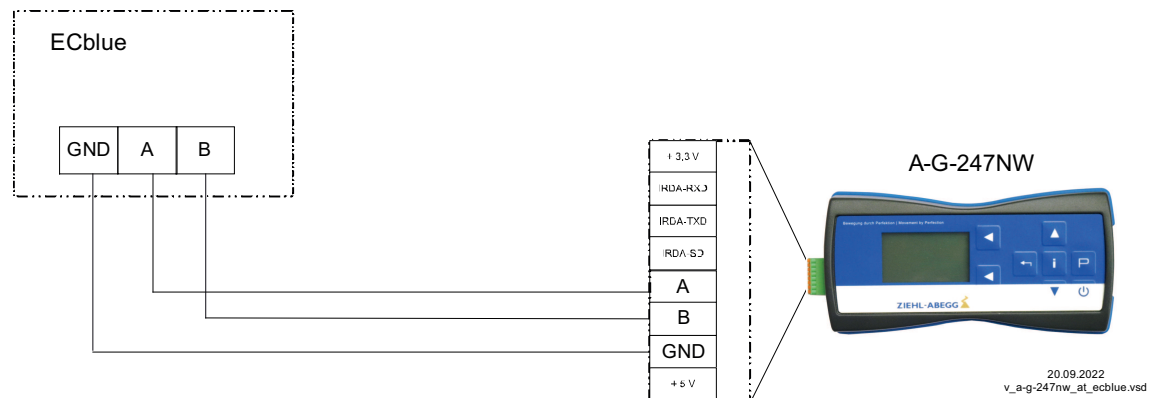
It is not permissible to connect outputs of several devices to each other!

5.11 Connection terminal type A-G-247NW for service

If necessary an external terminal can be connected. This can be e.g. necessary to adapt the pre-setting during start-up.

The connection is made by a 4-wire cable at the terminals: A (D+), B (D-) and GND. E. g. telephone cable type: J-Y (St) Y 2x2x0.6 (or similar), maximum cable length approx. 250 m.

The voltage supply of the terminal is made by the accumulators inserted there or the plug power supply unit.



5.12 Digital input “D1” for enable (device ON / OFF)

Electronic ON / OFF control via floating contact at terminals “+10V” - “D1” (input resistance and voltage range  Technical data).

Function factory setting for “D1”:

- 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).



Danger due to electric current

- No disconnection (no potential isolation in accordance with VBG4 §6) in remote control of the device!
- Never apply line voltage to the digital input!

5.13 Relay output “K1” for fault indication

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

Function factory setting for “K1”:

- For operation the relay is energized, connections “11” and “14” are bridged. For fault the relay is de-energized (see Diagnostics / Faults).
- When switching off via enable (D1 = Digital In 1), the relay remains energized.



Information

After switching on the line voltage, an initialisation time of a maximum 7.5 seconds is required for the device's electronics to be operational. Subsequently, a reliable status message will be possible. If no malfunction is detected, the relay will be energised after the initialisation time.

Since both line voltage fluctuations and ambient conditions affect the initialisation time, a different delay might occur in individual cases.

5.14 Communication

5.14.1 Networking via MODBUS-RTU

The device comes equipped with a RS-485 interface for networking via MODBUS. Connection at: "A (D+)", "B (D-)" and "GND".

The address must be set in the "IO Setup" menu.



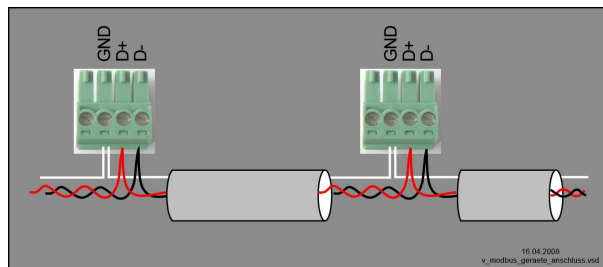
Information

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

5.14.2 RS-485 - network design and interface parameter

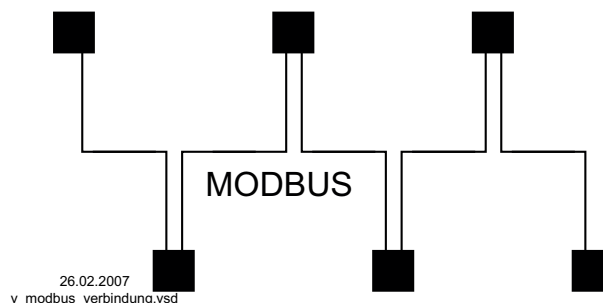
Please ensure the correct connection; i.e. "A (D+)" must always be connected to "A (D+)" of the next devices. The same applies to "B (D-)" .

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



general example for MODBUS device connection

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



Example for MODBUS connection

Recommended wire types

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

When using telephone cable with four cable cores, we recommend the following allocation:

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



Information

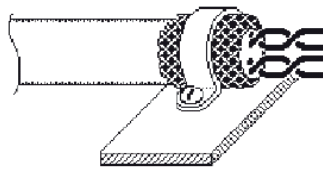
- Pay attention to sufficient distance from powerlines and motor wires (min. 20 cm).
- Except the data link "A (D+)", "B (D-)" and "GND"- connection may no further cable cores of the data line be used.
- Max allowed wire length 1000 m (CAT5/7 500 m).

Shielding

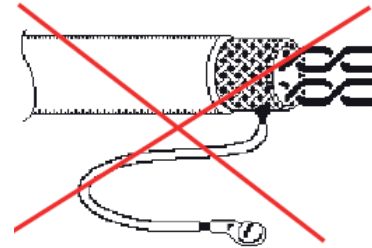
The use of shielded cables is normally not needed but offers high protection against electromagnetic interferences, especially high frequencies. However, the effectiveness of the shield depends on careful installation of the line.

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

Shield connection correct



Shield connection incorrect



Default interface parameter

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



Information

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

5.15 Open-Collector output A1 (status / tacho)

Open-Collector pulse output for status display or speed display.

Status display (function for factory setting)

Depending on the operating state of the device, the output "A1" is switched to GND potential for a certain number of pulses.

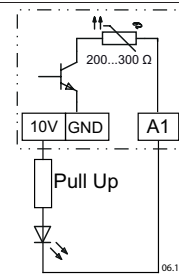
The status of the device can be displayed by this digitally coded signal.

With the output voltage 10 V, a standard LED / low-power LED can be controlled by using a pull-up resistor. This lights up if the output A1 Status Out OC (OC = Open-Collector) is on GND potential.

Attention! Observe the maximum 10 V output voltage load, see technical data and connection diagram.

The details of which pull-up resistor needs to be used depend on the specification on the LED that is used.

Explanation of flash codes see Diagnostic / Status Out with flash code.

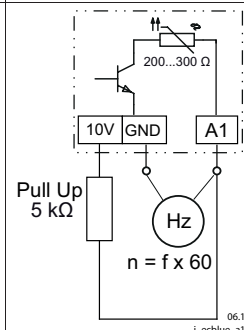


Tacho out

Alternatively, via output A1, the current motor speed can be output.

The frequency (duty cycle 50 : 50) that can be measured by a pull-up resistor at the output A1 corresponds to the motor speed.

Example: 10 Hz x 60 = 600 rpm



A1 more specifications: Technical data!

5.16 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).

5.17 High voltage test

The manufacturer performs a high voltage test, which corresponds at least to the values of EN 62477-1. If the relevant certification requires higher values, these products are tested accordingly.



Danger!

