



**robatherm AHUs.**

**Maintenance and cleaning.**

**November 2024**

English - Translation of the original instructions

Air handling units | type RM/RL/TL-50

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To improve readability, this document does not use male, female, and non-binary pronouns (m/f/d). All pronouns apply equally to all genders.

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# General remarks

## Information about these instructions

These instructions will facilitate safe and efficient use of the AHU.



All persons working on the AHU must thoroughly read and understand these instructions before starting any kind of work.

Safe working is dependent on adhering to all safety information and instructions.

## Further information

The instructions describe all the available options. Whether and which options are available in the AHU depends on the options selected and the country for which the AHU is intended. The illustrations serve as an example and may differ.

The instructions consist of several parts and have the following structure:



Fig. 1: Parts of the instructions

Main operating instructions

- ➔ Transport and unloading
- ➔ Installation and assembly
- ➔ Commissioning
- ➔ Operation and faults
- ➔ Maintenance and cleaning
- ➔ Disabling and disposal

# Security

## General risk sources

### Electrical hazards due to electric current and voltage

#### DANGER



##### Risk of electric shock

Risk of death from electric current when touching parts with live voltage. If the insulation is damaged, there is risk of death from electric current.

- When the insulation is damaged, turn the voltage supply off immediately, and arrange for repair.
- Before carrying out any work on the AHU, disconnect power and voltage supply as follows:
  - Turn the main switch to position "0".
  - Secure the main switch with a lock.
  - Disconnect AHU from power and voltage supply of the supply line.
  - Ensure that the unit is disconnected.
  - Ground and short-circuit.
  - Do not bridge or switch off fuses.
  - Keep moisture away from live parts.

#### DANGER



##### Danger to life due to stored electric charge!

DC link capacitors of the frequency converter can remain charged even when the mains supply is switched off and disconnected. There is a risk of death if the discharging time is not observed.

- Wait for a discharging time of 15 minutes.

#### WARNING



##### Risk of electric shock

When the main switch is switched off, the following parts are still live and can cause injury from electric current: electrical conductors and terminals upstream of the main switch, switch cabinet lamps, surge arresters including their connected wires, cables and terminals.

- Do not touch live parts.
- Work on the switch cabinet may only be carried out by a qualified electrician.

## Mechanical hazards due to machine movements

### WARNING



#### **Risk of death due to sudden switch-on**

When AHU is switched off, or the electrical power supply fails, certain control functions (e.g., timer programs, pump-out, fan overshoot, frost protection) or power restoration can cause components to switch on immediately. This poses danger to life.

- Carry out the steps "Securing the AHU against restarting" (see "Main operating instructions", section "Securing against restarting").

### WARNING



#### **Danger from moving parts**

After switching off the AHU, there is still a risk of death due to moving parts, as the components do not have immediate stop functions.

- Wait for all moving parts (e.g., fan, rotary heat exchanger, motor, belt drive) to come to a standstill.

## Thermal hazards due to hot and cold surfaces

### CAUTION



#### Risk of burns due to hot surfaces

Hot surfaces of components (e.g., heating coils, direct firing, pressure steam humidifiers, steam heaters) pose a risk of burn injuries during operation and even after the AHU has been switched off.

- Let the fan run to cool down to room temperature.
- Do not touch the hot surface.

### CAUTION



#### Risk of burns due to hot surfaces

There is a risk of burns when touching hot pipes.

- Pipes outside the AHU must be insulated by the customer to make them impermeable.

### CAUTION



#### Risk of injury due to cold surfaces

Cold surfaces of components (e.g., cooling coils, refrigeration technology) pose a risk of injury from ice burns or frostbite during operation and even after the AHU has been switched off.

- Wait until the temperature of components matches room temperature.
- Do not touch cold surfaces.

### CAUTION



#### Risk of injury due to cold surfaces

There is a risk of injury from ice burns or frostbite when touching cold pipes.

- Pipes outside the AHU must be insulated by the customer to make them impermeable.



## General hazards

### WARNING



#### **Risk of injury due to modifications or use of incorrect spare parts**

Serious injuries, death, and material damage can be caused by modifications or installation of incorrect spare parts.

- Use original spare parts only.
- Do not make any modifications.

### WARNING



#### **Danger to life from falling!**

If a grate above an air opening is overloaded downwards (>400kg), this will cause the structure to fail. When a person steps on the grate, the structure may fail, causing a risk to life by falling through the air opening.

- Do not exceed the maximum load ( $\leq 400\text{kg}$  or 2 persons).

### WARNING



#### **Danger to life from falling!**

Removing the grates in the floor causes a risk to life from falling, as the opening in the floor is exposed.

- When working on air openings with removed grates, the customer must provide protection against falling.
- After the work, mount the grates again according to the instructions.

### WARNING



#### **Danger to life from falling!**

When stepping on the protection roof, there is a risk to life from falling, as the protection roof is unsuitable for supporting loads.

- Do not enter the protection roof.

### NOTE



#### **Material damage due to localized weight**

If more than one person enters the AHU at a time or localized loads are otherwise applied, pans and floors may be deformed.

- Do not let several persons enter the AHU at the same time.
- If this becomes necessary, take suitable measures to distribute the weight (e.g., grates, wooden boards, wood beams).

## Personnel qualification

The work described in this section may only be performed if the person has the following qualifications:

- Qualified person in accordance with pressure equipment regulation
- Qualified electrician
- Registered gas installer
- Hygiene specialist
- Refrigeration specialist
- Mechanic
- Cleaning specialist

## Maintenance interval

AHUs are machines that require regular maintenance. The specified intervals are approximate and refer to normally polluted air inspired by VDI 6022. If the air is very polluted, the intervals must be shortened accordingly. Regular maintenance does not release the operator from his duty of care to check the system daily for function or damage.

## Leak tightness test

In hygienically relevant areas where a transfer of substances from the extract air to the supply air is not permissible, the components concerned must be checked for tightness annually or after each scheduled maintenance (e.g., using suitable test gas). Observe the manufacturer's safety information. If necessary, take appropriate measures to restore the required tightness in consultation with the manufacturer.

# Casing

## Inspection

### WARNING



#### **Risk of explosion from lack of equipotential bonding**

Non-existent or incorrectly connected equipotential bonding may cause components to become statically charged. The discharge may cause an explosion.



- Connect all factory installed equipotential bonding conductors and secure them to prevent them from loosening.
- Observe the work steps set out in the operating instructions.

### Maintenance interval

Monthly.

### Work steps

1. Check that all equipotential bonding conductors, earthing straps and earthing screws are tight and secure.
2. Check the connecting elements for corrosion.
3. Replace corroded connecting elements.

### Maintenance interval

Every three months.

### Work steps

- Perform an electrical safety check of the connection to the equipotential bonding conductor of the AHU see chapter "Electrical safety tests ", page 127.

## Cleaning and scheduled maintenance

### WARNING



#### **Risk of explosion from electrostatic discharge**

Cleaning the AHU with a dry cloth may cause a static charge. The discharge and the resulting sparks may cause an explosion.

- Only wipe the AHU with a damp cloth.
- Follow the instructions in the operating instructions.

### Maintenance interval

Every three months.

### Work steps

- Remove dry coarse soiling with an industrial vacuum cleaner.
- For other contamination: use a damp cloth; if necessary, use grease- and oil-dissolving cleaning agents with a pH between 7 and 9.
- In the case of pans that are difficult to access (e.g., underneath coils), the corresponding components may need to be removed for complete cleaning.
- Treat galvanized parts with clear coat (...).
- Regularly treat all moving parts, such as lever locks and hinges, with lubricant.
- Check seals, especially door seals, regularly for damage and function.
- Immediately repair damage to the coating or corrosion with varnish.
- Remove contamination from joints of built-in parts (e.g., transition panel/unit lighting) with industrial vacuum cleaner and joint nozzle, if necessary spray bottle with cleaning agent and a damp cloth.

### Disinfection

Only use alcohol-based disinfectants with country-specific approval (e.g., RKI, VAH, DGKH).

# Repair

## Locking systems for doors

### Lever lock for the outside

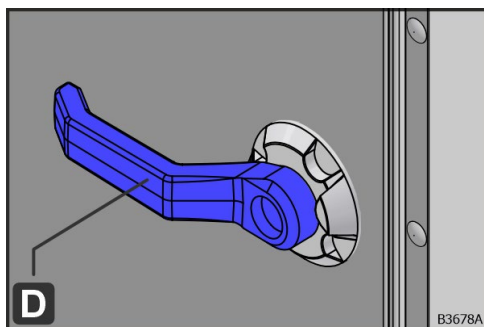


Fig. 2: Standard lever lock

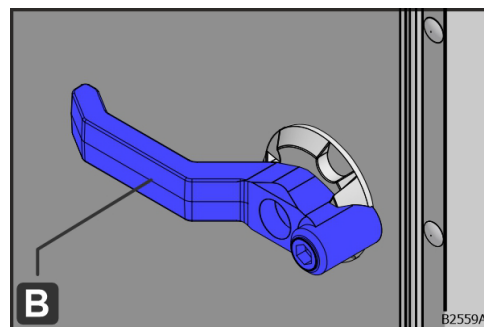


Fig. 3: Lever lock with key size 10 / double-bit 3

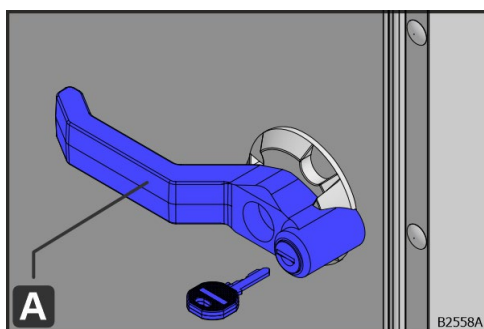


Fig. 4: Lever lock with key cylinder

### Combinations on the inside

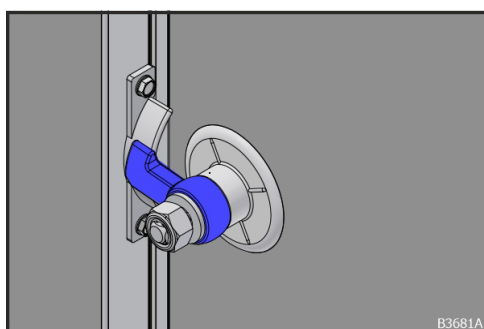


Fig. 5: Locking cam catch (suction side)

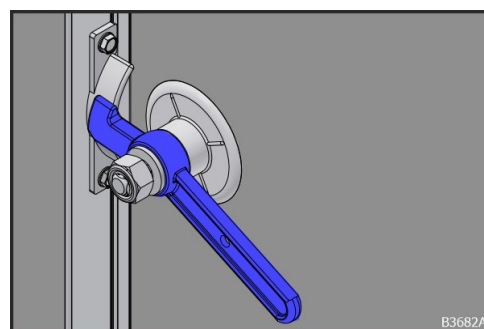


Fig. 6: Locking cam catch with emergency lever lock (suction side)

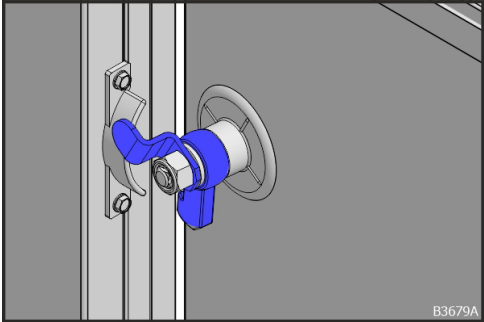


Fig. 7: Locking cam catch with retaining mechanism (discharge side)

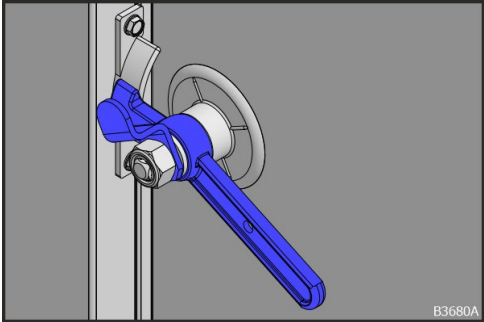


Fig. 8: Locking cam catch with emergency lever lock and retaining mechanism (discharge side)

**External lock**

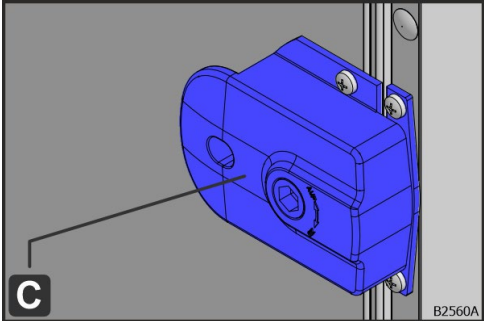


Fig. 9: External lock with key size 10 / double-bit 3

# Filter component

## CAUTION



### **Allergic reactions to skin, eyes, or respiratory tract due to contact with filter dust**

Filters may be contaminated with viruses, bacteria, or fungi. During maintenance, cleaning and replacement of the filters, there is a risk of allergic reactions to the skin, eyes or respiratory organs.

- Comply with work instructions.
- Wear protective clothing, gloves, safety glasses, and respiratory protection.
- Avoid contaminating the environment and the new filters.

## Spare filter

Stock at least one set of spare filters. Store in a dry and dust-free environment. Avoid filter contamination and damage. Observe the manufacturer's specifications.

## **Inspection**

### **Maintenance interval**

Every three months.

### **Work steps**

- Check the filter for hygienic condition, dirt, odours, damage and corrosion.
- Particle filter: check the differential pressure with a measuring instrument.
- Activated carbon filter: it is usually sufficient to check the filter sensorially for any odours. (To objectively determine the remaining service life and thus use it as a guide value for the inspection interval, the filter manufacturer can carry out a laboratory analysis of the degree of saturation of the activated carbon.) Weighing the filter cartridge is generally not indicative of its service life, as the increase in weight is mostly due to the humidity absorbed.
- Check the filter seat for tightness.



# Repair

## Maintenance interval

- Replace filter immediately in case of noticeable contamination, odors, damage, or leakage, when the recommended final resistance or time interval is reached:
  - 1. Filter stage after 12 months at the latest
  - 2. Filter stage after 24 months at the latest

Premature filter replacement may also be necessary if construction or conversion work causes a significant filter load, or if this is indicated as a result of a hygiene inspection.

Replacement of individual filter elements is only permitted in the event of damage to individual elements, provided that the last replacement was not more than 6 months ago.

## Final pressure loss

### Recommended final pressure loss for ISO 16890 filters

Filter class	Recommended final pressure loss (lower value)
ISO coarse	50 Pa + initial pressure loss or 3 x initial pressure loss
ISO ePM1, ISO ePM2.5, ISO ePM10	100 Pa + initial pressure loss or 3 x initial pressure loss

Table 1: Final pressure loss for ISO 16890 filters

### Recommended final pressure loss for EN 779 filters

Filter class	Recommended final pressure loss
G1 - G4	150 Pa
M5 - M6, F7	200 Pa
F8 - F9	300 Pa
E10 - E12, H13	500 Pa

Table 2: Final pressure loss for EN 779 filters

## **Work steps**

1. Fasten the filter in the filter mounting frame with 4 filter clamps (B) each or hand-tighten the bayonet catch.
2. Do not clamp or damage the filter.
3. Check that the filter is fitted airtight in the filter mounting frame.

## HEPA filter installation according to EN 1822

### General procedure

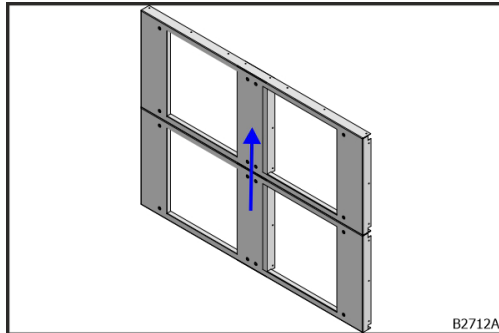


Fig. 10: Assembly sequence

- Start with the bottom row. Work from the bottom up.

### HEPA filter installation work steps according to EN 1822

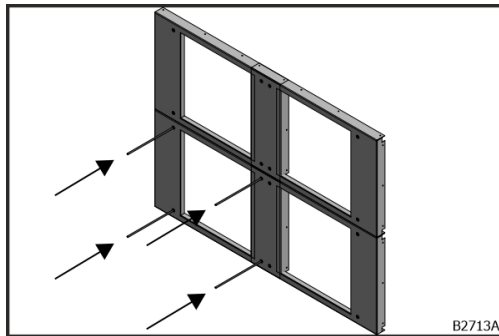


Fig. 11: installing the threaded rods

1. Screw 4 x threaded rod (E) in the rivet nut (F) 8–10 mm deep.

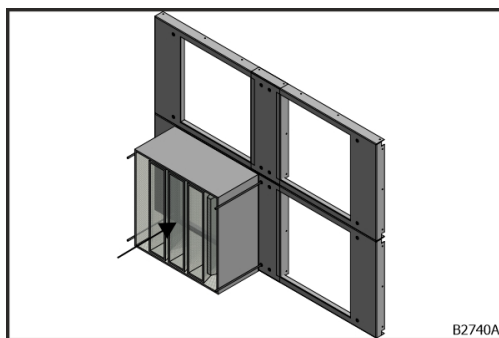


Fig. 12: placing the filter

2. Place the filter (A) between the threaded rods (E).

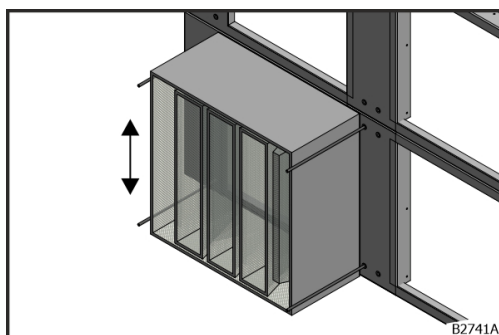


Fig. 13: aligning the filter

3. Align the filter (A) so that the lower edge of the filter finishes 1 mm above the lower edge of the filter wall (G).

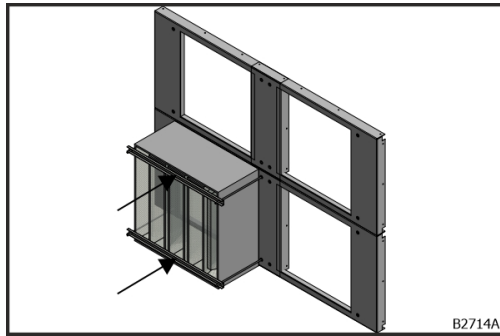


Fig. 14: sliding on clamping sections

4. Slide 2 x clamping section (B) onto the threaded rods (E).

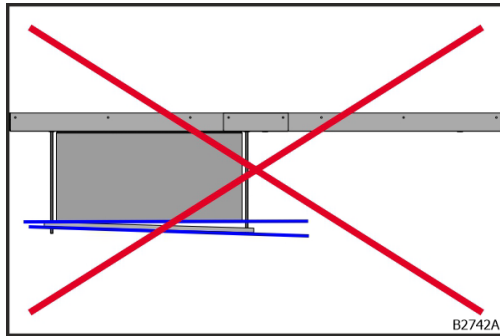


Fig. 15: incorrect alignment of clamping sections

5. Align the clamping sections (B) parallel to the filter wall (G).

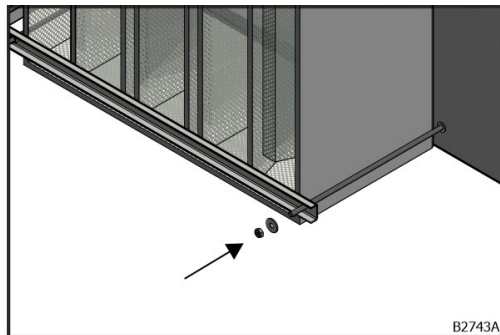


Fig. 16: screwing on the washer and nut

6. Screw 4 x washer (D) and 4 x nut (C) evenly onto the threaded rods (E).

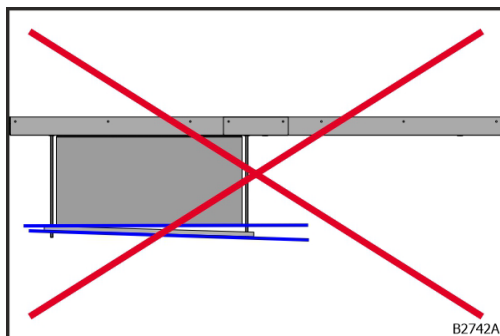
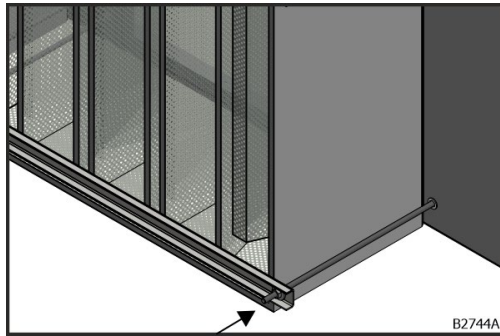


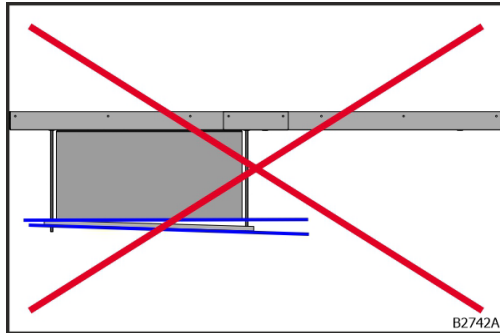
Fig. 17: incorrect alignment of clamping sections

7. Align the clamping sections (B) parallel to the filter wall (G).



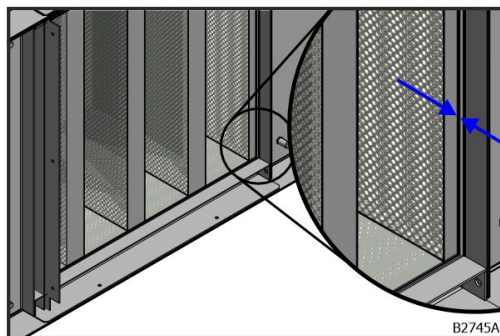
8. Fasten the nuts (C) with a 2 Nm tightening torque.

Fig. 18: 2 Nm tightening torque



9. Align the clamping sections (B) parallel to the filter wall (G).

Fig. 19: incorrect alignment of clamping sections



10. Check for correct assembly: the distance between the filter and filter wall  $2 \pm 0.5$  mm.

Fig. 20: mounted filter

Carry out the work steps for the next filters until all filters have been mounted.

# Silencer

## WARNING



### **Risk of explosion due to the splitters being installed with an inadequate connection to the equipotential bonding of the AHU**

If the splitters are not adequately connected to the AHU floor, the splitters may become statically charged. The discharge and the resulting sparks may cause an explosion.

- Lay the splitters on a clean unit floor to establish equipotential bonding with the AHU.

## CAUTION



### **Allergic reactions to skin, eyes, or respiratory tract due to contact with splitters**

Splitters may be contaminated with viruses, bacteria, or fungi. During maintenance and cleaning of the silencers, there is a risk of allergic reactions to the skin, eyes or respiratory organs.

- Comply with work instructions.
- Wear protective clothing, gloves, safety glasses, and respiratory protection.
- Avoid contaminating the environment.

## Inspection

### **Maintenance interval**

Every three months.

### **Work steps**

- Check splitters for hygienic condition, contamination, damage, and corrosion.

## Cleaning

### WARNING



#### **Risk of explosion from electrostatic discharge**

Cleaning the AHU with a dry cloth may cause a static charge. The discharge and the resulting sparks may cause an explosion.

- Only wipe the AHU with a damp cloth.
- Follow the instructions in the operating instructions.

### **Maintenance interval**

Every three months.

### **Work steps**

- Clean splitters using an industrial vacuum cleaner.

