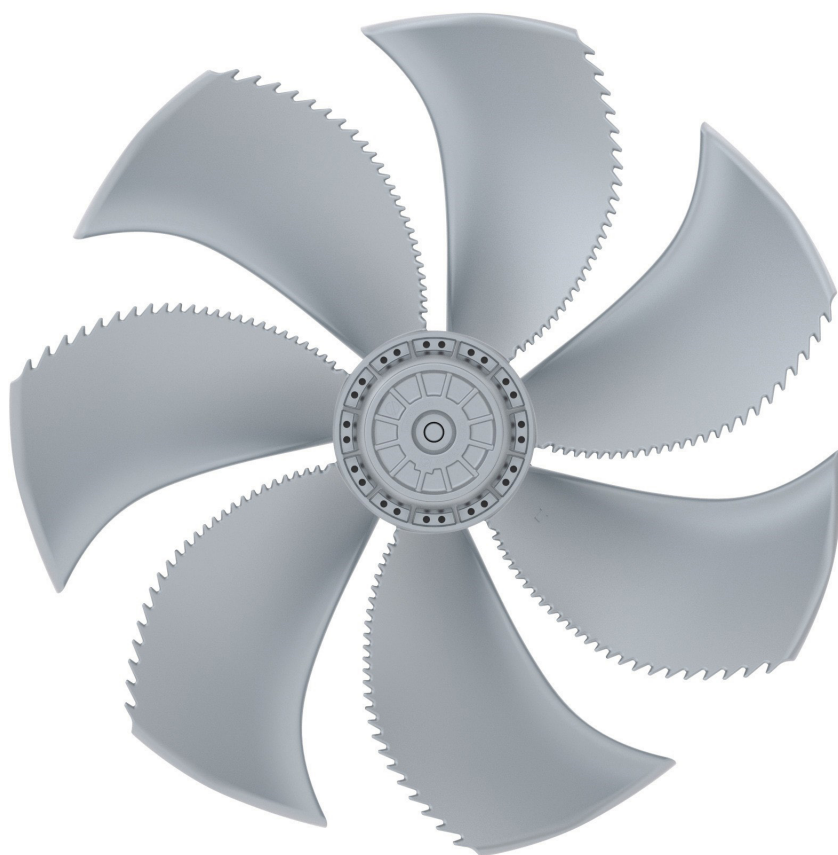


Movement by Perfection



Axial fan

with integrated external rotor motor in AC technology

Issue 2025/34

Operating instructions
Store for future use!

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1 Introduction

1.1 Liability

Compliance with the following specifications serves to ensure product safety. Should the information specified especially with regard to general safety, transport, storage, assembly, operating conditions, start-up, service, maintenance, cleaning and disposal/recycling not be observed, safe operation of the product may not be guaranteed posing a possible danger to life and limb of users and third parties. Thus, deviations from the specifications below can lead to the loss of legal materials defect liability as well as to the buyer's liability for the product rendered unsafe by deviation from the specifications.

1.2 Validity and meaning of the instructions

These instructions are valid for axial fans in the FB, FC, FF, FG, FN, SG, ZC, ZF, ZG and ZN model ranges with an integrated asynchronous external rotor motor. The model range can be identified by the type designation, see *Rating plate, page 11*.

The instructions can be accessed online using the product's article number, see the rating plate on the product. All language versions available for the instructions can be downloaded.

<https://www.ziehl-abegg.com/int-bal>



- ▷ Store the instructions so that they are accessible to all persons who work with the product.
- ▷ Pass the instructions on to subsequent users.
- ▷ Read and follow the instructions in full.

These instructions apply only to the product ZIEHL-ABEGG and not to the complete system. If additional devices are used or installed, the respective instructions must be observed.

1.3 Target group of the instructions

The target group of these instructions are transport personnel, fitters who have been instructed in mechanical and electrical engineering, electricians, electrically instructed personnel, start-up and maintenance personnel, see *Requirements placed on the personnel, page 5*.

1.4 Applicable documents

Observe the following documents for instructions:

- Technical product specification, insofar as agreed in individual cases.
- Order confirmation
- Connection diagram



2 Safety instructions

2.1 Intended use

The product is intended for commercial use.

The instructions are part of the product. The product is only intended for use according to these instructions.

2.2 Requirements placed on the personnel

The client of the required measures in the product life cycle is responsible for ensuring that the personnel carrying out the work are sufficiently qualified.

Personnel	Minimum requirements, knowledge and experience
Planners and project designers	They are responsible for the project planning of the complete system. They have knowledge of applicable standards, legal requirements and safety regulations.
Transport personnel	They can deal safely with industrial trucks, loads and transport regulations. They can identify and avoid hazards that can occur when transporting the product. They have also been instructed and trained in the necessary protective equipment and protective measures to use.
Assembly personnel	They can deal safely with tools, loads and assembly instructions. They can identify and avoid hazards during assembly of the product. They have also been instructed and trained in the necessary protective equipment and protective measures to use.
Electrician	They have technical training in the field of electrical engineering. They can identify and avoid hazards associated with electricity. They have also been instructed and trained in the necessary protective equipment and protective measures to use. They comply with the technical regulations and have the following electrotechnical knowledge: ▫ Read and fully understand electronic connection diagrams. ▫ Understand all relationships regarding the safety devices. ▫ Are familiar with the function and design of the electrical components used.
Electrically trained personnel	Personnel instructed or supervised by a qualified electrician. They can identify and avoid hazards associated with electricity. They have been instructed in the assigned tasks and possible hazards in the event of improper conduct. They have also been instructed and trained in the necessary protective equipment and protective measures to use.
Start-up technician	They handle the entire system safely. They can identify and avoid hazards that may occur during start-up. They have also been instructed and trained in the necessary protective equipment and protective measures to use.
Maintenance personnel	They handle the entire system safely. They can identify and avoid hazards that may occur during service and maintenance. They have also been instructed and trained in the necessary protective equipment and protective measures to use. They can detect and avoid hazards associated with electricity.

2.3 Live parts

Touching live parts poses a risk of death due to electric shock.

- ▷ Do NOT touch connection points of wires, terminal points, parts of the motor winding, or the capacitor.
- ▷ Disconnect the product from the power supply before carrying out any work and secure it against being switched

back on.

- ▷ The safe isolation from the supply must be checked using a two-pole voltage detector.
- ▷ Do NOT insert objects or limbs through openings.
- ▷ Use the product according to the IP degree of protection.
- ▷ Check the product for damage; do NOT use the product if the insulation is defective.

2.4 Parts that can become loose

A product or parts that become loose, e.g. due to excessive vibrations, can lead to a risk of death.

- ▷ Ensure low vibration operation and avoid system resonances.
- ▷ DO NOT operate the product when the blades have ice on them.
- ▷ Take protective measures against to prevent parts becoming loose.
- ▷ Use guard grilles or structural measures for critical applications, e.g. refrigerating systems with refrigerants subject to hazardous substance regulations.

2.5 Rotating parts

At high speeds and in poor lighting, rotating parts are not visible and can cause serious injury

- ▷ Install the product in a way that ensures that contact between the rotor and impeller is NOT possible.
- ▷ Observe the safety distances in the danger area.
- ▷ DO NOT put the product into operation if protective devices are missing.
- ▷ DO NOT place any objects or limbs into the fan's rotation range.

