OSTROV

refrigeration

CONDENSING UNITS
OA331

Operating Instructions

06.2018

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Introduction

These operating instructions contain important information on installation, use and maintenance of OSTROV OA331 condensing units (hereinafter referred to as the units).
Please read the instructions carefully before operating the equipment and keep them in the unit'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.
Ignoring the information given in these instructions can put the warranty rights at risk.
The instructions cannot cover every installation, use or service situation. If you need more detailed information, contact us directly.
In addition to these instructions, refer to the manufacturer documentation for the individual components of the unit.
Osrtov reserves the right to modify its products as it deems necessary without altering their main characteristics. Specifications are subject to change without notice.
All names referred to are registered trademarks of their respective owners.
Ostrov assumes no responsibility for any errors and misprints that these operating instructions may contain.

1 Terms and definitions

The following definitions are used in these operating instructions:
«Manufacturer» means the legal person who has designed and manufactured the unit.
«System installer» means a legal person who installs and commissions the unit.
«Owner» means a legal person who owns, uses and disposes of the unit.
«Operator» means a legal person who operates and maintains the unit.
«Condensing unit» means a combination of one or more compressors, condensers, liquid receivers (when required) and the regularly furnished accessories.

«Refrigerating system» means a combination of interconnected refrigerant-containing parts constituting one closed refrigerant circuit in which the refrigerant is circulated for the purpose of extracting and rejecting heat.

«**Refrigerant»** means a fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and a low pressure and rejects heat at a higher temperature and a higher pressure usually involving changes of the state of the fluid.
«Chilled water loop» means a closed loop inside which the heat transfer fluid circulates, to cool the condenser.
«Heat transfer fluid» means a liquid used in the heat transfer process.

2 General Information

OSTROV OA331 condensing units (hereinafter referred to as the units) are completely factory-assembled and built in compliance with current international and national standards in the specific field of refrigeration systems.
These units have a protective housing made of galvanized powder-coated steel and are intended for indoor installation. They are equipped with a hermetic piston compressor.

The unit is equipped with a high-efficiency plate water cooled condenser.

The units are used as part of refrigeration systems for technological processes and conditioning in industrial plants, equipping storage and freezing rooms, manufacturing food products and in trade organizations.

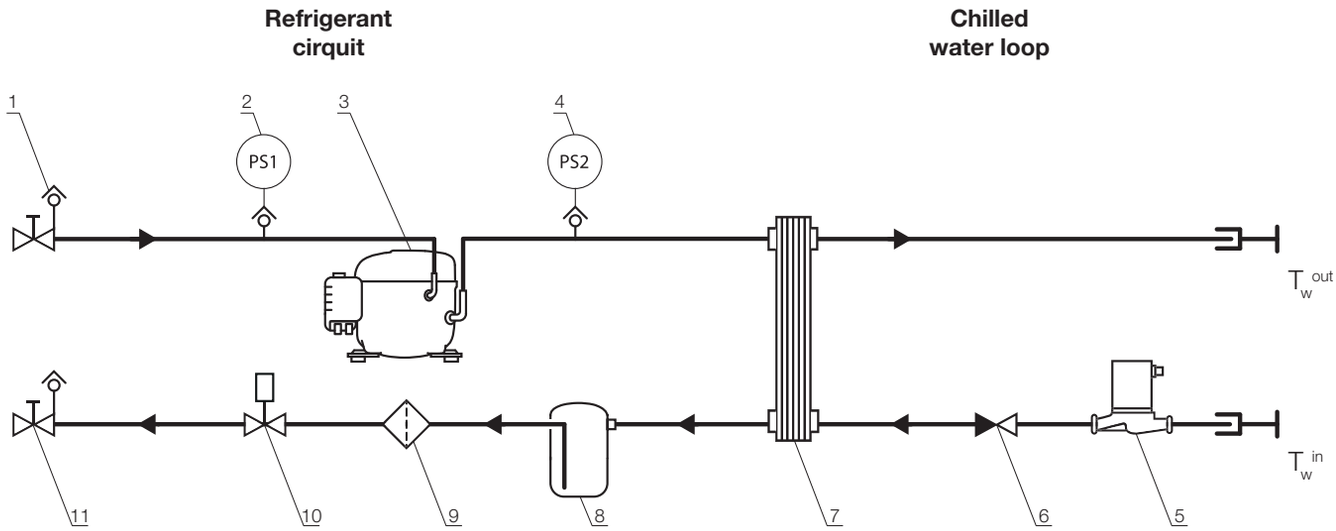
The refrigerant circuit of each unit is tested for strength and leaks. Before delivery, the circuit is charged with dry nitrogen up to excess pressure.

The units must be operated only within the limits specified on the identification plate as well as in these operating instructions. If they are used under other operating conditions, the manufacturer does not guarantee their efficiency.

The identification plate of the unit contains the following information:

- trademark, name, location and phone number of the manufacturer;
- model of condensing unit;
- code;
- serial number;
- power supply (voltage / frequency / maximum current);
- net weight;
- refrigerant;
- maximum allowable pressure;
- test pressure (strength);
- maximum and minimum ambient temperature;
- country of origin;
- date of production (month and year).

Piping and instrumentation diagram



1 – shut-off valve Rotalock with service valves on the unit's housing;
2 – low pressure relays with fixed settings (mini pressure switch);
3 – compressor;
4 – high pressure relays with fixed settings (mini pressure switch);
5 – pump with frequency inverter;
6 – check valve;
7 – water cooled condenser;
8 – refrigerant receiver;
9 – filter drier;
10 – solenoid valve;
11 – shut-off valve Rotalock with service valves on the unit's housing.

