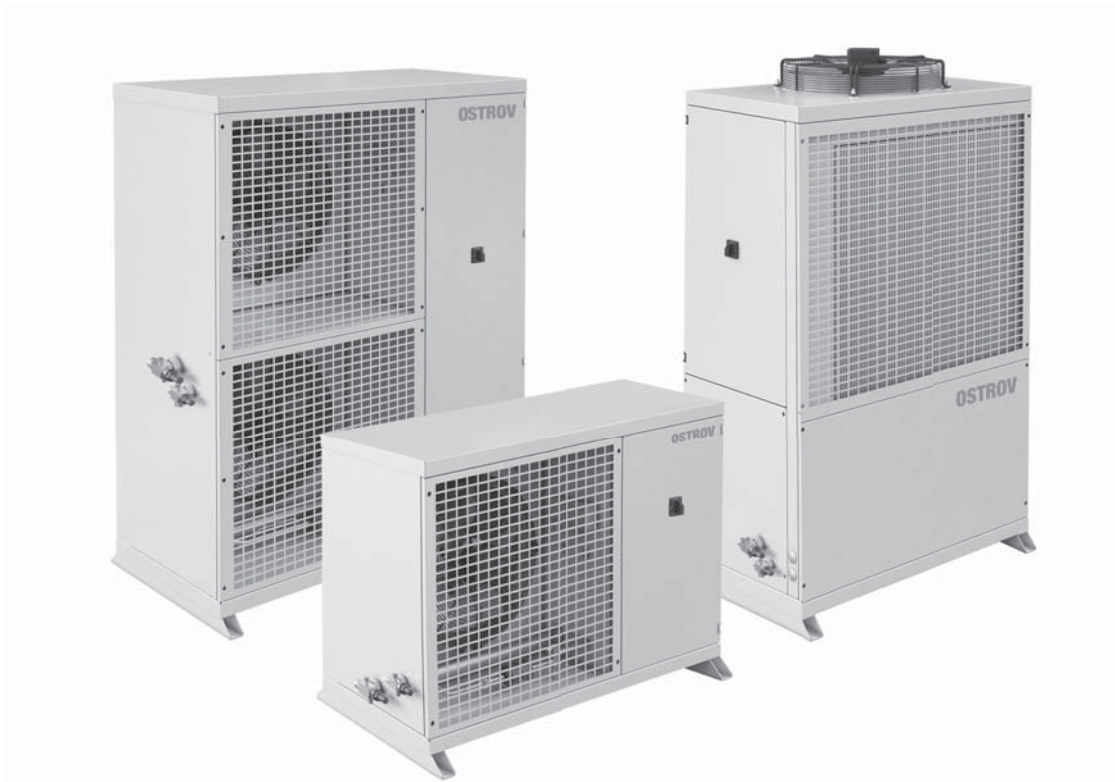


OSTROV

refrigeration

0A14, 0A15 Condensing Units



operating instructions

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Introduction

These operating instructions (hereinafter referred to as the Instructions) contain important information on installation, use and maintenance of OSTROV OA14, OA15 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.

Ostrov 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.

«**Condenser**» means a heat exchanger in which vaporised refrigerant is liquefied by removal of heat.

2 General Information

OSTROV OA14, OA15 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 outdoor or indoor installation. They are equipped with a scroll, hermetic piston or semi-hermetic piston compressor and an air cooled condenser manufactured with internally grooved copper tubes and aluminium fins. The condenser has one or two axial fans.

The units are designed and optimized in accordance with the requirements of Ecodesign Directive 2009/125/EC. Data on the energy efficiency of specific models of aggregates in accordance with EU Regulation 2015/1095 are listed in the catalog sheets at ostrov.com.

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

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

The units must be operated only within the limits specified on the nameplate 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;
- refrigerant charge;
- maximum allowable pressure;
- test pressure (strength);
- maximum and minimum ambient temperature;
- country of origin;
- date of production (month and year).