## Repair

### WARNING



#### **Risk of explosion from electrostatic discharge**

Cleaning the AHU with a dry cloth may cause a static charge. The discharge and the resulting sparks may cause an explosion.

- Only wipe the AHU with a damp cloth.
- Follow the instructions in the operating instructions.

- Repair splitters with the repair kit and remove corrosion; if necessary, take a test sample.

Replacing the splitters:

1. Clean soiled surfaces (unit floor and unit frame) with a damp cloth, as the position of the silencers on the unit floor or the unit frame provides a conductive connection and ensures that the component is included in the equipotential bonding of the unit.
2. Check the connecting elements for corrosion.
3. Replace corroded connecting elements.



# Fan

## WARNING



### **Risk of injury due to impeller rotation despite the fan being switched off**

Risk of injury due to impeller rotation as a result of air movement caused by thermal conditions despite of the fan being switched off.

- Avoid backflows from the building (e.g., by closing the dampers).

## NOTE



### **Property damage due to foreign objects**

Foreign objects (e.g., tools, small parts) in the AHU or in the duct system can be carried away and cause damage to the fan, the AHU, the duct system, or in the rooms.

- Before switching on the fan, turn the impeller by hand to check if it can run unobstructed.
- Before switching on the fan, check the AHU and the duct system for foreign objects and remove them.

## Inspection

### Maintenance interval

Every three months.

In case of multi-shift operation and/or special operating conditions such as medium temperature > 40 °C, dust accumulation, etc., the interval must be shortened accordingly.

### Work steps

- Check the fan for hygienic condition, dirt, damage, corrosion and fastening.
- Check bearings for noise, vibrations and heating.
- Check the flexible connection for tightness.
- Check the function of the vibration damper.
- Check safety devices for damage, fastening and function.
- Check the function of the swirl controller.
- Check the function of the drainage.
- Remove any dirt from flexible connectors with an industrial vacuum cleaner and wipe with a damp cloth and cleaning agent with a pH value between 7 and 9.

### Impeller

- Check impeller for imbalance and vibration; rebalance if necessary.
- Check gap distance for plug fans; correct if necessary.

### Equipotential bonding conductor

Check the equipotential bonding conductor of the fan:

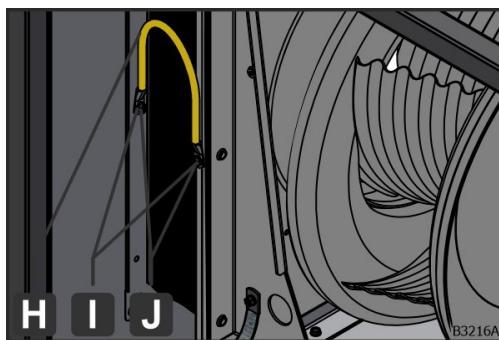


Fig. 21: equipotential bonding conductor for the flexible connection

The support construction of the fan is connected to the AHU equipotential bonding by an equipotential bonding conductor for the flexible connection.

- Check that the equipotential bonding conductor (H) is tight and secure.
- Check that the screws (I) are tight and secure.
- Check that there are toothed lock washers (J).
- Check the connecting elements for corrosion.
- Replace corroded connecting elements.

**Motor**

- Check motor for smooth running, heat, and direction of rotation.
- Clean motor; remove damage and corrosion.
- Measure voltage, current consumption, and phase symmetry.
- Check clamps in terminal board for tight fit; tighten if necessary.
- Check equipotential bonding; retighten or replace if necessary.
- Check cable guides (e.g., cable duct) for contamination and, if necessary, clean them with an industrial vacuum cleaner and wipe them with a cloth and a cleaning agent with a pH value between 7 and 9.

## **Fan with housing**

### **Belt drive**

- Check belt drive for wear, tension, alignment of motor and fan pulley (tolerance  $< 0.4^\circ$ ; i.e.  $< 7 \text{ mm/m}$ ), function, and mount (see tightening torques).

### **Drive clutch**

- Observe the manufacturer's specifications.
- Check the temperature.

## Repair

- Replace bearings (at the latest at the end of the theoretical service life).
- Lubricate the bearing. Observe manufacturer's instructions.
- Clean fan, remove damage and corrosion, tighten mounting parts.

## Motor

Only use suitable and authorised load handling attachments when removing the motor. Ensure sufficient AHU stability, e.g. by fixing it to the foundation.

The following options are available from robatherm for removing the motor:

- Motor removal device see chapter "Motor removal device", page 31
- Motor removal device with lift out device see chapter "Motor removal device with lift out device", page 47
- Motor extraction device

## Fan with housing

### Belt drive

- Replace belt set
- Set alignment of motor and fan pulley
- Readjust belt tension
- Clean belt drive

If one or more V-belts fail in a multi-groove drive, a new set of V-belts must be fitted. Before V-belt installation, reduce the center distance so that the belt can be placed in the grooves without forcing. Forcible assembly by means of a screwdriver, etc. is not permitted in any case, as this will result in damage.

Before commissioning, check V-belt drive and adjust if necessary:

- Fastening screws of bushings and hubs (see tightening torques).
- Belt tension (see chapter on belt tension).
- Alignment of belt pulleys (tolerance  $< 0.4^\circ$ ; i.e.  $< 7$  mm/m).

After a run-in period of 1 to 2 hours, check the V-belt drive and adjust if necessary:

- Fastening screws of bushings and hubs (see tightening torques).
- Belt tension (see chapter on belt tension).
- Alignment of belt pulleys (tolerance  $< 0.4^\circ$ ; i.e.  $< 7$  mm/m).

The belt tension must be checked or adjusted according to the manufacturer's specifications using a suitable measuring device (e.g., belt tension gauge). Observe the operating instructions of the measuring device.

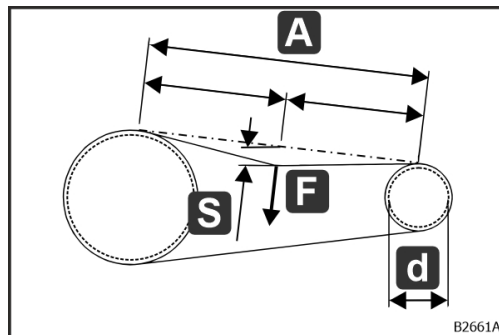


Fig. 22: Belt tension for the fan with housing

1. Measure the center distance (A) of the pulleys [m].
2. Multiply the center distance (A) by 16.
- The product is the belt deflection (S) [mm].
3. Apply force (F) to the belt in the middle of the center distance (A) so that the calculated belt deflection (S) is achieved.
4. Measure deflection force (F) [N].
5. Compare the deflection force (F) with the value on the nameplate (test force  $F_P$ ).

After a run-in period of 1 to 2 hours, check the V-belt drive and adjust if necessary.

The belt drive is largely maintenance-free after the run-in phase. However, depending on the installation site and operating mode, it is recommended to check the belt tension regularly.

#### Drive clutch

- Observe the manufacturer's specifications.
- Change oil.
- Clean the drive coupling.

## Motor removal device

### Proper use

The motor removal device is suitable for the removal and installation of electric motors and smaller complete fan units within AHUs weighing up to 800 kg. Corner nodes are installed in the relevant casings. The motor removal device is suitable for temperatures from -20 °C to +40 °C. The motor removal device is designed for 10 load cycles.

### Foreseeable misuse

#### WARNING



#### Danger from misuse

Serious personal injury or even death and damage to property can be caused by misuse of the motor removal device.

The motor removal device may only be used in conjunction with the corner nodes. Any other use, in particular attaching the lever hoists to other fastening points on the casing, is not permitted.

Only use lever hoists with a maximum load capacity of 3000 kg.

The load to be moved may have a maximum weight of 800 kg.

The motor removal device must not be exposed to aggressive media.

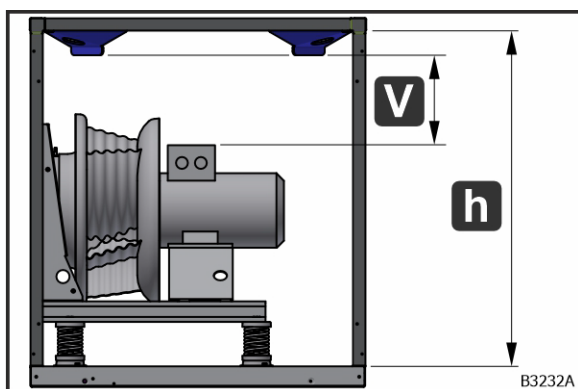
The motor removal device must not be used in environments with a potentially explosive atmosphere (e.g. conductive dusts, explosive gases).

### Personnel qualification

The work described in this section may only be performed if the person has the following qualifications:

- Mechanic

### Space requirements



A minimum height  $V$  of 400 mm is required between the upper edge of the load to be suspended and the installation level of the corner nodes; this height must not be lower than this during use.

Fig. 23: minimum height  $V$

## Set-up and function

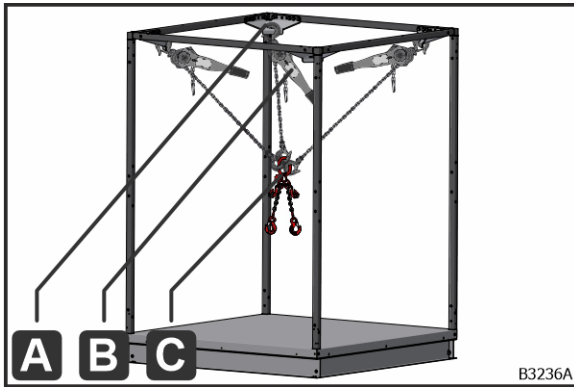


Fig. 24: motor removal device structure

The motor removal device comprises

- 4 corner nodes (A),
- 3 lever chain hoists (B) and
- 1 sling chain (C).

The 4 corner nodes (A) were factory installed in the upper corners of the casing. 3 lever chain hoists (B) are hooked into 3 (of these 4) corner nodes (A). Depending on the number of anchorage eyelets, 1 or 2 hooks of the sling chain (C) are hooked into the existing anchorage eyelets of the load (e.g. electric motor). The 3 hooks of the lever chain hoists (B) are hooked into the ring eye of the sling chain (C).

The load can be moved to any position in the casing by actuating the lever chain hoists (B) alternately and/or simultaneously in the correct sequence and pulling direction.

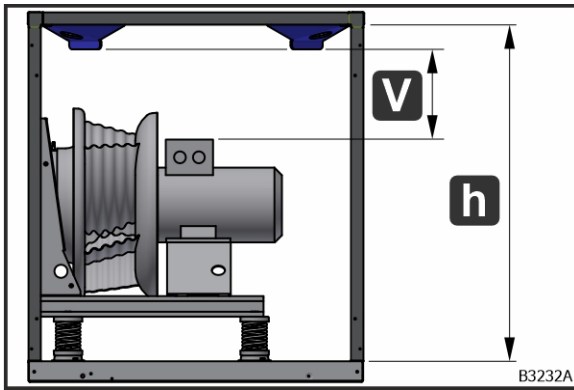


Fig. 25: minimum distance (V) between corner nodes and load.

The lifting height is limited by the tractive force of the lever chain hoists (B) (the load capacity is set via a slipping clutch). This limit is reached at a minimum distance (V) of approx. 400 mm between the installation level of the corner nodes (A) and the upper edge of the load to be suspended.

The height by which the load can be lowered is limited by the length of the chains of the lever chain hoists (B). This height can be increased by (temporarily) lowering the load and extending the sling chains (C) using the shortening hooks (or by attaching additional sling chains with a corresponding load capacity).



## Components

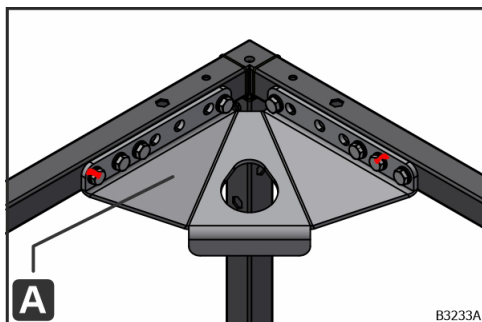


Fig. 26: A – corner nodes

The corner nodes (A) transfer the tractive force into the casing frame.

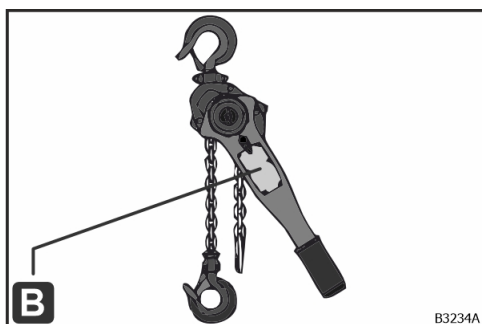


Fig. 27: B – lever chain hoist

The lever chain hoists (B) provide the required tractive force.

Model	Load capacity [kg]	Weight [kg]
DD-LB 075	750	9.5
DD-LB 150	1500	13
DD-LB 150	3000	29

For selecting the right lever chain hoist see chapter "Selecting the lever chain hoist", page 35.

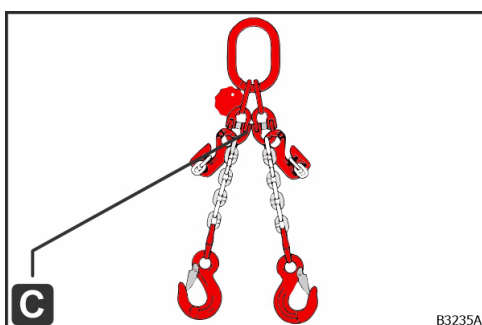


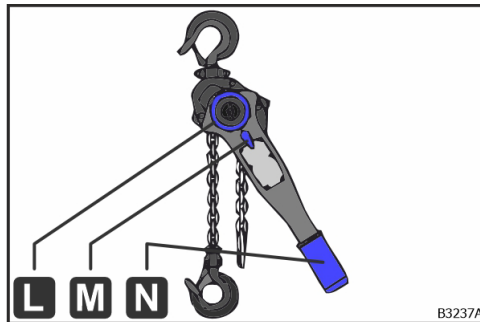
Fig. 28: C – sling chain

A 2-leg sling chain (C) is used to attach the load. This also includes a chain shortening hook.

Weight: 3.9 kg

### Lever chain hoist

The lever chain hoists are a central operating element of the motor removal device. For a detailed description of the function and operation, see the appendix "Dolezych – DoLast hoists – original operating instructions – DD lever hoist", "Operation" section.



- L – handwheel
- M – changeover lever
- N – hand lever

Fig. 29: Part designation of the lever chain hoist from the manufacturer Dolezych

### Selecting the lever chain hoist

The correct lever chain hoists can be determined using the following table, depending on the size of the fan, the motor weight and the installation height.

<b>Fan (with AC motor)</b>	<b>Max. motor weight</b>	<b>Minimum dimension height h</b>	<b>Lever chain hoist (nominal load capacity)</b>	<b>Minimum dimension height h</b>	<b>Lever chain hoist (nominal load capacity)</b>
Fan size	[kg]	[mm]	[kg]	[mm]	[kg]
280	30	1224	750	-	-
315	40	1224	750	-	-
355	40	1224	750	-	-
400	65	1224	750	-	-
450	65	1224	750	-	-
500	142	1224	750	-	-
560	142	1224	1500	1530	750
630	142	1224	1500	1530	750
710	142	1428	750	-	-
800	210	1530	750	-	-
900	284	1530	1500	1836	750
1000	373	1632	1500	2142	750
1120	373	1836	1500	2142	750

Table 3: Selection of the lever chain hoist depending on the size of the fan, motor weight and installation dimension height

## Storage

The following storage conditions must be observed for the motor removal device:

- Do not store outdoors.
- Store in a dry and dust-free environment.
- Do not expose to aggressive media.
- Observe a storage temperature of -20 °C to +40 °C.

## Commissioning

### Commissioning requirements

The condition of the corner nodes (A), the lever hoists (B) and the sling chains (C) must be checked:

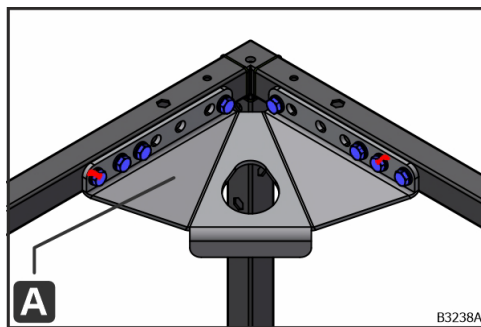


Fig. 30: Fastening the corner nodes

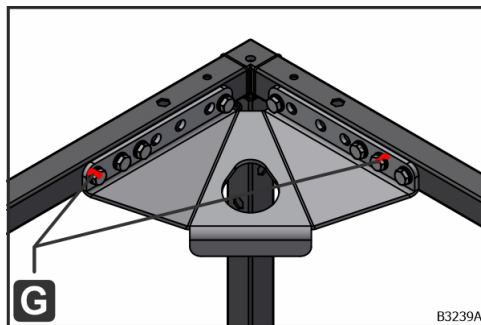


Fig. 31: G – screw locking lacquer

For rectification of faults see chapter "Fault", page 46.

- Visually inspect all parts for cracks, corrosion and/or deformation. If there are any abnormalities, the motor removal device must not be put into operation.
- Check the fastening of the corner nodes (A). Each corner node (A) must be secured with 8 screws. If incomplete, the motor removal device must not be put into operation.
- Carry out a visual inspection of the screw locking lacquer (G) on the corner nodes (A). If there is any damage, the motor removal device must not be put into operation.

## Operation

### Impeller suspension for AC motors

For fans with AC motors, the impeller must be taken off before removing the motor see chapter "Impeller suspension for AC motors", page 43.

## Attaching the sling chains

### NOTICE



#### Material damage due to wrongly attached load

The anchorage eyelets of the load are not designed for oblique pull.

- Use the sling chain to attach the load.

The sling chains (B) are attached to the existing anchorage eyelets of the load (e.g. electric motor) with one or two hooks.

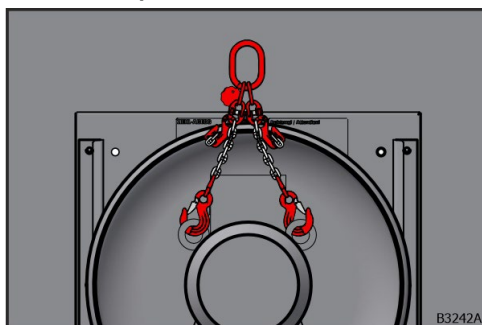


Fig. 32: attaching the sling chains to two anchorage eyelets

- Hook the sling chains into the existing anchorage eyelets of the load (e.g. electric motor).

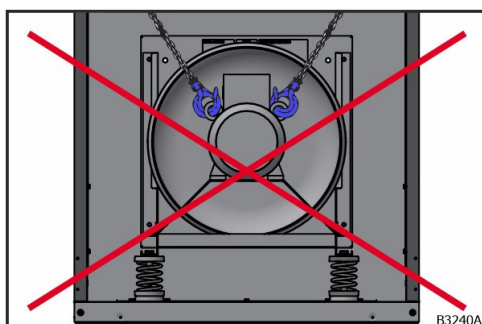


Fig. 33: Load attached wrongly

By using chain shortening hooks, the length of the sling chains (B) can be adjusted to the requirements of the specific situation.

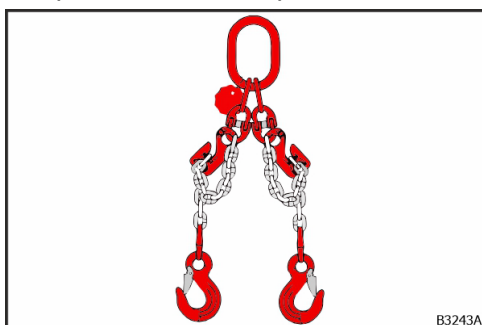
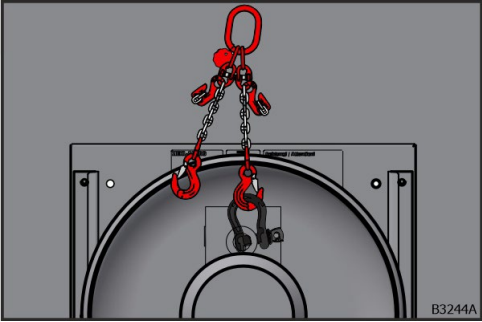


Fig. 34: using the chain shortening hooks

- The sling chains (B) can be shortened to a minimum using chain shortening hooks.



- With an anchorage eyelet, a shackle can be inserted into the centre of it.

Fig. 35: attaching the sling chains to an anchorage eyelet

### Determining the 3 corner nodes for attaching the lever chain hoists

The load is statically suspended from 3 lever chain hoists. As the lever chain hoists can only be loaded in tension due to the chains as the means of traction, the lever chain hoists must always be arranged in a star shape (when viewed from above). None of the chains may form an angle of more than  $180^\circ$  to the neighbouring chain.

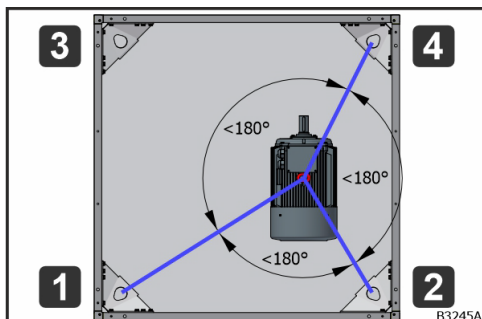


Fig. 36: correct use of corner nodes 1, 2 and 3

- Using corner nodes 1, 2 and 4: all angles are less than  $180^\circ$ .

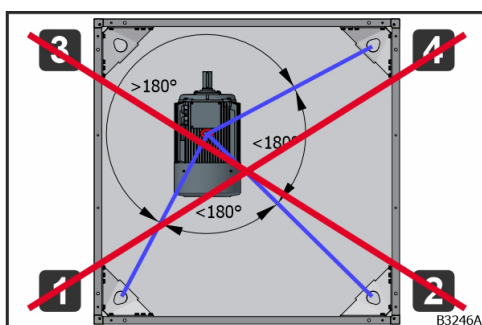


Fig. 37: wrong use of corner nodes 1, 2 and 3

- Using corner nodes 1, 2 and 4: one angle is greater than  $180^\circ$ . The load must not be lifted, as it may swing uncontrollably in the direction of corner node 2.
- Unhook lever chain hoist from corner node 2 and reattach at corner node 3.

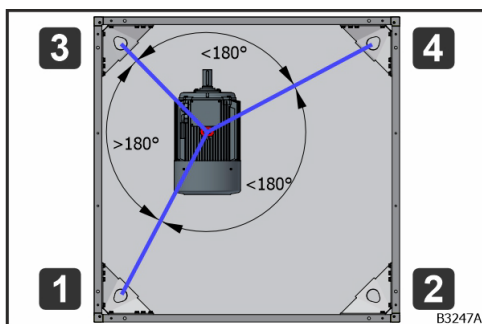


Fig. 38: correct use of corner nodes 1, 3 and 4

- Using corner nodes 1, 3 and 4: all angles are less than  $180^\circ$ .

## Adjusting the length of the lever chain hoists

### WARNING



#### Risk of injury from falling or swinging load

If the changeover lever of the lever chain hoist is set to the freewheel position "N" when the load is below the minimum load, the load may move in an uncontrolled manner. This may result in injury due to the load swinging or falling.

- No lifting and clamping operations when the changeover lever is in the freewheel position "N".
- Do not select freewheel position "N" when loaded.

The chain is set to the correct length with the freewheel of the lever chain hoist.

#### Requirement

- No load is attached to the lever chain hoist.
- The lever chain hoist is not under tension.

#### Work steps

1. Set the changeover lever (M) to freewheel position "N".
2. Turn the handwheel (L) anti-clockwise until it locks.
  - ➔ The brake is released.
3. Pull the chain into the required position.
  - ➔ The chain is set to the correct length.



