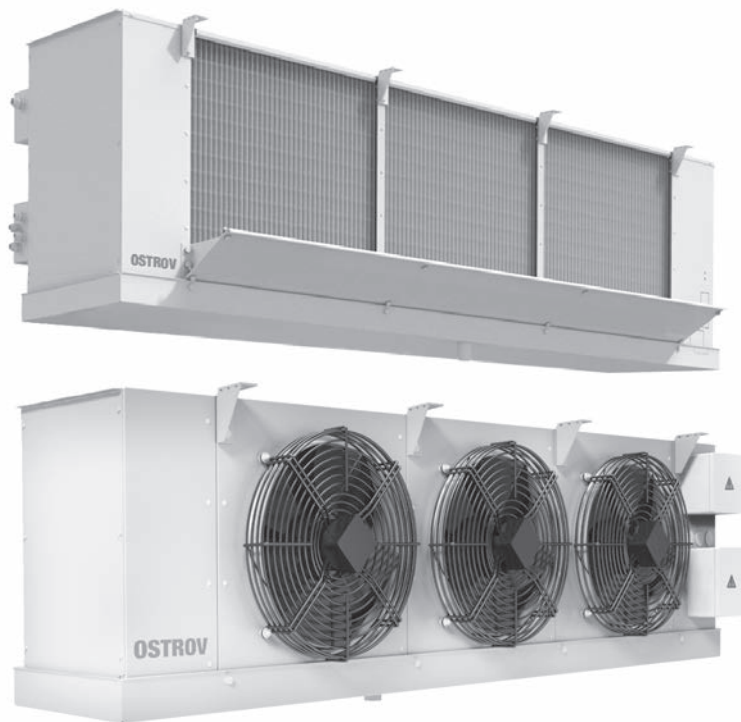


OSTROV

refrigeration

OH 201/OH203/OH601/OH603 Unit Coolers



operating instructions

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Introduction

These operating instructions contain important information on installation, use and maintenance of OSTROV OH201/OH203/OH601/OH603 unit coolers.

Please read the instructions carefully before operating the equipment and keep them in the unit cooler's immediate vicinity during its entire lifetime.

Observance of these instructions helps in avoiding dangers, reducing repair costs and down-times and increasing the reliability and durability of the unit cooler.

Ignoring the information given in these instructions can put the warranty rights at risk.

Ostrov reserves the right to change specifications due to technical developments. Specifications subject to change without notice.

All names referred to are registered trademarks of their respective owners.

1. General information

OSTROV unit coolers are completely factory-assembled, built in compliance with current international and national standards on the specific field of refrigeration and air conditioning systems.

The OH201/OH203/OH601/OH603 unit coolers are intended for installation in commercial and industrial refrigeration systems and are used for cooling the air in small and medium-sized cold storage rooms, deep-freeze rooms, etc.

The OH201/OH203 unit coolers are direct expansion heat exchangers. The OH601/OH603 unit coolers are heat exchangers with secondary coolants. Their coils are manufactured with copper tubes and aluminium fins. Air circulation is carried out by one or several fans.



The heat exchangers are tested for strength and leaks and supplied filled with pure nitrogen.

The unit coolers are used for operation only within the limits of the application data, ambient temperature range, refrigerant types and electrical specification mentioned in these operating instructions as well as on the nameplate attached to the equipment. A different use is allowed respecting the working conditions for which the unit coolers are designed and made.

The information about available options is indicated on the nameplate in accordance with description given in the technical catalogue for OSTROV OH201/OH203/OH601/OH603 unit coolers.

The nameplate contains the following information:

- Trademark, manufacturer, location and website;
- Model of heat exchanger;
- Code;
- Serial number;
- Operating pressure;
- Test pressure;
- Min/max temperature;
- Power supply of fans;
- Power supply of heaters;
- Internal volume;
- Net weight;
- Country of origin;
- Date of production (month and year).

OSTROV refrigeration		Ostrov Complete s.r.o. Ringhofferova 115/1, 15521, Prague 5, Czech Republic, tel.: +420 234 252 223		 
Unit Cooler <input type="text"/>				
Code <input type="text"/>		Serial number <input type="text"/>		
Pressure oper. / test		<input type="text"/>		
Min / max temperature		<input type="text"/>		
Power supply of fans		<input type="text"/>		
Internal volume		<input type="text"/>		
Net weight		<input type="text"/>		
Made in EU		<input type="text"/>		

The scope of delivery contains the following documents:

- Operating instructions;
- EU Declaration of Conformity –
www.ostrovcomplete.com.

2. Areas of responsibility

2.1 Manufacturer's responsibilities

The responsibility of the manufacturer extends to the present unit cooler only.

The manufacturer's responsibilities include designing, manufacturing and testing the unit cooler according to EN 378-2.

All refrigerant-carrying elements of the unit cooler are tight, made of materials compatible with the refrigerants used and withstand the maximum permissible working pressure.

The unit cooler is part of a refrigeration system containing refrigerants. It should be installed, operated and serviced by skilled and qualified refrigeration technicians only.

The manufacturer does not take any liability for the damages and injuries occurred as a result of:

- Incorrect installation;
- Improper use;
- Improper operating conditions;
- Inadequate maintenance;
- Modifications not allowed by the manufacturer;
- Use of unoriginal accessories or spare parts;
- Non-observance of these operating instructions.

The instructions cannot cover every installation, use or service situation. Please contact us for additional information.

The contact information is presented in the section "Manufacturers". In case of inquiries please provide us all the data indicated on the nameplate of the unit cooler in order to allow rapid processing.

All responsibilities concerning the refrigeration system, into which the unit cooler is integrated, are the sole responsibility of the people involved in the appropriate working processes.

2.2 System installer's responsibilities

The system installer's responsibilities include designing, manufacturing and testing the refrigeration system according to EN 378-2.

The system installer is responsible for:

- Planning the works required for the installation of the refrigeration system;
- Preparing the installation site;
- Mounting the unit cooler;
- Connection of pipelines;
- Testing pipelines for strength;
- Installing automatic controls;
- Installing an automatic emergency switch;
- Testing pipelines and the entire system for leaks;
- Providing thermal insulation of pipelines;
- Evacuation and drying of the system;
- Charging the system with refrigerant (coolant);
- Commissioning of the system;
- Start-up of the system;
- Specifying intervals of checking and other maintenance works etc.

The system must be provided with all equipment necessary for testing, maintaining and repairing the system according to EN 378-4.

The system installer shall draw the attention of the owner or operator to the necessity for adequate instruction of the operating and supervising personnel when operating and maintaining the system.

The refrigerant (coolant) used and the version of the unit cooler integrated into the system must not differ from those indicated in the project documentation.

The system installer is responsible for informing the manufacturer immediately if any defects of the unit cooler are detected.

It is recommended that the operating personnel are present during evacuation, charging with refrigerant (coolant), adjustment of the refrigeration system and, if possible, during assembly on site.

2.3 Owner or operator responsibilities

The responsibilities of the owner or operator include operation, maintenance, servicing and recovery of the refrigeration system according to EN 378-4.

The owner or operator is responsible for:

- Checking that the proper people are sufficiently trained and qualified for operating, monitoring and servicing the system as well as familiar with these operating instructions;
- Informing the personnel about the design and working principles of the system;
- Informing the personnel about the operating and maintenance rules of the system;
- Instructing the personnel about handling with the refrigerants (coolants) used as well as about necessary safety measures;

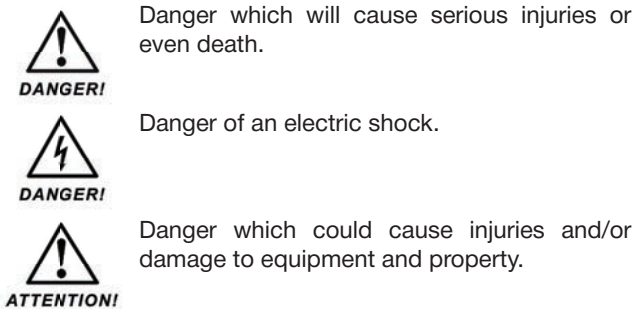
- Acceptance of the refrigeration system;
- Providing a warning system;
- Planning emergency measures;
- Making sure that maintenance is carried out regularly (inspection, cleaning, defrost) etc.

