RH../ER../GR..

Radial impellers RH.. and plug fans ER../GR.. directly powered with IEC standard motor

Assembly instructions



RH..



ER..

Keep for reference!

L-BAL-F018-GB 2021/22 Index 004 Part.-No. 00282063-GB

ZIEHL-ABEGG

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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 Scope of documentation

This documentation applies to free running centrifugal impellers of model range RH.., as well as device model ranges ER.. and GR.. with standard motors (for type designation, see rating plate).

The complete documentation for the product consists of these fan assembly instructions and the motor operating instructions.

To ensure the final suitability of the product for the permissible conditions of use specified in the order acknowledgement, it is absolutely imperative to observe the fan assembly instructions and the motor operating instructions. In particular, this applies to safety instructions, storage, transport, assembly and service.

If necessary, you can request the motor operating instructions from the motor manufacturer in your desired language.

Information

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

1.2 Structure of the assembly instructions

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

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

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

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

1.4 Exclusion of liability

Concurrence between the contents of these assembly instructions and the described hardware and software in the device has been examined. It is still possible that non-compliances exist; no guarantee is assumed for complete conformity. To allow for future developments, construction methods and technical data given are subject to alteration. We do not accept any liability for possible errors or omissions in the information contained in data, illustrations or drawings provided.
ZIEHL-ABEGG SE is not liable for damage due to misuse, improper use or as a consequence of unauthorized repairs or modifications.

1.5 Copyright

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

2 Safety

2.1 Safety instructions

This chapter contains instructions to prevent personal injury and property damage. These instructions do not lay claim to completeness. In case of questions and problems, please consult our company technicians.



Attention!

- Non-compliance with the information and safety instructions listed in these assembly instructions can cause serious health and safety risks!
- It is essential to observe the notes in the motor manufacturer’s operating instructions, which is part of the scope of supply.

Be aware of the following Points:

- Operate the fan only in accordance with its intended use and only up to the **max. permissible operating speed** according to "n_max" on the fan / impeller rating plate. Exceeding the maximum permissible operating speed will lead to a hazard situation due to the high kinetic energy. **The impeller can burst - risk of fatal injury!**
- Countercurrent braking by interchanging two supply phases is not allowed!
- In a fan system consisting of a motor, frequency inverter and impeller, impermissibly high vibrations can occur in narrowly limited speed ranges. Continuous duty is not permissible under these conditions (see operating with frequency inverter). **The impeller could burst - danger of death!**
- When operating by means of frequency converter, ensure that the waiting time is maintained after safety disconnection - see manufacturer´s operating instructions regarding capacitor discharge time.

- The conveyance of solid matter or solids content in the conveying medium is not permissible and can lead to dangerous situations. ZIEHL-ABEGG rejects any liability for damage of any kind as a result of such use.
- Only operate the fans in the permissible temperature ranges (see order acknowledgement).
- Assembly and electrical connection may only be carried out by skilled personnel in compliance of applicable standards and these assembly instructions.
- If the impeller is accessible, guard grilles must be installed according to EN 13857. These must not be changed and must be adequately secured. The appropriate specified screw size and quality must be used.
- Objects which can fall onto the fan from a greater height must not be allowed to enter the impeller.
  – Since a residual risk due to falling objects, incorrect behaviour, etc. cannot be completely ruled out, the designer, operator or manufacturer of the installation or system in which the fan is to be installed, must prevent any potentially hazardous situation from arising by means of appropriate safety measures in line with standard EN ISO 12100.
- The operator is responsible for maintenance of the fan.
- Compliance with the EMC Directive only exists if the fan is directly connected to the main power supply. If the fan is installed in a system or combined with other products, the system manufacturer is responsible for compliance with the EMC Directive.
- Use the fan and electrical system only according to these assembly instructions and keep in a safe operating state.
- The fan may only be put into operation after it has been properly installed.
- To ensure operability, safety devices (especially the overheating protection equipment) must be checked regularly.
- The instructions for installation and use must be complete and available to users at any time.
- No safety and warning instructions on the fan may be removed, and the user must make sure that they are legible.
- The persons responsible for the installation, start-up, operation and maintenance of the device must be competent and possess sufficient experience to correctly perform their work.
- In addition, they must know the European standards and guidelines (at national and regional level and if applicable the in-house regulations) for safety and hazard prevention. A new user may only work under the supervision of an experienced operator.
- This device must not be used by persons with limited physical and mental abilities. Moreover, the minimum legal age must be observed, the users must be adequately trained.

2.2 Intended use



Attention!

- 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.