## Tightening the lever chain hoists to lift the load

### TIP



#### Lever chain hoist braking mechanism

The braking mechanism is only activated in the "UP" position by applying the following minimum loads:

- DD-LB 075 35daN
- DD-LB 150 38daN
- DD-LB 300 50daN

#### Requirement

- Ensure that there are no persons or blocking parts in the immediate movement area of the load.

#### Work steps

1. Set the changeover lever (M) to the "UP" position.
  2. Turn the handwheel (L) clockwise to tension the chain.
  3. Turn the hand lever (N) clockwise to lift the load.
- The load is lifted.

## Releasing the lever chain hoists and lowering the load

#### Requirement

- Ensure that there are no persons or blocking parts in the immediate movement area of the load.

#### Work steps

- Set the changeover lever (M) to the "DN" (down) position.
  - Turn the hand lever (N) anti-clockwise to slowly lower the load.
- The load is lowered.

### Moving the load diagonally

The following steps are required to move the load from one corner to the diagonally opposite corner (e.g. from corner node 4 to corner node 2):

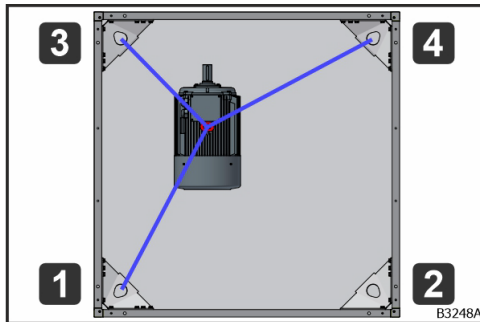


Fig. 39: load with corner node 4

1. Tighten all 3 lever chain hoists.
  2. Tighten lever chain hoists 1 and 4 further and loosen lever chain hoist 3.
- The load moves towards the casing centre.

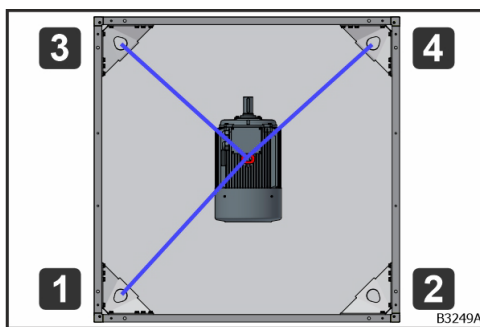


Fig. 40: load in centre of casing with lever chain hoist in corner node 4

Chains of lever chain hoist 1 and 4 are in line.

3. Release lever chain hoist 3.
4. Detach lever chain hoist from corner node 3.

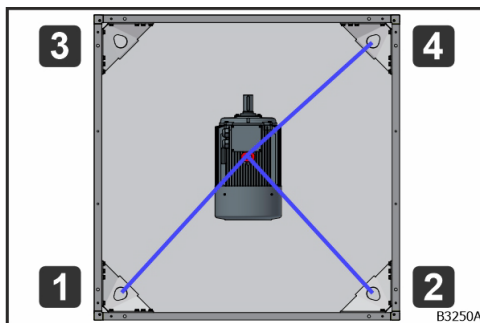


Fig. 41: load in centre of casing with lever chain hoist in corner node 2

Chains of lever chain hoist 1 and 4 are in line.

5. Attach lever chain hoist to corner node 2.

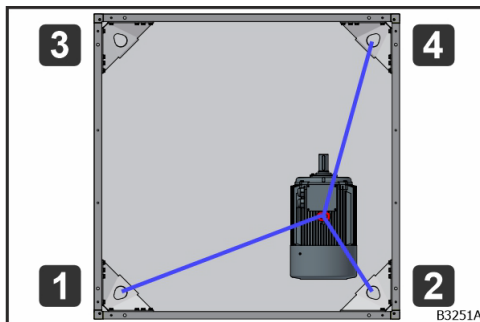


Fig. 42: load moves towards corner node 2

6. Release the chains of lever chain hoists 1 and 4 and tighten lever chain hoist 2.
- The load moves towards corner node 2.

## Impeller suspension for AC motors

For fans with AC motors, the impeller must be taken off before removing the motor.

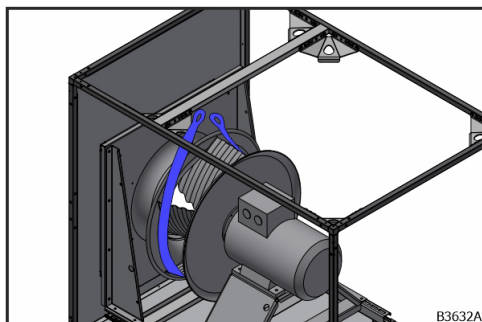


Fig. 43: Impeller with polyester sling

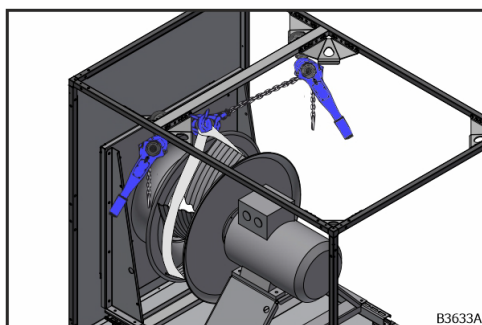


Fig. 44: Lever chain hoists in the corner brackets

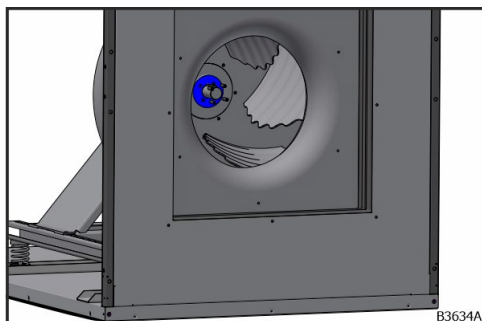


Fig. 45: Impeller bushing

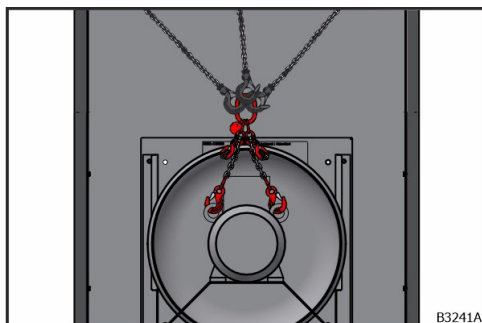


Fig. 46: Suspended motor

1. Lay the polyester sling round the impeller.
2. Attach the polyester sling to two corner brackets above the impeller using shackles in two lever chain hoists.
3. Pull the lever chain hoists until there is a slight tension see chapter "Adjusting the length of the lever chain hoists", page 40, see chapter "Tightening the lever chain hoists to lift the load", page 41 and see chapter "Releasing the lever chain hoists and lowering the load", page 41.
4. Detach the impeller bushing from the intake side.
5. Attach the sling chains to the existing anchorage eyelets of the AC motor see chapter "Determining the 3 corner nodes for attaching the lever chain hoists", page 39.
6. Attach the load hook of the lever chain hoists to the lug of the sling chain see chapter "Attaching the sling chains", page 37.

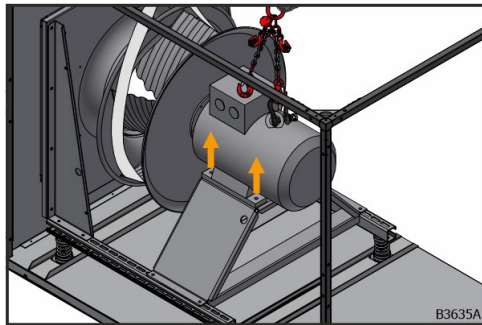


Fig. 47: Motor mount screws

7. Remove the screws attaching the motor to the motor mount.

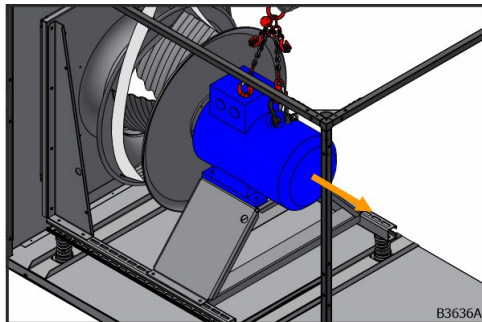


Fig. 48: Pulling out the motor

8. Pull the motor with drive shaft out of the impeller.  
→ The motor can now be removed see chapter "Moving the load diagonally", page 42.

## Maintenance

### Maintenance interval

Every year.



Fig. 49: inspection sticker (lever chain hoist)

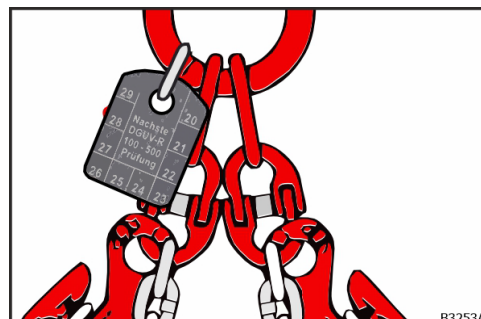


Fig. 50: inspection mark (sling chain)

The inspection sticker or inspection mark indicates the next required inspection.

### Inspection

The condition of the corner nodes (A), the lever hoists (B) and the sling chains (C) must be checked:

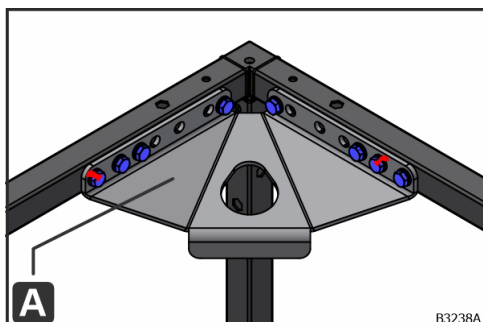


Fig. 51: Fastening the corner nodes

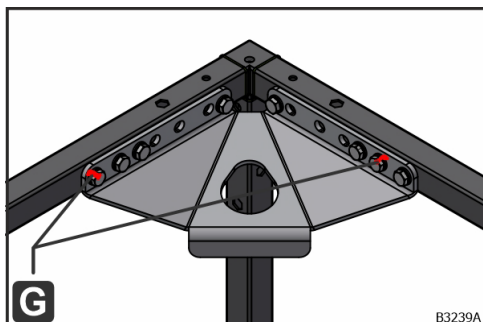


Fig. 52: G – screw locking lacquer

For rectification of faults see chapter "Fault", page 46.

- Visually inspect all parts for cracks, corrosion and/or deformation. If there are any abnormalities, the motor removal device must not be put into operation.
- Check the fastening of the corner nodes (A). Each corner node (A) must be secured with 8 screws. If incomplete, the motor removal device must not be put into operation.
- Carry out a visual inspection of the screw locking lacquer (G) on the corner nodes (A). If there is any damage, the motor removal device must not be put into operation.

## **Fault**

### **Defective parts**

In the event of any faults or defective parts in the motor removal device, these must be rectified by appropriately trained personnel.

- Do not bend any bent parts back into shape. Replace bent parts with original spare parts.
- Do not weld cracked parts. Replace cracked parts with original spare parts.

The disassembly and assembly of the parts must be carried out professionally, taking into account and with an understanding of the function and load of the parts. The work carried out must also be checked and confirmed by qualified personnel.

### **Interrupted screw locking lacquer**

The screw locking lacquer must not be interrupted. Proceed as follows if the screw locking lacquer is interrupted:

1. Have the cause determined by appropriately trained personnel.
2. Tighten the screw with a torque of 20 Nm.
3. Apply screw locking lacquer.

The work carried out must be checked and confirmed by qualified personnel.

## Motor removal device with lift out device

### Proper use

In conjunction with the motor removal device, the lift out device is suitable for removing and installing electric motors and smaller complete fan units weighing up to 400 kg from AHUs. Fasteners are installed in the relevant casings. The lift out device enables the load to be lifted from a position inside the casing to a position outside the casing or vice versa. This is necessary if the load inside the casing cannot be picked up by another industrial truck (e.g. forklift). The lift out device is suitable for temperatures from -20 °C to +40 °C. The lift out device is designed for 10 load cycles.

### Foreseeable misuse

#### WARNING



#### Danger from misuse

Serious personal injury or even death and damage to property can be caused by misuse of the motor removal device.

The motor removal device may only be used in conjunction with the fasteners. Any other use, in particular attaching the lever hoists or the supporting arm to other fastening points on the casing, is not permitted.

Only use lever hoists with a maximum load capacity of 3000 kg.

The load to be moved may have a maximum weight of 400 kg.

The lift out device may only be installed in the appropriate door widths.

The lift out device must not be exposed to aggressive media (e.g....).

The lift out device must not be used in environments with a potentially explosive atmosphere (e.g. conductive dusts, explosive gases).

### Personnel qualification

The work described in this section may only be performed if the person has the following qualifications:

→ Mechanic

### Space requirements

The lift out device is installed in inspection doors or behind panels. It must be possible to open the inspection door fully. It must be possible to remove the panel.

## Set-up and function

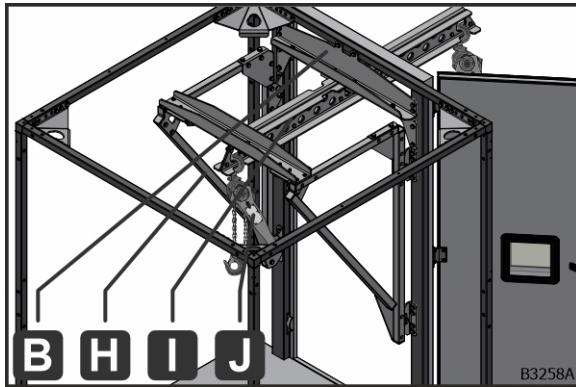


Fig. 53: lift out device mounted

The lift out device comprises factory installed fasteners and attachments that are only fitted on site when the device is used. The factory installed fasteners are already mounted in the corresponding position in the casing. Once all components have been fitted, the lift out device is ready for use.

The supporting arm (I) is fastened centrally in the opening. At the beginning (=inside the casing) and at the end (=outside the casing), there are lifting points in the supporting arm (I) where the corresponding lever hoists (J) can be attached. The mounting section (B) uses the two support struts (H) to brace the bending torque generated when the load is lifted on the casing frame.

The load can be moved from a defined position inside the casing to a defined position outside the casing, or vice versa, by alternately and/or simultaneously actuating the lever chain hoists (J) in the correct sequence and pulling direction. The load can then be set down on the floor. For greater height distances, the third lever chain hoist (J) can be used as an extension for the outer lever chain hoist (J).



## Components

The lift out device comprises factory installed fasteners and attachments that are only fitted on site when the device is used. The factory installed fasteners are already mounted in the corresponding position in the casing.

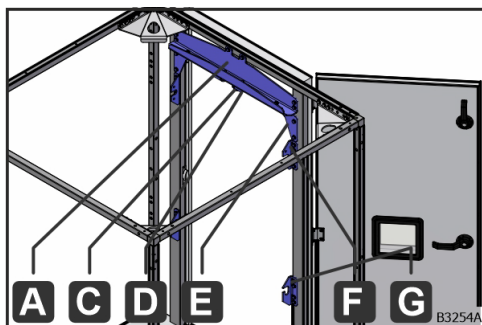


Fig. 54: factory installed fasteners

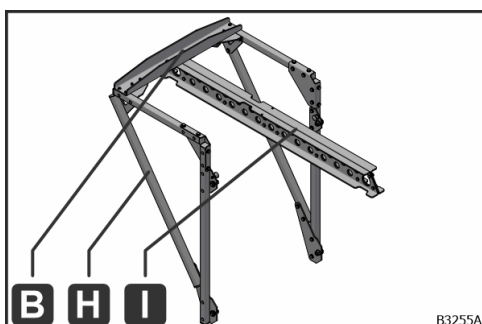


Fig. 55: parts to be mounted on site

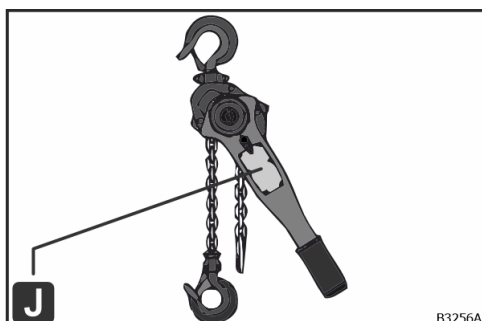


Fig. 56: J – lever chain hoist

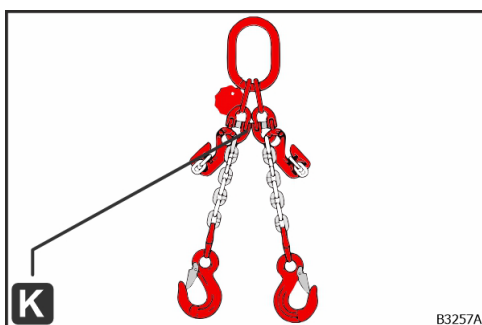


Fig. 57: K – sling chain

A – mounting section

D – guide plate

E – additional bracket right/left

C – C-M10 mini indexing plunger

F – upper suspension bracket right/left

G – lower suspension bracket right/left

B – mounting section

Model	Outer door frame/ panel width [mm]	Weight [kg]
L06	612	4.5
L07.5	765	5.4
L09	918	6.3

H – support strut right/left:

I – supporting arm; weight: 14.1 kg

The lever chain hoists (J) provide the required tractive force.

Model	Load capacity [kg]	Weight [kg]
DD-LB 075	750	9.5
DD-LB 150	1500	13
DD-LB 150	3000	29

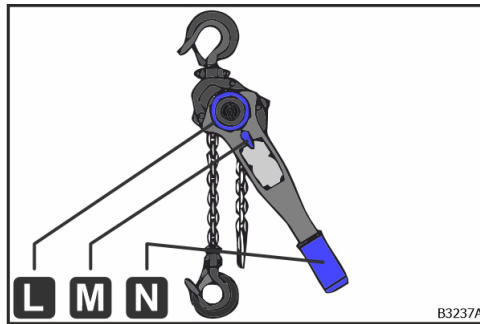
For selecting the right lever chain hoist see chapter "Selecting the lever chain hoist", page 51.

A 2-leg sling chain (K) is used to attach the load. This also includes a chain shortening hook.

Weight: 3.9 kg

### Lever chain hoist

The lever chain hoists are a central operating element of the motor removal device. For a detailed description of the function and operation, see the appendix "Dolezych – DoLast hoists – original operating instructions – DD lever hoist", "Operation" section.



- L – handwheel
- M – changeover lever
- N – hand lever

Fig. 58: Part designation of the lever chain hoist from the manufacturer Dolezych

### Selecting the lever chain hoist

The correct lever chain hoists can be determined using the following table, depending on the size of the fan, the motor weight and the installation height.

Fan (with AC motor)	Max. motor weight	Minimum dimension height h	Lever chain hoist (nominal load capacity)	Minimum dimension height h	Lever chain hoist (nominal load capacity)
Fan size	[kg]	[mm]	[kg]	[mm]	[kg]
280	30	1224	750	-	-
315	40	1224	750	-	-
355	40	1224	750	-	-
400	65	1224	750	-	-
450	65	1224	750	-	-
500	142	1224	750	-	-
560	142	1224	1500	1530	750
630	142	1224	1500	1530	750
710	142	1428	750	-	-
800	210	1530	750	-	-
900	284	1530	1500	1836	750
1000	373	1632	1500	2142	750
1120	373	1836	1500	2142	750

Table 4: Selection of the lever chain hoist depending on the size of the fan, motor weight and installation dimension height

### Storage

The following storage conditions must be observed for the motor removal device:

- Do not store outdoors.
- Store in a dry and dust-free environment.
- Do not expose to aggressive media.
- Observe a storage temperature of -20 °C to +40 °C.

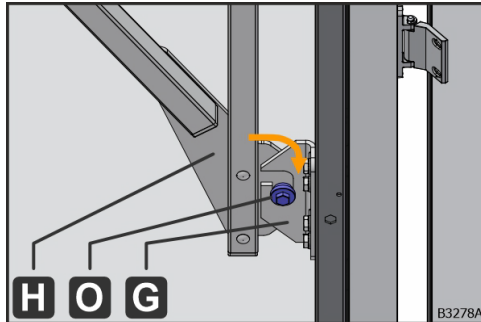
## Assembly and removal

### Work steps for assembly of parts to be installed on site

#### Requirements

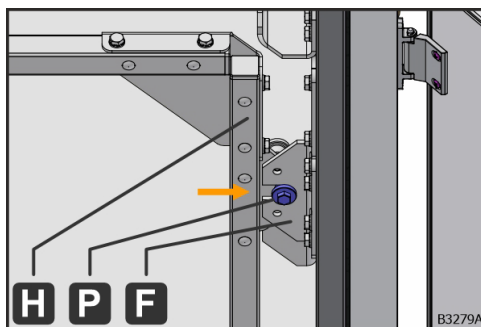
The parts to be installed on site (see chapter "Work steps for assembly of parts to be installed on site", page 52) are available.

#### Work steps for assembling the left-hand support strut (H)



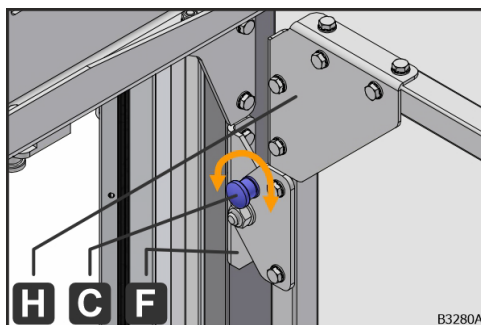
1. Insert the lower centring pin (O) of the support strut (H) into the groove of the lower suspension bracket (G).
2. Push the support strut (H) downwards.

Fig. 59: Inserting the lower centring pin into the groove



3. Swivel the support strut (H) upwards.
4. Insert the upper centring pin (M) into the groove of the upper suspension bracket (F).

Fig. 60: Inserting the upper centring pin in the groove



5. Turn the handle of the C-M10 indexing plunger (C) back and forth to lock the C-M10 mini indexing plunger (C) in the opening of the upper suspension bracket (F).
- The left-hand support strut H is now engaged.

Fig. 61: Engaging the mini indexing plunger in the upper suspension bracket

#### Work steps for assembling the right-hand support strut (H)

Carry out steps 1–5 for the right-hand support strut (H).

## Work steps for assembling the mounting section (B)

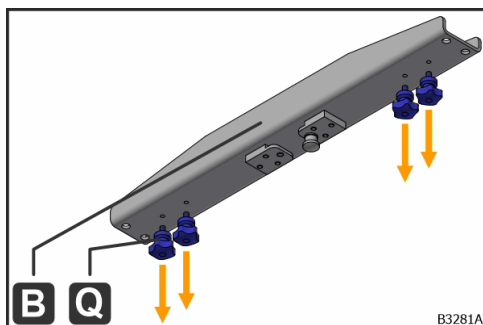


Fig. 62: Removing the M8 star grips

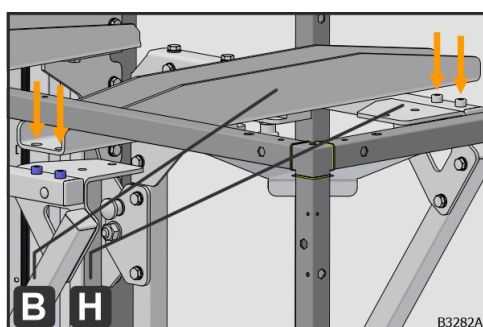


Fig. 63: Placing the mounting section (B)

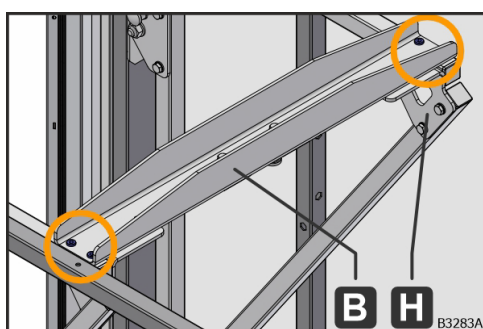


Fig. 64: Centring the cheese head screws

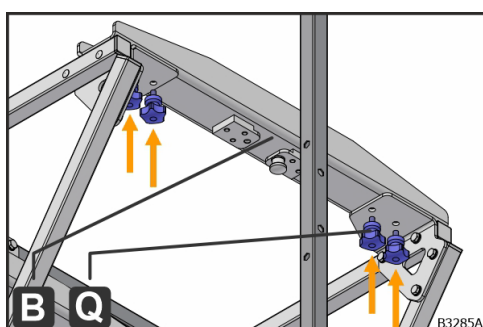


Fig. 65: Screwing on the mounting section (B)

1. Remove 4 x star grips M8 (Q) from the mounting section (B).

2. Place the mounting section (B) on top of the previously installed support struts (H).

→ The side boreholes of the mounting section (B) engage in the screw heads of the cylinder head screws of the support struts (H).