2.6 Strong air flow

The product can suck in and blow away loose parts; flying parts can cause serious injury.

- ▷ Take structural measures to protect the impeller from loose parts, e.g. with a guard grille.
- ▷ Remove loose parts from the operation area.
- ▷ DO NOT wear loose or billowing items of clothing, etc.
- ▷ Tie hair back and cover.

2.7 Automatic restart

If voltage supply is present, the product can switch off and restart automatically. After interruption and resumption of the voltage supply, an automatic restart takes place. Unexpected restarts can result in serious injury.

- ▷ Switch off the product. Before working on the product, ensure that it is de-energised and secured against being switched on again.

2.8 Modifications and spare parts

Unauthorised modifications and unauthorised spare parts can lead to serious injuries.

- ▷ Do NOT modify the product.
- ▷ Before making changes, obtain written approval from ZIEHL-ABEGG.
- ▷ Use spare parts from ZIEHL-ABEGG.

2.9 Do not disassemble components

Dismantling components can cause serious injury.

- ▷ DO NOT remove any components from the product, e.g.: Impeller, fan blade, motor suspension, guard grille, balancing weight.

This does not apply to components that must be dismantled for the period of assembly, electrical connection



and cleaning.

2.10 Hot surfaces

Hot surfaces on the product can cause burns.

- ▷ Allow the product to cool down before starting work.
- ▷ Wear protective equipment, e.g. safety gloves.

2.11 Fire hazard

Hot surfaces on the product can cause a fire.

- ▷ Keep the product a safe distance from combustible and flammable substances.

2.12 Explosion hazard

Explosive dusts and gases can ignite outside or inside the product. There is a risk of fire or serious explosion.

- ▷ Do NOT use the product in an explosive atmosphere.
- ▷ If an explosive atmosphere is able to form due to a leakage caused by a fault, assess the risks and take precautions to prevent combustion.

2.13 Excessive vibrations

Increased vibrations can lead to failure and shorten the service life of the product, see *Checking for low-vibration operation*, page 26.

- ▷ Ensure low-vibration operation and avoid system resonance.
- ▷ If speed control is used, prevent the product from running at resonance-critical speeds.
- ▷ In applications with external vibrations, the product must be decoupled from the vibration source.

2.14 Impacts and shocks

Impacts and shocks may result in material damage.

- ▷ Handle the product with care.
- ▷ Do NOT transport the product by the impeller.
- ▷ Do NOT place the product on its impeller.
- ▷ Protect the product when installed.
- ▷ Do NOT step on the product.

2.15 Conveyed media

Pumping abrasive, adherent or liquid media can cause material damage.

- ▷ Use the product only for conveying gaseous media, air or air-like mixtures without any solids.

2.16 Ambient conditions

Excessively high and low temperatures on the conveyor or in the environment can cause material damage.

- ▷ Observe the temperature specification, see *Technical data*, page 35, *Rating plate*, page 11 and *Applicable documents*, page 4.
- ▷ DO NOT subject the material to shock or mechanical stress at ambient temperatures below -10 °C (14 °F).

2.17 Subsequent coating

Subsequent coating of the product can lead to material damage.

- ▷ Do NOT coat the product without consulting ZIEHL-ABEGG.

3 Transport and storage

Personnel qualifications: Transport personnel

3.1 Transport



WARNING

Crushing hazard due to suspended loads and uncontrolled moving parts.

- ▷ Wear safety helmet, safety gloves and safety shoes.
- ▷ Only move the load under supervision.
- ▷ Do NOT walk or reach under suspended loads.
- ▷ Set down the load when you leave the work area.
- ▷ Secure the product during transport.
- ▷ If the products are delivered on pallets, DO NOT stack the pallets.

ATTENTION Material damage to components caused by transport.

- ▷ DO NOT transport by the connecting cable.
- ▷ DO NOT hold or prop up on the individual blades.
- ▷ DO NOT touch the chain or rope when lifting the product with a load beam.

Procedure:

1. Select the lifting gear for the total weight to be transported.
2. Transport the product in its original packaging. Transport larger products at the designated suspension points. Suspension points are the boreholes on the housing flange, motor bed, support plates, motor suspensions, fixing brackets and any crane eyes, depending on the product model.
3. Unpack the product.
4. Check the product for damage.
5. In the event of uncertainty, contact the service team; see service note on the back of the instructions.
6. Remove the packing material and dispose of it in accordance with local regulations.

3.2 Storage

Prerequisite:

The product is stored in the ambient conditions specified in the technical data, see *Technical data, page 35*. If deviating ambient conditions are required, contact the service team during project planning; see back page of the instructions.

Procedure:

- ▷ Protect the product from moisture, dirt and heat sources.
- ▷ Storage longer than 12 months: Rotate the impeller 30 turns by hand per month.
- ▷ Storage longer than 24 months: Contact the ZIEHL-ABEGG service team. The ball bearings must be replaced. Ball bearing replacement is not possible for motor size W (068).

Drain the condensate every 6 months

Products with motor size W (068) have condensate drainage holes in the rotor; the boreholes in the stator are for attaching add-on parts. All other motor sizes have condensate drainage holes in the rotor and in the stator.



Upon delivery, the condensate drainage holes are (depending on the version):

- open
- sealed with a screw
- sealed with a plug

Procedure:

1. Open the condensate drainage holes, point them downwards and allow the condensate to drain. For motor size W (068), allow condensate to drain on the stator side via the cable inlet.
2. Reseal any opened condensate drainage holes.

4 Product overview

4.1 Description

An axial fan conveys the medium axially to the impeller's rotary axis. 1 ~ and 3 ~ asynchronous external rotor motors of different sizes are used for the drive. The fan is delivered as an incomplete machine to be integrated into a machine, device or plant. Contact protection must be ensured before product start-up.

For fans with 1 ~ motors, a service capacitor is required; for capacity, see *Rating plate*, page 11.

For many of the motors used, the rotation speed can be controlled via voltage reduction thanks to a special design, see *Operating fan on voltage controller*, page 23.

The rotational speed can be controlled via a frequency inverter regardless of the motor design. The prerequisite is compliance with the requirements for frequency inverter operation, see *Operating fan on frequency inverter*, page 24.