2.3 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 diffusor 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.



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

2.4 Explanations of symbols

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

	**Attention!** General hazardous area. Death or severe injury or significant property damage can occur if the corresponding precautions are not taken!
	**Danger due to electric current** 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.

2.5 Product safety

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



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

2.6 Requirements placed on the personnel / due diligence

Persons entrusted with the planning, installation, commissioning and maintenance and servicing in connection with the frequency inverter must have the corresponding qualifications and skills for these jobs.
In addition, they must be knowledgeable about the safety regulations, EU/EC directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations. Personnel to be trained or instructed and apprentices are only permitted to work on the device under the supervision of an experienced person. This also applies to personnel undergoing general training. Comply with the legal minimum age.

2.7 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. DIN EN 50110 or DIN EN 60204)!



Danger due to electric current
- It is generally forbidden to carry out work on electrical live parts. Protection class of the device when open is IP00! It is possible to touch hazardous voltages directly.
- The safe isolation from the supply must be checked using a **two-pole** voltage detector.
- When operation with a frequency inverter the protective conductor is carrying high discharge currents (irrespective of the clock frequency, current-source voltage and motor capacity). Earthing in compliance with VDE 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 fan / motor may switch on and off automatically for functional reasons.
- After power failure or mains disconnection an automatic restart of the fan takes place after voltage return! Therefore the fan must be disconnected from voltage before doing any work (see service work).
- Wait for the fan to come to a complete standstill before approaching it!



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

2.8 Modifications / interventions in the device



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

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

2.9 Operator's obligation of diligence

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

2.10 Employment of external personnel

Maintenance and service work are frequently carried out by external employees who often do not recognize the specific situations and the thus resulting dangers.These persons must be comprehensively informed about the hazards in their area of activity. You must monitor their working methods in order to intervene in good time if necessary.

3 Product overview

3.1 Area of application/Notes on use

The fans / motors are not ready-for-use products, but conceived as components for ventilation systems (type designation see 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 SE 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.



Attention!
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 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".

3.3 Transport, storage



Attention!

- Wear safety clothing / shoes and cut-resistant safety gloves when handling.
- Avoid shocks and impacts to the device during the transport.
- Avoid extreme humidity, heat or exposure to cold (see technical data).
- Improper storage can result in preliminary damage to the motor, which may lead to premature failure. Only after correct installation do the motors comply with the specified degree of protection.
- Watch out for possible damage to the packaging or fan.
- Fix pallets during transport.
- Do not stack pallets.
- Transport the fan(s) either in the original packaging or, in the case of larger fans, on the dedicated transportation fixtures.
- Depending on the type: Lifting eyes, bore holes in the housing flange, motor bed, fastening brackets and support plates, bore holes in the motor housing for screwing in eye bolts.
- Observe the weight specifications (see rating plate) and the permissible carrying loads of the means of transport.
- Only handle with suitable hoisting gear.
- **RH..C construction without motor:** Fit a sling with sufficient carrying load around a blade. Observe the weight specified on the rating plate (rear of impeller base plate). Use only a sling suitable for carrying sharp-edged loads.
- **ER..CdesignER.., GR..:** Fan unit may only be lifted and transported using a suitable hoisting device (load spreader). Ensure there is sufficient cable or chain length.
- Position the lifting beam transversely to the motor axis. Ensure that the lifting beam has a sufficient width. The chain or cable may not touch the fan wheel when lifting.
- 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.
- The fan may not be exposed to vibrations or impacts during standstill to avoid roller bearing damages.
- Observe the motor operating instructions supplied.

3.4 Disposal / recycling



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

4 Mounting

4.1 General notes



Attention!

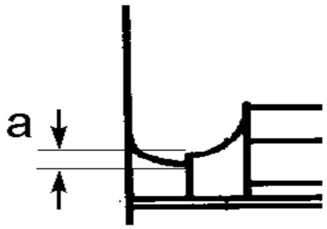
- Mounting is only to be undertaken by trained service personnel. The system manufacturer or the machine builder and/or the user is responsible that the inherent installation and security information are harmonized with the valid standard and guidelines (EN ISO12100 / 13857).
- Check the fan for damage, 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.
- 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.
- 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).
- The chain/rope may not touch the impeller and the possibly mounted frequency inverter when lifting with the lifting beam, otherwise damage is possible.
- 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 appropriare protective constuctions which meet the requirements to EN ISO 13857.
- Protective measures must be taken against falling parts when mounting with a hanging rotor.
- 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”.

4.2 Erecting the equipment design ER, GR

Use screws, for example, of strength class 8.8 according to DIN EN ISO 4014 to fasten the fan.