The owner or operator must ensure that the refrigerant used in the system and the unit cooler's version do not differ from those indicated in the project documentation.

The owner or operator is not absolved from the responsibility even if the system is used by somebody else, unless there is an agreement on sharing responsibility.

3. General safety information

The following warning signs are used in these operating instructions:



4. Packaging

In order to avoid transport damages, unit coolers are supplied mounted on a wooden pallet inside a wooden crate. The crate is covered with polyethylene film against atmospheric effects.

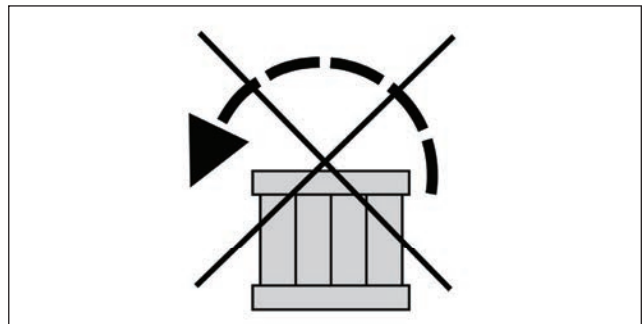
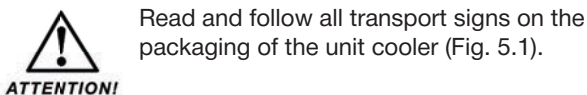


Fig. 4.1

5 Transportation

5.1 Safety rules



The unit coolers have to be transported and unloaded with suitable transport equipment such as forklifts. Operators must be qualified for unloading the equipment properly.

The carrying capacity of the vehicle must be rated for the weight of the unit cooler, and its overall dimensions. The unit coolers must be lifted from underneath with the load spread.



Fig. 5.1

Please contact Ostrov in case you have any doubts about proper transportation.



Check that the forks of the forklift protrude for a sufficient length beyond the entire width of the crate (Fig. 5.2).

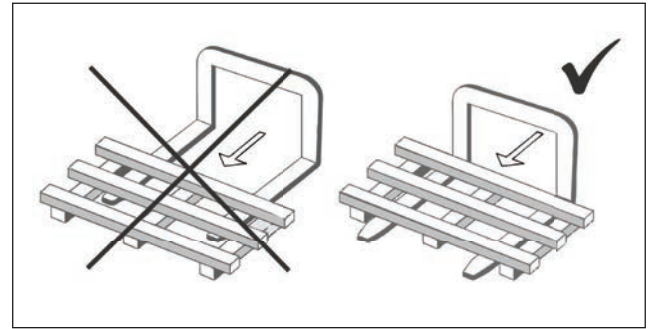


Fig. 5.2

It is allowed to lift and move the unit cooler only with the forklift and on a wooden pallet (Fig. 5.3).

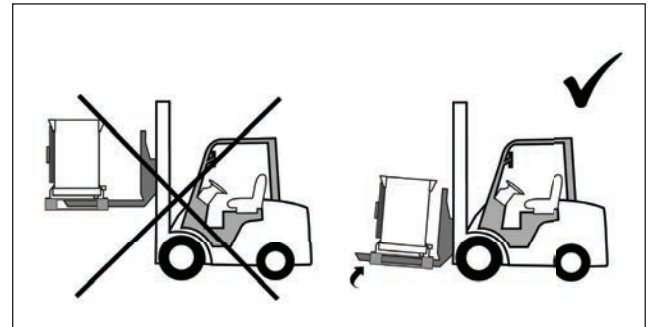


Fig. 5.3



Make sure that nobody is under the load or near it (Fig. 5.4).



Fig. 5.4

It is allowed to lift and move not more than one package with a product at a time (Fig. 5.5).

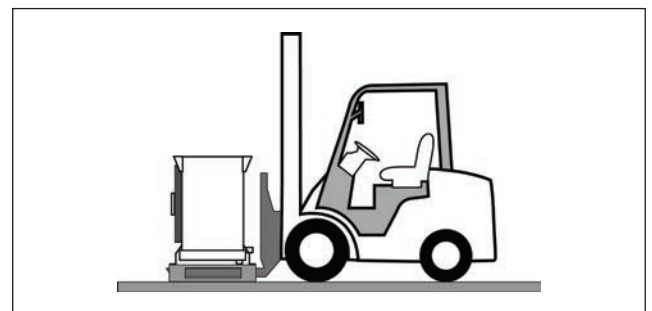


Fig. 5.5

It is not allowed to lift and move more than one package with a product at a time. It can cause damage to the unit cooler (Fig. 5.6).



Fig. 5.6

6. Storage

The unit coolers have to be warehoused dry and weather protected in the original packaging until installation. It is desirable to store them indoors. Unit coolers should not be exposed to extreme environmental conditions during storage.

Not more than three unit coolers of the same size may be stacked one upon the other (Fig. 6.1).

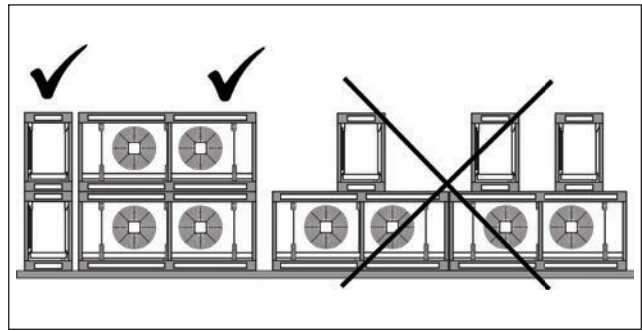


Fig. 6.1

7. Placement

The unit cooler is designed for mounting inside the cooling areas. Use special brackets to fix a unit cooler on the surface. The surface for mounting should be flat and strong enough for the unit cooler weight. Weight information and dimensions are listed on the nameplate of the unit cooler and in the relevant product documentation.

Enough space should be provided for maintenance. All the components, connections and electrical connections should be easy to access.

The unit coolers have to be placed so that they cannot be damaged by internal traffic or transport processes.

It is not recommended to place the unit cooler above doors and gates (Fig. 7.1).

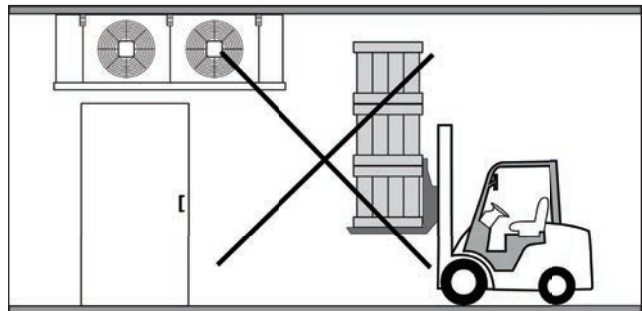


Fig. 7.1

It is necessary to provide enough space for mounting and demounting of the heaters (Fig. 7.2).

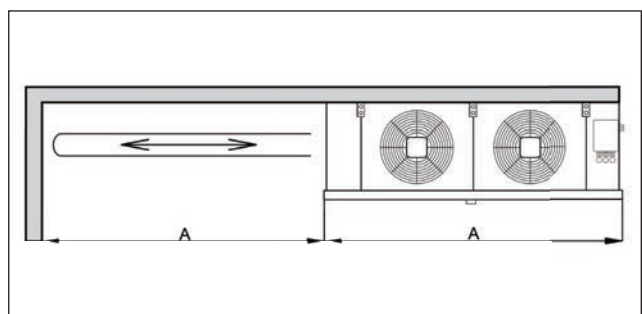


Fig. 7.2

A distance of one height must be allowed between the unit cooler and the wall on the inlet air side for correct air flow (Fig. 7.3).