Every further high-voltage test also places strain on the electrical components and the insulation system and can lead to a reduction in the service life.

To prevent an additional load on the insulating system, a repeated high-voltage test with the same test height as at the manufacturer is not required.

- ▷ Before carrying out a high-voltage test of the overall installation, disconnect the product from the voltage supply or perform it with the manufacturer's support department on request, see service note.

6 Start-up



Danger!

- 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.
- Do not start the fan until all safety instructions (EN 50110, IEC 60364-1) have been checked, the fan is out of range (EN ISO 13857) and danger can be ruled out.
- A-rated sound power levels of over 80 dB(A) are possible, see product catalogue.

6.1 Before first-time start-up

Observe the following points before the first-time start-up:

1. Installation and electrical connection have been properly completed?
2. Has any leftover installation material and other foreign material been removed from the fan area?
3. That safety devices -if necessary- are mounted (EN ISO 13857)?
4. The impeller is out of reach?
5. Are the drain holes (as far as available) open or respectively closed according to the suitable installation position?
6. Connection data complies with the specifications on the rating plate?

6.2 During start-up

Observe the following points during start-up:

1. Check the direction of rotation, see rotation direction arrow on the fan blade, impeller base plate, support plates on suction side or rating plate.
2. Ensure even, low-vibration running. Significant vibrations due to uneven running, e.g. due to transport damage or improper handling, can lead to damage and subsequently to failure.
3. ZIEHL-ABEGG SE fans are delivered balanced in compliance with DIN ISO 21940-11 for the corresponding fan category as set out in ISO 14694. After installation, check the fan for mechanical vibrations and resonances in accordance with ISO 14694. If the limit values for the corresponding fan category are exceeded during start-up, see section **f**, the entire system must be checked and the vibrations reduced. System start-up is not allowed until the limit values are observed.

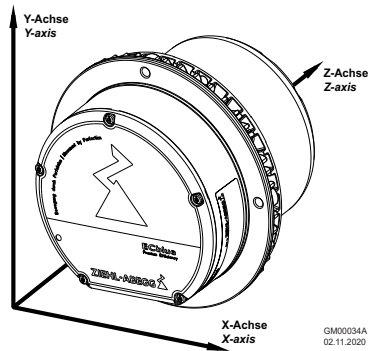
a. Time frame for checking the vibration values:

- On a new system or a new device
 - If necessary in the event of factory acceptance.
 - At the installation site at the time of proper start-up of the system or device at the latest.

b. Measuring device and sensors:

- It is recommended that measurement is performed with a resolution based on the r.m.s. (root-mean-square value), a measurement interval of 1 s and a ramp-up time of 180 s.
- At the same time, precisely timed measurement of the speeds is necessary so that the vibration values can be assigned to the speed.
- Perform the measurement over the entire fan speed range.
- Perform the measurement in all 3 axes, see Point c.

c. Direction of vibration amplitude

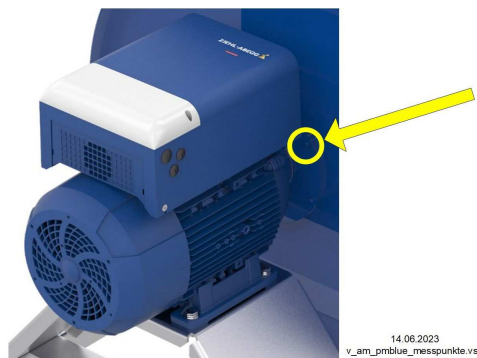


d. Measuring point on fan

- For ECblue fans with external rotor motors
 - At the stator fixing screw opposite the cable inlet, see arrow.



- On AMblue and PMblue fans with internal rotor motors
 - At the fixing screw for the A-side bearing bracket, see arrow.



e. The fans are classified in the following categories in accordance with the standard and the power consumption:

- $\leq 3,7$ kW in BV-2
- $> 3,7$ kW in BV-3

f. Limit value r.m.s. for vibration amplitude during start-up within the customer operating speeds:

- Max. 5.6 mm/s, in compliance with ISO 14694 Table 5 Start-up / BV-2.
- Max. 4.5 mm/s, in compliance with ISO 14694 Table 5 Start-up / BV-3.

4. For example, vibrations in the system may have the following causes:
 - Transport and handling of the fans can lead to a change in the balance of the fan.
 - The air feed and resulting turbulence, e.g. obstructions, deflections, branches, flaps.
 - Operation at a prohibited fan operating point, e.g. demolition operation in a flat characteristic curve range.
 - Insufficiently rigid fan mounting surfaces, e.g. mounting walls.
 - Vibration transmitted by adjacent components, e.g. compressors, adjacent fans.
 - Flow-related influences from adjacent fans.
5. If resonance vibrations occur that cannot be prevented by the design, it is possible to mask out certain speed ranges for the operation area of the fan, see Motor setup. If necessary, also observe the technical information L-TI-0634 Speed bypasses for ECblue fans with recommendations from the manufacturer. Passing through this resonant range as quickly as possible is allowed. Operation of the fan in the resonant range is not allowed.

7 Operating hand held terminal A-G-247NW

7.1 Menu operation



- ▷ Switch over between actual value* and "Start" with **[Esc]** arrow key.
- ▷ Switch over between "Start" and actual value* with **[i]** key.



* Actual value depending on device type: "Speed" / rpm, "Frequency" / Hz, "Modulation" / %



P↓

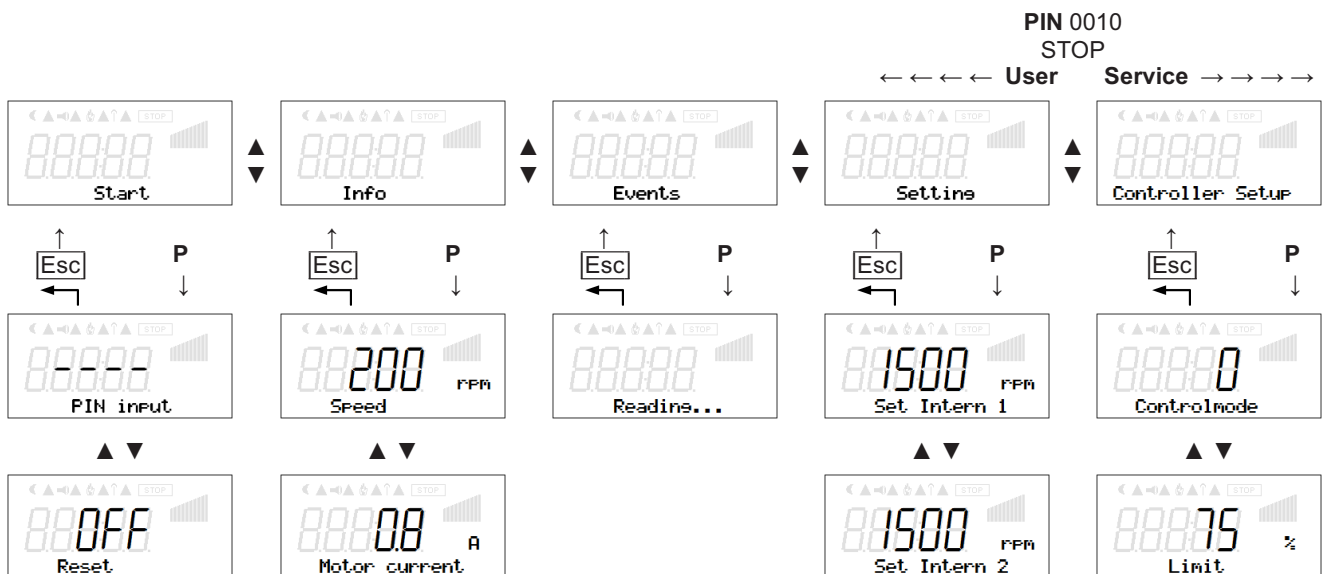


▲ ▼

- ▷ By pushing the **P**- key one reaches the menu item "Start".
- ▷ Return to the menu group "Start" using arrow key **[Esc]**.
- ▷ One moves up and down within the menu group using the arrow keys.