Fig. 2.1

The scope of delivery includes the following documents:
- operating instructions;
- piping and instrumentation diagram;
- wiring diagram;
- EU Declaration of Conformity – ostrov.com.

3 Areas of responsibility

3.1 Manufacturer's responsibilities

The responsibility of the manufacturer extends to the delivered condensing unit only.

The unit should be installed, operated and serviced by skilled and qualified 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;
- using accessories or spare parts not recommended by the manufacturer;
- using refrigerants, liquids and oils not recommended by the manufacturer;
- modifications not allowed by the manufacturer;
- non-observance of these operating instructions.

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

3.2 System installer's responsibilities

The system installer's responsibility includes designing, manufacturing and testing the refrigeration system according to EN 378-2, EN 378-3 and the regulations in force in the country where the unit is installed.
The system installer is responsible for:

- planning of operations required to install and commission the system;
- preparing the installation site;
- installation of the refrigeration system and the hydraulic chilled water loop in accordance with the design documentation;
- installation of automatic controls;
- installation of an emergency stop switch;
- testing pipelines for leaks;
- providing thermal insulation;
- evacuation of the system;
- charging the refrigerant circuit;
- charging the chilled water loop;
- commissioning of the system;
- start-up of the system;
- specifying intervals of checking and other maintenance operations;
- informing the owner or operator about the working principles and operating rules of the system;
- other work relating to the installation and commissioning of the refrigeration system.

The system must be provided with all equipment necessary for testing, maintaining and repairing the system according to EN 378-4 and the regulations in force in the country where the unit is installed.
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 system must be charged only with the refrigerant which corresponds to the model of the condensing unit and is indicated in the project documentation.
The system installer is responsible for informing the manufacturer immediately if any defects of the unit are detected.
It is recommended that the operating personnel of the owner or operator are present during evacuation, charging with refrigerant, heat transfer fluid, adjustment of the refrigeration system and, if possible, during assembly on site.

3.3 Owner or operator responsibilities

The responsibility of the owner or operator includes operation, maintenance, servicing and recovery of the refrigeration system according to EN 378-4 and the regulations in force in the country where the unit is installed.

The owner or operator is responsible for:

- checking that the proper people are sufficiently trained and qualified for operating, monitoring and servicing the refrigeration system as well as being familiar with these operating instructions;
- informing personnel about the design of the refrigeration system and its working principles;
- informing personnel about operating and maintenance rules of the system;
- instructing personnel about handling the working refrigerant, and heat transfer fluid, as well as about necessary safety measures;
- acceptance of the system;
- providing a warning system;
- planning emergency measures;
- making sure that maintenance is carried out regularly;
- other work according to the legislation in force in the country where the system is used.

The owner or operator must ensure that the refrigerant used in the system does not differ from the refrigerant which corresponds to the model of the condensing unit and is indicated in the project documentation.

4 General information on safety requirements

4.1 Safety of the refrigeration system

The cooling systems into which the unit is installed must comply with the requirements of the European machinery directive 2006/42/EC and the European pressure equipment directive 2014/68/EC.

4.2 Safety Signs

The following safety signs are used in these operating instructions:

prohibitory signs;

warning signs;

mandatory action signs.

4.3 Personnel requirements

All work on the units must be carried out only by skilled and qualified personnel who have the required training and specialist knowledge for their work according to EN 378 and the regulations in force in the country where the unit is installed.

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

Non-observance of the safety rules indicated in these operating instructions may lead to the destruction of the unit or the entire refrigeration system.

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

4.4 Hazards, hazardous situations and hazardous events

Mechanical hazards

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

After having finished the work, do not leave any foreign objects inside the unit as they may cause damage to the fans and/or the unit after reactivation.

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.

The unit can be started automatically. Beware of unexpected activation of the fans.

Be careful when working with the refrigeration circuit, since excessive pressure can damage the skin and eyes.

Do not exceed the maximum allowable pressure in the refrigerant receiver. this can lead to its rupture. Severe injuries are possible. When working with a pressure vessel, wear safety glasses.

On pressurized equipment, it is prohibited to carry out welding and soldering operations, or to tighten threaded connections.

Electrical hazards

Prior to commencing work on the unit, ensure that the power supply is disconnected.
Attach the label «DO NOT SWITCH ON!»

Non-observance of the safety rules indicated in these operating instructions may lead to the destruction of the unit or the entire refrigeration system as well as cause severe injuries or even death.

Make sure that the power supply is stable and corresponds with the characteristics of the delivered equipment.

Switching on/off the unit is allowed only if necessary safety measures are taken to avoid the risk of electric shock.

Direct and indirect contact with voltage-carrying parts of motors and electrical lines can cause serious injuries or even death. Personnel must be trained to provide first aid in case of electric shock.

Even after the unit is turned off, voltage remains at inputs of the control cable and the power supply cable as well as on the terminal blocks to which the cables are connected.

The unit must be connected to the grounding conductor.

Fire or explosion hazards

Smoking is strictly prohibited during work.

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

Spreading refrigerant and oil residues can lead to ignition or explosion.

Ensure that suitable fire extinguishing equipment is available and ready for use in sufficient numbers. Use extinguishing substances which are suitable for use on live equipment.