4.2 Type key

Excerpt from the type key with the relevant notices for the instructions:

ZN	045-	4	E	Q.	2	F.	V	7	P	2
Fan		Electrical features			Motor		Blade features — —			
Model range	Model size	Number of poles	Current type	Design	Model size	Component length				
F_ V_ Z_ = ZAplus S_ = ZAplus	— — -	—	D = 3 ~ E = 1 ~ I = EC	A = Motor flange attachment D, I, K, P, W, D, S, T = Support arm attachment F, L, H, Q = Wall ring attachment, nozzle	W = 068 0 = 074 2 = 085 3 = 092 C = 101 4 = 106 6 = 137 7 = 165	—				

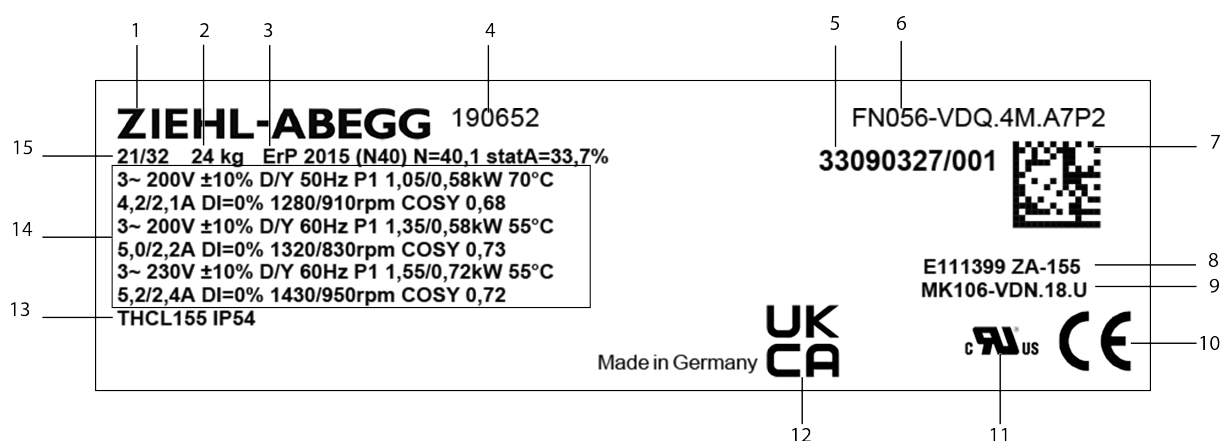
Example: ZN045-4EQ.2F.V7P2

The product is a ZAplus fan of size 045 with a single-phase motor and a square wall ring plate.



4.3 Rating plate

Example:



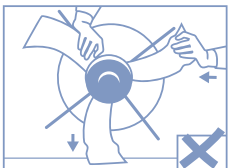
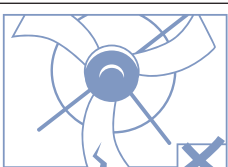
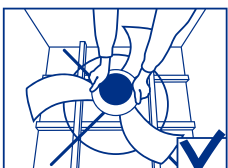
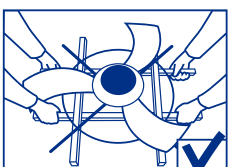
1	Manufacturer	9	Motor identification UL
2	Weight	10	European conformity mark
3	ErP data	11	UL Recognised Component Mark
4	ZIEHL-ABEGG Article number	12	UK conformity mark
5	ZIEHL-ABEGG Serial number	13	Thermal class THCL, IP rating of motor and notice if the motor is not voltage variable.
6	Type designation, see <i>Type key</i> , page 10	14	Rated data 50/60 Hz Rated voltage and tolerance, circuit type, rated frequency, power consumption, maximum allowed pumped medium temperature, rated current, current increase, rated speed, power factor With 1 ~ motor, additional capacitor capacity, power factor and circuit type are omitted
7	Data Matrix Code	15	Year and calendar week of production
8	UL file and insulation system		

The information shown here are examples. Only the rating plate affixed to the respective product is valid.

4.4 Signage

Observe any signage on the packaging and product.

Example:

	ATTENTION! The impeller can bend due to incorrect handling. ▷ DO NOT hold or prop up on the individual blades.
	
	▷ Remove the product from the packaging by the flange ring. Working with a second person will make the handling process easier.
	

5 Installation

Personnel qualifications: Assembly personnel

⚠ WARNING Crushing hazard due to suspended loads and uncontrolled moving parts.

- ▷ Wear safety helmet, safety gloves and safety shoes.
- ▷ Only move the load under supervision.
- ▷ Do NOT walk or reach under suspended loads.
- ▷ Set down the load when you leave the work area.



5.1 Assembling the product

Assembly is dependent on the design and version of the product, see next chapter. This chapter contains general information.

ATTENTION Risk of material damage due to falling parts.

- ▷ Protect the product from falling parts using guard grilles or structural measures.

ATTENTION Functional impairment due to interference in the inlet air.

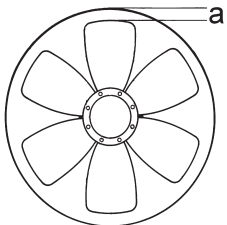
- ▷ Guide the axial air supply through the device structure and system structure in a twist-free manner and without additional air resistance.

Prerequisite:

- The mounting surfaces are flat.

Procedure:

1. Observe the storage duration, see *Storage*, page 8.
2. Select the lifting gear for the total weight to be transported.
3. Check the product for damage and contamination. Do not put damaged products into operation.
4. Observe the installation position according to the planning specifications and marking on the product.
5. Turn the impeller by hand and check that it engages easily.
6. Note the position of the condensate drainage holes, see *Condensate drainage holes dependent on the motor size*, page 13.
7. Fit all fastening elements with an anti-rotation lock.
8. Use all available mounting holes.
9. The specific attachment method is dependent on the respective installation situation.
10. Depending on the version, install the impeller in the centre. Make sure that the mounting distance (a) is even all the way round. Make sure that the impeller does not rub.



11. Install a guard grille if necessary.

Condensate drainage holes dependent on the motor size

Motor size W (068)

There are open condensate drainage holes in the rotor. For assembly with the stator at the bottom, the condensate drains off in the area of the cable inlet.

Motor sizes 0 (074) to 7 (165)

On delivery, the condensate drainage hole in the rotor and the one in the stator are (depending on the version):

- open
- sealed with a screw
- sealed with a plug

Assembly process:

Products with degree of protection IP44, IP54 and motor size C (101) IP55

- ▷ The motor axis is horizontal: Align the condensate drainage hole on the stator side so it points downward and open it.
- ▷ The motor axis is vertical: Open the condensate drainage hole at the bottom; depending on the installation position, this is the condensate drainage hole in the stator or the one in the rotor.

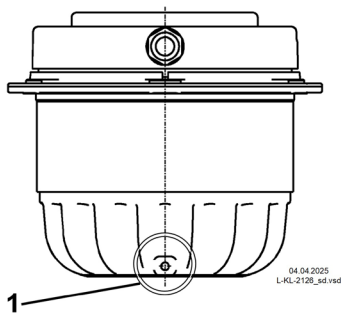
Products with degree of protection IP55, except motor size C (101) IP55

All condensate drainage holes must be sealed, except for when draining condensate.

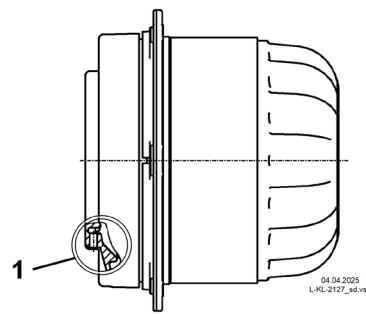
- ▷ The motor axis is horizontal: Align the condensate drainage hole on the stator side so that it is pointing downward to allow for regular draining of the condensate.
- ▷ The motor axis is vertical: The condensate can be drained regularly through the lower condensate drainage hole. Depending on the installation position, this is the condensate drainage hole in the stator or the one in the rotor.