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 manufacturer is responsible for the quality of the unit and guarantees the following:

- the unit is designed, manufactured and tested according to EN 378-2;
- the refrigerant circuit is made of materials compatible with the refrigerants used, tight and withstands the maximum permissible working pressure.

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 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;
- 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;
- 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, 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 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 fluids used, 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 jewelry 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.



Electrical work on the unit after it is turned off, should be carried out no earlier than after 5 minutes.



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/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/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.



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.



Avoid skin and eye contact with refrigerant. Remove contaminated, soaked clothing without delay. In case of liquid refrigerant coming in contact with skin or eyes, see a doctor immediately.



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.



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.

Table 4.5

Stage equipment \ Personal protective						
Transportation, par. 7	+	+		+	+	
Unpacking, par. 9.1	+	+	+	+	+	
Installation, par. 9.3	+	+	+	+	+	
Connection of pipelines, par. 9.4		+	+	+	+	
Commissioning, par. 10		+	+	+	+	+
Operation, par. 11		+	+	+	+	+
Maintenance, par. 13		+	+	+	+	+
Cleaning, par. 14		+	+	+	+	
Decommissioning for a prolonged period, par. 15		+	+	+		+
Decommissioning and disposal par.16		+	+	+	+	+

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).

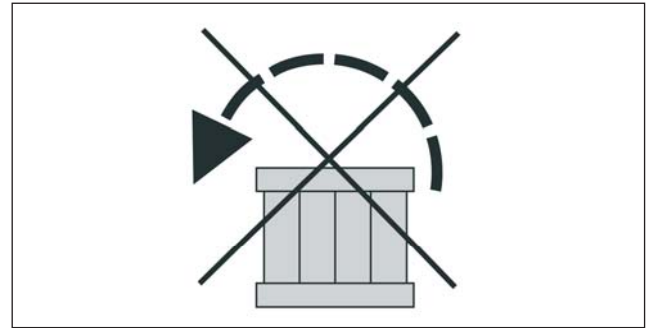


Fig. 5.1

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. Stacking the units is forbidden (Fig. 6.1).

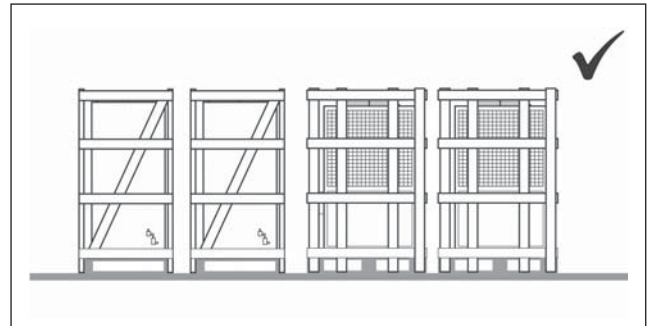


Fig. 6.1

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.

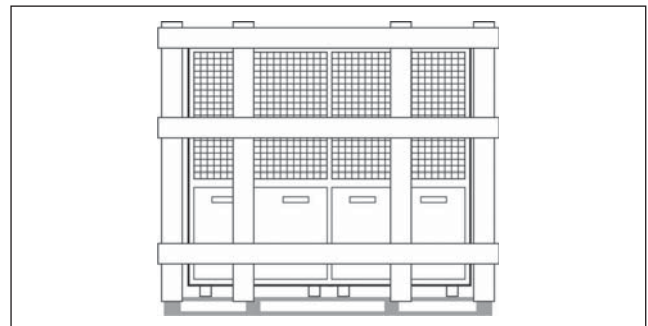


Fig. 7.2

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).

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

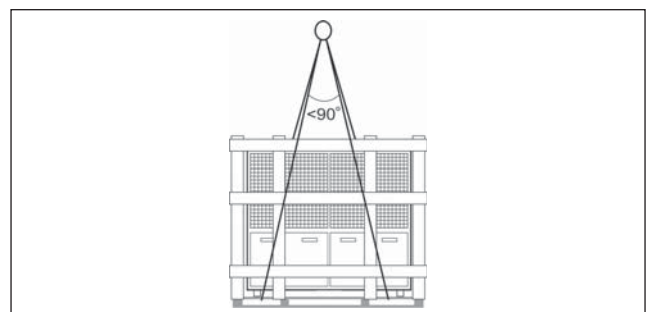


Fig. 7.3

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).