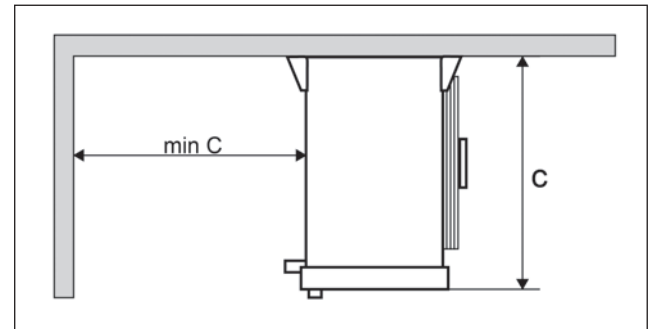


Fig. 7.3

The area above the unit cooler must be sealed or exposed in such a way to facilitate hand cleaning without the use of tools (Fig. 7.4).

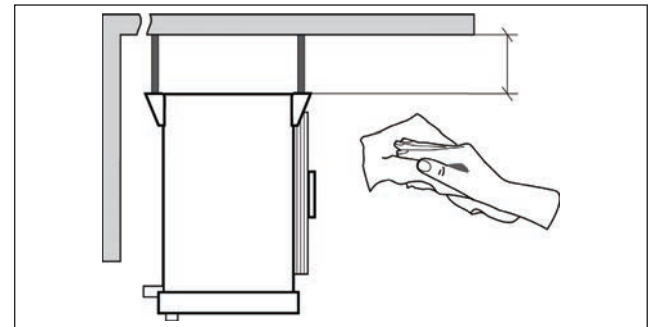


Fig. 7.4

Sufficient space should be provided under the unit cooler to allow the opening of the drip tray (Fig. 7.5).

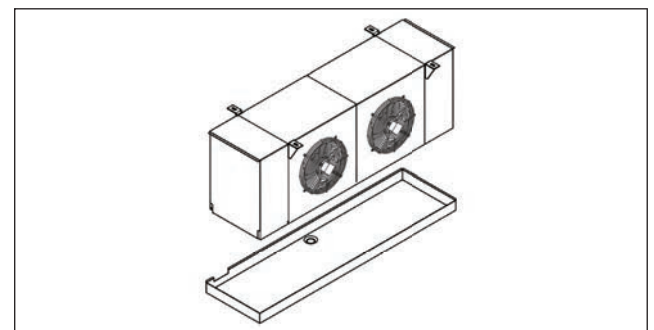


Fig. 7.5

The unit cooler must be installed horizontally (Fig. 7.6).

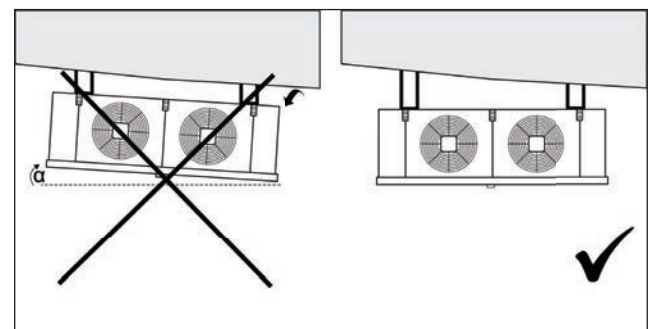


Fig. 7.6

Provide additional lighting for safe operation of the unit cooler.

Take into consideration the noise level of the fans when selecting the installation place.

8. Unpacking

8.1 Safety rules



Care should be taken while unpacking and installing the unit coolers in order not to cause any damage to the tubes and piping connections.

No person should walk or step over the equipment because it can generate an accident or a risky situation (Fig. 8.1).



Protruding parts and corners of the unit coolers as well as sharp edges of the fins can cause injuries to fingers and hands.



Wear individual protection equipment such as safety gloves and glasses.

8.2 Operating sequence

1. The unit cooler should be delivered packed to the installation position. Check the packaging. Any damages must be immediately reported to the supplier of the equipment in writing (Fig. 8.2).

2. Remove the protective film and the wooden crate (but not the wooden pallet) on arrival (Fig. 8.3).

3. Check the contents of the packaging for completeness. Any damages or missing parts must be immediately reported to the supplier of the equipment in writing (Fig. 8.4).

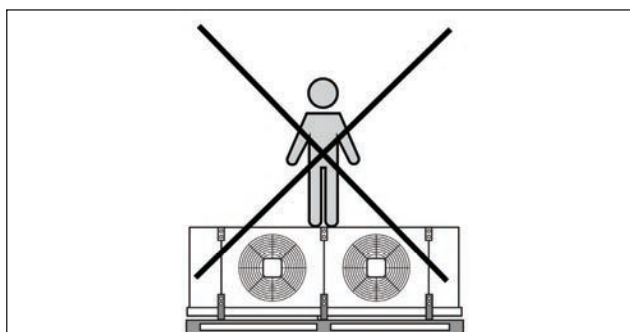


Fig. 8.1

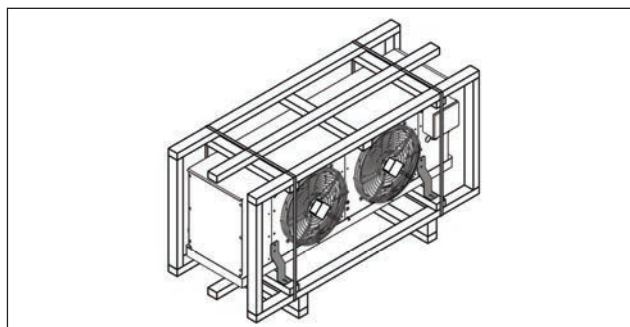


Fig. 8.2

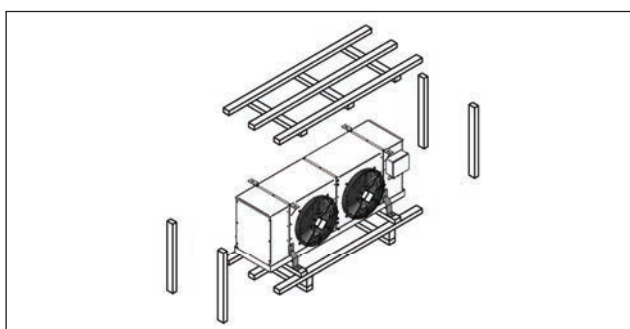


Fig. 8.3

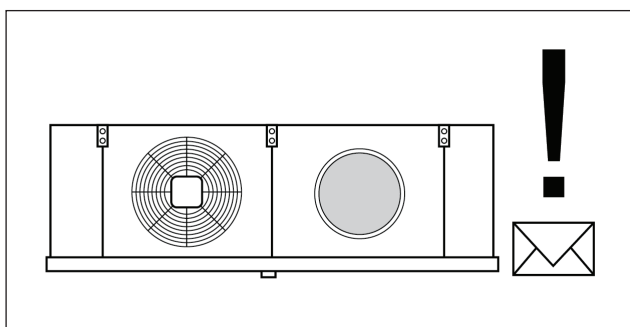


Fig. 8.4

4. The unit coolers are filled with pure nitrogen to the excess pressure. Check the excess pressure before installation.

An unpressurized unit cooler indicates a leakage.

Please contact the supplier if you get the unit cooler without pressure (Fig. 8.5).

Pressureless unit coolers must not be put into operation!