Example of motor size C (101)

Vertical motor axis with condensate drainage hole (1) in the rotor at the bottom



Horizontal motor axis with condensate drainage hole (1) in the stator at the bottom



5.2 Mounting fan model A on the motor flange

Procedure:

1. Transfer the interfaces (1) for installation from the motor flange to the substructure.
2. Create the boreholes.

WARNING! Falling product due to screws that are too short

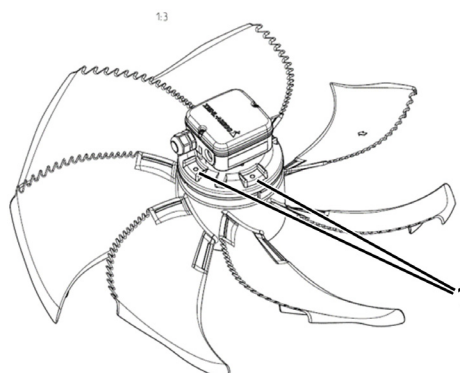
- ▷ ALWAYS observe the minimum screw-in depth of the screws.

ATTENTION! Impeller rubbing due to screws that are too long

- ▷ NEVER exceed the maximum screw-in depth of the screws.

3. Secure the product with screws, see table.
4. Secure the connecting cable to one of the fan's support arms, e.g. with cable ties.

Example:



Thread size Motor size	Tightening torque M_A for strength grade 8.8 Friction coefficient μ_{total} = 0.12	Tightening torque M_A for A2-70	Screw-in depth	
			Minimum	Maximum
M4 W (068)	2.5 Nm (1.84 ft. lb.)	-	6 mm (0.23 in.)	6 mm (0.23 in.)
M6 0 (074), 2 (085), 3 (092), C (101), 4 (106)	9.5 Nm (7.0 ft. lb.)	7 Nm (5.16 ft. lb.)	9 mm (0.35 in.)	11 mm (0.43 in.)
M10 6 (137)	40 Nm (29.5 ft. lb.)	33 Nm (24.3 ft. lb.)	15 mm (0.59 in.)	18 mm (0.7 in.)
M12 7 (165)	70 Nm (51.6 ft. lb.)	57 Nm (42 ft. lb.)	18 mm (0.7 in.)	20 mm (0.79 in.)

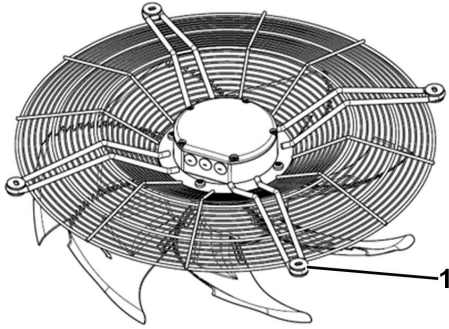
5.3 Mounting fan model D, I, K, P, S, T, W on the suspension support arm

Procedure:

1. Transfer the interfaces (1) for installation from the suspension to the substructure.

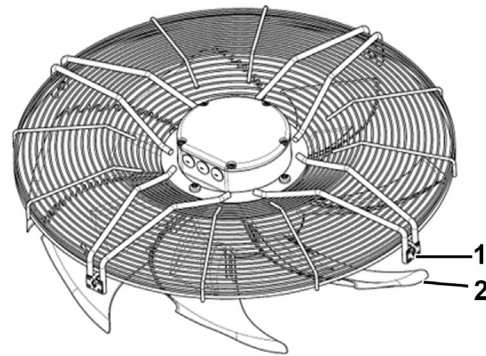
Example:

Model D, I, K, P, W, axial mounting



Example:

Model S, T, radial mounting



2. Create the boreholes.

Attention! Impeller rubbing due to screws that are too long during radial mounting

▷ Do NOT allow the screw to protrude until it touches the impeller (2).

3. Secure the product with screws.
4. Secure the connecting cable to one of the fan's support arms, e.g. with cable ties.



5.4 Mounting fan model T in the exhaust chimney

Mounting fan size 040 to 063 with plastic bracket

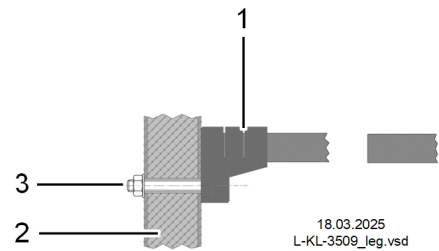
Prerequisite:

- The assembly accessories from the scope of delivery are used.

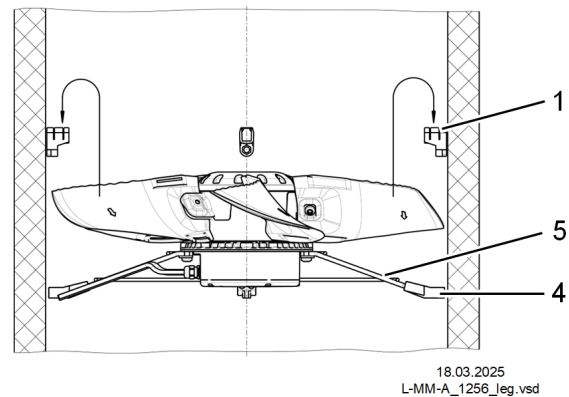
Procedure:

1. Mark the position of the enclosed 4 fixing brackets (1) in the exhaust chimney (2), 4 x 90°.
 2. Create the boreholes.
 3. Place a washer made of corrosion-resistant material under the inner fixing bracket (1) and the outer threaded connection (3).
 4. In the case of a foamed chimney, secure the threaded connection (3) only so that it does not dig into the chimney wall.
 5. Place the 4 enclosed plastic end pieces (4) onto the ends of the fan support arms (5).
 6. Insert the fan into the chimney and click it into the fixing brackets (1) from above.
- To release the fan if necessary, grasp the support arms and push upwards with a jerk.
7. Guide the connecting cable through the chimney wall and fasten it to one of the fan's support arms, e.g. with cable ties.

Sectional view: Fixing bracket



Sectional view: Installing the fan



Mounting fans from size 063 with stainless steel bracket

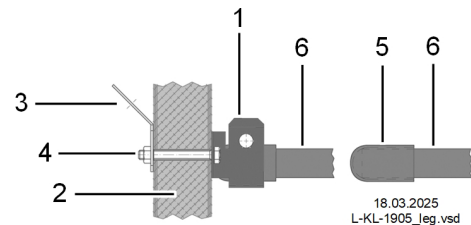
Prerequisite:

- The installation kit suitable for the fan size is used, available as an accessory.

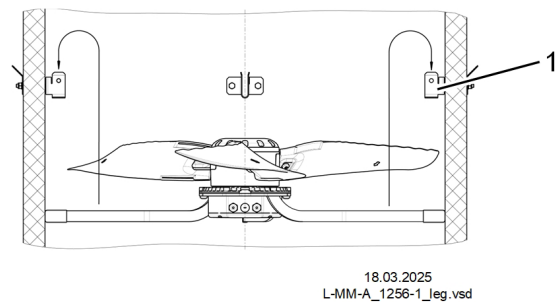
Procedure:

1. Mark the position of the 4 fixing brackets (1) in the exhaust chimney (2), 4 x 90°.
2. Create the boreholes.
3. Place a washer underneath the threaded connection for the fixing brackets (1) on the inside, use the mounting brackets (3) as a base on the outside. Align the borehole in the mounting brackets so it is at the top.
4. In the case of a foamed chimney, only fasten the screw connection (4) so that it does not dig into the chimney wall.
5. Slide protective caps (5) onto the ends of the fan support arms (6).
6. Insert the fan into the chimney and fix it in the fixing brackets (1).