3. Screw the mounting section (B) to the support struts (H) using 2 M8 star grips on each side.
  4. Hand-tighten the M8 star grips.
- The mounting section (B) is now mounted.

Work steps for assembling the supporting arm (I)

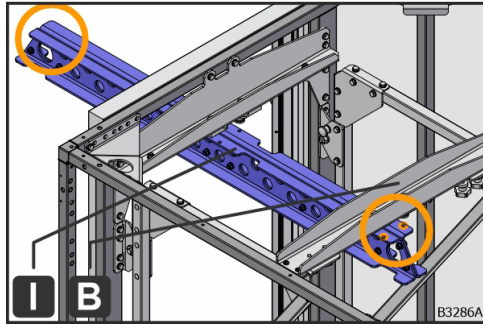


Fig. 66: Borehole in the supporting arm (I)

1. The borehole for the mini indexing plunger in the supporting arm (I) must point towards the mounting section (B).

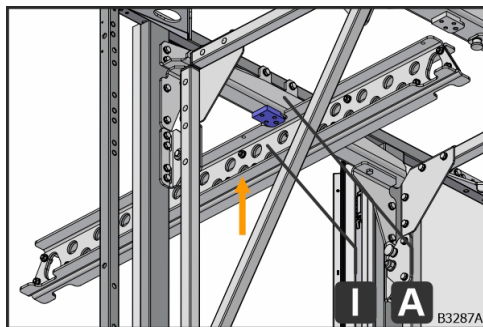


Fig. 67: Lifting the supporting arm (I) into the front guide plate

2. Lift the recess of the supporting arm (I) into the front guide plates of the mounting section (A).

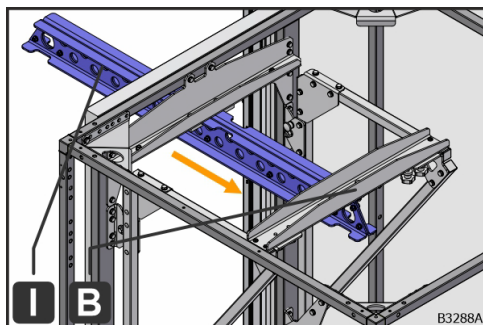


Fig. 68: Sliding in the supporting arm (I)

3. Push the supporting arm (I) towards the mounting section (B).

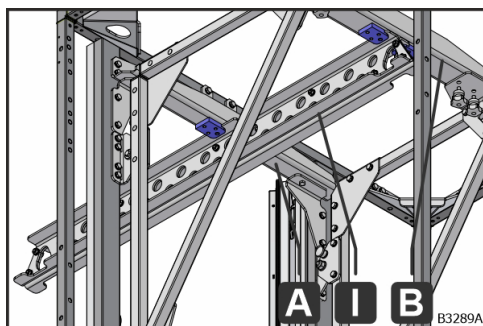


Fig. 69: Inserting the supporting arm (I) into the rear guide plate

4. Slide the supporting arm (I) into the rear guide plate. Ensure that the supporting arm (I) is pushed into both the front and rear guide plate.

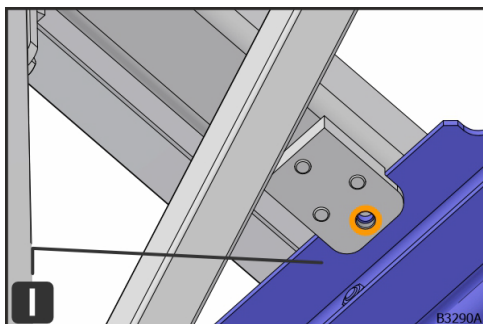


Fig. 70: Positioning the supporting arm for securing with the mini indexing plungers

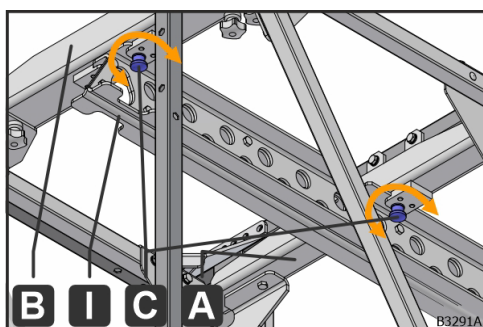


Fig. 71: Securing the supporting arm with mini indexing plungers

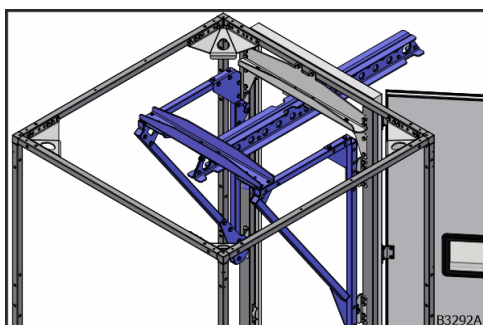


Fig. 72: Installed lift out device

5. Push in the supporting arm (I) until the boreholes of the supporting arm (I) are aligned with the pins of the C-M10 mini indexing plunger (C).

6. Turn the handle of the front C-M10 mini indexing plunger (C) back and forth until it engages in the boreholes of the supporting arm (I).

7. Turn the handle of the rear C-M10 mini indexing plunger (C) back and forth until it engages in the boreholes of the supporting arm (I).

→ The supporting arm (I) is secured.

→ Assembly of the parts to be mounted on site is complete.

### Removal of parts to be installed on site

The on-site parts are removed in the reverse order to installation.

## Commissioning

### Commissioning requirements

The condition of the corner nodes (A), the lever hoists (B) and the sling chains (C) must be checked:

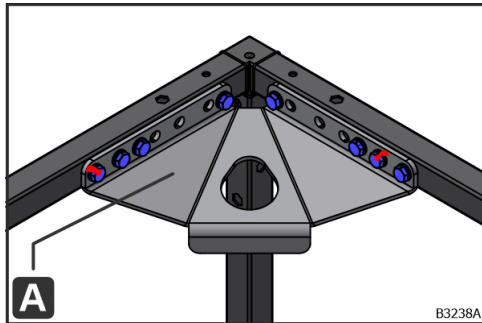


Fig. 73: Fastening the corner nodes

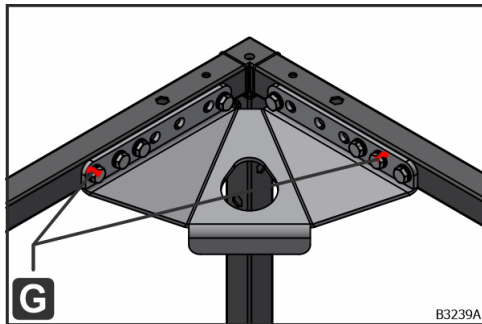


Fig. 74: G – screw locking lacquer

For rectification of faults see chapter "Fault", page 74.

- Visually inspect all parts for cracks, corrosion and/or deformation. If there are any abnormalities, the motor removal device must not be put into operation.
- Check the fastening of the corner nodes (A). Each corner node (A) must be secured with 8 screws. If incomplete, the motor removal device must not be put into operation.
- Carry out a visual inspection of the screw locking lacquer (G) on the corner nodes (A). If there is any damage, the motor removal device must not be put into operation.



The condition of the factory installed fasteners, the parts to be installed on site, the lever hoists (J) and the sling chains (K) must be checked:

- Visually inspect all parts for cracks, corrosion and/or deformation. If there are any abnormalities, the lift out device must not be put into operation.
- The centring pins (P) of the support struts (H) must be inserted into the grooves of the upper suspension brackets (F).

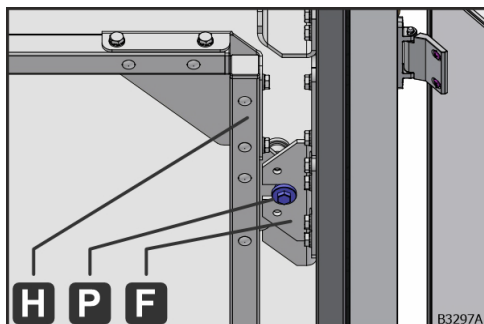


Fig. 75: centring pin (P) in upper suspension bracket (F)

- The centring pins (O) of the support struts (H) must be inserted into the grooves of the lower suspension brackets (G).

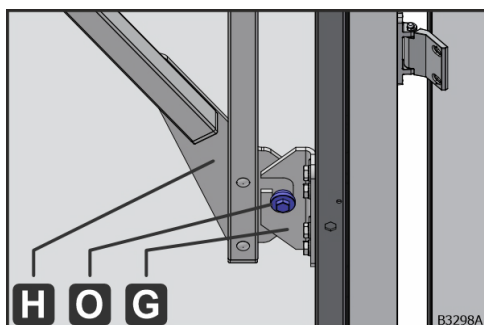


Fig. 76: centring pin (O) in lower suspension bracket (G)

- The C-M10 mini indexing plungers (C) on the support struts (H) right and left must be engaged in the upper suspension bracket (F).

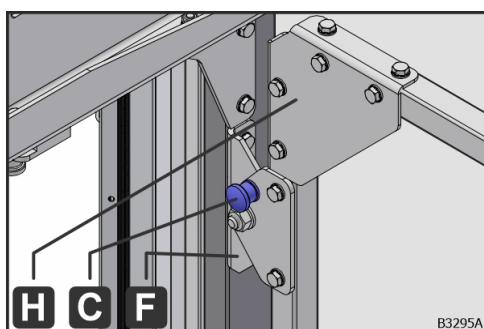


Fig. 77: C-M10 mini indexing plunger (C) in upper suspension bracket (F)

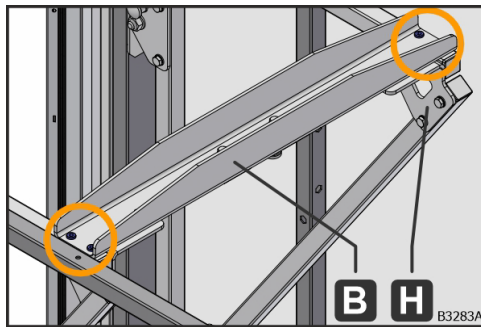


Fig. 78: cylinder head screws in centring boreholes

- The centring boreholes of the mounting section (B) must be engaged in the screw heads of the cylinder head screws of the support struts (H).

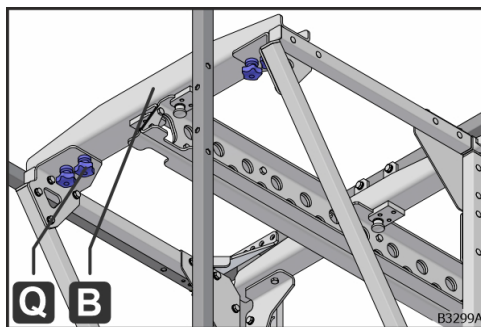


Fig. 79: M8 star grips in support struts

- the mounting section (B) must be screwed onto the support struts with 4 M8 star grips (Q). The 4 M8 star grips (Q) must be fastened hand-tight.

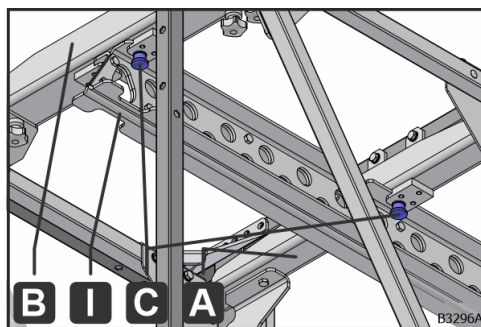


Fig. 80: mini indexing plungers (C) in guide plates

- The mini indexing plungers (C) in the guide plates front and back must be properly engaged.

For rectification of faults see chapter "Fault", page 74.

## Operation

### **Impeller suspension for AC motors**

For fans with AC motors, the impeller must be taken off before removing the motor see chapter "Impeller suspension for AC motors", page 66.

## Attaching the sling chains

### NOTICE



#### Material damage due to wrongly attached load

The anchorage eyelets of the load are not designed for oblique pull.

- Use the sling chain to attach the load.

The sling chains (B) are attached to the existing anchorage eyelets of the load (e.g. electric motor) with one or two hooks.

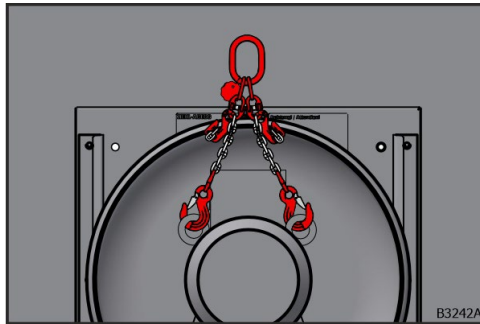


Fig. 81: attaching the sling chains to two anchorage eyelets

- Hook the sling chains into the existing anchorage eyelets of the load (e.g. electric motor).

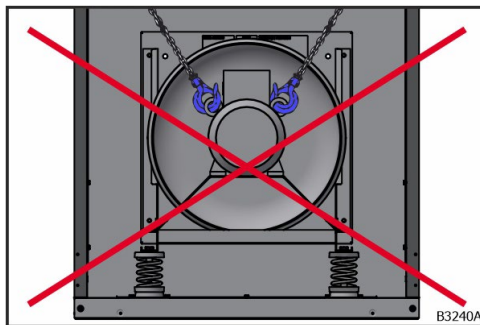


Fig. 82: Load attached wrongly

By using chain shortening hooks, the length of the sling chains (B) can be adjusted to the requirements of the specific situation.

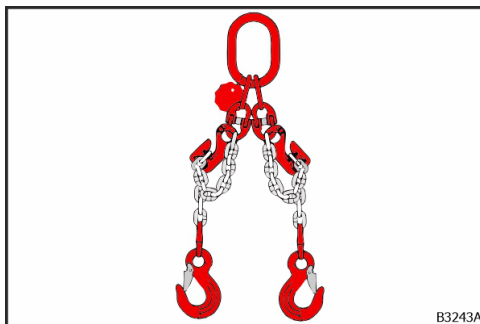
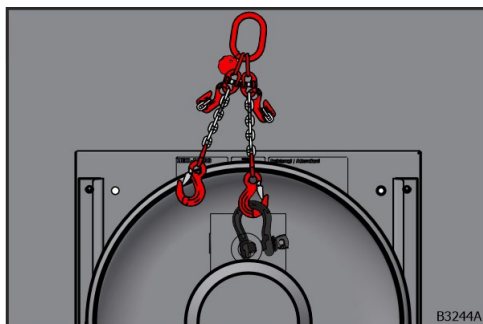


Fig. 83: using the chain shortening hooks

- The sling chains (B) can be shortened to a minimum using chain shortening hooks.



- With an anchorage eyelet, a shackle can be inserted into the centre of it.

Fig. 84: attaching the sling chains to an anchorage eyelet

### Determining the 3 corner nodes for attaching the lever chain hoists

The load is statically suspended from 3 lever chain hoists. As the lever chain hoists can only be loaded in tension due to the chains as the means of traction, the lever chain hoists must always be arranged in a star shape (when viewed from above). None of the chains may form an angle of more than  $180^\circ$  to the neighbouring chain.

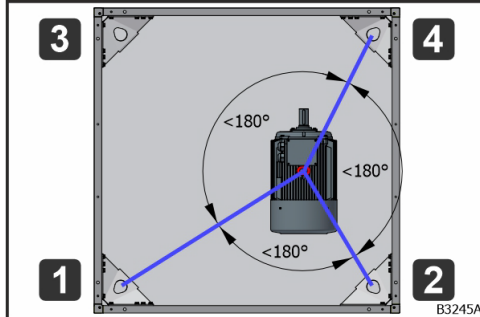


Fig. 85: correct use of corner nodes 1, 2 and 3

- Using corner nodes 1, 2 and 4: all angles are less than  $180^\circ$ .

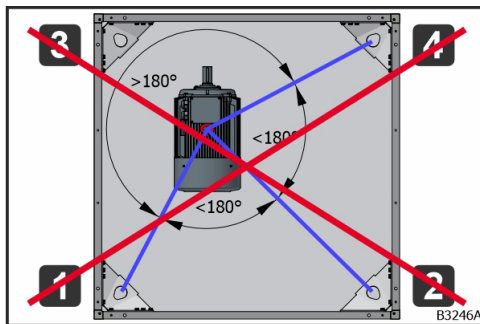


Fig. 86: wrong use of corner nodes 1, 2 and 3

- Using corner nodes 1, 2 and 4: one angle is greater than  $180^\circ$ . The load must not be lifted, as it may swing uncontrollably in the direction of corner node 2.
- Unhook lever chain hoist from corner node 2 and reattach at corner node 3.

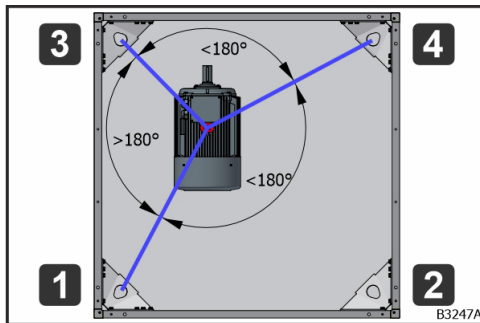


Fig. 87: correct use of corner nodes 1, 3 and 4

- Using corner nodes 1, 3 and 4: all angles are less than  $180^\circ$ .

## Adjusting the length of the lever chain hoists

### WARNING



#### Risk of injury from falling or swinging load

If the changeover lever of the lever chain hoist is set to the freewheel position "N" when the load is below the minimum load, the load may move in an uncontrolled manner. This may result in injury due to the load swinging or falling.

- No lifting and clamping operations when the changeover lever is in the freewheel position "N".
- Do not select freewheel position "N" when loaded.

The chain is set to the correct length with the freewheel of the lever chain hoist.

#### Requirement

- No load is attached to the lever chain hoist.
- The lever chain hoist is not under tension.

#### Work steps

1. Set the changeover lever (M) to freewheel position "N".
2. Turn the handwheel (L) anti-clockwise until it locks.
  - ➔ The brake is released.
3. Pull the chain into the required position.
  - ➔ The chain is set to the correct length.

## Tightening the lever chain hoists to lift the load

### TIP



#### Lever chain hoist braking mechanism

The braking mechanism is only activated in the "UP" position by applying the following minimum loads:

- DD-LB 075 35daN
- DD-LB 150 38daN
- DD-LB 300 50daN

#### Requirement

- Ensure that there are no persons or blocking parts in the immediate movement area of the load.

#### Work steps

1. Set the changeover lever (M) to the "UP" position.
2. Turn the handwheel (L) clockwise to tension the chain.
3. Turn the hand lever (N) clockwise to lift the load.
  - ➔ The load is lifted.

### **Releasing the lever chain hoists and lowering the load**

#### Requirement

- Ensure that there are no persons or blocking parts in the immediate movement area of the load.

#### Work steps

- Set the changeover lever (M) to the "DN" (down) position.
- Turn the hand lever (N) anti-clockwise to slowly lower the load.
- The load is lowered.



## Moving the load diagonally

The following steps are required to move the load from one corner to the diagonally opposite corner (e.g. from corner node 4 to corner node 2):

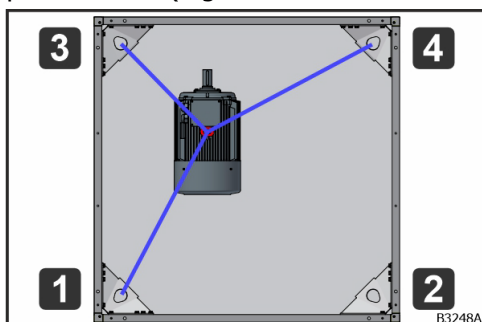


Fig. 88: load with corner node 4

1. Tighten all 3 lever chain hoists.
  2. Tighten lever chain hoists 1 and 4 further and loosen lever chain hoist 3.
- The load moves towards the casing centre.

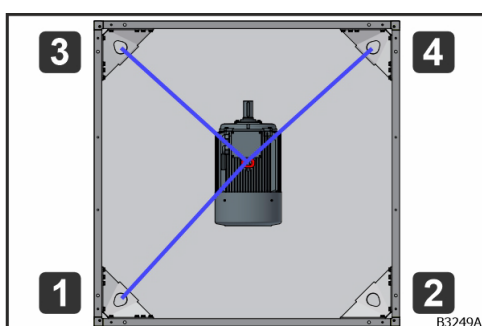


Fig. 89: load in centre of casing with lever chain hoist in corner node 4

Chains of lever chain hoist 1 and 4 are in line.

3. Release lever chain hoist 3.
4. Detach lever chain hoist from corner node 3.

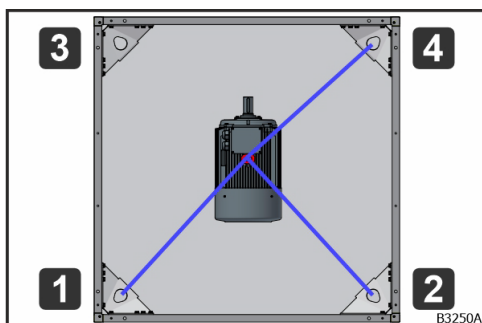


Fig. 90: load in centre of casing with lever chain hoist in corner node 2

Chains of lever chain hoist 1 and 4 are in line.

5. Attach lever chain hoist to corner node 2.

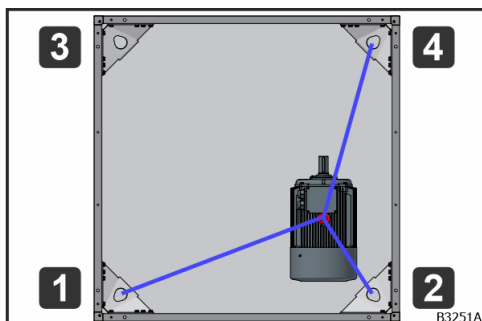


Fig. 91: load moves towards corner node 2

6. Release the chains of lever chain hoists 1 and 4 and tighten lever chain hoist 2.
- The load moves towards corner node 2.

### Impeller suspension for AC motors

For fans with AC motors, the impeller must be taken off before removing the motor.