Thermal hazards

During normal operation and during fault conditions some components of the unit will reach extremely high and/or low temperatures. Accidental contacts with the headers or piping parts can cause burns and/or frostbite.
The personnel must be trained to provide first aid in case of burns/frostbite.

Danger of thermal burns! Avoid contact of refrigerant with skin and clothing. Remove contaminated and refrigerant soaked clothing immediately. If liquid refrigerant enters the eyes or skin, consult a doctor immediately.

Hazards from operating materials

The units are designed for compression HFC, HFC/HFO refrigerants. 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/m^3.

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.

Always prevent refrigerant and oil from leaking.

When in contact with open flame or hot surfaces (surface temperature higher than 250 °C), the refrigerants mentioned above decompose releasing poisonous substances.

In case of any deviations from normal operating conditions while adding refrigerant (unusual noises, high condensing pressure etc.), stop adding immediately and eliminate the source of the problem.

Be careful during work with oil. In case of contact with the skin, thoroughly wash off the oil with soap and water. In case of contact with the eyes, carefully rinse the eyes with plenty of water.
In case of swallowing, do not induce vomiting nor offer any beverages. If you feel sick after having come in contact with oil, see a doctor immediately.

As a heat transfer fluid an aqueous solution of glycol (water mix) is used. Other heat transfer fluids are accepted only with the manufacturer's agreement. Glycol may cause harm to the health. Avoid contact with skin, floor, clothing. With ingestion agitation, glycol causes chronic poisoning with the failure of vital organs (blood vessels, kidneys, central nervous system). Glycol can penetrate through the skin. In case of contact with skin, remove clothing and wash skin with warm soapy water. Production staff must be equipped with special protective clothing in accordance with industry regulations and protections. Glycol is combustible at high temperature in a gaseous state. The premises must be equipped with a ventilation system and provided with fire extinguishing equipment. Glycol spilled on the ground or equipment, must be washed with abundant water spray.

Liquid spilled on the floor may lead to slipping.

4.5 Personal protective equipment

In accordance with EN 378-3, personal protective equipment is required to protect personnel. Individual protective equipment must be ready for use and stored in a place accessible to the personnel. Responsibility for the definition and selection of personal protective equipment rests with the Assembly Organization, the Owner and the Operating Organization.

Summary of the personal protective equipment to be used throughout the life of the unit is shown in the Table 4.5

Table 4.5

Stage equipment / Personal protective						
Transportation, par. 7	+	+		+	+	
Unpacking, par. 9.1	+	+	+	+	+	
Installation, par. 9.3	+	+	+	+	+	
Connection of pipelines of refrigerant circuit, par. 9.4		+	+	+	+	
Commissioning, par. 10		+	+	+	+	+
Operation, par. 11		+	+	+	+	+
Maintenance, par. 13		+	+	+	+	+
Decommissioning, par. 14		+	+	+		+
Decommissioning and disposal par.15		+	+	+	+	+

5 Packaging

The units are covered with polyethylene film against atmospheric effects. Upon the client's request, the units may be supplied mounted on a wooden pallet inside a wooden crate in order to avoid transport damage (Fig. 5.1).

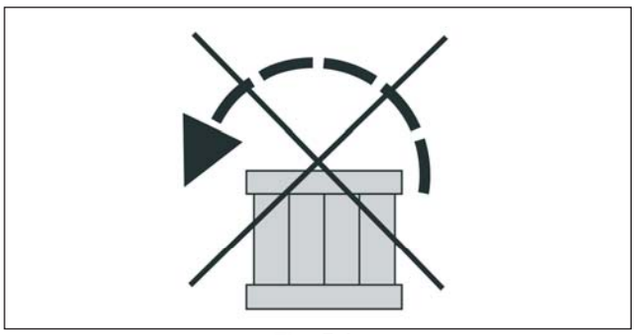


Fig. 5.1

Units can be supplied individually wrapped (Figure 5.2), and a total package, in a quantity that can fit on a fully loaded pallet (Fig. 5.3).

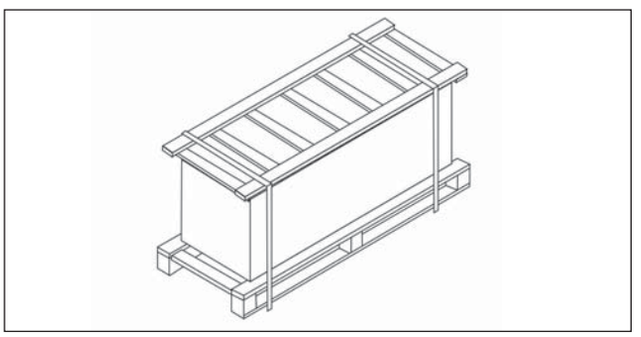


Fig. 5.2

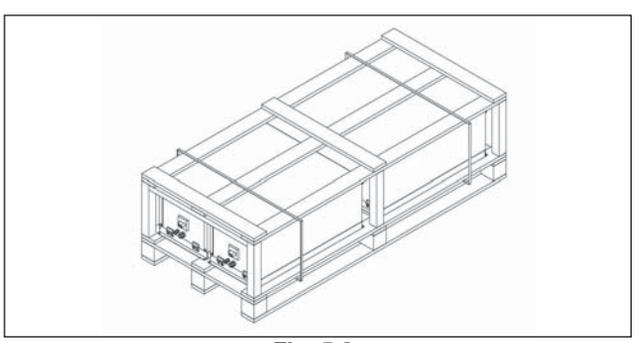


Fig. 5.3

6 Storage

The units have to be warehoused in the original packaging until installation. It is obligatory to store them indoors. The units must not be kept in extreme hot or cold places.

