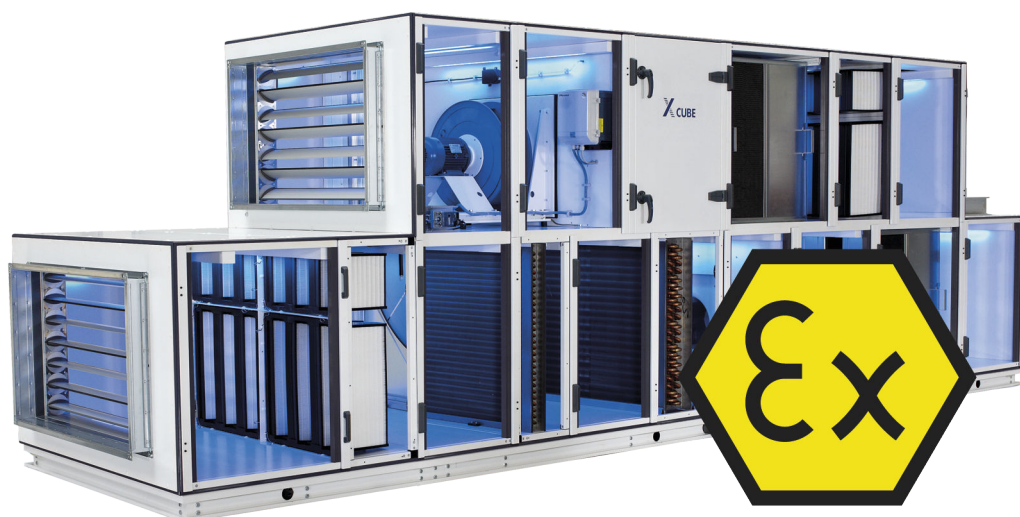




Air handling unit

X-CUBE-Ex

for areas with potentially explosive atmospheres



TROX[®] TECHNİK
The art of handling air

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About this manual

This operating manual enables operating or service personnel to use the X-CUBE Ex air handling unit (AHU) safely and efficiently in potentially explosive atmospheres.

The operating manual is intended for use by instructed persons.

It is essential that instructed persons (↗ *Chapter 1.3.1 'Qualification' on page 9*) read and fully understand this manual before starting any work. The basic prerequisite for safe working is to comply with the safety notes and all instructions in this manual.

The local regulations for health and safety at work and the general safety regulations for the area of application of the air handling unit also apply.

Illustrations in this manual are mainly for information and may differ from the actual design of the air handling unit.

Other applicable documentation

In addition to these instructions, the following documents apply:

- Transport and installation manual
- Order-specific approval drawing
- Data sheets for components from other suppliers, ↗ Appendix

TROX Technical Service

To ensure that your request is processed as quickly as possible, please keep the following information ready:

- Product name
- TROX order number
- Delivery date
- Brief description of the fault

Online	www.troxtechnik.com
Phone	+49 2845 202-400

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Limitation of liability

The information in this manual has been compiled with reference to the applicable standards and guidelines, the state of the art, and our expertise and experience of many years.

The manufacturer does not accept any liability for damages resulting from:

- Non-compliance with this manual
- Incorrect use
- Operation or handling by untrained individuals
- Unauthorised modifications
- Technical changes
- Use of non-approved replacement parts

The actual scope of delivery may differ from the information in this manual for bespoke constructions, additional order options or as a result of recent technical changes.

The obligations agreed in the order, the general terms and conditions, the manufacturer's terms of delivery, and the legal regulations in effect at the time the contract is signed shall apply.

We reserve the right to make technical changes.

Warranty claims

The provisions of the respective general delivery terms apply to warranty claims. For purchase orders placed with TROX GmbH, these are the regulations in section "VI. Warranty claims" of the Delivery Terms of TROX GmbH, see www.trox.de/en/.

Safety notes

Symbols are used in this manual to alert readers to areas of potential hazard. Signal words express the degree of the hazard.

Comply with all safety instructions and proceed carefully to avoid accidents, injuries and damage to property.

DANGER!

Imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

Potentially hazardous situation which, if not avoided, may result in death or serious injury.

CAUTION!

Potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE!

Potentially hazardous situation which, if not avoided, may result in property damage.

ENVIRONMENT!

Environmental pollution hazard.




Tips and recommendations



Useful tips and recommendations as well as information for efficient and fault-free operation.





Specific safety notes




The following symbols are used in safety notes to alert you to specific hazards:

Warning signs	Type of danger
	Warning - danger of crushing.
	Warning – hand injuries.
	Warning – high-voltage.
	Warning – explosive atmosphere.
	Warning – danger of falling.
	Warning – danger zone.

Additional markers

In order to highlight instructions, results, lists, references and other elements, the following markers are used in this manual:

Marker	Explanation
 1., 2., 3. ...	Step-by-step instructions
	Results of actions
	References to sections in this manual and to other applicable documents
	Lists without a defined sequence
[Switch]	Operating elements (e.g. push buttons, switches), display elements (e.g. LEDs)
'Display'	Screen elements (e.g. buttons or menus)

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1 Safety

1.1 Correct use

The TROX X-CUBE-Ex air handling unit (AHU) is designed exclusively for the treatment of air, i.e. transporting, filtering, heating, cooling, humidifying and dehumidifying air, in areas with potentially explosive atmospheres.

Explosion-proof air handling units carry a rating plate in compliance with the ATEX directive 2014/34/EU. Explosion-proof units must only be used in Ex zones that correspond to their equipment category.

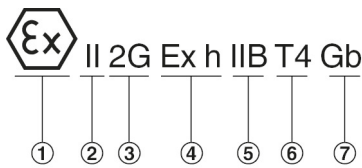


Fig. 1: Ex marking (example)

Name	Meaning
① ATEX logo	
② Equipment group	The air handling unit may be used in areas with potentially explosive atmospheres, but not in mining.
③ Equipment category	<p>Equipment category 2G is suitable for atmospheres where potentially explosive gases (G) may occur sometimes. Such equipment provides a high level of protection and may be used in zone 1 and zone 2 areas.</p> <p>Equipment category 3G is suitable for atmospheres where potentially explosive gases (G) are unlikely to occur, or if they do occur, are likely to do so only infrequently and for a short period only. Such equipment provides a normal level of protection and may be used in zone 2 areas.</p>
④ Type of protection	<p>Type of protection Ex h in accordance with EN ISO 80079-37:</p> <p>Constructional safety: c Type of protection in which constructional measures are applied to avoid the possibility of ignition from hot surfaces, sparks and adiabatic compression caused by moving parts.</p>
⑤ Group of explosive materials	<p>Gases are grouped according to their ignitability, which is based on standard criteria.</p> <p>Units that have been approved for group II B of explosive materials may also be used in group II A.</p>

Name	Meaning
⑥ Temperature class	<p>T1 - Maximum surface temperature that occurs: 450 °C</p> <p>T2 - Maximum surface temperature that occurs: 300 °C</p> <p>T3 - Maximum surface temperature that occurs: 200 °C</p> <p>T4 - Maximum surface temperature that occurs: 135 °C.</p>
⑦ Equipment protection level	<p>Equipment protection level (EPL) in accordance with EN 60079-0:</p> <ul style="list-style-type: none"> ■ EPL "Gb" Unit with a "high" level of protection for use in areas with a potentially explosive atmosphere in which there is no risk of ignition during normal operation or in the event of foreseeable errors/malfunctions. ■ EPL "Gc" Unit with "extended" level of protection for use in areas with a potentially explosive atmosphere in which there is no risk of ignition during normal operation and which has some additional protective measures that ensure that there is no risk of ignition in the event of normally foreseeable faults in the device (e.g. defect in a lamp).

Correct use also involves complying with all the information provided in this manual.

Any use that goes beyond the correct use or any different use of the unit is regarded as incorrect use.

Incorrect use **WARNING!****Danger due to incorrect use!**

Incorrect use of the air handling unit can lead to dangerous situations.

Do not use the air handling unit:

- in an Ex area for which it has not been approved
- for the transport of fluids with a temperature beyond the specified temperature range (↪ *Chapter 9.1 'Operating conditions' on page 60*)
- in rooms
 - with potentially explosive dusts
 - with aggressive room air components, e.g. sand
- near
 - strong electromagnetic fields
 - high frequency sources (e.g. transmitting stations)
 - strong light sources (e.g. laser beams)
 - ionising radiation (e.g. X-ray tubes)
 - ultrasound equipment
- outside of the design specifications, see TROX air handling unit data sheet
- as a structural element or as a roof for a building
- as a smoke extract system in the event of a fire

1.2 System owner's responsibility

System owner

The system owner is a natural or legal person who for commercial or business purposes owns or manages the air handling unit or allows third parties to use or operate it, but continues to bear legal responsibility for the safety of users, staff or third parties while the product is in use.

System owner's obligations

The unit is intended for commercial use. The system owner is therefore subject to the legal obligations of occupational health and safety regulations.

In addition to the safety notes in this manual, the applicable regulations for safety, accident prevention and environmental protection must also be complied with.

In particular:

- The system owner must be aware of the applicable occupational health and safety regulations and carry out a risk assessment to determine any additional hazards that may exist or result from the specific working conditions at the installation location of the air handling unit. The system owner has to create operating instructions for the air handling unit that reflect the results of this risk assessment.
- The system owner has to ensure, throughout the entire operating period of the air handling unit, that these operating instructions conform to applicable standards and guidelines; in case of any deviation, the system owner has to adapt the instructions.
- The system owner must secure the air handling unit to prevent access by unauthorised individuals.
- The system owner must clearly define the responsibilities for operation, maintenance, cleaning, troubleshooting and removal.
- The system owner has to ensure that all individuals who handle or use the air handling unit have read and understood this manual.

The system owner must regularly provide training for the personnel and inform them of any dangers:

- Fire and explosion hazards at and near the installation location
- Local fire and explosion protection measures
- Position and function of guards
- Prohibition of smoking
- Prohibition of open flames and open ignition sources
- Cleaning, maintenance and repair procedures, tools and materials
- Personal protective clothing for areas with potentially explosive atmospheres
- The system owner must comply with Directive 1999/92/EC on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres. This includes additional organisational measures such as:

- Designating areas with potentially explosive atmospheres.
- Creating an explosion protection document for each zone.
- Preventing unauthorised people from accessing the area or zone.
- Putting up warning signs.
- Allowing access by permit only for dangerous jobs to be carried out.
- The system owner must provide the employees with the required personal protective equipment.
- The system owner must observe the local fire regulations.

In addition, the system owner has to ensure that the AHU is in perfect technical condition at all times:

- The system owner must ensure that the maintenance intervals specified in this manual are observed. If the AHU is used beyond average, maintenance intervals should be shorter.
- The system owner must have all safeguards tested regularly to ensure that they are functional and complete.
- The system owner must document and permanently save the control matrix on which commissioning is based. The system owner must save both a digital version and a hardcopy of the initial version of the control matrix.
- The system owner must document and save any changes to the control matrix.

Risk of explosion



Explosion hazard!

If a component or device is to be installed in a system intended for use in potentially explosive atmospheres according to 2014/34/EU, the system owner has to ensure compliance of the entire system with that directive.

Non-compliance may lead to an explosion.

Hygiene requirements

The system owner has to comply with the local regulations and harmonised standards for hygiene requirements. This includes compliance with

- specific maintenance and inspection intervals for AHUs
- specifications for connected ducts and air terminal devices

1.3 Personnel requirements

1.3.1 Qualification

The work described in this manual has to be carried out by individuals with the qualification, training, knowledge and experience described below:

HVAC technician

HVAC technicians are individuals who have sufficient professional or technical training in the field they are working in to enable them to carry out their assigned duties at the level of responsibility allocated to them and in compliance with the relevant guidelines, safety regulations and instructions. HVAC technicians are individuals who have in-depth knowledge and skills related to HVAC systems; they are also responsible for the professional completion of the work under consideration.

HVAC technicians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on HVAC systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Hygiene inspector

Hygiene inspectors are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to carry out hygiene inspections on air handling units. Hygiene inspectors have been trained in the field of air hygiene and indoor air quality, and they are familiar with the relevant standards and guidelines.

Instructed person

Instructed persons have been adequately advised or supervised to enable them to avoid any potential hazards related to the work under consideration. Instruction is provided by a qualified expert in the respective field.

A person instructed in the use of the AHU may carry out the following jobs:

- Visual inspections
- Replace filter elements
- Clean filter chambers
- Clean heat exchangers
- Clean fans

Skilled qualified electrician

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on electrical systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Skilled qualified electrician for Ex areas

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on electrical systems in areas with potentially explosive atmospheres, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Skilled qualified electricians for Ex areas have special experience, and their training has included instruction on the various types of protection and installation practices and on the general principles of area classification. Evidence of the relevant experience and training claimed must be available.

They know the rules and regulations relevant to their work and to explosion protection, in particular the ATEX directive 2014/34/EU and the related standard EN 60079 as well as IEC Ex standard IEC 60079.

Skilled qualified refrigeration technician

Skilled qualified refrigeration technicians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on refrigeration systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved. They are also familiar with the avoidance of emissions, the recovery of fluorinated greenhouse gases and the safe handling of refrigeration equipment of the required type and size.

Skilled qualified refrigeration technicians have been trained in the field of refrigeration engineering, and they know the relevant standards and guidelines. Evidence of the relevant experience claimed must be available.

Any work has to be carried out by individuals who can be expected to carry out their assigned duties reliably. Individuals whose reaction time is delayed due to alcohol, drugs or other medication must not carry out any work.

Instruction

System owners must regularly instruct their personnel. The instruction procedure has to be documented for further reference.

At least the following details have to be documented:

- Date of instruction
- Names of persons being instructed
- Type of instruction
- Name of instructor
- Signature of person being instructed

1.3.2 Unauthorised persons

 **WARNING!**

Risk to life! Unauthorised access to the hazardous area and work area must be prevented!

Unauthorised persons who do not fulfil the requirements specified here are usually not aware of the dangers in the work area. There is a risk to life and limb for unauthorised people.

- Keep unauthorised persons away from hazardous areas and work areas.
- Instruct these persons to leave the hazardous area or work area.
- Stop work while unauthorised persons are present in the hazardous area or work area.

1.4 Personal protective equipment

Personal protective equipment is equipment that protects the user against health or safety risks at work.

Personal protective equipment must be worn for various types of work; the protective equipment required is listed in this manual together with the description of each type of work.

Description of personal protective equipment

Hearing protection



Hearing protection protects against hearing damage resulting from noise exposure.

Industrial safety helmet



Industrial safety helmets protect the head from falling objects, swinging loads, and impacts with stationary objects.

Protective clothing



Protective clothing is close-fitting, with low tear resistance, close-fitting sleeves, and no projecting parts.

Protective gloves



Protective gloves protect hands from friction, abrasions, punctures, deep cuts, and direct contact with hot surfaces.

Safety harness



A safety harness protects people from a fall when they are working at height. You are at risk from a fall if the task is at height and if there is no railing in place.

When you put on a safety harness, connect it via an energy-absorbing lanyard to a suitable anchor point.

Safety harnesses must only be used by individuals who have been specifically trained to use them.

Safety shoes



Safety shoes protect the feet against crushing, falling parts, and from slipping on slippery ground.

Safety goggles



Safety goggles protect the eyes from flying particles and liquid splashes.

Explosion protection

WARNING!

Explosion hazard from electrostatic charges!

If you have to work in areas with potentially explosive atmospheres, make sure that no electrostatic charge is built up on non-metallic parts and induced in your body.

To avoid electrostatic charges:

- Wear anti static clothes, shoes, gloves etc.
- For tools, comply with EN 1127-1, appendix A.

The work area should ideally have anti static flooring.

1.5 Safety signs

The following symbols and signs are usually found in the work area. They apply to the very location where they are found.

 **WARNING!**
Danger due to illegible signage!
 Over time, stickers and signs may fade or become otherwise illegible, meaning that hazards cannot be identified and necessary operating instructions cannot be followed. There is then a risk of injury.

- Ensure that all of the safety, warning and operating information is clearly legible.
- Replace illegible signs or stickers immediately.

Ex logo



Fig. 2: Ex logo

Sticker indicating that the AHU may be used in the specified areas with potentially explosive atmospheres.

ATEX rating plate







TROX® TECHNIK				
TROX GmbH Heinrich-Trox-Platz 47504 Neukirchen-Vluyn, Germany		Tel.: +49 (0) 2845 202-0 E-Mail: trox@trox.de www.trox.de		
Product:	X-CUBE Ex			
Unit No.:	DE3456789-1			
Year:	2016			
Weight:	132 kg			
Conformity No.:	EPS 16 ATEX 2 117 X			
Certificate No. UKCA:	EPS 22 UKEX 2 025 X			
Ex-Marking (internal SUP):	 II 2G Ex h IIB T4 Gb			
Ex-Marking (internal ETA):	 II 2G Ex h IIB T4 Gb			
Ex-Marking (external):	 II 3G Ex h IIB T4 Gc			

Fig. 3: Rating plate (rating plate for supply air and extract air combination shown)

You will find the rating plate on the operating side of the AHU.

Rating plate explanation ↪ 60 .

For more information on Ex areas ↪ 6 .

Notice – Potentially explosive atmosphere

 **WARNING!** 



Risk of explosion!
 This system may contain a potentially explosive atmosphere. To remove the potentially explosive atmosphere, purge the air handling unit with fresh air before you open it.

- **Open the air handling unit only if no potentially explosive atmosphere is present.**
- **Follow the safety notes and maintenance instructions in the operating manual.**

Fig. 4: Notice – Potentially explosive atmosphere

You will find this notice on the AHU. It alerts you to a potentially explosive atmosphere in the AHU. You have to purge the system with outdoor air before you open the AHU.

Notice – Cleaning hazard

 **WARNING!** 

Risk of explosion!
 Electrostatic ignition hazard.
 Wiping the air handling unit with a dry cloth can cause an electrostatic charge, which may lead to an explosion.

- **Use only damp cloths to wipe the air handling unit.**
- **Follow the safety notes and cleaning instructions in the operating manual.**

Fig. 5: Notice – Cleaning hazard

You will find this notice on the AHU. It warns you not to use a dry cloth to clean the AHU. Follow the cleaning instructions in the operating manual!

Fan run down time

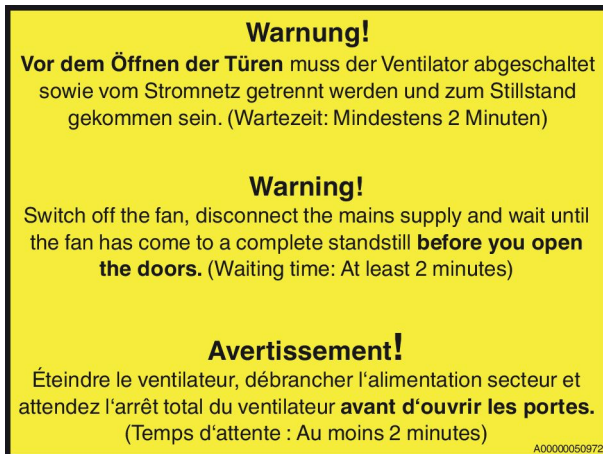


Fig. 6: Notice on inspection access doors

You will find this notice on inspection access doors that allow access to centrifugal fans and rotary heat exchangers.

Electrical voltage



Only skilled qualified electricians must work on AHU components and in internal spaces with this sign.

Unauthorised persons must not enter areas, open cabinets or work on components where an electrical voltage is present and which are hence marked with this symbol.

Earthing



You will find these numbered stickers inside the AHU on all equipotential bonding connection points.

You will also find this sticker on the main equipotential bonding point on the AHU base frame. For more information on equipotential bonding ↪ 'Equipotential bonding' on page 14.

Ground cable

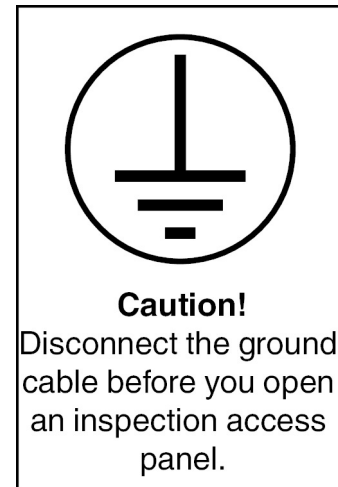


Fig. 7: Note on inspection access panel

This note can be found on inspection access panels with an earthing cable. It indicates that the earthing cable must be dismantled before opening in order to avoid damage to the earthing cable.

Reattach the earthing cable before closing the panel!

1.6 Safeguards

Defective safeguards

⚠ WARNING!

Risk to life from defective safeguards!

The mains cable between the utility grid and the mains isolator carries a hazardous electrical voltage. Defective or disabled safeguards can cause serious or even fatal injuries.

- Do not disable or bypass any safeguards.

AHU casing

The AHU casing is made from steel panels with duplex powder coating on all sides. This construction ensures that no parts can be ejected from the unit in case of a fault. This construction also protects the interior of the AHU from environmental effects.

The inner skins of the casing are also available in stainless steel (optional).

Local isolator

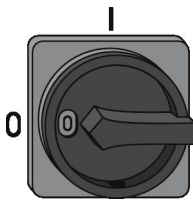


Fig. 8: Local isolator



As long as the AHU remains switched on (mains isolator in 'I' position), the connecting cable for the local isolator is live.

Each local isolator carries a sticker with the code of the equipment that it isolates.

You can lock each local isolator in the '0' position (with a padlock) to secure it against being switched on accidentally so that you can safely work on the respective component (e.g. fan).

Equipotential bonding

A skilled qualified electrician has to connect the AHU to the local earth bar; this is done as part of installation. Equipotential bonding prevents electrostatic ignition hazards.

Safety lock on inspection access doors to hazardous areas

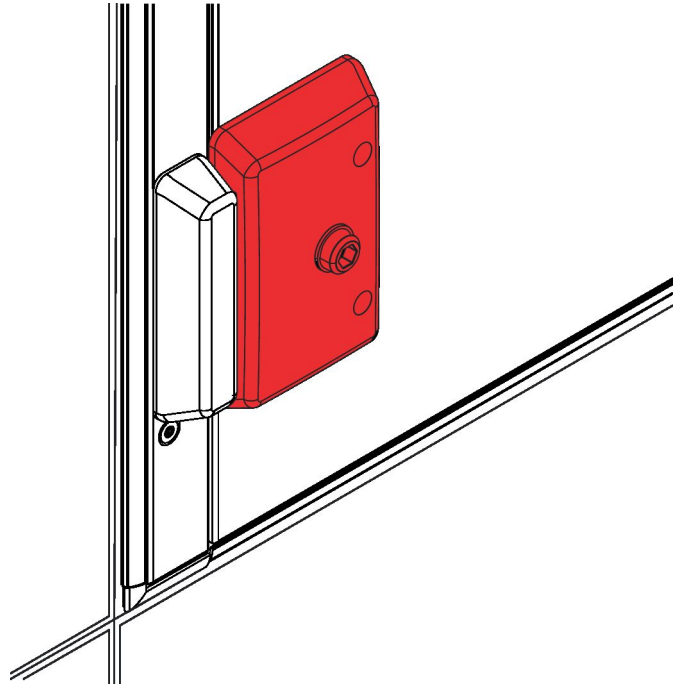


Fig. 9: Safety lock

Inspection access doors to hazardous areas can only be opened with a special key.

Safety catch on discharge side inspection access doors

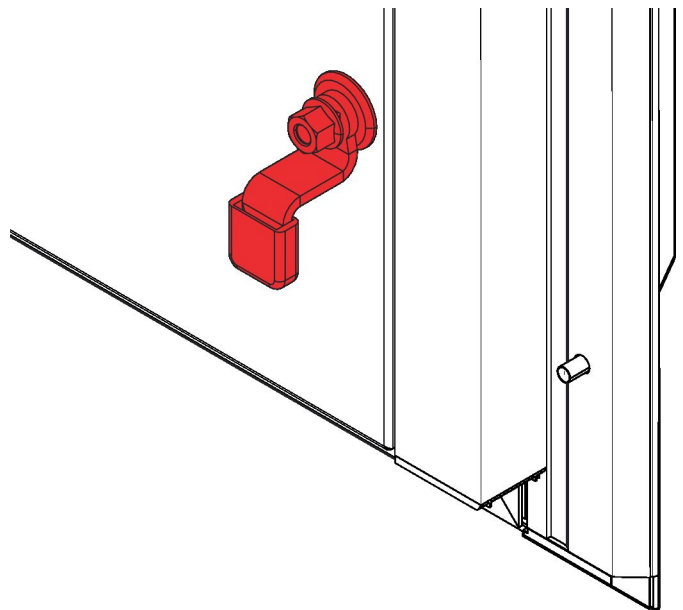


Fig. 10: Safety catch

Each inspection access door on the discharge side is fitted with a safety catch (Fig. 10). The safety catch prevents the inspection access door from suddenly swinging open and injuring people.

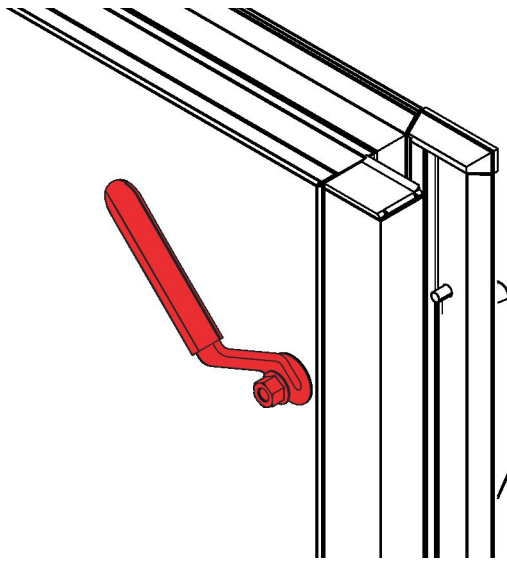
Inside door handle

Fig. 11: Inside door handle on an inspection access door

If an AHU casing unit is higher than 1836 mm, the inspection access doors are factory fitted with an inside door handle. The inside door handle prevents people from becoming trapped inside the unit.

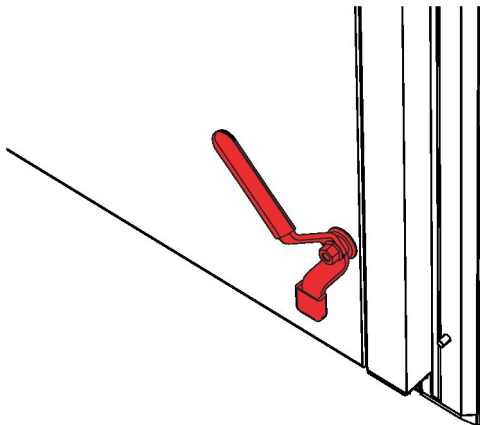
Inside door handle with safety catch

Fig. 12: Inside door handle with safety catch

If an AHU casing unit is higher than 1836 mm, the inspection access doors on the discharge side are factory fitted with an inside door handle with safety catch. This safeguard prevents:

- inspection access doors on the discharge side from swinging open and injuring people
- people from becoming trapped inside the unit

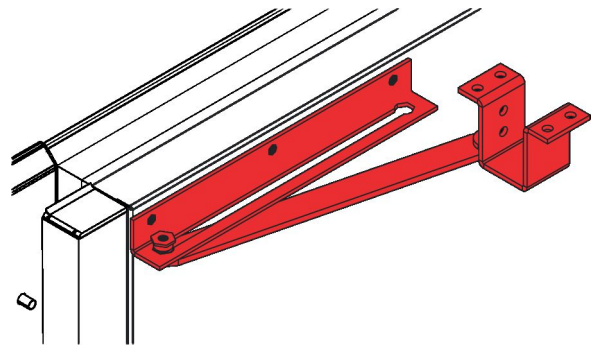
Hold open device

Fig. 13: Hold open device for outdoor air handling units

On devices designed for outdoor installations, each inspection access door is equipped with a hold open device (Fig. 13). The hold open device prevents the inspection access door from being slammed shut by wind.

Note: If there is no hold open device on an inspection access door due to lack of space, it must be secured against slamming shut by suitable means.

**WARNING!****Risk of crushing from doors slamming shut**

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Motor protection switch

Motor protection switches are safety devices for switching, protecting and isolating motors or actuators on electric circuits. Motor protection switches protect motors against destruction due to overload, short circuits, locking during start-up, or failure of a live wire in three-phase systems. They also have a thermal tripping mechanism and an electromechanic tripping mechanism (short circuit protection). The motor protection switches are located in the AHU switch cabinet.

Securing the unit against being switched on acci...

1.7 Securing the unit against being switched on accidentally

Securing the unit against being switched on accidentally

⚠ WARNING!

Risk to life from unauthorised people starting the unit or from people starting the unit accidentally!

If someone who is not authorised starts the unit, or if someone starts the unit accidentally, people could be seriously or even fatally injured.

Before you switch on the unit, make sure that

- nobody is inside the AHU
- all inspection access doors have been closed
- no tools or materials have been left inside the AHU

1. ▶ Switch off the AHU at the mains isolator (provided by others).

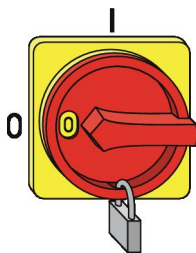


Fig. 14: Securing the mains isolator

2. ▶

⚠ WARNING!

Electric shock hazard!

The power cable which connects the AHU to the mains holds electrical charges even after power is turned off.

Switch off the power supply to the AHU by turning the mains isolator to '0'.

3. ▶ Secure the mains isolator with a padlock (Fig. 14).
4. ▶ Keep the key in a safe place.
5. ▶ Cover the mains isolator with a notice informing people that work is in progress.

1.8 Work areas and hazardous areas

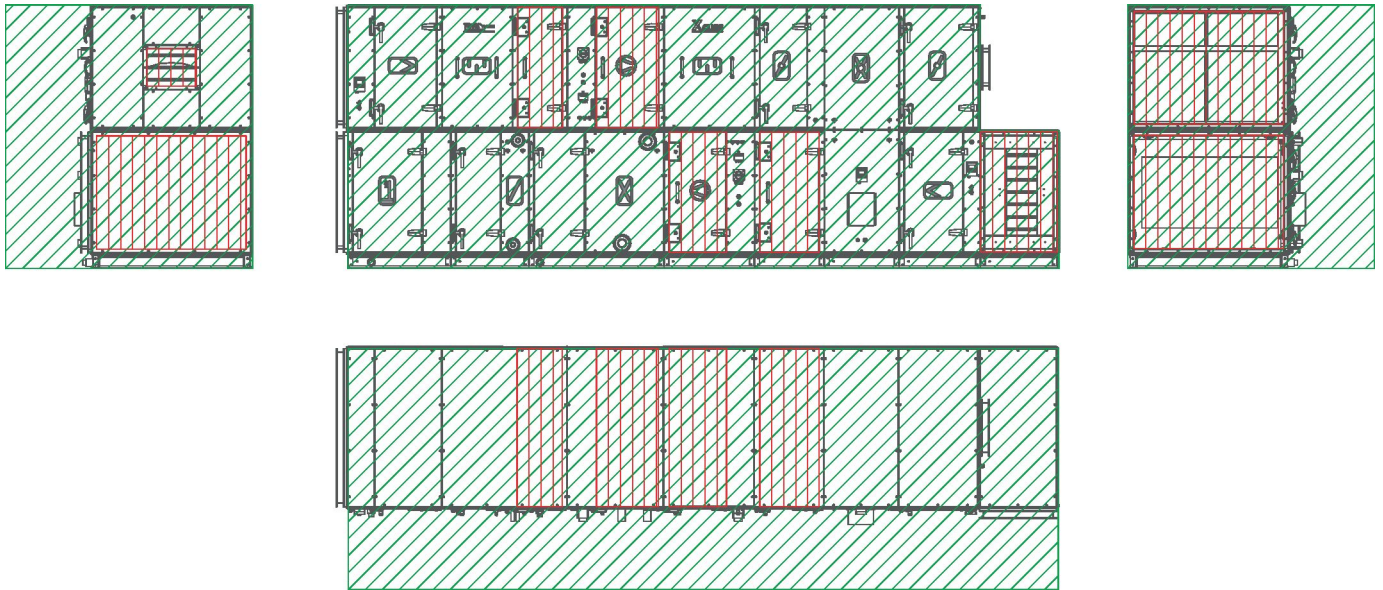




Fig. 15: Hazardous areas

-  Work areas
-  Hazardous area

Areas from which you can access

- fans
- electric air heaters
- integral switch cabinets

are hazardous areas. You can access these hazardous areas only after you open an inspection access door.

Before installation is complete, open air inlets and outlets are also considered hazardous areas.

1.9 Areas with potentially explosive atmospheres

Ex zones on the AHU

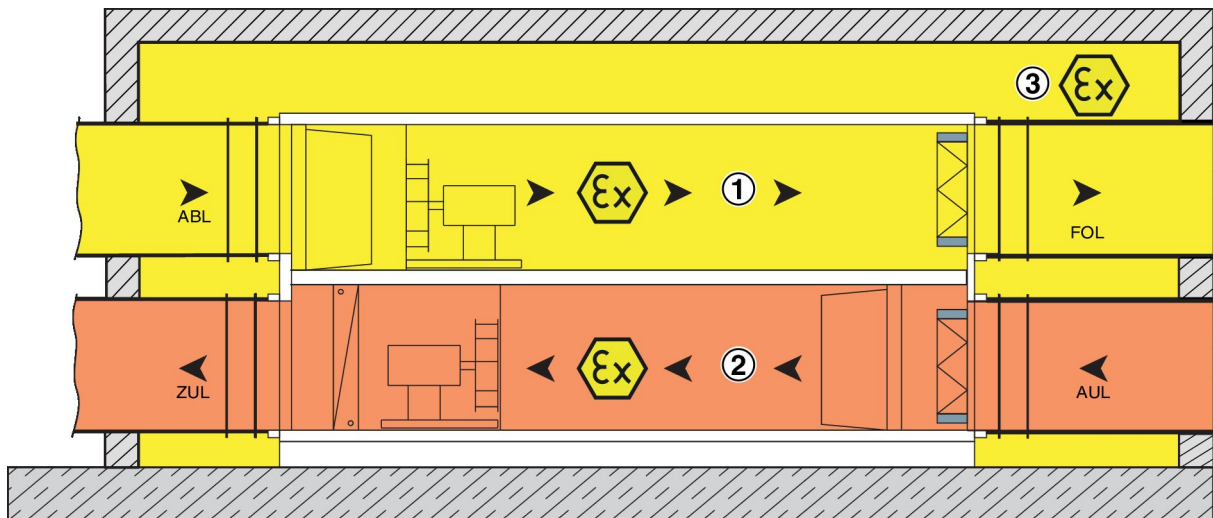


Fig. 16: Ex zones (example)

- | | | | |
|---|--------------------------------------|-----|-------------|
| ① | Ex zone inside the AHU (extract air) | ABL | Extract air |
| ② | Ex zone inside the AHU (supply air) | AUL | Outdoor air |
| ③ | Ex zone outside the AHU | FOL | Exhaust air |
| | | ZUL | Supply air |

There can be one or several Ex zones inside an AHU, depending on the unit design. If an AHU is installed in an Ex zone, i.e. if there is a potentially explosive atmosphere outside (in the environment) of the AHU, the system owner is responsible for marking the Ex zone accordingly.

While the AHU is not in operation, an explosive gas (explosive atmosphere) outside may find its way back into the AHU; this can be prevented with low leakage multileaf dampers (by others) installed in the ducts.

AHUs with different Ex zones:

Two scenarios:

- Inside Ex zone: The AHU transports an explosive gas.
- Outside Ex zone: The AHU is installed in an enclosed space with an explosive gas.

Keep in mind that an explosive gas can mix with the air in the environment (zonal dispersion), either due to normal leakage or when someone opens an inspection access door.

If the atmosphere inside the AHU is more hazardous:

- Ensure sufficient ventilation of the installation room so as to avoid an explosive atmosphere in the room.
- Devices which could become sources of ignition and which are installed up to 1 m or even more from the AHU need to have the same type of protection that applies to the inside of the AHU.

1.10 Residual risks

The air handling unit is a state-of-the-art product and meets current safety requirements. Residual risks cannot be excluded, however, and you should proceed with caution. This section describes the residual risks that have been identified in a risk assessment.

Always observe the safety notes provided in the following chapters of this manual to reduce health hazards and prevent any hazardous situations.

1.10.1 General workplace hazards

Working at height

WARNING!

Risk of a fall when you work at height!

Working at height without using any fall protection equipment, or using unsuitable or damaged equipment to get up to where you work at height, may lead to yourself or others falling from height; people on the ground may be at risk from falling parts or tools. This can cause serious or even fatal injuries.

- Wear a safety harness.
- Only access roofs with suitable and intact fall protection equipment in place (ladders, railings, safety harness).
- Start working only if the components you have to work on are easily accessible.
- Stop materials or objects from falling.
- Wear safety shoes, protective clothing and a hard hat.

Leaks

CAUTION!

Risk of injury from slipping on a contaminated floor!

If a machine or component leaks, liquids may be getting onto the floor. People could slip and injure themselves.

- Remove any liquids on the floor quickly.
- Wear non-slip safety shoes.
- Note the safety data sheets provided by the liquid manufacturers.
- Attach warning notices and mandatory action signs wherever liquids may get onto the floor.

1.10.2 Electric shock hazards

Electric current

DANGER!

Danger of death due to electric current!

Danger of electric shock! Do not touch any live components! Damaged insulation or damaged parts are a life threatening hazard.

- Have work on the electrical system carried out only by skilled qualified electricians.
- Have work on the electrical system carried out only by skilled qualified electricians.
- If the insulation is damaged, disconnect the power supply immediately and have the insulation repaired.
- Before you start working on electric systems and equipment, switch off the supply voltage and secure it against being switched on accidentally. Comply with the following safety rules:
 - Use the mains isolator to switch off the unit.
 - Secure it against being switched on accidentally.
 - Disconnect the AHU from the mains power supply for the building.
 - Ensure that no voltage is present.
 - Connect to the earth; short circuit connection.
 - Either cover nearby parts that carry a voltage or install barriers.
- Do not bypass or disable any fuses. Be sure to maintain the correct current rating when you replace fuses.
- Ensure that live parts do not come into contact with moisture. Moisture can cause a short circuit.

Stored charges

DANGER!

Risk to life from charges stored in capacitors!

Many components contain capacitors, which may hold electrical charges even after power is turned off. Contact with these components can result in serious or fatal injuries.

- Before you start working on any component that contains capacitors, disconnect the component from the power supply. Then wait for 10 minutes to ensure that the capacitors have become fully discharged.

1.10.3 Explosion hazards

Explosion protection

 **WARNING!**

Risk of explosion!

Ignition sources, such as sparks, open flames or hot surfaces, can lead to explosions in an area with potentially explosive atmospheres.

- Only specially trained personnel must carry out work in an area with potentially explosive atmospheres.
- Get written permission before you start working in an area with potentially explosive atmospheres.
- To remove the potentially explosive atmosphere, purge the air handling unit with fresh air before you open it.
- If you have to carry out work, either ensure that there is no potentially explosive atmosphere, or at least avoid any source of ignition. If you have to work in a zone with potentially explosive atmospheres, use only equipment that has been approved for use in that particular zone.
- If the AHU installation room has not been defined as an Ex zone, the system owner has to ensure sufficient ventilation in the installation room as otherwise normal leakage may result in an explosive atmosphere outside of the AHU (zonal dispersion).

Failure to comply with these safety notes may lead to an explosion.

1.10.4 Moving machinery hazards


Rotating parts of a fan

 **WARNING!**

Risk of injury from rotating parts!

Rotating parts in the fan can cause severe injuries.

- Do not reach into the moving fan or tamper with it.
- Do not open any covers or inspection access panels while the unit is in operation.
- Make sure that the rotor is inaccessible while in operation.
- The fan does not stop immediately! Check that no parts are moving before you open an inspection access door.
- Switch off the system before you start working on movable fan parts and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.

Switch off the AHU before you start working on movable fan parts and secure it against accidentally being switched on again,  *Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16*. Wait until all parts have come to a standstill.

Movable parts of multileaf dampers

 **WARNING!**

Crushing hazard from movable parts!

Closing multileaf dampers may crush your hands and arms.

- Do not reach between the damper blades.
- Prevent access to crush points: Either install dampers on ducts or use fixed guards.
- Before you open an inspection access door, switch off the air handling unit and secure it against being switched on accidentally.

Rotating parts of the rotary heat exchanger

 **WARNING!**

Risk of injury from rotating parts!

Rotating parts in the rotary heat exchanger can cause serious injuries.

- Do not reach into the moving storage mass or tamper with it.
- Do not open any covers or inspection access panels while the unit is in operation.
- Make sure that the storage mass is inaccessible while in operation.
- Switch off the system before you start working on movable fan parts and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.

Switch off the system before you start working on movable parts of the rotary heat exchanger and secure it against accidentally being switched on again, ↪ *Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16*. Wait until all parts have come to a standstill.

Inspection access doors slamming shut

 **WARNING!**

Risk of crushing from doors slamming shut

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Crushing hazard.

 **WARNING!**

Crushing hazard from movable parts!

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

1.10.5 Hazards from the hydraulic system

Jet of liquid from a defective hydraulic system

 **DANGER!**

Risk to life from high pressure fluid injection!

If a hose or a pipe or an AHU component becomes defective, a jet of coolant, refrigerant or compressor oil under pressure may escape. The jet of liquid can cause serious injuries as well as frostbite and burns.

- Do not stand or hold objects in the path of a jet of liquid. Keep people away from the hazardous area.
- Immediately initiate an emergency stop. If necessary, initiate further measures to reduce the pressure and stop the jet of liquid.
- Remove escaping liquids and dispose of them correctly.
- Have any defective components repaired immediately.

Refrigeration system

 **WARNING!**

Risk of injury from the refrigeration system!

Components, operating fluids and incorrect handling of the refrigeration system can cause serious injuries.

- Work on the refrigeration system must only be carried out by skilled qualified refrigeration technicians or the ↪ *TROX Technical Service*.
- Always comply with the safety data sheet provided by the refrigerant manufacturer.
↪ *Appendix B.2 'Freezing agent' on page 160*

1.10.6 Hazards from high and low temperatures

Hot surfaces

 **WARNING!**

Risk of injury from hot surfaces!

The surfaces of the heating coil can get very hot during operation. Skin contact with hot surfaces causes severe skin burns.

- Wear heat-resistant protective clothing and gloves whenever you work near a potentially hot surface.
- Before you start working, make sure that all surfaces have cooled down to ambient temperature.

Cold surfaces

 **WARNING!**

Risk of injury from cold surfaces!

The surfaces of the integral refrigeration system and evaporator can cool down to -20 °C while in operation. Skin contact with cold surfaces causes frostbite and cold burns.

- Wear protective clothing and gloves that protect you from the cold when you work near a potentially cold surface.
- Before you start working, make sure that all surfaces have warmed up to ambient temperature.

1.10.7 Hazardous substances and operating fluids

Operating fluids with glycol

 **WARNING!**

Health risk from operating fluids that contain glycol!

The operating fluids in the heating coil, cooling coil and run around coil system contain glycol, which can damage your health if it comes into contact with your skin, if you swallow it or if you inhale the vapour or mist.