Sectional view: Fixing bracket

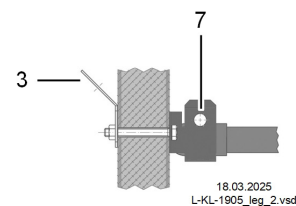


Sectional view: Installing the fan



7. Secure the support arms with the clamp connection (7).
8. The four retaining brackets (3) are designed as eyelets and can be used for additional attachments, e.g. with bearer cables, to relieve the weight of larger fans on the chimney.
9. Guide the connecting cable through the chimney wall and fasten it to one of the fan's support arms, e.g. with cable ties.

Clamp connection



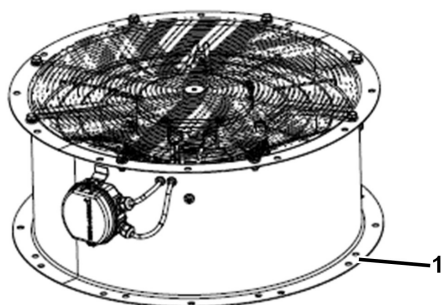
5.5 Mounting fan model F, L, H, Q on a wall ring or housing

Procedure:

1. Transfer the interfaces (1) for installation from the suspension to the substructure.

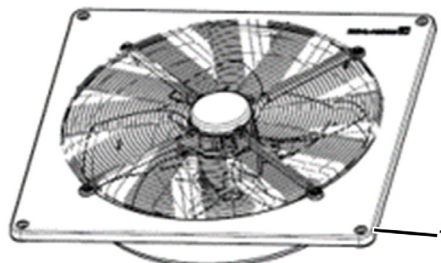
Example:

Model F, metal housing



Example:

Model Q, plastic wall ring plate



Products with a round mounting flange sometimes have 2 different hole diameters. Attaching the product to one of the two diameters is sufficient; the second diameter can be used for a guard grille.

2. Create the boreholes.
3. Secure the product with screws. The threaded connection on plastic components must have large mounting surfaces; see table for tightening torque.
4. Secure the connecting cable to the housing or one of the fan's support arms, e.g. with cable ties.

Plastic mounting interfaces

Material	Diameter of the through bore-hole		Thread size	Tightening torque M_A for strength grade 8.8 Friction coefficient μ_{total} = 0.12
	Minimum	Maximum		
Plastic wall ring plate	8.4 mm (0.33 in.)	10 mm (0.39 in.)	M8	10 Nm (7.37 ft. lb.)
	10.5 mm (0.41 in.)	12 mm (0.47 in.)	M10	21 Nm (15.5 ft. lb.)
Plastic type ZAplus Type: SG., ZC., ZG., ZN., ZF..	8.4 mm (0.33 in.)	10 mm (0.39 in.)	M8	12 Nm (8.85 ft. lb.)
	10.5 mm (0.41 in.)	12 mm (0.47 in.)	M10	24 Nm (17.7 ft. lb.)
	13 mm (0.51 in.)	14.5 mm (0.57 in.)	M12	40 Nm (29.5 ft. lb.)

6 Electrical installation

Personnel qualification: qualified electrician or electrically instructed personnel

⚠ DANGER Danger to life due to electric current.

- ▷ NEVER carry out work if the product is electrically live.
- ▷ Route the lines so that they are NOT damaged.

ATTENTION Material damage due to moisture ingress via the connecting cable.

- ▷ Depending on the installation position and exposure to moisture, route the connecting cables from below or with a water draining pipe elbow towards the product's cable gland.
- ▷ Mount a junction box that is separated from the product lower than the product so that no water can enter the motor through the connecting cable.

6.1 Product with connecting cable

Procedure:

- ▷ Connect the product according to the connection diagram and the information below. The connection diagram is attached to the stator or connecting cable.

6.2 Product with terminal box

⚠ DANGER Danger to life due to electric current.

- ▷ DO NOT use any cable glands made out of metal in plastic terminal boxes as potential is not equalised.
- ▷ NEVER operate the product with the terminal box open.
- ▷ Close all cable inlets that are not needed.

ATTENTION Material damage due to moisture and dust penetrating via the cable gland.

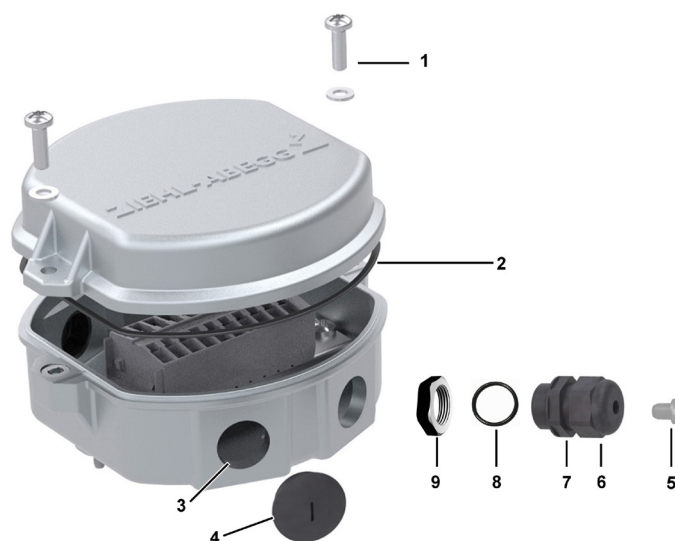
- ▷ NO additional sheathing of the line in the sealing area of the cable gland, e.g. with insulating tape or a heat-shrink tube.
- ▷ NO contamination of the line in the sealing area of the cable gland, e.g. with grease or dust.

Requirements:

- The sealing area is not damaged.
- The line diameter is in the sealing area of the cable gland.
- The cable gland is complete, the O-ring is present and is in contact with the hexagon socket.
- Lines are used that can guarantee a permanent seal around the cable glands, e.g. with pressure-resistant, dimensionally-stable, round-centred sheath or lines gusset filling.



Different terminal boxes are possible. All cable inlets are in a sealed condition upon delivery.



1	Cover screws
2	Cover sealing ring
3	Opening for cable inlet
4	Screw plug for line inlet
5	Sealing plug for cable gland with pre-assembled cable gland
6	Union nut for cable gland
7	Connecting thread with hexagon socket for the cable gland
8	O-ring
9	Counter nut for terminal box without internal thread in cable inlet

Procedure:

- ▷ Undo the cover screws (1) and remove the terminal box cover.

ATTENTION! DO NOT mix up the terminal box covers

- ▷ Mount the cover on the same terminal box that you removed it from, as the sealing on the cover can assume the contours of the terminal box over time.

If the cable gland is pre-assembled:

- ▷ Remove the sealing plug (5).