▷ Secure the screws with a suitable screw lock.
▷ Tighten the fastenings with the specified torques (see table).
▷ After an operating time of approx. 1 hr. re-check the torque of the screwed connection with the necessary MA.

Permissible tightening torques M_A			
Thread size	M6	M8	M10
Property class 8.8, friction coefcient µges = 0.12	9.5 Nm	23 Nm	40 Nm



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

Information

- Every screwing case is different. If the strength class of the screws differs from strength class 8.8, you must determine the adapted tightening torque by appropriate screw tests.
- Structure-borne noise decoupling of the complete centrifugal fan is recommended to avoid transmission of disturbing vibrations. (Spring or damping elements are not usually parts of the standard scope of supply). The assignment of the spacing dimensions of the damping elements can be taken from the catalogues on our home page under www.ziehl-abegg.de in the section Download - Ventilation and Control Engineering.
- 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.

Attention!

- ER.. plug fans may only be operated in installation position H (fan upright, motor shaft horizontal).
- Connect all contact points securely to the foundation or plant. If not fastened sufficiently, there is a risk of the fan tipping over or coming loose - danger of injury!
- The screwed connection that connects the impeller to the hub may never be loosened for any work on the fan! The impeller and hub form a commonly balanced assembly which may only be disassembled and installed as a complete unit. Merely loosening this screwed connection can lead to imbalance and therefore to vibrations even if the screws are connected again correctly before recommissioning!
- Blocking or braking the fan by, say, pushing objects into it is forbidden. This leads to heated surfaces and damage to the impeller.
- Making your own alterations/conversions on the fan module is unacceptable - safety risk!
- Please note the following for all types of centrifugal fans:
  - Avoid structural damage or stress with installation. Make sure the surface is flat and even.
  - Add-on parts (depending on the design: flanges, fastening brackets, frames, rails, support plates, etc.) must lie flat on the contact surfaces.
  - Do not use force, do not lever, do not bend.
  - Do not bend fan roller or fan wheel and blades - imbalance!
  - Important: Deformations and misalignments must not result in the striking or grinding of rotating parts!

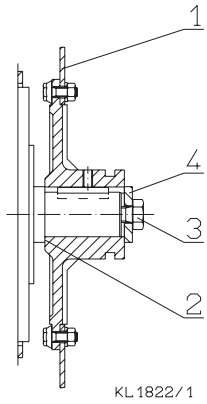
ER: When fitting a flexible connection fitting, make sure that it is not fitted completely tensioned when the fan is idle. GR: GR installation position depends on the design ordered (H = horizontal, Vu = vertical with intake from below, Vo = vertical with intake from above).

4.3 Mounting RH

Attention!
Whenever working on a fan, under no circumstances loosen the bolts that hold the impeller to the hub! Impeller and hub together form a balanced module which may only be removed and fitted as a complete unit. Loosening these bolts can lead to imbalance and therefore to vibrations, even if the bolts are tightened correctly before restarting the fan!

Impellers with fixed hub:

- The impeller is connected to the shaft end of the drive motor using a fixed hub.
- Installation: Lightly lubricate all bare surfaces (shaft ends, hub holes). Pull the impeller with the hub (1) up to the shaft shoulder (2) (transitional fit). Secure with the hoisting device with corresponding weight. Secure the axial shaft-locking device using the screw (3) and washer (4) with Loctite. Maintain torques in accordance with table.
- Disassembly: Release the axial screw connection and pull off the impeller with the hub using a suitable pulling unit (secure with hoisting device at the corresponding weight).

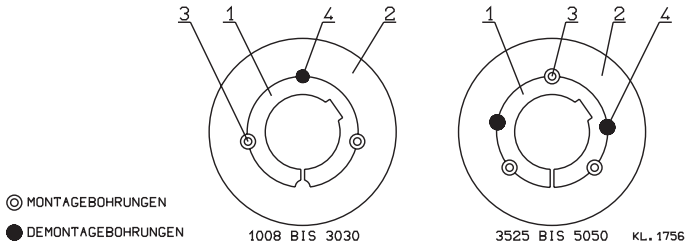


Tightening torques for screw connections with shaft screws combined with washers with associated nuts (μges.=0.12) in Nm:

Property class	M4	M5	M6	M8	M10	M12	M16	M20
8.8 (Steel)	2.8	5.5	9.5	23	45	79	195	390

Impellers with clamping bush hub:

- The impeller is fitted to the end of the motor shaft using bushings.
- Mounting: Clean and degrease all bare surfaces (fitting surfaces of clamping sleeves and motor shaft). Insert clamping sleeve (1) into the hub (2) and line up the holes as shown in the fig. (pg. 3). Lightly oil and screw in the set screws (3) - do not tighten yet.
- Push the impeller with clamping sleeve (1) load-free (with lifting gear if the impeller is heavy) onto the shaft, align in axial position and tighten the set screws (3) evenly, **tighten with torque according to the table**. Fill empty bore holes with grease to prevent penetration by foreign bodies. After an **operating time of approx. 1 hour. Re-check** the tightening torque**of the screwed connection with the necessary torque**.
- Removal: Loosen all set-screws (3), depending on the size of the bushing, unscrew one or two set-screws completely, oil them and screw them into the removal holes (4). Pull on one or both set-screws, until the bushing (1) comes free of the hub (2). The impeller can now be taken off.



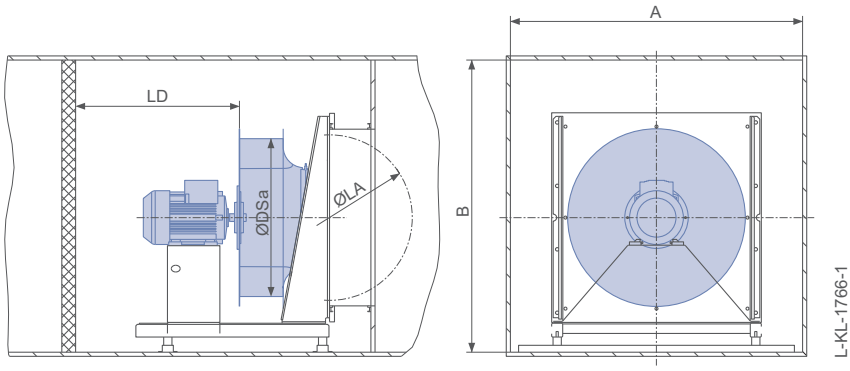
3 mounting holes, 4 removal holes

*1	1008	1108	1210	1610	1615	2012	2517	3020	3030	3525	3535	4030	4040	4535	4545	5040	5050
*2	5.6	5.6	20	20	20	31	48	90	90	112	112	170	170	192	192	271	271
*3	4.8	4.8	17	17	17	26	41	77	77	95	95	145	145	163	163	230	230

**1 clamping bush*
**2 Tightening torque without feather key in Nm*
**3 Tightening torque with feather key in Nm*

4.4 Installation and usage information

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



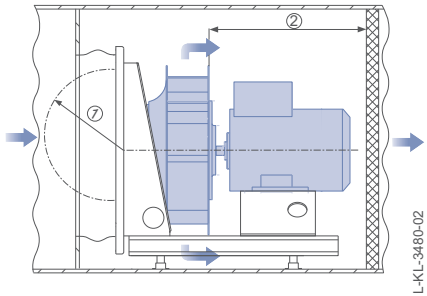
- Impeller blade external-diameter : Ø DSa
- Distance on suction side: LA ≥ 0.5 x DSa *
- Distance on pressure side: LD for C/Cpro ≥ 1 x DSa, LD for ZAbluefin ≥ 0.8 x DSa
- Housing wall distances: A = 1.8 x DSa (A = B)

* In the case of disturbance flow (per example curved pipe at the suction side, flaps etc.) LA ≥ 1 x DSa

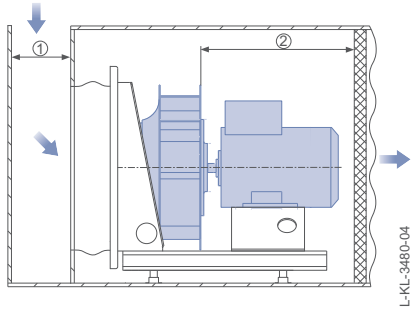
4.4.2 Information for montage

The following installation information is based on experience from applications and measurements on our test benches.
These are general guidelines, as variations may occur in your device due to differences in its construction.

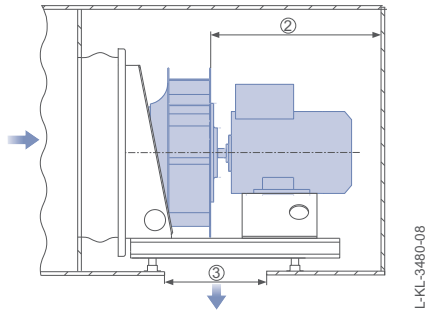
- The performance depends on the distance to components on the intake “1” and pressure side“2”.
- Saugseite “1” ≥ 0.5 x DSA.
- Optimum on pressure side “2” ≥ 1.0 x DSA, absolute minimum “2” ≥ 0.7 x DSA (exception: cooling battery or humidifier after the fan).