- Avoid contact with operating fluids that contain glycol.
- Work must only be carried out by HVAC technicians.
- Do not eat, drink, or smoke while handling operating fluids that contain glycol.
- Wash your hands when you interrupt or finish your work.
- If you have come into contact with an operating fluid that contains glycol, follow the first aid instructions given on the safety data sheet for the operating fluid.
- When you have to handle an operating fluid that contains glycol, wear the personal protective equipment specified in the safety data sheet for the operating fluid.

Refrigerant R-410A

 **WARNING!**

Health risk from refrigerants!

If you inhale the refrigerant used in the refrigeration system you may feel severe shortness of breath, become unconscious, suffer cardiac arrhythmia and eventually suffocate. Skin contact with refrigerant causes cold burns.


- Avoid any contact with refrigerant.
- Work on the refrigeration system must only be carried out by skilled qualified refrigeration technicians or the  *TROX Technical Service*.
- Do not eat, drink or smoke while handling refrigerants.
- Wash your hands when you interrupt or finish your work.
- If you have come into contact with refrigerant, follow the first aid instructions given on the manufacturer's safety data sheet for the refrigerant.  *Appendix B.2 'Freezing agent' on page 160*
- If any refrigerant has escaped, provide sufficient ventilation of the space.
- Wear safety goggles and protective gloves against thermal risks when you handle refrigerants.

Compressor oil

 **WARNING!**

Health risk from compressor oil!

If your skin comes into contact with compressor oil, or if you swallow or inhale it, you may suffer irritation to the skin, eyes, the gastro-intestinal tract and the upper respiratory tract.

- Avoid any contact with compressor oil.
- Work on the refrigeration system must only be carried out by skilled qualified refrigeration technicians.
- Do not eat, drink, or smoke while handling refrigerants.
- If you have come into contact with compressor oil, follow the first aid instructions given on the manufacturer's safety data sheet for the oil.  *Appendix B.1 'Compressor oil' on page 150*

Lubricants

WARNING!

Health risk from lubricants!

Contact with lubricants can induce allergies and skin irritation.

- Wear protective gloves when handling lubricants.
- Be careful not to swallow lubricants or inhale the vapours.
- If any lubricant has got into your eyes, rinse your eyes thoroughly with plenty of water and seek medical attention if necessary.
- If your skin has come into contact with any lubricant, wash your hands thoroughly with plenty of water and soap.
- Comply with the safety data sheets provided by the lubricant manufacturer.

1.10.8 Fire hazards

Fire protection

WARNING!

Risk of injury from insufficient or inadequate fire-fighting!

If there is a fire and the fire extinguisher is not in working order or is unsuitable for the class of fire, this can result in serious or even fatal injuries and considerable damage to property.

- Make sure that all fire extinguishers are suitable for the expected class of fire.
- Check fire extinguishers every 2 years to ensure that they are in working order.
- Refill each fire extinguisher after it has been used.
- Use only extinguishing agents and replacement parts that comply with the information specified on the fire extinguisher.
- If you have to use a fire extinguisher, make sure you know how to use it safely (see instructions on the extinguisher).

Damaged fan parts

WARNING!

Risk of fire from damaged fan parts!

Grinding rotors or overheating bearings can cause a fire and eventually serious or even fatal injuries.

- Do not put a damaged or defective fan into operation.
- The power consumption must not exceed the specified nominal current.
- Make sure that the maximum motor speed is not exceeded.

1.10.9 Risk of entrapment in units with whole body access

Risk of entrapment in units with whole body access

WARNING!

Risk of entrapment where there is whole body access into air handling units!

Entrapment in an air handling unit can cause serious injury or even death.

- When you have to work on the air handling unit, secure the air handling unit against being switched on accidentally.
- Before you switch on the air handling unit again, make sure that nobody is inside.

Measures to take if a harmful substance has been...

1.11 Environmental protection

! NOTICE!

Risk of harm to the environment due to the incorrect handling of hazardous materials and substances.

Many substances are hazardous. If you handle them incorrectly or dispose of them incorrectly, they can considerably harm the environment.

- If you have to handle or dispose of substances that can harm the environment, follow the instructions below.
- If any hazardous substances have escaped to the environment, immediately take suitable measures to avoid further damage. If you are in doubt, inform the local authorities about the damage and enquire about suitable measures to be taken.
- If any hazardous substances have escaped to the environment, immediately take suitable measures to avoid further damage. If you are in doubt, inform the local authorities about the damage and enquire about suitable measures to be taken.

The following substances and materials which are hazardous to the environment are used in this AHU:

Coolant, glycol

Coolants may contain substances that are toxic and pose a hazard to the environment. They must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

Only use one of the following glycols for the air handling unit:

- Propylene glycol
- Ethylene glycol

Refrigerant R-410A

Refrigerants may contain substances that are toxic and hazardous to the environment, or which release hazardous decomposition products. These must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

Compressor oil

Compressor oil must not enter sewerage systems or bodies of water. Commission a specialist disposal company to dispose of hazardous substances and materials.

Lubricants

Lubricants such as greases and oils contain toxic substances. Lubricants must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

1.12 Measures to take if a harmful substance has been released

Refrigerant R-410A

Personal safety:

- Bring people to safety.
- Provide sufficient ventilation in work areas, and extract harmful substances.
- Wear safety goggles and protective gloves against thermal risks.

Environmental protection:

- Make sure that hazardous substances cannot be released into the environment. Use collection devices.

Comply with the safety data sheet provided by the manufacturer, ↗ *Appendix B.2 'Freezing agent' on page 160.*

Compressor oil

Personal safety:

- Wear safety goggles and protective gloves.

Environmental protection:

- Harmful substances must not enter sewerage systems or bodies of water. Use collection devices.
- Use sand, earth or a similar absorbent material to absorb any spills, and fill the contaminated material into a container so that it can be safely disposed of.
- Clean the contaminated area with water.
- If a hazardous substance has been released to a body of water or into the sewerage system, immediately inform the local authorities.

Comply with the safety data sheet provided by the manufacturer, ↗ *Appendix B.1 'Compressor oil' on page 150.*

Coolant, glycol

Coolants that contain glycol are hazardous, so please note:

Personal safety:

- Bring people to safety.
- Wear protective equipment.
- Provide sufficient ventilation in work areas, and extract harmful substances.
- Do not inhale vapours or aerosols. Avoid contact with the eyes and skin.

Environmental protection:

- Harmful substances must not enter sewerage systems or bodies of water. Use collection devices.
- Use sand, earth or a similar absorbent material to absorb any spills, and fill the contaminated material into a container so that it can be safely disposed of.
- If a hazardous substance has been released to a body of water or into the sewerage system, immediately inform the local authorities.

Comply with the safety data sheet provided by the manufacturer.

Lubricants

Comply with the safety data sheet provided by the manufacturer.

Batteries

Batteries contain toxic heavy metals. They are hazardous waste and must be taken to a hazardous waste collection point or disposed of by a specialist company.

2 Functional description

Your air handling unit (AHU) is a bespoke product and has been configured according to your project. A list of all functions is given on the technical data sheets. An illustration and the technical data should already have been provided to you for information and acceptance. We recommend that you keep those documents with this manual.

2.1 Symbols used on the air handling unit

Symbols on the AHU casing indicate which optional components have been installed.

Explanation

Symbol	Description
	Filters
	Fan: <ul style="list-style-type: none"> Centrifugal fan FanArray
	Sound attenuators
	Multileaf damper
	Cooling: <ul style="list-style-type: none"> Cooling coil Evaporator
	Heating: <ul style="list-style-type: none"> Heating coil Electric air heater Condenser Steam heated register
	Rotary heat exchanger
	Plate heat exchanger
	Run around coil system
	Run around coil system with hydraulic unit
	Humidifier: <ul style="list-style-type: none"> Steam humidifier High-pressure spray humidifier Evaporative humidifier

Symbol	Description
-	Noise insulating connector
-	Air recirculation chamber
	Switch cabinet: <ul style="list-style-type: none"> Integral switch cabinet Floor-standing switch cabinet Wall-mounted switch cabinet
	Mains isolator
FOL (EHA)	Exhaust air
ZUL (SUP)	Supply air
AUL (ODA)	Outdoor air
ABL (ETA)	extract air

2.2 Function of the air handling unit

General function

The AHU consists of several casing units with components.

Depending on the equipment of the device, the following functions can be designed for air treatment:

- Filtering
- Circulation
- Heating
- Cooling
- Heat recovery
- Humidification
- Dehumidification
- Mixing

2.3 Operating modes

The operating modes have been configured based on information by the system owner and the manufacturer of the central BMS.

2.4 Function of each component

➤ Filter

The filter cleans the air and removes any contaminants to ensure purity. Filter elements may be of various filter classes, depending on the application. The filter is accessed through an inspection access door so that you can change filter elements easily.

The filter consists of:

- Filter chamber
- Filter frame
- Filter element

⊙ Centrifugal fan

The centrifugal fan moves air through the AHU and the entire ventilation system.

The AHU casing unit with the centrifugal fan is a hazardous area; the inspection access door is marked accordingly and allows access for authorised individuals only. Before you access the centrifugal fan, use the mains isolator to switch off the AHU and secure it against being switched on accidentally.

⊙ FanArray

The FanArray moves air through the AHU and the entire ventilation system. All the fans work together to produce the required volume flow rate.

🔊 Sound attenuator

The sound attenuator consists of sound attenuator splitters; they reduce noise resulting from fan operation and air treatment. The splitters are accessed through an inspection access door; you can remove them for cleaning.

🔍 Multileaf dampers

The multileaf dampers are used to restrict or completely block the airflow. The multileaf dampers are accessed through an inspection access door so that you can clean and maintain them easily.

❄️ Cooling coil

If required, the cooling coil cools the supply air to the specified setpoint value. The required cooling energy comes from an external energy source and is transferred to the airflow by a heat exchanger. The cooling coil is accessed through an inspection access door so that you can clean and maintain it easily.

❄️ Condenser

In the condenser, the vaporous refrigerant coming from the evaporator liquefies, which emits heat.

Depending on the installation location of the condenser, the following function results:

Exhaust air - Heat dissipation

Supply air - Heating of supply air to setpoint value

🔥 Heating coil

If required, the heating coil heats the supply air to the specified setpoint value. The required heating energy comes from an external energy source and is transferred to the airflow by a heat exchanger. The heating coil is accessed through an inspection access door so that you can clean and maintain it easily.

⚡ Electric air heater

The electric air heater is used to heat the supply air. If required, it heats the supply air to the specified setpoint value. The required heating energy is transferred to the airflow by electric heating elements.

❄️ Evaporator

The evaporator cools the supply air to the setpoint value when required. The refrigerant evaporates during the heat transfer and withdraws energy (heat) from the environment, which then cools the supplied air.

🌀 Rotary heat exchanger

The storage mass consists of alternate layers of smooth and corrugated aluminium. As the wheel slowly rotates, extract air and supply air flow in opposite directions through the heat exchanger so that the thermal energy of the airflows is transferred.

📄 Plate heat exchanger

The plate heat exchanger consists of stacked plates of corrugated metal which are arranged in such a way that the fluid to be heated and the fluid to be cooled flow through alternating spaces between each two plates.

⊙ Run around coil system with hydraulic unit

At least one heat exchanger in the supply air flow and one in the extract air flow are connected via a TROX pump (hydraulic unit) and pipes. This arrangement forms the run around coil system with hydraulic unit. The extract air heat is transferred to the heat transfer fluid in the heat exchanger. The pump moves the heat

transfer fluid to the supply air heat exchanger. The heat is then transferred from the heat transfer fluid to the supply air. Connections should be in counterflow so that the heat transfer fluid and the air flow in opposite directions. This ensures that the two airflows are completely separate from each other.

☒ **Run around coil system**

At least one heat exchanger in the supply air flow and one in the extract air flow are connected by a pump (by others) and pipes. This arrangement constitutes a run around coil system. The extract air heat is transferred to the heat transfer fluid in the heat exchanger. The pump moves the heat transfer fluid to the supply air heat exchanger. The heat is then transferred from the heat transfer fluid to the supply air. Connections should be in counterflow so that the heat transfer fluid and the air flow in opposite directions. This ensures that the two airflows are completely separate from each other.

☐ **Steam humidifier**

The humidifier unit consists of two separate components: the steam generator and the steam distribution system. As the water in the steam generator evaporates, the steam is transferred to the airflow via the steam distribution system. This is how the air is humidified.

☐ **High-pressure spray humidifier**

The high-pressure spray humidifier is used to humidify the supply air without heat exchange. A grid of spray nozzles atomise fresh water, thereby creating a fine mist in the humidification chamber.

☐ **Evaporative humidifier**

The evaporative humidifier is used for evaporative cooling of the extract air (adiabatic cooling); no heat exchange takes place. If the outdoor air temperature is fairly high, the extract air is cooled; the warm outdoor air can hence be cooled without the need for an external refrigeration system. As a result, less refrigeration energy is required. There is a choice of two constructions, either for flow-through operation or for recirculation of water in the water container.

Air recirculation chamber

The air recirculation chamber is a central chamber in the AHU in which air recirculation is controlled by multi-leaf dampers. Recirculation operation may be anything between 0 and 100%, depending on requirements.

Noise insulating connector

The noise insulating connector is fitted between the AHU and the ducting. The noise insulating connector includes an anti-vibration element that prevents the transmission of noise and vibrations from the AHU to the ducting.

Flexible connectors

Flexible connectors are fitted between the AHU and the ducting. Flexible connectors prevent the transmission of noise and vibrations from the AHU to the ducting; they are also used to accommodate expansion.

2.5 Operating and display elements

2.5.1 Mains isolator

Mains isolator

The air handling unit does not have a factory fitted mains isolator. The mains isolator has to be provided by others.

Local isolator

☞ *'Local isolator'* on page 14

2.5.2 Inspection access doors with a lock

Inspection access doors

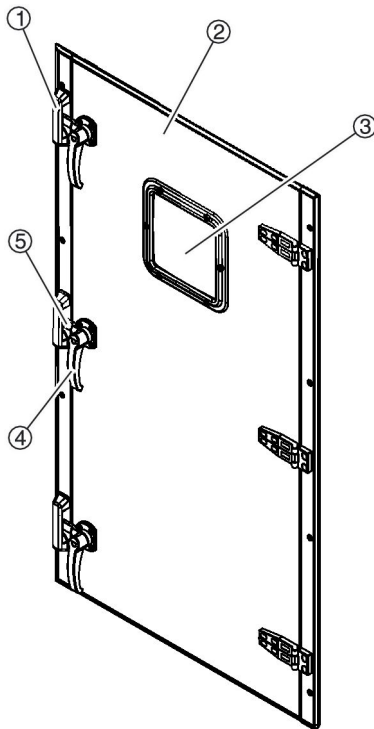


Fig. 17: Inspection access door

- 1 Lock
- 2 Inspection access door
- 3 Inspection window
- 4 Lever
- 5 Latch

Inspection access doors (Fig. 17 /2) are located at the front of the AHU; they allow you to access various AHU components. Some doors are fitted with an inspection window (Fig. 17 /3).

The inspection access doors are closed with a latch (Fig. 17 /5) and lock (Fig. 17 /1); depending on the AHU component, the door can be opened with a handle (Fig. 17 /4) or requires a special key (not shown).

Each inspection access door is fitted with several safeguards:

- ☞ Safety catch
- ☞ Inside door handle
- ☞ Inside door handle with safety catch
- ☞ Safety lock

2.5.3 Filter monitoring

For filter monitoring, the air pressures in front of and behind the filter elements are measured with a differential pressure gauge and the differential pressure is visualised. In differential pressure gauges with differential pressure switches (optional), the pre-set pressure value of the filter is monitored. If this is exceeded, a signal is sent to the control unit. In devices with X-CUBE control, a message is output in the visualisation.

The differential pressure gauges are installed on the operating side of the air handling unit, on each filter . The AHU may have been fitted with analogue or digital differential pressure measuring devices.

ENVIRONMENT!

Saving energy

The higher the differential pressure, the higher the resistance of the filter and hence the power consumption of the air handling unit. If the maximum final differential pressure has been reached, you have to replace the filter.



The maximum final differential pressure (ΔP_{max}) for a filter is given on a sticker on the inspection access door to the filter chamber.

Differential pressure gauge

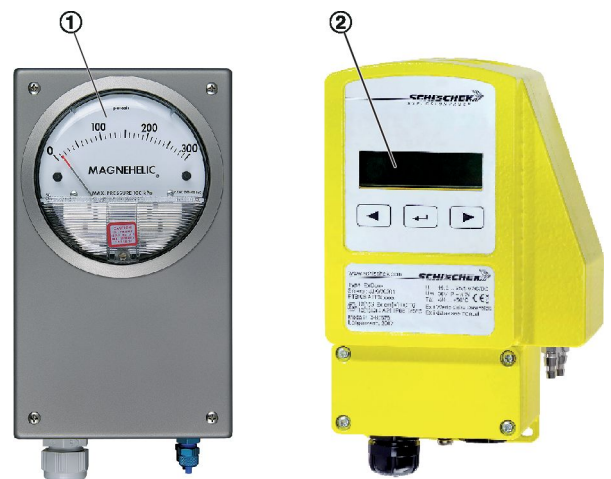


Fig. 18: Differential pressure gauge

The current differential pressure is displayed on the inspection window (Fig. 18 /1) or the digital display (Fig. 18 /2), further information

2.6 Connections and interfaces

Duct connections of the air handling unit

Duct connection	Meaning
Extract air (ETA/ABL)	Duct through which the extract air from rooms enters the AHU.
Supply air (SUP/ZUL)	Duct through which the supply air flows from the AHU into rooms.

Connections and interfaces

Duct connection	Meaning
Outdoor air (ODA/AUL)	Duct through which outdoor air enters the AHU.
Exhaust air (EHA/FOL)	Duct through which air is led outside.

Connections for heat transfer fluids

Used to lead the heat transfer fluid (by others) into the heating coil or cooling coil and out again.

Condensate drains

Used to discharge condensate.

Humidifier connections

Used to transport the humidifying fluid to the distribution system.

Evaporator and condenser connections

Used to lead the heat transfer fluid (by others) into the evaporator or condenser and out again.

Cable glands

The casing panels of components that need supply voltage or a control cable (such as fans, actuators, anti-frost thermostats) are fitted with cable glands.

3 Software use

3.1 Safety notes regarding operation

Incorrect operation

WARNING!

Risk of injury from incorrect operation!

Incorrect operation can cause serious injuries and considerable damage to property.

- Read the operating manual.
- Follow the instructions in in this manual.
- Before you start working, ensure that:
 - all inspection access doors and covers have been closed.
 - all safeguards have been installed and function correctly.
 - nobody is inside the AHU.
- Do not open any covers or inspection access doors while the unit is in operation.
- Do not disable or bypass any safeguards while the unit is in operation.

Working at height


WARNING!

Risk of a fall when you work at height!

Working at height without using any fall protection equipment, or using unsuitable or damaged equipment to get up to where you work at height, may lead to yourself or others falling from height; people on the ground may be at risk from falling parts or tools. This can cause serious or even fatal injuries.

- Wear a safety harness.
- Only access roofs with suitable and intact fall protection equipment in place (ladders, railings, safety harness).
- Start working only if the components you have to work on are easily accessible.
- Stop materials or objects from falling.
- Wear safety shoes, protective clothing and a hard hat.

3.2 Emergency switch-off

- Switch off the mains isolator and secure it against being switched on accidentally,  *Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16*.
- Raise the alarm.
- If there is no risk to your own health, rescue other people from the hazardous area.
- Notify the emergency services.

- Provide first aid.
- Get yourself to safety. Take people in danger with you.

3.3 Switch-off in the event of a fire

The owner of the ventilation and air conditioning system has to include the air handling unit in the fire protection strategy for the building. The system owner has to define the steps to be followed in the event of a fire.

3.4 Preparing a (re)start

Risk of entrapment in units with whole body access

WARNING!

Risk of entrapment where there is whole body access into air handling units!

Entrapment in an air handling unit can cause serious injury or even death.

- When you have to work on the air handling unit, secure the air handling unit against being switched on accidentally.
- Before you switch on the air handling unit again, make sure that nobody is inside.

Before you start the AHU

Before you start the AHU, ensure that:

- Nobody is inside the AHU and no objects have been left inside the AHU.
- All filter elements have been inserted and are intact.
- All connections for water, electricity etc. are intact and open.
- The AHU casing has been completely closed.
- Ventilation (if required) in the installation room has been switched on.

3.5 Starting the air handling unit

Switching the mains isolator on

Personnel:

- Instructed person

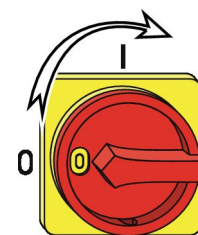


Fig. 19: How to turn the mains isolator

1. ▶ Turn the mains isolator (provided by others) for the AHU to the 'I' position.

After shutdown

2. ▶ Start up the AHU from the central BMS (by others) and according to the system owner's instructions.
 - ⇒ The AHU is now ready for operation.

3.6 Checks during operation

The following checks must be carried out each week while the air handling unit is in operation:

- Check the differential pressure on the filter, *↪ Chapter 3.10 'Reading the differential pressure on the filter' on page 33*.
- Check the system pressure of the heat transfer fluids according to the instructions of the system manufacturer (system by others).
- Check the air handling unit for faults.
- Check the air handling unit for leakage.
- Check fans for faults, e.g.:
 - Unusual vibration
 - Grinding rotor
 - Foreign objects caught in the cover grille

WARNING!

Risk of explosion!

Unusual vibration of the fans poses a hazard which is why the fans have to be monitored, e.g. by frequent visual checks.

We recommend using an electronic vibration monitoring system.

3.7 Tips for operation

Follow the maintenance schedule

Follow the maintenance schedule to ensure economic and energy-efficient operation of each AHU component. If a filter is contaminated, the fan and the entire AHU consume more power.

Keep the building usage in mind

Ensure that the operating mode of the AHU fits the requirements of the building. If the building usage changes, you may have to adapt the operating mode.

Demand-based control

Demand-based control ensures optimum operation and prevents excessive energy consumption.

3.8 Shutting the AHU down

Personnel:

- Instructed person
1. ▶ Shut down the air handling unit from the central BMS (by others) and according to the system owner's instructions.
 2. ▶ Secure the AHU against being switched on accidentally, *↪ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16*.
 - ⇒ The AHU has been secured against being switched on accidentally. It is safe to start working now.

3.9 After shutdown

Decommissioning

WARNING!

Risk of injury from incorrect decommissioning!

Incorrect decommissioning may lead to dangerous situations.

- Appoint an HVAC technician for decommissioning.
- Appoint a skilled qualified electrician and refrigeration technician for decommissioning.

Decommissioning if there is a risk of frost

A decommissioned AHU has to be protected from frost. If only water (without any additives) has been used as a heat transfer fluid, you have to drain the following components:

- Heating coil
- Cooling coil
- Humidifier
- Condensate drip trays
- Drain traps
- Run around coil system

Decommissioning the rotary heat exchanger

If the unit is down for up to 3 months (e.g. in summer), start the fan every 2 weeks so it retains its self-cleaning function.

Downtime of 3 months or longer

If downtime lasts 3 months or longer

- Remove the drive belts of the rotary heat exchangers in order to protect the belts from damage.
- Physically disconnect the entire AHU from the mains.

- Ensure that any residual energy is dissipated.
- Remove and dispose of any operating fluids, auxiliary materials and leftover processing materials in an environmentally sound manner.

Downtime of 1 year or longer

If downtime lasts 1 year or longer

- Replace the bearings.
- If an automatic lubricant for the bearings is in place, remove the used lubricant and replace it with new lubricant; follow the instructions of the fan manufacturer.
- Remove the droplet eliminator and demister for cleaning.

Removing motors

Use only suitable and approved equipment to lift and move motors. If, for example, an integral cross bar and trolley are used to remove a fan motor, ensure that the unit remains stable, e.g. by fixing it to the building structure.

3.10 Reading the differential pressure on the filter

Personnel:

- Instructed person

Protective equipment:

- Industrial safety helmet



ENVIRONMENT!

Saving energy

The higher the differential pressure, the higher the resistance of the filter and hence the power consumption of the air handling unit. If the maximum final differential pressure has been reached, you have to replace the filter.



Fig. 20: Analogue and digital differential pressure measuring devices

- ▶ Read the differential pressure from the inspection window (Fig. 20 /1) or the display (Fig. 20 /2).
- ⇒ If the maximum final differential pressure has been reached, you have to replace the filter element,  Chapter 4.4.4  'Replacing a filter element' on page 49 .



The maximum final differential pressure (ΔP_{max}) for a filter is given on a sticker on the inspection access door to the filter chamber.

Reading the differential pressure measuring devices

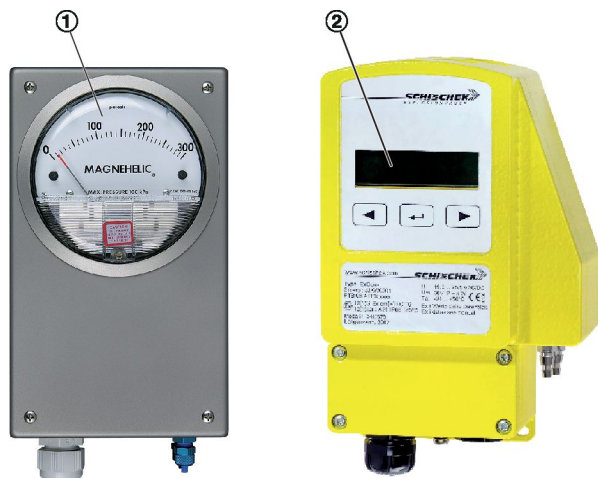



Fig. 21: Analogue and digital differential pressure measuring devices

- ▶ Read the differential pressure on the analogue gauge (Fig. 21 /1) or on the digital display (Fig. 21 /2).
- ⇒ If the maximum final differential pressure has been reached, you have to replace the filter element, ↪ Chapter 4.4.4  'Replacing a filter element' on page 49 .



The maximum final differential pressure (ΔP_{max}) for a filter is given on a sticker on the inspection access door to the filter chamber.

4 Maintenance

The air handling unit requires regular maintenance. Regular care and maintenance ensure operational readiness, functional reliability and long service life of the air handling unit.



Maintenance can also be performed by the TROX Technical Service (optional) (☞ 'TROX Technical Service' on page 3).

4.1 Safety notes regarding maintenance



WARNING!

Risk of explosion!

Ignition sources, such as sparks, open flames or hot surfaces, can lead to explosions in an area with potentially explosive atmospheres.

- Only specially trained personnel must carry out work in an area with potentially explosive atmospheres.
- Get written permission before you start working in an area with potentially explosive atmospheres.
- To remove the potentially explosive atmosphere, purge the air handling unit with outdoor air before you open it.
- If you have to carry out work, either ensure that there is no potentially explosive atmosphere, or at least avoid any source of ignition. If you have to work in a zone with potentially explosive atmospheres, use only equipment that has been approved for use in that particular zone.

Failure to comply with these safety notes may lead to an explosion.

Incorrect maintenance



WARNING!

Risk of injury from incorrect maintenance!

Incorrect maintenance can cause serious injuries and considerable damage to property.

- Before you start maintenance, switch off the air handling unit and secure it against being restarted accidentally.
- Have only authorised persons carry out maintenance.
- Before you start, make sure that there is sufficient clearance for the work you have to complete.
- Keep the work area tidy and clean. Parts and tools that are loosely stacked or left lying around are a source of accident.
- When you reinstall previously removed parts, follow the correct procedure, use all fixing elements and tighten all screws with the correct torque.
- Before you recommission the unit, make sure that:
 - All maintenance jobs have been completed according to this manual.
 - Nobody is inside the AHU.
 - All inspection access doors and covers have been closed.
 - All safeguards have been installed and function correctly.

Working at height



WARNING!

Risk of a fall when you work at height!

Working at height without using any fall protection equipment, or using unsuitable or damaged equipment to get up to where you work at height, may lead to yourself or others falling from height; people on the ground may be at risk from falling parts or tools. This can cause serious or even fatal injuries.

- Wear a safety harness.
- Only access roofs with suitable and intact fall protection equipment in place (ladders, railings, safety harness).
- Start working only if the components you have to work on are easily accessible.
- Stop materials or objects from falling.
- Wear safety shoes, protective clothing and a hard hat.

Rotating parts of a fan

 **WARNING!**

Risk of injury from rotating parts!

Rotating parts in the fan can cause severe injuries.

- Do not reach into the moving fan or tamper with it.
- Do not open any covers or inspection access panels while the unit is in operation.
- Make sure that the rotor is inaccessible while in operation.
- The fan does not stop immediately! Check that no parts are moving before you open an inspection access door.
- Switch off the system before you start working on movable fan parts and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.

Switch off the AHU before you start working on movable fan parts and secure it against accidentally being switched on again, ↪ *Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16* . Wait until all parts have come to a standstill.

Movable parts of multileaf dampers

 **WARNING!**

Crushing hazard from movable parts!

Closing multileaf dampers may crush your hands and arms.

- Do not reach between the damper blades.
- Prevent access to crush points: Either install dampers on ducts or use fixed guards.
- Before you open an inspection access door, switch off the air handling unit and secure it against being switched on accidentally.

Inspection access doors slamming shut

 **WARNING!**

Risk of crushing from doors slamming shut

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Crushing hazard.

 **WARNING!**

Crushing hazard from movable parts!

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

4.2 Switching off the AHU and securing it against being switched on accidentally

Explosion protection

 **WARNING!**

Risk of explosion!

A potentially explosive atmosphere may prevail inside the AHU. If you switch the AHU off, the explosive gas concentration and consequently the risk of an explosion may increase.

- It may be necessary to purge the entire system with outdoor air before you switch it off.
- Avoid any source of ignition while you carry out maintenance.
- Check the explosive gas concentration (using a measuring device) before you start maintenance and while you carry out maintenance.

Before you start maintenance, switch off the AHU and secure it against being switched on accidentally:

- ↪ *Chapter 3.8 'Shutting the AHU down' on page 32*
- ↪ *Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16*

4.3 Maintenance plan

The following sections describe the maintenance jobs required to ensure efficient and fault-free operation.

If during regular checks you detect increased wear, change the maintenance intervals accordingly and carry out more frequent checks for wear and tear. If you have any questions about maintenance and maintenance intervals, contact the TROX Technical Service, ↪ *'TROX Technical Service' on page 3*.



*You may also commission the TROX Technical Service to carry out maintenance (↪ *'TROX Technical Service' on page 3*).*

AHU hygiene inspection

Interval	Maintenance work	Personnel
Every two years (for devices with humidifier)	Check AHU for hygienic conditions.	Hygiene inspector
Every three years (for devices without humidifier)	Check AHU for hygienic conditions.	Hygiene inspector

Ducting and air terminal devices

Interval	Maintenance work	Personnel
Every 6 months	Check supply air and extract air terminal devices for contamination, damage and corrosion. If necessary, clean and repair them according to the manufacturer's instructions.	Instructed person
	Check external weather louvres for contamination, damage and corrosion. If necessary, clean and repair them according to the manufacturer's instructions.	Instructed person
	Check ducts for damage. If necessary, repair them according to the manufacturer's instructions.	Instructed person
	Check flexible connectors for leakage, correct function and damage. If necessary, repair them according to the manufacturer's instructions.	Instructed person
Every 12 months	Clean supply air and extract air terminal devices.	Instructed person
	Check outdoor air and exhaust air terminal devices for contamination, damage and corrosion. If necessary, clean and repair them according to the manufacturer's instructions.	Instructed person
	Check the inside of ducts in at least 2 spots for contamination, damage, corrosion and condensation. If necessary, check further spots and determine whether cleaning is required.	Instructed person
	Check flexible connectors for leakage, correct function and damage.	Instructed person

Explosion protection

Interval	Maintenance work	Personnel
Every month	<p>Check equipotential bonding of the AHU:</p> <ul style="list-style-type: none"> ■ AHU casing <ul style="list-style-type: none"> – Doors – Spigots and connectors for duct connection ■ AHU components: <ul style="list-style-type: none"> – Filter – Cooling coil – Heating coil – Multileaf dampers – Centrifugal fans – Sound attenuator – Plate heat exchanger – Refrigeration system – evaporator ■ Connected systems such as: <ul style="list-style-type: none"> – Ducts – Pipes <p>Check all equipotential bonding cables and ground cables for secure seating and wear. Fix any connections that may have come loose; replace damaged, corroded or lost cables.</p>	Instructed person
Every 3 months	Perform measurements to ensure that the equipotential bonding for the AHU and for all attachments is effective.	Skilled qualified electrician for Ex areas

AHU casing

Interval	Maintenance work	Personnel
Every month	Visually check the interior and exterior of the AHU for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check if warning signs have been attached and if they are legible; replace, if necessary.	Instructed person
	Check interfaces of AHU casing units for leakage.	Instructed person
	Check panel seals and fasteners for firm fit and function.	Instructed person
	Check all equipotential bonding cables and ground cables for secure seating and wear. Fix any connections that may have come loose; replace damaged, corroded or lost cables.	Instructed person
Every 12 months	Check casing for condensation build-up.	Instructed person

➤ Filter

Interval	Maintenance work	Personnel
Every month	Visually check filter element for contamination, ↪ Chapter 3.10 'Reading the differential pressure on the filter' on page 33 . Replace filter element if the maximum differential pressure is exceeded, ↪ Chapter 4.4.4 'Replacing a filter element' on page 49 .	Instructed person
	Check filter element for odours and moisture penetration. Replace filter element, if necessary, ↪ Chapter 4.4.4 'Replacing a filter element' on page 49 .	Instructed person
	Check filter frames and clamping rails for contamination, secure seating, damage and corrosion. Clean if necessary.	Instructed person
Every 6 months	Measure and check the differential pressure of all filters.	Instructed person
Every 12 months	Replace filter elements of the first stage, ↪ Chapter 4.4.4 'Replacing a filter element' on page 49 .	Instructed person
	Check filter frames and clamping rails for secure seating, damage and corrosion.	Instructed person
	Check filter monitoring function.	Instructed person
Every two years	Replace filter elements of the second stage, ↪ Chapter 4.4.4 'Replacing a filter element' on page 49 .	Instructed person

☒ Cooling coil

Interval	Maintenance work	Personnel
Every 3 months	Check dehumidifying cooling coil, condensate drip tray and droplet eliminator for contamination, damage, corrosion and leakage. Clean and repair if necessary.	Instructed person
	Check function of condensate drain and drain trap. Clean and repair if necessary.	Instructed person
Every 6 months	Check heat exchanger for contamination, damage, corrosion and leakage.	HVAC technician
Every 12 months	Check function of feed and return pipes.	HVAC technician

☒ Heating coil

Interval	Maintenance work	Personnel
Every 6 months	Check heat exchanger for contamination, damage, corrosion and leakage.	HVAC technician
Every 12 months	Check function of feed and return pipes.	HVAC technician

Rotary heat exchanger

Interval	Maintenance work	Personnel
Every 3 months	Visually check the rotary heat exchanger for foreign matter, contamination, hygienic condition, damage and corrosion. Clean if necessary.	Instructed person
	Visually check seals for wear, contamination, foreign matter and contact. The seals must be close to the storage mass, but not in contact with it. Clean if necessary.	Instructed person
	Check drive belt for wear and tension.	Instructed person
	Visually check the rotor for imbalance and runout.	Instructed person
	Check bearings for overheating, vibration and running noise.	Instructed person
	Check function of condensate drip tray, condensate drain and drain trap. Clean if necessary.	Instructed person
	Check rotor operation monitoring function.	HVAC technician

Multileaf dampers



Do not use oil or grease on multileaf dampers with gears.

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion.	Instructed person
	Check whether damper blades move smoothly.	Instructed person
	Check function of damper bearings and linkage.	Instructed person
Every 12 months	Check actuator function.	HVAC technician

Electric air heater

Interval	Maintenance work	Personnel
Every 6 months	Visually check the electric air heater for contamination and damage.	Instructed person
	Check function of the electric air heater.	Skilled qualified electrician

High-pressure spray humidifier

Interval	Maintenance work	Personnel
Every 6 months	Visually check high-pressure spray humidifier for contamination, damage and corrosion.	Instructed person

Electric motors

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion.	Instructed person
	Check motors for bearing noise.	Instructed person

Maintenance plan

Interval	Maintenance work	Personnel
Every 12 months	Check electrical connections.	Skilled qualified electrician
	Measure current consumption and compare it with nominal current.	Skilled qualified electrician
	Check all safeguards for correct function.	Skilled qualified electrician

⊕ Centrifugal fan with direct drive

Interval	Maintenance work	Personnel
Every week	Check fans visually and aurally for vibration. In case of vibration, switch the unit off and have the fan repaired.	Instructed person
	This check is not required if you use a vibration monitoring system.	
Every 3 months	Check the equipotential bonding. Repair if necessary.	Skilled qualified electrician for Ex areas
Every 6 months	Visually check for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Visually check anti-vibration elements for damage and correct function.	Instructed person
	Check seals for fit and damage.	Instructed person
	Check impeller for imbalance.	Instructed person
	Check motor for bearing noise.	Instructed person

⊕ FanArray

Interval	Maintenance work	Personnel
Every 6 months	Check for contamination, damage and corrosion. Clean and repair if necessary.	Instructed person
	Check seals for fit and damage. Repair or replace them if necessary.	Instructed person
	Check equipotential bonding. Repair if necessary.	Skilled qualified electrician
	Check motor for bearing noise. Repair or replace bearings if necessary.	Instructed person

Pumps

Interval	Maintenance work	Personnel
Every 6 months	Check for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check flanges and stuffing boxes for leakages.	Instructed person
	Check pump function.	HVAC technician

Control valves

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check connections and free movement.	Instructed person
Every 12 months	Check function of control valves.	HVAC technician

 Sound attenuator

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion. Clean if necessary.	Instructed person

Air recirculation chamber

Interval	Maintenance work	Personnel
Every 6 months	Visually check air recirculation chamber for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check whether damper blades move smoothly.	Instructed person
	Check function of damper bearings and linkage.	Instructed person

 Plate heat exchanger

Interval	Maintenance work	Personnel
Every 3 months	Check condensate drain, condensate drip tray and drain trap for correct function and contamination. Clean if necessary.	Instructed person
Every 6 months	Visually check plate heat exchanger for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check heat exchanger for leakages.	Instructed person

Refrigeration system – compressor

Interval	Maintenance work	Personnel
Every 6 months	Visually check the compressor fixing and anti-vibration elements.	Instructed person
Every 12 months	Check the compressor fixing and anti-vibration elements.	Instructed person
	Check Rotalock valves.	Skilled qualified refrigeration technician
	Check flange connections, quick-release fasteners and seals.	Skilled qualified refrigeration technician
	Check oil sump heater.	Skilled qualified refrigeration technician
	Check collector pipes and connections.	Skilled qualified refrigeration technician
	Check function of high pressure and low pressure sensors.	Skilled qualified refrigeration technician
	Measure power consumption to check PTC thermistor.	Skilled qualified refrigeration technician
	Check refrigerant and oil levels.	Skilled qualified refrigeration technician
	Check output control.	Skilled qualified refrigeration technician
	Check scroll compressor.	Skilled qualified refrigeration technician
	Check refrigeration system safety valve.	Skilled qualified refrigeration technician
Check refrigeration system for leakage.	Skilled qualified refrigeration technician	

Refrigeration system and evaporator

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage, corrosion and leakage. Clean if necessary.	Instructed person
	Visually check for ice buildup.	Instructed person
	Check droplet eliminator, condensate drip tray, condensate drain and drain trap for correct function and contamination. Clean and repair if necessary.	Instructed person
Every 12 months	Check function of expansion valve.	Skilled qualified refrigeration technician

Refrigeration system – condenser

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage, corrosion and leakage. Clean if necessary.	Instructed person
	Check condenser function.	Instructed person

Electrical components and devices

Interval	Maintenance work	Personnel
Every 6 months	Visually check sensors for contamination, damage and corrosion. Clean if necessary.	Instructed person
Every 12 months	Check sensor connections.	Skilled qualified electrician
	Check sensor function.	Skilled qualified electrician
	Check actuators for contamination, damage and corrosion.	Instructed person
	Check actuator input signals, and check operating and adjustment ranges.	Skilled qualified electrician
	Check anti-frost thermostat.	Instructed person
	Check frequency inverter.	Skilled qualified electrician
	Check fan vibration monitoring system.	Skilled qualified electrician
	Check local isolators.	Skilled qualified electrician
	Check CO sensor.	Skilled qualified electrician

Switch cabinet

Interval	Maintenance work	Personnel
Every 6 months	Visually check switch cabinet ventilation and lighting.	Instructed person
Every 12 months	Check cable glands and terminals for secure seating.	Skilled qualified electrician
	Check for contamination, damage and corrosion.	Instructed person
	Check that all protective covers are in place.	Instructed person
	Check functional elements.	Skilled qualified electrician
	Check switching and control procedures.	Skilled qualified electrician
	Check manual, automatic and remote control functions.	Instructed person

Evaporative humidifier

Interval	Maintenance work	Personnel
Every 6 months	Check for contamination, damage and corrosion. Clean and repair if necessary.	Instructed person

Steam humidifier

Interval	Maintenance work	Personnel
Every week	Check water and steam installation for leakages and damage.	Instructed person
	Check drain pipe for contamination.	Instructed person
	Check electrical system for loose cables and damaged components.	Instructed person
	Check steam humidifier for damage.	Instructed person

Interval	Maintenance work	Personnel
Every 6 months	Drain steam cylinder and clean scale collector tank.	HVAC technician
Every 12 months	Remove and clean steam cylinder.	HVAC technician
	Clean unit interior.	HVAC technician
	Visually check components (heating cable connector on steam cylinder, level unit, etc.) inside the unit for damage.	HVAC technician

4.4 Maintenance

4.4.1 Opening inspection access doors

Opening inspection access doors to hazardous areas

Personnel:

- Instructed person

Protective equipment:

- Safety harness
- Industrial safety helmet
- Protective gloves

Tool:

- TROX special key

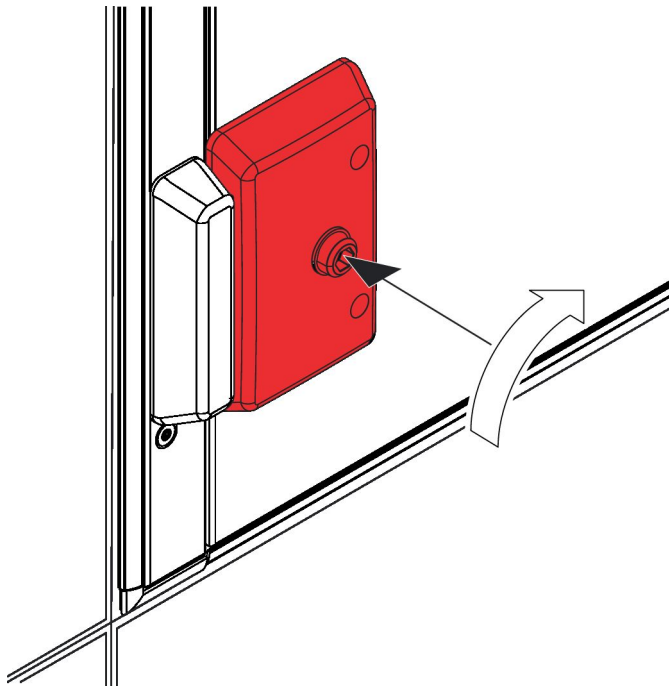


Fig. 22: Opening a lock with the special key (hazardous areas)

- ▶ Insert the TROX special key into the lock and turn it anti-clockwise as far as it will go (Fig. 22).
- ⇒ This unlocks the door; it can now be opened.