7 Transportation

Read and follow all transport signs on the packaging of the unit (Fig. 7.1).

Fig. 7.1

The unit has to be transported and unloaded with suitable equipment. Operators must be properly qualified for performing loading and unloading operations.
The carrying capacity of lifting and transport equipment must be rated for the unit's gross weight and geometric characteristics. The unit must be lifted from underneath with the load spread (Fig. 7.2).

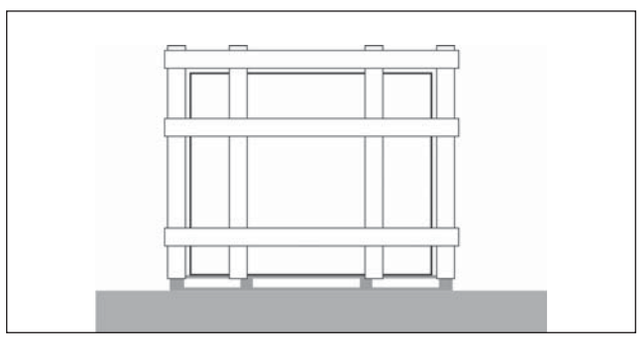


Fig. 7.2

If you have any doubts about the proper transportation method, please contact Ostrov.

In case of lifting the unit by crane, use only slings corresponding to the type and weight of the transported load. Take into consideration the number of sling legs and their inclination angle. The angle between the legs must not exceed 90° (Fig. 7.3).

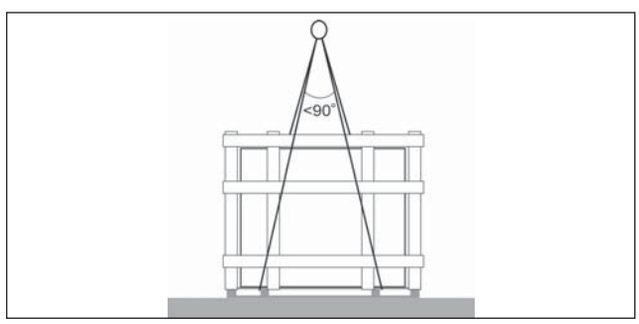


Fig. 7.3

Check that the forks of the forklift protrude for a sufficient length beyond the entire width of the crate (Fig.7.4).

Ensure that the unit is balanced when lifting as the weight may not be centred.
During transportation, never stand under the load or close to it.

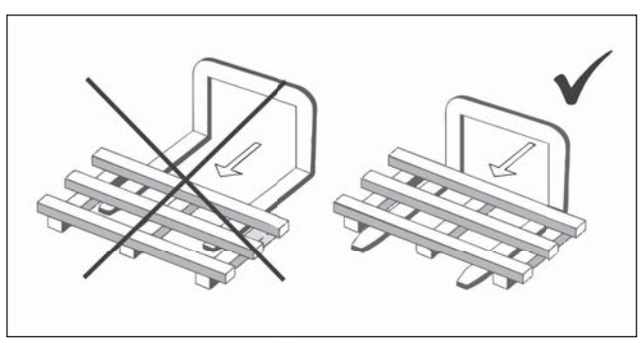


Fig. 7.4

8 Placement

The units are designed for indoor placement.
The units can be installed in machinery rooms, in technical rooms, in general-purpose rooms, as well as directly on the housing of consumer of cold.
It is recommended to place the units in accordance with the requirements of the standard EN 378-3, as well as national standards and regulatory documents of the state in whose territory the equipment is installed.
The unit should not be installed in corrosive environments.

It is forbidden to position the unit in a flammable or explosive atmosphere as well as in environments where the risk of electric shock is increased.

The permissible range of air temperatures at the unit location is between +5 and +40 °C.

The unit's foundation must be sufficiently strong, horizontal and stable enough to hold the weight of the unit. Weight information and dimensions are listed on the nameplate and in the relevant product documentation.

Install the units in such a way to leave enough space for maintenance and repairs.

Sufficient lighting should be provided for safe operation of the unit.

The distance from the unit to an obstacle must be at least equivalent to the height H (Fig. 8.1).

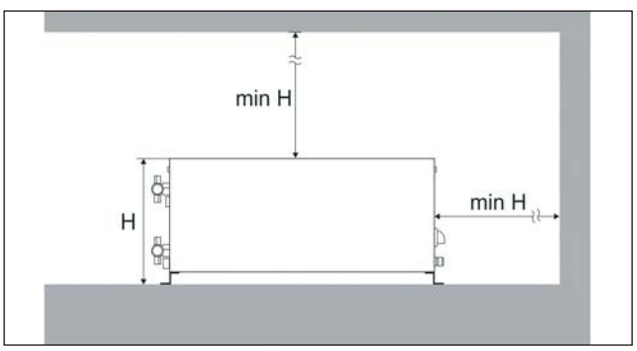


Fig. 8.1

9 Mounting

9.1 Unpacking

- Care should be taken while unpacking the unit in order not to cause any damage to the equipment.
- No person should walk or step over the equipment because it can generate an accident or a risky situation (Fig. 9.1).