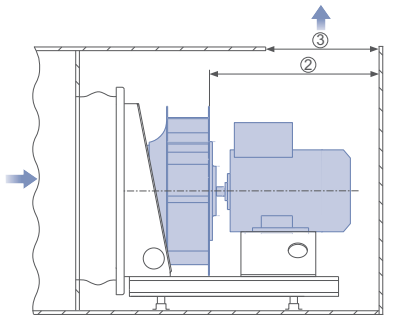


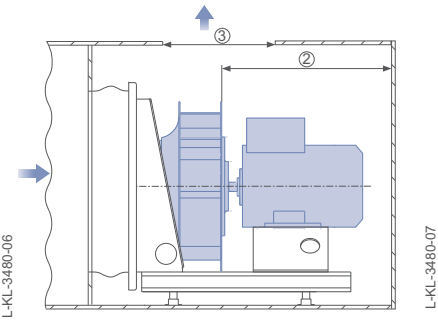
- Changes to the flow direction before the fan create significant turbulence in the intake area.
- Intake side “1” ≥ 1.0 x DSA, with guide blades this can be reduced to “1” 0.7 x DSA, otherwise there are increased acoustics and power loss.



- The position of the opening can be above or below the fan, size “3” ≥ 0.8 x DSA.
- Ideal design if the opening extends over the entire width of the device.



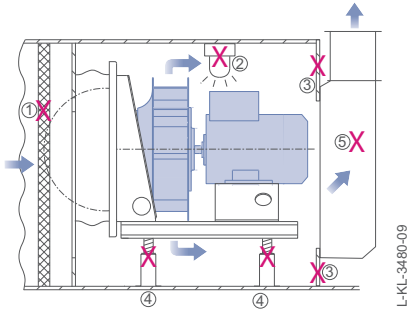




4.4.3 Possible sources of faults during installation

Please pay attention to possible sources of faults:

- 90° change in flow direction and reduction in cross-section “5”.
- Obstructions on the pressure side (long lamp, fluorescent lamp) “2”.
- Failure on the intake side (battery too close) “1”.
- Obstruction on the pressure side (high bottom rails) “4”.
- Constriction at outlet “3”.



4.5 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 two hours every month at 80 - 100 % of maximum speed to remove any moisture that has penetrated inside.
If available, the stationary heaters must be turned on when the motor is not running.

4.6 Connection lead & terminal box

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

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!
- Connect fan only to electrical circuits that can be disconnected with an all-pole isolating switch.
- The device owner is responsible for the EMC of the entire plant according to the locally applicable standards.
- It is forbidden to carry out work on electrically live parts!
- 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.
- Electrical equipment must be checked regularly: Loose connections are to be re-tightened and damaged cables must be replaced immediately.

5.2 Connection



Attention!
The electrical connection must be carried out according to the motor operating instructions.

Be aware of the following Points:

▷ 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).
▷ Observe the connection values in the motor operating instructions.
▷ Observe the tightening torques in the motor operating instructions.
▷ When using an external terminal box, the operating instructions must be taken into account.
▷ **The protective devices of the motor must be connected!**
▷ Check all components for continuity.
▷ Before start-up of the installation, check the direction of rotation of the impeller.

5.3 Frequency inverter and EMC

Interference emission and installation of cables

- In order to prevent faults attributable to interference and to ensure compliance with the radio interference level, the connecting leads must be kept as short as possible both in the motor terminal box as well as in the controller. Spacing between supply cables, motor cable and signal cable should thereby be kept as large as possible.
- When laying shielded lines, never use so-called "pigtails" on shields (twisting of the shielding braid into strands).
- EMC screwed connections must be used on cable entries.
- High-frequency earthing of the complete drive system must be carried out on both sides on the motor and the inverter in a technically correct manner. Implement a contacting process on a large-scale for good discharge of high-frequency currents for a 360° contacting process by means of EMC shield clips on the inverter and an EMC screwed connection on the motor.
- **Make sure that the cable gland has an electro-conductive connection to the terminal box. If necessary, the available coating must be removed on the contact point or a tooth lock washer used on the counter ring.**
- **Maintenance or emergency switches installed between inverter and motor must also be shielded.**
- **Please observe the corresponding installation instructions of the frequency inverter that is used!**