Display for english menu language = "GB "

7.2 Menu structure



Display for english menu language = "GB "

Selection of the menu group (e.g. "Setting") to the right through the ▼-key, to the left through the ▲-key.

You can go to the menu items in the menu groups (e.g. "Set Intern1") by using the **P**-key. Use the arrow keys to move up and down within the menu group.

The menu groups consist of one area for the user (user menu) and one area for installation (service). The service area can be protected against unauthorized access by using a PIN.

To make adjustments, press the **P**-key after selecting the menu item. If the previously set value starts to flash, it can be adjusted with the ▼ + ▲ keys and then saved with the **P**-key. To exit the menu without making any changes, use the "Esc" key, i.e., the originally set values remain.

8 Programming by hand held terminal A-G-247NW

8.1 Information

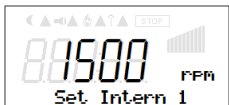
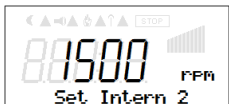
The menu language can be set on the hand held terminal type A-G-247NW (see operating instructions). The text in the graphic display (left column) is shown in the factory-set menu language English.

8.2 Menu group Setting



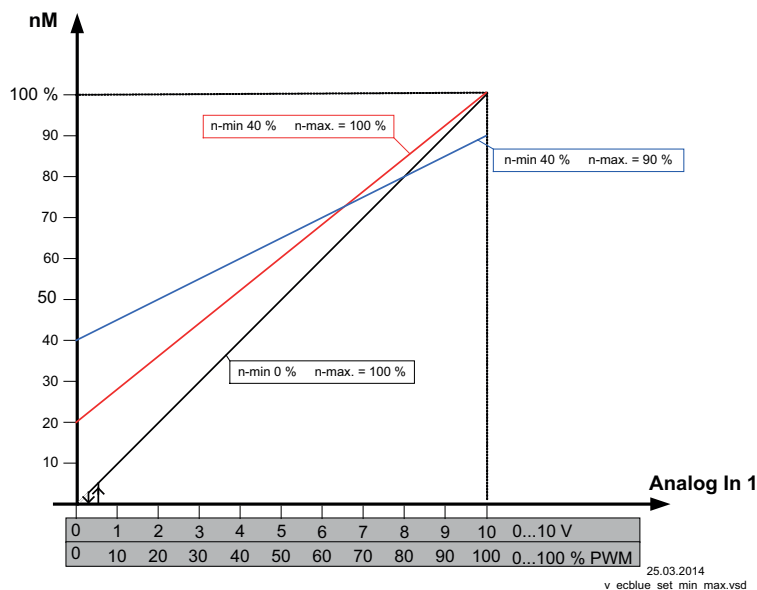
Information

Factory setting: Activation by external signal (0 - 10 V / PWM) at input "E1" (control mode = 0 (Controller Setup)). I.e. the following settings "Set Internal1", "Set Internal2", "Set Internal3" are not active!

	Settings
	Set Internal 1 Setting only in Controlmode 4 active (Controller Setup). Via the inputs "D1" / "E1" it is possible to switch to "Set Internal2" or "Set Internal3" (IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	Setpoint2 Setting only in control mode 5 active only in control mode 4 , if activated via inputs "D1" / "E1" (Controller Setup / IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	Set Internal 3 Setting only in control mode 6 active only in control mode 4 , if activated via inputs "D1" / "E1" (Controller Setup / IO Setup). Setting range manual speed setting: 0...100 % (Rated speed) Factory setting*: 100 % (Rated speed)
	Min. Speed The basic speed is active in every control mode. Setting range: 0...100 % (Rated speed) Factory setting*: 0 %
	Max. Speed The speed limiting is active in every control mode. Setting range: 100 % (Rated speed)... "Min.Speed" Factory setting*: 100 % (Rated speed)

* Specifications not binding, these values can differ depending on the software version and customer-specific pre-setting.

Diagram setting signal and speed

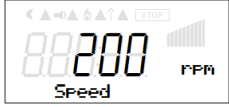
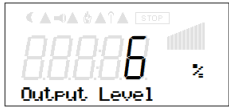
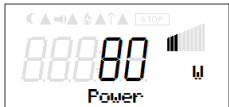


nM: Motor speed
Analog In 1: Speed setting signal
n-min: Min. Speed
n-max: Max. Speed
100 % Rated speed

8.3 Menu group Start

	Start
	PIN input The service menu for the installation can be protected against unintentional changes by a pin code. With further pin codes putting back to pre-setting is possible. PIN 0010 Release of the service settings with programmed PIN-Accesslevel 0 (see "Controller Setup"). Menu groups Service: "Controller Setup", "IO Setup", "Motor Setup" PIN 1234 Freischalten Menu group "Setting". Release of the menu group for the user "setting" with programmed PIN-Accesslevel 0 (see "Controller Setup"). PIN 3698 Communications parameters take-over. PIN 9095 Loading the factory settings. Only the parameters which are released by the currently set PIN-Accesslevel are loaded.
	Reset Complete re-start of the device
	Software version
	Parameter sets can be saved by the module in the terminal type A-G-247NW and transferred to other devices (see Operating Instructions Terminal Type A-G-247NW). Name parameterset with the keys ▼ , ▲ + P and load in the terminal with the P -key.

8.4 Menu group Info

	Info
	Speed Motor speed
	Motor current Display of internal motor current (metering precision approx. +/-10 %)
	modulation Display of modulation 0...100 % (metering precision approx. +/- 10 %)
	Motor input power Display of input power (metering precision approx. +/-10 %)

8.5 Menu group Controller Setup

	Controller Setup
--	-------------------------



Information

The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

8.5.1 Controlmode

	Type of device modulation.
0	Factory setting Control by external signal (0 - 10 V / PWM) at the input "E1". Switching to fixed speed "Set Internal2" or "Set Internal3" via digital input possible (☞ IO Setup).
1	no function
2	no function
3	no function
4	constant speed "Set Internal1". Switching to fixed speed "Set Internal2" or "Set Internal3" via digital input possible (☞ IO Setup).
5	Fixed speed "Default Internal2" (without switching possibility to other default).
6	Fixed speed "Default Internal3" (without switching possibility to other default).

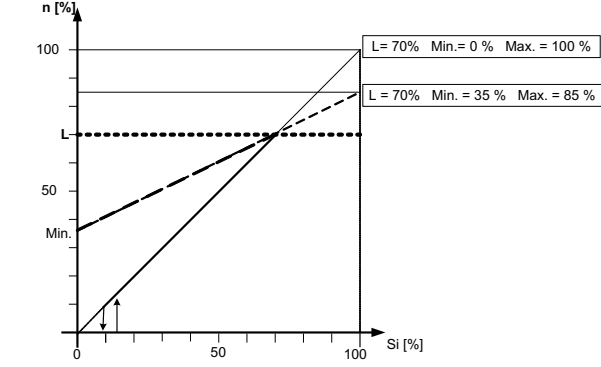
8.5.2 Limit



After allocation of a digital input (☞ IO Setup) an adjustable limitation of the modulation can be activated via a digital input.