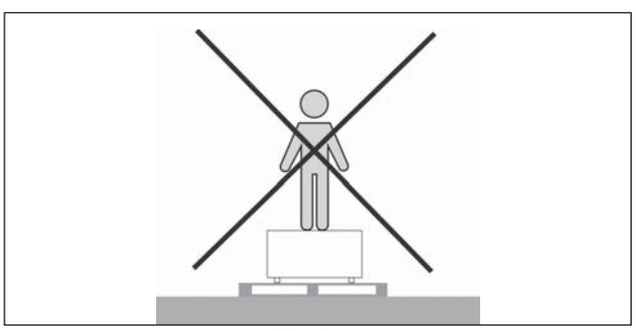


Fig. 9.1

1. Deliver the unit to the installation site in the original packaging. Ensure that there is no damage to the packaging (Fig. 9.2).

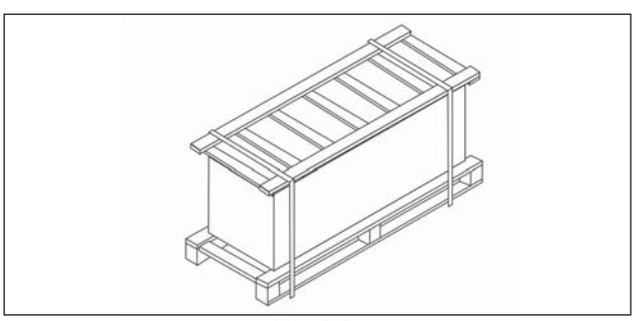


Fig. 9.2

2. Remove the fasteners of the wooden frame (Fig. 9.3).

3. Remove the wooden frame.
4. Remove the protective film.
5. Check the contents of the packaging for completeness.
6. Check the unit for damage.

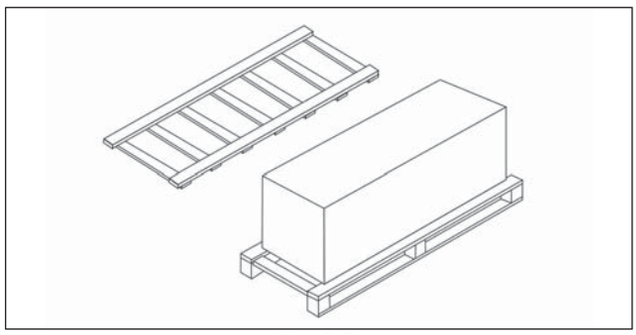


Fig. 9.3

9.2 Check the factory pressure

Check the excess pressure. The equipment is delivered with approximately 1-2 bar pressure. A pressurized unit indicates that the refrigerant circuit is tight (Fig. 9.4).

The information on any damage, missing parts or lack of excess pressure must be immediately reported to the delivering carrier and the supplier of the equipment in writing.

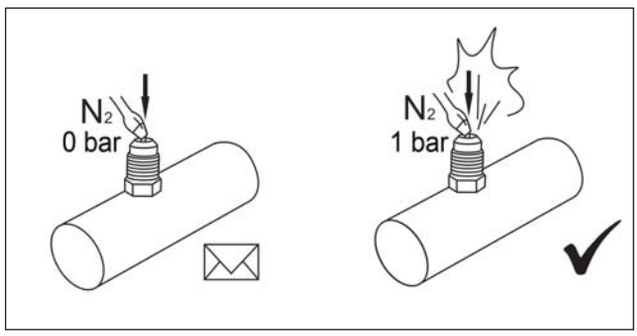


Fig. 9.4

9.3 Installation

1. Follow these rules for mounting the unit:
   - The unit must be mounted level. The difference from the horizontal must not be more than 3 mm per 1 m (Fig. 9.5).
   - Fasten the unit to the foundation only at the fastening points provided for that.
   - If it is necessary to reduce vibrations and noise, use anti-vibration mountings.

2. Mounting holes are out of the dimensions of the unit. Marking and making holes are possible after placement of the unit.

3. Place the unit on the foundation.

4. Fix the unit in its position. Use all the provided fastening points. Check whether the unit is installed horizontally by means of a level. 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. The nuts must not be overtightened or stripped.

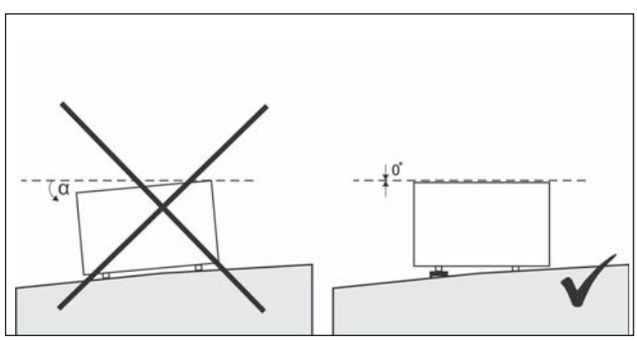


Fig. 9.5

9.4 Connection of pipelines of refrigerant circuit

In case of improper pipeline connections there is a danger of liquid leaks during operation of the system. This may lead to injuries and serious malfunctions.

When performing brazing operations, make sure that the flame nozzle is not aimed towards sensitive components in order to avoid overheating. Use a safety screen if necessary. It is permissible to cover sensitive components with a wet cloth.

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

1. It is recommended to connect pipelines to the unit in accordance with EN 378 and the regulations in force in the country where the unit is installed. Refer to the project documentation in order to connect piping.

