

Operating instructions
in accordance with DIN EN 307
for
Küba
Condensers
and
Dry coolers

Notes on using these Operating instructions

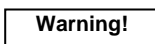
It is vital that this document, the Assembly instructions and the Declaration of Conformity are read prior to assembly or start-up of the condenser / dry cooler.

Operational safety symbol



This symbol is used in these Operating instructions for all operational safety notes where a danger exists to life and limb of persons. Observe these notes and exercise particular caution in these instances. Pass on all operational safety notes to other users as well. The general safety and Accident Prevention Regulations must be observed in addition to the notes contained in these Operating instructions.

Warning symbol



This symbol is shown in all sections of the Operating instructions where special precautions must be taken to ensure that the applicable guidelines, regulations and notes are observed, the correct working procedure is complied with and damage and destruction of equipment or other systems must be avoided.

Disposal



Any equipment, components and spare parts that are replaced must be properly disposed of. Refer to Sections 10.1 to 10.6 in this regard.

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Check list for periodic inspections of condensers / dry coolers (Proposal) Appendix

1. Basic preliminary notes

1.1. Basics

The technical data originate from the applicable catalogue information on condensers / dry coolers and from the nameplate data.

For fan motors, only the nameplate details are binding.

1.2. Application area

Warning!

- The condensers / dry coolers may be used with refrigerants using the fluids specified on the nameplate
- for heat transfer media using the fluids specified on the nameplate

Remark:

Fluid Group 1: Refrigerants or heat transfer media with hazard classification Refrigerant in Group L2 and L3 in acc. with the DIN EN 378 standard (e.g. ammonia), thermo oil)

Fluid Group 2: Refrigerants or heat transfer media without hazard classification (Refrigerant in Group L1 in acc. with the DIN EN 378 standard (e.g. HCFC's, brine, glycol or water)

1.3. General safety note



Assembly and start-up, service and maintenance may only be carried out by trained persons in accordance with the Accident Prevention Regulation BGV A1, "Prevention principles".

1.4. Copyright

GEA Küba GmbH reserves all rights, also in case of proprietary rights claims. GEA Küba GmbH also has power of disposal, such as copy and disclosure rights.

1.5. Changes

Technical changes with reference to illustrations and specifications contained in these Operating instructions, serving to improve the condensers / dry coolers are reserved.

2. Technical data

2.1. Nameplate data

See model designation and nameplate



The following data are shown on the nameplate:

- Type designation (see 2.4 for the type key)
- Manufacturer's number, year of manufacture
- Electrical supply
- Electrical power (active)
- Maximum permissible heat exchanger pressure PS
- Maximum permissible heat exchanger temperature TSmax
- Minimum permissible heat exchanger temperature TSmin
- Permissible fluid group
- See 1.2 Application area
- Marking of ATEX type unit - in acc. with EC Directive 94/9/EC (only for ATEX type unit)
- Additional test markings (e.g. VDE) may be shown

2.2. Area of application and designated use

Warning!

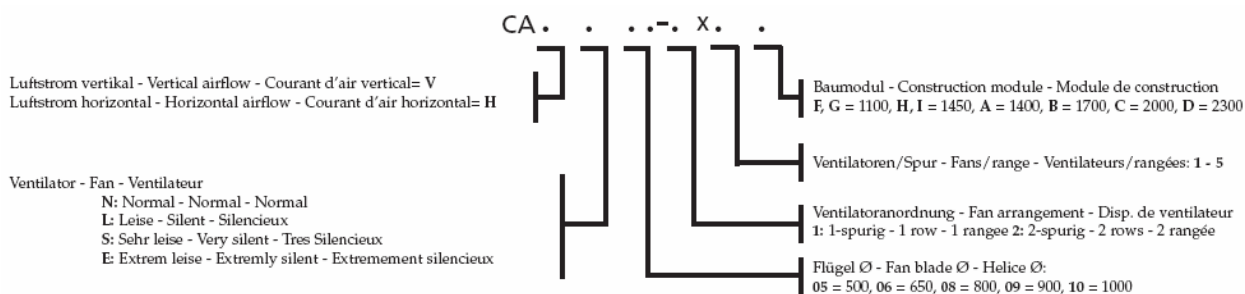
The condenser / dry cooler is suited for use only in refrigeration systems in accordance with the DIN EN 378 standard or as a heat exchanger for the fluid group specified on the nameplate (see 1.2 Application area). The permissible ambient temperature may not exceed 60 °C. Any use over and above this is deemed improper. The manufacturer is not liable for any arising damages; the user bears sole responsibility. The equipment may only be used where the materials are not attacked by the ambient atmosphere.