“Limit value” = max. possible modulation (e.g. speed reduction during night operation by time switch).
setting range: 0 - 100 % (100 % $\hat{=}$ max. modulation, i.e. keine limitation)
Factory setting: 75 %

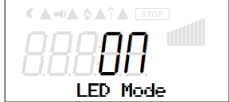
Limit (idealized principle diagram)



n [%] Motor speed
 L Limit
 Si Speed setting signal

07.10.2010
v_limit_101_rpm.vsd

8.5.3 LED Mode



LED Mode
Only for versions with integrated status LED!

Settings	Function
ON	Status LED in ECblue active i.e. operating conditions are indicated by flash code (factory setting).
OFF	Status LED not active, i.e. always OFF.

8.5.4 PIN-Accesslevel



PIN-Accesslevel
The PIN-Accesslevel determines for which setting ranges a PIN must be entered.

Settings	Function
2	Factory setting All menu groups are visible, settings are possible without a PIN.
1	- The menu group “Setting” is free, i.e. changes are possible without a PIN. PIN 0010: for changes in the menu groups: “Controller Setup”, “IO Setup” and “Motor Setup” (these menu groups are not visible without a PIN).
0	All settings are only possible after entering a PIN. PIN 1234 for changes in the menu group: “Setting” PIN 0010: for changes in the menu groups: “Controller Setup”, “IO Setup” and “Motor Setup” (these menu groups are not visible without a PIN).

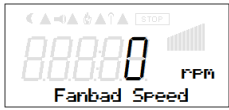


Information
Changes for the PIN protection “which” effect a reduced access right only become active after switching off the device or executing the Reset (see Start menu group) function.

8.5.5 Tacho output f_{out}

	Tacho out See the function description Electrical installation / Open-Collector output "A1"
Settings	Function
OFF	A1 = Status output
ON	A1 = Tacho output ($n = f \times 60$)

8.5.6 Message at speed deviation "Fan Bad"

	Fanbad Speed Speed deviation Factory setting: 0 rpm Setting range: 0 - 255 rpm
	Fanbad Time Time delay Factory setting: 0 sec Setting range: 0 - 255 sec.

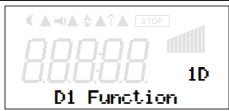
8.6 Menu group IO Setup

	IO Setup
--	-----------------

**Information**

The following factory settings specifications are not binding, these values can differ depending on the software version and customer-specific pre-setting.

8.6.1 Digital inputs "D1" ("E1" *)

	D1 Function Different functions can be assigned to the digital inputs "D1" and "E1"*. Activation via floating contacts (a low voltage of approx. 10/24 V DC is connected). "D1" is programmed for the "Enable" function at the factory.
	D1 Inverting For inverting switch to "ON". The input inversion is set at the factory to "OFF" (when a function is programming).

* If the analogue input "E1" is not required for specifying the fan speed, this can be used as a digital input (see E1 function).
 The same functions can be assigned for "E1" as for "D1".

**Danger!**

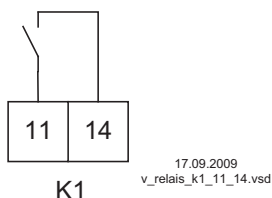
Never apply line voltage to the digital input!

Function	Designation
OFF	No function
1D	Enable ON / OFF (factory setting) Remote ON/OFF (electronic switch-off) by potential-free contact. The power unit is switched off electronically, the device can still be operated in the switched-off state after pressing the "Esc" key combination. Signal inputs and outputs remain active. A programmed alarm relay (factory set "K1 function" = [2K]) does not report the switch-off. Danger! No disconnection (no potential isolation in accordance with VBG4 §6) in remote control of the device!
3D	Limit ON / OFF see Controller Setup / Limit
5D	Setpoint2 Fixed speed "Default Internal2" active. Function with selected "control mode": 0, 1, 2, 3 (see "Controller Setup"). With simultaneous activation of "Default Internal3" with function [6D], [5D] has priority).
6D	Set Internal 3 Constant speed "Set Internal3", also with selected "control mode": 0 (see "Controller Setup").
13D	Reverse rotation Switch over between direction of rotation "RIGHT" = [CW] and direction of rotation "LEFT" [CCW]. When "switching" over via a digital input, the device works with the opposite direction of rotation than the one set in Motor Setup. If the rotary direction is reversed with an available modulation, it is initially reduced to "0" (disconnected) and subsequently increased back to the default value.
15D	Bypass temperature management (operation at max. speed) To make the ECblue as durable as possible, the devices have active temperature management. The modulation is reduced when internal temperature limits are exceeded. In ventilation systems in which the fan has to continue operating at maximum speed despite overtemperature, temperature management can be deactivated using a digital input. At the same time, the fan is operated at maximum speed regardless of the specified speed for regular operation. The function is active at the digital input when the contact is open (in factory setting [D1/E1 Inverting] = OFF), so that the maximum fan speed is still possible even when the line to the digital input is interrupted. Danger! • This function is implemented by switching to "Set Intern3". A setting of 100 % (= rated speed) of "Set Intern3" is a prerequisite for operation at maximum speed. • The device and its internal components are no longer protected against overtemperature when this function is activated (this affects the life installation instructions ECblue).
19D	Bypass temperature management (operation with variable speed) This function differs from 15D due to operation at variable speed. When temperature management is switched off by a digital input, speed setting by an external signal is still possible. The speed set in "Set Intern3" is the maximum speed at 100 % setting signal (limitation).

8.6.2 Relay outputs “K1”

	Function K1 Various functions can be allocated to the relay outputs “K1”. This is preset at the factory for fault indication.
	K1 Inverting For switching inversion to “ON” (switching behaviour dependent on assigned function). The relays can only pull up basically when the voltage supply of the electronics is working. Three-phase current devices must have at least 2 line phases! The relay inversion “K1” is set at the factory to “OFF” (when a function is programming).

Function	Designation
OFF	No function Relays remain always de-energized .
1K	Operating indication Operation without fault, reports enable “OFF”.
2K	Fault indication (factory setting) Pulled up in operation without fault, with release “OFF” not dropped out. Drops out at: line fault, motor fault, etc.  Events / Fault indications
4K	Limit Alarm when the speed exceeds the value set under “Set Internal3” ( menu group “Setting”) (output power > 0 %). The function is active in every Controlmode ( menu group: “Controller Setup”).
17K	Bus Control The relay output can be controlled by bus if networked.
20K	Fault indication or message for active temperature management In addition to the fault indication, a message will appear in the case of active temperature management, i.e. if the specified temperature limits are exceeded resulting in a reduction in modulation (function from software version 13.31 and upwards).



K1
1 = energized, terminals 11 - 14 bridged
0 = de-energized 11 - 14 not bridged

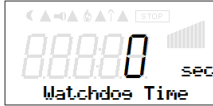
Function	State controller	K1 1 = energized 0 = de-energized	
		Inverting	
		OFF	ON
1K	Operation without fault, line supply okay	1	0
2K	Fault with indication by relay	0	1
4K	Exceed Frequency / Speed > setting “Set Internal3”	1	0
20K	Fault indication or message for active temperature management	0	1

8.6.3 Input "E1"

	E1 Function [1E] (factory setting) = speed setting by external signal (0 - 10 V / PWM). For settings via [1E] "E1" operates like "D1" as a digital input (see digital inputs / function).
	E1 Inverting Factory setting inverting to "OFF". For control with inverted setting signal switch to "ON" (setting signal: 10 - 0 V).
	E1 min. Value of the input signal at which the controller starts at minimum modulation. Setting range: 0 - 100 % Factory setting: 5 %
	E1 Max. Value of the input signal at which the maximum modulation of the controller is reached. Setting range: 0 - 100 % Factory setting: 100 %

8.6.4 MODBUS communication watchdog

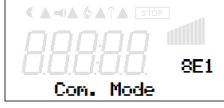
The MODBUS communication watchdog defines the behaviour in case of a communication fault.