2. Only use pipes that have sufficient strength and are clean and dry inside and outside.

3. Pipelines should be laid in accordance with the general rules and regulations for the installation of pipelines for refrigeration systems. Integration and pipeline installation of the unit in the system must be carried out in such a way that penetration of liquid into the compressor is impossible. The suction line should be sized to ensure good oil return. Avoid flash gas in the liquid line.

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

5. Relieve the pressure before starting work. All shut-off valves must be open. The overpressure relief is carried out through the service valves.

After having released the excess pressure, connect the unit to the system as soon as possible to prevent moisture and contaminants from entering the system.

6. Connect the liquid line and the suction line.

Service valves located on the outside of the housing allow the pipes to be fixed in any direction. For convenience of carrying out soldering work and excluding damage to the protective layer of the paint unit, the valves can be removed. When reinstalling it is recommended to replace the valve gaskets.

7. Secure the pipelines on supporting structures. The fastening must be carried out without disrupting the integrity of the pipes.

8. If, after connecting the pipelines to the unit, the refrigeration system is not mounted and the installation is to be suspended for a long period of time, it is necessary to solder the plugs, to evacuate and fill the refrigerant circuit with dry nitrogen or other inert gas to an overpressure of 1-2 bars, verify the tightness of the installed contour and close the valves on the body of the unit.

9.5 Connection of pipelines of chilled water loop

1. It is recommended to connect pipelines to the unit in accordance with the regulations in force in the country where the unit is installed. Refer to the project documentation in order to connect piping.

2. Only use pipes that have sufficient strength and are clean and dry inside and outside.

3. Pipelines should be laid in accordance with the general rules and regulations for the installation of pipelines.

4. The choice of pipe diameters is determined when designing a chilled water loop. The diameters of the pipelines may not coincide with the connecting diameters of nozzles for threaded connection of the units to chilled water loop.

5. Connect the chilled water loop.

The unit has two nozzles for threaded connection. The connecting dimensions are given in the technical catalog and the catalog sheet on the OA331 unit at ostrov.com.

6. Secure the pipelines on supporting structures. The fastening must be carried out without disrupting the integrity of the pipes.

9.6 Electrical connection

The units are designed for operation from an electrical network, the parameters of which are indicated in the technical documentation and on the nameplate. The deviation from the rated voltage should not exceed ± 10%.

1. It is recommended to make electrical connections in accordance with EN 60204-1 and the regulations in force in the country where the unit is installed. These operating instructions and the enclosed wiring diagram must be strictly followed.

2. When carrying out electrical connections, pay attention the following:

- use cables with copper conductors only;
- the cross-section of the cables must be in accordance with the maximum current consumption of the unit;
- minimize cable length observing the required bending radii;
- lay the cables in a position so that it is protected from impacts and heat sources;
- do not fit power supply cables and control cables in the same raceways or ducts;
- connect the cables to the terminal box or control cabinet using bottom entry;
- the cables must not be damaged or twisted;
- equip the power supply system with appropriate overcurrent protection devices.

3. Carefully read the wiring diagram.

4. Make sure that the power supply is disconnected and there is no voltage in the circuit.

5. Attach the "DO NOT SWITCH ON!" label.

6. Carry out all electrical connections according to the wiring diagram.

7. A power supply cable, a control cable and a grounding conductor have to be used for connection of the unit.

10 Commissioning

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

Before commissioning of the unit, follow the following instructions:

- check that the unit has been installed correctly and in the correct location;
- check that the unit is properly fixed to the foundation;
- check that all valves of the system are fully opened;
- check all refrigerant and chilled water loop connections;
- check all electrical connections;
- check that the unit is grounded;
- check that the supply voltage is within the upper and lower limits of the unit;
- check that the access to the power supply switch of the machine room is free and clear of obstacles;
- check that the cover of the terminal box (door of the control cabinet) is closed.

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

10.1 Connection to the circuit of the refrigeration system

The manifold is connected to the service valves (indicated by the «P» index on the P&I Diagram). All subsequent operations with the refrigeration system circuit are performed using the connection data.

10.2 Tightness test pressure

1. Test the refrigerant circuit for leaks according to EN 378-2 and the regulations in force in the country where the unit is installed. The leak test should be carried out by pressurizing the system with nitrogen or another suitable inert gas, with all valves in the system open.The whole circuit of the refrigeration system must be tested. Never pressurize the refrigerant circuit with oxygen or dry air as it can cause fire or explosion. The required testing pressure depends on the refrigerant used as well as on the system design. It is strictly prohibited to perform welding or brazing work as well as tighten screw connections on equipment under pressure.
If leaks are found, relieve the pressure, make repairs as necessary and repeat the leak detection
2. Release the excess pressure.

10.3 Vacuum procedure

Evacuate the system to remove any moisture or air. A vacuum pump must be used for the evacuation.
Never use the compressor to evacuate the system or start the compressor when it is under vacuum.

Evacuate the system to 1.5 ÷ 2 mbar absolute pressure. Failure to reach this value during a sufficient period indicates a lot of moisture or a small leak. In this case, to purge the moisture, pressurize the system with dry nitrogen or another neutral gas. If there are no leaks, continue evacuating the system until the required vacuum is obtained.

10.4 Charge by a refrigerant

The units are designed for compression HFC and HFC/HFO refrigerants. Usage of refrigerant is permitted only after prior written consent of the manufacturer.