4.4.2 Checking filters for contamination

To check the filter for contamination, check the differential pressure Chapter 3.10 'Reading the differential pressure on the filter

If the maximum differential pressure is exceeded, replace the filter, Chapter 4.4.4 Replacing a filter element' on page 49 .



The maximum differential pressure is given on a sticker on the revision access door to the filter chamber.

4.4.3 Cleaning the AHU

General cleaning procedure

Unless specified otherwise, use

- lint free cloths
- non-corrosive and silicone free cleaning agents

to clean the AHU.



Explosion hazard from electrostatic charges!

- To prevent electrostatic ignition hazards, use only a damp cloth to clean surfaces and plastic parts.
- Use only cleaning materials that cannot cause an electrostatic ignition hazard.

When you remove dirt or dust, ensure that it does not get into adjacent parts of the system. Remove dirt and dirty water carefully and dispose of them correctly.

Special regulations or guidelines may apply to the cleaning of AHUs in the pharmaceutical and food industries and in hospitals; be sure to comply with them.

🔧 Cleaning the heating coil

WARNING!

Risk of injury from hot surfaces!

The surfaces of the heating coil can heat up to 100 °C during operation. Skin contact with hot surfaces causes severe skin burns.

- Wear heat-resistant protective clothing and gloves whenever you work near a potentially hot surface.
- Before you start working, make sure that all surfaces have cooled down to the ambient temperature.

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the heating coil may cause cuts or grazes.

- Be careful when you are working on the heating coil.
- Wear protective gloves, safety shoes and a hard hat.

Clean the heating coil while installed; remove it only if it is otherwise not accessible.

Ensure the following:

- Use only water, compressed air or a vacuum cleaner.
- Do not use a high pressure cleaner or high pressure steam cleaner.
- Be careful so as not to damage the blades.
- Use only cleaning agents with a pH value between 7 and 9.
- Prevent dirt and dust from getting into adjacent parts of the system.
- Carefully remove dirt and dirty water.
- Dispose correctly of dirt and dirty water.

🔧 Cleaning the cooling coil

WARNING!

Risk of injury from cold surfaces!

The surfaces of the cooling coil can cool down to -20 °C during operation. Skin contact with cold surfaces causes frostbite and cold burns.

- Wear protective clothing and gloves that protect you from the cold when you work near a potentially cold surface.
- Before you start working, make sure that all surfaces have warmed up to the ambient temperature.

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the cooling coil may cause cuts or grazes.

- Be careful when you are working on the cooling coil.
- Wear protective gloves, safety shoes and a hard hat.

Clean the cooling coil while installed; remove it only if it is otherwise not accessible.

Ensure the following:

- Use only water, compressed air or a vacuum cleaner.
- Do not use a high pressure cleaner or high pressure steam cleaner.
- Be careful so as not to damage the fins.
- Use only cleaning agents with a pH value between 7 and 9.
- Prevent dirt and dust from getting into adjacent parts of the system.
- Carefully remove dirt and dirty water.
- Dispose correctly of dirt and dirty water.

🗑️ Cleaning the rotary heat exchanger

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the rotary heat exchanger may cause cuts or grazes.

- Be careful when you are working on the rotary heat exchanger.
- Wear protective gloves, safety shoes and a hard hat.

Clean the rotary heat exchanger if it has been idle for 14 days or more; clean it while installed; remove it only if it is otherwise not accessible.

Ensure the following:

- Use only water, compressed air or a vacuum cleaner.
- Do not use a high pressure cleaner or high pressure steam cleaner.
- Be careful so as not to damage the blades.
- Use only cleaning agents with a pH value between 7 and 9.
- Prevent dirt and dust from getting into adjacent parts of the system.
- Carefully remove dirt and dirty water.
- Dispose correctly of dirt and dirty water.

🗑️ Cleaning the plate heat exchanger

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the plate heat exchanger may cause cuts or grazes.

- Be careful when you are working on the plate heat exchanger.
- Wear protective gloves, safety shoes and a hard hat.

Clean the plate heat exchanger while installed; remove it only if it is otherwise not accessible.

Ensure the following:

- Use only water, compressed air or a vacuum cleaner.
- Do not use a high pressure cleaner or high pressure steam cleaner.
- Direct air jets or water jets only at an angle of 90° onto surfaces.
- Be careful so as not to damage the blades.
- Use only cleaning agents with a pH value between 7 and 9.
- Prevent dirt and dust from getting into adjacent parts of the system.
- Carefully remove dirt and dirty water.
- Dispose correctly of dirt and dirty water.

4.4.4 ➤ Replacing a filter element

Missing filter element

⚠ CAUTION!

Risk of injury due to a missing filter element!

If no filter element has been fitted in the AHU, dust and germs can get into the ventilation system and will be spread by the AHU. People may fall seriously ill as a consequence.

- Do not put the AHU into operation if no filter element has been fitted.
- Make sure that enough spare filter elements are readily available.

⚠ EX WARNING!

Risk of explosion from unsuitable filters!

For explosion-proof air handling units please note:

- Use only filters suitable for use in areas with potentially explosive atmospheres.
- No electrostatic charge must build up on filters; surface resistance $<10^9$ ohms.
- Ensure that the filter frame is made of a conductive material and that it is connected to the equipotential bonding.

Replacing a filter element with quick release fasteners

Personnel:

- Instructed person

Protective equipment:

- Safety harness
- Industrial safety helmet
- Safety shoes
- Protective gloves

1. ▶ Switch off the air handling unit and secure it against being switched on accidentally, ↪ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16 .
2. ▶ Open the inspection access doors on the upstream side of the filter, .
3. ▶ Disconnect the ground cable of each filter element from the earth bar.

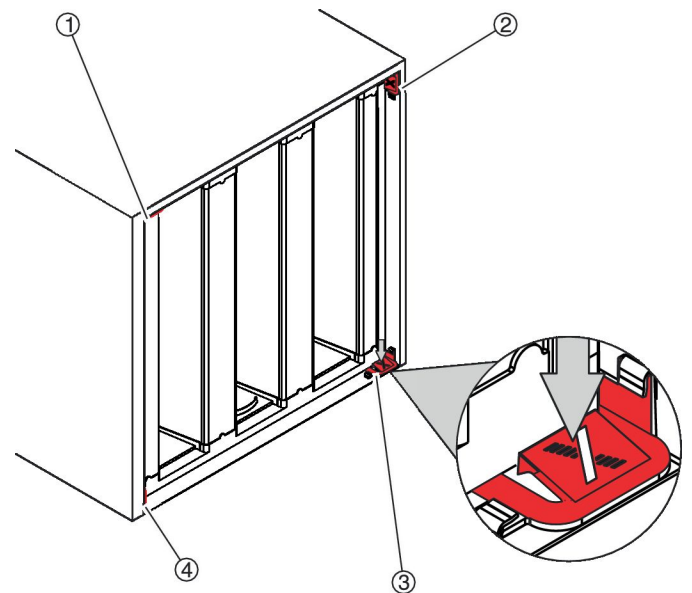


Fig. 23: Loosening the quick release fasteners

4. ▶ Press down the quick release fasteners (Fig. 23 /1 to 4).
- ⇒ The filter element can now be removed.

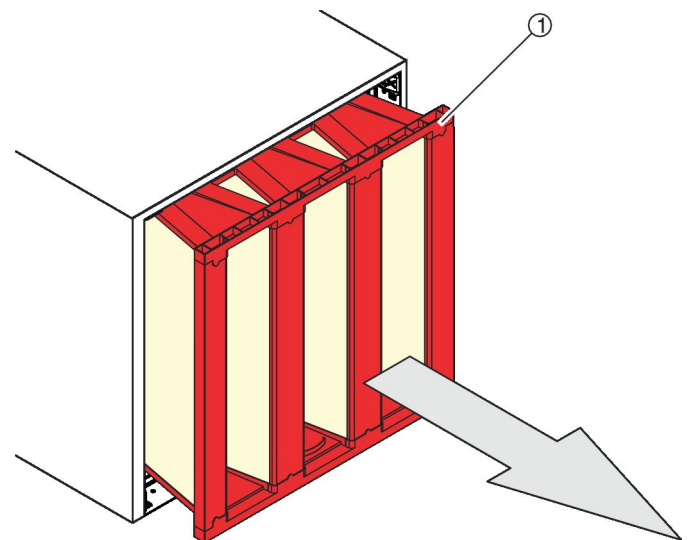


Fig. 24: Removing the filter element

5. ▶ Pull out the filter element (Fig. 24 /1).

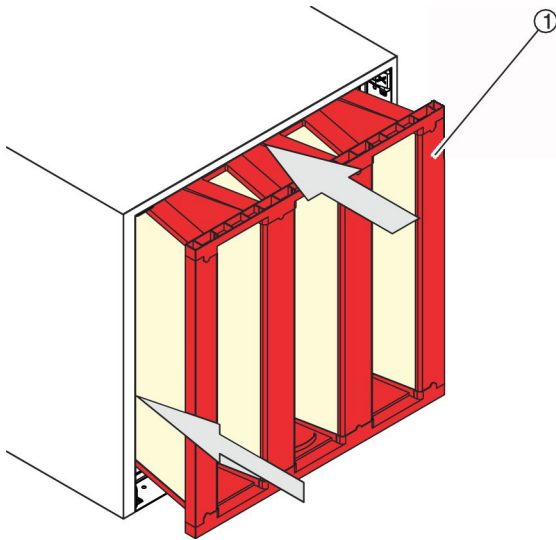


Fig. 25: Replacing the filter element

6. ▶ Insert a new filter element.

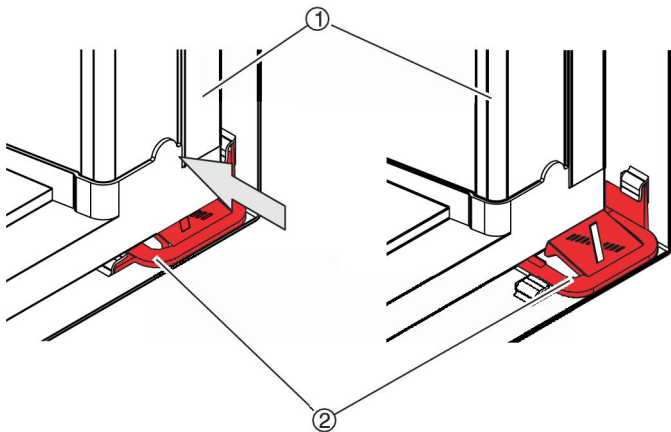


Fig. 26: Filter element locks in place

7. ▶ Push the new filter element (Fig. 26 /1) in and over the quick release fasteners (Fig. 26 /2) until it locks into place.

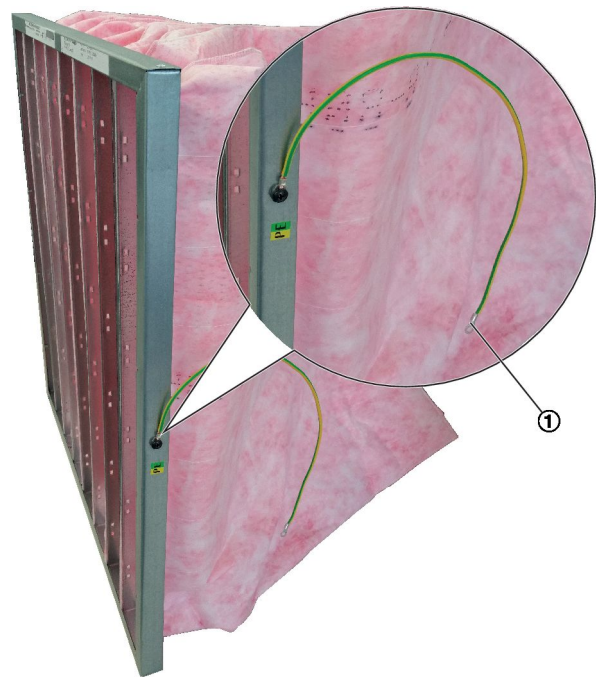


Fig. 27: Connecting the filter ground cable

8. ▶ Connect the ground cable of each filter element with the earth bar.

EX WARNING!

Risk of explosion from incorrect filter installation!

When you assemble the individual filter pockets, connect the eye (Fig. 27 /1) of the ground cable to the earth bar so that a conducting connection is established; secure the cable against coming loose.

9. ▶ Close the inspection access doors.
10. ▶ Carry out a zero point correction for the pressure monitor, .
11. ▶ Prepare restart, ⚡ 'Before you start the AHU' on page 31 .
12. ▶ Remove the padlock from the mains isolator.
13. ▶ Restart the air handling unit, ⚡ 'Switching the mains isolator on' on page 31 .
14. ▶ If software by others is used, enter the new filter element in that software or central BMS.

4.5 After maintenance

Personnel:

- Instructed person
1. ▶ Prepare restart, ⚡ 'Before you start the AHU' on page 31 .
 2. ▶ Remove the padlock from the mains isolator.

3. ▶ Restart the air handling unit, ↺ *'Switching the mains isolator on'* on page 31 .

5 Faults

5.1 Safety notes regarding troubleshooting

Incorrect troubleshooting

 **WARNING!**

Risk of injury due to incorrect troubleshooting!

Incorrect troubleshooting can cause serious injuries and considerable damage to property.

- Before you start maintenance, switch off the air handling unit and secure it against being restarted accidentally.
- Refer to the list of possible faults to see who should or should not clear a fault.
- Before you start, make sure that there is sufficient clearance for the work you have to complete.
- Keep the work area tidy and clean. Parts and tools that are loosely stacked or left lying around are a source of accident.
- Before you recommission the unit, ensure the following:
 - All faults have been rectified according to this manual.
 - Nobody is inside the AHU.
 - All inspection access doors and covers have been closed.
 - All safeguards have been installed and function correctly.


Rotating parts of a fan

 **WARNING!**

Risk of injury from rotating parts!

Rotating parts in the fan can cause severe injuries.

- Do not reach into the moving fan or tamper with it.
- Do not open any covers or inspection access panels while the unit is in operation.
- Make sure that the rotor is inaccessible while in operation.
- The fan does not stop immediately! Check that no parts are moving before you open an inspection access door.
- Switch off the system before you start working on movable fan parts and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.

Switch off the AHU before you start working on movable fan parts and secure it against accidentally being switched on again,  *Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16*. Wait until all parts have come to a standstill.

Inspection access doors slamming shut

 **WARNING!**

Risk of crushing from doors slamming shut

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Crushing hazard.**WARNING!****Crushing hazard from movable parts!**

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

5.2 Faults displayed on the AHU


Differential pressure measuring devices

The differential pressure is indicated on the digital pressure measuring device that is attached to the AHU casing, ↪ *Chapter 2.5.3 'Filter monitoring' on page 29*. If the differential pressure exceeds the maximum final differential pressure, this indicates a fault.



The maximum final differential pressure (ΔP_{max}) for a filter is given on a sticker on the inspection access door to the filter chamber.

5.3 List of faults

Fault description	Cause	Remedy	Personnel
The maximum differential pressure for the filter has been exceeded.	The filter element is contaminated.	In this order: <ul style="list-style-type: none"> Switch off the AHU (via the central BMS) and secure it against being switched on accidentally, ↪ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16. Replace the filter element, ↪ Chapter 4.4.4  Replacing a filter element' on page 49 	Instructed person
The pressure of the heat transfer fluid in the systems provided by others is too high or too low.	Systems provided by others are not working properly.	In this order: <ul style="list-style-type: none"> Switch off the AHU (via the central BMS) and secure it against being switched on accidentally, ↪ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 16. Rectify faults in the systems provided by others according to the system manufacturers' instructions. 	Instructed person

5.4 Troubleshooting

Replacing a filter element

See: [↪ Chapter 4.4.4 !\[\]\(830769b31eeeaca920791081939ff8ba_img.jpg\) Replacing a filter element' on page 49](#)

5.5 After troubleshooting

Personnel:

- Instructed person
1. ▶ Prepare restart, [↪ 'Before you start the AHU' on page 31](#).
 2. ▶ Remove the padlock from the mains isolator.
 3. ▶ Restart the air handling unit, [↪ 'Switching the mains isolator on' on page 31](#).

6 Replacement parts

6.1 Safety notes regarding replacement parts

Explosion protection

 **WARNING!**

Risk of explosion from the use of incorrect replacement parts!

Using incorrect or faulty replacement parts in areas with potentially explosive atmospheres may lead to an explosion. This can cause serious or even fatal injuries as well as considerable damage to property.

- Use only genuine replacement parts from the manufacturer or replacement parts that the manufacturer has approved.
- When in doubt, contact the manufacturer.

Failure to comply with these safety notes may lead to an explosion.

 **Void of warranty**

Using non-approved replacement parts will void your product's warranty.

Buy replacement parts from an authorised supplier or from the manufacturer. For contact details see page 2.

 **WARNING!**

Risk of injury from the incorrect installation of replacement parts!

Incorrect installation of replacement parts can lead to dangerous situations.

- Filter elements may be replaced by instructed persons.
- All other replacement parts have to be installed by the TROX Technical Service, skilled qualified electricians or HVAC technicians.

6.2 Ordering replacement parts



One spare set of filter elements should always be available so that the air handling unit does not have to be switched off.

Replacement parts can be ordered from the TROX Technical Service, ☎ 'TROX Technical Service' on page 3.

7 Accessories

Accessories

TROX special key

8 Removal and disposal

8.1 Safety notes regarding disassembly and disposal

 **WARNING!**

Risk of explosion!

Ignition sources, such as sparks, open flames or hot surfaces, can lead to explosions in an area with potentially explosive atmospheres.

- Only specially trained personnel must carry out work in an area with potentially explosive atmospheres.
- Get written permission before you start working in an area with potentially explosive atmospheres.
- To remove the potentially explosive atmosphere, purge the air handling unit with fresh air before you open it.
- If you have to carry out work, either ensure that there is no potentially explosive atmosphere, or at least avoid any source of ignition. If you have to work in a zone with potentially explosive atmospheres, use only equipment that has been approved for use in that particular zone.
- If the AHU installation room has not been defined as an Ex zone, the system owner has to ensure sufficient ventilation in the installation room as otherwise normal leakage may result in an explosive atmosphere outside of the AHU (zonal dispersion).

Failure to comply with these safety notes may lead to an explosion.

Incorrect disassembly

 **DANGER!**

Risk to life from incorrect assembly and disassembly!

Incorrect assembly or disassembly can result in risks to life and limb and in environmental hazards.

- Before you start disassembly, professionally disconnect all electrical cables.
 - Only a skilled qualified electrician must disconnect the power supply.
 - Ensure that no voltage is present.
- Before you start disassembly, correctly drain all operating fluids.
 - Disconnect operating fluid pipes and hoses.
 - Ensure that operating fluids are disposed of correctly.
- If you have any questions regarding disassembly, refer to the assembly instructions in this manual.

Pay attention to the component manufacturers' documentation.
- Only trained specialist personnel must remove any components.
- If necessary, use additional personal protective equipment for outdoor installations, e.g. a safety harness.

Improper transport equipment

WARNING!

Risk to life from using improper transport equipment!

If packages are lifted without adequate transport equipment and if they are not properly secured, they may fall off and lead to fatal injuries.

- Move components only in the position in which they are to be installed.
- Stand clear of suspended loads.
- Do not move additional loads on top of a package.
- Use only the intended lashing points.
- Make sure that no load is imposed on pipes, ducts or cables.
- Use only approved lifting gear and slings that are suitable and sufficient for the load to be carried.
- Do not tie ropes and chains or make knots or place them on sharp edges.
- Use lifting equipment only to lift packages or units, not to push or pull them.
- Ensure that ropes, belts and chains do not twist.
- Ensure that transport equipment has been correctly assembled, fastened and secured before you use it to lift anything.
- Secure all doors, dampers and panels.
- Move packages without any jerky movements and put them down when you leave your workplace.
- Lifting eyes are designed for one-time use only and not for permanently suspending loads.
- Transport tubes are designed for one-time use only and not for permanently suspending loads.

 1.10 'Residual risks' on page 19

Unbalanced loads and centre of gravity

WARNING!

Risk of injury from falling or toppling loads!

Loads may be unbalanced, i.e. the centre of gravity may not be obvious. If the load is not properly attached to the lifting equipment, it may topple and fall. Falling or toppling loads can cause serious injuries.

- When you use a crane to move loads, ensure that the centre of gravity of the load is directly beneath the crane hook.
- Lift any load carefully and keep an eye on it to see whether it will stay in place. If required, change the lashing point(s).

Crushing hazard.

WARNING!

Crushing hazard from movable parts!

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Inspection access doors slamming shut

WARNING!

Risk of crushing from doors slamming shut

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Sharp edges, sharp corners and thin sheet metal parts

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the heat exchanger or of the cooling or heating coil may cause cuts or grazes.

- Be careful when working on these components.
- Wear protective gloves, safety shoes and a hard hat.

ENVIRONMENT!

Risk of harm to the environment due to incorrect disposal of goods and packaging!

Incorrect disposal can harm the environment.

- Have electronic waste, electronic components and operating fluids (refrigerant, compressor oil, lubricants etc.) disposed of by an approved specialist disposal company.

8.2 Disassembly

Personnel:

- HVAC technician
- Skilled qualified electrician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Hearing protection
- Protective gloves
- Safety shoes

1. ▶ Disconnect electrical cables.
Ensure that no voltage is present.
2. ▶ Remove all operating fluids.
Properly dispose of all operating fluids.
3. ▶ Disconnect operating fluid pipes and hoses.
4. ▶ Open all module connectors and base frame connectors.
5. ▶ Remove the various unit components.
Use suitable transport equipment to move unit components away from the site.

8.3 Disposal

If no return or disposal agreement is in place, any disassembled components should be disposed of by an approved specialist disposal company.

Components that are no longer required should be recycled:

- Scrap the metals.
- Take plastic parts to be recycled.
- Dispose of other components and waste in a suitable manner, i.e. depending on their material properties.

Electrical and electronic components

Electrical and electronic components can contain materials and substances that are hazardous to health and the environment and which must not get into household and commercial waste.

As electrical and electronic components may also contain recyclables (e.g. precious metals), they must be provided for recycling or disposal by a specialist disposal company.

Chemicals

Chemicals (solvents, cleaning agents, operating fluids, etc.) affect the air, soil, water, and human health in various ways. In some cases, valuable substances can be extracted from them.

Chemicals must therefore not get into the air, soil, sewerage system, surface water or groundwater.

Commission an approved specialist disposal company to recover or dispose of chemicals.

Refrigerant R-410A

Refrigerants may contain substances that are toxic and hazardous to the environment, or which release hazardous decomposition products. These must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

Coolant, glycol

Coolants may contain substances that are toxic and pose a hazard to the environment. They must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

Batteries

Battery components are toxic and pose a hazard to the environment. Batteries must not be disposed of with domestic waste. Batteries must only be disposed of by locally approved specialist companies.

Lubricants

Lubricants such as greases and oils contain toxic substances. They must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

Compressor oil

Compressor oil must not enter sewerage systems or bodies of water. Commission a specialist disposal company to dispose of hazardous substances and materials.

9 Technical data

9.1 Operating conditions

Data	Value	Unit
Ambient temperature – operation	-20...+40	°C
Temperature of the transported fluid (air, gas)	-10...+40	°C
Storage temperature	-40...+60	°C
Humidity, no condensation	0...45%	rh

EX WARNING!

Risk of explosion!

The maximum temperature range for the transported fluid must not be exceeded. If the temperature range can not be ensured, monitoring is required. If the temperature of the transported fluid exceeds the maximum temperature range, the AHU has to be switched off.

9.2 Technical data sheet

An illustration and the technical data should already have been provided to you for information and acceptance. We recommend that you keep those documents with this manual.

9.3 Rating plate

You will find the rating plate on the operating side of the AHU. In addition, AHU casing units carry stickers with technical data for the respective component, e.g. for a fan.

①	TROX GmbH Heinrich-Trox-Platz 47504 Neukirchen-Vluyn, Germany Tel.: +49 (0) 2845 202-0 E-Mail: trox@trox.de www.trox.de
②	Product: X-CUBE Ex
③	Unit No.: DE3456789-1
④	Year: 2016
⑤	Weight: 132 kg
⑥	Conformity No.: EPS 16 ATEX 2 117 X
⑦	Certificate No. UKCA: EPS 22 UKEX 2 025 X
⑧	Ex-Marking (internal SUP): II 2G Ex h IIB T4 Gb
⑨	Ex-Marking (internal ETA): II 2G Ex h IIB T4 Gb
⑩	Ex-Marking (external): II 3G Ex h IIB T4 Gc

Fig. 28: Rating plate (rating plate for supply air and extract air combination shown)

- ① Manufacturers
- ② Type of product
- ③ Unit ID
- ④ Year of manufacture
- ⑤ Weight
- ⑥ Conformity number according to CE
- ⑦ Certificate number according to UKCA
- ⑧ Area of application, Ex zone inside, supply air
- ⑨ Area of application, Ex zone inside, extract air
- ⑩ Area of application, Ex zone outside

9.4 CE declaration of conformity

The EU declaration of incorporation or the EU declaration of conformity for the air handling unit should have been provided together with the technical data sheets.

We recommend that you keep those documents with this manual.

Important notes:

- In compliance with Directive 2009/125/EC the unit has to be fitted with a suitable speed control, unless a speed control is already part of the supply package.
- The CE mark on the air handling unit is of no relevance with regard to 2006/42/EC, Machinery Directive; according to the Machinery Directive, an air handling unit without integral controls is considered partly completed machinery.
- The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared to be in conformity with the provisions of Directive 2006/42/EC, where appropriate.

10 Glossary

Components (to 2014/34/EU)

Any item essential to the safe functioning of equipment and protective systems but with no autonomous function.

Equipment (to 2014/34/EU)

Machines, apparatus, fixed or mobile devices, control components and instrumentation thereof and detection or prevention systems which, separately or jointly, are intended for the generation, transfer, storage, measurement, control and conversion of energy and/or the processing of material and which are capable of causing an explosion through their own potential sources of ignition.

Exhaust air – EHA

Air that flows from an internal space to the outside.

Explosive atmosphere (to 2014/34/EU)

A mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture. May also be called 'zone with potentially explosive atmospheres' in this manual.

Extract air – ETA

Air that flows out of a conditioned room.

HVAC technician

HVAC technicians are individuals who have sufficient professional or technical training in the field they are working in to enable them to carry out their assigned duties at the level of responsibility allocated to them and in compliance with the relevant guidelines, safety regulations and instructions. HVAC technicians are individuals who have in-depth knowledge and skills related to HVAC systems; they are also responsible for the professional completion of the work under consideration.

Indoor air – IDA

Air in a conditioned internal space.

ODA – Outdoor air

Untreated air that flows through an inlet into the air handling unit or a building.

Potentially explosive atmosphere (to 2014/34/EU)

An atmosphere which could become explosive due to local and operational conditions. May also be called 'area with potentially explosive atmospheres' in this manual.

Recirculated air – RCA

Extract air that is reconditioned in the air handling unit and supplied to an internal space again.

Secondary air – SEC

Air that is conditioned and then supplied to the same room from which it was extracted.

Skilled qualified electrician

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on electrical systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Skilled qualified refrigeration technicians

Skilled qualified refrigeration technicians have been trained in the field of refrigeration engineering, and they know the relevant standards and guidelines. Evidence of the relevant experience claimed must be available. Skilled qualified refrigeration technicians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on refrigeration systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Supply air – SUP

Air that is supplied to a conditioned internal space; it is also conditioned air that enters an air handling unit.

Transfer air – TRA

Air that flows from one conditioned internal space to another conditioned internal space.

Zone (1999/92/EC, Annex I)

Hazardous places are classified in terms of zones on the basis of the frequency and duration of the occurrence of an explosive atmosphere. May also be called 'zone with potentially explosive atmospheres' in this manual.

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Appendix

A Supplier documents**A.1 Ziehl-Abegg RH..C / ER..C fan**

Name	Data
Designation	Fans
Type	RH..C / ER..C
Number	
Type of manual	Installation manual
Manufacturer	Ziehl-Abegg

Freilaufende Radiallaufräder / Einbauventilatoren

direktgetrieben, mit IEC-Normmotor der Schutzart druckfeste Kapselung Ex de IIC T4 Gb oder druckfeste Kapselung mit Klemmkasten erhöhte Sicherheit Ex de IIC T4 Gb für die Förderung von explosionsfähiger Atmosphäre der Zone 1 Kategorie 2G und Zone 2 Kategorie 3G.

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VENTILATOR-Typenschild
einkleben!

Die Einhaltung der nachfolgenden Vorgaben dient auch der Sicherheit des Produktes. Sollten die angegebenen Hinweise insbesondere zur generellen Sicherheit, Transport, Lagerung, Montage, Betriebsbedingungen, Inbetriebnahme, Instandhaltung, Wartung, Reinigung und Entsorgung / Recycling nicht beachtet werden, kann das Produkt eventuell nicht sicher betrieben werden und kann eine Gefahr für Leib und Leben der Benutzer und dritter Personen darstellen. Abweichungen von den nachfolgenden Vorgaben können daher sowohl zum Verlust der gesetzlichen Sachmängelhaftungsrechte führen als auch zu einer Haftung des Käufers für das durch die Abweichung von den Vorgaben unsicher gewordene Produkt

Anwendung

RH..C



- ZIEHL-ABEGG - Freilaufende Radiallaufräder der Baureihe **RH..C**, in den lieferbaren Baugrößen **250 bis 1000**, sowie die Gerätebaureihe **ER..C** (Typenbezeichnung siehe Typenschild) in explosionsgeschützter Ausführung **Ex II 2G c IIB T4 mit IEC-Normmotor der Zünd-**

Centrifugal impeller without scroll / Plenum Fans

direct-driven, with IEC standard motor of protection type pressure-proof housing Ex de IIC T4 Gb or pressure-proof housing with terminal box for increased safety Ex de IIC T4 Gb for conveyance of zone 1 category 2G and zone 2 category 3G explosive atmospheres.

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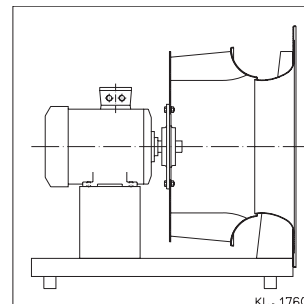
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Compliance with the following instructions is mandatory to ensure the functionality and safety of the product. If the following instructions given especially but not limited for general safety, transport, storage, mounting, operating conditions, start-up, 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.

Application

ER..C



- ZIEHL-ABEGG - Series **RH..C** free running centrifugal impeller, available in frame sizes **250 to 1000**, and the device series **ER..C** (Type designation see rating plate) in explosion-proof version **Ex II 2G c IIB T4 with IEC standard motor protection type Ex de IIC T4 Gb or Ex de IIC T4 Gb** are not ready-for-use products, but are designed

schutzart Ex de IIC T4 Gb oder Ex d IIC T4 Gb sind keine gebrauchsfertigen Produkte, sondern als Komponenten für Klima-, Be- und Entlüftungsanlagen konzipiert. Sie dürfen erst betrieben werden, wenn sie ihrer Bestimmung entsprechend eingebaut sind und die Sicherheit durch Schutzeinrichtungen nach DIN EN ISO 13857 / EN 60529 und die nach EN 14986 erforderlichen baulichen Explosionsschutzmaßnahmen sichergestellt ist.

- Der Anlagenbauer ist für die Abdichtung der Anlage verantwortlich.
- Die Ventilatoren erfüllen hinsichtlich der Werkstoffwahl durch besondere Schutzmaßnahmen im Bereich möglicher Berührungsflächen zwischen rotierenden und stehenden Bauteilen (Lüfterraddeckscheibe / Einströmdüse) die Anforderungen der Norm EN 14986. Für das rotierende Teil (Lüfterraddeckscheibe) wird als Werkstoff „Stahl beschichtet“ eingesetzt. Für die Auswahl des Werkstoffs der feststehenden Peripherieteile ist, bei Bezug des Lüfterrades ohne ZIEHL-ABEGG-Einströmdüse, der Anlagenbauer verantwortlich. Es dürfen nur Werkstoffpaarungen nach EN 14986 eingesetzt werden.



Sicherheitshinweise

- Die Laufräder sind nur zur Förderung von Luft oder explosionsfähiger Atmosphäre der Zone 1 Kategorie 2G und Zone 2 Kategorie 3G bestimmt. Die Förderung von Feststoffen oder Feststoffanteilen im Fördermedium ist nicht zulässig.
- Betreiben Sie den Ventilator nur nach seiner bestimmungsgemäßen Verwendung und nur bis zur **max. zulässigen Betriebsdrehzahl** gemäß Angaben auf dem Ventilator-/Laufrad-Typenschild. Ein Überschreiten der max. zul. Betriebsdrehzahl führt als Folge der hohen kinetischen Energie (Masse x Drehzahl) zu einer Gefährdungssituation. **Das Laufrad kann bersten - Lebensgefahr!** Die max. zulässigen Betriebsdaten auf dem Typenschild gelten für eine Luftdichte $\rho = 1,2 \text{ kg/m}^3$.
- Freilaufende Laufräder sowie die Gerätebaureihe **ER...** dürfen mit Frequenzumrichter nur dann betrieben werden, wenn ein Antriebsmotor der Zündschutzart „**Druckfeste Kapselung Ex de IIC oder Ex d IIC**“ verwendet wird.
- Die Angabe der Temperaturklasse auf dem EX-Prüfschild (Motor) muss mit der Temperaturklasse des möglicherweise auftretenden brennbaren Gases übereinstimmen.
- Montage und elektrische Installation darf nur durch geeignetes Fachpersonal, das die **einschlägigen Vorschriften** beachtet, vorgenommen werden!
- Jedem Motor muss ein Motorschutzschalter vorgeschaltet sein. Beachten Sie hierzu die Angaben des Motorherstellers.
- Wicklungsüberwachung durch Kaltleiter für Abschaltung am Umrichter. Zur Schutzeinrichtung wird ein Auslösegerät mit Kennzeichen II (2) G benötigt.
- Bei Drehzahlsteuerung durch Frequenzumrichter ist sicherzustellen, dass die max. zul. Drehzahl nicht durch eine Fehlfunktion des Frequenzumrichters überschritten wird.
- Bei Betrieb mit Frequenzumrichter ist eine Übermodulation nicht zulässig. Lüfterrad kann bersten - **Lebensgefahr!**
- Bezüglich Drehzahlregelung mit Frequenzumrichter sind die Sicherheitshinweise und Empfehlungen gemäß der Betriebsanleitung des Motorherstellers einzuhalten. Dies gilt auch in Bezug auf Motoreinbau, elektrischen Anschluss und Wartung.
- Beachten Sie die Einbau- und Sicherheitshinweise zu den verschiedenen Ventilatorbauformen. Nichtbeachtung oder Missbrauch kann zu körperlichen Schäden oder Beschädigung des Ventilators und zur Explosion einer zündfähigen Gas-Luftatmosphäre führen - **Lebensgefahr.**
- Beachten Sie die Hinweise in der Betriebsanleitung des Motorherstellers, die Bestandteil des Lieferumfangs ist.
- Wird der Ventilator frei ansaugend oder frei ausblasend eingesetzt, ist zu prüfen, ob die Sicherheitsabstände gemäß **DIN EN ISO 13857 / EN 60529** eingehalten werden.
- Die Einhaltung der Norm DIN EN ISO 13857 / EN 60529 bezieht sich nur auf den montierten Berührschutz, sofern dieser zum Lieferumfang gehört.
- Achten Sie insbesondere saugseitig auf ausreichend bemessenen Sicherheitsabstand, da durch die Sogwirkung des Ventilators Kleidung, Gliedmaßen oder bei größeren Ventilatoren auch Personen angesaugt werden können.

as components for air-conditioning and ventilation plants. They may only then be operated when they are installed in accordance with their intended use and safety has been ensured through protective devices in accordance with DIN EN ISO 13857 / EN 60529 and the required structural explosion-protective measures in accordance with the EN 14986.

- The system constructor is responsible for the sealing of the system.
- Regarding the choice of materials, the fans fulfill the requirements of the EN 14986 standard through special protective measures in the area of possible accidental contact between the rotating and stationary component parts (impeller). „Coated steel“ is used as the material for the rotating part (impeller shroud). The system constructor is responsible for the selection of the material for the stationary periphery parts when the impeller is purchased without ZIEHL-ABEGG inlet rings. Only mating materials in accordance with the EN 14986 may be utilized.



Safety instructions

- The impellers are only intended for the conveyance of air or zone 1 category 2G and zone 2 category 3G explosive atmospheres. The conveyance of solid matter or solids content in the conveyance medium handled is not permitted.
- Only operate the fan according to the intended application, and only up to the **maximum permissible speed** given in the information on the fan/impeller rating plate. Exceeding the maximum permissible speed leads, as a result of the high kinetic energy (mass x rotation rate), to a hazardous situation. **The impeller can burst - lethal hazard!** The maximum permissible operating data given on the rating plate is valid at an air density $\rho = 1.2 \text{ kg/m}^3$.
- Impellers without housing/plug fans as well as the **ER...** device series may only then be operated with a frequency converter if a drive motor of the **"Ex de IIC or Ex d IIC pressure-proof housing"** ignition protection type is utilized.
- The data concerning the temperature class on the EX-rating plate (motor) must coincide with the temperature class of any possibly occurring combustible gasses.
- Mounting and electrical installation may only be carried out by trained specialized personnel who observe the **relevant regulations!**
- A protective motor switch must be connected before each motor. Please comply with the motor manufacturer's instructions.
- Winding monitoring through PTC thermistors for disconnection at the converter. A triggering device with the II (2) G mark is needed as a safeguard.
- 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.
- When in operation with a frequency converter, no over-modulation is allowed. The fan wheel may burst – **danger to life!**
- With regard to speed regulation with frequency converters, the safety instructions and recommendations are to be maintained in accordance with the motor manufacturer's operating instructions. This also applies to motor installation, electrical connections, and servicing.
- Observe the installation and safety instructions applicable to the various fan designs. Non-observance or misuse can lead to bodily harm or damage to the fan and to the explosion of ignitable gas-air mixtures - **Danger of death.**
- Observe the notes in the motor manufacturer's operating instructions, which form part of the supply.
- If a fan is utilized as a free inlet or free discharge type, verify that the required clearance based on **DIN EN ISO 13857 / EN 60529** is maintained.
- The maintenance of the standard DIN EN ISO 13857 / EN 60529 relates only to the installed accidental contact protection, provided that it is part of the scope of delivery.
- Pay special attention that there is sufficiently dimensioned safety clearance on the inlet side, as clothes, limbs, or, in the case of large fans, even people can be sucked in due to the fan's suction power.

- Wenn durch die Geräte- oder Anlagenkonstruktion das Ansaugen oder Hereinfallen größerer Teile in den Laufbereich nicht ausgeschlossen werden kann - **Gefahr der Explosion einer zündfähigen Gas-Luftatmosphäre** - ist saugseitig ein Schutzgitter zwingend erforderlich.
- Blockieren oder Abbremsen des Ventilators durch z. B. Hineinstecken von Gegenständen ist untersagt. Dies führt zu heißen Oberflächen und Beschädigungen am Laufrad.
- Ein Restrisiko durch Fehlverhalten, Fehlfunktion oder Einwirken höherer Gewalt beim Betreiben des Laufrades kann nicht völlig ausgeschlossen werden. Der Planer oder Erbauer der Anlage muss durch geeignete Sicherheitsmaßnahmen nach DIN EN ISO 13857 / EN 60529, z. B. Schutzeinrichtungen, verhindern, dass eine Gefährdungssituation entstehen kann.
- Diese Montageanleitung ist Teil des Produktes und als solche zugänglich aufzubewahren.



Transport, Lagerung

Bei der Handhabung Sicherheitsschuhe und Schutzhandschuhe benutzen!

- Radiallaufräder oder Einbauventilatoren ER..C werden in der Regel auf Europaletten geliefert und können mittels Hubwagen transportiert werden.
- Bei Transport mit Hebezeugen:
 - **Bauform RH..C ohne Motor:** Hebeband mit ausreichender Traglast um eine Laufradschaufel herumlegen. Beachten Sie die Gewichtsangabe auf dem Typenschild (Rückseite der Laufradbodenscheibe). Verwenden Sie nur ein Hebeband, das geeignet ist, scharfkantige Lasten zu tragen.
 - **Bauform ER..C:** Ventilatoreinheit darf nur mit geeignetem Hebezeug (Lasttraverse) angehoben und transportiert werden. Auf ausreichende Seil- bzw. Kettenlänge ist zu achten.
 - **Achtung: Anordnung der Lasttraverse quer zur Motorachse. Auf ausreichende Breite der Lasttraverse achten. Kette bzw. Seil darf das Lüfterrad beim Anheben nicht berühren! Stellen Sie sich auf keinen Fall unter den schwebenden Ventilator, da im Falle eines Defektes am Transportmittel Lebensgefahr besteht. Beachten Sie unbedingt immer die Gewichtsangaben auf dem Ventilator-Typenschild und die zul. Traglasten des Transportmittels.**
- Vermeiden Sie Schläge und Stöße, besonders bei auf Geräten aufgebauten Ventilatoren.
- Bei Beschädigungen umgehend den Spediteur benachrichtigen.
- Lagern Sie den Ventilator in trockener, staub- und schwingungsfreier Umgebung.
- Vermeiden Sie zu lange Lagerzeiträume. Beachten Sie hierzu die Hinweise des Motorherstellers.



Laufradeinbau

- **Laufräder mit Festnabe**
 - Das Laufrad wird mittels Festnabe mit dem Wellenende des Antriebsmotors verbunden.
 - Montage: Alle blanken Oberflächen (Wellenende, Nabenbohrung) leicht befeuchten. Laufrad mit Nabe (1) bis auf Wellenschulter (2) aufziehen (Übergangspassung). Bei entsprechendem Gewicht mit Hebezeug sichern. Axiale Wellensicherung mittels Schraube (3) und Scheibe (4) vorsehen. Anzugsmomente nach Tabelle einhalten. Die Schraube (3) ist mit einer Sicherungsscheibe (z. B. Sperrkant- oder Kontaktscheibe) zu sichern. Bei Motoren ab BG132 (WellenØ 38) ist nach Norm EN 14986 eine Sonderscheibe mit Schrauben (5) zur zusätzlichen Sicherung angebracht. Anzugsmomente nach Tabelle einhalten.
 - Demontage: Axiale Schraubensicherung lösen und Laufrad mit Nabe mittels geeigneter Abziehvorrichtung abziehen (bei entsprechendem Gewicht mit Hebezeug sichern). Bei Motoren ab BG132 muss die zusätzliche axiale Wellensicherung (5) ebenfalls gelöst werden.