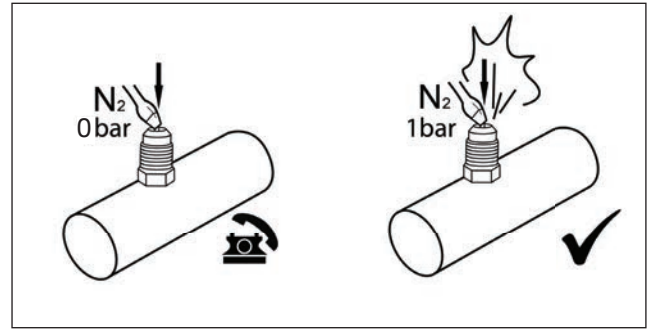


Fig. 8.5

9. Mounting

9.1 Preparations for mounting

Observe the following recommendations before installation:

- The unit coolers must be fastened only at the fastening points provided for this purpose.
- Use anchor bolts with plane washers, locking washers and nuts (Fig. 9.1). The diameter of the fastening elements must correspond with the diameter of the mounting holes. Observe the distance between the fastening axes of the unit cooler.
- Provide high thermal insulation to avoid thermal bridges.
- During operation of the refrigeration system, there must be no external vibrations to the unit cooler. If necessary, use vibration absorbers and anti-vibration mountings.
- In case of low-quality mounting there is a danger of refrigerant (coolant) leaks during operation of the system. This may lead to serious malfunctions.
- Foreign substances in the refrigerant (coolant) circuit may decrease the capacity of the system and damage its components. Release the transport pressure only immediately before the connection of the unit cooler to the system.
- The load-bearing capacity of the fastening points and connections is the responsibility of the installer of the unit coolers.

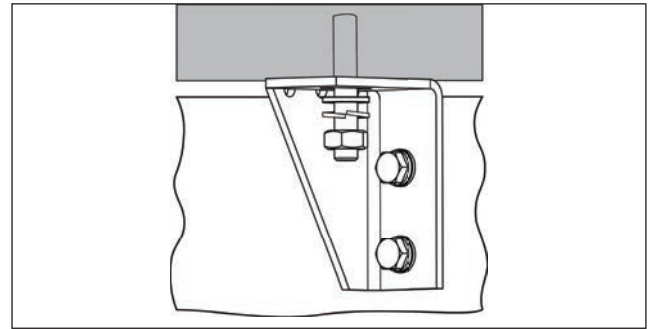


Fig. 9.1

9.2 Safety rules



All work on the unit coolers must only be carried out by skilled and qualified personnel having the required training and specialist knowledge for their work according to EN 378-1.



Non-observance of the safety rules may lead to the failure of the unit cooler or the entire system. In some emergency situations, there is a danger of injuries due to thrown-out parts.



During installation, the unit cooler must not be connected to power supply.



The drip tray is in operating position. The unit cooler should be lifted only with the wooden pallet. The drip tray and the drain line connection must not be damaged.



Protruding parts and corners of the unit cooler as well as sharp edges of the fins can cause injuries to fingers and hands.



Do not leave any components near the fans as these components may cause damage to the fans and/or the unit cooler after reactivation.



Smoking is absolutely prohibited during work.



Wear personal protective clothing suitable for the refrigerant used.



Wear safety gloves and glasses.



9.3 Operating sequence

1. Prepare the place for installation of the unit cooler.
2. Lift the unit cooler to the ceiling using the wooden pallet (Fig. 9.2).

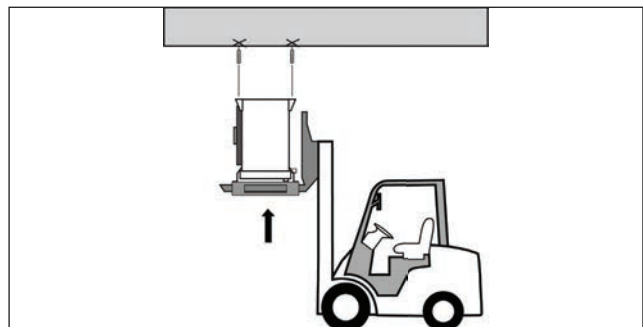


Fig. 9.2

3. Fix the unit cooler in its position (Fig. 9.3). Use all the provided fastening points.

Tighten the fastening nuts; protect the fastenings against loosening by means of an appropriate locking device.

The nuts must be tightened equally to achieve a load distribution that is as balanced as possible.

They must not be overtightened or stripped.

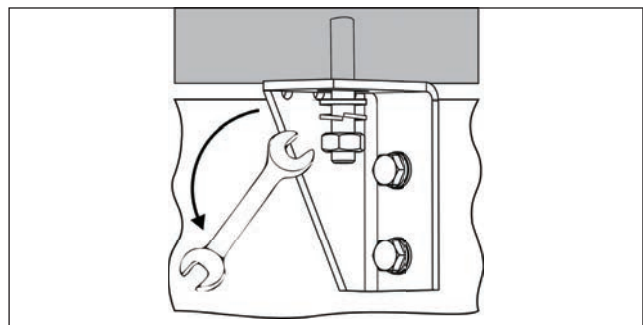


Fig. 9.3

4. Remove the wooden pallet and transportation brackets (Fig. 9.4).

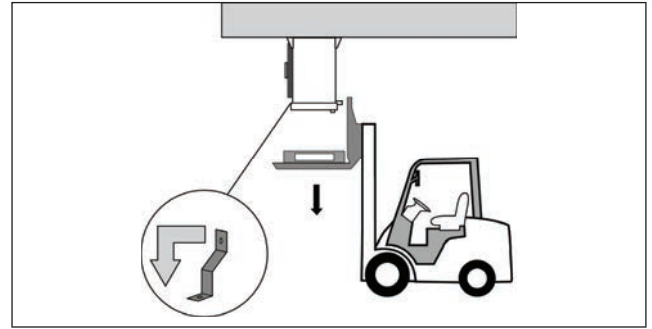


Fig. 9.4

10. Connection of the drain line

10.1 Safety rules



All work on the unit coolers must only be carried out by skilled and qualified personnel having the required training and specialist knowledge for their work according to EN 378-1.

10.2 Operating sequence

Connect the drain line to the drip tray in such a manner to provide free drainage. The inclination angle of the line must not be less than 20° (Fig. 10.1). The connection must be tight. In case of negative temperatures around the drain line, it is necessary to avoid ice formation in the pipeline by heating it and/or providing thermal insulation.

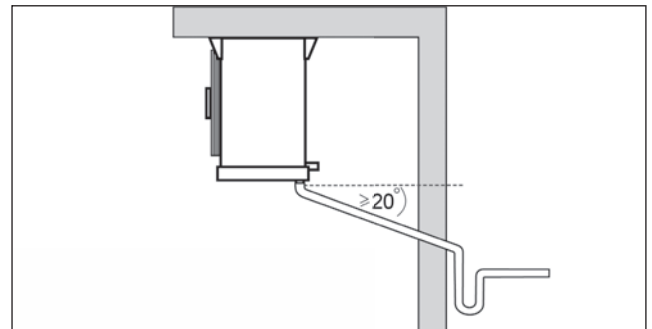


Fig. 10.1

Take measures to prevent penetration of warm air into the drip tray through the drain line using, for example, a U-trap outside the refrigerated room.

11. Connection of the unit cooler to the system

11.1 General

Every installation is different so the pipe sizes may differ from the unit cooler's connection sizes. Pipework to and from the unit cooler should be selected to suit the application and not the connection size of the unit cooler. Pipe sizes must be determined according to good engineering practices.

Pipes must be installed according to EN 378-1 and EN 378-3. In order to avoid sufficient pressure losses ahead of the expansion valve, ensure that the pipeline installation is as short as possible. Use as few bends as possible, and if bends are required, only large radii should be used. All piping must be supported properly. Force may not be exerted on the refrigerant distributor and the header as it can cause leaks. Lay pipelines to the unit cooler in such a way to provide an easy access for maintenance.

11.2 Safety rules

All work on the unit coolers must only be carried out by skilled and qualified personnel having the required training and specialist knowledge for their work according to EN 378-1.



Non-observance of the safety rules may lead to the failure of the unit cooler or the entire system. In some emergency situations, there is a danger of injuries due to thrown-out parts.



Suitable fire-fighting equipment must be provided on site. The fire extinguishers must be available and ready for use in sufficient numbers. Use extinguishing substances which are suitable for use on live equipment.