Reducing bearing currents when operating on the inverter

- When operating on the inverter harmful bearing currents can occur in the motor. This depends on many factors which, in many cases, ZIEHL-ABEGG cannot influence. Thus, it comes down to the expert installation in the respective assembly situation. The following points serve as a guideline, but cannot always prevent bearing currents from occurring.
- To systematically reduce and prevent damage by bearing currents, you must take into account the overall system made up of motor and inverter. But further additional measures may be necessary, e.g. use of all-pole sinusoidal filters or use of hybrid bearings.
- **The ZIEHL-ABEGG Fcontrol frequency inverter is already geared to ZIEHL-ABEGG motors and possesses an all-pole sinusoidal filter so that no harmful bearing currents at all can be expected with the correct installation.**

Frequency inverter, external brand

The following measures support the reduction of harmful bearing currents:

- The specified measures with regard to EMC-compatible installation must be observed and implemented.
- For electrical bridging of vibration dampers, use high-frequency equipotential bonding conductors made of braided flat copper strips with a minimum cross-section of 16mm².
- Design the contacting process on a large-scale.
- Use shielded connecting cables with as symmetrical a design as possible.
- Connect the screen on both sides on the motor and inverter.

- If the cable shield cannot be contacted or not contacted sufficiently due to special framework conditions, use a separate high-frequency equipotential bonding conductor between the motor housing and the protective earth bar of the inverter.
  - Install the separate high-frequency equipotential bonding conductor using braided flat copper strips or high-frequency stranded conductors. Solid copper lines are not suitable for high-frequency earthing due to the current displacement effect.
- Use suitable common mode filters at the inverter output.
- Limit the voltage increase by using suitable output filters (du/dt filters).
- We recommend the use of all-pole sinusoidal filters.
- When using all-pole sinusoidal filters, screened motor leads, metal terminal boxes and a second earth connection to the motor can be omitted.
- **General recommendation: Continuous operation of the fan / motor below 15 % of the nominal speed is not economically and technically reasonable.**



Attention!
If the speed is excessively high due to incorrect configuration of the frequency converter, parts of the fan may come loose, which can cause serious injuries.
Check the settings on the frequency converter and ensure that the maximum speed “n_max” and the maximum frequency “f_max” (see fan rating plate) cannot be exceeded.
Refer to the frequency inverter documentation for further details.

5.4 Operation with frequency inverter

During operation of the frequency inverter pay attention to the following points:

- In order to approve its centrifugal fans with standard motors, ZIEHL-ABEGG carries out extensive qualification tests. Depending on the installation conditions and the other system components in use (e.g. frequency inverter incl. parameter configuration), in individual cases there may be unusual noises and vibrations (resonance) caused by the electrics.
- If a fan is operated with a frequency inverter, unacceptably high vibrations can occur in narrowly limited speed ranges. Constant running is therefore not permitted. The impeller can burst - danger of serious or even mortal injury!
- During start-up, check whether certain speed ranges result in high vibrations. If this is the case, these speed ranges must be faded out by programming the frequency inverter.
- In case of speed control through a frequency converter, it must be ensured that the max. permissible speed cannot be exceeded due to any frequency converter malfunction.
- If the operating voltage differs, the current may change disproportionately. This must be taken into account when a selecting possible frequency inverter and the mains side fuse protection.
- Do not exceed the maximum operating speed (fan/impeller rating plate), see the safety notes. The maximum permissible operational revolution speed applies for sustained operation S. Increased switching repetitions only permissible with gentle step-up by means of frequency converter or with operation without frequency converter by means of Y/D circuit. Do not operate the fan in the resonance range of the impeller - risk of fatigue fracture. When speed control, pass rapidly through the resonance range.

- Determine the resonance range of the impeller. If the resonance range lies in the operating range, adjust the frequency inverter so that the resonance range is quickly run through. Strong vibrations caused by irregular running (imbalance; overmodulation frequency inverter), for instance due to shipping damage, improper handling or operation in the resonance range, can lead to failure.



Attention!
When in operation with a frequency converter, no overmodulation is allowed. The fan wheel may burst – danger to life!

5.5 Motor protection

The thermal motor protection is to be implemented depending on the motor design, observing the motor manufacturer's instructions.