2.3. Material data

- Copper or stainless steel tubes, aluminium fins; epoxy resin coating or copper optional.
- The tube systems are hard-soldered or welded.
- Suitable for refrigerants or heat transfer media belonging to the fluid group specified on the nameplate.
- When operating with a heat transfer media, the heat transfer media must, if necessary, contain suitable inhibitors to prevent, e.g., corrosion.
- Refer to the catalogue for further information.

The heat exchanger of the condenser is dried using dry air and sealed under over-pressure after the leakage and over-pressure test at the manufacturer, the heat exchanger of the dry cooler is sealed under normal pressure.

2.4. Model designation



3. Safety

The data relates only to the “condenser / dry cooler” component and not to the complete system in which the condenser / dry cooler is installed.

3.1. General safety notes

Warning! The condenser / dry cooler is built according to the state of the art and is safe to operate. The condenser / dry cooler must only be used as specified in the catalogue. The condenser / dry cooler may be hazardous if it is not installed, operated or repaired by trained staff or if it is used contrary to its designated use. With installation, the installation requirements pursuant to the DIN EN 378 standard and the national regulations (e.g. Water Management Act, Ordinance on Industrial Safety and Health, Accident prevention regulations) must be observed.

The information provided on the nameplate, i.e. max. permissible pressure, permissible temperature and the fluid group, must be ensured by the manufacturer of the plant. The integration and safeguarding of the equipment must be carried out by the plant manufacturer in accordance with his hazard analysis for the system, with due consideration of the DIN EN 378 standard and national regulations.



EC directives 94/9/EC (ATEX) and the Ordinance on Industrial Safety and Health must be observed when operating in explosive atmospheres. Only ATEX model condensers / dry coolers may be installed and operated in explosive atmospheres. The information provided on the nameplate of ATEX model condensers / dry coolers, specifying the explosion group, category and temperature class must be taken into account.

Warning! The condenser / dry cooler may only be installed, integrated into the refrigeration system, operated and repaired by specialised companies and trained staff.

Each person tasked with assembly, disassembly and reassembly, starting up, operation and maintenance (inspection, servicing, repairs) of the condenser / dry cooler is required to read and be familiar with the Operating instructions, in particular the sections on safety measures. Appropriate personal protective gear must be used when handling the refrigerant, compliant with the Accident Prevention Regulation BGR 500 [Occupational Health and Safety Regulations], Chapter 2.35 “Refrigeration systems, heat pumps and cooling equipment”.

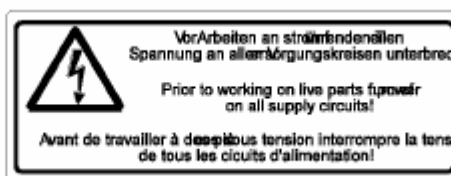
3.2. Assembly

The responsible specialist company is responsible for the load bearing capacity of the on site plinths or foundations. With installation, the installation requirements pursuant to the DIN EN 378 standard and the national regulations must be observed.



Prior to start-up, check that all protective devices, especially the fan safety grille, are fitted.

Switch off the power supply to all circuits when performing assembly, repair and maintenance tasks. Avoid touching the fin edges: risk of injury.



Unauthorised modifications and changes affecting the safety and functioning of the condenser / dry cooler are prohibited. No soldering or welding on equipment containing refrigerants.

3.3. Electrical installations

The DIN VDE 0100 and DIN EN 60204 Part 1 standards, the provisions of the local power supply company, all other safety regulations and the fan motor nameplate data must be observed with electrical installations.

Only the data on the equipment nameplates are binding.



The electrical connection may only be performed by staff with appropriate technical training, taking into account the local electrical regulations.