If there is a sealing plug in the opening for the cable inlet in the terminal box:

- ▷ Remove the sealing plug (4).
- ▷ If there is an internal thread in the opening, position the cable gland by hand and tighten it using the hexagon socket (7). Refer to the table below for the tightening torques.
- ▷ Insert the cable gland without internal thread into the opening and tighten with counter nut (9).

If a plastic terminal box has a thin seal in the opening of the cable inlet:

- ▷ Position the cable gland by hand and then screw it in over the hexagon socket (7) until the seal breaks off.
- ▷ Remove the broken seal.
- ▷ Tighten the cable gland via the hexagon socket (7); see the following table for the tightening torque.
- ▷ Insert the line and tighten the union nut (6); see the following table for the tightening torque.
- ▷ Pull the line to test it; the line must not move.
- ▷ Connect the product according to the connection diagram and the information below. The connection diagram is attached to the stator or on the inside of the terminal box cover.
- ▷ Remove all assembly backlogs, foreign objects, dirt and ingressed water from the terminal box and the sealing area on the cover.
- ▷ Mount the cover on the same terminal box that you removed it from.

Tightening torque for the cover screws

- Round plastic terminal box Ø 74 mm: 1.6 Nm (1.18 ft. lb.)
- All other plastic terminal boxes: 1.7 Nm (1.25 ft. lb.)

- Metal terminal box: 2.6 Nm (1.91 ft. lb.)

Tightening torques for cable glands

Thread size	Material	Tightening torque M_A
M12	Plastic	1.5 Nm (1.10 ft. lb.)
	Brass	4 Nm (2.95 ft. lb.)
M16	Plastic	2.5 Nm (1.84 ft. lb.)
	Brass	5 Nm (3.68 ft. lb.)
M20	Plastic	4 Nm (2.95 ft. lb.)
	Brass	6.5 Nm (4.79 ft. lb.)
M25	Plastic	6.5 Nm (4.79 ft. lb.)
	Brass	6.5 Nm (4.79 ft. lb.)

Tightening torque for the sealing plugs

- M16, M20, M25 made from brass or plastic: 2.5 Nm (1.84 ft. lb.)

6.3 Connecting the voltage supply



DANGER Danger to life due to electric current.

- ▷ Connect the product to an electrical circuit with an all-pole disconnection switch.

ATTENTION Material damage due to overloading.

- ▷ NO counter current braking with 3 ~ motors by swapping of 2 phases.
- ▷ DO NOT enable the product to run in a mode with continuous changes to the direction of rotation.

Prerequisite:

- The voltage supply is within the range of the rated voltage, see rating plate on the product.
- The voltage supply complies with the marks of quality in EN 50160.
- Restrictions apply for mounting heights > 1000 m (3280 ft.), see *Technical data, page 35*.

Procedure:

- ▷ Connect the voltage supply according to the connection diagram.
 - 3 ~ motor: dependent on the level of the voltage supply, observe the correct D/Y circuit type.
 - 1 ~ motor: connect the required service capacitor if this was not performed at the factory. For capacity and rated voltage, see the rating plate.

6.4 Motor protection

Ensure that the motor protection is dependent on the motor version, see connection diagram and product specification.

Type of motor	Type of motor protection
Without integrated thermal protectors.	Use a motor protection switch. Temperature is monitored indirectly by monitoring the motor current.
Temperature monitoring via thermostat switch TB internally connected in the winding.	If motor over-temperature occurs, the temperature switch opens and the current flow to the motor is interrupted. After cooling, the thermostat closes and an automatic restart takes place.



Type of motor	Type of motor protection
Temperature monitoring via integrated thermostats TB with fed-out connection.	Connect the thermostats to a suitable motor protection device or to a control unit with motor protection function. If motor over-temperature occurs, the temperature switch opens and the motor shuts down. The control system or the motor protection device must prevent automatic restarting. Thermostat technical data ▫ Max. switching voltage: 250 V AC or 60 V DC ▫ Min. current for thermostats to switch reliably: 50 mA
Temperature monitoring via integrated thermistor temperature sensors TP with fed-out connection.	Connect the thermistors to a suitable motor protection device or to a control unit with motor protection function. If motor over-temperature occurs, the thermistor temperature sensors become highly resistive and the motor shuts down. The control system or the motor protection device must prevent automatic restarting. • Maximum allowed measuring voltage of the thermistors: 2.5 V

6.5 Speed control



WARNING

Risk of injury due to components that become loose due to excessive vibrations.

- ▷ Ensure low-vibration operation and avoid system resonance.

6.5.1 Operating fan on voltage controller

The fan speed can be decreased by reducing the input voltage. This does not apply to fans that are marked as non-voltage-variable on the rating plate.

- Notice in German: nicht spannungsregelbar
- Notice in English: not voltage controllable

Reduction of the input voltage in voltage-variable motors can lead to an increase in current compared to the rated current at rated voltage. The rise in current must be taken into account when dimensioning and selecting the supply line, fuse and speed control device.

ATTENTION! Material damage due to increased current.

- ▷ DO NOT operate non-voltage-variable motors or fans on a voltage controller.

Control unit with sinusoidal output voltage

- ▷ If control units with sinusoidal output voltage are used, e.g. for transformer control units, observe the percental rise in current DI on the rating plate.

Example:

3 ~ 400 V +/-10 % 50 Hz ... **5,5 A** , **DI = 10 %**

The highest current that can occur in the event of sinusoidal voltage reduction is the rated current + percental rise in current DI.

$5.5 \text{ A} + 0.55 \text{ A} = \mathbf{6.05 \text{ A}}$

Other properties of electronic voltage controllers via phase cutting

- In addition to the rise in current due to voltage reduction, there is an additional rise in current due to harmonics. This additional rise in current can reach up to 30 % of the rated current. The value of this additional rise in current and thus also the additional motor heating is dependent on the control method of the electronic voltage controller and cannot therefore be specified in general terms.
- The motor can heat up more than with sinusoidal voltage. This reduces the maximum allowed medium temperature compared to the rating plate specification.
- The system may cause disruptive motor noises to arise.

6.5.2 Operating fan on frequency inverter



WARNING

Risk of injury due to components becoming loose.

- ▷ DO NOT exceed the rated voltage, rated frequency and rated speed of the fan, see *Rating plate*, page 11.

Procedure:

1. Install an all-pole sine filter between the frequency inverter and the motor.

ATTENTION! Material damage due to voltage peaks and bearing currents.

- ▷ The sinusoidal voltage must be generated not only from phase to phase, but also from phase to protective conductor. The ZIEHL-ABEGG **Fcontrol** model range of frequency inverters with integrated sine filter enables parallel operation of several motors without risk to the motors.

Exceptions: For motors specially designed for operation with a frequency inverter, an all-pole sine filter is not required for independent operation, see Technical Product Specification.

2. If the leakage current is higher than 3.5 mA, connect another protective conductor.

The connection screw for the second protective conductor is located in the terminal box or on the stator for versions with a connecting cable. Tightening torque 2.7 Nm (1.99 ft. lb.).



7 Start-up

Personnel qualifications: Start-up technician

7.1 Putting the product into operation



DANGER

Risk of death when working on the device while in operation.