Transport, storage

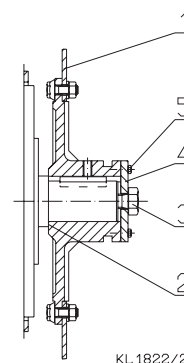
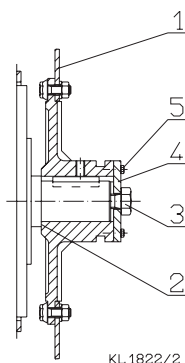
Wear safety shoes and gloves for handling!

- Centrifugal impellers and ER..C plug fans are generally delivered on Euro palettes and can be transported using lift trucks.
- When transporting using hoists/cranes:
 - **RH..C design without motor:** Wrap an impeller blade using a sling band with a sufficient amount of ultimate load. Observe the weight data on the identification plate (back of the impeller base plate). Use only sling bands that are suitable for carrying sharp-edged loads.
 - **ER..C design:** Fan unit may only be lifted and transported using a suitable hoisting device (load spreader). Ensure there is sufficient cable or chain length.
 - **Caution: Arrange the lifting beam transverse to the motor axis. Ensure that the lifting beam is sufficiently wide. Chain or cable must not touch the fan impeller during lifting! Never stand under the swinging fan, since life can be at risk in the event of a defect in the transporter. Make sure that the weight information on the fan rating plate and the permissible loads of the transporter are always observed.**
- Avoid impacts and collisions, especially on fans set-up on devices.
- In the event of damage inform the carrying agent immediately.
- Store the fan in a dry, dust- and vibration-free environment.
- Avoid excessive storage times. Please refer to the manufacturer's motor information on this.



Installing the impeller

- **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 (5) (transitional fit). Secure with the hoisting device with corresponding weight. Secure the axial shaft-locking device using the screw (3) and washer (4). Maintain the torque in accordance with the table. The screw (3) is to be secured using a locking washer (e.g. square taper washer or contact washer). For motors starting from BG132 (shaft Ø 38), a special washer with screws (5) is to be attached as an additional safeguard in accordance with EN 14986 standard. Maintain the torque in accordance with the 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). For motors starting from BG132, the additional axial shaft-locking device (5) must be released also.

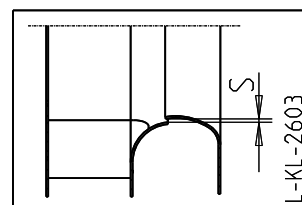
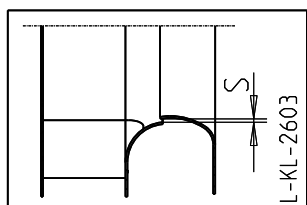


FK 8.8	M4	M5	M6	M8	M10	M12
MA	2,8 Nm	5,5 Nm	9,5 Nm	23 Nm	46 Nm	79 Nm

SC 8.8	M4	M5	M6	M8	M10	M12
MA	2,8 Nm	5,5 Nm	9,5 Nm	23 Nm	46 Nm	79 Nm

- Bei Einhaltung der Werkstoffpaarung müssen folgende Mindestspalte eingehalten werden: zwischen rotierenden und stehenden Teilen (Laufraddeckscheibe / Einströmdüse bzw. Druckentnahmenippel) darf der Mindestspalt (s) nicht kleiner als 1 % des maßgeblichen Kontaktdurchmessers, aber nicht weniger als 2 mm betragen.

- *The following minimum gap must be maintained during compliance of materials mating: between the rotating and stationary parts (impeller shroud / inlet ring or pressure release nipple), the minimum gap (s) must not be smaller than 1 % of the relevant contact diameter, but must not be less than 2 mm.*



- Vor- bzw. nachgeschaltete Bauteile oder solche, die unmittelbar im Luftstrom liegen, dürfen keine ungeschützten Aluminium- oder Stahloberflächen aufweisen. Erforderlich ist eine Lackierung oder Kunststoffbeschichtung, welche mindestens Gitterschnitt-Kennwert 2 nach DIN EN ISO 2409 erfüllt. Der Oberflächenschutz soll verhindern, dass es zur Bildung von Rost oder Ablagerung von Eisenoxyd oder kleineren Rostpartikeln kommt, welche in Verbindung mit Aluminium und dem Auftreffen von Partikeln mit hoher Luftgeschwindigkeit zu einer chemischen Reaktion (aluminotherm. Reaktion) und somit zur Zündung einer explosionsfähigen Gas-Luftatmosphäre führt.

- *Up and downstream components or those that lie directly in the airflow must not have any unprotected aluminum or steel surfaces. A paint finish or plastic coating that at least fulfills the crosscut test parameter 2 in accordance with DIN EN ISO 2409 is required. The surface protection is to prevent the formation of rust or sedimentary deposition of red oxide or small rust particles, which in connection with aluminum and the emergence of particles with high airflow velocity lead to a chemical reaction (aluminothermal reaction) and thus to ignition of an explosive gas-air atmosphere.*



Elektrischer Anschluss

- Darf nur von technisch ausgebildetem Fachpersonal (DIN EN 50 110, IEC 364) vorgenommen werden.
- Nur Kabel verwenden, die eine dauerhafte Dichtigkeit in Kabelverschraubungen gewährleisten (druckfest-formstabiler, zentrisch-runder Mantel; z. B. mittels Zwickelfüllung!)
- Der Ventilator darf nur an Stromkreise angeschlossen werden, die mit einem allpolig trennenden Schalter abschaltbar sind.
- Beachten Sie unbedingt die Sicherheits- und Inbetriebnahmehinweise des Motorherstellers, sowie die im Motor-Klemmenkasten befindlichen Schaltbilder.
- Vor dem elektrischen Anschluss des Motors die Anschlussdaten mit den Angaben auf dem Motortypenschild vergleichen.



Electrical connection

- *May only be undertaken by technically trained personnel (DIN EN 50 110, IEC 364).*
- *Only use lines which can guarantee a permanent seal around the cable glands (pressure-resistant, dimensionally-stable, round-centred jacket; e.g. by means of gusset filling)!*
- *Connect fan only to electrical circuits that can be disconnected with an all-pole isolating switch.*
- *Ensure that attention is paid to the motor manufacturer's safety and commissioning information and the circuit diagrams in the motor terminal box.*
- *Before making the electrical motor connections, compare the connection specifications with the specifications on the motor identification plate.*



Geräteaufstellung

Bei der Handhabung Sicherheitsschuhe und Schutzhandschuhe benutzen!

- Sicherheitshinweise beachten!
- Um die Übertragung störender Schwingungen zu vermeiden, wird eine Körperschallentkopplung des kompletten Einbauventilators empfohlen. (Feder- bzw. Dämpfungselemente sind nicht Bestandteil des serienmäßigen Lieferumfangs). Die Zuordnung der Abstandmaße der Federdämpfer, je nachdem, ob der Ventilator mit oder ohne Zubehör ausgestattet ist, kann unserer Homepage



Setting up the unit

Wear safety shoes and gloves for handling!

- *Observe the safety information!*
- *In order to avoid transmitting disturbing vibrations, it is recommended that a means of decoupling the structure borne noise of the complete built-in fan should be used. (Spring or attenuation components are not part of the standard supply). The allocation of the distance between the spring suspensions, depending on whether the fan is fitted with accessories or not, can be found on our homepage at www.ziehl-abegg.de in the Download section - Ventilation and Control Technology.*

unter www.ziehl-abegg.de im Bereich Download - Luft- und Regeltechnik entnommen werden.

- **Achtung: Alle Auflagepunkte müssen betriebssicher mit dem Fundament verbunden sein. Bei nicht ausreichender Befestigung besteht Gefahr durch Kippen des Ventilators.**
- Auf ausreichende saug- und druckseitige Abstände achten.
- Aufstellung im Freien nur, wenn in den Bestellunterlagen ausdrücklich vermerkt und bestätigt. Bei längeren Stillstandszeiten in feuchter Umgebung besteht die Gefahr von Lagerschäden. Korrosion durch entsprechende Schutzmaßnahmen vermeiden. Eine Überdachung ist erforderlich.
- Eigenmächtige Veränderungen/Umbauten am Ventilator sind nicht zulässig - Sicherheitsrisiko.
- Werden Gefährdungen durch Blitzschlag festgestellt, müssen die Anlagen durch geeignete Blitzschutzmaßnahmen geschützt werden.
- Anlagen müssen in ausreichendem Sicherheitsabstand zu Sendeanlagen oder durch geeignete Abschirmung geschützt werden.
- ER-Ventilatoren dürfen nur in Einbaulage H (Ventilator stehend, Motorwelle horizontal) betrieben werden!
- Das Demontieren bzw. das Anbringen von Bauteilen am Ventilator bzw. Laufrad führt zum Erlöschen der Garantieleistung! Ausnahme: Der Klemmkastendeckel darf zum Auflegen der Anschlusskabel von technisch ausgebildetem Fachpersonal (DIN EN 50110, IEC 364) geöffnet werden. Am Klemmkasten dürfen geeignete Kabelverschraubungen angebracht werden.

Zubehör:

- Als Zubehör können Schutzgitter, Federdämpfer und Gewebekompensatoren bezogen werden. Beim Einbau bzw. Anbau dieser Elemente ist der Anlagebauer dafür verantwortlich die Zubehörteile zu erten.



Betriebsbedingungen

- Beachten Sie die Angaben des Motorherstellers.
- Ein Überschreiten der max. zul. Betriebsdrehzahl (Ventilator-/Laufrad-Typenschild) ist nicht zulässig, siehe Sicherheitshinweise. Die max. zulässige Betriebsdrehzahl gilt für Dauerbetrieb S1. Hohe Schalthäufigkeit ist zu vermeiden. Anlauf über Y/D-Schaltung. Ventilator nicht im Resonanzbereich des Laufrades betreiben - Gefahr durch Dauerbruch.
- Bei Betrieb mit Frequenzumrichter ist eine Übermodulation nicht zulässig. Lüfterrad kann bersten - **Lebensgefahr!**
- A-bewerteter Schallleistungspegel größer 80dB(A) möglich, siehe Produktkatalog.



Inbetriebnahme

- Vor Erstinbetriebnahme prüfen:
 - Hinweise des Motorherstellers zur Inbetriebnahme berücksichtigt?
 - Ist der Motorschutz richtig eingestellt? Polumschaltbare Motoren benötigen für jede Polzahl einen eigenen Schalter. Bei Dreieck-Schaltung muss ein Überlastschutz mit Phasenausfallschutz vorgesehen werden.
 - Einbau und elektrische Installation fachgerecht abgeschlossen?
 - Eventuell vorhandene Montagerückstände und Fremdkörper aus dem Laufrad- und Ansaugbereich entfernt?
- Der Ventilator ist nach dem Einbau auf mechanische Schwingungen zu überprüfen. Ist die Schwingstärke des Ventilators größer als 2,8 mm/s (gemessen am Lager Schild des laufradseitigen Motorlagers), muss das Laufrad von Fachpersonal überprüft und gegebenenfalls nachgewuchtet werden.
- Inbetriebnahme darf erst erfolgen, wenn alle Sicherheitshinweise überprüft und eine Gefährdung ausgeschlossen ist.
 - Stromaufnahme prüfen! **Ist die Stromaufnahme höher als auf dem Motor-Leistungsschild angegeben, ist der Ventilator sofort außer Betrieb zu setzen.**
 - Drehrichtung kontrollieren (Drehrichtungspfeil auf Laufradbodenscheibe bzw. am Ventilatorgehäuse)
 - Auf ruhigen, schwingungsarmen Lauf achten.

- **Caution: All contact points must be fixed securely to the base. If the fixing is inadequate there is a risk of the fan overturning.**
- Ensure adequate clearance on suction and pressure sides.

- 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.
- Modifications/conversions to the fan undertaken by the operator are not permissible - safety hazard.
- If hazards from lightning strikes have been ascertained, the system must be protected through the use of suitable lightning protection measures.
- Systems must be sufficiently separated from transmitting installations or be protected through suitable shielding.
- ER fans may only be operated in installation position H (fan upright, motor shaft horizontal)!
- Dismantling and attaching components to the fan or impeller results in expiration of the warranty! Exception: the terminal-box cover may be opened so that technically trained qualified-persons (DIN EN 50110, IEC 364) can attach the connection cable. Suitable threaded cable-connections may be attached to the terminal box.

Accessories:

- Guard grills, spring suspensions, and fabric expansion joints can be ordered as accessories. During the installation or addition of these elements, the system constructor is responsible for grounding the accessory components.



Operating conditions

- Observe the motor manufacturer's instructions.
- Exceeding the max. permissible operating speed (fan / impeller rating plate) is not permissible; see safety instructions. The max. permissible operating speed applies to continuous operation S1. High switching frequencies are to be avoided. Start-up via Y/D connection. Do not operate the fan in the resonance range of the impeller - danger through fatigue fracture.
- When in operation with a frequency converter, no over-modulation is allowed. The fan wheel may burst – **danger to life!**
- A-rated sound power levels of over 80 dB(A) are possible, see product catalogue.



Start-up

- Before first-time start-up, check the following:
 - Account has been taken of the motor manufacturer's information?
 - Ensure that the motor protection is correctly set? Pole-changing motors need a separate switch for each number of poles. An excess-current switch with phase monitor must be provided for delta connections.
 - Installation and electrical connection have been properly completed?
 - All leftover installation materials and other foreign materials have been removed from the fan cavity.
- After installation, check the fan for mechanical oscillations. If the amount of fan oscillation is larger than 2.8 mm/s, (measured on the end plate of the impeller side of the motor bearing), the impeller must be examined by specialists and, if necessary, rebalanced.
- Commissioning may only take place if all safety instructions have been checked and danger can be excluded.
 - Check the current consumption! **If the current consumption is higher than that stated on the motor rating plate, the fan must be disconnected immediately.**
 - Check the direction of rotation (the rotation direction arrow is on the impeller base plate or on the fan housing)
 - Watch out for smooth, vibration free motion.



Instandhaltung und Wartung

- Der Anlagenbauer muss eine leichte Zugänglichkeit für Reinigungs- und Inspektionsarbeiten ermöglichen.
- **Bei der Handhabung Sicherheitsschuhe und Schutzhandschuhe benutzen!**
- Überprüfung des Ventilators auf mechanische Schwingungen gemäß ISO 14694. Empfehlung: alle 6 Monate. Die max. zul. Schwingstärke beträgt 2,8 mm/s (gemessen am Lagerschild des laufradseitigen Motorlagers, oder gem. den speziellen Vereinbarungen mit dem Kunden).
- Je nach Einsatzbereich und Fördermedium unterliegen Laufrad und Gehäuse einem natürlichem Verschleiß. Ablagerungen am Laufrad können zur Unwucht und damit zu Schäden (Gefahr eines Dauerbruchs) führen.
 - Laufrad kann bersten - Lebensgefahr!
 - Beachten Sie die Angaben des Motorherstellers zur Instandhaltung und Wartung.
- Instandsetzungsarbeiten nur durch ausgebildetes Fachpersonal vornehmen lassen.
- **Bei allen Instandsetzungs- und Wartungsarbeiten:**
 - Sicherheits- und Arbeitsvorschriften (DIN EN 50 110, IEC 364) beachten.
 - Ventilatorlaufad steht still!
 - Stromkreis unterbrochen und gegen Wiedereinschalten gesichert.
 - Bei Betrieb über Frequenzumrichter Wartezeit nach dem Freischalten beachten - siehe Betriebsanleitung des Herstellers bezüglich Entladungszeit der Kondensatoren.
 - Spannungsfreiheit feststellen.
 - Keine Wartungsarbeiten am laufenden Ventilator!
 - Halten Sie die Luftwege des Ventilators frei - Gefahr durch herausfliegende Gegenstände!
 - Flügel nicht verbiegen - Unwucht!
 - Achten Sie auf untypische Laufgeräusche!
- Die Betriebsmittel in explosionsgeschützter Ausführung dürfen weder geöffnet noch repariert werden. Ein Lagerwechsel von Kunden oder vom normalen Servicefachmann ist ebenfalls nicht zugelassen.
- Nach Laufraddemontage und Wiedermontage ist es zwingend erforderlich, die gesamte rotierende Einheit nach DIN ISO 1940-1 neu auszuwuchten.
- Bei allen anderen Schäden (z.B. Wicklungsschäden) wenden Sie sich bitte an unsere Serviceabteilung.
- Laufrad, insbesondere Schweißnähte, auf eventuelle Rissbildung überprüfen.
- ZIEHL-ABEGG Atex-Ventilatoren / Motoren sind ganz oder teilweise mit antistatischer, ableitfähiger Lackierung oder Beschichtung versehen. Ein Nachlackieren kann zu gefährlichen statischen Aufladungen führen und ist daher nicht zulässig.



Reinigung

- Regelmäßige Inspektion, ggf. mit Reinigung erforderlich um Unwucht durch Verschmutzung zu vermeiden.
 - Durchströmungsbereich des Ventilators säubern.
- Achten Sie auf schwingungsarmen Lauf.
- Wartungsintervalle je nach Verschmutzungsgrad des Laufrades.
- Der komplette Ventilator darf mit einem feuchten Putztuch gereinigt werden.
- Zur Reinigung dürfen keine aggressiven, lacklösenden Reinigungsmittel verwendet werden.
- **Verwenden Sie keinesfalls einen Hochdruckreiniger oder Strahlwasser zur Reinigung - schon gar nicht bei laufendem Ventilator.**
- Wenn Wasser in den Motor eingedrungen ist:
 - Vor erneutem Einsatz Wicklung des Motors trocknen.
 - Ex-geschützte Motoren dürfen weder geöffnet noch repariert werden. Wenn ein Ex-geschützter Motor Fehler aufweist, ist er unbedingt zum Hersteller / Lieferant zurückzuschicken, und ein neuer Ersatzmotor ist anzufordern.
- **Nassreinigung unter Spannung kann zum Stromschlag führen - Lebensgefahr!**



Repairs and maintenance

- *The system constructor must enable easy access for cleaning and inspection work.*
- **Wear safety shoes and gloves for handling!**
- *Check the fan for mechanical oscillations in accordance with ISO 14694. Recommendation: every six months. The max. permissible vibration severity is 2.8 mm/s (measured on the end shield of the impeller side of the motor bearing or according to the special service agreement with the customer).*
- *Depending on the use and the medium in which it operates, the impeller and housing are subject to normal wear. Deposits on the impeller can lead to imbalance and hence to damage (risk of fatigue fracture)*
 - *The impeller can disintegrate - lethal hazard!*
 - *Observe the motor manufacturer's instructions concerning maintenance and service.*
- *Allow maintenance work to be carried out by trained specialists only.*
- **For all repair and maintenance work:**
 - *Observe the safety and labour regulations (DIN EN 50 110, IEC 364).*
 - *The fan impeller stopped!*
 - *Open the electrical circuit and secure against being switched back on.*
 - *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.*
 - *Verify the absence of voltage.*
 - *No maintenance work at running fan!*
 - *Keep the airways of the fan free- danger because of objects dropping out!*
 - *Do not deform the blades - out-of balance!*
 - *Take note of abnormal operating noise!*
- *The equipment in explosion-proof version must neither be opened nor repaired. Bearing changes are also not permitted by the customer or normal service technician.*
- *After dismantling and reinstalling an impeller, the entire rotating unit must be rebalanced in accordance with DIN ISO 21940-11*
- *Please contact our service department about any other damage (e.g. winding damage).*
- *Check the impeller, in particular the weld-seams, for possible cracks.*
- *ZIEHL-ABEGG Atex-fans / motors are completely or partly covered by antistatic painting or coating, which is able to derivate electric charges. A repaint may lead to dangerous static charges and is therefore not allowed.*



Cleaning

- *Regular inspection, and cleaning is necessary to prevent imbalance due to ingress of dirt.*
 - *Clean the fans's flow area.*
- *Watch out for vibration free motion.*
- *Maintenance interval in accordance with the degree of contamination of the impeller!*
- *You can clean the entire fan with a moist cloth.*
- *Do not use any aggressive, paint solvent cleaning agents when cleaning.*
- **Never use a high-pressure cleaner or water-spray for cleaning - particularly when the ventilator is running.**
- *If water enters the motor:*
 - *Dry off the motor winding before using it again.*
 - *Explosion-proof motors must neither be opened nor repaired. If an explosion-proof motor has defects, it is absolutely essential to send it back to the manufacturer / supplier requesting a new replacement motor.*
- **Wet cleaning under voltage may lead to an electric shock - danger to life!**

CE Hersteller

Unsere Produkte sind nach den einschlägigen internationalen Vorschriften gefertigt (Auflistung und Ausgabestände siehe EG-Einbauerklärung und EU-Konformitätserklärung). Haben Sie Fragen zur Verwendung unserer Produkte oder planen Sie spezielle Anwendungen, wenden Sie sich bitte an:

ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
D-74653 Künzelsau
Tel. 07940/16-0
Fax 07940/16-300
info@ziehl-abegg.de

Serviceadresse

Länderspezifische Serviceadressen siehe Homepage unter www.ziehl-abegg.com

CE Manufacturer:

*Our products are manufactured in compliance with applicable international standards and regulations (listing and relevant version see EC Declaration of Incorporation and EC Declaration of Conformity).
If you have any questions about how to use our products or if you are planning special applications, please contact:*

ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
D-74653 Künzelsau
Phone 07940/16-0
Fax 07940/16-300
info@ziehl-abegg.de

Service address

Please refer to the homepage at www.ziehl-abegg.com for a list of our subsidiaries worldwide.

EC Declaration of Incorporation

- Translation -
(english)

ZA87ex-GB 1831 Index 006

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

The design of the incomplete machine:

- External rotor motor for explosion-hazardous areas, type of protection "nA" / "ec" or "e" / "eb" MK..
- Axial fan for explosion-hazardous areas, type of protection "c" / "h", with external rotor motor for explosion-hazardous areas, type of protection "nA" / "ec" or "e" / "eb" FB..
- Centrifugal fan for potentially explosive areas, ignition protection class "c" / "h" with external rotor motor, ignition protection class "nA" / "ec" or ignition protection class "e" / "eb" for RE.., RH.
- Centrifugal fan for explosion-hazardous areas, type of protection "c" / "h", with internal rotor motor for explosion-hazardous areas, type of protection "tc" RH.., GR..
- Centrifugal fan for explosion-hazardous areas, type of protection "c" / "h", with internal rotor motor for explosion-hazardous areas, type of protection "d" / "db" ER..
- Centrifugal fan for explosion-hazardous areas, type of protection "c" / "h", with internal rotor motor for explosion-hazardous areas, type of protection "nA" / "ec" GR.., RG..
- Centrifugal fan for explosion-hazardous areas, type of protection "c" / "h", with internal rotor motor for explosion-hazardous areas, type of protection "tc" GR.., RG..

Motor type:

- Asynchronous external or internal rotor motor
- Electronically commutated internal 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, 1.5.7 in EC Machinery Directive 2006/42/EC.

The manufacturer is the

ZIEHL-ABEGG SE
Heinz-Ziehl-Strasse
D-74653 Künzelsau

The following harmonised standards have been used:

EN 1127-1:2011	Explosive atmospheres - Explosion protection - Part 1: Fundamentals and methodology
EN 60204-1:2006	Safety of machinery; electrical equipment of machines; Part 1: General requirements
EN ISO 12100:2010	Safety of machinery; basic concepts, general principles for design
EN ISO 13857:2008	Safety of machinery; safety distances to prevent danger zones being reached by the upper limbs

Note: The maintenance of the EN1-ISO 13857:2008 relates only to the installed accidental contact protection, \rightarrow 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, 01.08.2018
(location, date of issue)

ZIEHL-ABEGG SE
Dr. W. Angelis
Technical Director Air Movement Division
(name, function)

i.v. W. Angelis

(Signature)

ZIEHL-ABEGG SE
Dr. D. Kappel
Deputy Head of Electrical Systems
(name, function)

i.v. David Kappel

(Signature)

Manufacturer: ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
74653 Künzelsau
Germany

The manufacturer is solely responsible for issuance of the declaration of conformity.

The products:

- **External rotor motor MK..**
 - with EC type approval certificates PTB 08 ATEX 3060, PTB 08 ATEX 3061, PTB 08 ATEX 3062 as electrical equipment for potentially explosive areas, ignition protection class "e" / "eb"
 - as electrical operating equipment for potentially explosive areas, ignition protection class "nA" / "ec"
- **Internal rotor motor**
 - with EC type approval certificate or EC declaration of conformity BG080_U58_BVS_13_ATEX_E_128_X, BG090_U58_BVS_13_ATEX_E_098_X, BG100_U58_BVS_13_ATEX_E_127_X, BG112_U58_BVS_13_ATEX_E_126_X, BG132_U58_BVS_13_ATEX_E_099_X, BG160_U58_BVS_13_ATEX_E_019_X, BG180_U58_BVS_13_ATEX_E_017_X, BG200_U58_BVS_13_ATEX_E_012_X, BG225_U58_BVS_12_ATEX_E_103_X, BG250_U58_BVS_11_ATEX_E_045_X and PTB 12 ATEX 3016 as electrical operating equipment for potentially explosive areas, ignition protection class "d" / "db", "de" / "db eb", "tb" and "tc"
 - with EC type approval certificate or EC declaration of conformity PTB 05 ATEX 3006, PTB 12 ATEX 3014 and BVS 14 ATEX E 081 as electrical operating equipment for potentially explosive areas, ignition protection class "nA" / "ec"
 - with EC type approval certificates or EC declarations of conformity Baseefa 13 ATEX 0016 X, Baseefa 13 ATEX 0079 X, Baseefa 13 ATEX 0288 X, Baseefa 14 ATEX 0208 X as electrical operating equipment for potentially explosive areas, ignition protection class "d", "db", "de", "db eb" and "tb"
 - with EC type approval certificate or EC declaration of conformity CNEX 17 ATEX 0004 X as electrical operating equipment for potentially explosive areas, ignition protection class "db" and "tb"
- **Axial fan FB.. of Group II, Device Category 2G**

with EC model test certificate ZELM 04 ATEX 0236 X, with protection type "c" for conveying explosive gas atmospheres of Group IIB for zone 1 and zone 2, with external rotor motor MK.. for explosive areas, protection type "e" / "eb".
- **Group II, 3G appliance category FB.. axial fan**

type of protection "c" / "h" for the conveyance of potentially explosive, group IIB for zone 2 gas atmospheres; type of protection "nA" / "ec" with an external rotor motor MK.. for explosion-hazardous areas
- **Group II, 2G appliance category RE.., RH.. centrifugal fans**

type of protection "c" "h" for the conveyance of potentially explosive, group IIB gas atmospheres for zones 1 and 2, with an external rotor motor MK.. with EC type approval certificates PTB 08 ATEX 3060, PTB 08 ATEX 3061, PTB 08 ATEX 3062 for explosion-hazardous areas, type of protection "e" / "eb"
- **Group II, 3G appliance category RE.., RH.. centrifugal fans**

type of protection "c" / "h" for the conveyance of potentially explosive, group IIB gas atmospheres for zone 2, with an external rotor motor MK.. for explosion-hazardous areas, type of protection "nA" / "ec".
- **Group II, 3D appliance category RE.., RH.., GR.. centrifugal fans**

type of protection "c" / "h" for the conveyance of potentially explosive, group IIB dust atmospheres for zone 22, with an EC-internal rotor motor MK.. for explosion-hazardous areas, type of protection "tc"
- **Group II, 2G appliance category ER.. centrifugal fans**

type of protection "c" / "h" for the conveyance of potentially explosive, group IIB gas atmospheres for zone 1 and zone 2, with an internal rotor motor for explosion-hazardous areas, type of protection "d" / "db"

- **Group II, 3G equipment category GR.., RG.. centrifugal fans**
ignition protection class “c” / “h” for conveyance of explosive, group IIB gas atmospheres for zone 2, with internal rotor motor for potentially explosive areas, ignition protection class “nA” / “ec”
- **Group II, 3D appliance category GR.., RG.. centrifugal fans**
type of protection "c" / "h" for the conveyance of potentially explosive, group IIIB dust atmospheres for zone 22, with an internal rotor motor for explosion-hazardous areas, type of protection "tc"

These products are developed, designed and manufactured according to the following directives:

- EMC Directive 2014/30/EU
- ATEX Directive 2014/34/EU

The following harmonised standards have been used:

EN 61000-6-3:2007	EN 60079-31:2014
EN 61000-6-2:2005	EN 1127-1:2011
EN 60079-0:2012+A11:2013	EN 80079-36:2017
EN 60079-7:2015	EN 80079-37:2016
EN 60079-15:2010	

- **The following standard is in use for FB axial fans**

EN14986:2017 Design of fans working in potentially explosive atmospheres
Note: The manufacturer of the plant is responsible for the complete compliance with the standard EN14986:2017 as well as for the compliance with the combinations of material and the minimum gap.
Compliance with the EN14986:2017 standard relates only to the installed protective grille and the inlet nozzle, if these are included in the scope of supply.

- **The following standard is in use for RE.., RH.., ER.., GR.. and RG.. centrifugal fans:**

EN14986:2017 Design of fans working in potentially explosive atmospheres
Note: The manufacturer of the plant is responsible for the complete compliance with the standard EN14986:2017 as well as for the compliance with the combinations of material and the minimum gap.
Also applicable to ER:
Compliance with the EN14986:2017 standard relates only to the installed protective grille and the inlet nozzle, if these are included in the scope of supply.

Name , address and identification number of the notified location:

- **For external rotor motors MK :**
Physikalisch-Technische Bundesanstalt (PTB)
Bundesallee 100 , D - 38116 Braunschweig , identification number 0102
- **For axial fans FB :**
ZELM Ex E.K. - Testing and Certification Body
Siekgraben 56 , D - 38124 Braunschweig , identification number 0820
- **For centrifugal fans RE .. , RH .. , ER .. :**
Federal Institute for Materials Research and Testing (BAM)
Unter den Eichen 87 , D - 12205 Berlin , identification number 0589

Compliance with the EMC Directive 2014/30 / EU refers only to those products when they are connected by mounting / operating instructions . If these products are integrated into a system or supplemented with other components (eg. sensing controls) and operated , the manufacturer or operator is responsible of the overall system for compliance with the EMC Directive 2014/30 / EU .

Künzelsau, 01.08.2018
(location, date of issue)

ZIEHL-ABEGG SE
Dr. W. Angelis
Technical Director Air Movement Division
(name, function)

i.v. W. Angelis

(Signature)

ZIEHL-ABEGG SE
Dr. D. Kappel
Deputy Head of Electrical Systems
(name, function)

i.v. David Kappel

(Signature)

A.2 Nicotra Gebhardt RLM... fan

Name	Data
Designation	Fans
Type	RLM...
Number	
Type of manual	Operating manual
Manufacturer	Nicotra Gebhardt

Betriebsanleitung

ATEX - Ventilatormodule ohne Gehäuse

(Original)

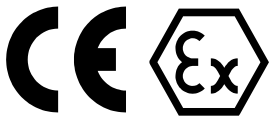
DE

Operating Instructions

ATEX - Centrifugal fans without scroll

(Translation of the original)

EN



II 2G Ex h IIB(+H2) T4 Gb

BA-CFD-RLM-ATEX 4.0 – 05/2019

		<p>RLM E6 RLM E3 RLM G6</p>
		<p>RLM 55 RLM 56</p>

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English

EN-2...EN-23

weitere Sprachen auf Anfrage

1. Revisionsindex

Table 1-1: Revisionsindex

Revision	Datum
BA-CFD-RLM-ATEX 3.1 – 08/2011	08/2011
BA-CFD-RLM-ATEX 3.2 – 03/2012	03/2012
BA-CFD-RLM-ATEX 3.3 – 01/2013	01/2013
BA-CFD-RLM-ATEX 3.4 – 03/2013	03/2013
BA-CFD-RLM-ATEX 3.5 – 06/2014	06/2014
BA-CFD-RLM-ATEX 3.6 – 12/2014	12/2014
BA-CFD-RLM-ATEX 3.7 – 03/2015	03/2015
BA-CFD-RLM-ATEX 3.8 – 12/2015	12/2015
BA-CFD-RLM-ATEX 3.9 – 04/2016	04/2016
BA-CFD-RLM-ATEX 4.0 – 05/2019	05/2019

2. Zu dieser Betriebsanleitung



Diese Betriebsanleitung ist Teil des Ventilators.

Für Schäden und Folgeschäden, die durch Nichtbeachtung der Betriebsanleitung entstehen, übernimmt Nicotra Gebhardt keinerlei Haftung oder Gewährleistung.

- ▶ Betriebsanleitung vor Gebrauch aufmerksam lesen.
- ▶ Betriebsanleitung während der Lebensdauer des Ventilators aufbewahren.
- ▶ Betriebsanleitung dem Personal jederzeit zugänglich machen.
- ▶ Betriebsanleitung an jeden nachfolgenden Besitzer oder Benutzer des Ventilators weitergeben.
- ▶ Jede vom Hersteller erhaltene Ergänzung in die Betriebsanleitung einfügen.

2.1. Gültigkeit

Diese Betriebsanleitung ist nur gültig für die auf der Titelseite angegebenen Ventilatoren.

2.2. Zielgruppe

Zielgruppe dieser Betriebsanleitung sind Betreiber und ausgebildetes Fachpersonal, das mit Montage, Inbetriebnahme, Bedienung, Instandhaltung und Außerbetriebnahme vertraut ist.

2.2. Zielgruppe

2.3. Mitgeltende Dokumente

- ▶ **Zusätzlich zu der dem Ventilator beiliegenden Betriebsanleitung, den am Ventilator angebrachten Typen-, Warn- und Hinweisschildern, folgende Dokumente beachten:**
 - DIN VDE 0100-100
 - DIN EN 60204-1
 - DIN EN ISO 13857
 - DIN EN ISO 12100
 - DIN EN ISO 13732-1
 - DIN EN ISO 80079-36;-37
 - DIN EN 1127-1
 - DIN EN 60079-0
 - DIN EN 14986
 - Technischer Katalog
 - EU-Richtlinie 2014/34/EU

2.4. Symbole und Kennzeichnungen

2.4.1. Aufbau von Warnhinweisen






Signalwort

Art, Quelle und Folgen der Gefahr!

- ▶ Maßnahme zur Vermeidung der Gefahr

2.4.2. Gefahrenstufen in Warnhinweisen

Tabelle 2-1: Gefahrenstufen in Warnhinweisen

Symbol / Gefahrenstufe	Eintretens-Wahrscheinlichkeit	Folgen bei Nichtbeachtung
 GEFAHR!	Unmittelbar drohende Gefahr	Tod, schwere Körperverletzung
 WARNUNG!	Mögliche drohende Gefahr	Tod, schwere Körperverletzung
 VORSICHT!	Mögliche drohende Gefahr	Leichte Körperverletzung
VORSICHT	Mögliche drohende Gefahr	Sachschaden

2.4.3. Hinweise

Hinweis Hinweis zum leichteren bzw. sicheren Arbeiten.

- ▶ Maßnahme zum leichteren bzw. sicheren Arbeiten.

2.4.4. Sonstige Symbole und Kennzeichnungen

Tabelle 2-2: Sonstige Symbole und Kennzeichnungen

Symbol	Bedeutung
☑	Voraussetzung zu einer Handlung
▶	Handlung mit einem Schritt
1. 2. 3.	Handlung mit mehreren Schritten
•	Aufzählung (1. Ebene)
-	Aufzählung (2. Ebene)
Hervorhebung (fett)	Hervorhebung

3. Bestimmungsgemäße Verwendung

3.1. Betriebsdaten / Grenzdaten



VORSICHT!

Verletzungsgefahr!

- ▶ Technische Daten und zulässige Grenzwerte einhalten.

Die Technischen Daten sind dem Typenschild, dem technischen Datenblatt und dem technischen Katalog zu entnehmen!

Hinweis **ATEX Kategorie II 2G Ex h IIB T4 Gb**

Ventilatoren dieser Kategorie sind zur Verwendung in Bereichen bestimmt, in denen damit zu rechnen ist, dass eine explosionsfähige Atmosphäre aus einem Gemisch von Luft und Gasen, Dämpfen oder Nebeln gelegentlich auftritt. Die gerätebezogenen Explosionsschutzmaßnahmen dieser Kategorie müssen selbst bei häufigen Gerätestörungen oder Fehlerzuständen, die üblicherweise zu berücksichtigen sind (vorhersehbare Störungen), das erforderliche Maß an Sicherheit bieten.

Für den Betrieb der Ventilatoren in explosionsgefährdeten Bereichen sind die einschlägigen Bestimmungen und örtlichen Vorschriften und entsprechenden Richtlinien (ATEX 2014/34/EU) für den Hersteller und Betreiber zu beachten.



VORSICHT!

Die Aufstellung bei RLM E6/G6/55/56 ist nur mit horizontaler Achse, bei RLM E3 nur mit vertikaler Achse gestattet.

Tabelle 3-1:
Grenzdaten

Zulässige Fördermediumstemperaturen ATEX

Baureihe	zul. Temperatur des Fördermediums	max. Umgebungstemperatur am Antriebsmotor
RLM 55/56/G6/E6/E3	-20°C ... +40°C (60°C)	+ 40°C (60°C)

Bei Motoreignung für eine Kühlmitteltemperatur bis +60°C kann der Temperaturbereich in Sonderfällen auf diesen Wert ausgeweitet werden! (Unter Berücksichtigung einer Leistungsreduzierung nach Herstellerangaben)

- 3.1.1 Als nicht bestimmungsgemäße Verwendung gilt z.B. die Förderung:
- von Medien mit unerlaubten hohen oder niedrigen Temperaturen
 - von aggressiven Medien
 - von stark staubhaltigen Medien
- 3.1.2 Die Folgen von nicht bestimmungsgemäßem Einsatz sind:
- Lagerschäden
 - Korrosionsschäden
 - Unwucht
 - Vibration
 - Deformation
 - Abrieb

VORSICHT **Unerlaubte Betriebszustände**

- Kein Betrieb über der angegebenen Drehzahl (Typenschild, technische Daten)
- Kein Betrieb in Drehzahlbereichen erhöhter Schwingungen (Resonanz)
- Kein Betrieb in Drehzahlbereichen außerhalb des zulässigen Kennfeldbereiches (Strömungsstabilität)
- Kein Betrieb bei Verschmutzung des Ventilators
- Kein Betrieb wenn Ventilator nicht spannungs- und kräftefrei montiert ist



Als Gefahr drohen:

Personenschäden- und Sachschäden durch Wellenbrüche, Laufradbrüche, Dauerbrüche, oder Explosionen durch Funkenbildung

3.2. Explosionsschutz-Kennzeichnung

Die Kennzeichnung von Ventilatoren in explosionsgeschützter Ausführung erfolgt durch Angabe der Gerätegruppe, Kategorie, Zündschutzart und Temperaturklasse auf dem Typenschild sowie durch ein CE-Ex-Zeichen, durch das die Konformität des Geräts mit der europäischen ATEX-Richtlinie 2014/34/EU bestätigt wird.

Die Einbauerklärung und Konformitätserklärung zur ATEX-Richtlinie 2014/34/EU befinden sich im Anhang dieser Betriebsanleitung.

Richtlinienteil | Normenteil

CE Ex II 2 G Ex h IIB(+H2) T4 Gb

| | | | | | | | | |
 A B 1 2 3 4 5 6 7 8

Bild 3-1:
Explosionsschutz-
Kennzeichnung
(Beispiel)

A	CE-Kennzeichnung	
B	Ex-Geräte Kennzeichnung (lt. ATEX-Richtlinie)	
1	Gerätegruppe II	Nichtelektrische Geräte außerhalb von Bergbau- und Untertagebau-Einsatz
2	Geräteklasse 2	(innen und außen) einsetzbar in Zone 1+2; nur gelegentliche Ex-Atmosphäre in der Umgebung
3	Fördermedium G	Gasförmige Fördermedien
4	Ex-Symbol	Lt. EN ISO-Norm 80079-36
5	Ersatz-Zündschutzart h	Explosionsschutz durch konstruktive Sicherheit
6	Explosionsgruppe IIB (+H2)*	Art der Gasatmosphäre
7	Temperaturklasse T4	max. Oberflächentemperatur am Gerät +135°C
8	Geräteschutzniveau Gb	Bei Gas in Zone 1 - Gb (in Zone2 – Gc)

* (+H2) gilt nur für RLM E6, RLM G6 und RLM E3:

Für wasserstoffhaltige Gasgemische mit max. 4 % Wasserstoff (UEG); Voraussetzung ist eine Materialpaarung zwischen den rotierenden Teilen in Stahl (Edelstahl) – Kupfer und die Verwendung eines Ex de IIC T4 Motors.

4. Sicherheit

4.1. Produktsicherheit

Die Ventilatoren bieten ein hohes Maß an Betriebssicherheit und einen hohen Qualitätsstandard, der durch ein zertifiziertes Qualitätsmanagement-System (EN ISO 9001) gewährleistet wird.

Alle Ventilatoren werden vor Verlassen des Werkes einer Kontrolle unterzogen und mit einem Prüfsiegel versehen.

Dennoch können beim Betrieb der Ventilatoren Gefahren für Leib und Leben des Benutzers oder Dritter bzw. Beeinträchtigungen des Ventilators und anderer Sachwerte entstehen.

- Ventilator nur in technisch einwandfreiem Zustand sowie bestimmungsgemäß, sicherheits- und gefahrenbewusst unter Beachtung der Betriebsanleitung betreiben.
- Störungen, die die Sicherheit beeinträchtigen können, umgehend beseitigen lassen.



Explosionsfähige Gasgemische können in Verbindung mit heißen und bewegten Teilen schwere oder tödliche Verletzungen verursachen.

**Explosionsgefahr durch erhöhte Umgebungstemperatur!
Umgebungstemperatur beobachten.
Für ausreichende Kühlluftzufuhr sorgen**

4.2. Sicherheitsvorschriften

Ventilator nur in Übereinstimmung mit folgenden Vorschriften in Betrieb nehmen, betreiben und instand halten:

- Betriebsanleitung
- Warn- und Hinweisschilder am Ventilator
- Alle anderen zur Anlage gehörenden Betriebs- und Montageanleitungen
- Anlagenspezifische Bestimmungen und Erfordernisse
- Gültige nationale und regionale Vorschriften, insbesondere zu Explosionsschutz, Sicherheit, Unfallverhütung

4.3. Schutzeinrichtungen

1. Rotierende Teile (Wellen, Laufrad usw.) durch geeignete Schutzeinrichtungen gegen Berührung sichern.
2. Schutzvorrichtungen so auslegen, dass das Ansaugen oder Hineinfallen von Gegenständen verhindert wird.
3. Schutzvorrichtungen, die bei der Montage demontiert wurden, unmittelbar nach der Montage (und vor dem elektrischen Anschluss) wieder anbringen.



GEFAHR!

Die Ventilatoren werden mit saugseitigem Berührungsschutz geliefert. Besteht durch die Art des Einbaus die Gefahr einer Berührung des Laufrades, so sind bauseitig Schutzgitter entsprechend DIN EN ISO 13857 anzubringen. Erst dann darf der Ventilator in Betrieb gesetzt werden!



GEFAHR!

ATEX Ventilatoren der Kategorie 2G und 3G müssen gegen das Eindringen von Gegenständen geschützt werden (min. IP20 nach DIN EN 60529).

Vom Anlagenbetreiber müssen geeignete Maßnahmen ergriffen werden!



VORSICHT!