Wiring may only be done as specified in the enclosed Assembly instructions and according to the circuit diagrams in the junction boxes.

A sinus filter must be provided on all phases when speed is controlled with a frequency converter. To prevent the motors from over-heating, the minimum speed must not be less than 30% of the nominal speed.

An existing thermal protection relay to protect the fans is included either in the electrical supply to the motors or must be included in the motor control by the system manufacturer (see wiring diagram for the fans).

Warning!

A suitable isolator must be included in the installation (master / disconnect switch).



After installation of the electrical system or after repairs, the electrical system must be checked in accordance with the DIN EN 60204 Part 1 standard.

Ensure that the supply cable glands are sealed and tightened.

4. Transport

4.1. Packaging

4.1.1. Type of packaging

The transportation route and size of the equipment also affects the type of packaging. Unless agreed otherwise, packaging complies with the guidelines specified in Section 4.1.1.1.

4.1.2. Pallets, crates, export containers

These comply with the HPE packaging guidelines as stipulated by the German Wood Packaging, Pallet and Export Packaging Association and the German Machine Manufacturing Association.

4.1.3. GEA Küba transport packaging

This is made of environmentally friendly materials and can be recycled.

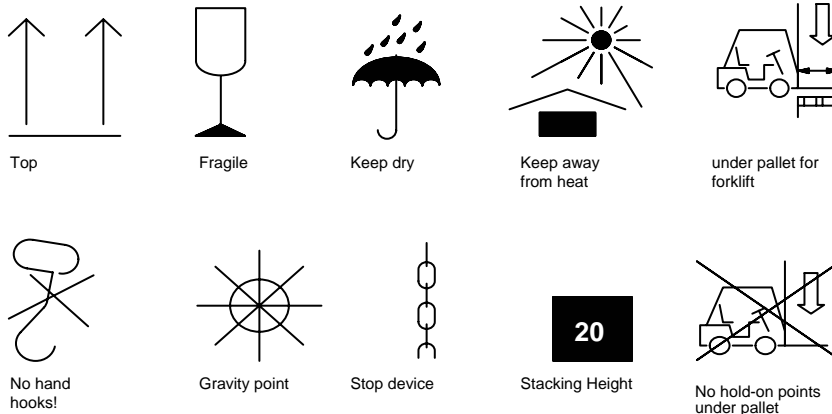
4.1.4. Packaging regulations

In compliance with the German packaging regulations, we are prepared to take back our qualifying packaging materials, when returned carriage paid, Baierbrunn.

To avoid any form of waste tourism, however, we suggest that you, the recipient of the goods, dispose of the packaging as best suits you.

4.1.5. Symbols

The symbols shown on the packaging must be observed, e.g.:



4.2. Knock-down level

The condensers / dry coolers are normally transported as complete units.

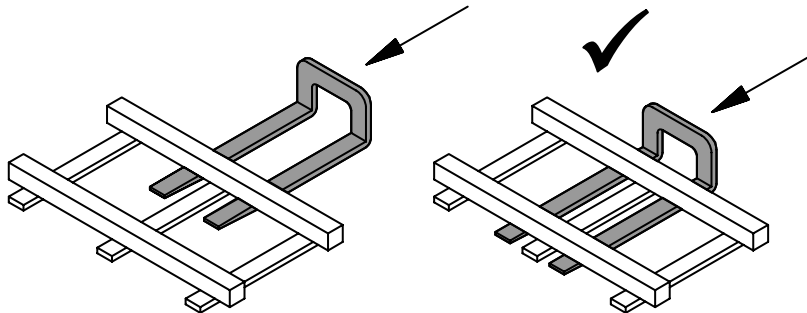
If the condenser / dry cooler is delivered knocked down, it must be assembled according to the attached order-specific drawings.