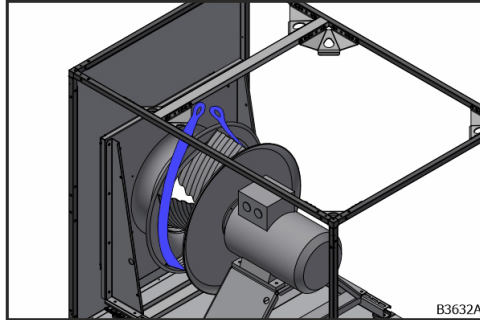


Fig. 92: Impeller with polyester sling

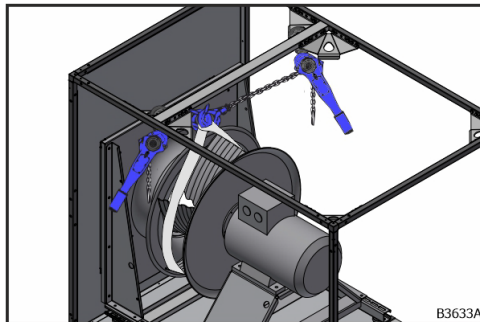


Fig. 93: Lever chain hoists in the corner brackets

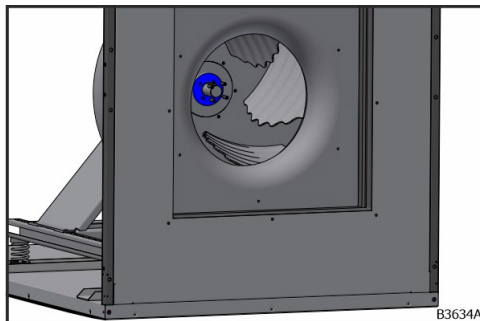


Fig. 94: Impeller bushing

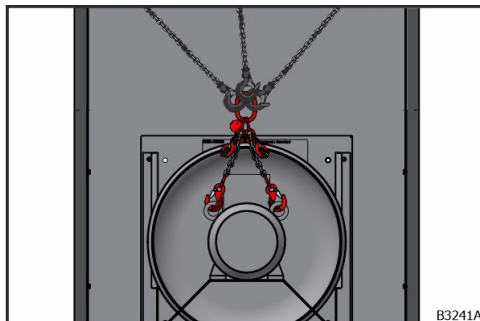


Fig. 95: Suspended motor

1. Lay the polyester sling round the impeller.
2. Attach the polyester sling to two corner brackets above the impeller using shackles in two lever chain hoists.
3. Pull the lever chain hoists until there is a slight tension see chapter "Adjusting the length of the lever chain hoists", page 63, see chapter "Tightening the lever chain hoists to lift the load", page 63 and see chapter "Releasing the lever chain hoists and lowering the load", page 64.
4. Detach the impeller bushing from the intake side.
5. Attach the sling chains to the existing anchorage eyelets of the AC motor see chapter "Attaching the sling chains", page 60.
6. Attach the load hook of the lever chain hoists to the lug of the sling chain see chapter "Determining the 3 corner nodes for attaching the lever chain hoists", page 62.

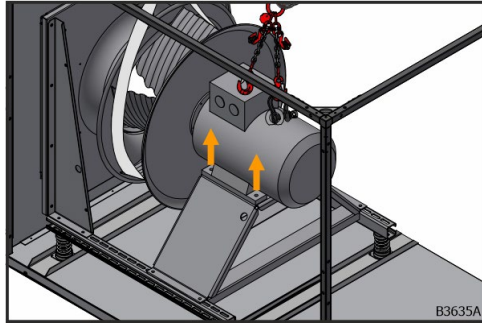


Fig. 96: Motor mount screws

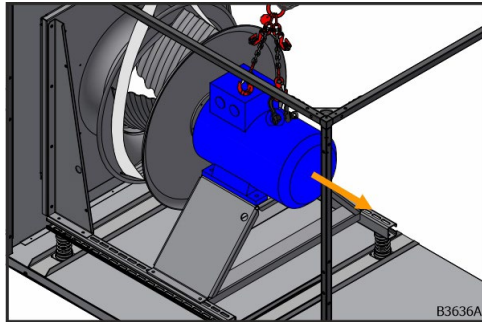


Fig. 97: Pulling out the motor

7. Remove the screws attaching the motor to the motor mount.

8. Pull the motor with drive shaft out of the impeller.  
→ The motor can now be removed see chapter "Moving the load diagonally", page 65.

## Work steps for removing a load

### WARNING



#### Danger to life caused by swinging loads

There is a danger to life from the attached load swinging.

- When lifting, the attached load must be vertically below the lifting point of the supporting arm (I).

#### Requirements

The factory installed fasteners must be mounted. The inspection door must be open or the panel removed at the corresponding opening.

Attaching the lever hoists (J) to the supporting arm (I)

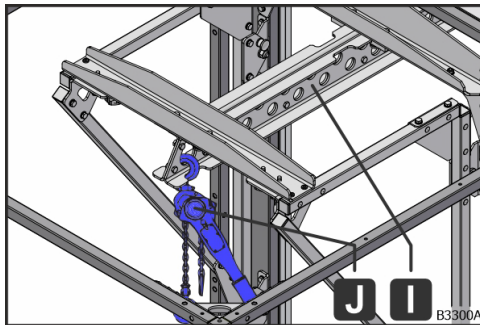


Fig. 98: inner lifting point

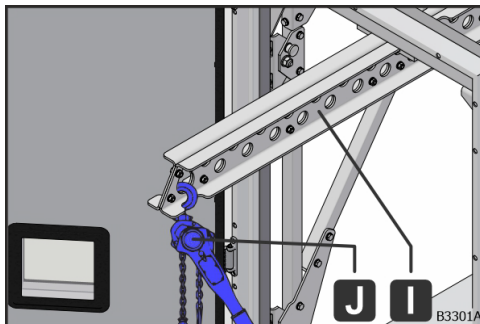


Fig. 99: external lifting point

1. Attach a lever hoist (J) to the inner lifting point of the supporting arm (I).

2. Attach the second lever hoist (I) to the external lifting point of the supporting arm (I).

Attaching the lever hoists (J) to the sling chain (K)

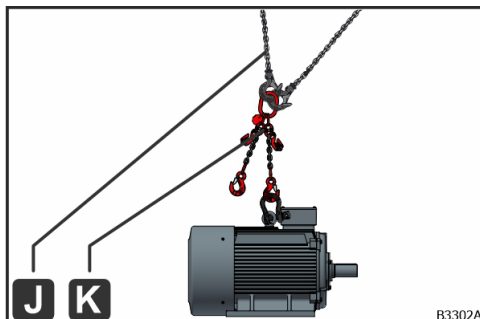


Fig. 100: load hook in sling chain (K)

1. Hook the load hooks of the lever hoists (J) into the eye of the sling chain (K).

## Lifting out the load

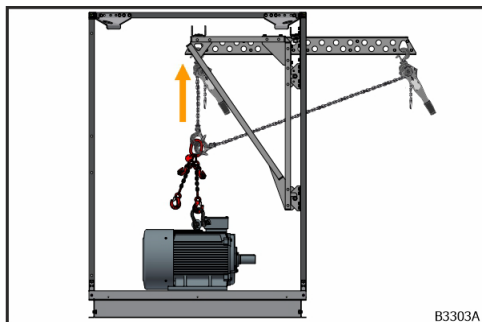


Fig. 101: load inside the casing

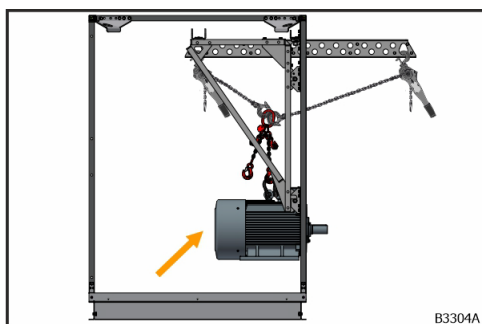


Fig. 102: load in intermediate position

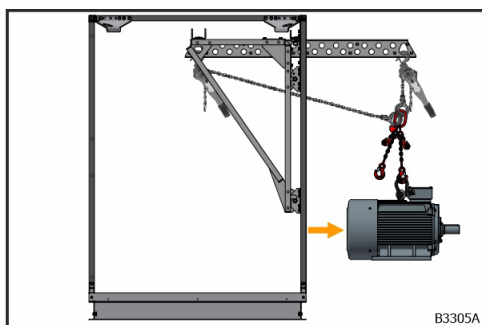


Fig. 103: load vertically below the outer lever hoist

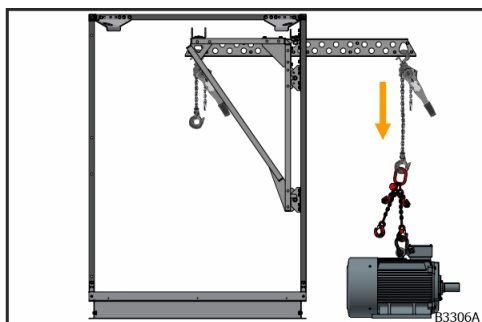
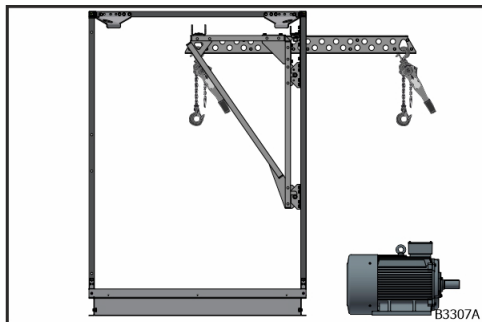


Fig. 104: load outside the casing

1. Tighten the inner lever hoist (J) to lift the load.
2. Tighten the outer lever hoist (J) to swivel the load towards the opening.
3. Loosen the inner lever hoist (J) to move the load more towards the opening. In the process, the load lowers.
4. Tighten the outer lever hoist (J) to counteract lowering and carry on moving the load towards the opening.
5. Repeat work steps 3 and 4 until the load is suspended vertically on the outer lever hoist (J).
6. Unhook the load hook of the inner lever hoist (J).
7. Release the outer lever hoist (J) to set down the load.



8. Unhook the load hook of the outer lever hoist (J).
- The load is lifted out.

Fig. 105: load set down

### **Lifting in the load**

Lifting in the load takes place in the reverse order of lifting out.

## Maintenance

### Maintenance interval

Every year.



Fig. 106: inspection sticker (lever chain hoist)

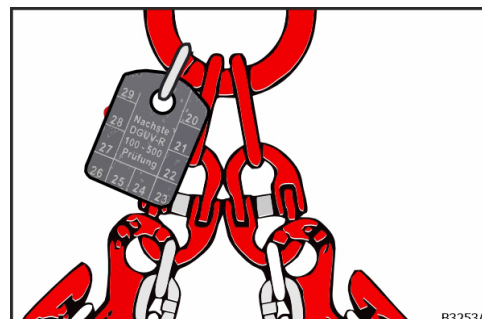


Fig. 107: inspection mark (sling chain)

The inspection sticker or inspection mark indicates the next required inspection.

### Inspection

The condition of the corner nodes (A), the lever hoists (B) and the sling chains (C) must be checked:

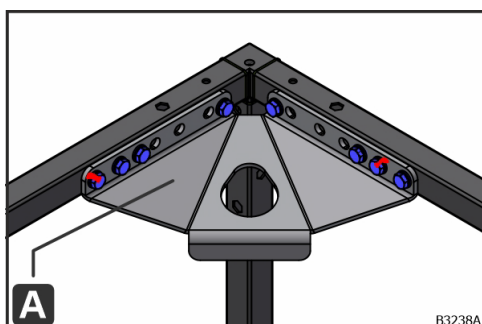


Fig. 108: Fastening the corner nodes

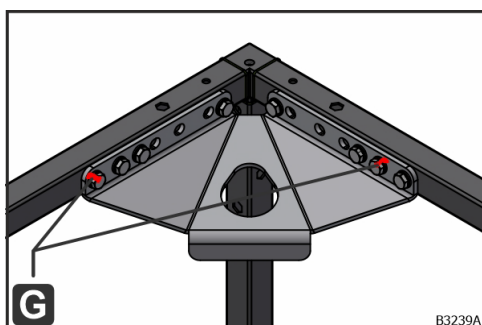


Fig. 109: G – screw locking lacquer

For rectification of faults see chapter "Fault", page 74.

- Visually inspect all parts for cracks, corrosion and/or deformation. If there are any abnormalities, the motor removal device must not be put into operation.
- Check the fastening of the corner nodes (A). Each corner node (A) must be secured with 8 screws. If incomplete, the motor removal device must not be put into operation.
- Carry out a visual inspection of the screw locking lacquer (G) on the corner nodes (A). If there is any damage, the motor removal device must not be put into operation.

The condition of the factory installed fasteners, the parts to be installed on site, the lever hoists (J) and the sling chains (K) must be checked:

- Visually inspect all parts for cracks, corrosion and/or deformation. If there are any abnormalities, the lift out device must not be put into operation.
- The centring pins (P) of the support struts (H) must be inserted into the grooves of the upper suspension brackets (F).

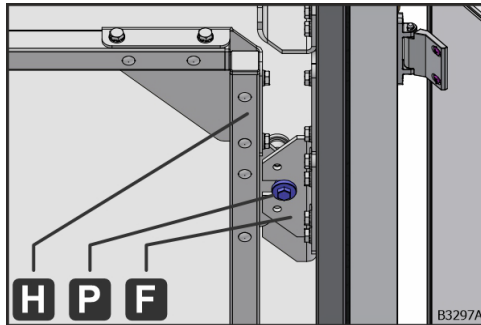


Fig. 110: centring pin (P) in upper suspension bracket (F)

- The centring pins (O) of the support struts (H) must be inserted into the grooves of the lower suspension brackets (G).

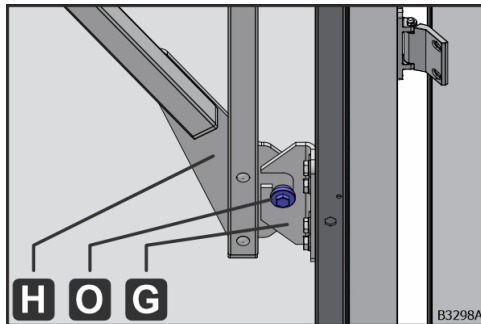


Fig. 111: centring pin (O) in lower suspension bracket (G)

- The C-M10 mini indexing plungers (C) on the support struts (H) right and left must be engaged in the upper suspension bracket (F).

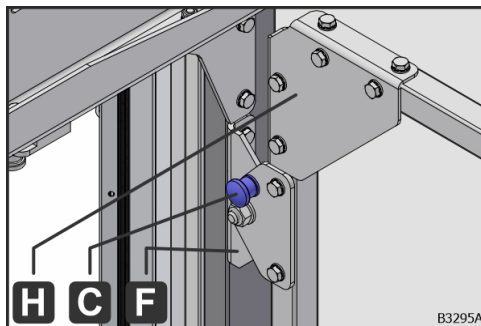


Fig. 112: C-M10 mini indexing plunger (C) in upper suspension bracket (F)



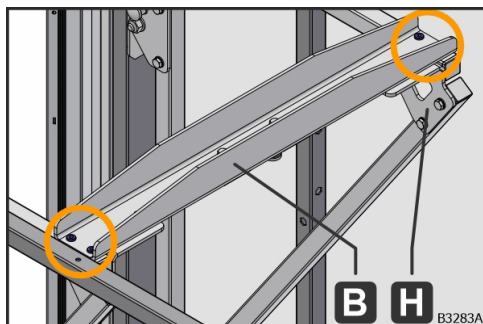


Fig. 113: cylinder head screws in centring boreholes

- The centring boreholes of the mounting section (B) must be engaged in the screw heads of the cylinder head screws of the support struts (H).

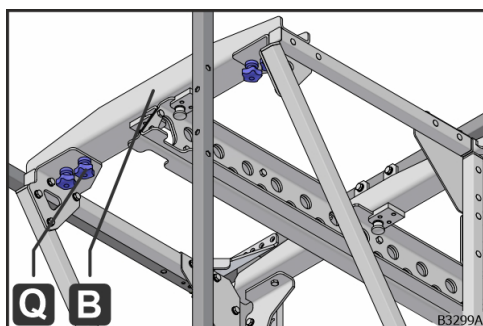


Fig. 114: M8 star grips in support struts

- the mounting section (B) must be screwed onto the support struts with 4 M8 star grips (Q). The 4 M8 star grips (Q) must be fastened hand-tight.

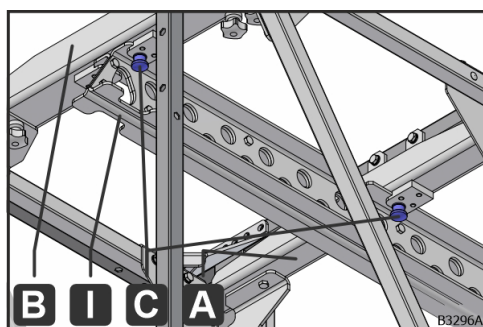


Fig. 115: mini indexing plungers (C) in guide plates

- The mini indexing plungers (C) in the guide plates front and back must be properly engaged.

For rectification of faults see chapter "Fault", page 74.

## **Fault**

### **Defective parts**

In the event of any faults or defective parts in the motor removal device, these must be rectified by appropriately trained personnel.

- Do not bend any bent parts back into shape. Replace bent parts with original spare parts.
- Do not weld cracked parts. Replace cracked parts with original spare parts.

The disassembly and assembly of the parts must be carried out professionally, taking into account and with an understanding of the function and load of the parts. The work carried out must also be checked and confirmed by qualified personnel.

### **Interrupted screw locking lacquer**

The screw locking lacquer must not be interrupted. Proceed as follows if the screw locking lacquer is interrupted:

1. Have the cause determined by appropriately trained personnel.
2. Tighten the screw with a torque of 20 Nm.
3. Apply screw locking lacquer.

The work carried out must be checked and confirmed by qualified personnel.

# Heat recovery systems (HRS)

## Rotary heat exchanger

### CAUTION



#### Risk of crushing due to automatic startup

When working on the rotary heat exchanger, there is a risk of injury from crushing due to moving and rotating parts, as the rotary heat exchanger can start up via an automatic cleaning run or restart after a power failure.

- Before carrying out any work on the rotary heat exchanger, switch off the AHU and secure it so that it cannot be switched back on.

### Maintenance interval

Every three months.

### Inspection

- Check the rotary heat exchanger for hygienic condition, foreign bodies, dirt, damage and corrosion.
- Check the sealing strips for dirt, foreign bodies and compression.
- Check drive belts for wear and tension; if necessary, shorten or replace.
- Check the rotary heat exchanger for imbalance and lateral run-out.
- Check the bearing for impermissible heating, vibrations or running noises and replace if necessary (at the latest at the end of its life time).
- Check the function of the water drain and siphon; clean if necessary.
- Check the water level in the siphon and top up if necessary.
- Check the correct function of the rotor run-out control; align the sensor if necessary.

### Repair

- Eliminate foreign matter, contamination, damage and corrosion.
- Clean the accumulation mass according to the specifications of the rotary heat exchanger manufacturer (e.g., with compressed air). Depending on the type of rotary heat exchanger, wet cleaning (e.g., with a high-pressure cleaner) can destroy the rotary heat exchanger. If cleaning is done with a high-pressure cleaner, use only water without additives and remove dirty water carefully.
- Clean sealing strips; replace if worn.
- Adjust the compression of sealing strips.
- Balance or align the rotary heat exchanger.

## Plate heat exchanger

### Inspection

#### Maintenance interval

Every three months.

#### Work steps

- Check plate heat exchanger for hygienic condition, foreign matter, contamination, damage, and corrosion.
- Check pan drain and siphon for function; clean if necessary.
- Check siphon water filling and refill if necessary.

### Repair

- Eliminate foreign matter, contamination, damage and corrosion
- Cleaning with compressed air or high pressure cleaner (only water without additives). To avoid damage during cleaning, direct the air or water jet only at a right angle to the inflow surface of the plate heat exchanger. Carefully remove wastewater.

## Heat pipe

### Maintenance interval

Every three months.

### Inspection

- Check heat pipe for hygienic condition, contamination, damage, and corrosion.
- Check water drain and siphon for function; clean if necessary.
- Check siphon water filling and refill if necessary.

### Repair

- Clean heat pipe on the airside, remove damage and corrosion:
  - Avoid bending the fins.
  - Blow out with compressed air against the air direction.
  - Do not use a high-pressure cleaner or high-pressure steam cleaner.
  - Cleaning with water and low pressure.

# Heating coil, cooling coil, and electric heater

## Heating coil

### NOTE



#### **Material damage due to inadequate venting**

If systems are not properly vented, air pockets will form which can lead to reduced performance or pump damage.

- Exhaust ventilate the system according to VDI 2035 during system filling at the highest point of the system.

## Inspection

### **Maintenance interval**

Monthly.

### **Work steps**

- Check the coil, pipework and hydraulic set for damage, tightness and corrosion.

### **Maintenance interval**

Every three months.

### **Work steps**

- Check the coil for hygienic condition, contamination on the airside, damage, tightness, and corrosion.
- Exhaust ventilate the coil according to VDI 2035.
- Check the function of the supply and medium return lines.
- Check frost protection for function (medium by spinning out or temperature sensor using cold spray).

## Repair

- Clean the coil on the airside, remove damage, leaks, and corrosion.
  - Clean the coil while installed or, if it is not accessible, remove it for cleaning. Removed dirt must not get into adjacent parts of the plant. Carefully remove dirt and wastewater.
  - Avoid bending the fins.
  - Blow out with compressed air against the air direction.
  - Do not use a high-pressure cleaner or high-pressure steam cleaner.
  - Clean with water and low pressure.

### Removal/installation

#### Requirements

- Disable the coil.
- Hydraulic set or pipework (medium supply and medium return) removed.

#### Work steps

1. Unscrew front panel with Torx (Tx25).
2. For the cooling coil, remove the condensate deflector plate from the casing frame.
3. Pull out the coil to the front.
4. Support the coil if necessary.
5. Check seals for damage and replace if necessary.
6. Insert the coil.
7. For the cooling coil, glue the condensate deflector plate with joint sealant.
8. Screw on front panel with Torx (Tx25).
9. Slide in the coil.
10. Glue the condensate deflector plate on the cooling coil with joint sealant.
11. Attach the front panel with Torx (Tx25).

## Making the flange connection

### Requirements

Flange contact surfaces must be clean, flat and undamaged.

### Work steps

## NOTICE



### Material damage due to incorrect tightening of the screws

Incorrect sequence when tightening the screws may cause material damage due to stresses.

- Tighten the screws crosswise.

Tighten the flange connections with the following tightening torque using a torque wrench, depending on the nominal diameter of the screw:

Nominal diameter of screw	Tightening torque [Nm]
M10	35
M12	55
M16	120
M20	240

Table 5: Torques for flange connections

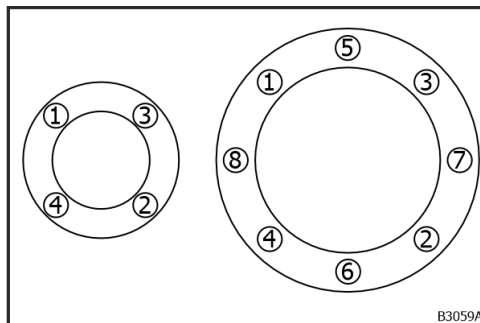


Fig. 116: tightening crosswise

The screws are tightened with a torque wrench in the sequence shown (= crosswise) in 3 passes:

1. Fix the screws crosswise with 30% of the tightening torque.
  2. Tighten the screws crosswise with 60% of the tightening torque.
  3. Tighten the screws crosswise with the tightening torque.
- The flange connection has been made correctly.
4. Check the tightening torque of all screws.

## Cooling coil

### NOTE



#### **Material damage due to inadequate venting**

If systems are not properly vented, air pockets will form which can lead to reduced performance or pump damage.

- Exhaust ventilate the system according to VDI 2035 during system filling at the highest point of the system.

## Inspection

### **Maintenance interval**

Monthly.

### **Work steps**

- Check the coil, pipework and hydraulic set for damage, tightness and corrosion.

### **Maintenance interval**

Every three months.

### **Work steps**

- Check the coil for hygienic condition, contamination on the airside, damage, tightness, and corrosion.
- Exhaust ventilate the coil according to VDI 2035.
- Check the function of the supply and medium return lines.
- Check frost protection for function (medium by spinning out or temperature sensor using cold spray).
- Check condensate pan for contamination, clean if necessary.
- Check water drain and siphon for function; clean if necessary.
- Check water supply siphon and refill if necessary.
- Check direct expansion coil for ice formations.
- Check droplet eliminator for sanitary condition, contamination, incrustation, damage, droplet penetration, and corrosion.