Die Eignung der Schutzeinrichtungen und deren Befestigungen am Ventilator sind im Zusammenhang mit dem gesamten Sicherheitskonzept der Anlage zu bewerten.

4.4. Qualifikation des Personals

1. Sicherstellen, dass die Montage und alle Arbeiten am Ventilator nur von Fachmonteuren unter Beachtung dieser Betriebsanleitung sowie den gültigen Vorschriften ausgeführt werden.
2. Elektroanschluss nur durch ausgebildete Elektro-Fachkraft ausführen lassen.

4.5. Schutzausrüstung



VORSICHT!

Sicherstellen, dass das Personal je nach Einsatz und Umgebungsbedingung geeignete Schutzausrüstung trägt.
Die Schutzkleidung ist in den folgenden Abschnitten beschrieben!

4.6. Besondere Gefahren

4.6.1. Geräuschemission



Die zu erwartende Schallemission für den bestimmungsgemäßen Betrieb des Ventilators ist in den technischen Katalogen dokumentiert und entsprechend zu berücksichtigen.

- ▶ **Gehörschutz tragen bei Arbeiten in der Nähe - oder am laufenden Ventilator!**

4.6.2. Schwere Lasten

Aufgrund des hohen Gewichts des Ventilators und seiner Komponenten ergeben sich bei Transport und Montage (Demontage) folgende Gefahren:

- Klemm-, Quetsch- und Schneidgefahren durch Bewegungen oder Kippen
- Gefahren durch Herabfallen von Komponenten



- ▶ **Nicht unter schwebenden Lasten aufhalten oder arbeiten.**
- ▶ **Schutzhelm, Sicherheitsschuhe und Handschuhe tragen.**

4.6.3. Rotierende Wellen und Laufräder

Auf rotierende Wellen und Laufräder fallende Gegenstände können wegfliegen und schwere Verletzungen verursachen. Kleidungsstücke oder Haare können sich an rotierenden Wellen und in Laufrädern verfangen.



- ▶ **Schutzvorrichtungen während des Betriebs nicht entfernen.**
- ▶ **eng anliegende Kleidung tragen, bei Arbeiten in der Nähe rotierender Wellen und Laufräder mit hoher Strömungsenergie**
- ▶ **Schutzbrille tragen**

4.6.4. Heiße Oberflächen

Im Betrieb besteht Verbrennungs- und Verbrühungsgefahr aufgrund heißer Oberflächen.



- ▶ **Motor während des Betriebs nicht berühren.**
- ▶ **Bei Stillstand des Ventilators warten, bis sich der Motor abgekühlt hat.**
- ▶ **Schutzhandschuhe tragen**

4.7. Bauliche Veränderungen, Ersatzteile

Hinweis Eigenmächtige bauliche Veränderungen am Ventilator sind ohne Zustimmung von Nicotra Gebhardt nicht zulässig. Für daraus entstandene Schäden übernimmt Nicotra Gebhardt keine Haftung. Es dürfen nur Original-Ersatzteile von Nicotra Gebhardt verwendet werden.

VORSICHT Im Ex-Bereich dürfen nur die Nicotra Gebhardt GmbH selbst, eine durch sie autorisierte Servicestelle oder durch sie ermächtigtes und ausgebildetes Personal den Ventilator ändern oder umrüsten.

4.8. Installation und Instandhaltung

Vor Arbeiten am Ventilator folgende Maßnahmen durchführen:

1. Sicherstellen, dass keine explosionsfähige Atmosphäre vorhanden ist.
2. Anlage abschalten und gegen unbeabsichtigtes Wiedereinschalten sichern.
3. Schild mit folgendem Text anbringen:
Nicht einschalten! An der Anlage wird gearbeitet.

4.9. Schilder auf dem Ventilator

Typenschild und Drehrichtungspfeil sind je nach Baureihe gut sichtbar am Ventilator angebracht.

4.9.1. Typenschild

Bild 4-1:
Typenschild-Muster

Nicotra Gebhardt		D-74638 Waldenburg	CE
Tel.: +49 (0)7942 101 384		Fax: -385	
E-Mail: service@nicotra-gebhardt.com			
RLM 56-3540-4Y-11-2G			
GERÄTE-Nr.	128-260549-220255/2	HERSTELLJAHR 2010	
VENTILATOR		MOTOR	
Dichte	= 1.2 kg/m ³	UN	= 400 V (D/Y)
T max	= 40 °C	FN	= 50 Hz
n max	= 1810 1/min	F max	= 64 Hz
		I N	= 3.3 /1.88 A
		nN	= 1395 1/min
		P N	= 0.75 kW
		Schutzart	= P55
		Wärmeklasse	= F
		Stromart	= 3~
Nur Muster!			
CE Ex II 2G Ex h IIB T4 Gb (innen/außen)			

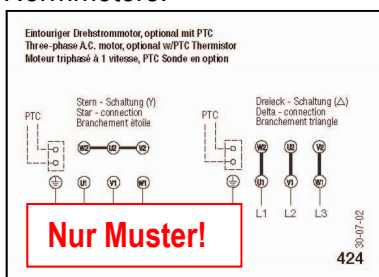
4.9.2 Drehrichtungspfeil

Bild 4-2:
Drehrichtungspfeil

4.9.3 Klemmbrett-Schaltbild

Bild 4-3:
Muster-Schaltbild

Das Anschluss Schaltbild befindet sich im Anschlussklemmenkasten des Normmotors.



5. Produktbeschreibung

5.1. Ventilatoren RLM



Ventilatoren RLM, optimiert zur Verwendung ohne Spiralgehäuse, mit Direktantrieb durch Anbaumotoren. Das Radiallaufrad mit rückwärtsgekrümmten Schaufeln ist direkt auf der Welle des Anbaumotors befestigt. Die Ventilatoreinheit mit Motorlaufrad, Einströmdüse, Motorbock und Grundrahmen werden werksseitig montiert und justiert! Die Ventilatoren sind standardmäßig mit einer Volumenstrom-Messeinrichtung und einem Ansaugschutzgitter ausgestattet. Die Ventilatoren RLM erfüllen die Anforderungen der ATEX-Richtlinie 2014/34/EU durch konstruktive Sicherheit und sichere Bauweise entsprechend DIN EN ISO 80079-36 und -37 und DIN EN 14986. Die Einordnung erfolgt in Gerätegruppe II, Kategorie 2G, Explosionsgruppe IIB(+H₂), Temperaturklasse T4(T₃) und Geräteschutzniveau EPL Gb.

Materialpaarung:

- **Laufrad** aus Stahlblech, beschichtet bzw. Edelstahl
- **Einströmdüse** aus Kupfer.

**Hinweis ATEX Ventilatoren dürfen nicht verändert werden!
Bei Veränderungen erlischt die ATEX – Konformität!**

5.2. Ventilatoren RLM

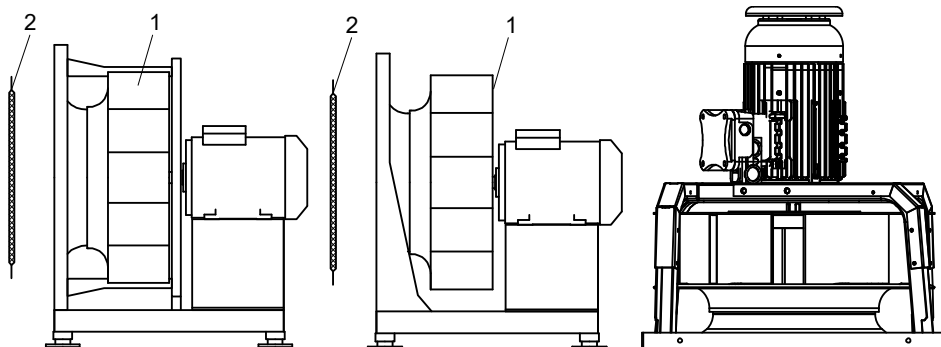
5.2.1 Ventilatoren RLM mit Direktantrieb

RLM 55-1112/-1214

RLM 56-2528/-1011 / RLM E3 –2528/-6371

RLM G6-2225 / RLM E6-2528/-1011

Bild 5-1:
Ausführungen



1. Ventilator
2. Schutzgitter für die Eintrittsseite (im Lieferumfang enthalten)
 - Berührungsschutz nach DIN EN ISO 13857
 - Schutz gegen das Eindringen von Gegenständen nach DIN EN 60529

6. Transport und Lagerung




6.1. Verpackung

Ventilatoren werden abhängig von Baugröße und Gewicht in stabilen Kartonagen oder Holzverschlügen verpackt bzw. auf stabile Paletten geschraubt. Hinweise auf das Entfernen von Transportsicherungen sind ggf. beigelegt.

6.2. Symbole auf der Verpackung

Auf den Kartonagen sind folgende Symbole angebracht:

Tabelle 6-1: Symbole auf der Verpackung

Symbol			
Bedeutung	Zerbrechliches Gut	Vor Nässe schützen	Oben

6.3. Ventilator transportieren



Verletzungsgefahr durch herabfallende Komponenten!

Nur geprüfte und für den jeweiligen Ventilator geeignete Lastaufnahmemittel verwenden!

Ventilator so lange wie möglich mit der Originalverpackung transportieren!
Ladung sichern!

- **Nicht unter schwebenden Lasten aufhalten!**

1. Transportmittel entsprechend dem Ventilatorgewicht, der Bauform oder der Aufhängemöglichkeit auswählen
(Gewichte siehe technischer Katalog)
2. Ventilator an Grundrahmen, Grund- oder Tragplatte aufnehmen.
3. Bei Transportgurten immer Vierpunktaufhängung vorsehen
(2 Gurtschlaufen). Die Gurtschlaufen dürfen keine verformende Kraft auf Ventilator oder Verpackung ausüben, gegebenenfalls Distanzstücke verwenden!
4. Ladung z. B. durch Transportgurte oder Rutschsicherungen sichern.
Ventilator sorgfältig transportieren und Schäden z. B. durch Stöße und hartes, verkantetes Aufsetzen vermeiden.

VORSICHT Keine Befestigungspunkte am Ventilator sind!

- Motortransportösen
- Laufrad
- Einströmdüse

6.4. Ventilator lagern

VORSICHT Korrosionsgefahr!

- ▶ Ventilator in Verpackung einlagern bzw. diese in Abhängigkeit von den äußeren Einflüssen ergänzen.
- ▶ Ventilator nur in einem gut durchlüfteten Raum unter normalen Temperaturverhältnissen und in einer nicht korrosiven Atmosphäre lagern.
- ▶ Ventilator bei Luftfeuchtigkeit unter 70 % (nicht kondensierend) lagern.
- ▶ Max. zulässige Temperatur von -20°C bis $+40^{\circ}\text{C}$ einhalten.

7. Montage

7.1. Sicherheitshinweise zur Montage

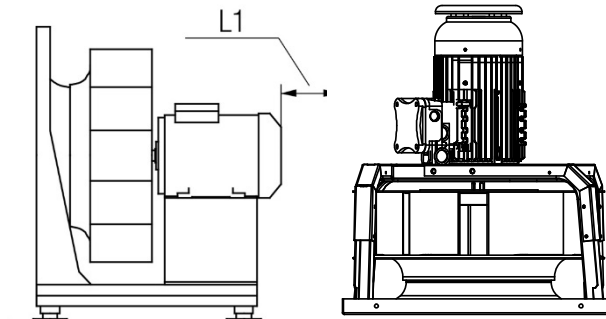
- ▶ Sicherheitshinweise und Schutzmaßnahmen in Kapitel 4 sowie die gültigen gesetzlichen Vorschriften beachten.

VORSICHT Das von Nicotra Gebhardt gelieferte ATEX-Ventilatorsystem darf in keiner Weise bauseitig verändert werden.
Der Betrieb ist nur im Originalzustand innerhalb der technisch festgelegten Grenzen zulässig!
(Katalog- und Typenschilddaten beachten).

7.1.1. Einbauhinweise

Um eine ausreichende Motorkühlung zu gewährleisten, ist ein Mindestabstand (L1) vom Ende des Motors bis zur Gehäusewand einzuhalten. Angaben zu L1 sind der beiliegenden Motor-Betriebsanleitung zu entnehmen.

Bild 7-1: Freiraum



RLM E3: nur vertikaler Einbau, mit Luftrichtung von unten nach oben, zulässig. Mindestabstand durch Motorschutzdach vorgegeben.

7.2. Montage vorbereiten

- Der Aufstellungsort ist in Art, Beschaffenheit, Umgebungstemperatur und Umgebungsmedium für den jeweiligen Ventilator geeignet.
- Die Unterkonstruktion ist eben und ausreichend tragfähig.
 1. Ventilator vorsichtig auspacken.
 2. Transportsicherungen ggf. demontieren.
 3. Verpackungsmaterial vollständig entfernen und fachgerecht entsorgen.
 4. Spaltmaß gemäß 7.4 prüfen.

7.3. Montage durchführen

1. Ventilator bzw. Grundrahmen spannungs- und kräftefrei auf der Unterkonstruktion befestigen bzw.-
 2. lose beigefügte Schwingungsdämpfer gleichmäßig um den Ventilator-schwerpunkt verteilt ausrichten und befestigen, dabei auf gleichmäßige Einfederung achten.
 3. Erdung des Ventilators ordnungsgemäß herstellen. Die Schwingungsdämpfer selbst gewährleisten keinen elektrischen Durchgang.
- Von Anlagenteilen werden keine Kräfte oder Schwingungen auf den Ventilator übertragen (flexible Anschlussstutzen)!
 - Die flexiblen saug- und /oder druckseitigen ATEX-Anschlussstutzen sind schwingfähig und ohne Versatz montiert und anlagenseitig geerdet.
 - Die Schwingungsdämpfer schwingen frei und sind gleichmäßig eingefedert!
 - Das Laufrad dreht frei und streift nicht an der Einströmdüse (Mindestspalte beachten, s. 7.4)!
 - Die Abstände vom Laufrad zu den bauseitigen Anlagenteilen sind geprüft und entsprechen den Explosionsschutzanforderungen.
 - Ventilator auf Standsicherheit geprüft (kein Kippen möglich).

7.4 Spaltmaß am Ventilator prüfen

- ▶ Spaltweite zwischen Laufrad und Einströmdüse, sowie zwischen Laufradkante und Messnippel der Volumenstrom - Messeinrichtung prüfen und mit den Tabellenwerten abgleichen!

Bild 7-2: Spaltmaße

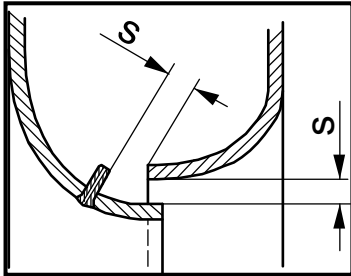
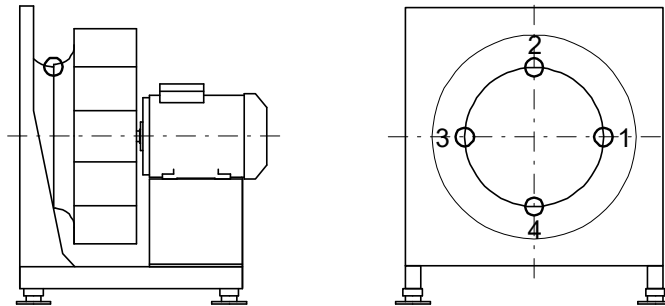


Bild 7-3: Messpunkte

Tabelle 7-1: Spaltmaße

RLM	Spaltmaß „s“	RLM	Spaltmaß „s“
2225	2,0	5663	4,3
2528	2,0	6371	4,8
2831	2,2	7180	5,4
3135	2,4	8090	6,0
3540	2,7	9010	6,7
4045	3,0	1011	7,5
4550	3,4	1112	8,5
5056	3,8	1214	9,5



1. Spalt messen, Sicherstellen, dass das Spaltmaß in keiner Phase der Drehbewegung (von Hand drehen) unterschritten wird.
2. Messung an vier um 90° versetzten Punkten am Umfang durchführen. Lehre liegt am Außendurchmesser der Einströmdüse an.

7.5 Volumenstrom-Messeinrichtung

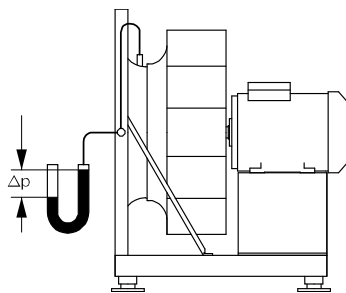
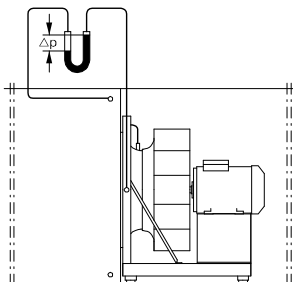


Bild 7-4: Volumenstrom-Messeinrichtung

Bild 7-5: Einbauventilator



Standardmäßig sind die Ventilatoren mit einer Volumenstrom-Messvorrichtung ausgestattet. Dadurch ist eine einfache Volumenstrombestimmung und -überwachung des Ventilators im Einbauzustand möglich.

- Messstutzen in der Einströmdüse
- Schlauchleitung zum Anschlussstück an der Trageinheit
- Anschlussstück (Aussendurchmesser 6mm) für die Druckmessung

$$q_v = K \times \sqrt{\frac{2}{\rho} \times \Delta p_{Dü}}$$

- q_v Volumenstrom [m³/h]
- K Kalibrierfaktor [m²s/h]
- ρ Gasdichte [kg/m³]
- $\Delta p_{Dü}$ Differenzdruck Düse [Pa]

Bei Ventilatoren, die in eine Kammer eingebaut sind, ist die Druckdifferenz zwischen statischem Druck in der saugseitigen Kammer und Druck an der Einströmdüse zu messen. Es ist darauf zu achten, dass der zu messende statische Druck vor der Einströmdüse nicht durch dynamische Druckanteile verfälscht wird. Häufig empfiehlt sich die Anordnung einer Ringleitung an der Wand zur Druckseite (siehe Skizze).

Wird der Differenzdruck über einen Drucksensor geführt, kann das Signal auch für Regelzwecke verwendet werden.

Zur Berechnung des Volumenstroms wird ein Kalibrierfaktor „K“ für den jeweiligen Ventilator benötigt, der durch eine Vergleichsmessung auf einem Normprüfstand bei ungestörter Zuströmung ermittelt wird.

K-Faktor Abweichung
Standard Kalibrierfaktor
K10 < 10%

RLM E6- E3-G6	Kalibrierfaktor K10	RLM 56- 55-	Kalibrierfaktor K10
2225	73 m ² /s/h	2528	73 m ² /s/h
2528	79 m ² /s/h	2831	90 m ² /s/h
2831	94 m ² /s/h	3135	105 m ² /s/h
3135	106 m ² /s/h	3540	120 m ² /s/h
3540	128 m ² /s/h	4045	150 m ² /s/h
4045	155 m ² /s/h	4550	190 m ² /s/h
4550	190 m ² /s/h	5056	240 m ² /s/h
5056	242 m ² /s/h	5663	300 m ² /s/h
5663	310 m ² /s/h	6371	385 m ² /s/h
6371	385 m ² /s/h	7180	485 m ² /s/h
7180	490 m ² /s/h	8090	620 m ² /s/h
8090	628 m ² /s/h	9010	790 m ² /s/h
9010	794 m ² /s/h	1011	1000 m ² /s/h
1011	1017 m ² /s/h	1112	1260 m ² /s/h
		1214	1540 m ² /s/h

7.6 Schutzvorrichtungen montieren

1. Frei zugängliche Eintrittsöffnungen mit Schutzvorrichtungen (DIN EN ISO 13857) sichern.
2. Schutzvorrichtungen so auslegen, dass das Ansaugen oder Hineinfallen von Gegenständen verhindert wird (DIN EN 60529).

8. Elektrischer Anschluss

8.1. Sicherheitshinweise zum elektrischen Anschluss



Achtung, Gefahr durch Stromschlag!

- ▶ Sicherheitshinweise und Schutzmaßnahmen in Kapitel 4 sowie die gültigen gesetzlichen Vorschriften beachten.
- ▶ EN 60204-1, DIN VDE 0100-100; DIN EN 60079-0, VDE 0170-1, DIN EN 60079-14, VDE 0165-1

Alle Ventilatoren werden anschlussfertig geliefert. Der Motor-Klemmkasten ist leicht zugänglich. Das Anschlussschaltbild befindet sich im Klemmkastendeckel. Schutzsysteme sind bauseits vorzusehen und gehören nicht zum Lieferumfang von Nicotra Gebhardt.

Bei Varianten mit max. Betriebsfrequenz < 50 Hz ist kein Netzbetrieb zulässig!

Hinweis Die Ventilatoren sind standardmäßig für den Betrieb mit Frequenzumrichter geeignet. Beim Einsatz von Frequenzumrichtern bzw. Regelgeräten mit elektronischen Komponenten, sind die Empfehlungen des Geräteherstellers zur Vermeidung von elektromagnetischen Störungen (EMV) zu beachten (Erdung, Kabellängen, Kabelabschirmungen, etc.).

VORSICHT **Sachschaden durch Revisionsschalter, elektronisches Steuergerät und Frequenzumrichter!**

- ▶ Kein elektronisches Steuergerät und keinen Frequenzumrichter im Ex-Bereich verwenden.
- ▶ Revisionsschalter – ausgenommen Ex-Revisionsschalter – außerhalb des Ex-Bereichs montieren.

Hinweis Die Normmotoren sind in Schutzart “druckfeste Kapselung Ex de II”, Temperaturklasse T4 für Umgebungstemperaturen -20°C bis +40°C (60°C) nach Richtlinie 2014/34/EU (ATEX) bzw. IEC/EN 60079-0, IEC/EN 60079-1 ausgeführt.

- ▶ Stromart, Spannung und Frequenz des Netzanschlusses auf Übereinstimmung zum Ventilator- bzw. Motortypenschild geprüft
- ▶ Bei Motoren mit Nennleistung >4 kW Stern-Dreieck-Anlauf oder Sanftanlauf berücksichtigen.
- ▶ Die Leistungsbegrenzung des Energieversorgungsunternehmens sind beachtet!
- ▶ Ggf. Revisionsschalter vorhanden (außerhalb des Ex-Bereiches)
- ▶ Die Bauteile des Ventilators sind untereinander leitend verbunden, die Erdung ist sichergestellt!
- ▶ **Der Ventilator ist gegen unerwarteten Anlauf geschützt!**
- ▶ **Kapitel 4. „Sicherheit“ wird beachtet!**

8.2. Motor anschließen

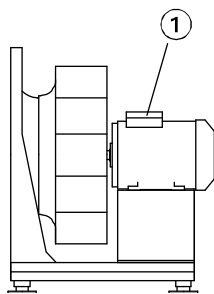


Bild 8-1: Anschluss RLM

1. Ggf. Revisionsschalter anbringen.
2. Anschlusskabel zum Ventilator bzw. Revisionsschalter führen.
3. Ventilator nach beigefügtem Anschlussschema anschließen.
4. Sicherstellen, dass alle elektrischen Schutzeinrichtungen angebracht und angeschlossen sind.

1 = Klemmenkasten

8.3. Motorschutz

Motoren entsprechend EN 60204-1 gegen Überlast schützen.

- Regelbare, druckfest gekapselte Motoren mit geprüften Kaltleitern, sind bei EX-Anwendung mit einem ATEX-geprüften Auslösegerät zu betreiben, das den Ventilator bei einer Oberflächentemperatur von 125°C abschaltet!
- Es sind nur Motoren zulässig, die der jeweiligen ATEX – Kategorie des Ventilators entsprechen
- Motorschutzschalter auf den Motornennstrom (siehe Typenschild) einstellen. Ein höherer Einstellwert ist nicht zulässig!
- die auf dem Motortypenschild angegebene te-Zeit für Überlast-Schutzeinrichtungen beachten!

VORSICHT Schmelzsicherungen und Sicherungsautomaten aber auch einfache Bimetallschutzschalter bieten keinen ausreichenden Motorvollschutz. Bei Schäden durch unzureichenden Motorvollschutz entfällt die Herstellergarantie!

Hinweis Beachten Sie in allen Fällen die vorgegebenen Leistungsbegrenzungen vom zuständigen Energieversorgungsunternehmen.

Sollte anlagenbedingt ein Direktanlauf erforderlich sein, so ist auch die konstruktive Eignung des Ventilators von Nicotra Gebhardt zu bestätigen. Bei Ventilatoren mit einem hohen Massenträgheitsmoment des Laufrades kann es zu Hochlaufzeiten von über 6 Sekunden kommen. In diesem Fall Motorschutzschalter oder Bimetall-Relais für Schweranlauf vorsehen.

8.4. Probelauf durchführen



Verletzungsgefahr durch rotierendes Laufrad!

- ▶ Bei frei zugänglichem Ventilator nie in das Laufrad greifen.

1. Ventilator gegen unbeabsichtigtes Einschalten sichern.
2. Alle Fremdkörper (Werkzeuge, Kleinteile, Bauschutt etc.) aus dem Kanalsystem und dem Ventilator entfernen.
3. Alle Revisionsöffnungen schließen.
4. Ventilator einschalten und die Drehrichtung des Laufrades durch Vergleich mit dem Drehrichtungspfeil am Ventilator prüfen.
5. Bei falscher Drehrichtung den Motor unter Beachtung der Sicherheitsvorschriften elektrisch umpolen.
6. Nach Erreichen der Betriebsdrehzahl die Stromaufnahme messen und mit dem Motornennstrom auf dem Ventilator- bzw. Motortypenschild vergleichen.
7. Bei anhaltendem Überstrom Ventilator sofort abschalten.
8. Ventilator auf ruhigen Lauf prüfen. Sicherstellen, dass keine außergewöhnlichen Schwingungen und Vibrationen auftreten.
9. Motor auf untypische Geräusche prüfen.

9. Inbetriebnahme

Die Motoren sind für Dauerbetrieb S1 ausgelegt. Bei mehr als drei Anläufen pro Stunde ist die Eignung des Motors von Nicotra Gebhardt zu bestätigen.



Explosionsfähige Gasgemische können in Verbindung mit heißen und bewegten Teilen schwere oder tödliche Verletzungen verursachen.

Explosionsgefahr durch erhöhte Umgebungstemperatur!

1. Umgebungstemperatur beobachten.
2. Für ausreichende Kühlluftzufuhr sorgen.

9.1. Voraussetzungen für den Betrieb im Ex-Bereich

Ventilator im Ex-Bereich nur in Betrieb nehmen, wenn folgende Bedingungen erfüllt sind:

- ☑ Die Angaben auf dem Typenschild stimmen mit den Anforderungen des Ex-Einsatzbereichs vor Ort überein (Gerätegruppe, Ex-Kategorie(Ex-Zone), Gasgruppe, Temperaturklasse).
- ☑ Alle an den Ventilator gekoppelten Komponenten, von denen eine Zündgefahr ausgehen kann, haben die erforderliche Ex-Zulassung.
- ☑ Die Umgebungstemperatur beim späteren Einsatz liegt im erlaubten Bereich!
- ☑ Alle erforderlichen Schutzeinrichtungen sind installiert.
- ☑ Das Laufrad ist gegen Berührung und vor dem Auftreffen fallender oder angesaugter Gegenstände geschützt.
- ☑ Der Ventilator wird nicht in staubiger Umgebung betrieben.
- ☑ Es ist sichergestellt, dass sich auf dem Ventilator keine unzulässigen Staubansammlungen bilden (Wartungsvorschriften beachten).
- ☑ Die Abstände vom Laufrad zu den bauseitigen Anlagenteilen sind geprüft und entsprechen den Explosionsschutzanforderungen.
- ☑ Der Ventilator ist ordnungsgemäß geerdet.

9.2. Ventilator in Betrieb nehmen



Verletzungsgefahr durch rotierende Teile und heiße Oberflächen!

1. Sicherstellen, dass alle Schutzvorrichtungen angebracht sind.
2. Sicherstellen, dass das Laufrad entsprechend DIN EN ISO 13857 abgesichert ist.

Inbetriebnahme

1. Funktion aller angeschlossenen Regelorgane prüfen.
2. **Ventilator einschalten.**

10. Instandhaltung

10.1. Sicherheitshinweise zur Instandhaltung

- ▶ Sicherheitshinweise und Schutzmaßnahmen in Kapitel 4 sowie die gültigen gesetzlichen Vorschriften beachten.
- ▶ Die Vorschriften des Motorherstellers sowie Angaben der Hersteller der Schalt- und Steuergeräte beachten



Nur bei gesicherter Netztrennung am Ventilator arbeiten!

Sachschaden durch Hochdruckreiniger!

VORSICHT

- ▶ Keine Hochdruckreiniger (Dampfstrahlreiniger) verwenden.

VORSICHT

- Störung und Gefährdung durch austretende Fördermedien.
- ▶ Undichte Stutzen austauschen.

10.2. Regelmäßige Kontrollintervalle durchführen

Zur Aufrechterhaltung des Betriebes und der Sicherheit, empfehlen wir die Ventilatoren in regelmäßigen Abständen auf ihre Funktion und Beschaffenheit von fachlich qualifiziertem Wartungspersonal oder einer Fachfirma prüfen zu lassen und dies zu dokumentieren. Art, Umfang und Wartungsintervalle, sowie darüber hinaus erforderliche Tätigkeiten sind in Abhängigkeit des Einsatzes der Ventilatoren sowie der vor Ort vorherrschenden Bedingungen festzulegen. Die Wartungs- und Prüfungsempfehlung in Anlehnung an die VDMA 24186-1 finden Sie auch auf unserer Internetseite.

10.3. Instandhaltung vorbereiten

1. Motor vom Netz trennen.
2. Bei Ventilator mit geprüfem Revisionsschalter, Motor mit Revisionsschalter abschalten.
3. Ventilator gegen unbeabsichtigtes Einschalten sichern.
4. Warten, bis das Laufrad steht.
5. Warten, bis alle heißen Oberflächen kalt sind.
6. Alle Reststoffe im Ventilator entfernen.
7. Je nach Einbausituation Anlagenteile demontieren.

Instandhaltung vorbereitet

10.4. Wartungsempfehlung für Ventilatoren RLM-ATEX

Tabelle 10-1:

Wartungsempfehlung

- ▶ Ggf. Probelauf durchführen (siehe Kapitel 8.4.).
- ▶ Durchgeführte Kontrollintervalle dokumentieren.

	Beschreibung	¼ jährl.	periodisch	Bedarf
1.0	Ventilator			
1.1	Auf Verschmutzung, Beschädigung, Korrosion und Befestigung prüfen	X		
1.2	Laufrad auf Beschädigung und Unwucht prüfen, Schwingungsmessung	X		
1.3	Axialen und radialen Spalt prüfen	X		
1.4	Flexible Verbindungen auf Dichtheit prüfen	X		
1.5	Schwingungsdämpfer auf Funktion prüfen	X		
1.6	Schutzeinrichtungen auf Funktion prüfen	X		
1.7	Entwässerung auf Funktion prüfen	X		
1.8	Funktionserhaltendes Reinigen	X		
1.9	Laufraddrehrichtung prüfen (in allen Drehzahlstufen)	X		
2.0	Ventilator auf Funktion und Betriebsbereitschaft prüfen		X	
2.1	Motor	¼ jährl.	periodisch	Bedarf
2.2	Äußerlich auf Verschmutzung, Beschädigung, Korrosion und Befestigung prüfen	X		
2.3	Drehrichtung prüfen	X		
2.4	Lager auf Geräusch prüfen	X		
2.5	Lager schmieren (bei nachschmierbarer Ausführung)		X	
2.6	Schutzeinrichtung auf Funktion prüfen	X		
2.7	Anschlussklemmen auf festen Sitz prüfen	X		
2.8	Funktionserhaltendes Reinigen	X		

10.4.1 Schwingungsüberprüfung

Der Ventilator ist regelmäßig auf mechanische Schwingungen zu überprüfen. Die maximal zulässigen Schwinggeschwindigkeiten sind der ISO 14694 angelehnt.

Tabelle 10-2:
Schwinggeschwindigkeit

Ventilator mit Schwingungsdämpfern		Ventilator ohne Schwingungsdämpfer	
Motorleistung	Schwing- geschwindigkeit	Motorleistung	Schwing- geschwindigkeit
≤ 3,7 kW	9,0 mm/s	≤ 3,7 kW	5,6 mm/s
> 3,7 kW	6,3 mm/s	> 3,7 kW	4,5 mm/s

Die Schwinggeschwindigkeiten werden in radialer Richtung an den Lagern bzw. am Lagerschild des Motors gemessen.

Eine Laufradverschmutzung kann Unwucht und Beschädigung hervorrufen. Um diesen Gefahren vorzubeugen, sind je nach Einsatz geeignete Inspektions- und Reinigungsintervalle einzuhalten.

10.4.2 Motorlager

Die Lager des Motors sind werksseitig mit einer Dauerschmierung versehen; erfahrungsgemäß muss das Fett bei normalen Betriebsbedingungen erst nach mehreren Jahren erneuert werden.

Bei nachschmierbaren Motorlagerungen sind die Herstellerangaben zu beachten!

Bei Lagergeräuschen ist die Service-Abteilung von Nicotra Gebhardt zur Überprüfung oder zum Austausch der defekten Lager zu beauftragen.

10.4.3 Stillstandzeiten

Bei längeren Stillstandszeiten ist der Ventilator regelmäßig kurzzeitig in Betrieb zu nehmen um Lagerschäden durch statische, mechanische Belastung oder Eindringen von Feuchtigkeit zu vermeiden.

Nach längerer Lagerung sind vor dem Einbau die Lager zu überprüfen.

Lässt der Zustand des Ventilators eine Instandsetzung durch geeignete Maßnahmen nicht mehr zu, ist der Ventilator unverzüglich außer Betrieb zu setzen und ggf. zu erneuern.

11. Störungen

Treten während des Betriebs Störungen auf, die nicht vom Wartungspersonal behoben werden können, bitte Kontakt mit der Service-Abteilung der Nicotra Gebhardt GmbH aufnehmen.



Explosionsgefahr durch unzulässige Betriebszustände!

- ▶ Bei Überschreitung der zulässigen Werte, Unregelmäßigkeiten oder auffälligen Störungen Ventilator sofort abschalten.

12. Service, Ersatzteile und Zubehör

Nicotra Gebhardt GmbH
Gebhardtstraße 19–25
74638 Waldenburg
Germany

Fon: +49 (0) 7942 101 384
Fax: +49 (0) 7942 101 385
Mail: info@nicotra-gebhardt.com
Web: www.nicotra-gebhardt.com

12.1. Ersatzteile bestellen

- ▶ Nur Original-Ersatzteile der Nicotra Gebhardt GmbH entsprechend der Ersatzteilliste verwenden.

Der Einbau von Ersatzteilen anderer Fabrikate kann die Sicherheit beeinträchtigen.

Für Schäden und Folgeschäden, die durch Verwendung von Ersatzteilen anderer Fabrikate entstehen, übernimmt die Nicotra Gebhardt GmbH keinerlei Haftung oder Gewährleistung.

Ersatzteile online bestellen - www.nicotra-gebhardt.com/Partshop

12.2. Zubehör

Die Nicotra Gebhardt GmbH bietet ein breites Zubehörprogramm zum wirtschaftlichen Einsatz der Ventilatoren.

Das Zubehör ist optional und immer separat zu bestellen.

Die Auswahl erfolgt über die technische Dokumentation oder unser elektronisches Auswahlprogramm.

Für die Montage bzw. Anwendung ist das Zubehör, soweit nicht selbsterklärend, mit separaten Bedien- oder Montagehinweisen versehen.

13. Anhang

13.1 Weitere Dokumentation der Nicotra Gebhardt GmbH

Tabelle 13 1: Weitere Dokumentation

Art der Dokumentation	Ort der Dokumentation
Wartungs- und Prüfeempfehlungen	Internet
EU-Konformitätserklärung 2014/34/EU (ATEX)	Anhang
EG-Einbauerklärung	Anhang

EU-Konformitätserklärung zur EU-Richtlinie 2014/34/EU (ATEX)

Hersteller:	Nicotra Gebhardt GmbH, Gebhardtstraße 19-25, 74638 Waldenburg, Germany
	erklärt hiermit, dass die nachfolgend bezeichnete Maschine aufgrund ihrer Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der unten angeführten EU-Richtlinie entspricht.
Bezeichnung:	Radialventilator mit Direktantrieb ohne Gehäuse der Kategorie 2G, zur Förderung explosionsfähiger Atmosphäre
Maschinentyp:	RLM 55-....-2G ; RLM 56-....-2G; RLM E6-.... -Y-...; RLM E3-.... -Y-...; RLM G6-.... -Y-...
Kennzeichnung:	II 2G Ex h IIB T4 Gb ; II 2G Ex h IIB+H2 T4 Gb
Seriennummer:	siehe Typenschild
Baujahr:	siehe Typenschild
Einschlägige Richtlinien:	EU-Richtlinie 2014/34/EU (ATEX)
Hinterlegungsbescheinigung:	EX9 12 10 78300 006 (RLM E6 + RLM G6) EX9 14 11 78300 007 (RLM E3) EX9 11 09 78300 003 (RLM 55/56)
Notifizierte Stelle:	TÜV SÜD Product Service; Zertifizierstelle; Ridlerstraße 65; 80339 München; Germany;
Angewandte, harmonisierte Normen ¹⁾ , insbesondere:	DIN EN 1127-1, DIN EN 14986 , DIN EN 60079-0, DIN EN ISO 80079-36, DIN EN ISO 80079-37

Diese Konformitätserklärung ist nur für den werksseitig montierten, mit Antrieb versehenen und geprüften Ventilator gültig. Bei Änderungen am Ventilator ist die Konformität neu zu bestätigen.

Der Hersteller trägt die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung.

Waldenburg, den 20.01.2019



i.V. T. Ehrhardt
Produktionsleiter



i.V. Dr. J. Anschütz
Leiter Forschung & Entwicklung

¹⁾ Die vollständige Liste der angewandten Normen und technischen Spezifikationen siehe Herstellerdokumentationen.

EG-Einbauerklärung

Hersteller: **Nicotra Gebhardt GmbH**,
Gebhardtstraße 19-25, 74638 Waldenburg, Germany

erklärt hiermit, dass folgendes Produkt:

Bezeichnung: **Radialventilator mit Direktantrieb ohne Gehäuse der Kategorie 2G, zur Förderung explosionsfähiger Atmosphäre**

Maschinentyp: **RLM 55-....-2G ; RLM 56-....-2G;
RLM E6-.... -Y-... ; RLM E3-.... -Y-... ; RLM G6-.... -Y-...**

Seriennummer: siehe Typenschild

Baujahr: siehe Typenschild

als unvollständige Maschine gilt im Sinne von Artikel 2, Absatz „g“ und den folgenden grundlegenden Anforderungen der **Richtlinie Maschinen (2006/42/EG)** entspricht: **Anhang I, Artikel 1.1.2, 1.3.7.**

Die unvollständige Maschine darf erst dann in Betrieb genommen werden, wenn festgestellt wurde, dass die Maschine, in die die unvollständige Maschine eingebaut werden soll, den Bestimmungen der Richtlinie Maschinen (2006/42/EG) entspricht.

Folgende harmonisierte Normen¹⁾ wurden angewandt:

DIN EN ISO 12100 Sicherheit von Maschinen - Allgemeine Gestaltungsleitsätze

DIN EN ISO 13857 Sicherheit von Maschinen – Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen


Angewandte, nationale Normen und technische Spezifikationen²⁾ insbesondere:

VDMA 24167: Ventilatoren – Sicherheitsanforderungen

Der Hersteller verpflichtet sich, die speziellen Unterlagen nach Anhang VII, Teil B zur unvollständigen Maschine einzelstaatlichen Stellen auf Verlangen per Post/E-Post zu übermitteln.

Waldenburg, den 20.01.2019

Bevollmächtigter für die technische Dokumentation: Michael Hampel



i.V. T. Ehrhardt
Produktionsleiter



i.V. Dr. J. Anschütz
Leiter Forschung & Entwicklung

¹⁾ Die Vollständige Liste der angewandten Normen und technischen Spezifikationen siehe Herstellerdokumentation

²⁾ Sofern noch keine entsprechende harmonisierten Normen vorliegen

NICOTRA || **Gebhardt**
fan|tastic solutions

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Operating Instructions

ATEX - Plug fans

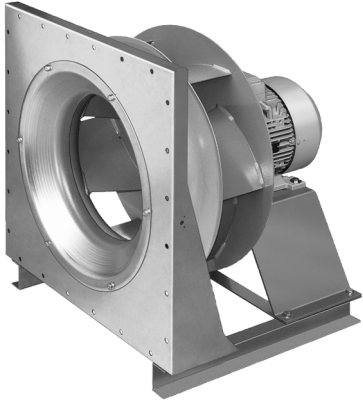

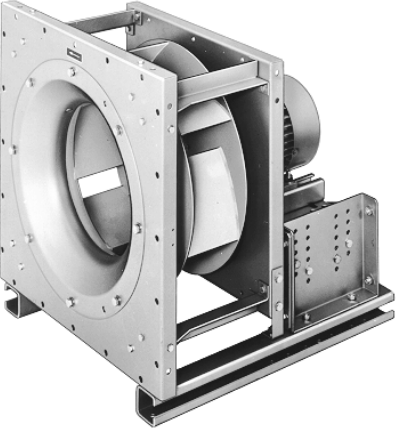
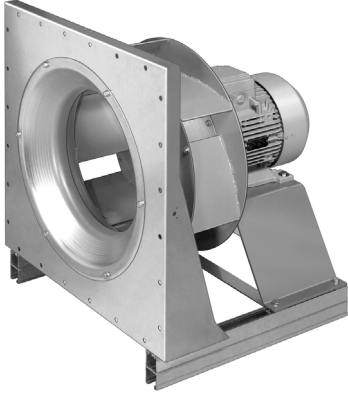
(Translation of the original)

EN



II 2G Ex h IIB(+H2) T4 Gb

BA-CFD-RLM-ATEX 4.0 – 05/2019

		<p>RLM E6 RLM E3 RLM G6</p>
		<p>RLM 55 RLM 56</p>

NICOTRA||G**ebhardt**

fan|tastic solutions

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Further languages on request!

1. Revision Index

Table 1-1: Revision Index

Revision	Datum
BA-CFD-RLM-ATEX 3.1 – 08/2011	08/2011
BA-CFD-RLM-ATEX 3.2 – 03/2012	03/2012
BA-CFD-RLM-ATEX 3.3 – 01/2013	01/2013
BA-CFD-RLM-ATEX 3.4 – 03/2013	03/2013
BA-CFD-RLM-ATEX 3.5 – 06/2014	06/2014
BA-CFD-RLM-ATEX 3.6 – 12/2014	12/2014
BA-CFD-RLM-ATEX 3.7 – 03/2015	03/2015
BA-CFD-RLM-ATEX 3.8 – 12/2015	12/2015
BA-CFD-RLM-ATEX 3.9 – 04/2016	04/2016
BA-CFD-RLM-ATEX 4.0 – 05/2019	05/2019

2. About This Operating Manual



These operating instructions are an integral part of the fan. Nicotra Gebhardt GmbH shall not accept any liability or provide any warranty cover for primary damage or secondary damage arising as a consequence of disregarding these operating instructions.