4.3. Loading and unloading, lifting

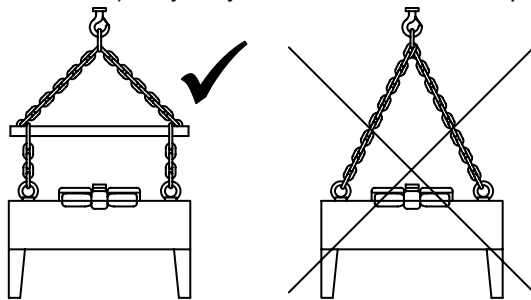
4.3.1. Proper transportation, lifting and positioning

Be particularly careful during transportation to prevent damage caused by external influences or careless loading and unloading.

Warning! In particular, do not lower the condenser / dry cooler down too hard. Do not use tubes or connectors to pull, lift, fasten or climb. This may result in leakages. Ensure that the forks are fully engaged when lifting with a forklift.



The condensers / dry coolers are normally supplied on protruding transport pallets. Lifting gear (ropes, chains etc.) may only be attached to the suspension points or eyebolts.



4.3.2. Position of centre of gravity

Observe the weight distribution when lifting. Most of the weight is on the fan side (air direction H).

4.4. Intermediate storage

The condensers / dry coolers must be stored in a dust- and moisture-proof place.

4.5. Scope of delivery

The content of the packaging must be checked for completeness on receipt. Any transportation damage and/or missing parts must be immediately reported, in writing.

4.6. Securing of load



We comply with the VDI [Ass. of German Engineers] guideline 2700 "Securing of loads on road transport vehicles". In the case of groupage traffic, the freight forwarder bears the responsibility.

4.7. Accident Prevention Regulations (UVV)



The valid national UVV must be observed, e.g. for:

- hoisting devices
- cranes
- load bearing facilities when using hoisting devices
- powered ground conveyors

5. Assembly

5.1. General notes on assembly

Warning!

Assembly tasks may only be carried out by trained staff. We are not liable for damage resulting from improper assembly.

The condenser / dry cooler may only be fastened by the attachment points provided for this purpose. Assembly may be with or without shock mounts (see Assembly instructions).

Each condenser / dry cooler has specific Assembly instructions, also available as a file for download in the Internet.

5.2. Set-up requirements

5.2.1. General notes on set-up

Warning!

Observe the set-up requirements specified in the DIN EN 378 standard and in the national regulations (e.g. Water Management Act). Planning must make allowance for adequate space around the equipment to enable assembly, functionality, maintenance and repair work.

The foundation and plinths must make provision for the weight and number of support points.



The installer is responsible for the load bearing capacity of the foundations and plinths as well as the strength of the bolts.

5.2.2. Dimensions, space requirement and weight

Dimensions:

See catalogue data.

Space requirement:

Plan for additional space on the refrigerant connection side and for adequate air suction cross section.

Allow for adequate spacing between the air intake and outlet and the wall, floor and ceiling surfaces. Also refer to the catalogue and Assembly instructions with regard to dimensions. Inadequate spacing causes malfunctions!

In the case of equipment with axial fans, ensure that there is no additional air resistance or air backflow.

When setting up the equipment in the open, the air should not exhaust into the direction of the prevalent wind.

Leave adequate distance between supply and exhaust air openings, to avoid thermal shorts.

Weights:

See catalogue data or Assembly instructions.

5.2.3. Lifting devices



The lifting capacity must be at least 1.5 times the weight of the equipment.

5.3. Assembly tasks

5.3.1. General notes on the assembly tasks

Refer to Section 3.2.

5.3.2. Electrical installations

Refer to Section 3.3.

5.3.3. Assembly of accessories

Refer to the Assembly instructions supplied with the accessories.

5.3.4. Refrigeration integration

Warning!

The integration and protection of the condenser / dry cooler into the refrigeration system must be carried out by the manufacturer of the plant in accordance with DIN EN 378. It is important to keep the interiors clean during system installation.

5.3.5. Draining instructions at risk of frost

When draining the dry cooler after performing the leakage and over-pressure test with water, there is no guarantee that the water has drained from the dry cooler completely, depending on the set-up tolerances. For this reason, following the leakage and over-pressure test and drainage of the dry cooler, repeated rinsing with an antifreeze agent that is compatible with the heat transfer media used, is recommended if frost is expected.

Before rinsing, the dry cooler must be separated from the heat transfer media circuit using the isolation valves (1) fitted by the manufacturer.