## Repair

- Clean the coil on the airside, remove damage, leaks, and corrosion.
  - Clean the coil while installed or, if it is not accessible, remove it for cleaning. Removed dirt must not get into adjacent parts of the plant. Carefully remove dirt and wastewater.
  - Avoid bending the fins.
  - Blow out with compressed air against the air direction.
  - Do not use a high-pressure cleaner or high-pressure steam cleaner.
  - Clean with water and low pressure.
- Clean and repair the droplet eliminator: Pull out cassette, disassemble and clean profiles individually; remove damage and corrosion.

### Removal/installation

#### Requirements

- Disable the coil.
- Hydraulic set or pipework (medium supply and medium return) removed.

#### Work steps

1. Unscrew front panel with Torx (Tx25).
2. For the cooling coil, remove the condensate deflector plate from the casing frame.
3. Pull out the coil to the front.
4. Support the coil if necessary.
5. Check seals for damage and replace if necessary.
6. Insert the coil.
7. For the cooling coil, glue the condensate deflector plate with joint sealant.
8. Screw on front panel with Torx (Tx25).
9. Clean soiled surfaces (unit floor, drain pan and casing frame) with a damp cloth, as the position of the coils on the unit floor, the drain pan or the casing frame provides a conductive connection and ensures that the component is included in the equipotential bonding of the unit.
10. Slide in the coil.
11. Glue the condensate deflector plate on the cooling coil with joint sealant.
12. Attach the front panel with Torx (Tx25).

### Making the flange connection

Requirements

Flange contact surfaces must be clean, flat and undamaged.

Work steps

#### NOTICE



#### Material damage due to incorrect tightening of the screws

Incorrect sequence when tightening the screws may cause material damage due to stresses.

- Tighten the screws crosswise.

Tighten the flange connections with the following tightening torque using a torque wrench, depending on the nominal diameter of the screw:

Nominal diameter of screw	Tightening torque [Nm]
M10	35
M12	55
M16	120
M20	240

Table 6: Torques for flange connections

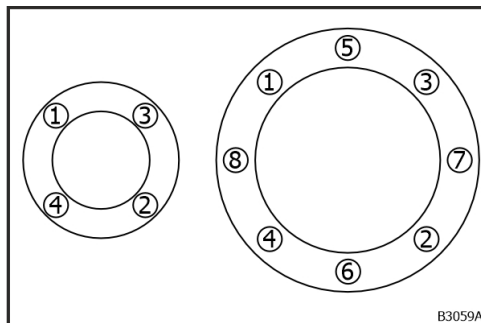


Fig. 117: tightening crosswise

The screws are tightened with a torque wrench in the sequence shown (= crosswise) in 3 passes:

1. Fix the screws crosswise with 30% of the tightening torque.
  2. Tighten the screws crosswise with 60% of the tightening torque.
  3. Tighten the screws crosswise with the tightening torque.
- The flange connection has been made correctly.
4. Check the tightening torque of all screws.

## Electric heater

### DANGER



#### Danger to life due to burns

When working on the electric heater, there is a danger to life due to hot surfaces or heat radiation.

- Let the fan run to cool down to room temperature.
- Before carrying out any work on the electric heater, switch off the AHU and secure it so that it cannot be switched back on.
- Wear heat-resistant gloves.

### CAUTION



#### Hot surfaces due to heat radiation of the electric heater

There is a risk of burns when touching the surfaces (duct, spigots,...) if the electric heater is at the end of the AHU.

- Let the fan run to cool down to room temperature.
- Wear heat-resistant gloves.

## Maintenance interval

Every three months.

## Inspection

- Check function of air flow monitoring; to do this, pull off the pressure measuring hoses at the differential pressure switch. A switching operation must take place.
- Check electric heater for function, hygienic condition, contamination, damage, corrosion, and fastening.
- Check function of safety temperature limiter.

The functions must be checked accordingly (e.g., using a hot air blower):

Recommendation:

- "Fan" setting: 40 °C.
- "Temperature sensor" setting: 70 °C.
- "Safety temperature limiter" setting: 90 °C.

## Repair

- Clean electric heater; remove scale, damage, and corrosion, and retighten mounting parts.

# Dampers

## Damper

### WARNING



#### **Risk of death due to moving parts**

Risk of death when closing fins, moving coupling bars or gears due to crushing between two moving parts.

- Attach separating protective devices (e.g., downstream grid, duct) to the damper.
- Before opening the door, switch off the AHU and secure it against restarting.
- Do not reach between the fins.

### NOTE



#### **Material damage due to improper commissioning**

Switching on the fan with the dampers closed may cause damage to the AHU.

- Do not switch on the fan before checking that the relevant dampers are open or before a limit switch indicates they are open.
- Make sure that the fans are switched off immediately when the shut-off dampers are closed.

## **Inspection**

### **Maintenance interval**

Every three months.

### **Work steps**

#### **Dampers**

- Check dampers for function, contamination, damage, and corrosion.
- Check the protective device for effectiveness.

#### **Dampers with rod drive**

- Check rods for tight fit and unobstructed movement.
- Check the setting.

## Repair

### Dampers

- Clean dampers; remove damage and corrosion.

### Dampers with rod drive

- Lubricate brass bearings (plastic bearings do not require lubrication).
- Lubricate rods.

Equipotential bonding:

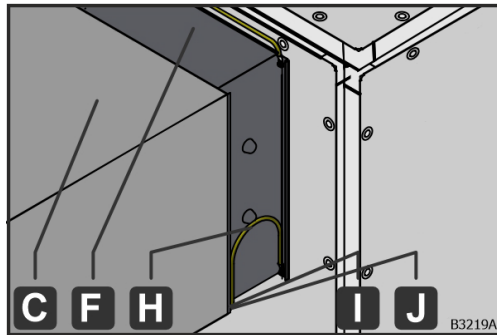


Fig. 118: damper with equipotential bonding conductor

1. Route the pre-assembled equipotential bonding conductor (H) of the damper (F) to the on-site duct (C).
  2. Secure the equipotential bonding conductor (H) with a toothed lock washer (J) to prevent loosening.
  3. Tighten the screw (I).
- The damper (F) is connected to the AHU and to the on-site duct (C) via the equipotential bonding conductor (H).

## Pressure relief damper

### CAUTION



#### **Risk of injury when triggering the pressure relief damper**

Risk of injury from impact or pressure due to sudden release of the pressure relief damper.

- Protective devices according to DIN EN ISO 12100 must be fitted and effective.

## Inspection

### **Maintenance interval**

every six months.

### **Work steps**

By simulating the maximum pressure in the network by means of sectional dampers, which are usually present in every plant, the release pressure must be checked and the weights readjusted if necessary.

- Check the pressure relief damper for function, foreign bodies, dirt, damage and corrosion.
- Apply lubricant to all movable parts.
- Apply Vaseline to the seal.
- Check the trigger pressure; adjust if necessary.

## Repair

- Clean pressure relief damper; remove damage and corrosion.
- Clean with damp cloth, use grease- and oil-dissolving cleaning agent if necessary.

# Humidifier

## CAUTION



### **Severe health damage due to infection and hypersensitivity reactions**

When exposed to water, there is a health risk from viruses, bacteria or fungi due to poor water quality.

- Check water quality at the specified intervals.
- The total colony count of 1000 CFU/ml in the humidifier water must not be exceeded (according to DIN EN ISO 6222).
- The legionella concentration of 100 CFU/100 ml must not be exceeded (according to DIN EN ISO 11731).
- The bacterial count of *Pseudomonas aeruginosa* King B of 100 CFU/100 ml must not be exceeded.
- There must be no visible mold growth.
- If bacterial counts are too high, clean the AHU immediately.

## TIP



### **Recurrent contamination**

In cases of doubt or in the event of rapidly recurring high levels of contamination, it is advisable to seek the advice of a qualified institute.



## Circulating water spray humidifier (low pressure)

### Inspection

#### Maintenance interval

Every week.

#### Work steps

- Empty the humidifier tray and clean it with fresh water (this is carried out automatically on units with HYGIENECONTROL depending on the cleaning interval).

#### Maintenance interval

Every 2 weeks.

#### Work steps

- Check bacterial count of the circulating water and compare it with the permissible values. If the recommended bacterial count is exceeded, clean and disinfect immediately.
- Assess inner surfaces for visible or palpable biofilm (slimy coating), bacterial contamination, contamination, damage, or corrosion; if necessary, repair; clean manually or using a high-pressure cleaner and disinfect. In the case of deposits caused by lime precipitation, add a commercially available descaling agent to the circulating water with the fan at a standstill and allow to react for a few hours. Then empty the humidifier tray and clean it with fresh water. Remove droplet eliminator and flow rectifier profiles for cleaning, if required.

#### Desalination system

- For inspection work, see the attachment "Herco – desalination system Cooltrol data", "Scheduled maintenance" section.
- For details on cleaning, see the attachment "Herco – Cooltrol data desalination system", attachment "Herco – Cooltrol data open-loop control manual", "For cleaning" section.

## UV-C technology for water disinfection

**WARNING****Damage to health from mercury**

UV-C illuminants contain mercury. Mercury is toxic and dangerous to the environment.

- Avoid contact with skin and eyes. In case of contact, flush skin and eyes with plenty of water. Take off contaminated clothing.
- Do not swallow. If swallowed, induce vomiting.
- Ensure good air exchange in the danger zone.
- Comply with the safety data sheet of the manufacturer.

**CAUTION****Risk of serious injuries due to hazardous substances**

There is a risk of poisoning if the carton is damaged or if the UV-C illuminants break.

- When handling broken UV-C illuminants, follow the safety instructions for handling mercury.
- Avoid direct contact with eyes, skin, and clothing.
- Ensure excellent ventilation of the AHU and the rooms connected via the ducts.
- Keep broken pieces of UV-C illuminants in airtight packaging and dispose of properly.

**TIP****Removal of small amounts of mercury**

UV-C illuminants contain small amounts of mercury. Removal of the small amount leaked at breakage can be done with special sorbents for mercury.

**CAUTION****Risk of injury from UV-C radiation**

During operation of the UV-C lamp, there is a risk of injury from direct exposure to high-energy UV-C radiation.

- Before carrying out any work on UV-C lamps, switch off the AHU and secure it so that it cannot be switched back on.

**NOTICE****UV-C disinfection performance impaired by finger perspiration**

Finger perspiration leaves stains on the UV-C illuminant that burn in and impair the performance of UV-C disinfection.

- Wear cotton gloves when handling the UV-C illuminant.

**NOTICE****Damage to components caused by UV-C radiation**

UV-C radiation poses a risk of damage to components that are not UV-resistant.

- Components in the effective range of UV-C radiation must be UV-resistant or protected by UV-resistant shielding.
- For inspection work, see the attachment "Herco – UV disinfection system UVE 35 – 45 (P) digital", "Scheduled maintenance/Maintenance" section. The maintenance work under "Inspection during each operation" must also be carried out during the work for "Inspections every 2 weeks".
- For the pressure switch functional test, see the attachment "Herco – UV disinfection system UVE 35 – 45 (P) digital", "Testing the pressure switch function" section.

**Maintenance interval**

every six months.

**Work steps**

- Check strainer, pump, and lines for dirt, buildup, condition, and function; clean with fresh water if necessary; repair if necessary.
- Check pump incl. bearings for smooth, vibration-free running, heating, and noise; repair if necessary.
- Check the function and clean the conduction electrode according to the manufacturer's information; repair if necessary.
- Unscrew caps of spray nozzles and inspect for deposits; clean with commercial descaling agents if necessary.
- Check dry-run protection and float valve and adjust if necessary.
- Functional check of blowdown device, water treatment, sterilization system, water drain, and overflow; repair if necessary.
- Check cut-off devices for proper operation; repair or recalibrate if necessary.

**Repair**

- Dry using fan overshoot.
- Lubricate pump motor bearing according to manufacturer's instructions. Replace bearings (at the latest at the end of the theoretical service life).
- In case of failure of the water treatment system or the sterilization system, all parts of the system must be cleaned.
- Refill the humidifier tray with fresh water.

**UV-C technology for water disinfection****WARNING****Damage to health from mercury**

UV-C illuminants contain mercury. Mercury is toxic and dangerous to the environment.

- Avoid contact with skin and eyes. In case of contact, flush skin and eyes with plenty of water. Take off contaminated clothing.
- Do not swallow. If swallowed, induce vomiting.
- Ensure good air exchange in the danger zone.
- Comply with the safety data sheet of the manufacturer.

**CAUTION****Risk of serious injuries due to hazardous substances**

There is a risk of poisoning if the carton is damaged or if the UV-C illuminants break.

- When handling broken UV-C illuminants, follow the safety instructions for handling mercury.
- Avoid direct contact with eyes, skin, and clothing.
- Ensure excellent ventilation of the AHU and the rooms connected via the ducts.
- Keep broken pieces of UV-C illuminants in airtight packaging and dispose of properly.

**TIP Removal of small amounts of mercury**

UV-C illuminants contain small amounts of mercury. Removal of the small amount leaked at breakage can be done with special sorbents for mercury.

**CAUTION****Risk of injury from UV-C radiation**

During operation of the UV-C lamp, there is a risk of injury from direct exposure to high-energy UV-C radiation.



- Before carrying out any work on UV-C lamps, switch off the AHU and secure it so that it cannot be switched back on.

**NOTICE****UV-C disinfection performance impaired by finger perspiration**

Finger perspiration leaves stains on the UV-C illuminant that burn in and impair the performance of UV-C disinfection.

- Wear cotton gloves when handling the UV-C illuminant.

- For repair (replacing UV-C illuminants), see appendix "Herco – UV-disinfection system UVE 35 – 45 (P) digital", "Replacing UVE emitters" section.
- For cleaning the quartz protection tube, see appendix "Herco – UV disinfection system UVE 35 – 45 (P) digital", "Cleaning the quartz protection tube" section.
- For cleaning the UV sensor, see appendix "Herco – UV disinfection system UVE 35 – 45 (P) digital", "Cleaning the UV sensor" section.

## Fresh water spray humidifier (high pressure)

### WARNING



#### **Danger to life from high pressure!**

When working with spray humidifiers in the high-pressure range, there is a danger to life due to a pressure build-up in the pipelines or in the pressure vessel.

- Before carrying out any work on high pressure spray humidifiers, switch off the AHU and secure it so that it cannot be switched back on.

### Inspection

#### **Every 2 weeks**

Observe manufacturer's information.

- Check pump station, hose connections, vortex grids, nozzle sticks incl. nozzles, droplet eliminator, humidifier tray and casing wall surfaces for function, foreign bodies, contamination, damage and corrosion; clean or repair if necessary.
- Check for contamination in the base area of the humidifier tray, clean or disinfect if necessary.
- Check oil level; top up or change oil if necessary.
- Flush the filter screen manually.

#### **Every 6 months**

- Check cut-off devices for proper operation; repair or recalibrate if necessary.

### Repair

- Replace wear parts Observe manufacturer's information.

# Circulating water contact humidifier

## Inspection

### Maintenance interval

Every year.

### Work steps

UV-C technology for water disinfection

#### WARNING



#### Damage to health from mercury

UV-C illuminants contain mercury. Mercury is toxic and dangerous to the environment.

- Avoid contact with skin and eyes. In case of contact, flush skin and eyes with plenty of water. Take off contaminated clothing.
- Do not swallow. If swallowed, induce vomiting.
- Ensure good air exchange in the danger zone.
- Comply with the safety data sheet of the manufacturer.

#### CAUTION



#### Risk of serious injuries due to hazardous substances

There is a risk of poisoning if the carton is damaged or if the UV-C illuminants break.

- When handling broken UV-C illuminants, follow the safety instructions for handling mercury.
- Avoid direct contact with eyes, skin, and clothing.
- Ensure excellent ventilation of the AHU and the rooms connected via the ducts.
- Keep broken pieces of UV-C illuminants in airtight packaging and dispose of properly.

#### TIP

#### Removal of small amounts of mercury



UV-C illuminants contain small amounts of mercury. Removal of the small amount leaked at breakage can be done with special sorbents for mercury.

#### CAUTION



#### Risk of injury from UV-C radiation

During operation of the UV-C lamp, there is a risk of injury from direct exposure to high-energy UV-C radiation.

- Equip doors with door contact switches for safe shutdown of the UV-C lamp in case of unauthorized access.
- Before carrying out any work on UV-C lamps, switch off the AHU and secure it so that it cannot be switched back on.

**CAUTION**



**Risk of injury due to hot surfaces**

When working on the UV-C lamps in the AHU, there is a risk of burns from hot surfaces.



- Let the fan run to cool down to room temperature.
- Before carrying out any work on UV-C lamps, switch off the AHU and secure it so that it cannot be switched back on.



- Wear heat-resistant gloves.

**NOTICE**



**UV-C disinfection performance impaired by finger perspiration**

Finger perspiration leaves stains on the UV-C illuminant that burn in and impair the performance of UV-C disinfection.



- Wear cotton gloves when handling the UV-C illuminant.

**NOTICE**



**Damage to components caused by UV-C radiation**

UV-C radiation poses a risk of damage to components that are not UV-resistant.

- Components in the effective range of UV-C radiation must be UV-resistant or protected by UV-resistant shielding.

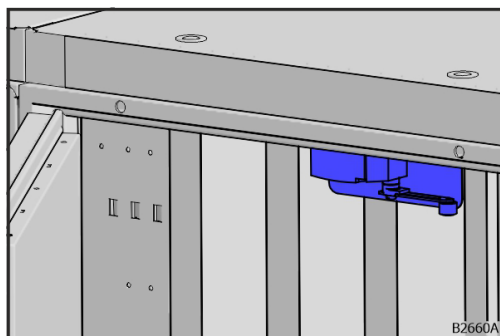
**Personnel qualifications**

The tasks described in the section may only be carried out if the person concerned has the following qualification:

- Qualified electrician



### Door contact switch



The door contact switch interrupts the current and voltage supply of the UV-C lamp when the door is opened.

Fig. 119: Door contact switch

The inspection doors in the effective range of the UV-C radiation are equipped with door contact switches to safely switch off the UV-C illuminants in the event of unauthorised access. The door contact switches are pre-wired in terminal boxes. Where possible, the door contact switches are grouped together in a terminal box. If the structural situation in the AHU does not allow this (e.g. different delivery sections), several terminal boxes are installed accordingly.

1. Close all inspection doors with door contact switches.
  2. Check that the blue LED (UV) on the switch cabinet lights up.
- If the blue LED is lit up, even though all inspection doors are shut, there is a fault (see appendix "fisair – installation and operating instructions for the basic control panel (CCB2.0) of the fisair evaporation humidifier", "Wiring diagram" or appendix "fisair – installation and operating instructions for the basic control panel (CCB2.0) of the fisair evaporation humidifier", "Wiring diagram").

## Repair

For replacing the UV-C illuminants

- See appendix "fisair – installation and maintenance manual for series HEF2", "Installation procedure for UV-C illuminants" section or
- See appendix "fisair – installation and maintenance manual for series HEF2E", "Installation procedure for UV-C illuminants".

For resetting the operating hours after replacing the UV-C illuminant

- See appendix "fisair – installation and operating instructions for the basic control panel (CCB2.0) of the fisair evaporation humidifier", "Configuration" section or
- See appendix "fisair – installation and operating instructions for the step control panel (CCE2.0) of the fisair evaporation humidifier", "Configuration" section.

## Electro steam humidifier

### CAUTION



#### **Danger of scalding from hot water**

With electro steam humidifiers, there is a risk of scalding at the open discharge due to water at up to 95 °C.

- Do not touch the open discharge and water.

## Inspection

### **4 weeks after commissioning**

- Visual inspection of all connections and terminals.
- Clean the steam cylinder, pump, and hoses.
- Check electrode length if necessary.
- Retighten all screws.

### **Every 6 months**

- Visual inspection of all connections and terminals.
- Clean the steam cylinder, pump, and hoses.
- Check electrode length if necessary.
- Retighten all screws.

## Pressure steam humidifier

### WARNING



#### **Danger to life from high pressure!**

When working with pressure steam humidifiers, there is a risk of death due to pressure build-up in the pipelines or in the pressure vessel.

- Before carrying out any work on pressure steam humidifiers, switch off the AHU and secure it so that it cannot be switched back on.

# Refrigeration technology (refrigeration plant, heat pump, and split air conditioner)

## WARNING



### Danger to life from explosion

In the event of leakages or when handling refrigerant R32, there is a risk of explosion, as A2L refrigerants can produce a potentially explosive atmosphere.

- Avoid potential sources of ignition.
- Ventilate the room.
- Check the inside of the AHU with a refrigerant sensor before starting any work.
- Only use a tool designed for A2L refrigerant.

## WARNING



### Permanent hearing loss or tinnitus due to high noise levels

When working near fans and compressors, there is a risk of permanent hearing loss or tinnitus due to high noise levels of the components.

- Wear hearing protection for 120 dB(A).

## TIP

### Combination of earplugs and earmuffs



If no hearing protection achieves adequate sound insulation, earplugs and earmuffs can be combined to achieve adequate protection.

For all activities, the requirements of the service manual for refrigeration plants (available on request), and the applicable standards and guidelines (e.g., DIN EN 378, BGR 500, and F-Gas regulation) must be observed.

## Personnel qualification

In accordance with §15 of the German Ordinance on Industrial Safety and Health (BetrSichV), the refrigeration technology and its system components are partly subject to periodic inspections by a competent person or authorised inspection body. Other applicable legal regulations of the respective installation site must be observed.

## **Maintenance interval**

Information about sensors see chapter "Control system", page 109.

## **Inspection**

Information about sensors see chapter "Sensors, control and safety devices", page 110.

## **Repair**

Information about sensors see chapter "Sensors, control and safety devices", page 111.

# Hydraulic set

## Exhaust ventilating

### NOTE



#### **Material damage due to inadequate venting**

If systems are not properly vented, air pockets will form which can lead to reduced performance or pump damage.

- Exhaust ventilate the system according to VDI 2035 during system filling at the highest point of the system.

Pumps with a venting device (e.g., high-pressure centrifugal pumps in heavy duty run around coils) must be exhaust ventilated again approx. 2 weeks after commissioning as part of scheduled maintenance. Observe manufacturer's information.

Pump bearings and mechanical seals may otherwise be damaged.

## **Inspection**

### **Maintenance interval**

Every three months.

### **Work steps**

- Check hydraulic set for contamination, damage, corrosion, and tightness.
- Exhaust ventilate the hydraulic set and, if necessary, the pump according to VDI 2035.
- Check filters; clean if necessary.
- Check all valves, slides and flaps for free movement; if necessary, lubricate spindle according to manufacturer's information.
- Check overpressure devices for activation pressure.
- Maintain pumps, control valves, and actuators according to manufacturer's information.

## **Repair**

- Clean hydraulic set, eliminate damage, leakage, and corrosion.
- Retighten screw connections and stuffing boxes.

### **Removal/installation of coils**

To replace coils see chapter "Removal/installation ", page 78.

# Direct firing

## WARNING



### Fire hazard due to loose parts

There is a fire hazard when flammable substances come into contact with the combustion chamber or the direct gas-fired heater.

- Check that there are no parts in front of the combustion chamber and the direct gas-fired heater that could be carried away when the AHU is switched on for the first time.

# Combustion chamber

## WARNING



### Danger to life due to burns

There is a danger to life from burns when working on the flame pot.

- Wear personal protective equipment (safety glasses, respiratory protection, and protective clothing).

## Personnel qualification

The initial commissioning of a combustion chamber or the associated ventilation system must be carried out by the manufacturer or another expert appointed by the manufacturer (DIN 4794).

## Maintenance interval

### Single-shift operation

Min. every 12 months.

### Two-shift operation

Min. every 6 months.

### Three-shift operation or other modes of operation

Min. every 4 months.