- ▶ Read the operating manual carefully before use.
- ▶ Retain the operating manual for the entire service life of the fan.
- ▶ Keep the operating manual accessible to personnel at all times.
- ▶ Pass the operating manual on to any subsequent owner or user of fan.
- ▶ Insert any supplementary instructions received from the manufacturer into the operating manual.

2.1. Validity

This operating manual only applies to the fans stated on the front page

2.2. Target Group

This operating manual is intended for operators and qualified professionals trained in installation, commissioning, operation, maintenance and decommissioning.

2.3. Other Applicable Documents

- ▶ **In addition to reading these instructions, due notice should also be taken of the type plate, warning signs, indicating label on the fan and the following documents and specifications:**
 - VDE 0100-100
 - EN 60204-1
 - EN ISO 13857
 - EN ISO 12100
 - EN ISO 13732-1
 - EN ISO 80079-36; -37
 - EN 1127-1
 - EN 60079-0
 - EN 14986
 - Technical catalogue
 - EU-Directive 2014/34/EU

2.4. Symbols und Markings

2.4.1. Use of Warning Signs






Signal word

Nature, source and consequences of hazard!

- ▶ Steps required to avert danger

2.4.2. Levels of Danger in Warning Signs

Table 2-1: Levels of danger in warning signs

Symbol / Danger Level	Likelihood of Occurrence	Consequences of Neglect
 <p>DANGER!</p>	Imminent danger	Death, serious physical injury
 <p>WARNING!</p>	Potential danger	Death, serious physical injury
 <p>CAUTION!</p>	Potential danger	Minor physical injury
<p>CAUTION</p>	Potential danger	Damage to property

2.4.3. Notes

Note Note giving pointers for easier or safe work.

- ▶ Steps required for easier or safe work.

2.4.4. Other Symbols and Markings

Table 2-2: Other symbols and markings

Symbol	Meaning
☑	Requirement for an operation
▶	Operation with one step
1. 2. 3.	Operation with several steps
•	Bullet point (primary list)
-	Bullet point (secondary list)
Accentuation (bold)	For emphasis

3. Designated Use

3.1. Operating Data / Maximum Ratings



Risk of injury!

- ▶ Adhere to the technical specifications and permissible limits.

For technical specifications please refer should be made to the type plate, technical data sheet and technical catalogue.

Note ATEX category II 2G Ex h IIB T4 Gb

Fans of this category are designed for areas where an explosive atmosphere – as a mix of air, gases, vapors or mist - is likely to occur occasionally. The unit related measures for explosion protection of this category have to offer the necessary amount of safety, even in the case of frequent unit troubles or failure modes, to be usually anticipated (predictable troubles). For the operation of the fans in explosion hazardous areas the relevant prescriptions, local regulations and directives (ATEX 2014/34/EU) for manufacturers and user have to be respected.



The installation is authorized in a horizontal shaft position only

Table 3-1:
Maximum ratings

Permissible conveyed medium temperatures (ATEX)

Range	Perm. temperature of conveyed medium	Max. ambient temp. on drive motor
RLM 55/56/G6/E6/E3	-20°C ... +40°C (60°C)	+ 40°C (60°C)

3.1.1 Examples of incorrect use include the following:

- Extraction of media with impermissibly high or low temperatures
- Extraction of corrosive media
- Extraction of very dusty media

3.1.2 The results are:

- Bearing damage
- Corrosion damage
- Loss of balance
- Vibration
- Deformation
- Abrasion damage

CAUTION Unauthorised operation

- No operation above the indicated rpm (see type plate, data sheet)
- No operation at rpm ranges with increased vibration (resonance)
- No operation at rpm ranges out of permitted fan curve area (stability of flow pattern).
- No operation if fan becomes polluted



Danger points:
 There can be injury to personnel and material damage through impeller breakage, shaft breakage, fatigue failure, fire (explosions) from spark creation.

3.2. Explosion Protection Markings

The marking on the type label of the explosion proof fans includes the group, category, ignition class and temperature class as well as a CE-Ex-sign thus confirming the conformity to the European directive 2014/34/EU. The manufacturer’s declaration and the declaration of conformity 2014/34/EU (ATEX) are attached to this maintenance instructions.

Directive Part I Standard Part
CE **Ex** **II 2 G Ex h IIB(+H2) T4 Gb**

| | | | | | | | | |
A B 1 2 3 4 5 6 7 8

Fig 3-1: Explosion protection markings (example)

A	CE-Mark	
B	Hazardous duty marking	
1	Machine group II	Non-electric machines for use outside of the mining industry and underground mining
2	Machine category 2	(internal and external) for use in Zones 1+2; An explosive atmosphere is only present in the area occasionally
3	Conveyed medium G	Gaseous conveying medium
4	Ex-symbol	ac. EN ISO-Norm 80079-36
5	Replacement ignition protection h	Explosion protection by design safety
6	Explosion group IIB (+H2)*	Type of gas atmosphere
7	Temperature class T4	Max. Surface temperature at the device + 135 ° C
8	Equipment protection level Gb	For gas in zone 1 - Gb (in zone 2 - Gc)

* (+ H2) is valid only for RLM E6, RLM G6 and RLM E3:
 For hydrogen-containing gas mixtures with max. 4% hydrogen (LEL);
 Prerequisite is a material pairing between the rotating parts in steel - copper and the use of an Ex de IIC T4 motor

4. Safety

4.1. Product safety

The fans offer a high degree of operational safety and high quality standards guaranteed by a certified Quality Management System (EN ISO 9001). Before leaving the factory all the fans are inspected and sealed with a mark of conformity.

Nevertheless, when operating fans supplied by Nicotra Gebhardt GmbH there can be a risk of death or injury for the user or third parties, and a risk of damage to the fan or other material assets.

- Only use the fans in perfect working order and for its designated use as intended, having due regard for safety, an awareness of hazards and in due compliance with the operating instructions.
- Arrange immediate repair of any faults which could compromise safety.



Potentially explosive gas mixtures in conjunction with hot and moving parts may cause serious or fatal injury.

Risk of explosion due to increased ambient temperature!

1. **Observe ambient temperature**
2. **Ensure adequate supply of cooling air**

4.2. Safety Instructions

The fan may only be commissioned, operated and serviced in compliance with the following instructions:

- Operating instructions
- Warning and information signs on the fan
- Any other operating and installation instructions pertaining to the machine
- Terms and requirements relevant to the machine
- Applicable national and regional regulations, especially regarding explosion protection, health & safety and accident prevention.

4.3. Safety Devices

1. Use appropriate safeguards to prevent contact with rotating parts (shafts, impeller, etc.).
2. Protection devices are so selected so that sucking or falling-in of objects will be prevented.
3. After installation (and before electrical connection) immediately refit any guards which have been removed during installation.



The fans are delivered with inlet guards. If there is a danger of contact with the impeller owing to the way the fan is installed, then it is necessary to fit guards conforming to EN ISO 13857. Only then can the fan be set in operation!



**ATEX fans of categories 2G or 3G are made for integration into installations. Care must be taken to avoid any ingress of object into the fan. (min. IP20 to EN 60529).
The user has to find corresponding protection in order to ensure a safe operation!**



The suitability of protection devices and their fixtures to the fan have to be evaluated within the overall security concept of the installation.

4.4. Professional Staff

1. Ensure that the Installation of the fan and any work on it is carried out by skilled professionals only with due regard to these operating instructions and any applicable regulations.
2. Electrical connection to be carried out by qualified electricians only.

4.5. Protective Gear



**Ensure that members of staff are wearing protective gear appropriate to their deployment and environment.
The protective clothing is specified below!**

4.6. Specific Hazards

4.6.1. Noise Emission



The sound emission expected during normal use of the fan is documented in the technical lists and should be duly taken into account.

- ▶ **Wear ear defenders when working near to or on the running fan!**

4.6.2. Heavy Loads

The heavy weight of the fan and its components entail the following risks in transit and during installation (deinstallation):



- Risk of being trapped, crushed or cut by moving or toppling machinery
- Danger of falling components

- ▶ **Do not stand or work under suspended loads.**
- ▶ **Wear a hard hat, safety shoes and gloves.**

4.6.3. Rotating Shafts and Impellers

Objects falling onto rotating shafts and impellers can fly off at an angle and cause serious injury.

Articles of clothing and hair can get caught in rotating shafts and impellers.



- ▶ **Do not remove guards during operation.**
- ▶ **Do not wear loose-fitting clothing when working near rotating shafts and impellers.**
- ▶ **Wear goggles.**

4.6.4. Hot Surfaces

There is a risk of sustaining burns or scalds on hot surfaces during operation.



- ▶ Do not touch the motor during operation.
- ▶ When the fan has stopped wait until the motor has cooled down.
- ▶ Wear protective gloves.

4.7. Structural Modifications, Spare Parts

Note Unauthorised structural modifications may not be made to the fan without the consent of Nicotra Gebhardt GmbH. Nicotra Gebhardt GmbH shall not accept liability for any damage arising as a result such modifications. Use only genuine spare parts supplied by Nicotra Gebhardt GmbH.

CAUTION In areas subject to explosion hazards the fan may only be modified or converted by Nicotra Gebhardt GmbH itself, by a service location approved by the company, or by personnel authorised and trained by the company.

4.8. Installation and Maintenance

The following steps should be taken before working on the fan:

1. Ensure that the atmosphere is not potentially explosive.
2. Switch off the machine and take measures to prevent it from being switched back on accidentally.
3. Display the following message on a sign:
Do not switch on! Work currently in progress on the machine.

4.9. Signs on the Fan

Depending on the model, the type plate and the arrow indicating the direction of rotation are fitted to the fan for high visibility.

4.9.1. Type plate

Fig 4-1:
Example type plate

Nicotra Gebhardt		D-74638 Waldenburg		CE
Tel.: +49 (0)7942 101 384		Fax: -385		
E-Mail: service@nicotra-gebhardt.com				
RLM 56-3540-4Y-11-2G				
GERÄTE-Nr.	128-260549-220255/2		HERSTELLJAHR 2010	
VENTILATOR			MOTOR	
Dichte	= 1.2	kg/m ³	UN	= 400 V (D/Y)
T max	= 40	°C	FN	= 50 Hz
n max	= 1810	1/min	F max	= 64 Hz
			IN	= 3.3 / 1.88 A
				= 1395 1/min
				= 0.75 kW
				= P55
			Wärmeklasse	= F
			Stromart	= 3~
Example!				
CE II 2G Ex h IIB T4 Gb (int./ext.)				

4.9.2 Arrow Indicating Direction of Rotation

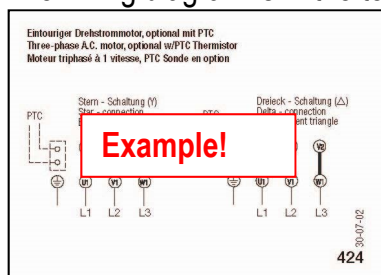
Fig 4-2: Arrow indicating direction of rotation



4.9.3 Terminal Board Circuit Diagram

Fig 4-3: Example circuit diagram

The wiring diagram is in the terminal box of the motor.



5. Product Description

5.1. Centrifugal fan RLM without housing, direct driven (Plug Fan)



Plug fans RLM are optimized for operation without scroll. Direct drive with IEC motor. The centrifugal impeller with backward-curved blades is fitted directly to the motor shaft. The fan unit consisting of impeller with inlet cone, motor block and base frame, installed and adjusted at the factory. The fans are equipped with a volumeter and inlet guard as a standard.

Plug fans RLM are comply to the requirements of ATEX-Directive 2014/34/EU by designed safety and safe construction according to EN ISO 80079-36 and -37 and EN 14986. The classification of these fans is fitting into group II, category 2G, Explosion group IIB(+H2), Temperature class T4 (T3) and Equipment protection level EPL Gb.

Materials:

- Impeller made of sheet steel, ATEX special coated (etc.stainless steel)
- Inlet cone made of copper.

Note The ATEX fan must not be modified by the user. Any modification will render ATEX conformity invalid.

5.2. Centrifugal fan (Plug fan) RLM

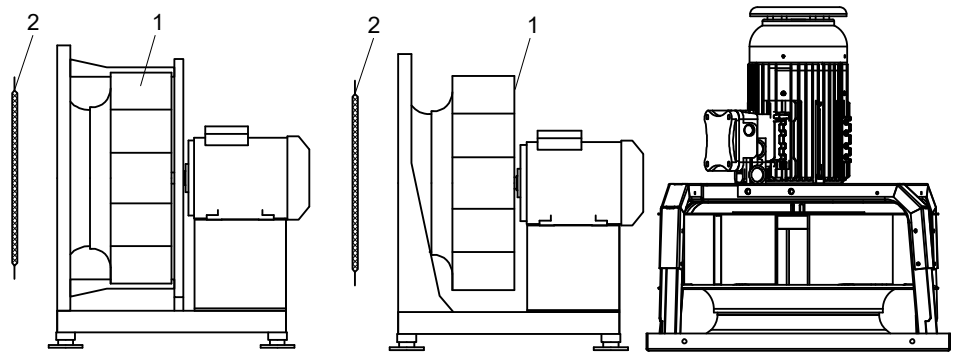
5.2.1 Centrifugal fan direct driven RLM

RLM 55-1112/-1214

RLM 56-2528/-1011 / RLM E3 -2528/-6371

RLM G6-2225 / RLM E6-2528/-1011

Figure 5-1:
Ranges



- 1. Fan
- 1. Inlet guard (included)
 - Safety of machinery EN ISO 13857
 - Degrees of protection EN 60529

6. Transport and Storage

6.1. Packaging

Fans are packaged in sturdy cardboard boxes or wooden crates depending on their size and weight. Instructions for removing transportation locks are enclosed.

6.2. Symbols on Packaging

The following symbols are printed on the cardboard boxes:

Table 6-1:
Symbols on packaging

Symbol			
Meaning	Handle with care	Keep dry	Top

6.3. Transportation of Plug fans



Danger of injury from falling components!

Use tested and appropriate load handling equipment only (see type plate or data sheet). Transport the fan in the original packaging for as long as possible. Secure the load

- **Do not stand under suspended loads**

1. Select means of transport according to weight and dimensions of fan. Fan must be attached at the base frame, base plate or supporting plate (For weights please see the technical catalogue)
2. Lift the fan by the base frame and/or by the carrier plate only
3. When using transport belts always provide 4 points of suspension (2 belts). The belt may not exert a deforming force on the fan or its packing. If necessary, use a spacer!
4. Secure load with belts or fix it against sliding!
5. Handle centrifugal fan with care to prevent damages avoid e.g. shock or rough placement

CAUTION These are NOT fixing points at the fan!

- Motor lifting ring bolt

- Impeller
- Inlet cone

6.4. Storage of Centrifugal Fan

CAUTION Risk of corrosion!

- ▶ Store the fan in its packaging adding any other protection dictated by its storage environment
- ▶ Store centrifugal fan in a well-ventilated room only at normal temperatures and in a non-corrosive atmosphere
- ▶ Store centrifugal fan in conditions registering less than 70 % atmospheric humidity (non-condensing)
- ▶ Adhere to max. permissible temperature of -20°C to +40°C

7. Installation

7.1. Safety Instructions for Installation

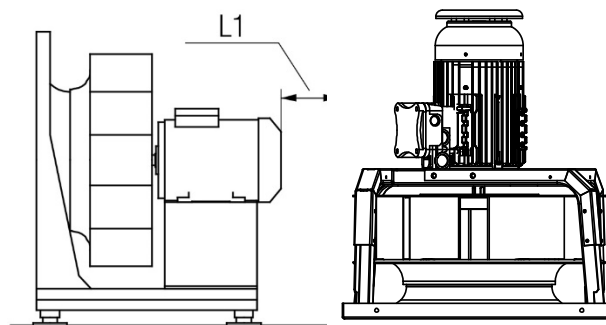
- ▶ Observe the safety instructions and preventive measures in Chapter 4 and the relevant legal requirements.

CAUTION The ATEX- fan system supplied by Nicotra Gebhardt must not be modified in any way! Its operation is exclusively permitted in it's state as originally supplied and within the LIMITS SPECIFIED. (Respect catalogue- and type plate data).

7.1.1. Installation notes

In order to achieve a sufficient motor cooling, care has to be taken that the fan at motor side is keeping a minimum clearance (L1) to the next wall. For disclosures on L1 refer to the motor operating instructions.

Figure 7-1:
Clearance



RLM E3: only vertical installation, with air direction from bottom to top, permissible. Minimum distance determined by motor protection cover.

7.2. Preparation to Installation

- The place of installation must be suitable for the fan in terms of its category, condition, ambient temperature and environmental media.
- The base must be level and have sufficient load-bearing capacity.
 1. Unpack centrifugal fan carefully.
 2. Unfasten or dismantle transport locks
 3. Packing material to be fully removed and disposed.
 4. Check gaps as per 7.4.

7.3. Carrying out the Installation

1. The fan or base frame must be fixed without stressing and free of forces to the supporting structure.
 2. loose fitted AVM to be regularly placed around centre of gravity and definitely fixed. Check whether the AVM is evenly under load.
 3. Ensure that the fan is earthed in accordance with regulations. The anti-vibration mounts themselves do not ensure electrical transmission.
- No forces or vibrations may be transferred from other plant parts to the fan (flexible connection)!
 - The flexible connections (ATEX) at intake and/or discharge are installed, well aligned, freely moving and earthed plant side.
 - The AVM are freely moving and under even load!
- The impeller is turning idly and does not touch the intake cone! (Note minimum gap, see 7.4)!
 - The distances from the impeller to the plant parts on site are checked and meet the requirements for explosion protection.
 - The stability of the fan against collapse of the fan has been checked.

7.4 Checking the Gap Dimension on the Fan

- ▶ Check gap between impeller and inlet cone and between impeller border and pressure measuring nipple of the volumeter against chart values below!

Figure 7-2: Gap width

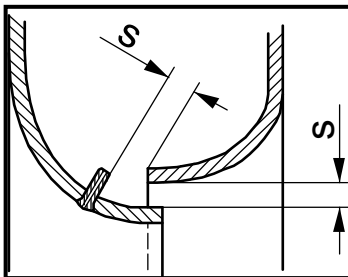
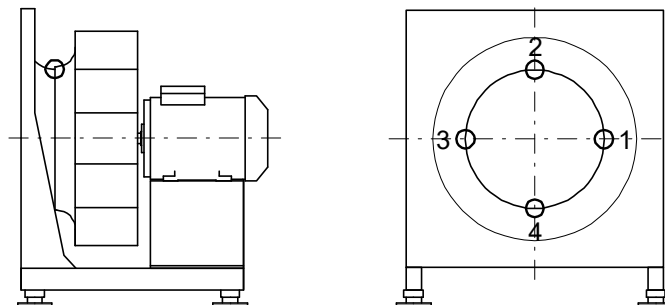


Table 7-1: Gap width

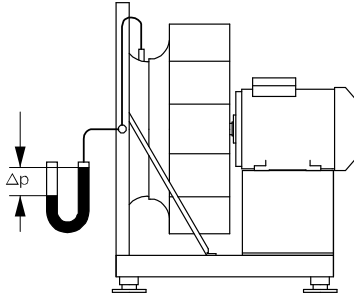
RLM	Gap width „s“	RLM	Gap width „s“
2225	2,0	5663	4,3
2528	2,0	6371	4,8
2831	2,2	7180	5,4
3135	2,4	8090	6,0
3540	2,7	9010	6,7
4045	3,0	1011	7,5
4550	3,4	1112	8,5
5056	3,8	1214	9,5

Figure 7-3: Measured points



1. Measure the gap and ensure that the width of the gap does not fall below the threshold in any phase of the rotation (manual rotation).
2. Carry out measurements on four 90° points on the circumference. Ensure that the gauge is placed on the outer diameter of the inlet cone.

7.5 Volumeter



The fans are equipped with a volumeter as a standard. With this flow measuring device it is possible to measure/monitor the flow easily after the fan is installed.

- Measuring nipple on intake cone
- piping to connector at support unit
- connector (external diameter 6mm) to pressure measuring device

Figure 7-4: Volumeter

$$qv = K \times \sqrt{\frac{2}{\rho} \times \Delta p_{Dü}}$$

- qv volume flow [m³/h]
- K calibration factor [m²s/h]
- ρ density of media [kg/m³]
- Δp_{Dü} pressure difference at cone [Pa]

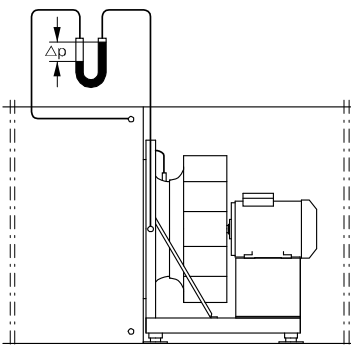


Figure 7-5 :Built in fan

When fans are built in a plenum, it is required to measure the differential pressure between the static pressure in the plenum on the suction side and the pressure at the inlet cone.

To ensure that the static pressure to be measured at the inlet nozzle is not distorted by dynamic velocities, it is recommended to attach a ring-line of measuring points on the wall as shown in the following diagram.

When using a differential pressure sensor, the signal can be used for automatic control purpose.

For calculation of the flow rate a calibration coefficient (K-factor) for every fan required this is determined by comparative measurement on a standard test rig with none disturbed air flow at suction.

K-Factor deviation
Standard calibration
K10 < 10%

RLM E6- E3-G6	Calibration factor K10	RLM 56- 55-	Calibration factor K10
2225	73 m²s/h	2528	73 m²s/h
2528	79 m²s/h	2831	90 m²s/h
2831	94 m²s/h	3135	105 m²s/h
3135	106 m²s/h	3540	120 m²s/h
3540	128 m²s/h	4045	150 m²s/h
4045	155 m²s/h	4550	190 m²s/h
4550	190 m²s/h	5056	240 m²s/h
5056	242 m²s/h	5663	300 m²s/h
5663	310 m²s/h	6371	385 m²s/h
6371	385 m²s/h	7180	485 m²s/h
7180	490 m²s/h	8090	620 m²s/h
8090	628 m²s/h	9010	790 m²s/h
9010	794 m²s/h	1011	1000 m²s/h
1011	1017 m²s/h	1112	1260 m²s/h
		1214	1540 m²s/h

7.6 Install Protection Devices

1. Fit guards to protect exposed inlet openings (EN ISO 13857).
2. Design safety devices in such a way that they prevent objects from being sucked in or from falling in (see EN 60529).

8. Electrical Connection

8.1. Safety Instructions for Electrical Connection



Danger of electric shock!

- ▶ Observe the safety instructions and preventive measures in Chapter 4 as well as the relevant legal requirements.
- ▶ EN 60204-1, IEC 60364-1 / VDE 0100-100; EN 60079-0, VDE 0170-1; EN 60079-14, VDE 0165-1.

All fans are delivered ready for connection. The terminal box is easily accessible. The wiring diagram is in the terminal box. Protection systems are provided by the customer and are not supplied by Nicotra Gebhardt.

No mains connection operation allowed for models with max. operating frequency <50 Hz!

Note As a standard feature the fans are suitable for operation by a frequency inverter. When operating the fans together with frequency inverter or control equipment containing electronic components the manufacturer's recommendations are to be observed concerning radio noise suppression (EMC) (through suitable earthing, cable lengths, cable screening, etc.).

CAUTION **Inspection switches, electronic control units and frequency converters can cause material damage!**

- ▶ Do not use electronic control units or frequency converters in areas subject to explosion hazards.
- ▶ Install inspection switches - except inspection switches approved for areas subject to explosion hazard – outside the area subject to explosion hazards.

Note The standard motors are classified as protection category "Explosion proof Ex de II", temperature class T4, for ambient temperature from -20°C to +40°C (60°C) in accordance with Directive 2014/34/EU (ATEX) and IEC/EN 60079-0, IEC/EN 60079-1.

- ▶ Current, voltage and frequency of mains supply checked for conformity with fan type plate and motor rating plate.
- ▶ Star-delta or soft start provided for motors with a nominal output >4 kW.
- ▶ Adhere to the output limits imposed by the power supply company.
- ▶ If necessary, an Isolator must be provided (outside the area subject to explosion hazards)
- ▶ All components are provided with an earthing. The fan components are electrically connected to each other.
- ▶ **The fan is protected against unexpected start!**
- ▶ **Chapter 4. „Safety“ must be respected!**

8.2. Electrical connection of the motor

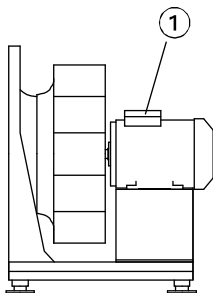


Figure 8-1 Connection box

1. Fit inspection switch if applicable.
2. Connect feed line to fan or service switch.
3. Connect motor as shown on connection diagram supplied.
4. Ensure that all the electrical safety devices have been fitted and connected.

1 = Connection box

8.3. Motor Protection

Protect motors against overload in accordance with EN 60204-1.

- Speed controlled, pressure resistant encapsulated motors, equipped with certified PTC-thermistors have to be operated – in the case of explosion proof application – with an ATEX certified tripping unit, which switches off the fan at a surface temperature of 125 ° C!
- Only motors conforming to the corresponding ATEX – category of the fan are permitted.
- Motor protection switches must be set to the nominal motor current (see type plate). A higher setting value is not admitted!
- Respect the te-time for overload protection indicated on the motor type plate.

CAUTION Fuses or circuit breakers do not provide sufficient motor protection. Damage due to insufficient motor protection invalidates the manufacturer's guarantee.

Note In all cases the power limitations provided by the existing power supply company must be taken into account.

If plant conditions necessitate a direct start the suitability of the fan design must be confirmed with Nicotra Gebhardt. Fans with high inertia impellers can take over 6 seconds to reach top running speed. In these cases heavy duty motor protection relays or bimetal relays must be provided.

8.4. Carrying out a Test Run



Risk of injury from rotating impeller!

- ▶ Never reach into the impeller when the fan is open.

1. Take measures to prevent the centrifugal fan from being switched on accidentally
2. Clear the ducting system and fan of all foreign bodies (tools, small parts, construction waste, etc.
3. Close all the inspection openings.
4. Switch on the fan and check the direction of rotation of the impeller by comparing it with the arrow on the fan indicating the direction of rotation.

5. If the direction of rotation is wrong, reverse the polarity of the motor having due regard to the safety instructions.
6. Once operating speed has been reached measure the current consumption and compare it with the nominal motor current on the fan type plate or motor rating plate
7. If there is continuous overload switch the fan off immediately.
8. Check that the fan runs smoothly and quietly. Ensure that there are no unusual oscillations or vibrations.
9. Check the motor for any abnormal noises.

9. Commissioning

The motors are designed for continuous operation S1. If operations involve more than three starts per hour Nicotra Gebhardt GmbH shall be required to confirm the suitability of the motor.



Potentially explosive gas mixtures in conjunction with hot and moving parts may cause serious or fatal injury.

Risk of explosion due to increased ambient temperature!

1. **Observe ambient temperature.**
2. **Ensure adequate supply of cooling air.**

9.1. Conditions for Commissioning in Ex-Area

The following requirements must be met before operating the fan in areas subject to explosion hazards:

- Specifications on the type plate to meet the standards required in the local operating conditions in respect of explosion hazards (device group, explosion hazard category (hazard zone), gas group, temperature class).
- All the components connected to the fan carrying a risk of ignition or explosion to have the required approval certificates.
- The ambient temperature during subsequent use to be within in the allowed limits!
- All the requisite safety devices to be installed.
- Prevent impeller from contact and from being hit by falling or sucked-in objects.
- The fan is not operated in a dusty environment.
- Ensure that unacceptable levels of dust are not allowed to gather on the fan. (Note maintenance instructions.)
- The distances from the impeller to the plant parts on site are checked and meet the requirements for explosion protection.
- Ensure that the fan is earthed in accordance with regulations.

9.2. Commissioning the Centrifugal Fan



Risk of injury from rotating parts and hot surfaces!

1. Ensure that all the safety devices are fitted.
2. Ensure that the impeller has been secured acc. to EN ISO 13857!

Commissioning

1. Check the working order of all the connected control instruments.
2. **Switch on the centrifugal fan.**

10. Maintenance

10.1. Safety Instructions for Maintenance

- ▶ Observe the safety instructions and preventive measures in Chapter 4 as well as the relevant legal requirements.
- ▶ Follow the directions of the motor supplier and the instructions specified by the manufacturers of the switches and control units.



Work on the fan is only permitted when the power supply is fully cut!

CAUTION

Pressure washers can cause damage to property!

- ▶ **Do not use pressure washers (steam jet cleaners) to clean the equipment.**

CAUTION

Breakdown and hazard because of leaking gas media.

- ▶ **Exchange leak flexible connections.**

10.2. Observing Regular Inspection Intervals

In the interests of upkeep and safety we recommend having the operation and condition of the fans inspected at regular intervals by duly qualified service personnel or a professional maintenance firm and documenting these inspections. The nature and extent of the maintenance work, the service intervals and any additional work required needs to be specified on a case-by-case basis depending on the use of the fans and the general conditions on site. Our servicing and inspection recommendations based on VDMA 24186-1 can be found on our website.

10.3. Preparing for Maintenance

1. Disconnect the motor from the mains.
2. Plug fans fitted with a certified inspection switch should be switched off using the inspection switch.
3. Take measures to prevent the centrifugal fan from being switched on accidentally.
4. Wait until the impeller has stopped.
5. Wait until all hot surfaces have cooled down.
6. Remove any residues from the fan.
7. Depending on the situation installation components may be dismantled for inspection and maintenance.

Preparation for maintenance is completed

10.4 Maintenance recommendations for Fans RLM-ATEX

Table 10-1: Maintenance recommendation

- ▶ Conduct test run if applicable (see Chapter 8.4).
- ▶ Document inspection intervals observed.

	Description	quarterly	cyclic	on demand
1.0	Fan			
1.1	Check deposit, damages, corrosion and fixing	X		
1.2	Check impeller for damage and unbalancing, vibration check	X		
1.3	Check the axial and radial gap	X		
1.4	Check flexible connections for tightness	X		
1.5	Check correct function of AVM	X		
1.6	Check correct function of safety devices (guards)	X		
1.7	Check condensate water drain	X		
1.8	Clean entire unit in order to keep all elements in best working conditions	X		
1.9	Check rotational sense of impeller (for all speeds)	X		
2.0	Check fan function and its readiness for immediate start up		X	
2.1	Motor			
2.2	Visual control for dirt, damages, corrosion and correct fixing	X		
2.3	Check rotational sense	X		
2.4	Check bearing noise	X		
2.5	Lubricate bearing (where bearings are re-lubricable)		X	
2.6	Check correct function of safety devices (guards)	X		
2.7	Check tight electrical connections on tight fixing	X		
2.8	Clean entire unit in order to keep all elements in best working conditions	X		

10.4.1 Vibration monitoring

The fan has to be frequently checked for vibrations. The max. vibration velocity values admitted are those which relate to ISO 14694.

Table 10-2: Vibrations

Fan with AVM		Fan without AVM	
Motor power	Vibration velocities	Motor power	Vibration velocities
≤ 3,7 kW	9,0 mm/s	≤ 3,7 kW	5,6 mm/s
> 3,7 kW	6,3 mm/s	> 3,7 kW	4,5 mm/s

These vibration velocities are to be measured in a radial direction on the bearing or bearing casing of the motor.

Deposits of dirt and dust on the impeller can cause unbalancing and subsequent damages. In order to prevent this danger frequent inspections and cleaning measures have to be carried out depending on the degree of possible deposit.

10.4.2 Motor bearings

The motor bearings are supplied permanently lubricated by the factory; experience has shown that the grease needs to be changed only after several years only under normal operating conditions.

In the case of bearing noise please contact Nicotra Gebhardt-Service for a check and a possible change of defective bearings.

10.4.3 Periods of stand still

During longer periods of standstill the fan must from time to time be put into operation for a short while. This is to avoid bearing damages due to statically mechanical load and ingress of humidity.

After longer periods of storage, the fan and motor bearings have to be checked prior to installation.

CAUTION

If the condition of the fan does not allow modified repair measures it must be put out of commission and be replaced immediately if required.

11. Faults

If any faults occur during operation which cannot be repaired by maintenance personnel please contact the service department at Nicotra Gebhardt GmbH.



Risk of explosion caused by improper operating states!

- ▶ Switch the fan off immediately if permissible limits are exceeded and in the event of irregularities or faults.

12. Service, Spare Parts and Accessories

Nicotra Gebhardt GmbH
Gebhardtstraße 19–25
74638 Waldenburg
Germany

Fon: +49 (0) 7942 101 0
Fax: +49 (0) 7942 101 170
Mail: info@nicotra-gebhardt.com
Web: www.nicotra-gebhardt.com

12.1. Ordering Spare Parts

- ▶ Use only genuine spare parts supplied by Nicotra Gebhardt GmbH as featured in the list of spare parts.

The use of spare parts supplied by other manufacturers may compromise the safety of the equipment. Nicotra Gebhardt GmbH shall not accept any liability or provide any warranty cover in respect of primary or secondary damage arising as a consequence of using spare parts supplied by other manufacturers.

Spare parts can be ordered online at -- www.nicotra-gebhardt.com/Partshop

12.2. Accessories

Nicotra Gebhardt GmbH has a wide range of accessories for the economical and efficient use of its fans.

Accessories are optional and always need to be ordered separately.

Spare parts should be selected on the basis of the technical specifications or via our electronic selection program. Accessories are supplied with separate operating or installation instructions unless their installation or uses are self-explanatory.

13. Annex

13.1 Further Documentation Supplied by Nicotra Gebhardt GmbH

Tabelle 13 1: Further documentation

Type of Documentation	File Location
Maintenance and inspection recommendations	Internet
EC-Declaration of Conformity 2014/34/EU (ATEX)	Annex
EC-Declaration of Incorporation	Annex

EU Declaration of Conformity to EU Council Directive 2014/34/EU (ATEX)

The manufacturer: **Nicotra Gebhardt GmbH,**
Gebhardtstraße 19-25, 74638 Waldenburg, Germany

herewith declares, that the machinery designated below, on the basis of its design and construction in the form brought onto the market by us is in accordance with the relevant safety and health requirements of the EU Council Directive as mentioned below.

If any alterations are made to the machinery without prior consultations with us this shall render the declaration invalid.

Designation: **Plug fans without scroll of categories 2G for conveying explosive atmosphere**

Machine type: **RLM 55-....-2G; RLM 56-....-2G;
RLM E6-....-.Y-..-.; RLM E3-....-.Y-..-.; RLM G6-....-.Y-..-.**

Category: **II2G Ex h IIB T4 Gb ; II2G Ex h IIB+H2 T4 Gb**

Year of Production/Type: **See type plate**

Relevant EC Council Directive: **EU Directive 2014/34/EU (ATEX)**

Statement of deposition: **EX9 12 10 78300 006 (RLM E6 + RLM G6)
EX9 14 11 78300 007 (RLM E3)
EX9 11 09 78300 003 (RLM 55/56)**

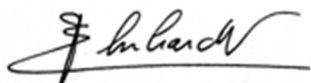
Name of Notified Body: **TÜV SÜD Product Service; Certification Body; Ridlerstraße 65;
80339 Munich; Germany**

Applied harmonized standards ¹⁾, in particular: **EN 1127-1, EN 14986, EN 60079-0, EN ISO 80079-36, EN ISO 80079-37**

It is the responsibility of the manufacturer or contractor to ensure that conformity to these standards is observed when installing the fan in a machine or system.

The manufacturer is solely responsible for issuing this declaration of conformity.

Waldenburg, 20.01.2019



i.V. T. Ehrhardt
Head of production



i.V. Dr. J. Anschütz
Research and Development Director

¹⁾ The complete listing of applied standards and technical specifications please see manufacturer's documentation.

EC-Declaration of Incorporation

The manufacturer: **Nicotra Gebhardt GmbH**,
Gebhardtstraße 19-25, 74638 Waldenburg, Germany

herewith declares, that the following product:

Product designation: **Plug fans without scroll of categories 2G for conveying explosive atmosphere**

Type nomination: **RLM 55-....-2G; RLM 56-....-2G;
RLM E6-.... -.Y-...-.; RLM E3-.... -.Y-...-.; RLM G6-.... -.Y-...-.**

Serial n°: **see type plate**

Year of manufacture: **see type plate**

qualifies as a partly completed machine, according to Article 2, clause “g” and complies with the following basic requirements of the **Machine Directive (2006/42/EC): Annex I, Article 1.1.2; 1.3.7.**

The partly completed machine may be put into operation only if it has been stated that the machine into which the uncompleted machine has to be incorporated complies with the requirements of the Machine Directive (2006/42/EC).

The following harmonised standards¹⁾ have been applied:

DIN EN ISO 12100 Safety of machines – General design principles

DIN EN ISO 13857 Safety of machines – Safety distances to hazardous areas

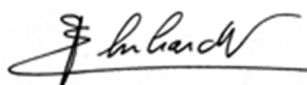
Applied, national standards and technical specifications²⁾ particularly:

VDMA 24167: Fans - Safety requirements

The manufacturer is committed to providing the special documents, to Annex VII, Part B for partly completed machines to any state authority on request by mail / e-mail.

Waldenburg, 20.01.2019

Representative for the documentation: Michael Hampel



i.V. T. Ehrhardt
Head of production



i.V. Dr. J. Anschütz
Research and Development Director

¹⁾ The complete listing of applied standards and technical specifications see manufacturer's documentation.

²⁾ If no corresponding harmonized standards are available yet

NICOTRA || **Gebhardt**
fan|tastic solutions

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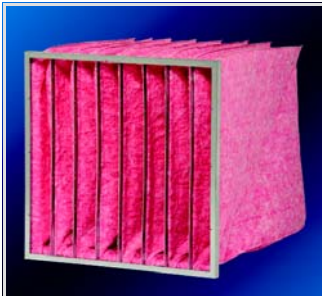
A.3 GEA pocket filter

Name	Data
Designation	Pocket filter
Type	Multisack G85 EX
Number	
Type of manual	Operating manual
Manufacturer	GEA



Proper use of the GEA explosion protected bag filters Multisack G85 EX stipulates compliance with the current operation manual. This manual must always be available at the site where the unit is in operation. Every person working on or with the GEA explosion protected bag filters of series Multisack G85 EX must read and understand this operation manual fully.

1. Technical Data



Type/designation	Dimensions W x H x D [mm]	Number of bags [quantity]	Filter surface [m ²]	Max. rated air flow rate [m ³ /h]
Bag filter G85 EX	592 x 592 x 600	8	2.6	4,250

Filter class	Norm	Initial pressure difference [Pa]	Max. end pres- sure difference [Pa]	Air flow velocity [m ³ /h]	Order number
F7	EN 779	91.7	450	3,400	10 42 646

Specifications:

Frame material: Galvanized metal sheet
 Filter medium: Micro glass fibre
 Max. operating temperature [°C]: -40 to +80
 Max. relative humidity [%]: 90
 Filter with grounding element

Notes:

Identification of explosion protection: II 2 GD IIB T6
 (-40°C to +80)
 Explosion protection conformity: RL 94/9/EG
 Unit category 2, group II RL 94/9/EG
 Application in zones 1, 2, 21, 22 RL 999/92/EG

2. Safety Instructions

Proper use

GEA explosion protected bag air filters of series Multisack G85 EX of the equipment category 2, group II in accordance with the EU directive 94/9/EG on explosion risk in areas with an explosive atmosphere or EN 13463-1:2001 are exclusively used to filter solid matter particles and dust of any kind and size out of air in air handling systems. Filtered air can be charged with foreign matter and the relevant surroundings can be classified as an explosion risk areas in accordance with 1999/92/EG directive on explosion protection. GEA explosion protected bag air filters of series Multisack G85 EX are exclusively suitable in explosion risk areas in zones 1, 2, 21 and 22 in accordance with 1999/92/EG directive on explosion protection.

Further process instructions and regulations on explosion risk prevention in terms of 1999/92/EG directive as well as other usually applied directives on using, handling, maintenance and recycling of air filters for air handling units SWKI 2003 as well as VDI 6022 must be taken into account.

Label

The supplied label must be attached on the external side of a service door of an air handling unit. The label must be clearly visible and accessible.



GEA explosion protected bag filters of series Multisack G85 EX are installed in air handling units that are classified as explosion risk areas according to 1999/92/EG and 94/9/EG directives on explosion risk protection. The Multisack G85 is not suitable for explosion risk areas where hybrid mixtures lead to explosion hazards.



Possible electrostatic charges of the GEA explosion risk protected bag filters of the series Multisack G85 EX are continuously diverted without special structural changes or technical measures if the following conditions are met:

- The air filter frame must always have an electrically conductive connection with the relevant filter retainer. For this purpose - an additionally supplied grounding set must be mounted and secured. This grounding set must be mounted in such a way that self-removal or accidental removal because external influence is prevented (⇒ refer to section „3. Installation“).
- The filter retainer as well as all electrically conductive components of an air handling unit must be grounded. This can be achieved by using conductive contact surfaces between components (direct contact) or an electrical conductor (e.g. grounding cable).

Air flow velocity and rated air flow rate

Air flow velocity through filter may not exceed 10 m/s and rated air flow rate specified in the technical data may not be exceeded under any circumstances.

In case of proper use of the GEA explosion protected bag filters at specified rated air flow rate the air flow velocity through filter medium will not exceed 0,5 m/s even if the filter has reached the intended operating life or compulsory maximum end pressure difference. The standard value for dimensioning is specific maximum air flow rate 0,3 m³/s per m² of filter surface. It must always be possible to check the maximum rated flow rate (⇒ refer to section „1. Technical Data“) of the unit by using check and monitoring devices (e.g. differential pressure monitor or flow measuring devices).



3. Installation

Pre-installation work

- Make sure that the planned installation location is suitable for the operation of the GEA explosion protected bag filter. This comprises the following:
 - The classification of the installation site as a hazard zone according to RL 1999/92/EG
 - Availability of a company internal document on explosion risk protection in accordance with RL1999/92/EG and the occupational safety codes and regulations.
- Remove the GEA explosion protected bag filter Multisack G85 EX from its packaging outside the explosion risk zone:
 - Handle the bag filter with care and do not damage the filter medium
 - Inspect the bag filter for any external damage and check if the grounding set is complete (operation manual and explosion protection label); if the filter is damaged or the grounding set is missing - the filter may not be mounted.

Installation

- Loosen the old grounding set from the unit.
- Remove the old bag filter including the grounding set.
- Carry out all necessary cleaning of the unit.
- Insert the new GEA explosion protected bag filter Multisack G85 EX in the unit and secure the filter using filter retainers.
- Screw the grounding electric cable with a ring tongue lug to grounded unit component together (e.g. filter retainer, slide in frame, monoblock etc.) in such a way that self or accidental removal without a tool is impossible.
- ✓ An electrically conducting connection between air filter frame and unit component must be ensured!
- Check the ring tongue lug for secure seat.
- Check electric resistance between filter frame and unit component using an ohmmeter – no matter where the measuring point is - electric resistance may not exceed 1 M Ω (Mega-Ohm).

4. Operating Life/Durability of the GEA Explosion Protected Bag Filter Multisack G85 EX

The characteristics and features of the GEA explosion protected bag filter Multisack G85 EX are the same as with conventional bag filters of the same type and same configuration.