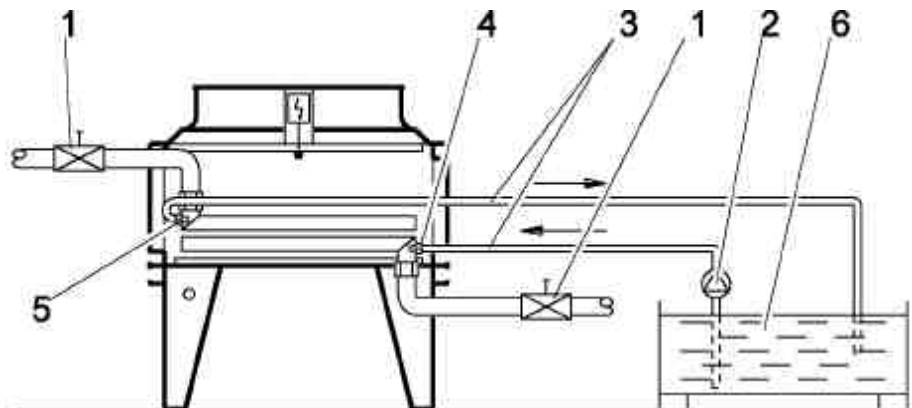
The dry cooler is rinsed using a pump (2) connected to the drainage connection (4) through a hose (3). The antifreeze agent, mixed with water, is discharged from the vent connection (5) and fed into a collecting vessel (6) from where it is re-circulated by the pump (2).

Rinsing must be continued until the residual water in the dry cooler and the antifreeze agent are sufficiently well mixed. At least a 10-times circulation is necessary in any event.

The degree of frost protection is given by the antifreeze concentration in the collecting vessel when rinsing is complete. Frost protection down to approx. -30°C is ensured if 50% of the volume of undiluted antifreeze agent as specified on the nameplate is used.

Example:

A dry cooler has a tube volume of 25 dm³. A volume of 12.5 l of undiluted antifreeze agent is then required for rinsing.



During frost and with delayed commissioning of the dry cooler, climatic conditions may cause condensate to accumulate in the tube system, forming ice plugs. In case of risk of frost, rinse the dry cooler with a suitable antifreeze agent several times, fill and close it. (see Drainage instructions above)

6. Commissioning

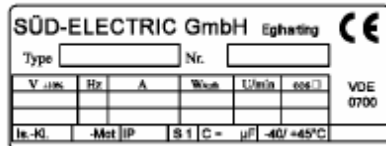


6.1. Notes

Commissioning may only be performed by trained persons after checking all the safety devices and testing for leakages in accordance with DIN EN 378.

6.2. Test run

Warning! Check the current as per the nameplate specifications and check the direction of rotation of the fans.



Warning! Check that all the connected control devices function properly

Warning! Check switch-off and switch-on points of the safety devices.

6.3. Testing before start-up

The operating company may need to prove that the authorised person has performed the tests in accordance with the Ordinance on Industrial Safety and Health, before the condenser / dry cooler are started up. The associated Declaration of Conformity is available as a file for download on the Internet.

6.4. Bleeding the heat transfer media circuits

When filling the cooling / heating circuits, ensure that there are no air pockets in the respective circuits. Suitable bleeding arrangements must be provided to vent gases released from the cooling / heating medium during operation.

7. Operation

7.1. Designated operation

7.1.1. Condenser operation

The refrigerant, overheated in the compressor, is liquified and under-cooled in the condenser, losing heat to the environment through the system of tubes and fins. The liquid refrigerant is fed into a high pressure collecting vessel or to the expansion valve.

7.1.2. Dry cooler operation

The heat transfer media cools down by losing heat to the environment via the system of tubes and fins.

7.2. Shutting down the condenser / dry cooler

The condenser / dry cooler is a component of the plant. System shut-down and re-start-up must be done according to the Operating instructions of the plant manufacturer.

If the dry cooler is operated below the freezing point of the heat transfer media, automatic drainage of the heat exchanger must be provided for the time the system is down.

Warning! For longer down time of the motors, perform two runs of 1 – 2 hours each per month.