- For a motor with no temperature monitor in the winding, a motor protection switch is required.
- For a motor with "TP" temperature sensors (PTC thermistor) a PTC thermistor relay is required, e.g. ZIEHL-ABEGG type U-EK230E with disconnection via a contactor. On the design with PTC thermistor, observe the max. permitted test voltage of 2.5 V.
- On a motor with KTY or PT100 temperature sensors, a suitable temperature monitoring unit is required.
- On a motor with "TB" thermostatic switches, a suitable motor contactor is required, e.g. ZIEHL-ABEGG type STDT16/25 or AWE/SK with disconnection via a contactor. Caution! Thermostatic switches switch on again automatically after cooling. The constructor of the plant must ensure that the fan does not start up automatically, or that an automatic start-up does not result in any hazard. ZIEHL-ABEGG motor contactors prevent an automatic restart after the drive has cooled.

6 Start-up

6.1 Prerequisites for commissioning



Attention!

- During commissioning, unexpected and hazardous conditions can arise in the entire installation due to defective adjustments, defective components or incorrect electrical connections. Remove all persons and objects from the hazardous area.
- Do not start the fan until all safety instructions (DIN EN 50110, IEC 60364-1) have been checked, the fan is out of range (DIN EN ISO 13857) and danger can be ruled out.

6.2 Procedure for commissioning

Observe the following points before the initial 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. Have all objects (tools, etc.) been removed from the air flow?
4. That safety devices -if necessary- are mounted (EN ISO 13857)?
5. The impeller is out of reach?
6. Are the condensation water drains holes (as far as available) open or respectively closed according to the suitable installation position?
7. Are all cable glands firmly tightened and leak-tight?
8. Connection data complies with the specifications on the rating plate?
9. Is the overheating protection equipment of the motor properly connected?



Attention!
Start-up may only begin when all safety instructions have been verified and any hazards have been ruled out.

Observe the following points during start-up:

1. Check the turning direction / airflow direction. The turning direction should match the turning direction arrow on the impeller bottom disc and / or the inlet nozzle support plate.
2. Check for quiet, low vibration operation. Strong vibrations due to erratic operation (unbalanced), e.g. caused by transportation damage or improper use, can lead to failure.
3. A-rated sound power levels of over 80 dB(A) are possible, see product catalogue.
4. Fans from ZIEHL-ABEGG SE are delivered balanced in accordance with DIN ISO 21940-11 for the appropriate fan category in accordance with ISO 14694 Check the fan for mechanical vibrations after installation. If the limit values of the corresponding fan category are exceeded in start-up, you must have the motor/impeller unit checked by an expert and rebalanced if necessary before continuous operation is permitted.
5. Check the system for resonances. If they lead to unacceptably high vibrations on the fan, the system must not be started up.

7 Trouble shooting

7.1 Code of behaviour in the event of faults

▷ In the event of faults, which represent a danger to people, installation or environment, the fan must be switched off.
▷ Search for the cause of the error.
▷ Inform the person responsible for the operating site.
▷ Contact the manufacturer if a fault of any kind is detected!



Attention!
Repair work which is not carried out correctly can result in serious injuries and/or material damage.

- 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!

7.2 Possible causes and remedial measures

Type of error	Possible cause	Adjustment
Fan does not run (anymore)	No line voltage Line failure	Check linevoltage
	Earth fault	Check motor connection and line voltage
	Short circuit winding	Replacing the motor / 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 temperature of supply air check voltage only for 1 ~ motors: check capacitor
	Impeller blocked or dirty	- Switch off power to the motor and secure against switching back on - Check safe isolation from supply - Remove safety grille - Remove foreign bodies or soiling - Remount the safety grille - Further procedure as in the chapter “Start-up”
Fan will not start	only for 1 ~ motors: wrong capacitor (capacity)	Select capacity according to the rating plate
	Temperature too low for bearing grease	Insert bearing with cold greasing
	see "Fan does not run"	
Fan turns too slowly	Line failure undervoltage	Check line voltage

Type of error	Possible cause	Adjustment
	Incorrect circuit in the case of a two-speed motor In the case of Y/D switch-over: Y instead of D In the case of Y/YY switch-over: Y instead of YY	Connect to suit voltage according to rating plate
	Only in 1~ motors: Capacitor worn	replace capacitor
	Fan turns in wrong direction	--> See this fault type
	Impeller / blade scrapes / brushes	When indicated, clear foreign bodies/dirt from the fan see "Impeller blocked or dirty"
Fan turns in wrong direction	Only in 3 ~ motors: Wrong connection (phase sequence)	Switch two mains phases
	only for 1 ~ motors: capacitor wrong connected	Connect according to circuit diagram
Air flow to low	Fan turns too slowly or in wrong direction	--> See this fault type
	Airways blocked	Check for free air passages (supply/exhaust air vents, filters) see "Impeller blocked or dirty"
	Pressure loss different to planned	Check fan selection
Vibrations	Imbalance	Check wings/blades for damage, soiling or ice see "Impeller blocked or dirty"
Unusual noises	Ball bearing damaged / worn	Replacement of the ball bearing by ZIEHL-ABEGG required
	Impeller / blade scrapes / brushes	When indicated, clear foreign bodies/dirt from the fan see "Impeller blocked or dirty"
	Operation beyond stall point	Check for free air passages (supply/exhaust air vents, filters)
	Fan turns in wrong direction	--> See this fault type
	In one-speed motor: Circuit wrong: D instead of Y	Connect to suit voltage according to rating plate

8 Service work

8.1 Repairs / maintenance



Attention!