	Watchdog Time If the device receives no message in the time window, a definable function is executed. Watchdog time in seconds. Setting range: 0 - 255 sec. Factory setting: 0 sec. = off
	Watchdog Mode Watchdog Mode: 0: No function (default) = OFF from FW 13 1: Fault (K1 function, h15) in case of communication fault (WDT) 2: Constant speed 1 * in case of communication fault (WDT) 3: Fault + constant speed 1 * in case of communication fault (WDT) 4: Fault by E1 Fault ** (only ECblue) 5: Constant speed 1 by E1 Fault (only ECblue) 6: Fault constant speed 1 in case of E1 fault (only ECblue) * in this condition it is possible by digital input function 5, 6 or digital control function to change between the constant speeds (Holding register h4). ** E1 fault is triggered when E1 falls below E1 min x 0.5. E1 fault is cancelled when E1 rises above E1 min x 0.9.

8.6.5 Networking via MODBUS

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

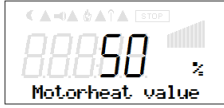
	Bus Address The device address is factory set to the highest available MODBUS address: 247. Setting range MODBUS Address: 1 - 247.
	UART Baudrate Setting transfer rate Valid values: 4800, 9600, 19200, 38400 Factory setting: 19200 Illegal value: 115200

	UART Mode Setting transfer format Valid values: 8O1, 8N1, 8E1 Factory setting: 8E1
---	--

**Information**

If it is attempted to change the baud rate to an impermissible value (e.g. 115200), the following exception code will be sent back: **[Exception Code 3: Illegal Data Value]**.

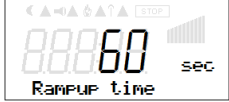
8.7 Menu group “Motor Setup”

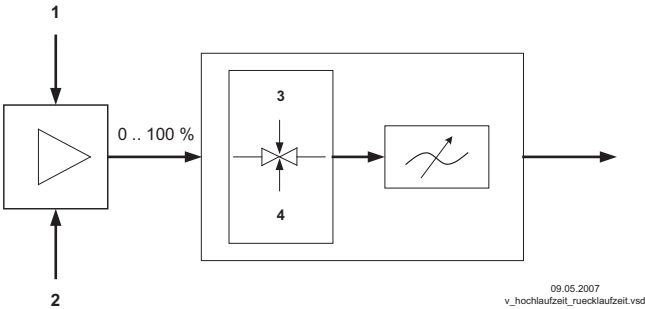
	Motor Setup	
	Rated speed	
	MotorRatedCurr.	* The following controller presettings are dependent on the respective motor design and are only shown for information. • Rated speed • MotorRatedCurr. • rotat. direction • Value motorheating
	Rampup time	
	Rampdown time	
	rotat. direction	
	Value motorheating	
	Suppression1	
	Range 1 min.	
	Range1 max.	
	Suppression2	
	Range 2 min.	

	Range2 max.	
	Suppression3	
	Range 3 min.	
	Range3 max.	

8.7.1 **Setting for Rampup time and Rampdown time**

By separate menus for Rampup time and Rampdown time an adjustment is possible to individual system conditions.
This function is switched behind the actual controller function.

	Rampup time Time setting in which the automatic controller output from 0 % to 100 % rises. Setting range: 0...255 sec. Factory setting depending on motor
	Rampdown time Time setting in which the automatic controller output from 100 % to 0 % reduces. Setting range: 0...255 sec. Factory setting depending on motor



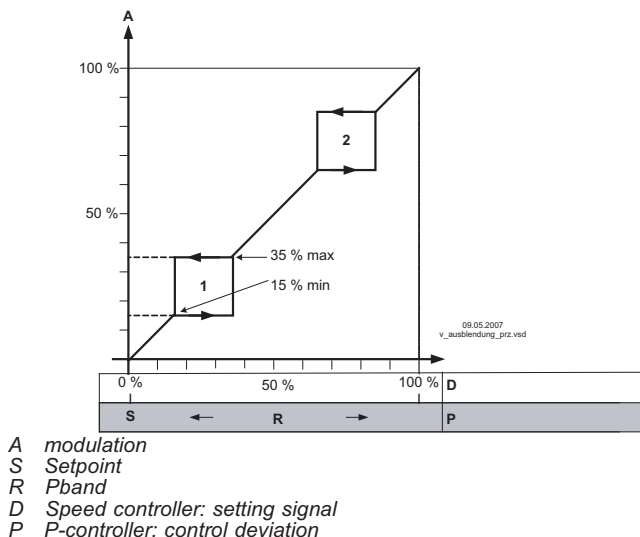
- 1 external Signal
- 2 Settings
- 3 Rampup time
- 4 Rampdown time

8.7.2 Suppression of speeds

Suppression of up to three speed ranges.

Under certain circumstances, it is possible to prevent disturbing noises that can arise at certain speeds due to resonances.

Example for suppression of 2 ranges (Idealized principle diagram)



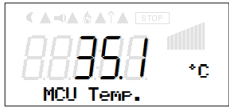
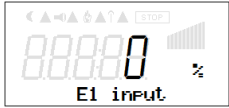
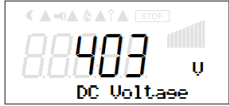
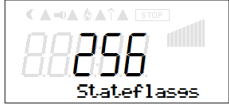
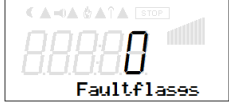
Setting depending on device type
in: %, Hz, rpm

	Suppression active = "ON"
	Setting for "Range1 min." Setting range: "0" - "Range 1 max."
	Setting for "Range1 max." Setting range: "Range 1 max." - "Rated speed"
	Identical procedures for Suppression2 and Suppression3, as far as desired

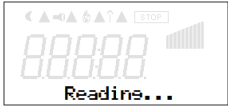
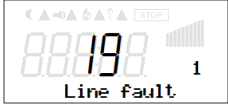
8.8 Diagnostics menu

The diagnostics menu supplies information about the momentary operating condition of the device.

	Diagnostic
	IGBT temp. Display of the internal temperature of the power semiconductor.
	Inside Temp. Display of electronics internal temperature.

	MCU Temp. Display of the internal temperature of the microcontroller.
	E1 input no function
	DC-Voltage DC-link voltage constant approx. 400 V.
	Mains voltage
	Stateflags
	Faultflags
	PIN-Accesslevel Momentarily adjusted PIN-Accesslevel (Controller Setup).

8.9 Display and query of events and malfunctions

	Events
	The event memory is read out after pressing the P key. Reading »»»
	Beispiel: keine vorliegenden Störungen Empty = no entry = no event in the memory
	Example line fault Position 1 = latest event The last 10 (1 - 10) events are saved. The desired position can be selected with the ▼+ ▲ keys. 19 = number of all previous faults

An error message appears alternately with the actual value display (Diagnostic faults).