When performing soldering or welding operations, make sure that the flame nozzle is not aimed towards the unit cooler. Welding or soldering work may only be performed after complete removal of the refrigerant from the respective section of the system.



There must be no ignition sources on the installation site or near it.



Particular attention must be paid to the danger of ignition by spread oil residue.



Smoking is absolutely prohibited during work.



After incorporation of the unit cooler into the refrigeration system, the safety risks of the unit cooler should be rerated.



Wear personal protective clothing suitable for the refrigerant used.



Wear safety gloves and glasses.



Use respiratory protection suitable for the refrigerant used.

11.3 Operating sequence

1. Release the excess pressure; after that, remove the pipe plugs.

2. Remove the panel of the casing on the refrigerant distributor side having loosened the six screws (Fig. 11.1).

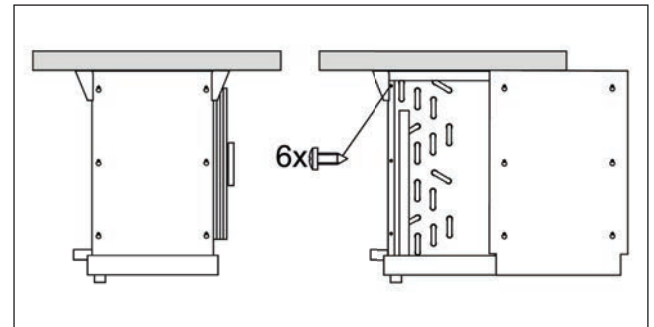


Fig. 11.1

3. Inspect the refrigerant distributor and verify that the nozzle is in place and has no mechanical damages. The distributor must be vertical (Fig. 11.2).

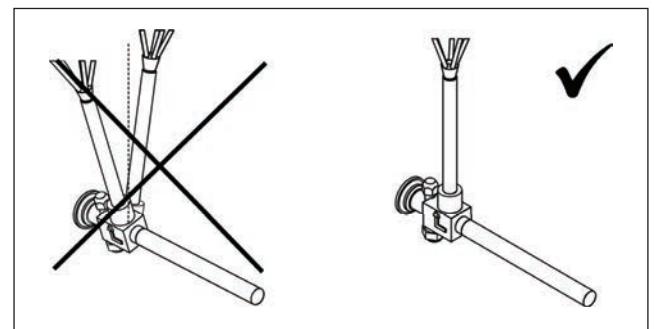


Fig. 11.2

4. Connect the suction line to the suction header (Fig. 11.3).

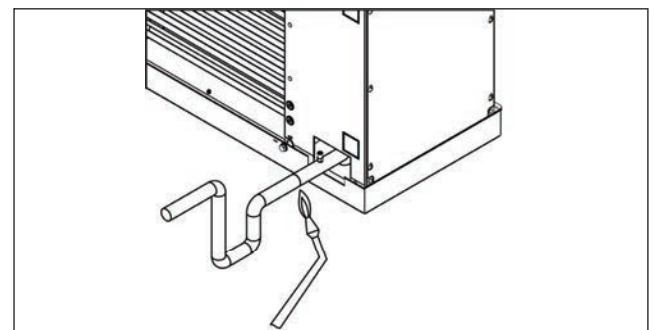


Fig. 11.3

5. The suction line should allow free oil flow from the unit cooler to the compressor. To make sure of that, it is recommended to do a piping loop, lift the tube up for 2/3 of the unit cooler height and do another loop on the upper part of the piping (Fig. 11.4).

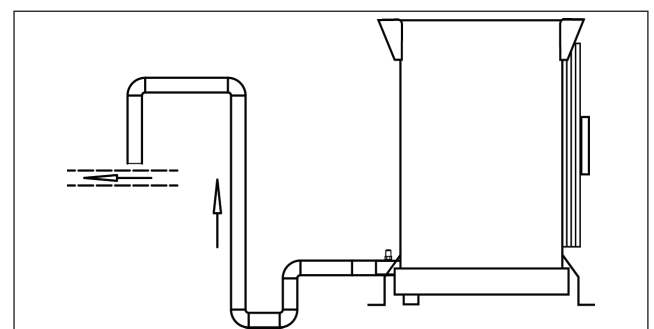
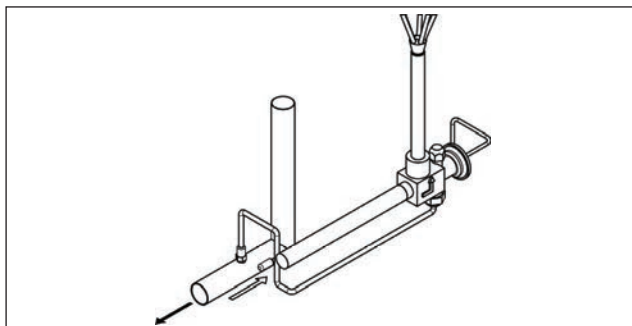


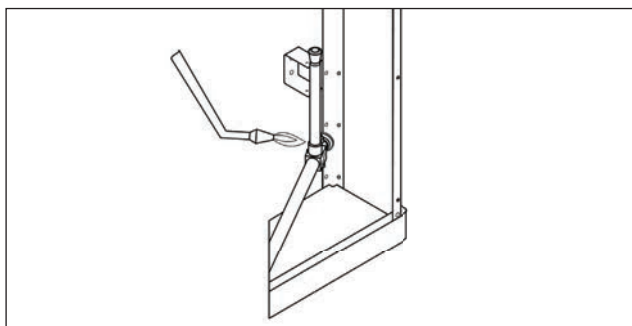
Fig. 11.4

Thermostatic expansion valve

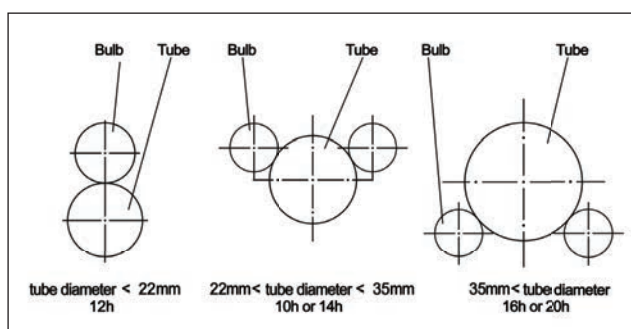
6. Install the expansion valve. The operating instructions for the valve must be strictly observed (Fig. 11.5).

**Fig. 11.5**

7. Connect the liquid line to the expansion valve (Fig. 11.6).

**Fig. 11.6**

8. Install the bulb of the expansion valve (Fig. 11.7). The position of the bulb depends on the suction line diameter. It is recommended to mount it on a horizontal tube, far away from all heat sources. The bulb must be installed as close to the suction header as possible. It is obligatory to install it ahead of the U-trap. The bulb must be insulated against external heat.

**Fig. 11.7**

9. If there is external pressure equalization, the equalizing line must be connected to the suction line immediately after the bulb.

Electronic expansion valve

6. Install the expansion valve. The operating instructions for the valve must be strictly observed.

7. Install a temperature sensor (TS) and a pressure sensor (PS). Both the sensors should be located on a horizontal suction line tube just at the outlet of the unit cooler in order to provide correct measuring of superheat (Fig. 11.8). The pressure sensor should be placed next to the temperature sensor on the upper side of the tube.