## Inspection

### Combustion chamber

- Disassemble the burner. Check combustion chamber for dirt, damage and leaks. In case of damage or leakage, the manufacturer must be informed immediately in order to initiate suitable repair measures. Burner must not be operated until damage has been repaired.

### Flame pot

- Check the flame pot for damage. Slight cracking is normal. Replace if damaged or deformed, but after 5,000 operating hours at the latest. To do this, remove the burner plate and cylinder cover.

### Heat recovery area

- Remove the inspection cover plate and cleaning cover of the combustion chamber. Remove all turbulators and check for general condition. Replace in case of severe corrosion.
- Check drainage system and clean if necessary.

### Burner

- Once the combustion chamber has been cleaned, burner maintenance must be carried out in accordance with the burner manufacturer's instructions (according to DIN 4755 or DVGW worksheet G600).
- Determine exhaust emission values according to the German Ordinance for the Implementation of the Federal Immission Control Act (BImSchV)
- All work must be recorded and sent to the manufacturer without request.
- Check gas line, connections, and gas control system for tightness and re-seal if necessary.

### Regulatory and security bodies

The AHU must be in "Off" operating mode. To check the function, heat the capillary, e.g., using a hot air blower.

Check triple thermostat:

- If the "fan" setting is  $\geq 40$  °C, the fan must switch on.
- If the "burner" setting is  $\geq 70$  °C, the burner must switch off.
- If the "safety temperature limiter" setting is  $\geq 100$  °C, the burner must switch off and the safety temperature limiter must lock. If this does not happen automatically:
  - Stop the burner.
  - Replace the triple thermostat.
  - Repeat the entire check.

After successful testing, manually unlock the safety temperature limiter using the reset button.

With two-stage burner: Check temperature sensor:

- If the "burner" setting is  $\geq 60$  °C, the burner must switch off.



### **Bypass and combustion chamber dampers**

For maintenance, see chapter "Damper".

For combustion chambers with bypass, check the operating direction of the dampers. If necessary, reverse the direction of rotation of the actuator by adjusting the slide switch.

For combustion chamber temperature control:

- As the heating demand increases, the combustion chamber damper must open and the bypass damper must close. As the heating demand decreases, the dampers behave in the opposite way.
- To ensure adequate cooling of the combustion chamber, the combustion chamber damper must not be closed further than 10 mm of free opening cross-section between the damper blades. Provide a limit switch to shut down burner.

For exhaust gas temperature control:

- When the exhaust gas temperature falls below the set minimum temperature, the combustion chamber damper (if present) must close and the bypass damper must open. If the set maximum flue gas temperature is exceeded, the burner output must be reduced.

## **Repair**

### **Combustion chamber**

- After cleaning the downstream heating surface, vacuum out the combustion chamber if necessary.

### **Heat recovery area**

- Use stainless steel brush to clean all pipes of the downstream heating surface and vacuum out the collection box.

## **Condensate combustion chamber**

Follow the instructions of the respective combustion chamber supplier. These are part of the supplied documentation.

## **Direct gas-fired heater**

### **Personnel qualification**

According to DIN 4794, the initial commissioning of an AHU with a direct gas-fired heater or the associated ventilation system must be carried out by the manufacturer or another expert appointed by the manufacturer. This person must be approved by the DVGW as a gas specialist.

### **Maintenance interval**

#### **Single-shift operation**

Min. every 12 months.

#### **Two-shift operation**

Min. every 6 months.

#### **Three-shift operation or other modes of operation**

Min. every 4 months.

## Inspection

- Check gas line, connections, and gas control system for tightness and re-seal if necessary.
- Perform all commissioning maintenance operations as listed.
- Remove debris with burner brush; make sure all air holes are clear. Check gas outlet openings, clean with nozzle needle if necessary. Do not come into contact with ignition or control devices.
- Check the distance between the ignition electrodes; adjust if necessary.

### For UV monitoring

- Unscrew the UV cell, clean it with a soft cloth, and mount it again. Replace if discolored.

### For ionization monitoring

- Unscrew the ionizing bar, clean it with a soft cloth and mount it again.

### Regulatory and security bodies

To check the function, heat the capillary, e.g., using a hot air blower.

Check safety temperature limiter:

- With the setting "Safety temperature limiter", the burner must switch off and the safety temperature limiter must lock. If this does not happen automatically:
  - Stop the burner.
  - Replace safety temperature limiter.
  - Repeat the entire check.

After successful testing, manually unlock the safety temperature limiter using the reset button.

1. Check whether the designed nominal volume flow is set; adjust if necessary.
2. Adjust the gas quantity with the gas meter provided by the customer by turning the adjusting screw on the pressure regulator (control damper with actuator must be fully open).
3. At full load (control damper fully open), the pressure at the differential pressure gauge must correspond to the set pressure according to the nameplate.
4. Set the setpoint of the duct or room sensor to a value lower than the actual value. The control damper must close.
5. Set the minimum gas flow rate using the control damper. To do this, set the control signal to 0 % and use the limit switch in the actuator to set the smallest possible flow rate at which a closed flame pattern is still present. Check via inspection window.
6. Set the AHU to maximum capacity again (open the control damper).
7. Set gas pressure switch to max. lower position until switch-off occurs. Set value: Switch-off threshold + approx. 20 %.
8. Gas pressure switch min. remains at minimum position.
9. Check the direction of rotation of the actuator. If room sensor is set higher than the actual value, the actuator must open the control damper and vice versa.
10. Basically check the function of the control.
11. Set sensors to the setpoint.
12. Carefully check the entire gas line for tightness using leak detection spray. In the event of leaks, initiate suitable re-sealing work.
13. For units with combustion air fan, adjust combustion air pressure by adjusting the intake throttle; follow the burner manufacturer's instructions carefully.
14. Set pressure switch on combustion air blower: Set value: Shutdown value - 20 %.

15. Setting burner orifice: Nominal pressure loss at the burner orifice should be approx. 180 to 250 Pa.
16. Set the pressure switch on the burner orifice: Set value: Nominal pressure loss burner orifice - 40 %.
17. All settings must be recorded and stored in a setting record.

## **Repair**

- Damaged parts may only be replaced by a specialist as described (see Page 75). Replacement parts must be approved for the system!

# Control system

## WARNING



### **Risk of explosion due to the use of components with inadequate ignition protection**

Using parts without adequate ignition protection may cause static charging of the AHU, for example. The discharge and the resulting sparks may cause an explosion.

- Use parts in the AHU that are at least compliant with the ATEX requirements for the inside of the AHU.
- Use parts on the outside of the AHU or next to the AHU that at least fulfil the ATEX requirements next to the AHU.
- When assembling parts, only use cable glands, reducers and dummy plugs with the appropriate ATEX approval.

## Maintenance interval

Every year.

## Inspection

### **Control cabinet, remote control, room control unit, controller**

- Check for professional and functional installation and environmental conditions.
- Check for contamination, corrosion, and damage.
- Check protective covers for completeness.
- Check the electrical/mechanical function of the connections, especially equipotential bonding.
- Check functional elements (e.g. operating and display devices).
- Check input signals (e.g., sensor, reference variable) for compliance with the setpoint.
- Check optical and acoustic control devices.
- Check contactors and relays for wear and damage (e.g., contact erosion).
- Check switching and control operations (e.g., frost protection function).
- Check safety devices (e.g., thermal releases).
- Check setting of control cabinet components (e.g., time relay).
- Check manual, automatic, and remote control function.
- Change control cabinet filter.

## **Sensors, control and safety devices**

- Check for correct and functional installation and ambient conditions.
- Check for dirt, corrosion, function and damage.
- Check connections for electrical/mechanical function, especially equipotential bonding.
- Measure and record physical parameters at the measuring point.
- Check electrical, electronic and pneumatic measuring signals.
- Check the indicators.

Further information on the maintenance of analog differential pressure gauges: see chapter "Dial gauge", page 112 or see chapter "Inclined tube gauge", page 126.

For further information on the maintenance of refrigerant sensors, see the appendix "Gas detectors with relay equalisation of the GS series", "Functional tests" section.

For further information on maintaining the duct smoke detector, see the "Duct smoke detector data sheet" annex in the "Scheduled maintenance and repair" section.

## **Controllers and additional modules**

- Check for professional and functional installation and environmental conditions.
- Check for contamination, corrosion, and damage.
- Check internal voltage supply (e.g., buffer batteries, rechargeable batteries).
- Check the electrical/mechanical function of the connections, especially equipotential bonding.
- Check functional elements (e.g. operating and display devices).
- Check electrical, electronic, and pneumatic input signals (e.g., sensor, remote adjuster, reference variable).
- Check controller function and control signal.
- Check control loop according to setting parameters, taking into account all additional functions.

## Actuators

- Check for professional and functional installation and environmental conditions.
- Check for contamination, corrosion, and damage.
- Check for external tightness (e.g., valve stuffing boxes).
- Check the electrical/mechanical function of the connections, especially equipotential bonding.
- Check electrical, electronic, and pneumatic input signals and working adjustment range.
- Check position sensor, limit sensor, and end position switch for function.
- Readjust.

## Repair

### Control cabinet, remote control, room control unit, controller

- Function-preserving cleaning.
- Set, adjust, tighten functional elements (e.g., operating and display devices).
- Adjust signals.
- Readjust.

### Sensors, control and safety devices

- Function-preserving cleaning.
- Readjust, regenerate, replace if necessary.

Further information on the maintenance of analog differential pressure gauges: see chapter "Dial gauge", page 112 or see chapter "Inclined tube gauge", page 126.

For further information on maintaining the duct smoke detector, see the "Duct smoke detector data sheet" annex in the "Scheduled maintenance and repair" section.

### Controllers and additional modules

- Replace batteries.
- Function-preserving cleaning.
- Set, adjust, tighten functional elements (e.g., operating and display devices).
- Adjust signals.
- Adjust controller function and control signal.
- Adjust the controller circuit according to the setting parameters, taking into account all additional functions.

## Actuators

- Lubricate (e.g., valve spindle).
- Function-preserving cleaning.

## Pressure measuring devices

### Analog differential pressure indicators

#### Dial gauge

##### Inspection

- Check the assembly.
- Check for soiling and damage.
- Check connections of pressure measuring hoses.
- Check display.

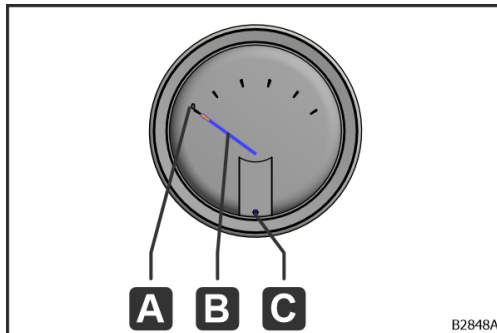
##### Repair

- Perform zero-point correction (see chapter "Zero-point correction for dial gauges", page 113).
- Replace dial gauge (see chapter "Exchanging dial gauge, in-wall mounting ", page 115 or see chapter "Removing dial gauge, wall mounting", page 120).



## Zero-point correction for dial gauges

Structure of a dial gauge:



- A - "0": Zero point on the scale
- B - pointer
- C - Screw for zero point correction

Fig. 120: Structure of a dial gauge

Tool:

- flat-bladed screwdriver

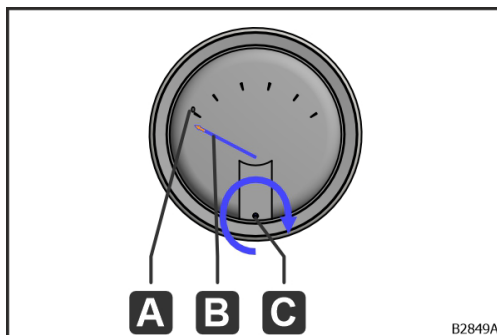
Requirements:

- The fan is not operating.

Possible deviations:

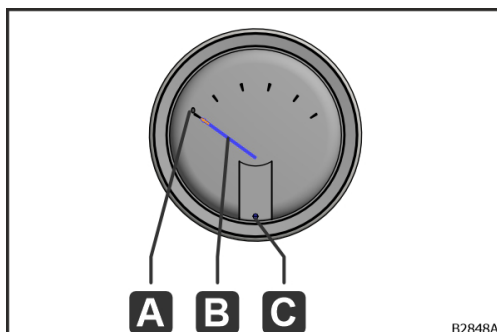
- The pointer (B) is below "0" (A) see chapter "The pointer (B) is below "0" (A)", page 113.
- The pointer (B) is above "0" (A) see chapter "The pointer (B) is above "0" (A)", page 114.

Work steps: **The pointer (B) is below "0" (A)**



1. Turn the screw for zero adjustment (C) clockwise until the pointer (B) is at "0" (A).

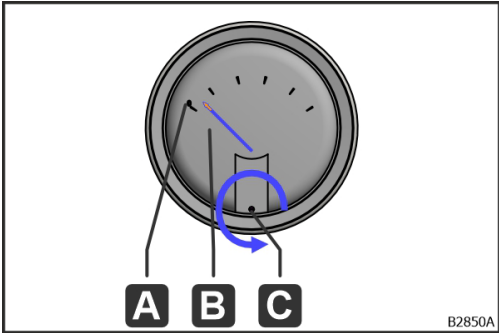
Fig. 121: pointer (B) below



- Pointer (B) is on "0" (A).

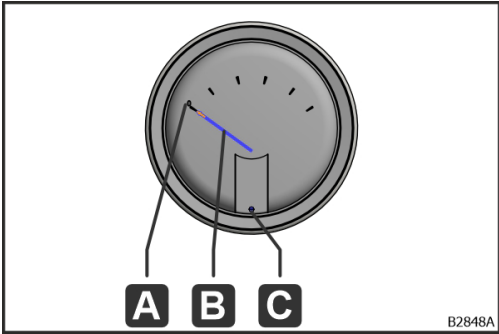
Fig. 122: pointer (B) set correctly

Work steps: **The pointer (B) is above "0" (A)**



- 1. Turn the screw for zero adjustment (C) anti-clockwise until the pointer (B) is on "0" (A).

Fig. 123: pointer (B) above



→ Pointer (B) is on "0" (A).

Fig. 124: pointer (B) set correctly

## Exchanging dial gauge, in-wall mounting

Tool: Removing dial gauge, in-wall mounting

- Cross-head screwdriver
- Pen for marking pressure measuring hoses

Work steps: removal of dial gauge, in-wall mounting

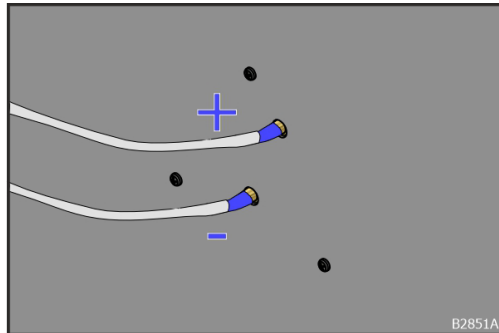


Fig. 125: marking with "+" and "-"

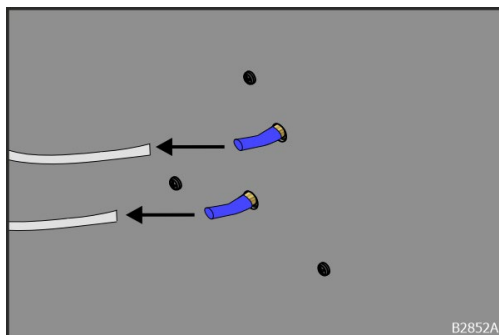


Fig. 126: removing the pressure measuring hoses

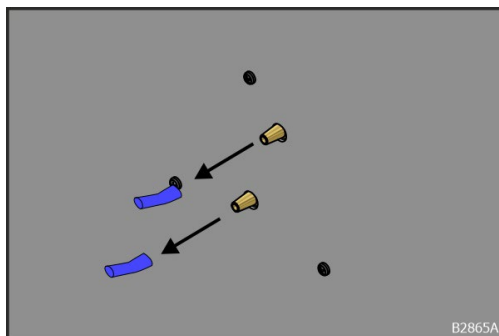


Fig. 127: removing the cuttings

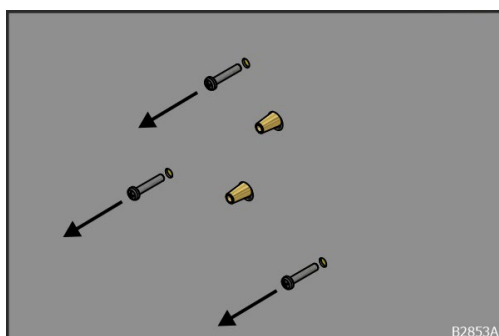
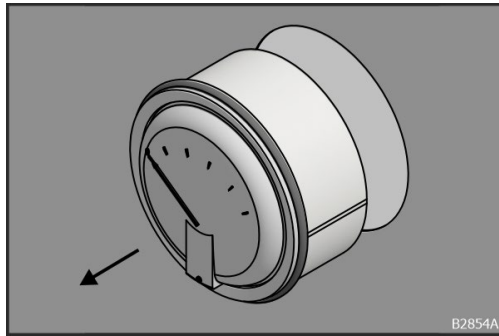


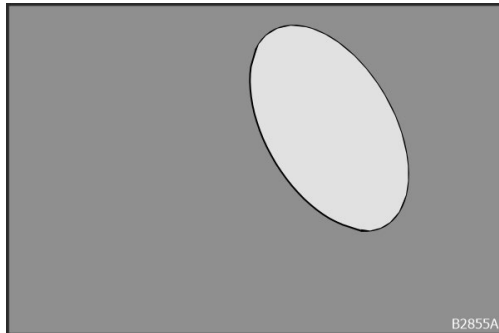
Fig. 128: removing the screws

1. Mark the pressure measuring hoses.
  - Mark the upper pressure measuring hose with "+".
  - Mark the lower pressure measuring hose with "-".
2. Remove the pressure measuring hoses.
3. Remove the plastic tube cutting.
4. Remove the crosshead screws with a crosshead screwdriver.



5. Remove the dial gauge from the panel.

Fig. 129: removing the dial gauge



- The dial gauge is removed.

Fig. 130: dial gauge removed

Tool: Installing dial gauge, in-wall mounting

- Cross-head screwdriver
- Hexagon socket 3/18"
- Combination wrench 7/16"

Install material: Installing dial gauge, in-wall mounting

- Mounting kit for the integrated Magnehelic differential pressure gauge
  - 1x O-ring 107.32 mm
  - 2x O-ring 6.3 mm
  - 3x 5/8 Philips head screws
- Dial gauge with mounting kit
  - 1x dial gauge for in-wall mounting
  - 2x grub screws
  - 2x brass tube connectors
- 2x plastic hose cutting temp. 60° d=3.9, D=6.1, blue

## Workflow: Installing dial gauge, in-wall mounting

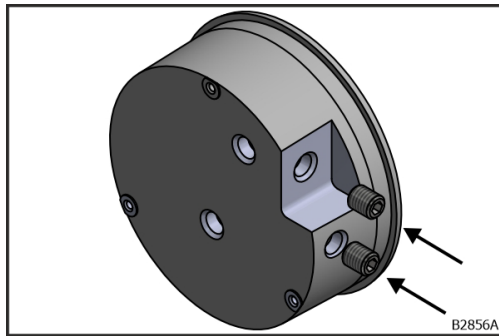


Fig. 131: Lock with grub screws

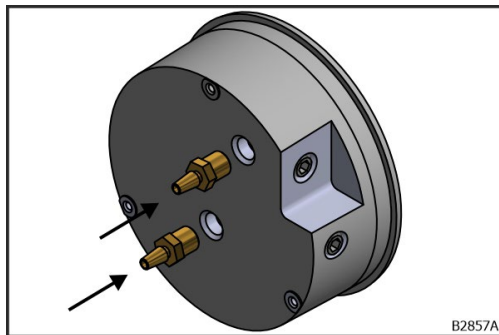


Fig. 132: Screw in tube connectors

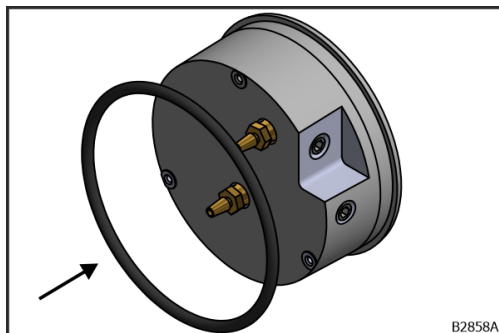


Fig. 133: Mount O-ring

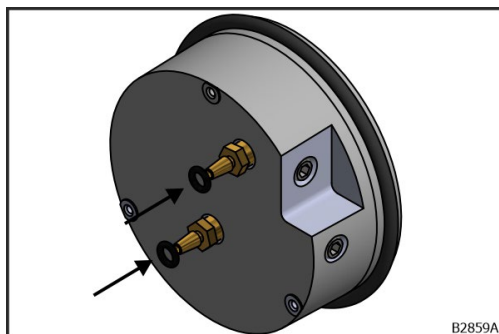


Fig. 134: Tighten O-rings

1. Close side pressure connections with grub screws using 3/18" hexagon socket.
2. Screw brass hose nozzles into the pressure ports on the back with 7/16" ring and socket wrench.
3. Pull the 107.32 mm O-ring onto the casing.
4. Pull the 6.3 mm O-rings onto the brass hose nozzles.

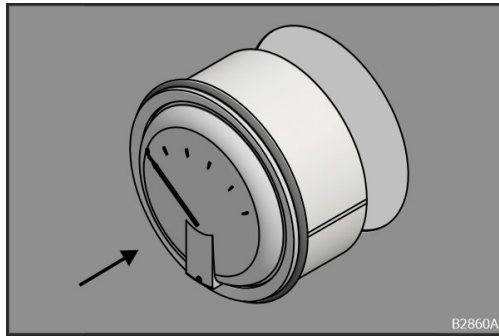


Fig. 135: Inserting dial gauge

5. Insert the dial gauge into the panel to match the hole pattern.

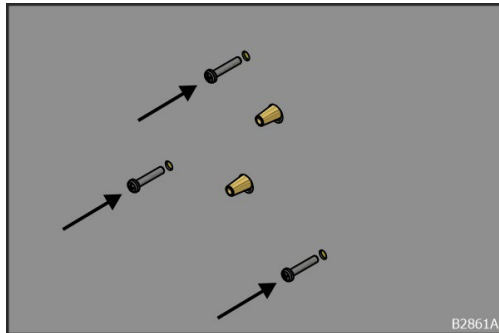


Fig. 136: Fasten with screws

6. Fasten the dial gauge with the 5/8 Phillips screws using a Phillips screwdriver.

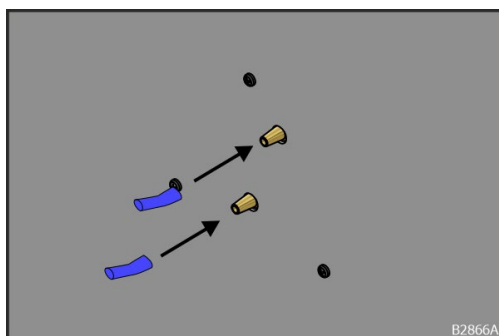


Fig. 137: Mounting cuttings

7. Fit plastic hose cutting.

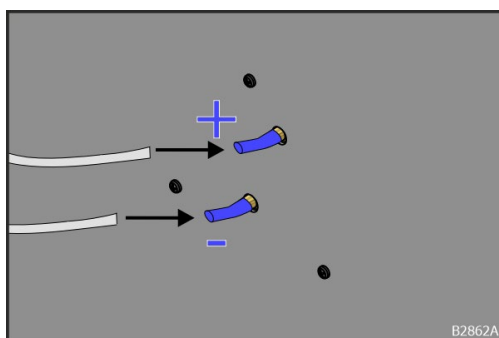
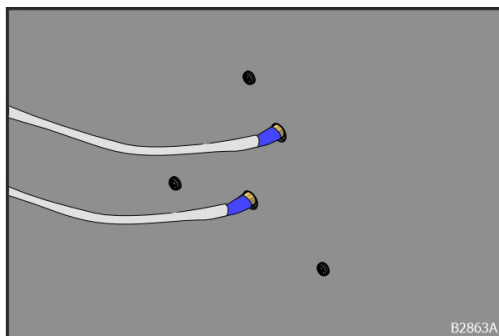


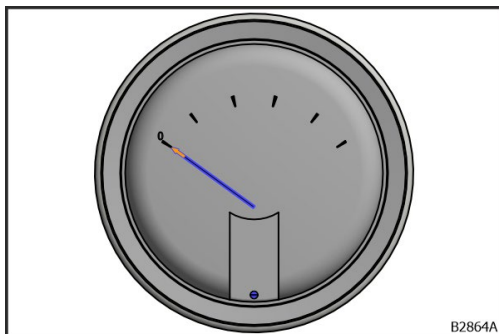
Fig. 138: Mounting pressure measuring hoses

8. Attach the pressure measuring hoses marked during removal to the brass hose nozzles.
  - Plug the pressure measuring hose with "+" onto the upper tube connector.
  - Plug the pressure measuring hose with "-" onto the lower tube connector.