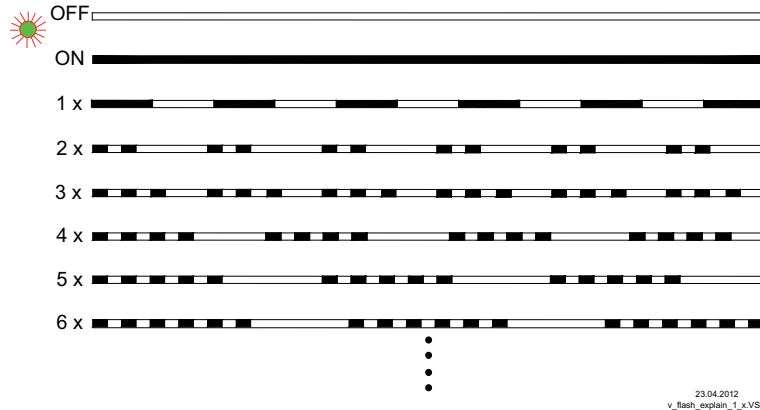
9 Diagnostics / Faults

9.1 Troubleshooting

Type of error	Possible cause	Remedial measures
Fan does not run (anymore)	Mains voltage failure Failure of a phase Under - or overvoltage	Check mains voltage
	Earth fault	Check the motor connection and mains voltage
	Coil closure	Replace fan
	thermal motor protection has triggered (motor is overheated)	Check for free air passages; remove foreign bodies if necessary See "Impeller blocked or dirty" Check supply air temperature Check voltage
	Impeller blocked or dirty	- Disconnect the motor from the power supply and secure it against switching back on - Check safe isolation from supply - Remove protective grille - Remove foreign bodies or dirt - Reinstall protective grille - proceed as described in the Commissioning chapter
Fan does 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 (see behaviour in rotation by air current in reverse direction)
	see "Fan does not run"	
Fan turns too slowly	Impeller / blade drags / scrapes	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 See "Impeller blocked or dirty" Check supply air temperature Check installation space (air speed over heat sink)
Air flow too low	Fan turns too slowly	see "Fan turns too slowly"
	Airways blocked	Check for free air passages (supply/exhaust air flaps, filters) See "Impeller blocked or dirty"
	Pressure loss different to projection	Check fan selection
Vibrations	Imbalance	Check blades for damage, soiling or ice (see "Impeller blocked or dirty")
	No or wrong vibration dampers (only in radial)	Install correct vibration dampers
Unusual noises	Bearing damaged / worn	Change bearings In motor size 055 ("Z" / "B" at cross flow) and 072 (O) change the fan.
	Impeller / blade drags / scrapes	When indicated clear foreign bodies / dirt from the fan (see "Impeller blocked or dirty")
	Operation beyond tear-off point (for axial fans)	Check for free air passages (supply/exhaust air flaps, filters)
	Wrong overlap on nozzle (for centrifugal fans)	Observe the installation instructions

9.2 Status Out with flash code

Status LED in the lid of the terminal compartment.
Output A1 Status Out OC  Electrical installation.



LED Code	Relays K1*	Cause Explanation	Reaction of Controller
			Remedial measures
OFF	de-energized, 11 - 14 interrupted	Mains voltage failure	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" - "10 V" (Digital In 1) not bridged or switch off by Bus.	Switch-off  digital input or Bus
2 x	energized, 11 - 14 bridged	Temperature management active 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 externally (in this operation permissible for the controller) in case of reduced operation due to too high an internal temperature, no fault message is sent via the relay.	With a drop in temperature the modulation rises again linear. Check installation of the device and cooling of the controller.
3 x	de-energized, 11 - 14 interrupted	HALL-IC Incorrect signal from the Hall-ICs, error in the commutation. Internal plug connection faulty.	The controller switches the motor off. Automatic restart if no faults are recognised. Replace fan / motor
5 x	de-energized, 11 - 14 interrupted	Motor blocked If after 8 seconds of commutation no speed is measured > 0, the fault "Motor blocked" is released.	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	IGBT Fault Short circuit to earth or short circuit of the motor winding.	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.
7 x	de-energized, 11 - 14 interrupted	ZK overvoltage 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.

LED Code	Relays K1*	Cause Explanation	Reaction of Controller
			Remedial measures
8 x	de-energized, 11 - 14 interrupted	ZK overvoltage If the DC-link voltage increases above a specified limit, the motor will switch off. Reason for excessively high input voltage or alternator motor operation.	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	IGBT cooling down period for approx. 60 sec. Final shutoff after 2 cooling-off intervals  Code 6.
11 x	de-energized, 11 - 14 interrupted	Error motor start If a starting command is given (enable available and Setpoint > 0) and the motor does not start to turn in the correct direction within 5 minutes, then an error message will appear.	If it is possible to start the motor in the target direction of rotation after the error message, the error message will disappear. Should a voltage interruption occur in the meantime, the time taken up to the switch off will begin again. Check if motor is freely rotatable. Check if the fan is driven in reverse direction by an air stream ( Behaviour in rotation by air current in reverse direction).
12 x	de-energized, 11 - 14 interrupted	Line voltage too low If the line voltage drops below a specified limit the device will switch off.	If the line voltage rises above a specified limit within 75 seconds, then the controller will attempt to start. Should the line voltage stay below the specified limit for more than 75 seconds, the device will switch off with an error message.
14 x	de-energized, 11 - 14 interrupted	Error peak current If the motor current increases above the specified limit (even in a short time-frame) the device will switch-off.	After a switch off the controller waits for 5 seconds then the controller attempt a start. Arises within 60 sec. in series 5 further disconnections a final switch off with fault indication follows. Should no further switch off be exceeded in 60 s the counter will be reset.
17 x	de-energized, 11 - 14 interrupted	Temperature alarm Excess of the max. permissible inside temperature.	Controller switches off motor. Automatic re-starting after cooling down. Check installation of the device and cooling of the controller.

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

9.3 Brake function and behaviour in rotation by air current

At applied line voltage, enable and a setting signal above "0", the speed control is active and the speed is stable even under load fluctuations.

If the motor is not controlled with line voltage applied, i.e. without enable or with enable with setting signal "0", the brake function becomes active to hold the motor until start (holding brake).

- If the line voltage is switched on whilst the fan is rotating in reverse (wrong turning direction), this is decelerated and started in the correct turning direction at a setting signal above "0". To protect the electronics against too high braking current, this function is partly (fan-dependent) only possible up to a certain speed value.
- The braking function also becomes active to bring the fan to a standstill if it is driven in the correct direction of rotation up to a maximum speed that depends on the respective motor design without being controlled (e.g. up to a speed of 100 min^{-1}). At speeds above this defined value, the motor control does not intervene (e.g. at speeds over 100 min^{-1}).
- When driven in correct direction of rotation and with enable with a setting signal above "0", the motor is started whilst the fan is rotating.

Behaviour in strong drive in reverse direction (e.g. suction)

The braking effect with applied line voltage is limited, strong reverse acting forces can lead to rotational movement despite the holding brake.

From a certain level (fan-dependent) it is no longer possible to start the fan in the correct turning direction ($\Rightarrow$ message: Fault motor start). Further start attempts follow; the error message disappears if start is successful.



Information

- Do not switch off the line voltage so that the braking function can prevent rotation of the fan in reverse (wrong) direction and safe starting is possible.
- If the application requires safe starting after switching on the line voltage, too strong an air current (suction effect) in reverse direction must be prevented by suitable measures.
- Special settings are possible which can lead to deviations from the above functional description.

10 Maintenance

10.1 Maintenance/servicing



Danger!