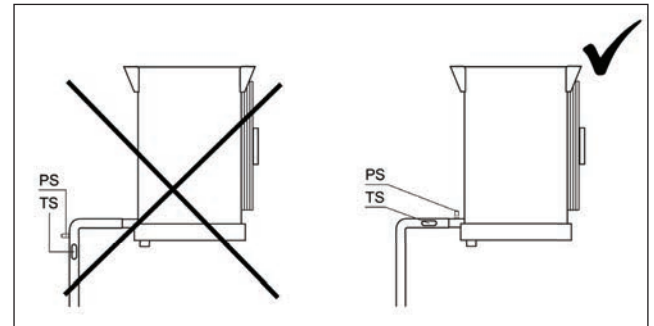


Fig. 11.8

8. Connect the liquid line to the expansion valve (Fig. 11.9).

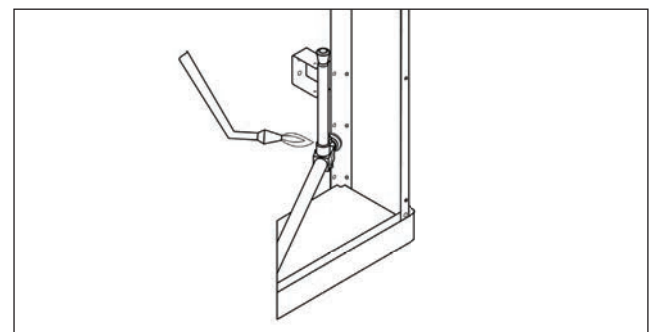


Fig. 11.9

12. Electrical connection

12.1 General

The electrical connections must be made in compliance with the wiring diagram, these operating instructions as well as with the regulations and standards for electrical systems in force in the country where the unit cooler is installed.

When carrying out electrical connections, observe the following:

- Check that the wire type is of copper conductor only and of the proper size to handle the connected load;
- Lay the power supply cable straight, avoiding twisting, crushing, overlapping or stresses, in a position that is protected from impacts and heat sources;
- Ground the unit cooler;
- Connect all electrical supply lines to the terminal boxes using bottom entry;
- Never damage the power supply cable. Damaged cable must be replaced by a qualified personnel;
- Equip the power supply system with appropriate overcurrent protection devices.

Protection against electrical shock must comply with the respective legislation in the country where the unit cooler is installed.

12.2 Safety rules



The electrical connections must be carried out by qualified personnel in possession of the technical qualifications required in the country where the unit cooler is installed.

Check whether power supply is suitable for the delivered equipment.

The grounding resistance must be less than 3 Ω.



Non-observance of the safety rules may lead to the failure of the unit cooler or the entire system. In some emergency situations, there is a danger of injuries due to thrown-out parts.



Prior to commencing work, ensure that the power circuit is disconnected.



Direct and indirect contact with voltage-carrying parts of motors and electrical lines can cause serious injuries or even death.



After having finished the work, do not leave any components near the fans as these components may cause damage to the fans and/or the unit cooler after reactivation.



The unit cooler can start automatically. Prior to work, make sure that there is no voltage in the circuit and attach the warning sign «DO NOT SWITCH ON!»



Smoking is absolutely prohibited during work.

12.3 Operating sequence

Carry out electrical connections according to the wiring diagram.

13. Commissioning

13.1 General

Before commissioning of the unit cooler, observe the following instructions:

- Ensure that the unit cooler has been installed correctly and in the correct location;
- Check that there are no foreign bodies on the fans;
- Check all fan guard grilles and motor connections for safety;
- Ensure that all terminal box covers are closed;
- Check that the supply voltage is within the upper and lower limits of the unit cooler;
- Check all electrical connections;
- Check all refrigerant connections. Be sure they are all tight;
- Check the room thermostat for normal operation and adjust it;
- Check the rotation direction of all fans;
- Check that the fans rotate freely (ensure that there are no unusual noises and the fan blades are not stuck; the blades must not touch the guard grille and the casing);
- Make sure that all Schrader valve caps are in place and tight.

The unit cooler is ready for use only after all the instructions and warnings have been scrupulously followed.

13.2 Safety rules



All work on the unit coolers must only be carried out by skilled and qualified personnel having the required training and specialist knowledge for their work according to EN 378-1.



Non-observance of the safety rules may lead to the failure of the unit cooler or the entire system. In some emergency situations, there is a danger of injuries due to thrown-out parts.



Do not leave the unit cooler unattended until the system has reached normal operating conditions.



The fans are only intended for the transfer of air or air-like mixtures. They must not be used for any other purposes.

There is a danger of cutting off fingers on the rotating fan blades, injury hazard for the hands and pulling in danger for loose elements such as hair, necklaces or clothing parts. Fan operation must be carried out only with guard grilles. Wearing jewellery is prohibited.

Removal of the guard grilles and working on the fans are permissible only when the power supply is switched off.



Direct and indirect contact with voltage-carrying parts of motors and electrical lines can cause serious injuries or even death.



During normal operation and during fault conditions some components will reach extremely high and/or low temperatures. Accidental contacts with the headers or piping parts can cause frostbites and/or burns.



After having finished the work, do not leave any components near the fans as these components may cause damage to the fans and/or the unit cooler after reactivation.



The unit cooler can start automatically. Prior to work, make sure that there is no voltage in the circuit and attach the warning sign "DO NOT SWITCH ON!"



Smoking is absolutely prohibited during work.



Wear personal protective clothing suitable for the refrigerant (coolant) used.

13.3 Operating sequence

1. Pressurize the coil as well as expansion valve assembly and suction connection to 10 bar with dry nitrogen or other suitable gas. Leave the coil pressurized for at least 10 minutes (Fig. 13.1).

If the coil holds pressure, the connection can be considered free of leaks. If the pressure drops by 0.5 bar or less, repressurize the coil and wait another 10 minutes. If the pressure drops again, there are likely one or more small leaks which should be located and repaired. Pressure losses more than 0.5 bar indicate larger leaks which should be isolated and repaired. Make sure to check valves and fittings as potential sites for leakage or bleed. If the coil is found to be leaking, directly contact Ostrov. Unauthorized repairs of the coil may void the manufacturer's warranty.

2. Evacuate the coil according to EN 378-2. Use a vacuum pump for evacuating the coil and any interconnecting piping that has been open to atmosphere (Fig. 13.2).

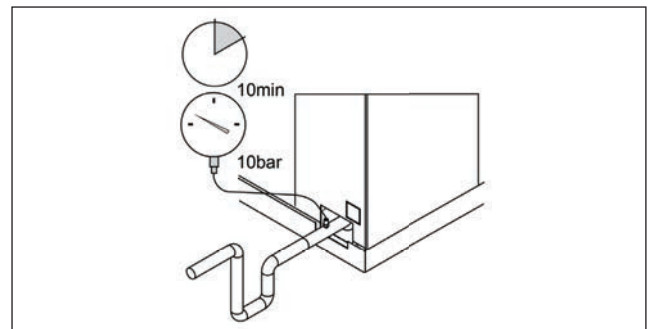


Fig. 13.1

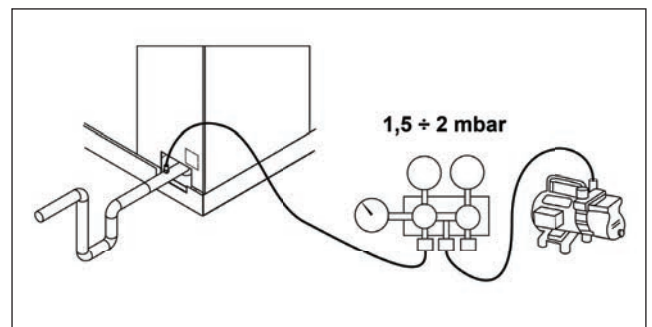


Fig. 13.2

Failure to reach a residual pressure of $1.5 \div 2$ mbar during a sufficient period indicates much moisture or a small leak. Break the vacuum with a charge of dry nitrogen or other suitable gas and test the coil for leaks again. If there are no leaks, continue evacuating the coil until the required vacuum is obtained.

3. To start the unit cooler, switch on the power (Fig. 13.3).

After the system has operated for at least two hours at normal operating conditions without any indication of malfunction, carry out the following measures:

- Check the expansion valve for proper superheat setting. Bulbs must be in positive contact with the suction line and should be insulated. Valves set at high superheat will lower cooling capacity. Low superheat promotes liquid slugging and compressor failure;
- Check defrost controls for initiation, termination setting and duration of defrost period;
- Ensure that the condensate drains downwards from the unit cooler.