Before starting work, make sure that the refrigerant charge is suitable for this unit. Adding foreign substances to the refrigerant or using a different refrigerant can cause an emergency.

It is necessary to fill only the amount of refrigerant that the refrigeration system is designed for. Excess refrigerant can lead to a significant increase in the condensation temperature and, in some cases, to a hydraulic shock, and its disadvantage is the compressor's overheating.

The refrigerant receiver must be filled with a refrigerant by no more than 90% at a temperature of 20 °C

Charge the system with refrigerant in liquid phase only. Refrigerant should be charged into the liquid line. Never add liquid refrigerant to the suction side as this may lead to penetration of liquid into the compressor. During charging, the compressor must be switched off.

There should be no direct heating of the refrigerant cylinder by open flames, radiant heaters, direct contact heaters etc. to increase the flow velocity of the refrigerant.

If the maximum permissible refrigerant charge of the system has been exceeded and the necessity arises to transfer part of the refrigerant charge to refrigerant balloon, take care that the maximum charge for each balloon is never exceeded.

10.5 Changing the chilled water loop

1. Selection of heat transfer fluid

In cases where the pipeline of chilled water loop is laid in places where the ambient temperature can drop below 0 °C, measures must be taken to prevent the heat transfer fluid from freezing.

The use of aqueous solutions of glycol is the most effective protection against freezing of the system.

The concentration of glycol solutions is selected at the lowest possible ambient temperature.

2. Before refueling, refer to Appendix 1 «Requirements for heat transfer fluids for chilled water loop».

3. Fill the chilled water loop and make sure it is sealed.

4. If necessary, remove air from the system.

10.6 Start up

When the unit is first started, especially during the cold season or after a long period of standing, make sure that the oil temperature in the compressor crankcase exceeds 10 °C and there is no dissolved refrigerant in the oil.

1. Turn on all the protection circuit breakers.

2. Check the external control system. Set the desired temperature in the cooled volume.

3. Set the power supply switch located on the terminal box to «I» position (Fig. 10.1).

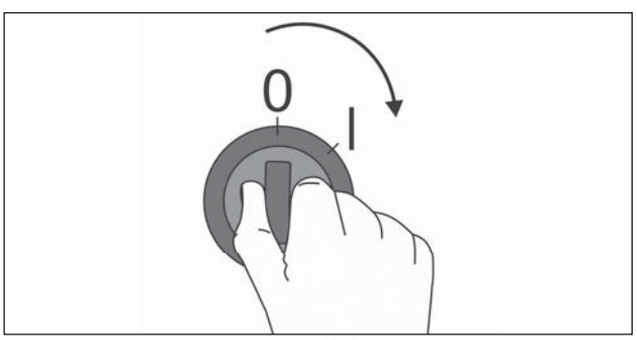


Fig. 10.1

After the start-up of the unit, the following must be checked:

- The value of the starting currents of the compressor. Starting currents are indicated on the assembly compressor nameplate and in the OA331 technical catalog on ostrov.com.
- Check that the suction pressure drops and the discharge pressure rises.
- Ensure that the heat transfer fluid circulates through the water-cooled condenser.

10.7 Check after the unit is operational

After the unit has reached normal operating conditions, perform the following checks:

- Ensure that there are no extraneous noises and abnormal vibrations.
- Check the refrigerant level. Check is performed according to the value of supercooling liquid refrigerant and superheated suction gas. Add refrigerant if necessary. Refrigerant should be refueled only in the liquid phase, in the liquid line. It is forbidden to refuel the refrigerant with the suction side to prevent liquid from entering the compressor suction cavity.
- Check the operating current of the compressor and pump.
- Check the suction pressure, the discharge pressure and the pressure in the liquid line.
- Check the suction gas superheat at the unit inlet. Operation of the unit at low values of superheated suction gas can lead to failure of the compressor.
- Check the number of starts of the compressor per hour. The number of starts should be no more than 6-8 times per hour.

11 Operation

The maximum allowable pressure on both the high and low pressure sides as well as the pressure in the chilled water loop must not be exceeded.

The unit is intended for automatic operation. Switching on/off the unit is carried out by the signal from the external control system.

The circuit of the refrigeration system must be designed, operated, maintained, decommissioned for a prolonged period and decommissioned before disposal, so that the maximum allowable pressure can not be exceeded in any part of the refrigeration system.

During operation, the unit must be regularly inspected. The inspection intervals should be determined by the owner or operator depending on the refrigerant used and the operating mode of the system.

The following operating data must be checked:

- evaporating temperature;
- suction gas superheat;
- discharge gas temperature;
- condensing temperature;
- temperature of the heat transfer fluid of the chilled water loop at the inlet and outlet;
- liquid subcooling;
- refrigerant charge. Check is performed according to the value of supercooling liquid refrigerant and superheated suction gas. If necessary, add or drain refrigerant;
- compressor switching frequency;
- vibration and noise;
- visual inspection of power cables and electrical connections.

Always compare these data with previous measurements. In case of greater deviations, the source of the problem must be determined and eliminated.

12 Shutdown

In order to perform a normal shutdown of the unit, carry out the following:

1. Stop the operation of the unit by the control system. The compressor and pump will stop automatically.

2. Turn off power (Fig. 12.1).

An emergency shutdown is carried out by turning off power (Fig. 12.1).