- Please read the Safety instructions chapter before working on the fan!
- Before working on the fan, this must be disconnected from the power supply and secured against switching back on!
- No maintenance work at running fan!
- Allow maintenance work to be carried out by trained specialists only.
- 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.
- Wear safety clothing / shoes and cut-resistant safety gloves when handling!
- Please observe the safety regulations and the worker's protection rules by all maintenance and service work (EN 50 110, IEC 60364-1).
- Fuses must always be only replaced; never repaired or bridged. The specifications for the maximum series fuse must always be adhered to (see Technical data). Only fuses cited in the electrical circuit diagram may be used.
- Generator operation can produce dangerous voltages (see safety instructions)!
- Keep the airways of the fan free - danger because of objects dropping out!
- Watch out for vibration free motion!
- The impeller is subject to natural wear depending on the area of application and the conveying medium. Deposits on the impeller can lead to imbalance and damage (danger of permanent fracture). The impeller can burst!
- If highly aggressive media for which the product is not suited are conveyed, the severe corrosion may result in the impeller breaking. Any impellers corroded in this way must be replaced immediately.
- Deposits on the motor, particularly on the cooling vanes and in recesses on the rotor, can lead to reduced cooling performance and the motor switching off prematurely. For this reason, remove deposits quickly (see chapter: Cleaning).
- Maintenance interval in accordance with the degree of contamination of the impeller!
- Check the fan at regular intervals (recommendation: every 6 months) for mechanical oscillations. Observe the limits specified in ISO 14694 and, if they are exceeded, implement remedial measures (e.g. rebalancing by specialist staff).
- Check the impeller, in particular the weld-seams, for possible cracks.
- Repair, e.g. by welding is prohibited!
- Bolted-on or pressed on impellers and/or wings may only be replaced by authorised ZIEHL-ABEGG SE staff. The manufacturer shall not be liable for damage caused through improper repair work.
- Please consult our service department with regard to changing the bearing as for all other damage (e.g. to the coil).
- Regular inspection and possibly cleaning is necessary to prevent imbalance and blockage of the drain holes due to ingress of dirt.
- 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.



Information

Confirmation number for inquiries or in service cases see rating plate.

State the additionally engraved confirmation number (available depending on the motor build) if the rating plate is no longer legible. This can be found under the affixed rating plate or on the stator flange (in external rotor motors) depending on the motor size.

10.2 Cleaning



Danger due to electric current

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

Clean the fans's flow area.

Danger!

- Do not use any aggressive, paint solvent cleaning agents when cleaning.
- Make sure that no water gets inside the motor and the electronics (e.g. by direct contact with seals or motor openings), observe protection class (IP).
- The drain holes (if available) corresponding to the installation position must be checked for free passage.
- In case of improper cleaning work, no warranty is assumed regarding corrosion formation / paint adhesion for unpainted / painted fans.
- To avoid accumulation of moisture in the motor, the fan must be operated for at least 1 hour at 80% to 100 % of the maximum speed before the cleaning process!
- After the cleaning process, the fan must be operated for at least 2 hours at 80 to 100 % of the maximum speed for drying purposes!

11 Enclosure

11.1 Technical data

Line voltage* (see rating plate)	1 ~ 200...277 V, 50/60 Hz
	1 ~ 100...130 V, 50/60 Hz
	DC 110 V, voltage range 110...400 V (+/- 2 %)
Maximal line fuse**	16 A
Max. load limit integral of cut-in current approx.	2.0 A ² s
Switching frequency	16 kHz
Input resistance for signal set for the rotational speed	@ 0...10 V: R _i = 300 kΩ @ PWM: R _i = 3 kΩ
Specification speed setting signal PWM	Switching frequency: 1...10 kHz On-off ratio: 0...100 % U _{in} high level: 15...28 V U _{in} low level: 0...10 V
Voltage supply for external devices	+10 V (-2 %), I _{max} 50 mA (short-circuit-proof)
Digital input "D1"	Input resistance: R _i approx. 2 kΩ Voltage range high level: 7.1...19 V DC Voltage range low level: 0...2.7 V DC
Open-Collector output "A1"	I _{max} : 20 mA U _{CE max} : 30 V DC
Duty type of motor/fan	Continuous operation with occasional starts (S1) according to DIN EN 60034-1:2011-02. Occasional starting between -35 °C and -25 °C is permissible. Continuous operation below -25 °C only with special bearings for refrigeration applications on request.
Permissible minimum and maximum ambient temperature for operation	Please refer to the technical documentation of the product for the minimum and maximum ambient temperature valid for the respective fan. Operation below -25 °C as well as partial load operation for refrigeration applications is only possible with special bearings for refrigeration applications on request. If special bearings for refrigeration applications are installed in the fan, please observe the permissible maximum temperatures in the technical documentation of the product. 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.

Permissible temperature range for storage and transport	-40...+80 °C
Permissible installation height	0...4000 m amsl ≤ 1000 m: no limitation > 1000 m: max. permissible input current = current indication rating plate minus 5 % / 1000 m > 2000 m: max. permissible line voltage = max. voltage indication name plate minus 1.29 % / 100 m
Permissible rel. humidity	The motor is released for a relative humidity of 100 % at continental climate without other ambient influences. Other ambient conditions on request.
Ball bearing life	The bearing service life of the motor-integrated ball bearings determined in accordance with the standard calculation method is largely determined by the grease service life F10h and is approx. 30,000 to 40,000 operating hours in standard use, taking into account a temperature and load spectrum. The fan or motor is maintenance-free due to the use of ball bearings with life-time lubrication. Once the grease service life F10h has been reached, it may be necessary to change the bearing. The bearing service life may change compared to the specified value if operating conditions such as increased vibrations, increased shocks, increased or excessively low temperatures, humidity, dirt in the ball bearing or unfavourable control modes are present. A service life calculation for special applications can be created on request.
Electromagnetic compatibility for the standard voltage 230 / 400 V according to IEC 60038	Interference emission EN IEC 61000-6-3 (domestic household applications)
	Interference immunity EN IEC 61000-6-2 (industrial applications)
Harmonics current	Active power factor adjustment for sinusoidal input current (PFC = Power - Factor - Correction), harmonic current in accordance with EN 61000-3-2 are guaranteed.
Contact rating of the internal relay "K1"	AC 250 V 2 A
Max. leakage current according to the defined networks of EN 60990	< 3.5 mA
dB(A) values	see product catalogue
Protection class of motor according to EN 60529	IP54