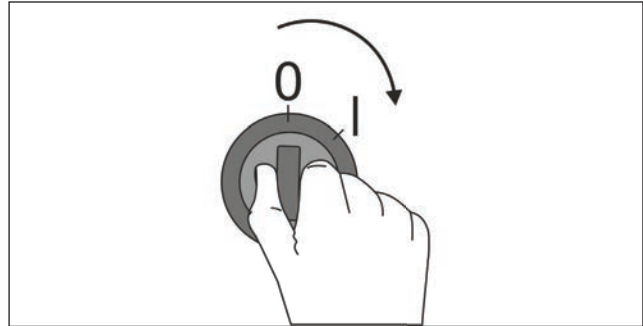


Fig. 13.3

14. Operation

14.1 General

Frost accumulates on external surfaces of coil during unit cooler operation due to the contact with moisture contained in the air. Frost thickness of 2..3 mm reduces the efficiency of the refrigeration system. Unit cooler must be defrosted regularly.

Defrosting of the unit coolers must result in all frost melting away and all surfaces of the heat exchanger to be completely clear.

Frequency and duration of defrost cycles depend on the humidity of the cooled air. The moisture enters cooling areas through doors and is released from cooled products.

The amount of condensed moisture also depends on the difference between the temperature of the air entering the heat exchanger and the evaporating temperature of the refrigerant. The unit coolers with greater temperature difference must be defrosted more frequently.

14.2 Safety rules



Only the HFC, HFO, HFC/HFO refrigerants are suitable for OSTROV unit coolers. These substances belong to Group A1 refrigerants in compliance with classification according to toxicity (A) and flammability (1) in line with EN 378-1:

- Refrigerants which, when gaseous, are non-flammable in air regardless of their concentration.
- Refrigerants with a time-weighted, average concentration that have no adverse effects on the majority of staff who are exposed to this concentration every day during a normal 8-hour working day and a 40-hour working week. This average concentration is greater than or equal to 400 ml/m³.

The personnel are not exposed to any direct danger. Group A1 refrigerants are however generally heavier than air and can flow into lower-lying areas. An increased concentration can arise in static air at ground level. At high concentrations, there is a danger of cardiac arrhythmias and suffocation due to low oxygen levels, especially at ground level.



When in contact with open flame, the refrigerants mentioned above decompose releasing poisonous substances (e.g. phosgene).



As a coolant an aqueous solution of ethylene glycol (water mix) is used. Other coolants accepted only with the manufacturer agreement.



Ethylene glycol may cause harm to the health. Avoid contact with skin, floor, clothing. With ingestion agitation, ethylene glycol causes chronic poisoning with the defeat of vital organs (blood vessels, kidneys, central nervous system). Ethylene glycol can penetrate through the skin. In case of contact with skin, remove clothing and wash skin with warm soap water. Production staff must be equipped with special protective clothing in accordance with industry regulations and protections.

Ethylene glycol is combustible and burnable at high temperature in gaseous state. The premises must be equipped with ventilation system and provided with fire extinguishing equipment in accordance with the timesheet approved in the prescribed manner.

Ethylene glycol spilled on the ground or equipment, must be washed with abundant water spray.

14.3 Air defrost

In refrigerated rooms operating at temperatures above 4°C it is possible to melt frost or ice with the help of ambient heat. For this purpose, it is necessary to stop the refrigerant (coolant) supply to the coil. While defrosting the unit cooler in such a way, the fans should continue to operate forcing air through the coil in order to reduce defrost time. After a set time delay the refrigerant (coolant) will be supplied to the coil again and the cooling will continue. However, the process may be rather slow even if the fans continue to

work.

14.4 Electric defrost

In refrigerated rooms operating at temperatures below 0°C it is possible to apply the electric defrost method. One design that achieves penetration of the heat into the internal sections of the coil is implemented by the insertion of electric heaters through the finned coil.

During defrosting, the heaters are switched on while the cooling mode is off.

The heaters are connected to a common terminal box.

In order to avoid overheating and to provide complete defrosting of the unit cooler, it is important to control defrosting by using a timer, a thermostat or a controller with a timer and a temperature sensor for defrost termination. The temperature sensor should be attached to a proper U-bend copper fitting of any unit cooler's tube at a distance of 1/2 ... 2/3 of the tube's length starting from the connection of this tube to the refrigerant distributor. It is not recommended to install the temperature sensor between the coil fins as it may cause ice formation around the sensor and, consequently, significant errors in measuring the coil temperature. Wrong measuring may result in incomplete defrosting of the unit cooler. Controllers with temperature sensors are usually set at a value between 8°C and 20°C.

Temperature sensors must not be placed in the direct vicinity of heaters. Take into consideration that a lot of factors (placement of the unit cooler relative to an access door or stored products, position of the bulb of the expansion valve, etc.) may cause identical unit coolers to perform differently. The final position of the temperature sensor is experimentally determined after start-up of the refrigeration system.

The defrosting is finished when the coil temperature reaches the set value. The defrosting ends and the cooling mode starts again. However, the fans go into operation only after an appropriate drain down time during which all the condensate drips from the fins into the drip tray and then into the drain line. Avoid long defrost cycles as it may cause formation of vapour around the unit cooler. Settings for start-up and duration of defrosting are entered in accordance with specific requirements of the site.

When the cooling is resumed after completion of defrosting, remaining frost and water may form sites of solid ice. Such ice will increase with every following defrost cycle, and finally accumulate up into the drip tray. Therefore the tray must also be heated (except in cold stores above zero) in order to prevent icing.

In the event of a failure during defrosting, check the connections of the heaters and ensure that they are all working properly; replace them if required. If the unit cooler shows very little or no defrosting, disconnect the heaters and check them for correct operation.

If the unit cooler is ordered with the option "Electric defrost of drip tray" (without defrosting of the coil), the heaters are installed into the drip tray only.

15. Maintenance

15.1 General

During operation, the coil of the unit cooler becomes contaminated with the substances contained in the room air. Deposits of these substances sufficiently decrease the unit cooler's capacity. Dirt, ice or damages to the fan blades cause imbalance of the fans. This may result in damages to both the unit cooler and the system components connected to it.

The planned and guaranteed heat transfer rate of the unit cooler can only be provided if the unit cooler is clean. Therefore performing regular maintenance is necessary to ensure that the unit cooler continues to operate properly. Maintenance must only be carried out by skilled and qualified personnel.

During maintenance checks, special attention should be given to looking for corrosion, dirt, ice, frost, leaks, noise, and vibrations. Maintenance intervals depend on the installation site and operating conditions of the unit cooler.

15.2 Safety rules



All work on the unit coolers must only be carried out by skilled and qualified personnel having the required training and specialist knowledge for their work according to EN 378-1.



Non-observance of the safety rules may lead to the failure of the unit cooler or the entire system. In some emergency situations, there is a danger of injuries due to thrown-out parts.



Safety regulations during maintenance must be strictly adhered to.

Electrical connections and fan motors must not be wetted during cleaning.

Before commencing maintenance work, the power supply must be disconnected and the refrigerant (coolant) must be siphoned off.



Protruding parts and corners of the unit coolers as well as sharp edges of the fins can cause injuries to fingers and hands.



The fans are only intended for the transfer of air or air-like mixtures. They must not be used for any other purposes.



There is a danger of cutting off fingers on the rotating fan blades, injury hazard for the hands and pulling in danger for loose elements such as hair, necklaces or clothing parts. Fan operation must be carried out only with guard grilles. Wearing jewellery is prohibited.

Removal of the guard grilles and working on the fans are permissible only when the power supply is switched off.



During normal operation and during fault conditions some components will reach extremely high and/or low temperatures. Accidental contacts with the headers or piping parts can cause frostbites and/or burns.



After having finished the work, do not leave any components near the fans as these components may cause damage to the fans and/or the unit cooler after reactivation.