→ The dial gauge has been correctly installed and connected.

Fig. 139: Dial gauge connected



9. Perform zero-point correction (see chapter "Zero-point correction for dial gauges", page 113).

Fig. 140: Zero-point correction

### Removing dial gauge, wall mounting

Tool: Removing dial gauge, wall mounting

- Cross-head screwdriver
- Pen for marking pressure measuring hoses

Work steps: removal of dial gauges, wall mounting

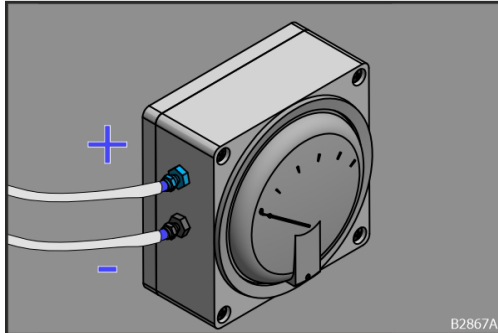


Fig. 141: marking with "+" and "-"

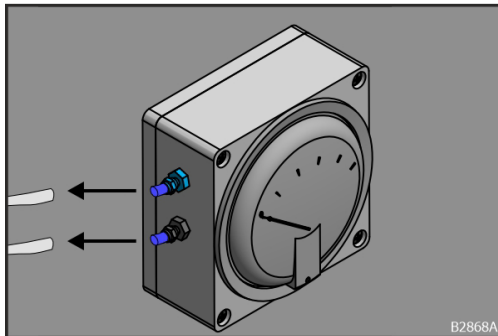


Fig. 142: removing the pressure measuring hoses

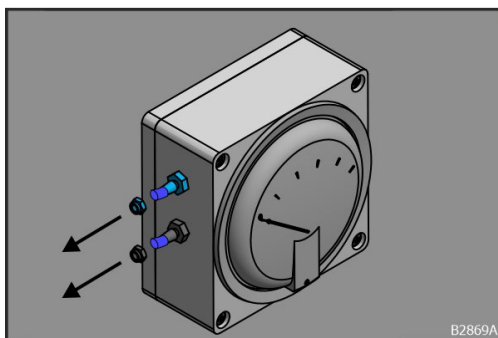


Fig. 143: removing the nuts

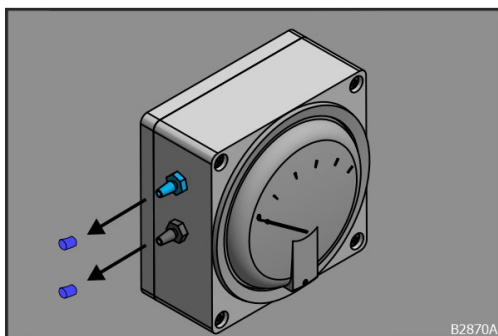


Fig. 144: removing the cuttings

1. Mark the pressure measuring hoses.

- Mark the upper pressure measuring hose with "+".
- Mark the lower pressure measuring hose with "-".

2. Remove the pressure measuring hoses.

3. Remove the nuts from the hose nozzles.

4. Remove the plastic tube cutting.



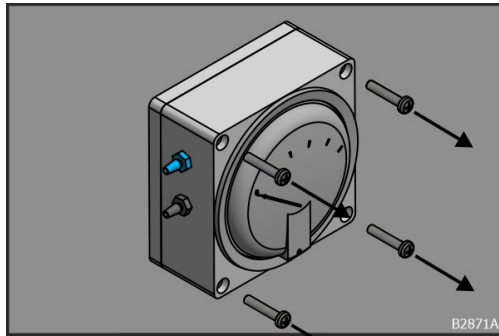


Fig. 145: removing the screws

5. Remove the crosshead screws from the casing with a crosshead screwdriver.

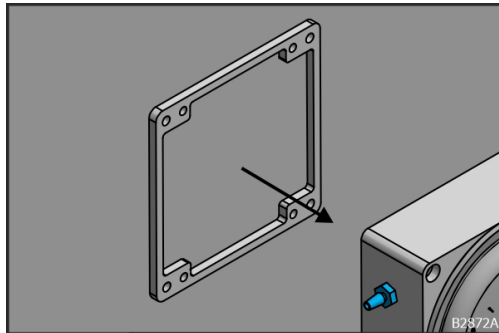


Fig. 146: removing the casing

6. Remove the upper part of the casing.

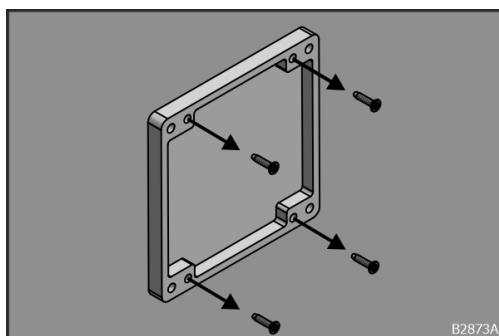


Fig. 147: removing the screws

7. Remove the Phillips screws from the lower part of the casing.

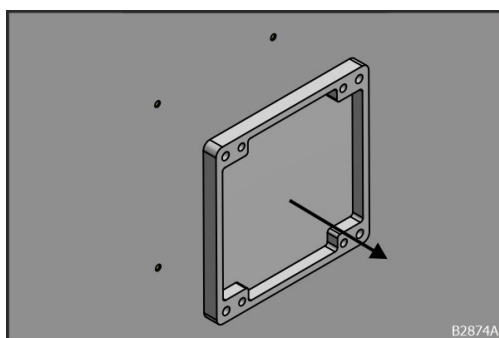
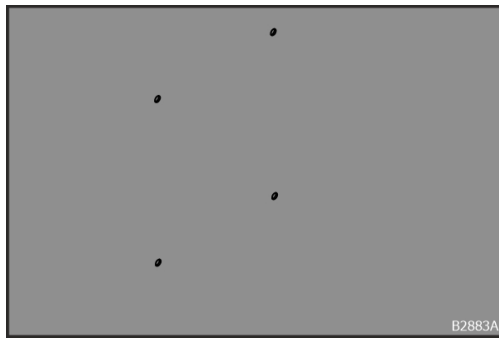


Fig. 148: removing the casing

8. Remove the lower part of the casing from the panel.



→ The dial gauge is removed.

Fig. 149: dial gauge removed

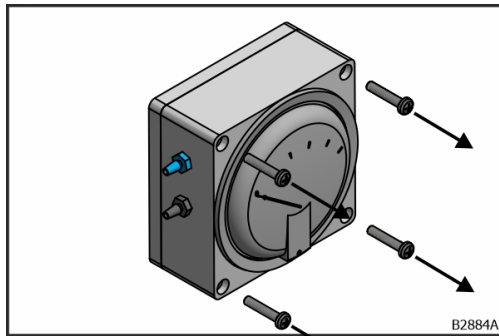
Tool: Installing dial gauge, wall mounting

- Cross-head screwdriver

Install material: Installing dial gauge, wall mounting

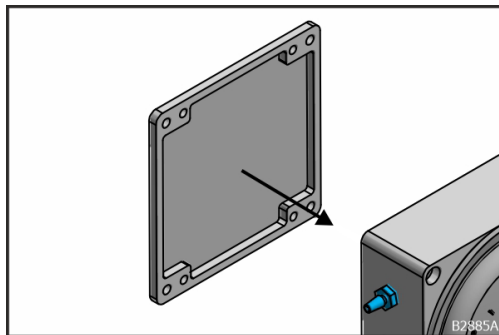
- 1x dial gauge for wall mounting
- 4x window screw JD-22 3.9x16 mm, galvanized
- 2x plastic hose cutting temp. 60° d=3.9, D=6.1, blue

## Work steps: installation of dial gauge, wall mounting



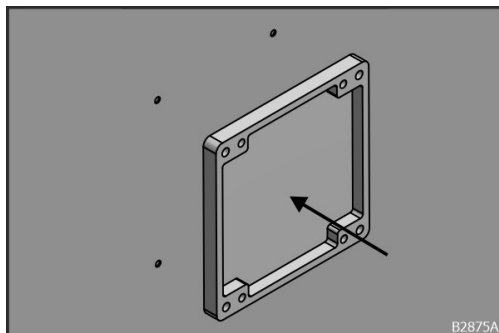
1. Open the casing of the dial gauge with a crosshead screwdriver.

Fig. 150: removing the screws



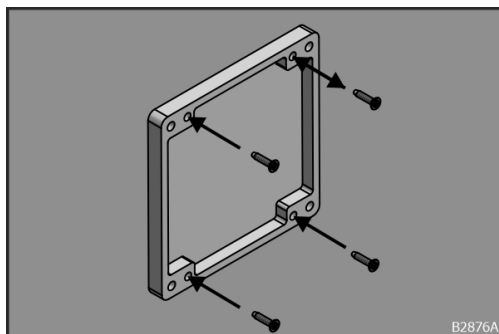
2. Open the casing.

Fig. 151: opening the casing



3. Place the lower part on the panel.

Fig. 152: positioning the casing



4. Fasten the lower part of the casing with JD-22 3.9 x 16 mm galvanised window screws in the existing holes in the panel using a crosshead screwdriver.

Fig. 153: fastening the casing

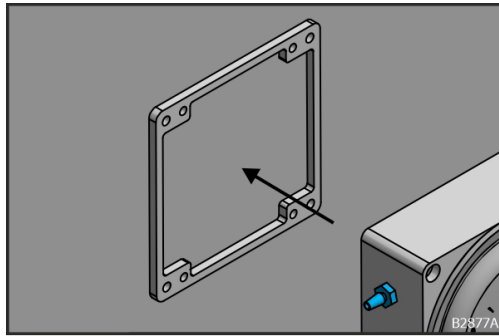


Fig. 154: positioning the casing

5. Position the upper part of the casing.

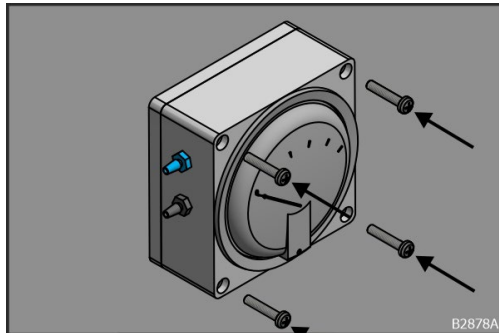


Fig. 155: positioning the casing

5. Mount the upper part of the casing with crosshead screws using a crosshead screwdriver.

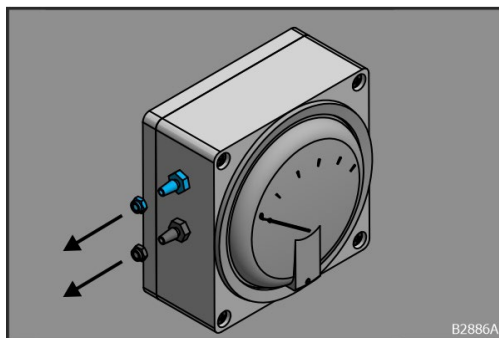


Fig. 156: removing the nuts

6. Remove the nuts from the hose nozzles.

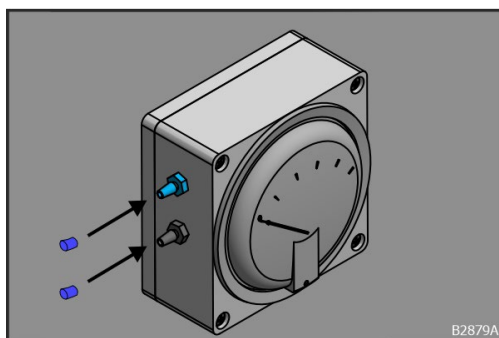


Fig. 157: pushing on the cuttings

7. Push the blue plastic tube cuttings (temp. 60° ID = 3.9, OD=6.1) onto the hose nozzles.

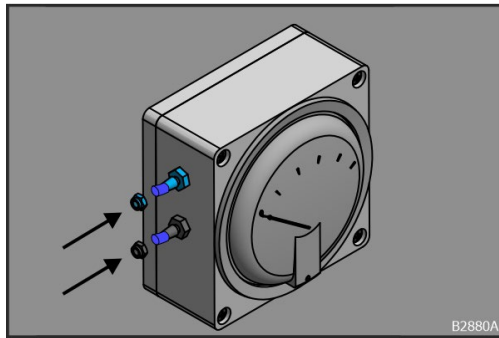


Fig. 158: screwing on the nuts

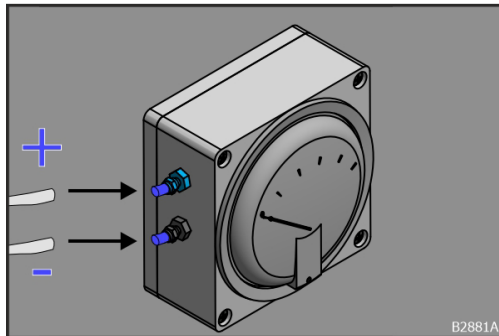


Fig. 159: pushing on the pressure measuring hoses

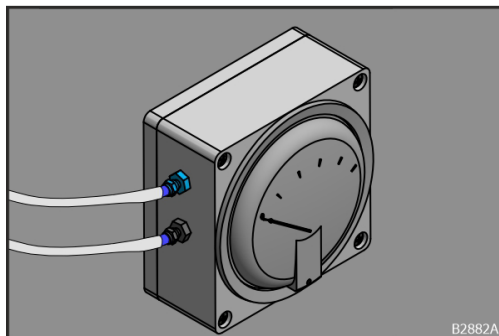


Fig. 160: dial gauge connected

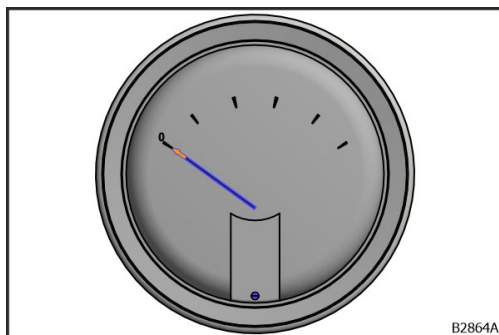


Fig. 161: Zero adjustment

8. Screw the nuts onto the hose nozzles with plastic tube.

9. Attach the pressure measuring hoses marked during removal to the brass hose nozzles with plastic tube.

- Attach the pressure measuring hose with "+" to the upper hose nozzle.
- Attach the pressure measuring hose with "-" to the lower hose nozzle.

→ The dial gauge has been properly installed and connected.

10. Perform zero adjustment (see chapter "Zero-point correction for dial gauges", page 113).

### **Inclined tube gauge**

#### Inspection

- Check the assembly.
- Check for soiling and damage.
- Check connections of pressure measuring hoses.
- Check display.

#### Repair

- Carry out zero-point correction (see annex "thermokon - pressure difference - inclined tube gauge" chapter "Installation instructions").
- Replace inclined tube manometer (see annex "thermokon - pressure difference - inclined tube gauge" chapter "Installation instructions").

# Electrical safety tests

## Maintenance interval

Every three months.

## Work steps

Perform electrical safety tests in accordance with DIN EN 60204-1 (VDE 0113-1), observing the necessary safety precautions. The on-site mains connections must also meet the requirements of DIN EN 60204-1, Table 10.

The operator is obliged to repeat these checks regularly in accordance with the nationally applicable regulations. In Germany, the intervals of the periodic inspections according to the German Professional Association Provisions (BGV) A3 Section 5 Table 1A (periodic inspections of stationary electrical systems and equipment) must be observed.

# UV-C technology

## WARNING



### Damage to health from mercury

UV-C illuminants contain mercury. Mercury is toxic and dangerous to the environment.

- Avoid contact with skin and eyes. In case of contact, flush skin and eyes with plenty of water. Take off contaminated clothing.
- Do not swallow. If swallowed, induce vomiting.
- Ensure good air exchange in the danger zone.
- Comply with the safety data sheet of the manufacturer.

## CAUTION



### Risk of serious injuries due to hazardous substances

There is a risk of poisoning if the carton is damaged or if the UV-C illuminants break.

- When handling broken UV-C illuminants, follow the safety instructions for handling mercury.
- Avoid direct contact with eyes, skin, and clothing.
- Ensure excellent ventilation of the AHU and the rooms connected via the ducts.
- Keep broken pieces of UV-C illuminants in airtight packaging and dispose of properly.

## TIP



### Removal of small amounts of mercury

UV-C illuminants contain small amounts of mercury. Removal of the small amount leaked at breakage can be done with special sorbents for mercury.

## CAUTION



### Risk of injury from UV-C radiation

During operation of the UV-C lamp, there is a risk of injury from direct exposure to high-energy UV-C radiation.



- Equip doors with door contact switches for safe shutdown of the UV-C lamp in case of unauthorized access.
- Before carrying out any work on UV-C lamps, switch off the AHU and secure it so that it cannot be switched back on.

## CAUTION



### Risk of injury due to hot surfaces

When working on the UV-C lamps in the AHU, there is a risk of burns from hot surfaces.



- Let the fan run to cool down to room temperature.
- Before carrying out any work on UV-C lamps, switch off the AHU and secure it so that it cannot be switched back on.
- Wear heat-resistant gloves.



**NOTICE****UV-C disinfection performance impaired by finger perspiration**

Finger perspiration leaves stains on the UV-C illuminant that burn in and impair the performance of UV-C disinfection.

- Wear cotton gloves when handling the UV-C illuminant.

**NOTICE****Damage to components caused by UV-C radiation**

UV-C radiation poses a risk of damage to components that are not UV-resistant.

- Components in the effective range of UV-C radiation must be UV-resistant or protected by UV-resistant shielding.

## UV-C technology for air disinfection

### Inspection

#### Maintenance interval

Every week.

#### Work steps

- Check the function of the UV-C illuminants at the switch cabinet; see appendix "Light progress – Master-SM operating instructions", "Description and meaning of the commands" section and appendix "Light progress – UV-DUCT-SQ SB-SQ operating instructions", "Description and use of the control panel" section.
- Check the operating hour counter for the UV-C illuminants on the switch cabinet; see appendix "Light progress – Master-SM operating instructions", "Description and meaning of the commands" section and appendix "Light progress – UV-DUCT-SQ SB-SQ operating instructions", "Description and use of the control panel" section.
- Check the UV-C illuminants for dirt.

**NOTICE****Malfunction due to contaminated UV-C illuminants**

Dirty UV-C illuminants do not achieve the designed deactivation rate due to shadow effects.

- Clean UV-C illuminants (see chapter "Repair", page 130).

#### Maintenance interval

Every year.

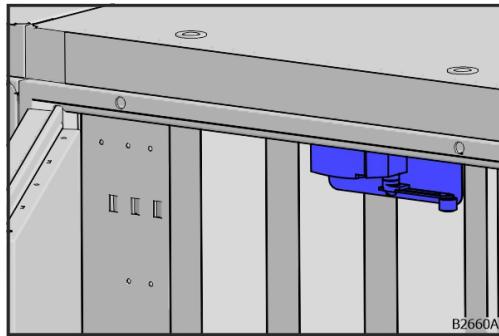
#### Work steps

Personnel qualifications

The tasks described in the section may only be carried out if the person concerned has the following qualification:

- Qualified electrician

### Door contact switch



The door contact switch interrupts the current and voltage supply of the UV-C lamp when the door is opened.

Fig. 162: Door contact switch

The inspection doors in the effective range of the UV-C radiation are equipped with door contact switches to safely switch off the UV-C illuminants in the event of unauthorised access. The door contact switches are pre-wired in terminal boxes. Where possible, the door contact switches are grouped together in a terminal box. If the structural situation in the AHU does not allow this (e.g. different delivery sections), several terminal boxes are installed accordingly.

1. Close all inspection doors with door contact switches.
  2. Check that the LED (SAFETY SWITCH) on the switch cabinet lights up.
- If the LED is lit up, even though all inspection doors are shut, there is a fault (see appendix "Light progress – Master-SM operating instructions", "Safety switch" section).

### Repair

- Clean dirty UV-C illuminants with a cloth and alcohol; see appendix "Light progress – UV-DUCT-SQ SB-SQ operating instructions", "Maintenance" section. If cleaning is not possible, the UV-C illuminant must be replaced.
- Replace any UV-C illuminants which have reached their maximum operating hours; see appendix "Light progress – UV-DUCT-SQ SB-SQ operating instructions", "Maintenance" section.

# UV-C technology for surface disinfection

## Inspection

### Maintenance interval

Every week.

### Work steps

- Check the function of the UV-C illuminants at the switch cabinet; see appendix "Light progress – Master-16-MA operating instructions", "Description and meaning of controls" section.
- Check the operating hour counter for the UV-C illuminants at the switch cabinet; see appendix "Light progress – Master-16-MA operating instructions", "Description and meaning of the controls".
- Check the UV-C illuminants for dirt.

## NOTICE



### Malfunction due to contaminated UV-C illuminants

Dirty UV-C illuminants do not achieve the designed deactivation rate due to shadow effects.

- Clean UV-C illuminants (see chapter "Repair", page 132).

## Maintenance interval

Every year.

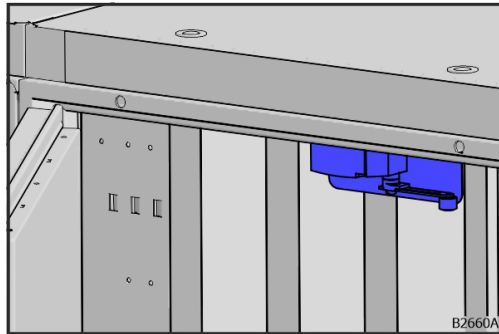
### Work steps

Personnel qualifications

The tasks described in the section may only be carried out if the person concerned has the following qualification:

→ Qualified electrician

Door contact switch



The door contact switch interrupts the current and voltage supply of the UV-C lamp when the door is opened.

Fig. 163: Door contact switch

The inspection doors in the effective range of the UV-C radiation are equipped with door contact switches to safely switch off the UV-C illuminants in the event of unauthorised access. The door contact switches are pre-wired in terminal boxes. Where possible, the door contact switches are grouped together in a terminal box. If the structural situation in the AHU does not allow this (e.g. different delivery sections), several terminal boxes are installed accordingly.

1. Close all inspection doors with door contact switches.
  2. Check that the LED (SAFETY SWITCH) on the switch cabinet lights up.
- If the LED is lit up, even though all inspection doors are shut, there is a fault (see appendix "Light progress – Master-16-MA operating instructions", "Safety switch" section).

## Repair

- Clean dirty UV-C illuminants with a cloth and alcohol; see appendix "Light progress – UV-STICK...AL-SCR operating instructions", "Maintenance" section. If cleaning is not possible, the UV-C illuminant must be replaced.
- Replace any UV-C illuminants which have reached their maximum operating hours; see appendix "Light progress – UV-STICK...AL-SCR operating instructions", "Maintenance" section.

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