7.3. In case of malfunctions



Use the personal protective gear when refrigerant is escaping!

Avoid all contact with refrigerants!

Immediately consult a medical practitioner if liquid refrigerant should come into contact with the eyes!

Maintenance and repairs may only be performed by trained staff.

7.4. Periodic inspections

Condensers / dry coolers must be inspected periodically by the authorised person in accordance with a risk assessment by the operating company (Ordinance on Industrial Safety and Health). If necessary, the leakage test must be performed in accordance with national regulations. The tests listed in the Annexure should be performed at intervals as deemed appropriate in the experience of the operating company.

8. Service and maintenance

In general, Küba condensers / dry coolers are maintenance-free.

To guarantee adequate heat transfer of the condenser / dry cooler, the heat exchanger should periodically be cleaned, with the motor switched off, depending on the degree of soiling.

Cleaning procedures:

- steam jet equipment against air flow direction,
- water jet against air flow direction,
- conventional cleaning agents,
- brushing off (not with steel brush) the fins on the air intake side

With steam jet or high pressure cleaning (max. 3 bar), electrical connections must not be sprayed directly. Only cleaning agents compatible with the materials used in the condenser / dry cooler may be used, cognisant of the manufacturer's application instructions (e.g. mixing ratio, exposure time, after-treatment).



Before starting any maintenance and cleaning work, isolate all poles of the electrical supply to the condenser / dry cooler from mains and secure against switching on again.



Depending on the fluid used, caustic, toxic, flammable or explosive substances may be formed when welding or soldering on the heat exchanger. Before soldering or welding on the heat exchanger therefore, extract residual gases from the heat exchanger and rinse the tubes with an inert gas such as nitrogen.

9. Customer service

9.1. Stocked spare parts

Customer services shall be provided by the installer. Refer to the current spare parts list for spares.

9.2. Corrosion

GEA Küba GmbH accepts no liability for limited service life when used in aggressive atmospheres; even if anti-corrosion methods were already applied.

10. Dismantling and disposal

10.1. Dismantling

With dismantling, DIN EN 378 and the national regulations (e.g. Water Management Act, Halon Prohibition Directive) must be observed.

10.2. Heat exchanger materials

Copper, aluminium, steel and stainless steel are the predominant materials. Such scrap metals, even when varnished, can be re-cycled using mechanical and/or thermal separation in waste processing.

10.3. Plastic components

Guards, grille consoles, rectifier nozzles, fan blades and junction boxes are made of polyamides, partly fibreglass reinforced. This material is fully recyclable.

10.4. Motor materials

Except for some insulation, steel, aluminium, copper and polyamides are used in motors. Re-cycle as described in Sections 10.2 and 10.3.

10.5. Packaging

We use untreated wood and polyethylene (PE) foils. These materials are recyclable. For packaging regulations, refer Section 4.1.3.

10.6. Waste management

Refer to Sections 10.2 to 10.5 for recommendations. The waste management laws applicable in the country of the operating company are binding.

11. Annexures

- The Declaration of Conformity under the applicable EC directives can be downloaded at GEA Küba GmbH on the Internet at www.kueba.com.
- The Assembly instructions for the specific series can be downloaded from GEA Küba GmbH on the Internet at www.kueba.com.
- Compilation of the periodic inspections for condensers / dry coolers (Proposal) in accordance with DIN EN 307

Check list for periodic inspections of Condensers / Dry Coolers

(Proposal)

- Visual inspection of brackets and fastenings
- Checks for external soiling, damage and corrosion
- Leakage test
- Visual inspection of the heat exchanger for dirt
- Measurement of the overheating and under-cooling temperature of the refrigerant
- Measurement of the inlet and outlet temperature of the heat transfer media
- Measurement of the inlet and outlet temperature of the air
- Measurement of the rpm and power consumption of the fans
- Cleaning of the heat exchanger
- Checking functionality of the safety devices (excluding safety valves)
- Checking functionality of the isolation armatures
- If necessary, checking adequate concentration of the antifreeze agent and heat transfer media inhibitors.

The checking periods shall be determined by the operating company based on a hazard assessment and in consideration of the operating conditions.