- ▷ DO NOT put the product into operation if protective devices are missing.
- ▷ Check that there are NO objects in the operation area, e.g. tools and remnants from assembly.
- ▷ DO NOT place any objects or limbs into the fan's rotation range.



CAUTION

Hearing impairments due to A-weighted sound power level greater than 80 dB(A).

- ▷ Use ear protectors.

Prerequisite:

- The product is undamaged.
- The humidity and temperature are within the allowed range for operation and the product has become acclimatised.
- The product is reliably connected to the fastening points of the device or system.
- All technical protective measures are in place.
- The assembly and electrical installation work is complete.
- The cover to the terminal box is closed.
- The impeller rotates freely.

Procedure:

1. Switch on the voltage supply.
2. Check that the direction of rotation indicated on the product and the actual direction of rotation match.

ATTENTION! Strong vibrations will cause the product to fail.

- ▷ Check for low-vibration operation and resonances according to ISO 14694.
 - ▷ If the limit values for the corresponding fan category are exceeded, the entire system must be checked and vibrations reduced.
3. Check the current consumption of the motor and compare it with the data on the rating plate.

7.2 Checking for low-vibration operation

ATTENTION Material damage due to excessive vibrations.

- ▷ Ensure that each fan is operating with a low level of vibration.
- ▷ Avoid system resonance.
- ▷ In applications with external vibrations, the product must be decoupled from the vibration source.

Basic requirements for vibration measurement:

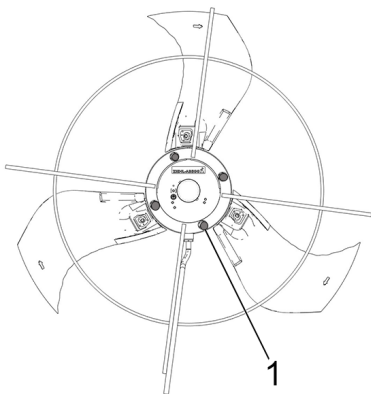
- Standing stability of the fans to be measured.
- Rigid mounting surfaces
- NO influence on the flow, e.g. due to blockages in the air supply or adjacent fans.

Procedure:

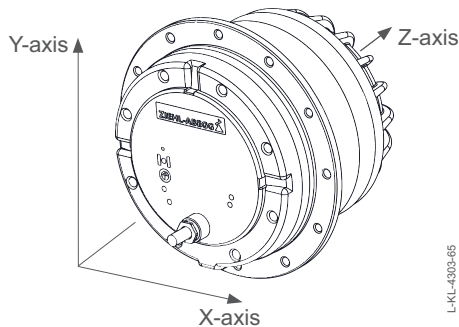
1. Connect calibrated measuring instrument to the measuring point (1).

ATTENTION! Incorrect measurement due to incorrect attachment.

- ▷ Ensure that the fans are positioned securely.
- ▷ Place on a smooth and level surface.
- ▷ Secure the wires for the measuring sensors.



2. Perform the measurements according to ISO 14694 at a measurement interval of 1 second and a ramp-up time of 180 seconds. In parallel, perform a time-accurate measurement of the rotation speeds so that the vibration values can be assigned to the rotation speed. Start up the operating speeds for fans without speed control.
3. Perform and record the vibration measurement on all three axes across the entire speed control range, and monitor the operating speeds for fans without speed control.



4. Analyse the evaluation of the measurement according to ISO 14694:2003:
The balancing quality and vibration values are classified in performance class BV-2 and BV-3 according to ISO



14694 Table 1. The limit values for vibration measurements are defined according to ISO 14694 Table 5.

ZIEHL-ABEGG-fans are delivered balanced in accordance with ISO 21940-11 for the appropriate fan category in accordance with ISO 14694 Table 2.

Ramp-up limit values for vibration values in accordance with ISO 14694

Performance class	BV class	Speed range to be evaluated	r.m.s limit value at measuring point	r.m.s limit value at measuring point
			Fixed structure	Free-standing
≤3.7 kW	BV2	Operating speed	5.6 mm/s	9.0 mm/s
>3.7 kW	BV3		4.5 mm/s	6.3 mm/s

If the limit values for the corresponding fan category are exceeded during start-up, have the fan checked by qualified specialists and, if necessary, carry out the following actions:

- Apply structural and technical measures, e.g. screw vertical profiles directly to the nozzle plate.
- Have the product rebalanced.
- Operation at non-compliant speeds must be avoided.

Start-up is complete when the limit values are complied with.

8 Troubleshooting

Personnel qualifications: Maintenance personnel

8.1 Failures

Failure	Possible cause	Remedy
The fan does not rotate.	The voltage supply is interrupted or defective.	▷ Connect the voltage supply.
	An earth fault has occurred.	▷ Check the motor connection. ▷ Check the voltage supply.
	A winding fault has occurred.	▷ Replace the product.
	Temperature monitoring has activated.	1. Allow the product to cool down. 2. Check the voltage supply. 3. Check maximum medium temperature. 4. Check the air passages; remove foreign bodies. 5. For 1 ~ motors, check the capacitor. With a permanent voltage supply of 240 V, install the next smallest capacitor.
	Wrong capacitor for 1 ~ motors.	▷ Check capacitor capacity, see <i>Rating plate</i> , page 11.
	The product is jammed.	▷ Remove the blockage.
The fan is rotating too slowly.	The voltage supply is too low.	▷ Check the voltage supply.
	A phase has failed.	▷ Check the voltage supply.
	The product is not connected correctly.	▷ Check the connection according to the connection diagram. The connection diagram is attached to the connecting cable, the stator or the inside of the terminal box cover.
	For 1 ~ motors: the capacitor has lost capacity.	▷ Replace the capacitor.
	The fan is rubbing.	▷ Check that the product is installed so that it sits centrally. ▷ Clean the product.
	The fan rotates in the wrong direction.	▷ See Failure: The fan rotates in the wrong direction.
The fan rotates the wrong way, see the direction of rotation arrow on the product.	For 3 ~ motors: connection is incorrect, wrong phase sequence.	▷ Replace 2 supply phases.
	For 1 ~ motors: Capacitor not connected correctly.	▷ Connect the capacitor according to the connection diagram. The connection diagram is attached to the connecting cable, the stator or the inside of the terminal box cover.
There are vibrations.	The product is imbalanced.	▷ Clean the product. ▷ Check the product for damage. If any parts are damaged, contact ZIEHL-ABEGG.
	The fan is operating at a level close to stalling.	▷ Reduce pressure losses in the system, e.g. clean the duct system, filter or heat exchanger.
	The fan is going into resonance.	▷ Reinforce the fan connection. ▷ For variable-speed fans, suppress the rotational speed at which resonance occurs.



Failure	Possible cause	Remedy
The product is making unusual noises.	The ball bearings are worn.	▷ Replace the ball bearings professionally or have them replaced by ZIEHL-ABEGG. Ball bearing replacement is not possible for motor size W (068).
	The fan is rubbing.	▷ Check that the product is installed so that it sits centrally. ▷ Clean the product. ▷ Remove the blockage.
	The air supply is disrupted.	▷ Check the air passage.
	Wrong direction of fan rotation.	▷ See Failure: The fan rotates in the wrong direction.
	Incorrect connection of the product.	▷ Check the connection according to the connection diagram.
The air flow is too low.	The air supply is disrupted.	▷ Check the air passage.
	The fan is rotating too slowly.	▷ See Failure: The fan is rotating too slowly.
	The fan rotates in the wrong direction.	▷ See Failure: The fan rotates in the wrong direction.