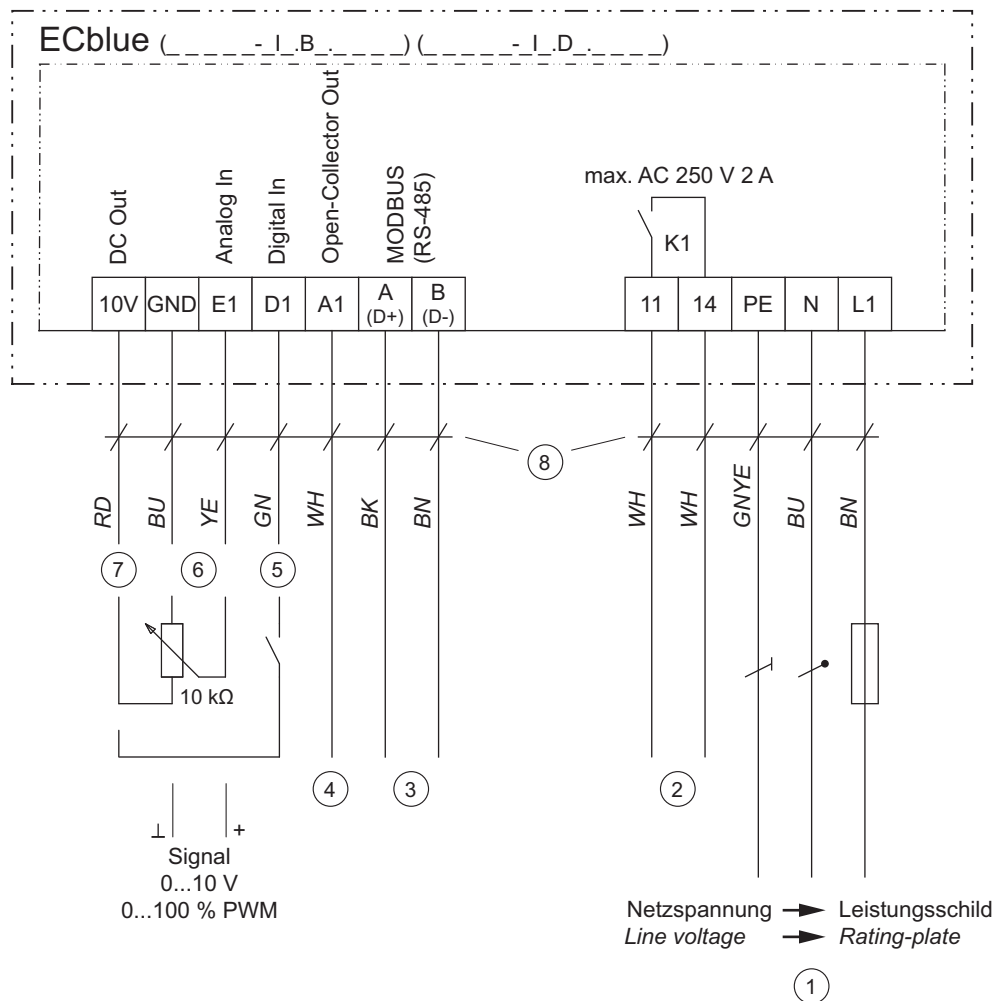
* Regarding the mains connection, these devices are to be classified as category "C2" devices according to the relevant DIN EN 61800-3. The increased requirements placed on electrical interference > 2 kHz for category "C1" devices are complied with in addition.

** Max. line fuse on site(line protection fuse) according to EN 60204-1 Classification VDE0113 Part 1 (see also Assembly instructions / Electrical installation / Voltage supply / Line protection fuse).

For motors with the corresponding quality mark (see rating plate)		
Authorization:	FILE No. E347018	UL 1004-1, UL 1004-3, UL 1004-7; CAN/CSA C22.2 No.100, CAN/CSA C22.2 No.77
		Electronically Protected Motors

For motors with the corresponding quality mark (see rating plate)		
Rated voltage 200 - 240 V, 50/60 Hz		
Zulassung	REG.-Nr. E418 Certificate number 40039441	DIN EN 60335-1 (VDE 0700-1):2020-08; EN 60335-1:2012+AC+A11+A13+A1+A2+A14:2019 EN 60335-1:2012/A15:2021
		Einbaumotor (Built-in-motor)

11.2 Connection diagram



EMUN19K0
08.06.2021

- 1 Line voltage rating plate
- 2 Relay output for fault indication (contact rating max. AC 250 V 2 A)
- 3 MODBUS (RS-485) interface
- 4 Open-Collector output status / tachometer (I_{max} 20 mA)
- 5 Digital input for enable (R_i approx. 2 kΩ)
- 6 Input for speed setting by 0...10 V signal / potentiometer ($R_i > 100$ kΩ)
- 7 Voltage supply 10 V DC (I_{max} 50 mA)
- 8 Version with connection cables

11.3

EC Declaration of Incorporation

- Translation -
(english)

ZA87-GB 2024/43 Index 014

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

The design of the partly completed machine:

- Axial fan DN., FA., FB., FC., FE., FF., FG., FH., FL., FN., FP., FS., FT., FV., SG., VN., VR., ZC., ZF., ZG., ZN..
- Centrifugal fan ER., GR., HR., RA., RD., RE., RF., RG., RH., RK., RM., RR., RZ., WR..

Motor type:

- Asynchronous internal or external rotor motor
- Asynchronous internal or external rotor motor with integrated frequency inverter
- Electronically commutated internal or external rotor motor
- Electronically commutated internal or external rotor motor 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 **ZIEHL-ABEGG SE**
 Heinz-Ziehl-Straße
 D-74653 Künzelsau

The following harmonized standards have been applied:

EN 60204-1:2018	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
EN ISO 12100:2010	Safety of machinery – General principles for design – Risk assessment and risk reduction
EN ISO 13857:2019	Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs
Note:	Compliance with EN ISO 13857:2019 relates only to the installed contact protection if it is part of the scope of delivery.

The special technical documents in accordance with Appendix VII B have been created and are available in full.

The following persons are authorized to compile the technical documents, address see above.

Upon reasonable request, the special documents shall be transmitted to the public authority. The transfer can be made electronically, on data carriers or on paper. All property rights remain with the aforementioned manufacturer.

Start-up of this incomplete machine is prohibited until it is ensured that the machine in which it has been installed complies with the provisions of the EC Machinery Directive.

Künzelsau, 22.10.2024
(Location, date of issue)

ZIEHL-ABEGG SE
Moritz Krämer
Director Product Development
Ventilation Technology
(name, function)

(signature)

ZIEHL-ABEGG SE
Jürgen Albig
Global President
Product Unit Ventilation
(name, function)

(signature)

11.4

UKCA Declaration of Incorporation

- Original -
(english)

ZA87_UK-GB
2024/43 Index 004

**as defined by the Supply of Machinery (Safety)
Regulations 2008
No. 1597, PART 2 / Annex II B**

The design of the incomplete machine:

- Axial fan DN., FA., FB., FC., FE., FF., FG., FH., FL., FN., FP., FS., FT., FV., SG., VN., VR., ZC., ZF., ZG., ZN..
- Centrifugal fan ER., GR., HR., RA., RD., RE., RF., RG., RH., RK., RM., RR., RZ., WR..

The motor type:

- Asynchronous internal or external rotor motor
- Asynchronous internal or external rotor motor with integrated frequency inverter
- Electronically commutated internal or external rotor motor
- Electronically commutated internal or external rotor motor with integrated EC controller

complies with the requirements in Annex I, Articles 1.1.2, 1.1.5, 1.4.1, 1.5.1 in Supply of Machinery (Safety) Regulations 2008 No. 1597.

The manufacturer is **ZIEHL-ABEGG SE**
Heinz-Ziehl-Straße
D-74653 Künzelsau

The following harmonised standards have been used:

EN 60204-1:2018	Safety of machinery; electrical equipment of machines; Part 1: General requirements
EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13857:2019	Safety of machinery; safety distances to prevent danger zones being reached by the upper limbs
Note:	The maintenance of the EN ISO 13857:2019 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 Annex VII B has been written and is available in its entirety.

The following persons are authorized to compile the technical documents, 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 Machinery (Safety) Regulations.

Künzelsau, 22.10.2024
(location, date of issue)

ZIEHL-ABEGG SE
Moritz Krämer
Director Product Development
Ventilation Technology
(name, function)



(signature)

ZIEHL-ABEGG SE
Jürgen Albig
Global President
Product Unit Ventilation
(name, function)



(signature)

11.5 Index

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11.6 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
phone: +49 (0) 7940 16-0
info@ziehl-abegg.de
<http://www.ziehl-abegg.com>

11.7 Service note

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.