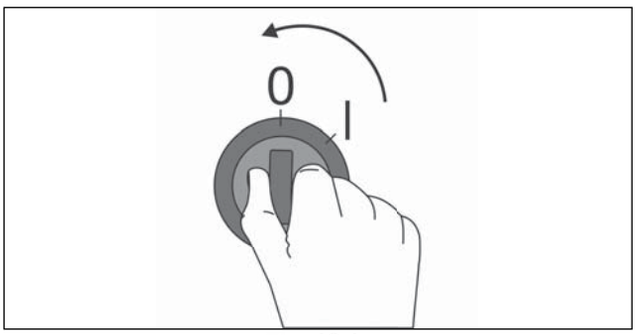


Fig. 12.1

13 Maintenance

It is strictly prohibited to perform welding or brazing work as well as tighten screw connections on equipment under pressure.

In order to maintain the required parameters and operating modes of the refrigeration system, maintenance of the unit must be regularly performed.
Maintenance work may be carried out by either skilled personnel in possession of the required qualifications or a licensed company.
During maintenance, perform the following checks:

- no leaks, mechanical damage, corrosion, dust, and dirt are present;
- the work of control and protection devices;
- the insulation of cables and wires is not damaged.

If the pipelines of the system have been opened, the refrigerant circuit should be evacuated to remove moisture.

Maintenance checklist

m - monthly, y – once a year		
Maintenance work	Interval	
	m	y
Visual inspection of unit for dirt deposits, rust and mechanical damage.	+	
Unit components and pipelines. Check and tightening of screw connections and fastenings to frame.	+	
Check pipelines for leaks.		+
Check state of thermal insulation.		+
Check fastenings of unit. If fastenings are loose, tighten them.		+
Monitoring of the functioning of the pump for chilled water loop. Check of the starting and operating current of the pump motor.		+
Performing chemical analysis of heat transfer fluids (Appendix 1).		+
Cleaning unit of dust and dirt.	+	
Control of electrical connections, tightening if necessary. Checking wires for kinks and wear. Checking wire insulation for damage and discoloration.	+	
Check supply voltage.	+	
Compressor. Measuring start-up and operating current.		+
Checking the monitoring and protection devices.		+
Check grounding resistance.		+

14 Decommissioning for a prolonged period

1. Close the shut-off valve on the liquid line on the body of the unit.

2. Wait until the low pressure switch stops the compressor.

3. Close the shut-off valve on the suction line on the unit housing.

4. Set the power supply switch to «0» position. Set all circuit breakers to «OFF» position.

5. Inspect and check all connections of the unit circuit. If leaks are found, repair them.

6. Drain heat transfer fluids from the chilled water loop.

7. Close all shut-off valves in chilled water loop. If there are no shut-off valves, disconnect the unit from the chilled water loop and install the plugs.

In order to restart the unit, proceed as follows:

1. Check the unit for corrosion, mechanical damage as well as damage to cables and thermal insulation.

2. Start the unit as described in chapter 10 («Commissioning»).

15 Decommissioning and disposal

The components of the unit may be under high pressure. Release the pressure before disconnecting the unit from the system.

1. Close the shut-off valve after the liquid receiver.
2. Wait until the low pressure switch stops the compressor.
3. Set the power supply switch to «0» position.
4. Disconnect the unit from the power supply.
5. Remove heat transfer fluid.
6. Pump-out the refrigerant.
7. Disconnect the unit's pipelines from the system.
8. Drain the oil.
9. Seal the pipelines of the unit.
10. Remove the unit from its mounting place.
11. Dispose of the unit, its components, its packaging as well as the refrigerant, oil and heat transfer fluid in accordance with the regulations in force in the country where the unit is installed.

16 Declaration of conformity

We hereby declare that the OSTROV OA331 condensing units comply with the following directives:

- pressure Equipment Directive 2014/68/EU;
- low Voltage Directive 2014/35/EU;
- EC Machinery Directive 2006/42/EC;
- EMC Directive 2014/30/EU.

The applicable standards are:

- EN 378-2+A2;
- EN 61439-1 Ed. 2.0;
- EN 61439-2 Ed. 2.0.

Certificates of conformity and Declaration of conformity are available on our website ostrov.com and on request.

Appendix 1. Requirements for heat transfer fluids for chilled water loop

As the heat transfer fluid of the chilled water loop, aqueous solutions of glycol are used. The percentage of glycol is determined by the project. Water should be of drinking quality. Indicators of aqueous solutions, the excess of which can lead to corrosion of copper and stainless steels, are listed in the table:

Parameter	Amount
Water hardness	4.5 - 8 (mol/dm^3)
Dry residue	< 100 (mg/l)
Cl^-	< 50 (mg/l)
SO_4^{2-}	< 100 (mg/l)
NO_3	< 100 (mg/l)
NH_3	< 0,5 (mg/l)
HCO_3	< 100 (mg/l)
HCO_3/ SO_4^2	>1

Compliance with these requirements for water quality does not guarantee complete absence of corrosion, but it is a tool for determining the most important factors of the chemical composition of water for the development of corrosion.

To provide the required fluid parameters it is necessary:

1. To exclude the appearance of stagnant zones. If there is no circulation and operation, it is necessary to drain the heat transfer fluid.

2. The elements must be properly and reliably grounded to the active ground loop (transient R ≤ 0.3 ohm, ground loop R ≤ 1.0 Ohm).

3. To exclude contamination of the solution with any organic products, silt, sand, and other solid substances.

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