9 Service

Personnel qualifications: Maintenance personnel

9.1 Service plan

DANGER Danger to life due to electric shock

- ▷ Disconnect the product from the power supply and secure it against being switched back on.
- ▷ Verify that no voltage is present.

WARNING Rotating parts can cause limbs to be severed.

- ▷ Wait for the impeller to come to a stop before starting work.

Defective components or lines must be replaced immediately regardless of the specified interval. Do not attempt to repair the product yourself by welding or glueing.

The maintenance intervals and cleaning intervals are dependent on the area of use, the environmental conditions and the degree of contamination of the product.

Standard operating conditions:

- Fixed installation in a vibration-free environment
- Moves clean air with slow temperature fluctuations throughout the day
- The limits of the allowed temperature range are rarely reached
- Inland installation location in temperate climate zone with low stress from corrosion
- For centrifugal fans: weather-protected installation

Light operating conditions:

- Indoor installation in air-conditioned rooms, e.g. clean room or data centre

Heavy-duty operating conditions:

- Mobile applications
- Continuous service at the allowed temperature limits
- Outdoor installation in corrosive environments, e.g. near the sea or in the immediate vicinity of industrial plants with chemical emissions

The information in the table refers to standard operating conditions.

- ▷ **If there are deviations from the standard operating conditions, adjust the maintenance intervals.**

Intervals	Component	Activity
Once after 1 month	Cable glands and cable inlet	▷ Check the tightening torque, see <i>Product with terminal box</i> , page 20.
Monthly, if installed in a humid atmosphere	Complete product	▷ Operate the product for at least 2 hours at 80 to 100 % of the rated speed.



Intervals	Component	Activity
Every 6 months	Complete product, inclusive add-on parts and lines	Visual inspection and functional test ▷ Replace defective parts immediately. ▷ Clean if dirty, see <i>Cleaning</i> , page 31.
Every 6 months	Bottom condensate drainage hole for products with degree of protection IP55, except motor size C (101) IP55. See <i>Condensate drainage holes dependent on the motor size</i> , page 13	▷ Open the condensate drainage hole, allow the condensate to drain and close again.
Every 6 months	Weld seams	Check weld seams for cracks ▷ Replace the product if it is cracked, DO NOT weld.
Annually	Cable glands	Visual inspection and functional test ▷ Retighten loose threaded connection; for tightening torque, see <i>Product with terminal box</i> , page 20.
Annually	Ball bearing	▷ Check the noise generated by the ball bearings.
Annually	Fan	▷ Check that the fan is installed centrally and that the impeller does not rub.
Annually	Connecting terminals	▷ Check that the connection terminals are tight and NOT damaged.
Annually	Rating plate	▷ Check legibility and clean if necessary.
After the end of the ball bearing grease service life, see <i>Technical data</i> , page 35	Ball bearing	▷ Replace the ball bearings professionally or have them replaced by ZIEHL-ABEGG. Ball bearing replacement is not possible for motor size W (068).

9.2 Cleaning

DANGER Danger to life due to electric shock

- ▷ Disconnect the product from the power supply and secure it against being switched back on.
- ▷ Verify that no voltage is present.

WARNING Rotating parts can cause limbs to be severed.

- ▷ Wait for the impeller to come to a stop before starting work.

ATTENTION Short circuit due to water ingress.

- ▷ Observe the product's IP protection rating.
- ▷ DO NOT allow water to enter the motor or electrical system.
- ▷ DO NOT use a high-pressure cleaner or steam jet.

Procedure:

1. Clean the product.

Clean the cooling fins or deepenings on the motor.

Do not use steel brushes or sharp-edged objects.

Do not remove balancing weights.

Do not use any aggressive cleaning agents or agents that could damage the paintwork.

2. Clean open condensate drainage holes of dirt.
3. Allow condensate to drain.
4. Leave the product to dry for at least 2 hours at 80 to 100 % of the rated speed, so that any moisture that has penetrated can evaporate.

10 Taking out of operation

Personnel qualifications: Qualified electrician or electrically instructed personnel

Procedure:

1. Disconnect the voltage supply and secure against being switched back on.
2. Depending on the design, open the terminal box on the product or the junction box.
3. Check that there is no voltage present.
4. Disconnect all connections.
5. Dismantle the product.

11 Disposal

- ▷ Dispose of the product 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, employ a specialised contractor to handle the disposal.

12 Certificates



EC Declaration of Incorporation

- Translation -
(english)

ZA87-GB 2025/30 Index 015

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 according to Table 4 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, 25.07.2025
(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)

UKCA Declaration of Incorporation

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

- Original -
(english)

ZA87_UK-GB
2025/30 Index 005

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 according to Table 4 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, 25.07.2025
(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)

ZIEHL-ABEGG 



13 Technical data

For rated data, see *Rating plate*, page 11, for technical description, see product specification.

Characteristic	Value
Weight	see rating plate
Type designation	see rating plate
Fan size	see rating plate
Rolling direct.	see direction of rotation arrow on the product
IP degree of protection for motor	see rating plate
Mode	S1, continuous service with occasional start-ups according to DIN EN 60034-1:2011-02
Storage temperature	-40 to +80 °C (-40 to 176 °F)
Transport temperature	-40 to +80 °C (-40 to 176 °F)
Maximum temperature rise rate	1.5 K/min (1.8 °F/min)
Maximum medium temperature	see rating plate
Minimum medium temperature	40 °C (-40 °F) Occasional start-up between -25 °C (13 °F) and -40 °C (40 °F) allowed, continuous service below -25 °C (13 °F) and partial load operation in cold applications require special ball bearings for cold application.
Relative humidity	The product is approved for relative air humidity of up to 100 % without further environmental influences, dependent on the temperature. Observe absolute humidity.
Absolute humidity	max. 35 g/m ³
Ball bearing life based on grease life service F10h	30,000 to 40,000 h The expected bearing service life of the motor-integrated ball bearings determined according to the standard calculation procedure is largely determined by the grease service life F10h and amounts to approx. 30,000 to 40,000 operating hours. The ball bearings have life-time lubrication, so no regular re-lubrication is required. Replace the ball bearings at the end of the grease service life, not possible for motor size W (068). The bearing life expectancy can differ from the stated value if operating conditions such as increased vibrations, increased shocks, high or too low temperatures, humidity, dirt in the ball bearing or unfavourable control modes are present.
1 ~ Motors: Life expectancy capacitor capacity	30,000 h
Installation height	≤ 1000 m (3280 ft.) no restrictions
	1000 to 2000 m (3280 to 6560 ft.)
	Maximum allowed input current = Current output on rating plate minus 5 %/1000 m (5 %/3280 ft.)
	> 2000 to 4000 m (6560 to 13100 ft.) Maximum allowed voltage supply = Maximum voltage specified on the rating plate minus 1.29 %/100 m (1.29 %/328 ft.)

The Royal League

Service

+49 7940 16 90600

service-airmovement@ziehl-abegg.com

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