- 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.
- Please observe the safety regulations and the worker´s protection rules by all maintenance and service work (EN 50 110, IEC 364).
- Wear safety clothing / shoes and cut-resistant safety gloves when handling.
- Before working on the fan, this must be disconnected from the power supply and secured against switching back on!
- 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.
- Keep the airways of the fan free - danger because of objects dropping out!
- No maintenance work at running fan!
- Check for low-vibration running and abnormal running noises.
- 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!
- Maintenance interval in accordance with the degree of contamination of the impeller!
- In the case of complete dismantling and reinstallation of the fan, checking must be carried out before start-up (see start-up).
- 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).
- Deposits on the motor, particularly on the cooling vanes and in recesses on the rotor, can lead to reduced cooling and the motor switching off prematurely. For this reason, remove deposits in good time (see Chapter: Cleaning).
- Check the impeller, in particular the weld-seams, for possible cracks.
- Repair, e.g. by welding is prohibited!
- Bolted-on wheels 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.
- 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.
- **The screen protection against accidental contact must be fixed again properly at the end of the work and before restarting!**

Information

- Maintenance should be carried out based on VDMA 24186-1. The scope and frequency of maintenance must be determined depending on operating and installation conditions. Maintenance work on the motor must be carried out according to the motor manufacturer's specifications.
- Confirmation number for inquiries or in service cases see rating plate.

8.2 Cleaning

To avoid risks of imbalance, the impeller must be checked and cleaned regularly. The impeller must be cleaned and dusted at least once a year. Depending on the place of use, this interval can also be shorter to exclude all risks of imbalance.

Danger due to electric current

- Voltage supply for motor must be interrupted and secured against restoration!
- Wet cleaning under voltage may lead to an electric shock - danger to life!

Be aware of the following Points:

- Clean the fans`s flow area.
- Keep the fan airways free. There is the danger of foreign bodies being sucked in and objects flying out!
- Do not use any aggressive, paint solvent cleaning agents when cleaning.
- Make sure that no water gets into the inside of the motor, note 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!

9 Enclosure

9.1 Technical data

Line voltage	see Fan-rating plate
Switching frequency	Fans are rated for S1 continuous operation. Controls must not allow extreme switching operation!
Permissible temperature range operation	-20 ...40 °C or according to rating plate Please see the technical documentation of the product for the minimum and maximum ambient temperature valid for the respective fan ; these may deviate from the specified permissible ambient temperatures.
Permissible temperature range transport	-20...+40 °C
Permissible temperature range storage	see enclosed operating instructions of the motor manufacturer
Permissible relative humidity for transport and storage	60 %
dB(A) values	see product catalog
Ball bearings grease service-life (F_{10h})	see enclosed operating instructions of the motor manufacturer
Protection class of motor according to DIN EN 60529	See IP specification on motor and fan rating plate
Weight	see Fan-rating plate

9.2 EC declaration of incorporation

- Translation -
(english)

ZA87-GB 2021/20 Index 010

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

The design of the incomplete machine:

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

Motor type:

- Asynchron-Innen- oder -Außenläufermotor (auch mit integriertem Frequenzumrichter)
- Electronically commutated internal or external rotor motor (also with integrated EC controller)

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

The manufacturer is

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 13857:2008	Safety of machinery; safety distances to prevent danger zones being reached by the upper limbs
Note:	The maintenance of the EN ISO 13857:2008 relates only to the installed accidental contact protection, provided that it is part of the scope of delivery.

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

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

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

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

Künzelsau, 17.05.2021
(location, date of issue)

ZIEHL-ABEGG SE
Dr. W. Angelis
Head of Technics Ventilation Technology
(name, function)

i. V. W. Angelis

(signature)

ZIEHL-ABEGG SE
Dr. D. Kappel
Leiter Elektrische Systeme
(name, function)

i. V. David Kappel

(signature)

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9.4 Manufacturer reference CE

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

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