- Replace the bag filter when the maximum allowed end pressure difference is reached. It can be assumed that the maximum allowed end pressure difference amounts to a standard value with initial pressure difference plus 100 Pascal of pressure drop increase. Refer to section "1. Technical Data" for the effective maximum allowed end pressure difference.
- Moreover, consider the recommendations of the hygiene directive SWKI 2003-5 and VDI 6022 in terms of the maximum service life.

A.4 EMW compact filter

Name	Data
Designation	Compact filter
Type	ATEX filter
Number	
Type of manual	Instruction manual
Manufacturer	EMW filtertechnik

Instructions for ATEX Air Filters

In conformance with ATEX Directive 94/9/EC Appendix II

Before starting with installation, **read these instructions completely** and follow them exactly. Not following the instructions can result in serious injuries and/or damages. Before carrying out installation, check to be sure that the filter selected is suitable for your intended application.

In accordance with legal regulations the installation of the filter may be carried out by qualified installation technicians only.

1) START-UP INSTRUCTIONS

1.1) APPLICATION

ATEX air filters are used to filter dust-laden gaseous substances in potentially explosive atmospheres.

1.2) USE AND MARKING OF THE PRODUCT

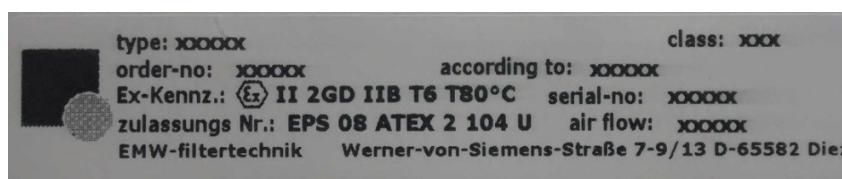
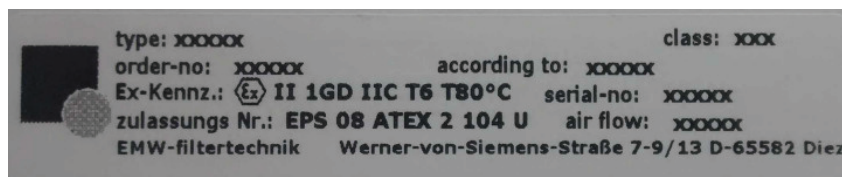
(in conformance with ATEX Directive 94/9/EC)

Intended use of the product: filtration of gaseous substances with dust content.

The filter can be used in potentially explosive atmospheres as follows:

- Gas:**
- zones 0, 1 or 2 (models with **fabric handles** are **not suitable** for usage in **zone 0**)
 - gas groups IIA, IIB or IIC (models with **fabric handles** are **not suitable** for usage in **gas group IIC**)
- Dust:**
- zone 20, 21 or 22 (models with **fabric handles** are **not suitable** for usage in **zone 20**)
 - conductive dusts must be excluded from these applications

Marking:



1.3) STANDARDS

When installed and used in accordance with operating instructions, this product conforms to the following standards: EN 13463-1 (2009)

1.4) MECHANICAL PROPERTIES

- Used for:** Final filtration or pre-filtration of dust-laden, potentially explosive atmospheres, filter classes F6/M6 up to U15
- Storage temperature:** -10 to +40°C
- Operating temperature:** -40 to +80°C
- Relative humidity:** 5% to 95%, without condensation

Instructions for ATEX Air Filters Rev. 7, 28.04.2015

Seite 1 von 2

1.5) INSTALLATION

The filter unit must be mandatory connected with **at least one** suitable potential equalisation device and for usage in ATEX zones 0 or 20 with **at least two** suitable, independently working and not self-detachable **potential equalisation devices**. All conductive components and all parts, through which discharge can occur, must be interconnected and grounded.

Some filters are supplied with **two separately added potential equalisation devices** consisting of:

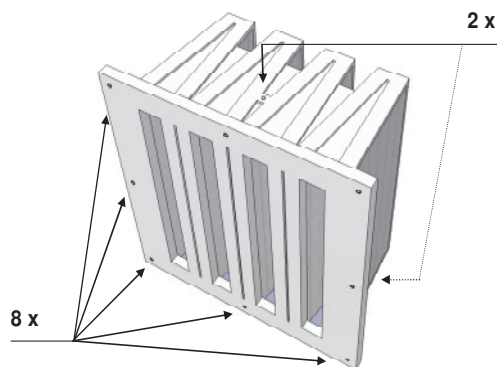
- 2 pz. grounding cable with eyelets at the cable ends
- 2 pz. screw for fixing the potential equalization device on the filter
- 2 pz. star washer externally toothed to be fit between eyelet and filter frame

Please attach the required number of potential equalisation devices to **suitable attachment points** on the filter frame. The screw is inserted through the eyelet and the washer and screwed at an attachment point on the filter frame as shown below.

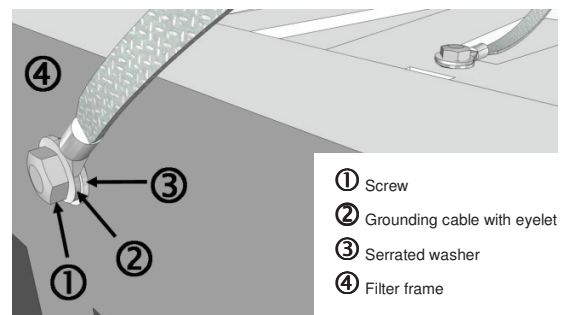
It is possible to renounce on the installation of the added potential equalisation devices **only** if a safe potential compensation is guaranteed at all time by a suitable filter fastening device of the air-handling system. If in doubt, this is to check by a qualified person by using an appropriate measuring device (eg. multimeter).

Maximum torque of the screw: 0.5 Nm

Possible attachment points



Mounting of the potential equalisation devices



Proper mounting of suitable potential equalisation devices and **periodic monitoring** of the potential compensation must be ensured **by the user** of the filter unit.

The ambient temperature range differs from the standard ambient temperature range and is $-40^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$

1.5.1) MOUNTING AND ASSEMBLY

The filter element can be operated in either vertical or horizontal position.

Please note:

- vertical position of filter element: the throughput openings should be positioned vertically
- horizontal position of filter element: the position of the throughput openings is irrelevant

2) MAINTENANCE

Observe the following precautionary measures when carrying out maintenance:

When removing or changing the filter, the unit must be **FREE OF VOLTAGE**.

Instructions for ATEX Air Filters Rev. 7, 28.04.2015

Seite 2 von 2

A.5 Anti-frost thermostat

Name	Data
Designation	Anti-frost thermostat
Type	ExBin-FR
Number	
Type of manual	Instruction manual
Manufacturer	Schischek

ExBin-FR Frost protection thermostat

ExBin - FR3
ExBin - FR6
ExBin - FR... -CT

Subject to change!

Electrical, explosion-proof frost protection thermostat

24 VAC/DC supply voltage, potential free relay output

EC type-approved in acc. with ATEX directive 2014/34/EU for zone 1, 2, 21, 22

Compact. Easy installation. Universal. Cost effective. Safe.

Type	Capillary length	Supply	Output	Max. ratings	Wiring diagram
ExBin- FR3	3 m	24 VAC/DC	Relay contact	250 VAC, 0.1 A / 30 V, 0.5 A	SB 1.0
ExBin- FR6	6 m	24 VAC/DC	Relay contact	250 VAC, 0.1 A / 30 V, 0.5 A	SB 1.0
ExBin- FR... - CT	Types as above with aluminium housing and seawater resistant coating (sensor connection and cable glands brass nickel-plated, screws in stainless steel)				

Product views and applications

Frost protection thermostat



...Bin-FR...-CT



Description

The ExBin-FR... frost protection thermostat is a revolution in HVAC systems, in chemical, pharmaceutical, industrial and offshore/onshore plants, for use in hazardous areas zone 1, 2 (gas) and zone 21, 22 (dust).

Highest protection class (ATEX) and IP66 protection, small dimensions, universal functions and technical data guarantee safe operation even under difficult environmental conditions.

All frost protection thermostats are programmable on site without any additional tools. The switching point is scalable within the maximum ranges.

Highlights

- ▶ For all types of gases, mists, vapours and dust for use in zone 1, 2, 21 and 22
- ▶ Power supply 24 VAC/DC
- ▶ Output potential free switching contact
- ▶ Integrated Ex-e terminal box
- ▶ No additional Ex-i module required
- ▶ No intrinsically safe wiring/installation between panel and sensor required
- ▶ No intrinsically safe wiring/installation and no space in the panel required
- ▶ LED switching state indication
- ▶ Compact design and small dimension
- ▶ Robust aluminium housing (optional with seawater resistant coating)
- ▶ IP66 protection



Technical data	ExBin	...-FR3	...-FR6
Supply voltage, frequency	24 VAC/DC \pm 20 % (19,2...28,8 VAC/DC), 50/60 Hz		
Current, power consumption	150 mA, ~ 4 W, internal fuse 500 mA, not removable		
Galvanic isolation	Supply for relay output min. 1,5 kV		
Electrical connection	Terminals 0,14...2,5 mm ² at integrated Ex-e terminal box, stripping length 9 mm, torque 0,4...0,5 Nm, equipotential bonding 4 mm ²		
Cable glands	2 x M16 x 1,5 mm, Ex-e approved, for cable diameter ~ \varnothing 5...9 mm		
...-CT	2 x M16 x 1,5 mm, Ex-e approved, brass nickel-plated, for cable diameter ~ \varnothing 6...10 mm		
Control elements	Rotary control for setpoint adjustment and fixing screw		
Measuring range	Setpoint adjustable -10 °C...+15 °C		
Status indication	via LEDs – GREEN: ambient temperature is above setpoint (normal), RED: ambient temperature is below setpoint		
Housing material	Aluminium die-cast housing, coated. Optional with seawater resistant coating (...-CT)		
Dimensions (L x B x H)	~ 180 x 107 x 66 mm (without connectors)		
Weight	~ 950 g		
Ambient temperature	-20...+50 °C, capillary max. +80 °C, storage temperature -35...+70 °C		
Temperature class	T6 (T80 °C) bei -20...+50 °C		
Ambient humidity	0...95 % rH, non condensing		
Sensor circuit	Internal intrinsically safe (IS) circuit		
Capillary	Length	3 m \pm 15 cm	6 m \pm 20 cm
	min. active length	~ 40 cm	
	min. bending radius	2 cm	
Hysteresis	~ 6 K, accuracy of setpoints \pm 3 K		
Start delay	5 s		
Output	Potential free switching contact – breaking contact		
	max. rating load	0,5 A (30 VAC/DC) – 0,1 A (250 VAC) – 0,1 A (220 VDC)	
	min. rating load	10 mW / 0,1 V / 1 mA	
Duration of life	mechanical	10 x 10 ⁶	
	electrical (rated load)	100 x 10 ³	
Wiring diagram	SB 1.0		
Scope of delivery	Frost protection thermostat, self-tapping screws 4,2 x 13 mm resp. in stainless steel (with ...-CT versions)		

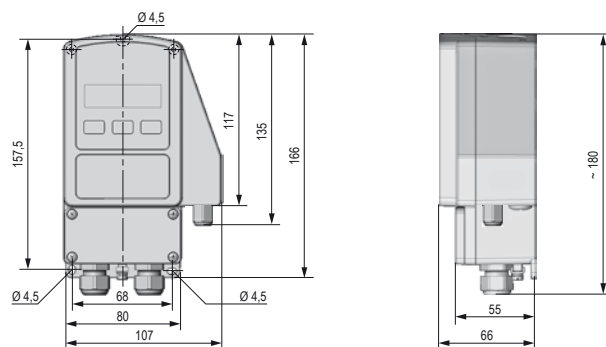
Approbationen

ATEX directive	2014/34/EU
EC type-approved	EPS 14 ATEX 1 657
IECEx certified	IECEx EPS 14.0074
Approval for gas	II 2 (1) G Ex e mb [ia Ga] IIC T6 Gb
Types ...-CT	II 2 (1) G Ex e mb [ia Ga] IIB T6 Gb
Approval for dust	II 2 (1) D Ex tb [ia Da] IIIC T80°C Db IP66
CE identification	CE № 0158
EMC directive	2014/30/EU
Enclosure protection	IP66 in acc. with EN 60529
EAC	TC RU C-DE.ГБ08.B.01510

Accessories

MKR	Mounting bracket for round ducts up to \varnothing 600 mm
Installation Kit 1.3	Assembly cramp and 4 assembly brackets for ...Bin-FR3
Installation Kit 1.6	Assembly cramp and 8 assembly brackets for ...Bin-FR6

Dimensions [mm]

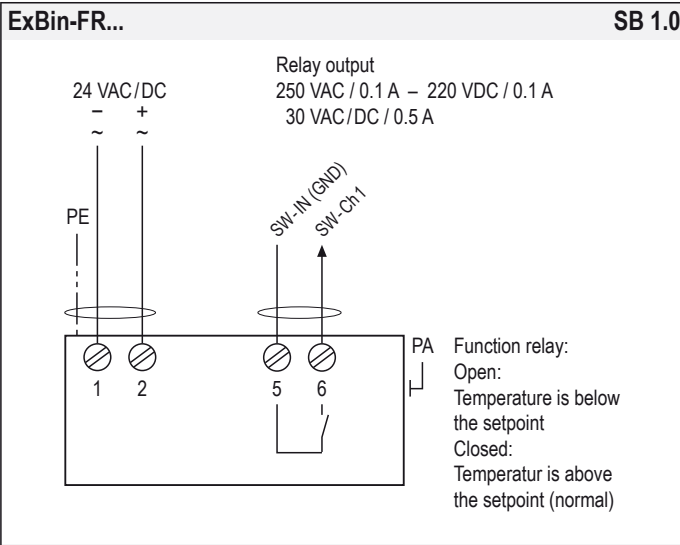


Electrical connection

All frost protection thermostats require a 24 VAC/DC power supply. The electrical wiring must be realized via the integrated Ex-e terminal box acc. to ATEX. The terminals' type of protection is "Increased safety Ex-e".

Attention: Before opening the terminal box cover, the supply voltage must be shut off! The supply has to be connected at terminals 1 (-/-) and 2 (+/-).

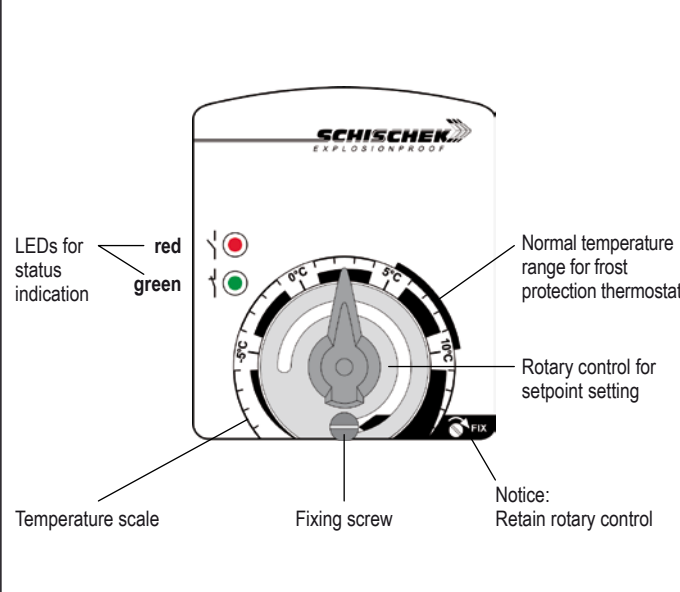
At different relay and supply voltages (24 VAC/DC) the cable installation must be considered (see "Information for Installation")!



Intrinsically safe parameters (IS) – Internal contact

$U_o = 7.14 \text{ V}$	$C_i \rightarrow 0$	IIC	IIB	IIA	
$I_o = 8 \text{ mA}$	$L_i \rightarrow 0$	L_o	5 mH	10 mH	20 mH
$P_o = 15 \text{ mW}$		C_o	1.5 μF	6.7 μF	8.6 μF

Control elements with status indication



A. Installation, commissioning, maintenance

All national and international standards, rules and regulations must be complied with. Certified apparatus must be installed in accordance with manufacturer instructions. If the equipment is used in a manner not specified by the manufacturer, the safety protection provided by the equipment may be impaired. For electrical installations design, selection and erection, EN/IEC 60079-14 can be used.

Attention: Apply all Ex rules and regulation before opening the internal terminal box. Do not open cover when circuits are live!

Draw the wiring cables through the cable glands. For connection use the internal Ex-e approved terminal box and connect equipotential bonding. After connection install the cables in a fixed position and protect them against mechanical and thermal damage. Close all openings and ensure IP protection (min. IP66). Avoid temperature transfer and ensure not to exceed max. ambient temperature! For outdoor installation a protective shield against sun, rain and snow should be applied. Sensors are maintenance free. An annual inspection is recommended. For electrical installations inspection and maintenance, EN/IEC 60079-17 can be used. Clean with damp cloth only. Ex sensors must not be opened and repaired by the end user.

B. Long cabling

We recommend using shielded signal wires and to connect one end of the shield to the ...Bin... terminal box.

C. Separate ground wires

For supply and signal wires use separate grounds.

D. Relay output

Wires for safety extra-low voltage must be installed separately from other circuits. At 24 VAC/DC only supply and signal wires are permitted in one cable, in all other cases use separate or double isolated cables. An over-current protection fuse < 10 A has to be provided by the installer.

Installation

Hazardous (classified) locations			Nonhazardous locations
			Relais output 250 V AC / 0.1 A 220 V DC / 0.1 A 30 V AC/DC / 0.5 A
			Supply * 24 V AC/DC \pm 20 %
* electrical wiring see diagram			
<ul style="list-style-type: none"> Do not crack the capillary, note capillary's bending radius 			

A.6 Pressure switch/Differential pressure switch

Name	Data
Designation	Pressure switch/Differential pressure switch
Type	ExBin-P
Number	
Type of manual	Instruction manual
Manufacturer	Schischek



ExBin-P Pressure switches 5 Pa ... 5.000 Pa

Electrical, explosion-proof binary pressure/differential pressure switches

5 Pa...100 Pa with adjustable switch activation delay

24 VAC/DC supply voltage, output potential free switching contact

EC type-approved in acc. with ATEX directive 2014/34/EU for zone 1, 2, 21, 22

ExBin - P- ...
ExBin - P- ... - 2
ExBin - ... - CT
ExBin - ... - OCT
ExBin - ... - VA
ExBin - ... - OVA

Subject to change!

Compact. Easy installation. Universal. Cost effective. Safe.

Type	Switch	Supply	Range	min. Setting	max. Pressure	Activation delay	Output switch	Wiring diagram	
ExBin-P- 100	Pressure	24 VAC/DC	0... 100 Pa	5 Pa	5.000 Pa	0...240 s	potential free contact	SB 1.0	
ExBin-P- 500	Pressure	24 VAC/DC	0... 500 Pa	25 Pa	5.000 Pa	-	potential free contact	SB 1.0	
ExBin-P-5000	Pressure	24 VAC/DC	0...5.000 Pa	250 Pa	50.000 Pa	-	potential free contact	SB 1.0	
ExBin-P- ... - 2	Types ...P-500 und ...P-5000 as above with additional switching output							2 × potential free contact	SB 1.0
ExBin-P- ... - CT	Types as above with aluminium housing and seawater resistant coating (cable glands M16 brass nickel-plated, screws in stainless steel)								
ExBin-P- ... - OCT	Types as above, offshore version with aluminium housing and seawater resistant coating (stainless steel tubes for clamping ring connection, cable glands M20 brass nickel-plated, screws in stainless steel)								
ExBin-P- ... - VA	Types as above with stainless steel housing for aggressive ambient (cable glands M20 brass nickel-plated, screws in stainless steel)								
ExBin-P- ... - OVA	Types as above, offshore version with stainless steel housing for aggressive ambient (tubes for clamping ring connection and screws in stainless steel, cable glands M20 brass nickel-plated)								

Product views and applications Figures ...Bin-P-...-2



Description Highlights

The ExBin-P-... pressure switch generation from 5...5000 Pa (acc. to type) is a revolution for differential pressure switches in HVAC systems, in chemical, pharmaceutical, industrial and offshore/onshore plants, for use in hazardous areas zone 1, 2 (gas) and zone 21, 22 (dust). Highest protection class (ATEX) and IP66 protection, small dimensions, universal functions and technical data guarantee safe operation even under difficult environmental conditions. All pressure switches are programmable on site without any additional tools. The switching points are scalable within the maximum ranges. The integrated display is for parametrisation and an actual value indication at working mode (can be switched off as needed). ...Bin-P-...-2 sensors are equipped with an additional switching output (2-stage), which can be parametrised independently. ...Bin-P-...-OCT and ...-OVA offshore versions are equipped with stainless steel tubing Ø 6 mm.

- ▶ For all types of gases, mists, vapours and dust for use in zone 1, 2, 21 and 22
- ▶ Power supply 24 VAC/DC
- ▶ Potential free switching contact output
- ▶ Adjustable switching threshold, hysteresis and start-up bypass time
- ▶ Adjustable switch activation delay (acc. to type)
- ▶ Integrated Ex-e terminal box
- ▶ No additional Ex-i module required
- ▶ No intrinsically safe wiring/installation between panel and sensor required
- ▶ No intrinsically safe wiring/installation and no space in the panel required
- ▶ Optional second switching output (acc. to type)
- ▶ Display with backlight, can be switched off
- ▶ Password locking
- ▶ Down to -20 °C ambient temperature applicable
- ▶ Compact design and small dimension
- ▶ Robust aluminium housing (optional with seawater resistant coating) or in stainless steel
- ▶ IP66 protection
- ▶ Offshore versions with pressure tube connection for clamping ring Ø 6 mm



Technical data	...-P-100	...-P-500	...-P-5000
Supply voltage, frequency	24 VAC/DC $\pm 20\%$ (19,2...28,8 VAC/DC), 50/60 Hz		
Current, power consumption	150 mA, ~ 4 W, internal fuse 500 mA, without bracket, not removable		
Galvanic isolation	Supply for relay output min. 1,5 kV		
Electrical connection	Terminals 0,14...2,5 mm ² at integrated Ex-e terminal box, stripping length 9 mm, torque 0,4...0,5 Nm, equipotential bonding 4 mm ²		
Cable glands	2 x M16 x 1,5 mm, Ex-e approved, for cable diameter ~ \varnothing 5...9 mm		
Cable glands ...-CT	2 x M16 x 1,5 mm, Ex-e approved, brass nickel-plated, for cable diameter ~ \varnothing 6...10 mm		
...-VA, ...-OCT, ...-OVA	2 x M20 x 1,5 mm, Ex-e approved, brass nickel-plated, for cable diameter ~ \varnothing 6...13 mm		
Protection class	Class I (grounded)		
Display	LC-Display, backlight, for configuration, user guidance, parameter and actual value indication. Status indicator via LEDs		
Control elements	3 buttons for configuration		
Housing material	Aluminium die-cast housing, coated. Optional with seawater resistant coating (...-CT/...-OCT) or stainless steel housing, № 1.4581 / UNS-J92900 / similar AISI 316Nb (...-VA/...-OVA)		
Dimensions (L x W x H)	Aluminium housing ~ 180 x 107 x 66 mm, stainless steel housing ~ 195 x 127 x 70 mm (each without connectors)		
Weight	~ 950 g aluminium housing, stainless steel version ~ 2,5 kg		
Ambient temperature	-20...+50 °C, storage temperature -35...+70 °C		
Temperature class	Aluminium housing T6 (T80 °C) at -20...+50 °C Stainless steel housing T5 (T95 °C) at -20...+40 °C, T4 (T130 °C) at -20...+50 °C		
Ambient humidity	0...95 % rH, non condensing		
Sensor circuit	Internal intrinsically safe (IS) circuit		
Sensor	Piezo pressure transmitter, installation in Ex zone		
Pressure connection	P+ / P- sleeves \varnothing 4...6 mm. OCT versions have 2 stainless steel (316L) tube connections for clamp ring fittings \varnothing 6 mm		
Measuring range	0...100 Pa	0...500 Pa	0...5000 Pa
	Minimum measuring range is 5 % of full range (e.g. 25 Pa at ...500 Pa switch)		
Response time of sensor	T90 / 5 s		
Accuracy of pressure	< $\pm 1\%$ typically, max. $\pm 5\%$ of end value ± 1 Pa		
Setting range hysteresis	0,1...10 Pa (factory setting 2 Pa)	0,5...50 Pa (factory setting 10 Pa)	5...500 Pa (factory setting 100 Pa)
Start delay	5 s		
Start-up bypass time (AUB)	3...240 s (factory setting 120 s)		
Switch activation delay	0...240 s (factory setting 0 s / Off)	-	-
Setting zero point	Via menu. Short-circuit mechanically both tube connectors P+ / P- for the moment of zero point setting		
Output	Potential free switching contact – breaking/making contact, adjustable per menu max. rating load: 0,5 A (30 VAC/DC) – 0,1 A (250 VAC) – 0,1 A (220 VDC); min. rating load: 10 mW / 0,1 V / 1 mA		
Additional relay output (type ...-2)	-	as above	as above
Duration of life Mechanical	10 x 10 ⁶		
Electrical (rated load)	100 x 10 ³		
Wiring diagram	SB 1.0		
Scope of delivery	Pressure switch, 3 self-tapping screws 4,2 x 13 mm resp. in stainless steel (with ...CT and ...VA versions), short circuit tube		

Approbations	
ATEX directive	2014/34/EU
EC type-approved	EPS 14 ATEX 1 657
IECEx certified	IECEx EPS 14.0074
Approval for gas	II 2 (1) G Ex e mb [ia Ga] IIC T6...T4 Gb
Types ...-CT, ...-OCT	II 2 (1) G Ex e mb [ia Ga] IIB T6 Gb
Approval for dust	II 2 (1) D Ex tb [ia Da] IIIC T80°C...T130°C Db IP66
CE identification	CE № 0158
EMC directive	2014/30/EU
Enclosure protection	IP66 in acc. with EN 60529
EAC	TC RU C-DE.ГБ08.В.01510

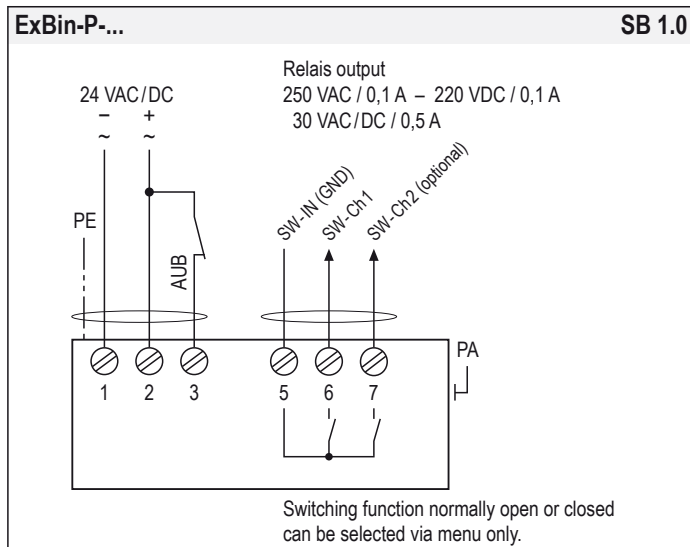
Special solutions and accessories	
...-CT	Types in aluminium housing with seawater resistant coating, parts nickel-plated
...-OCT	Offshore version in aluminium housing with seawater resistant coating, parts nickel-plated
...-VA	Types in stainless steel housing, parts nickel-plated
...-OVA	Offshore version in stainless steel housing, parts nickel-plated
MKR	Mounting bracket for round ducts up to \varnothing 600 mm
Kit 2	Flexible pressure tube, 2 m, inner \varnothing 6 mm, 2 connection nipples
Kit-S8-CBR	2 cable glands M16 x 1,5 mm, Ex-e, brass nickel-plated, for cable \varnothing 5...10 mm
Kit-Offs-GL-CBR	2 cable glands M20 x 1,5 mm, Ex-d, Ms-Ni, for armoured cables
Kit-PTC-CBR	2 connecting tubes for tube fittings \varnothing 6 mm, stainless steel 316 L

Electrical connection

All pressure switches require a 24 VAC/DC power supply. The electrical wiring must be realized via the integrated Ex-e terminal box acc. to ATEX. The terminals' type of protection is "Increased safety Ex-e".

Attention: Before opening the terminal box cover, the supply voltage must be shut off! The supply has to be connected at terminals 1 (-/-) and 2 (+/-). The start-up bypass delay (AUB) can be activated by bridging terminals 2-3. Activation is indicated by a flashing green LED.

At different relay and supply voltages (24 VAC/DC) the cable installation must be considered (see "Information for Installation")!

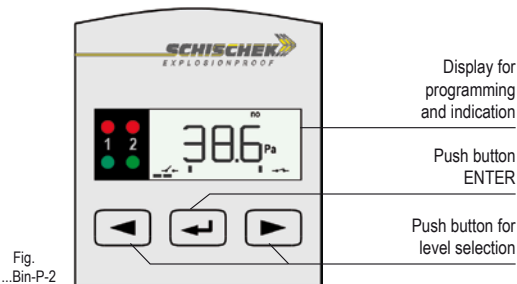


Zero point compensation

...Bin-P-... pressure switches are equipped with a zero point compensation to adjust the module to the installation position. The pressure nipples P+ / P- must be connected with a short circuit tube and the zero point compensation performed by following the menu for parametrisation (menu 14).

Before starting the zero point compensation, the device should be connected to power supply for a minimum of 15 minutes to reach the uniform working temperature!

Display, buttons and parameters



Change operation – parametrisation mode

To change from operation to parametrisation mode and vice versa, push ENTER button for minimum of 3 seconds. Back to operation mode with menu "save".

Indication of data logging

A flashing unit symbol (star) in the display shows that data is received and the device is working.

Password input

The default/delivery setup is 0000. In this configuration the password input is not activated. To activate the password protection (menu 15) change the 4 digits into your chosen numbers (e.g. 1234) and press ENTER. Please keep your password in mind for next parameter change! Due to a new parameter setup the password is requested.

Important information for installation and operation

A. Installation, commissioning, maintenance

All national and international standards, rules and regulations must be complied with. Certified apparatus must be installed in accordance with manufacturer instructions. If the equipment is used in a manner not specified by the manufacturer, the safety protection provided by the equipment may be impaired. For electrical installations design, selection and erection, EN/IEC 60079-14 can be used.

Attention: Apply all Ex rules and regulation before opening the internal terminal box. Do not open cover when circuits are live!

Draw the wiring cables through the cable glands. For connection use the internal Ex-e approved terminal box and connect equipotential bonding. After connection install the cables in a fixed position and protect them against mechanical and thermal damage. Close all openings and ensure IP protection (min. IP66). Avoid temperature transfer and ensure not to exceed max. ambient temperature! For outdoor installation a protective shield against sun, rain and snow should be applied. After mounting and installation a zero point compensation must be done to ensure correct measurement results (see description). Sensors are maintenance free. An annual inspection is recommended. For electrical installations inspection and maintenance, EN/IEC 60079-17 can be used. Clean with damp cloth only. Ex sensors must not be opened and repaired by the end user.

B. Long cabling

We recommend using shielded signal wires and to connect one end of the shield to the ...Bin-... terminal box.

C. Separate ground wires

For supply and signal wires use separate grounds.

D. Relais output

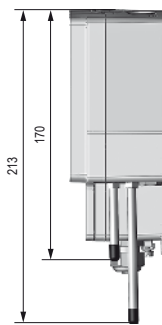
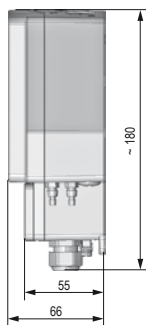
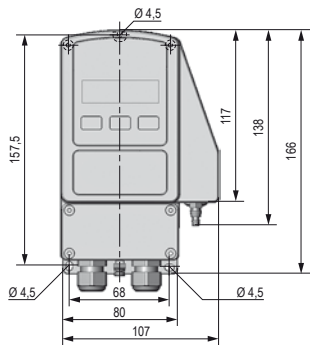
Wires for safety extra-low voltage must be installed separately from other circuits. At 24 VAC/DC only supply and signal wires are permitted in one cable, in all other cases use separate or double isolated cables. An over-current protection fuse < 10 A has to be provided by the installer.



Dimensions [mm]

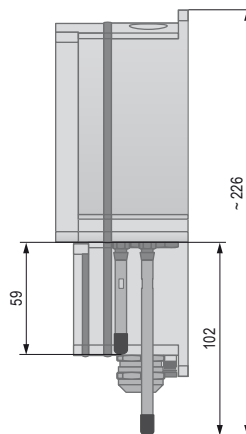
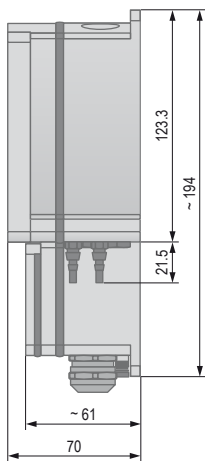
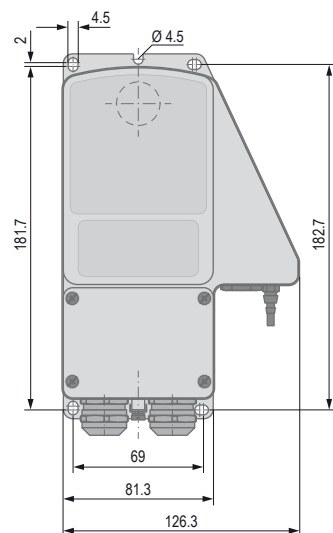
Aluminium housing

...Bin-P...-OCT



Stainless steel housing

...Bin-P...-OVA



Parametrisation and commissioning

To change from operation to parametrisation mode push the "ENTER" button for minimum 3 seconds. If password protected: type password and push. Skip menu with, back to operation mode with menu "save".

Operation -> Parametrisation push for min. 3 s



Table with 10 columns: Menu, Function, ENTER, Indication, Select, ENTER, Next indication, Select, ENTER, Next menu. Rows include Menu 1 (PSEt, PRO), Menu 2 (Unit, Pa), Menu 3 (SEt 1, 1000 Pa), Menu 4 (SEt 2, 4000 Pa), Menu 5 (HYSt, 100 Pa), Menu 6 (MODE, UP, NC), Menu 7 (no function).

Continue next page

ExBin-P_en V02 - 18-Oct-2016



Continue Parametrisation

Menu	Function	ENTER	Indication	Select	ENTER	Next indication	Select	ENTER	Next menu
Menu 8	no function – menu skip								
Menu 9	no function – menu skip								
Menu 10	no function – menu skip								
Menu 11	no function – menu skip								
Menu 12	time Select bypass (AUB) time		Menu 12 100			enter seconds for AUB			
Menu 13	display setting Select display		Menu 13 ON			on, off			
Menu 14	Zero point compensation Sensor's calibration for its installation position		Menu 14 FUN						
Menu 15	security Select password protection		Menu 15 0000			enter password			
Menu 16	save Select: save data, discard, back to menu, factory setting		Menu 16 YES			Yes, no, menu, dset (default setting)			(operation mode after "save")

* for ...Bin-P...-2 only (2-stage)

** adjustable in professional mode only (menu 1)

Menu 1 "pset" – Preset

For some applications you can select presetting to ease parametrisation. Besides fan belt („FAN“) and filter monitoring („FILT“) the professional mode („PRO“) is available for further applications.

Professional mode

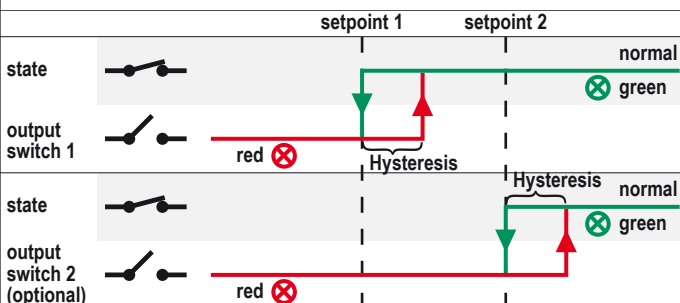
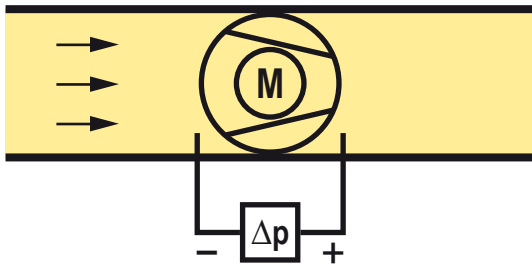
Menu 1
PRO

When this mode is selected the switching properties can be set at will per menu 5 ("hysteresis") and 6 ("mode") acc. to requirements.

Fan speed monitoring

Menu 1
FAN

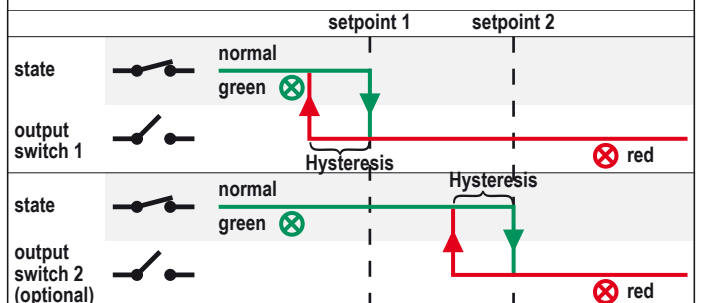
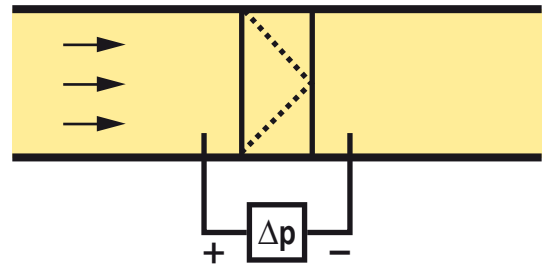
The preset "FAN" hides menu 5 ("hysteresis") and 6 ("mode") during parametrisation. The corresponding values are set automatically.



Filter monitoring

Menu 1
FILT

The preset "FILT" hides menu 5 ("hysteresis") and 6 ("mode") during parametrisation. The corresponding values are set automatically.



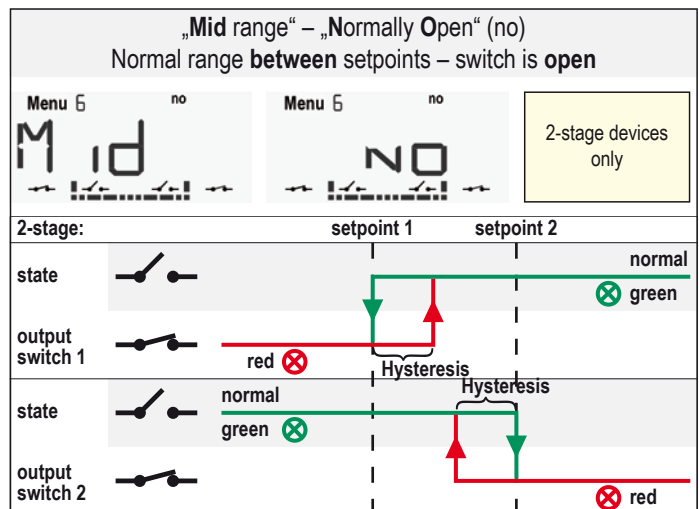
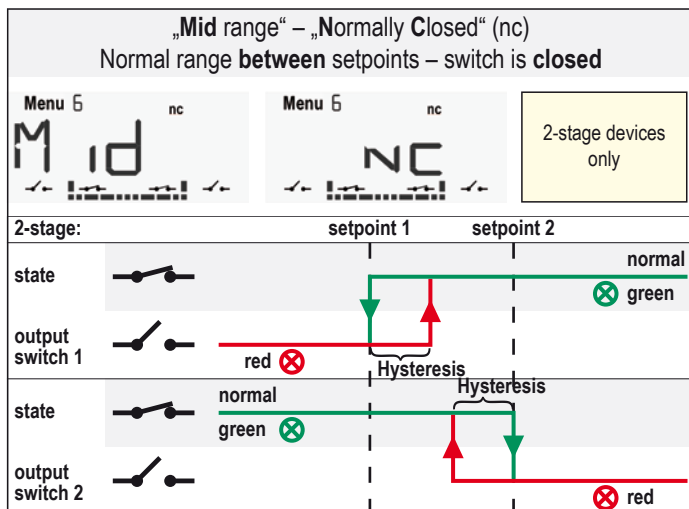
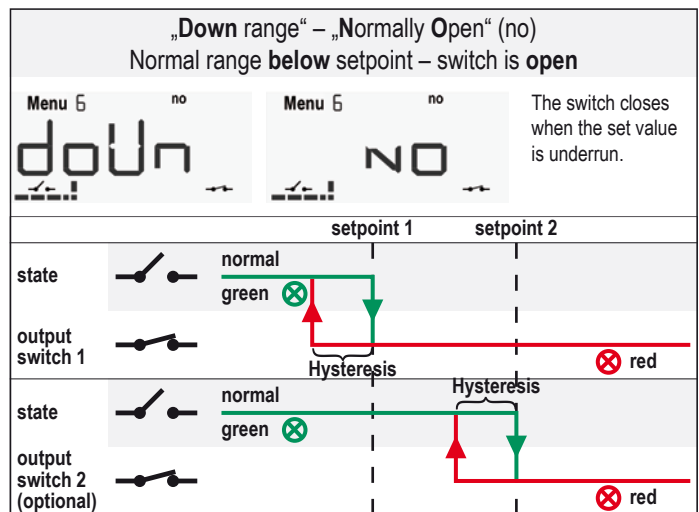
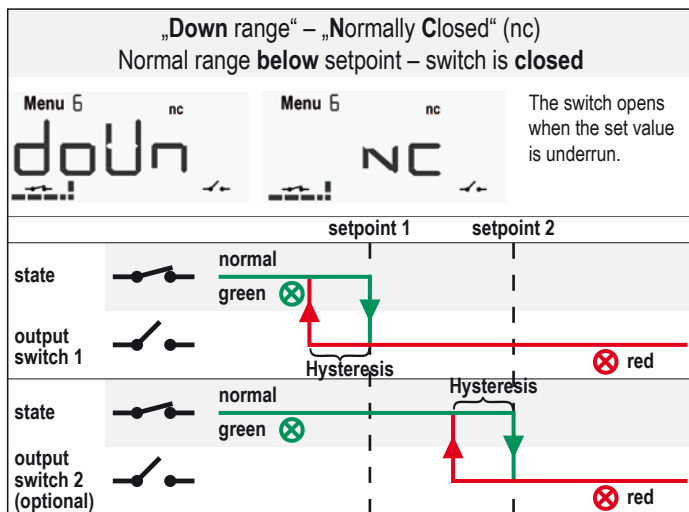
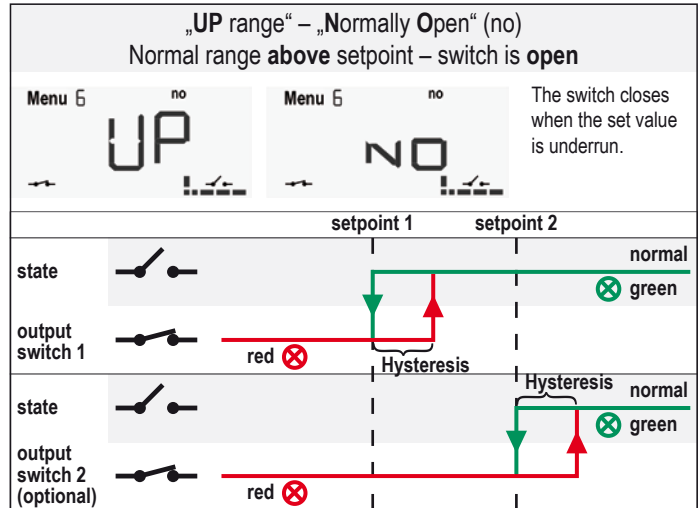
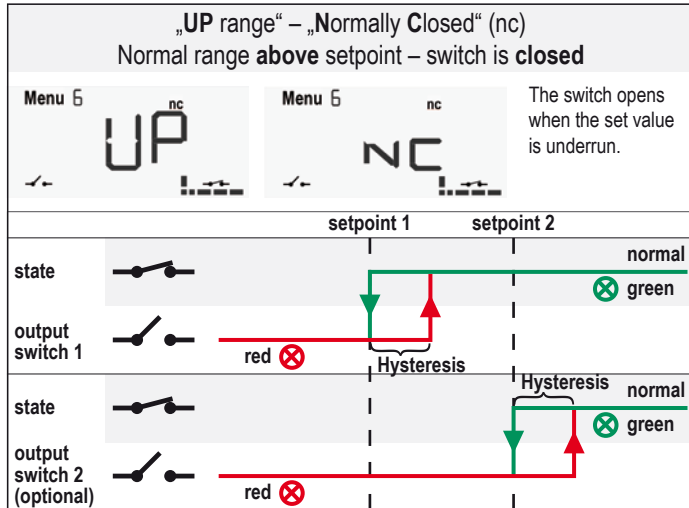
Menu 6 "mode" – Switching properties

1. Define the device's normal range first:

- The device should indicate (green LED) when the temperature/humidity is
 - above the setpoints – mode „up-range“ has to be selected.
 - under the setpoints – mode „down-range“ has to be selected.
 - between the setpoints – mode „mid-range“ has to be selected.
- This mode is available for 2-stage devices only (...Bin-P...-2).