The unit cooler can start automatically. Prior to work, make sure that there is no voltage in the circuit and attach the warning sign "DO NOT SWITCH ON!"



Smoking is absolutely prohibited during work.



Wear personal protective clothing suitable for the refrigerant (coolant) used.



Wear safety gloves and glasses.



Use respiratory protection suitable for the refrigerant (coolant) used.



15.3 Maintenance checklist

Maintenance plan

d – daily, w – weekly, m – monthly, y – once a year					
Work	Interval	d	w	m	y
Checking unit cooler for dirt deposits, frost, ice and mechanical damages: <ul style="list-style-type: none">• If dirt deposits are found, clean surfaces of unit cooler;• If frost or ice are found, defrost unit cooler, then clean its surfaces;• If mechanical damages are found, eliminate them.		+			
Checking pipelines for leaks.					+
Checking fans for proper running.				+	
Checking fan bearings.				+	
Checking fan blades for mechanical damages and corrosion.					+
Planned removal of dust and dirt.				+	
Checking and cleaning drain line.				+	
Checking fastenings of unit cooler and fans. If fastenings are loose, tighten them.					+
Control of electrical connections.					+
Checking grounding resistance.					+
Measuring operating current of fans and heaters, checking supply voltage.					+
Checking defrost parameters.				+	

16. Cleaning the unit cooler

16.1 Safety rules



All work on the unit coolers must only be carried out by skilled and qualified personnel having the required training and specialist knowledge for their work according to EN 378-1.



Non-observance of the safety rules may lead to the failure of the unit cooler or the entire system. In some emergency situations, there is a danger of injuries due to thrown-out parts.

Safety regulations during maintenance must be strictly adhered to.

Electrical connections and fan motors must not be wetted during cleaning.



In case of vapour-bath or high pressure cleaning, electrical parts should not come under direct air blast. Cover them if necessary.



The distance from the nozzle to the unit cooler must be not less than 200 mm.

Before commencing maintenance work, the power supply must be disconnected and the refrigerant (coolant) must be siphoned off.

Protruding parts and corners of the unit coolers as well as sharp edges of the fins can cause injuries to fingers and hands.

Direct and indirect contact with voltage-carrying parts of motors and electrical lines can cause serious injuries or even death.



During normal operation and during fault conditions some components will reach extremely high and/or low temperatures. Accidental contacts with the headers or piping parts can cause frostbites and/or burns.



After having finished the work, do not leave any components near the fans as these components may cause damage to the fans and/or the unit cooler after reactivation.



The unit cooler can start automatically. Prior to work, make sure that there is no voltage in the circuit and attach the warning sign "DO NOT SWITCH ON!"



Smoking is absolutely prohibited during work.



Wear personal protective clothing suitable for the refrigerant (coolant) used.



Wear safety gloves and glasses.



Use respiratory protection suitable for the refrigerant (coolant) used.

16.2 Operating sequence

The unit cooler should be cleaned of dust and dirt with warm water (approximately +25°C) or compatible cleaning agents which must be neither aggressive nor corrosive. The surface of the unit cooler should be cleaned with soft brushes, pressurized air or hot water (against the direction of air movement), a powerful industrial vacuum cleaner or using similar methods. If possible, always brush in the longitudinal direction of the fins. Never brush sideways across the fins in order to avoid their deformation and capacity losses of the unit cooler (Fig. 15.1). Mechanical cleaning with hard tools (for example, screwdrivers or wire brushes) is prohibited because it will damage the equipment.

If cleaning agents were used, thoroughly rinse the casing of the unit cooler with water and allow it to dry completely.

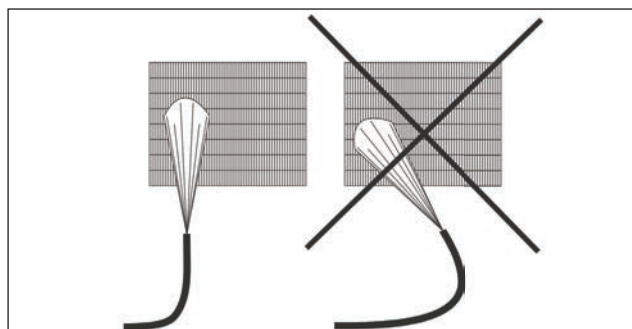


Fig. 15.1

17. Troubleshooting



Refrigerant (coolant) vapour must be prevented from penetrating neighbouring rooms, yards, passages, staircases or drainage systems in the close vicinity of the installation room and must be discharged without risk.

Avoid contact with skin, floor, and clothing! Remove contaminated, soaked clothing without delay!

In case of liquid refrigerant (coolant) getting in contact with skin or eyes, see a doctor immediately!

The table below contains problems, which may occur during operation of the unit cooler, possible sources of these problems and possible corrective steps to eliminate them.

In the event of any failure, it is mandatory to disconnect voltage.

Troubleshooting

Problems	Possible sources	Possible corrective steps
Fans do not run	Unit cooler in defrost cycle	Wait until defrost cycle is completed
	No connection to power supply	Connect power supply
	Damaged fuses	Check for short circuits or overload, then change damaged fuses
	Damaged fan motor	Change motor
	Defective timer or defrost thermostat	Change defective component
	Line voltage is lower than limit value	Check value of voltage with voltmeter, contact your electricity supplier
	Blocked fan blades	Remove source of blockade
Unit cooler is unusually loud or vibrates	Iced fan blades	Defrost fans
	Dirty fan blades	Clean fan blades carefully
	Damaged bearing inside fan	Change fan
	Loose fan fastening	Tighten fastening screws
	Damaged fan blades	Change fan
Too high room temperature (this section contains problems concerned with the unit cooler only)	Coil block is dirty, iced, frosted	Clean, defrost coil block
	Unit cooler is located too close to doors	Change location of unit cooler
	Heavy infiltration of warm air	Open doors not so frequently, check insulation
	Parameters of installed unit cooler do not correspond with dimensioning	Check whether unit cooler is correctly selected
	Fans rotate in wrong direction	Check whether electrical connections of fan motors are carried out correctly
Damaged unit cooler	Leaks	Change unit cooler; small leaks can be repaired
	Deformed fins	Straighten fins with suitable fin comb
Iced evaporator	Defrost period is too short	Adjust timer or defrost thermostat, check temperature sensor
	Too much time between defrost cycles	Increase frequency of defrost cycles
	Some condensate remains in drip tray	Increase drain period and fan delay time
	Heaters are not connected to power supply	Check connection of heaters to terminal box
	Defective heaters	Change defective heaters
Iced drip tray	Plugged drain line	Clean drain line
	Defective heater	Change defective heater
Uneven coil frosting	Defrost termination temperature is set too low	Adjust defrost termination temperature higher
	Unit cooler is located too close to doors	Change location of unit cooler
	Defective heaters	Change defective heaters

18. Decommissioning

18.1 Safety rules



All work on the unit coolers must only be carried out by skilled and qualified personnel having the required training and specialist knowledge for their work according to EN 378-1.



Disposal of refrigerants (coolants) may only be carried out by licensed companies.

18.2 Operating sequence

The unit cooler is taken out of service by disconnecting it from the refrigeration system. The pipes must be disconnected from the system and plugged; the fans and the heaters must be disconnected from the power supply.

The unit cooler contains refrigerant (coolant) and oil that is harmful to the environment; these must be recovered and returned to an approved recycling or destruction facility. Refrigerant (coolant) and oil must not be discharged into the environment.

Refrigerants shall be disposed of according to the regulations in force in the country where this unit cooler is installed.

European Union
Ringhofferova 115/1, 15521
Praha 5, Czech Republic
tel.: +420 234 252 223
fax: +420 234 252 225
e-mail: eu@ostrovcomplete.com

Russia and CIS
6, 2nd Bakuninsky Alleyway, Mytishchi
Moscow Region, 141011, Russia
tel.: +7 495 582 44 44
fax: +7 495 582 44 45
e-mail: ru@ostrovcomplete.com