2. Select the switching characteristic of the output relay:

- When the measured value is in normal range, the corresponding relays shall
 - close – select "normally closed" (nc)
 - open – select "normally open" (no)



A.7 Pressure sensors

Name	Data
Designation	Pressure sensors
Type	ExCos-P
Number	
Type of manual	Instruction manual
Manufacturer	Schischek



ExCos-P Pressure sensor 20 Pa ... 7.500 Pa

Electrical, explosion-proof pressure/differential pressure sensors
24 VAC/DC supply voltage, 0...10 V/(0)4...20 mA analogue output
EC type-approved in acc. with ATEX directive 2014/34/EU for zone 1, 2, 21, 22

ExCos - P- ...
ExCos - P- ... - A
ExCos - ... - CT
ExCos - ... - OCT
ExCos - ... - VA
ExCos - ... - OVA

Subject to change!

Compact. Easy installation. Universal. Cost effective. Safe.

Type	Sensor	Supply	Range	min. Setting	max. Pressure	Output	Ex-i output	Wiring diagram
ExCos-P-100	Pressure/Diff. press.	24 VAC/DC	± 100 Pa	20 Pa	25.000 Pa	(0)4...20 mA / 0...10 V	-	SB 1.0
ExCos-P-250	Pressure/Diff. press.	24 VAC/DC	± 250 Pa	50 Pa	25.000 Pa	(0)4...20 mA / 0...10 V	-	SB 1.0
ExCos-P-500	Pressure/Diff. press.	24 VAC/DC	± 500 Pa	100 Pa	50.000 Pa	(0)4...20 mA / 0...10 V	-	SB 1.0
ExCos-P-1250	Pressure/Diff. press.	24 VAC/DC	± 1.250 Pa	250 Pa	50.000 Pa	(0)4...20 mA / 0...10 V	-	SB 1.0
ExCos-P-2500	Pressure/Diff. press.	24 VAC/DC	± 2.500 Pa	500 Pa	50.000 Pa	(0)4...20 mA / 0...10 V	-	SB 1.0
ExCos-P-5000	Pressure/Diff. press.	24 VAC/DC	± 5.000 Pa	1.000 Pa	75.000 Pa	(0)4...20 mA / 0...10 V	-	SB 1.0
ExCos-P-7500	Pressure/Diff. press.	24 VAC/DC	± 7.500 Pa	1.500 Pa	120.000 Pa	(0)4...20 mA / 0...10 V	-	SB 1.0
ExCos-P-...-A	Types as above with additional intrinsically safe analogue output to connect an external digital indicator						(0)4...20 mA	SB 3.1
ExCos-P-...-CT	Types as above with aluminium housing and seawater resistant coating (cable glands M16 brass nickel-plated, screws in stainless steel)							
ExCos-P-...-OCT	Types as above, offshore version with aluminium housing and seawater resistant coating (stainless steel tubes for clamping ring connection, cable glands M20 brass nickel-plated, screws in stainless steel)							
ExCos-P-...-VA	Types as above with stainless steel housing for aggressive ambient (cable glands M20 brass nickel-plated, screws in stainless steel)							
ExCos-P-...-OVA	Types as above, offshore version with stainless steel housing for aggressive ambient (tubes for clamping ring connection and screws in stainless steel, cable glands M20 brass nickel-plated)							

Product views and applications

Pressure/Differential press.



...Cos-P...-CT



...Cos-P...-VA



Offshore ...-OCT



Offshore ...-OVA



Description

The ExCos-P... pressure sensor generation from ± 100 Pa to ± 7.500 Pa (acc. to type) is a revolution for differential pressure measuring in HVAC systems, in chemical, pharmaceutical, industrial and offshore/onshore plants, for use in hazardous areas zone 1, 2 (gas) and zone 21, 22 (dust).

Highest protection class (ATEX) and IP66 protection, small dimensions, universal functions and technical data guarantee safe operation even under difficult environmental conditions.

All sensors are programmable on site without any additional tools. The measuring ranges are scalable within the maximum ranges. At ...Cos-P-100 the smallest ΔP range is 20 Pa. The analogue output signal is either 0...10 VDC or (0)4...20 mA and can be selected on site. The integrated display is for parametrisation and an actual value indication at working mode (can be switched off as needed).

...Cos-P...-A sensors are equipped with an additional intrinsically safe (IS) output, e.g. for an external indicator.

...Cos-P...-OCT and ...-OVA offshore versions are equipped with stainless steel tubing Ø 6 mm.

Highlights

- ▶ For all types of gases, mists, vapours and dust for use in zone 1, 2, 21 and 22
- ▶ Power supply 24 VAC/DC
- ▶ Scalable analogue output, selectable 0...10 V / (0)4...20 mA
- ▶ Integrated Ex-e terminal box
- ▶ No additional Ex-i module required
- ▶ No intrinsically safe wiring/installation between panel and sensor required
- ▶ No intrinsically safe wiring/installation and no space in the panel required
- ▶ Optional IS-output (0)4...20 mA for external indicator in Ex-areas
- ▶ Display with backlight, can be switched off
- ▶ Password locking
- ▶ Down to -20 °C ambient temperature applicable
- ▶ Compact design and small dimension
- ▶ Robust aluminium housing (optional with seawater resistant coating) or in stainless steel
- ▶ IP66 protection
- ▶ Offshore versions with pressure tube connection for clamping ring Ø 6 mm


Technical data

Supply voltage, frequency	24 VAC/DC $\pm 20\%$ (19,2...28,8 VAC/DC), 50/60 Hz
Current, power consumption	150 mA, ~ 4 W, internal fuse 500 mA, without bracket, not removable
Galvanic isolation	Supply for analogue in- and outputs min. 1,5 kV, supply for relay output min. 1,5 kV
Electrical connection	Terminals 0,14...2,5 mm ² at integrated Ex-e terminal box, stripping length 9 mm, torque 0,4...0,5 Nm, equipotential bonding 4 mm ²
Cable glands	2 x M16 x 1,5 mm, Ex-e approved, for cable diameter ~ \varnothing 5...9 mm
Cable glands ...-CT	2 x M16 x 1,5 mm, Ex-e approved, brass nickel-plated, for cable diameter ~ \varnothing 6...10 mm
...-VA, ...-OCT, ...-OVA	2 x M20 x 1,5 mm, Ex-e approved, brass nickel-plated, for cable diameter ~ \varnothing 6...13 mm
Protection class	Class I (grounded)
Display	2 x 16 digits, dot-matrix display, backlit, for configuration, user guidance, parameter and actual value indication
Control elements	3 buttons for configuration
Housing material	Aluminium die-cast housing, coated. Optional with seawater resistant coating (...-CT/...-OCT) or stainless steel housing, № 1.4581 / UNS-J92900 / similar AISI 316Nb (...-VA/...-OVA)
Dimensions (L x W x H)	Aluminium housing ~ 180 x 107 x 66 mm, stainless steel housing ~ 195 x 127 x 70 mm (each without connectors)
Weight	~ 950 g aluminium housing, stainless steel version ~ 2,5 kg
Ambient temperature	-20...+50 °C, storage temperature -35...+70 °C
Temperature class	Aluminium housing T6 (T80 °C) at -20...+50 °C Stainless steel housing T5 (T95 °C) at -20...+40 °C, T4 (T130 °C) at -20...+50 °C
Ambient humidity	0...95 % rH, non condensing
Sensor circuit	Internal intrinsically safe (IS) circuit
Sensor	Piezo pressure transmitter
Pressure connection	P+ / P- sleeves \varnothing 4...6 mm. OCT versions have 2 stainless steel (316L) tube connections for clamp ring fittings \varnothing 6 mm
Measuring range	± 100 Pa, ± 250 Pa, ± 500 Pa, ± 1.250 Pa, ± 2.500 Pa, ± 5.000 Pa, ± 7.500 Pa in acc. to type Minimum measuring range is 20 % of full range (e.g. 20 Pa at ± 100 Pa sensor)
Response time of sensor	T90 / 5 s
Accuracy of pressure	< $\pm 1\%$ typically, max. $\pm 2\%$ of end value ± 1 Pa
Non linearity and hysteresis	$\pm 0,05\%$ typically, max. 0,25 % of end value
Start delay	5 s
Setting zero point	Via menu. Short-circuit mechanically both tube connectors P+ / P- for the moment of zero point setting
Stability	Long term stability < 0,2 %/year, temperature influence < 0,02 %/K, supply voltage influence < 0,01 %
Output	Voltage U [V] or current I [mA], selectable on site via menu, protected against short circuit and external voltage up to 24 V and against polarity reversal
Voltage output U	0...10 VDC adjustable, invertible, burden > 1 k Ω , influence < 0,05 %/100 Ω
Current output I	0...20 mA adjustable, invertible, burden < 500 Ω , influence < 0,1 %/100 Ω , open circuit voltage < 24 V
Output in alarm mode	Increasing or decreasing output signal, selectable on site, down to 0 VDC/0 mA or up to 10 VDC/20 mA
Wiring diagram	SB 1.0
Scope of delivery	Sensor, 3 self-tapping screws 4,2 x 13 mm resp. in stainless steel (with ...CT and ...VA versions), short circuit tube Cos-P...-A with 1 additional plug for cable \varnothing 6...8 mm
Parameter at delivery	min./max. pressure range limits (e.g. ExCos-P-100 = -100...+100 Pa), output 4...20 mA, output in alarm mode decreasing to 0 V/0 mA
...Cos-P...-A	as above and 1 additional intrinsically safe analogue output
Ex-i analogue output	(0)4...20 mA, intrinsically safe (IS), burden max. 400 Ω
Accuracy	$\pm 0,5\%$
Wiring diagram	SB 3.1

Approbations

ATEX directive	2014/34/EU
EC type-approved	EPS 14 ATEX 1 655 X
IECEx certified	IECEx EPS 14.0022X
Approval for gas	II 2 (1) G Ex e ma [ja Ga] IIC T6...T4 Gb Types ...-CT, ...-OCT II 2 (1) G Ex e ma [ja Ga] IIB T6 Gb
Approval for dust	II 2 (1) D Ex tb [ja Da] IIC T80°C...T130°C Db IP66
CE identification	CE № 0158
EMC directive	2014/30/EU
Enclosure protection	IP66 in acc. with EN 60529
EAC	TC RU C-DE.ГБ08.В.01510

Special solutions and accessories

...-CT	Types in aluminium housing with seawater resistant coating, parts nickel-plated
...-OCT	Offshore version in aluminium housing with seawater resistant coating, parts nickel-plated
...-VA	Types in stainless steel housing, parts nickel-plated
...-OVA	Offshore version in stainless steel housing, parts nickel-plated
EXC-RIA-16	LCD indicator (IS) for Ex-/RedCos... sensors in Ex-zones 1, 2, 21, 22
MKR	Mounting bracket for round ducts up to \varnothing 600 mm
Kit 2	Flexible pressure tube, 2 m, inner \varnothing 6 mm, 2 connection nipples
Kit-S8-CBR	2 cable glands M16 x 1,5 mm, Ex-e, brass nickel-plated, for cable \varnothing 5...10 mm
Kit-Offs-GL-CBR	2 cable glands M20 x 1,5 mm, Ex-d, Ms-Ni, for armoured cables
Kit-PTC-CBR	2 connecting tubes for tube fittings \varnothing 6 mm, stainless steel 316 L

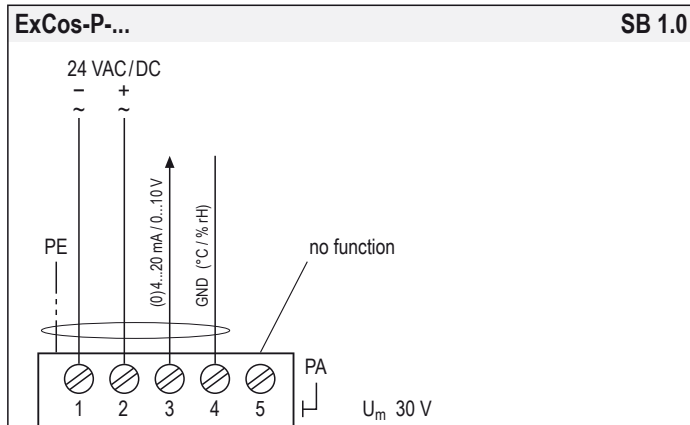


Electrical connection

All sensors require a 24 VAC/DC power supply. The electrical wiring must be realized via the integrated Ex-e terminal box acc. to ATEX. The terminals' type of protection is "Increased safety Ex-e".

Attention: Before opening the terminal box cover, the supply voltage must be shut off! The supply has to be connected at terminals 1 (-/~/) and 2 (+/~/), the analogue output at terminals 3 (mA/V) and 4 (GND).

The optional analogue output at ...Cos-P...-A is intrinsically safe. Note the maximum connection values of intrinsically safe parameters (see table below).

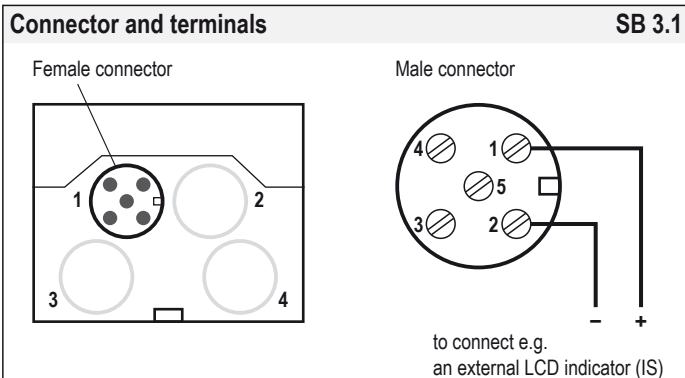


Intrinsically safe parameters (IS) – Internal pressure sensor

$U_o = 7.9 \text{ V}$	$C_i \rightarrow 0$		
$I_o = 48 \text{ mA}$	$L_i \rightarrow 0$		
$P_o = 95 \text{ mW}$			
		IIC	IIB
		L_o	10 mH
		C_o	$7.1 \mu\text{F}$

Internal sensor IS values are corresponding to the internal pressure sensor. Due to the matter of fact that there is no external sensor connected, these IS values are not relevant for the customer but shown for the sake of completeness.

Ex-i output (IS) (optional) – ExCos-P...-A



Intrinsically safe parameters (IS) – Analogue Ex-i output

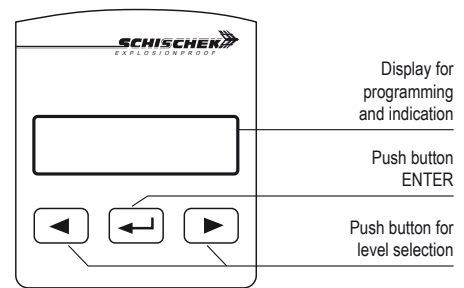
$U_o = 15.8 \text{ V}$	$C_i \rightarrow 0$		
$I_o = 85 \text{ mA}$	$L_i \rightarrow 0$		
$P_o = 336 \text{ mW}$			
		IIC	IIB
		L_o	10 mH
		C_o	$1.8 \mu\text{F}$

Zero point compensation

...Cos-P... pressure sensors are equipped with a zero point compensation to adjust the module to the installation position. The pressure nipples P+ / P- must be connected with a short circuit tube and the zero point compensation performed by following the menu for parametrisation (menu 18).

Before starting the zero point compensation, the device should be connected to power supply for a minimum of 15 minutes to reach the uniform working temperature!

Display, buttons and parameters



Change operation – parametrisation mode

To change from operation to parametrisation mode and vice versa, push ENTER button for minimum of 3 seconds. Back to operation mode with menu "save".

Indication of data logging

A flashing star in the display shows that data is received and the device is working.

Password input

The default/delivery setup is 0000. In this configuration the password input is not activated. To activate the password protection (menu 20) change the 4 digits into your chosen numbers (e.g. 1234) and press ENTER.

Please keep your password in mind for next parameter change! Due to a new parameter setup the password is requested.

Important information for installation and operation

A. Installation, commissioning, maintenance

All national and international standards, rules and regulations must be complied with. Certified apparatus must be installed in accordance with manufacturer instructions. If the equipment is used in a manner not specified by the manufacturer, the safety protection provided by the equipment may be impaired. For electrical installations design, selection and erection, EN/IEC 60079-14 can be used.

Attention: Apply all Ex rules and regulation before opening the internal terminal box. Do not open cover when circuits are live!

Draw the wiring cables through the cable glands. For connection use the internal Ex-e approved terminal box and connect equipotential bonding.

After connection install the cables in a fixed position and protect them against mechanical and thermal damage. Close all openings and ensure IP protection (min. IP66).

Avoid temperature transfer and ensure not to exceed max. ambient temperature! For outdoor installation a protective shield against sun, rain and snow should be applied.

After mounting and installation a zero point compensation must be done to ensure correct measurement results (see description).

Sensors are maintenance free. An annual inspection is recommended. For electrical installations inspection and maintenance, EN/IEC 60079-17 can be used.

Clean with damp cloth only.

Ex sensors must not be opened and repaired by the end user.

B. Long cabling

We recommend using shielded signal wires and to connect one end of the shield to the ...Cos... terminal box.

C. Separate ground wires

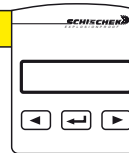
For supply and signal wires use separate grounds.



Parametrisation and commissioning

To change from operation to parametrisation mode push the "ENTER" button (↵) for minimum 3 seconds.
If password protected: type password and push (↵).
Back over to menu "Save" and exit.

Operation → Parametrisation
push (↵) for min. 3 s



Example: Menu language English
Range -25...+25 Pa
Output 4...20 mA
Output Ex-i 0...20 mA

Menu	Function	ENTER	Indication	Select	ENTER	Next indication	Select	ENTER	Next menu
Menu 1	DE, EN, FR Select language: German, English, French	(↵)	DE, EN, FR English	(←) (→)	(↵)				(→)
Menu 2	no function – menu skip		Deutsch, English, Francais						
Menu 3	no function – menu skip								
Menu 4	Unit sensor Select physical unit	(↵)	unit sensor Pa	(←) (→)	(↵)				(→)
Menu 5	Range Adjust the measuring range	(↵)	range -25...100 Pa	(←) (→)	(↵)	range -25...25 Pa	(←) (→)	(↵)	(→)
Menu 6	no function – menu skip		← adjust lower limit			← adjust higher limit			
Menu 7	Output V, mA Select output signal as V or mA		output V/mA mA	(←) (→)	(↵)				(→)
Menu 8	Output range Adjust output range		output range 4...20 mA	(←) (→)	(↵)	output range 4...20 mA	(←) (→)	(↵)	(→)
Menu 9	Sensor error Select signal at sensor error		sensor error 10 V/20 mA	(←) (→)	(↵)				(→)
Menu 10	Output ↕ Select signal output behaviour		output ↕ increasing	(←) (→)	(↵)				(→)
Menu 11	no function – menu skip		↕ increasing, decreasing						
Menu 12	no function – menu skip								
Menu 13	no function – menu skip								
Menu 14	no function – menu skip								
Menu 15	no function – menu skip								
Menu 16	Output Ex-i (option, only at ...Cos-P...-A) Select lower output signal: 0 mA resp. 4 mA (0...20 or 4...20 mA)	(↵)	output Ex-i 0...20 mA	(←) (→)	(↵)	output Ex-i 0...20 mA	(←) (→)	(↵)	(→)
Menu 17	no function – menu skip		← adjust lower limit			← adjust higher limit			
Menu 18	Zero point compensation After short circuit the pressure nipples P+/P- the sensor gets a zero point calibration		set zero point yes no	(←) (→)	(↵)				(→)
Menu 19	Display function Select display settings	(↵)	display function on illuminated	(←) (→)	(↵)				(→)
Menu 20	Password Select password protection	(↵)	new password yes no	(←) (→)	(↵)	password 0000	(←) (→)	(↵)	(→)
Menu 21	Save and exit Select: save data, factory setting, discard or back to menu	(↵)	save and exit save data	(←) (→)	(↵)				(→)
Menu 22	Set offset Add/subtract offset from measure value	(↵)	set offset 0.00 Pa	(←) (→)	(↵)				(→)
Menu 23	no function – menu skip								
Menu 24	Attenuation Damping the output signal (signal filter)	(↵)	attenuation 0	(←) (→)	(↵)				(→)

B Safety data sheets

B.1 Compressor oil

EMKARATE RL 32-3MAF
Material Safety Data Sheet
Date(s) : 2005-09-12 15:50:00
Version 3
MSDS#: 808802

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name	EMKARATE RL 32-3MAF
Product Use	Lubricant
Address/Telephone number	Uniqema Uniqema Corporate Center 1000 Uniqema Boulevard New Castle, DE 19720-2790 Uniqema Operator (Mon.-Fri., 8:15 AM - 4:30 PM Eastern): (302) 574-5000 Medical Emergency (24 hr.): (888) 456-6218 Transportation Emergency Involving Chemical Spills, Leaks, Fires, or Accidents (24 hr.): (800) 424-9300

Uniqema is an international business of Imperial Chemical Industries PLC.
Uniqema operates through ICI affiliated companies in the relevant countries such as ICI Americas Inc., Unichema, a division of ICI Uniqema Inc., and Mona Industries Inc. in the USA.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% (w/w)	OSHA PEL	ACGIH TLV
Polyol ester	---	>99	No PEL established	No TLV established
Additives	---	<1	No PEL established	No TLV established

Ingredients not precisely identified are proprietary or nonhazardous.
Values are not product specifications.

3. HAZARDS IDENTIFICATION

EMKARATE RL 32-3MAF

Material Safety Data Sheet

Date(s) : 2005-09-12 15:50:00

Version 3

MSDS#: 808802

Emergency Overview

Color	clear yellow
Form	Liquid
Odor	No data.

INHALATION OR INGESTION MAY CAUSE MUCOUS MEMBRANE IRRITATION.
MAY CAUSE EYE IRRITATION
REPEATED/PROLONGED CONTACT MAY CAUSE SKIN IRRITATION.

Routes of Exposure Eye contact Skin contact Inhalation

Eye contact	May cause eye irritation in man.
Skin contact	Short contact periods with human skin are not usually associated with skin irritation. Repeated contact can result in slight skin irritation. Prolonged contact can result in slight skin irritation. Systemically toxic concentrations of this product will probably not be absorbed through human skin.
Inhalation	High concentrations of mists or aerosols may irritate respiratory passages. No toxic effects are known to be associated with inhalation of this material.
Ingestion	In humans, irritation of the mouth, pharynx and esophagus can develop following ingestion of this product. No toxic effects are expected following ingestion of this product.
Other	Not listed by ACGIH, IARC, NIOSH, NTP OR OSHA.

4. FIRST AID MEASURES

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Eye contact	Immediately flush with plenty of water for at least 15 minutes. If redness, itching, or a burning sensation develops, have eyes examined and treated by medical personnel.
Skin contact	Wash material off of the skin with plenty of soap and water. If redness, itching, or a burning sensation develops, get medical attention.
Inhalation	Remove victim to fresh air. If a cough or other respiratory symptoms develop, consult medical personnel.
Ingestion	DO NOT INDUCE VOMITING. Give one or two glasses of water to drink and refer to medical personnel or take direction from either a physician or a poison control center. Never give anything by mouth to an unconscious person.

5. FIRE-FIGHTING MEASURES

Flash Point (°F)	> 392
Flash Point (°C)	> 200
Autoignition Temperature (°F)	No data.
Autoignition Temperature (°C)	No data.
Flammable Limits	No data.
Extinguishing Media	Water fog, alcohol foam, carbon dioxide, dry chemical.
Special fire-fighting protective equipment	A self contained breathing apparatus and suitable protective clothing must be worn in fire conditions.
Fire and explosion hazards	None known.
Explosion data	
Sensitivity to mechanical impact	No data.
Sensitivity to static discharge	No data.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Refer to section 8 for proper personal protective equipment.
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Steps to be taken in case material is released or spilled

Contain spill.
Soak up material with absorbent and shovel into a chemical waste container.
Wash residue from spill area with water containing detergent and flush to a sewer serviced by a permitted wastewater treatment facility.

7. HANDLING AND STORAGE

Handling

Prevent eye contact.
Prevent skin contact.
Avoid breathing this material.
Do not swallow.

Storage

50 - 70 ° F
Store in original containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limits

OSHA PEL

Component Name

No OSHA PEL assigned. Minimize exposure in accordance with good hygiene practice.

Exposure limits

Notes

ACGIH TLV

Component Name

No ACGIH TLV assigned. Minimize exposure in accordance with good hygiene practice.

Exposure limits

Notes

Engineering controls

Eye protection

Protective clothing

Provide adequate ventilation.
Chemical tight goggles.
Impervious gloves.

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Respiratory protection

Respiratory protection is not normally needed if controls are adequate.

Other

Eyewash and safety shower easily accessible to the work area.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color	clear yellow
Form	Liquid
Odor	No data.
pH	No data.
Boiling Point (°F)	No data.
Boiling Point (°C)	No data.
Flash Point (°F)	> 392
Flash Point (°C)	> 200
Autoignition Temperature (°F)	No data.
Autoignition Temperature (°C)	No data.
Flammable Limits	No data.
Explosive Properties	No data.
Oxidizing Properties	No data.
Specific Gravity	~1
Solubility (water)	Insoluble
Solubility (other)	No data.
Partition Coefficient	No data.

10. STABILITY AND REACTIVITY

Stability	Stable under normal conditions.
Materials to avoid	Strong oxidizing agents.
Conditions to avoid	None known.
Hazardous decomposition products	Carbon dioxide, carbon monoxide.
Hazardous polymerization	Will not occur.

11. TOXICOLOGICAL INFORMATION

No data available on this material.

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Toxicologically synergistic products None known.

12. ECOLOGICAL INFORMATION

No data is available on this product.

13. DISPOSAL CONSIDERATIONS

RCRA (Resource Conservation and Recovery Act) Classification:

Specifically Listed Wastes	Not applicable.	
Characteristic Wastes	Ignitability	Not applicable.
	Corrosivity	Not applicable.
	Reactivity	Not applicable.
	Toxicity	Not applicable.

Disposal method Disposal should be in accordance with local, state or national legislation.

Container disposal Empty container retains product residue. Observe all hazard precautions. Do not distribute, make available, furnish or reuse empty container except for storage and shipment of original product. Remove all product residue from container and puncture or otherwise destroy empty container before disposal.

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14. TRANSPORT INFORMATION

Department of Transportation:
Not regulated.

TDG (Transportation of Dangerous Goods):
Not regulated.

Not classified in RID/ADR - ADNR - IMDG - ICAO/IATA-DGR.

15. REGULATORY INFORMATION

Inventory Status

USA (TSCA) Compliant.

OSHA Hazard Communication Standard, 29 CFR 1910.1200, Hazard Summary:

Health Hazards Irritant (eye)
Physical Hazards None

WHMIS Classification Class D, Division 2 -- Toxic.

CERCLA and SARA Regulations (40 CFR 355, 370, and 372):

**This material contains the following
chemicals subject to the reporting
requirements of SARA 313:** No 313-listed
chemicals in this
product

SARA 311/312 Hazard Categories:

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Immediate	Y
Delayed	N
Fire	N
Pressure	N
Reactivity	N

16. OTHER INFORMATION

We assigned NFPA ratings and HMIS ratings to this product based on the hazards of its ingredient(s). Because the customer is most aware of the application of the product, he must ensure that the proper personal protective equipment (PPE) is provided consistent with information contained in the product MSDS.

HMIS Information

Health	1
Flammability	1
Physical Hazards	0

The HMIS ratings displayed above are from the HMIS III Third Edition. There have been significant changes made to the system. "Physical hazard" stands for physical hazard as defined in the OSHA Hazard Communication Standard and replaces the former code for reactivity. For a more detailed explanation of the system and the ratings, please contact our Product Safety and Regulatory Affairs group.

NFPA Information

Health	1
Flammability	1
Reactivity	0

This information is intended solely for the use of individuals trained in the particular hazard rating system.

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The following sections contain revisions or new statements:

The information herein is given in good faith but no warranty, expressed or implied, is made. (R) is a Registered Trademark of ICI Americas. (TM) is a Trademark of ICI Americas.

See also www.uniqema.com

B.2 Freezing agent

**DuPont™ Suva® 410A Refrigerant**

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

This SDS adheres to the standards and regulatory requirements of the United States and may not meet the regulatory requirements in other countries.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : DuPont™ Suva® 410A Refrigerant
Tradename/Synonym : Suva® 9100
R-410A
Suva® R-410A
410A
HFC 410A

Product Grade/Type : ASHRAE Refrigerant number designation: R-410A

Product Use : Refrigerant, For professional users only.

Restrictions on use : Do not use product for anything outside of the above specified uses
Manufacturer/Supplier : DuPont
1007 Market Street
Wilmington, DE 19898
United States of America

Product Information : +1-800-441-7515 (outside the U.S. +1-302-774-1000)
Medical Emergency : 1-800-441-3637 (outside the U.S. 1-302-774-1139)
Transport Emergency : CHEMTREC: +1-800-424-9300 (outside the U.S. +1-703-527-3887)

SECTION 2. HAZARDS IDENTIFICATION

Product hazard category
Gases under pressure Liquefied gas

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Label content

Pictogram

:



Signal word

: Warning

Hazardous warnings

: Contains gas under pressure; may explode if heated.

Hazardous prevention
measures

: Protect from sunlight. Store in a well-ventilated place.

Other hazards

Misuse or intentional inhalation abuse may lead to death without warning.

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Rapid evaporation of the liquid may cause frostbite.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Pentafluoroethane (HFC-125)	354-33-6	50 %
Difluoromethane (HFC-32)	75-10-5	50 %

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SECTION 4. FIRST AID MEASURES

- General advice : Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt seek medical advice.
- Inhalation : Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.
- Skin contact : Take off contaminated clothing and shoes immediately. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.
- Eye contact : Rinse immediately with plenty of water and seek medical advice.
- Ingestion : Is not considered a potential route of exposure.
- Most important symptoms/effects, acute and delayed : Anaesthetic effects Light-headedness irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness
- Protection of first-aiders : If potential for exposure exists refer to Section 8 for specific personal protective equipment.
- Notes to physician : Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, that may be used in situations of emergency life support should be used with special caution.

SECTION 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Unsuitable extinguishing media : No applicable data available.

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- Specific hazards** : Cylinders are equipped with pressure and temperature relief devices, but may still rupture under fire conditions. Decomposition may occur. Contact of welding or soldering torch flame with high concentrations of refrigerant can result in visible changes in the size and colour of the torch flame. This flame effect will only occur in concentrations of product well above the recommended exposure limit. Therefore stop all work and ventilate to disperse refrigerant vapors from the work area before using any open flames. This substance is not flammable in air at temperatures up to 100 deg. C (212 deg. F) at atmospheric pressure. However, mixtures of this substance with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. This substance can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing this substance and air, or this substance in an oxygen enriched atmosphere become combustible depends on the inter-relationship of 1) the temperature 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, this substance should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example this substance should NOT be mixed with air under pressure for leak testing or other purposes. Experimental data have also been reported which indicate combustibility of this substance in the presence of certain concentrations of chlorine.
- Special protective equipment for firefighters** : In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment. Wear neoprene gloves during cleaning up work after a fire.
- Further information** : Cool containers/tanks with water spray. Self-contained breathing apparatus (SCBA) is required if containers rupture and contents are released under fire conditions.
Water runoff should be contained and neutralized prior to release.

SECTION 6. ACCIDENTAL RELEASE MEASURES

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

- Safeguards (Personnel)** : Evacuate personnel to safe areas. Ventilate area, especially low or enclosed places where heavy vapours might collect.

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- Environmental precautions : Should not be released into the environment. In accordance with local and national regulations.
- Spill Cleanup : Evaporates. Ventilate area using forced ventilation, especially low or enclosed places where heavy vapors might collect.
- Accidental Release Measures : Avoid open flames and high temperatures. Self-contained breathing apparatus (SCBA) is required if a large release occurs.

SECTION 7. HANDLING AND STORAGE

- Handling (Personnel) : Avoid breathing vapours or mist. Avoid contact with skin, eyes and clothing. Provide sufficient air exchange and/or exhaust in work rooms. For personal protection see section 8.
- Handling (Physical Aspects) : The product should not be mixed with air for leak testing or used with air for any other purpose above atmospheric pressure. Contact with chlorine or other strong oxidizing agents should also be avoided.
- Dust explosion class : Not applicable
- Storage : Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over.
Separate full containers from empty containers. Keep at temperature not exceeding 52°C. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present.
The product has an indefinite shelf life when stored properly.
- Storage period : > 10 yr
- Storage temperature : < 52 °C (< 126 °F)

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION



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- Engineering controls : Use sufficient ventilation to keep employee exposure below recommended limits. Local exhaust should be used when large amounts are released. Mechanical ventilation should be used in low or enclosed places. Refrigerant Concentration monitors may be necessary to determine vapor concentrations in work areas prior to use of torches or other open flames, or if employees are entering enclosed areas.
- Personal protective equipment
- Respiratory protection : Under normal manufacturing conditions, no respiratory protection is required when using this product.
- Hand protection : Additional protection: Impervious gloves
- Eye protection : Wear safety glasses with side shields. Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.
- Protective measures : Self-contained breathing apparatus (SCBA) is required if a large release occurs.

Exposure Guidelines Exposure Limit Values

Pentafluoroethane AEL *	(DUPONT)	1,000 ppm	8 & 12 hr. TWA
Difluoromethane AEL *	(DUPONT)	1,000 ppm	8 & 12 hr. TWA

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

- Physical state : gaseous
Form : Liquefied gas
Color : colourless

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Odor	: slight, ether-like
Odor threshold	: No applicable data available.
pH	: neutral
Melting point/range	: No applicable data available.
Boiling point/boiling range	: Boiling point -51.4 °C (-60.5 °F)
Flash point	: does not flash
Evaporation rate	: > 1 (CCL4=1.0)
Flammability (solid, gas)	: No applicable data available.
Upper explosion limit	: Method: None per ASTM E681
Lower explosion limit	: Method: None per ASTM E681
Vapor pressure	: 16,574 hPa at 25 °C (77 °F)
Vapor density	: 2.5 at 25°C (77°F) and 1013 hPa (Air=1.0)
Density	: 1.062 g/cm ³ at 25 °C (77 °F) (as liquid)
Density	: 0.0066 g/cm ³ at ca. 26 °C (79 °F) at (1,013 hPa)
Specific gravity (Relative density)	: 1.06 at 25 °C (77 °F)
Water solubility	: not determined
Solubility(ies)	: No applicable data available.
Partition coefficient: n-octanol/water	: No applicable data available.
Auto-ignition temperature	: No applicable data available.
Decomposition temperature	: No applicable data available.



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Viscosity, kinematic : No applicable data available.

Viscosity : No applicable data available.

% Volatile : 100 %

SECTION 10. STABILITY AND REACTIVITY

Reactivity : Stable at normal ambient temperature and pressure.

Chemical stability : Stable under recommended storage conditions.

Possibility of hazardous reactions : Polymerization will not occur.

Conditions to avoid : Avoid open flames and high temperatures.

Incompatible materials : Alkali metals Alkaline earth metals, Powdered metals, Powdered metal salts

Hazardous decomposition products : Decomposition products are hazardous., This material can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrofluoric acid and possibly carbonyl fluoride., These materials are toxic and irritating., Avoid contact with decomposition products

SECTION 11. TOXICOLOGICAL INFORMATION

Pentafluoroethane (HFC-125)

Inhalation 4 h LC50 : > 800000 ppm , Rat

Inhalation No Observed Adverse Effect Concentration : 100000 ppm , Dog
Cardiac sensitization

Inhalation Low Observed Adverse Effect Concentration (LOAEC) : 75000 ppm , Dog
Cardiac sensitization

Skin sensitization : Does not cause respiratory sensitisation., human

Repeated dose toxicity : Inhalation
Rat
-
gas
NOAEL: > 50000,
No toxicologically significant effects were found.


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- Carcinogenicity** : Not classifiable as a human carcinogen.
Overall weight of evidence indicates that the substance is not carcinogenic.
- Mutagenicity** : Animal testing did not show any mutagenic effects.
Evidence suggests this substance does not cause genetic damage in cultured mammalian cells.
Did not cause genetic damage in cultured bacterial cells.
- Reproductive toxicity** : No toxicity to reproduction
Animal testing showed no reproductive toxicity.
- Teratogenicity** : Animal testing showed no developmental toxicity.
- Further information** : Cardiac sensitisation threshold limit : 490000 mg/m3

Difluoromethane (HFC-32)

- Inhalation 4 h LC50** : > 520000 ppm , Rat
- Inhalation Low Observed Adverse Effect Concentration (LOAEC)** : > 350000 ppm , Dog
Cardiac sensitization
- Inhalation No Observed Adverse Effect Concentration** : 350000 ppm , Dog
Cardiac sensitization
- Skin irritation** : No skin irritation, Not tested on animals
Not expected to cause skin irritation based on expert review of the properties of the substance.
- Eye irritation** : No eye irritation, Not tested on animals
Not expected to cause eye irritation based on expert review of the properties of the substance.
- Skin sensitization** : Does not cause skin sensitisation., Not tested on animals
Not expected to cause sensitization based on expert review of the properties of the substance.

There are no reports of human respiratory sensitization.
- Repeated dose toxicity** : Inhalation
Rat
-
No toxicologically significant effects were found.



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- Mutagenicity : Animal testing did not show any mutagenic effects.
Tests on bacterial or mammalian cell cultures did not show mutagenic effects.
- Reproductive toxicity : No toxicity to reproduction
Animal testing showed no reproductive toxicity.
Information given is based on data obtained from similar substances.
- Teratogenicity : Animal testing showed no developmental toxicity.
- Further information : Cardiac sensitisation threshold limit : > 735000 mg/m3

Carcinogenicity

The carcinogenicity classifications for this product and/or its ingredients have been determined according to HazCom 2012, Appendix A.6. The classifications may differ from those listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or those found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition).

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, or OSHA, as a carcinogen.

SECTION 12. ECOLOGICAL INFORMATION

Aquatic Toxicity

Pentafluoroethane (HFC-125)

- 96 h LC50 : Oncorhynchus mykiss (rainbow trout) 450 mg/l
Information given is based on data obtained from similar substances.
- 96 h ErC50 : Algae 142 mg/l
Information given is based on data obtained from similar substances.
- 72 h NOEC : Pseudokirchneriella subcapitata (green algae) 13.2 mg/l
Information given is based on data obtained from similar substances.
- 48 h EC50 : Daphnia magna (Water flea) 980 mg/l
Information given is based on data obtained from similar substances.

Difluoromethane (HFC-32)

- 96 h LC50 : Fish 1,507 mg/l


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96 h EC50 : Algae 142 mg/l
 48 h EC50 : Daphnia (water flea) 652 mg/l
 30 d : NOEC Fish (unspecified species) 65.8 mg/l

Environmental Fate

Difluoromethane (HFC-32)
 Biodegradability : 5 % OECD Test Guideline 301D
 Not readily biodegradable.

SECTION 13. DISPOSAL CONSIDERATIONS

Waste disposal methods - Product : Can be used after re-conditioning. Recover by distillation or remove to a permitted waste disposal facility. Comply with applicable Federal, State/Provincial and Local Regulations.

Contaminated packaging : Empty pressure vessels should be returned to the supplier.

SECTION 14. TRANSPORT INFORMATION

DOT	UN number	: 3163
	Proper shipping name	: Liquefied gas, n.o.s. (Pentafluoroethane, Difluoromethane)
	Class	: 2.2
	Labelling No.	: 2.2
IATA_C	UN number	: 3163
	Proper shipping name	: Liquefied gas, n.o.s. (Pentafluoroethane, Difluoromethane)
	Class	: 2.2
	Labelling No.	: 2.2
IMDG	UN number	: 3163
	Proper shipping name	: LIQUEFIED GAS, N.O.S. (Pentafluoroethane, Difluoromethane)
	Class	: 2.2
	Labelling No.	: 2.2

**DuPont™ Suva® 410A Refrigerant**

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Ref. 130000050990

SECTION 15. REGULATORY INFORMATION

TSCA	: On the inventory, or in compliance with the inventory
SARA 313 Regulated Chemical(s)	: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
PA Right to Know Regulated Chemical(s)	: Substances on the Pennsylvania Hazardous Substances List present at a concentration of 1% or more (0.01% for Special Hazardous Substances): Difluoromethane
NJ Right to Know Regulated Chemical(s)	: Substances on the New Jersey Workplace Hazardous Substance List present at a concentration of 1% or more (0.1% for substances identified as carcinogens, mutagens or teratogens): Difluoromethane
California Prop. 65	: Chemicals known to the State of California to cause cancer, birth defects or any other harm: none known

SECTION 16. OTHER INFORMATION

Suva® is a registered trademark of E. I. du Pont de Nemours and Company

® DuPont's registered trademark

Before use read DuPont's safety information.

For further information contact the local DuPont office or DuPont's nominated distributors.

Revision Date : 03/23/2015

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Significant change from previous version is denoted with a double bar.



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TROX[®] TECHNİK

The art of handling air

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