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

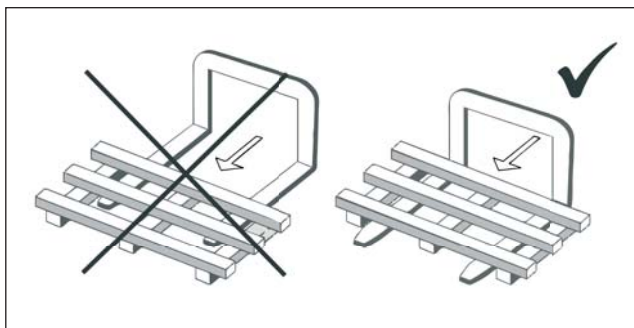


Fig. 7.4

Ensure that the unit is balanced when lifting as the weight may not be centred. (Fig. 7.5, 7.6).

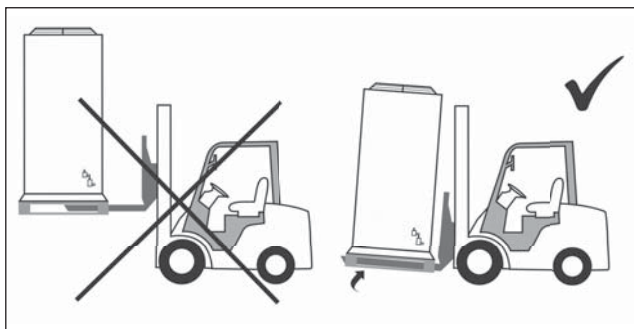


Fig. 7.5

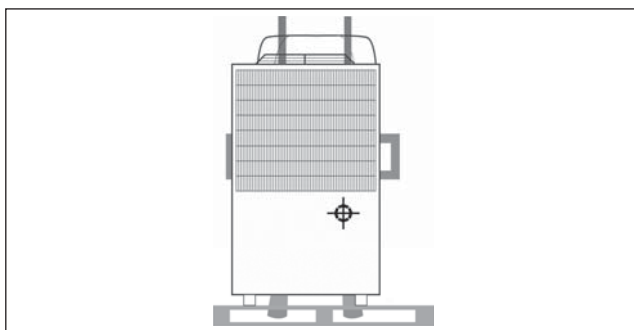


Fig. 7.6

During transportation, never stand under the load or close to it (Fig. 7.7).



Fig. 7.7

8 Placement

8.1 General Provisions

The units are designed for outdoor or indoor installation. It is recommended to place the units in accordance with EN 378-3 and the regulations in force in the country where the equipment is installed.

If the unit is placed indoors, ensure that the heat generated by the unit is removed.

The unit should be located in such a place to prevent any dust, dirt, leaves, snow or rubbish from penetrating into the condenser. Ensure that the air leaving the condenser will not face the prevailing wind. Otherwise the cooling capacity of the unit will be reduced. If necessary, use a baffle.

Avoid installing the unit in places that are exposed to direct sunlight for a long time.

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 -40 and +50 °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.

When selecting the installation place, take into consideration the noise level of the compressor and the condenser fans.

8.2 Placement of units OA14

The minimum distances to walls or other obstacles are given in Table 8.2 and Fig. 8.1.

Table 8.2

Unit model	A (mm)	B (mm)	C (mm)	D (mm)	H (mm)
14.1	210	1000	300	500	300
14.2	210	1000	300	500	300
14.3	230	1000	300	500	300
14.4	260	1000	300	500	300
14.5	300	1000	300	500	300
14.6	340	1500	300	500	300
14.7	340	1500	500	500	400
14.9	340	1500	500	500	400

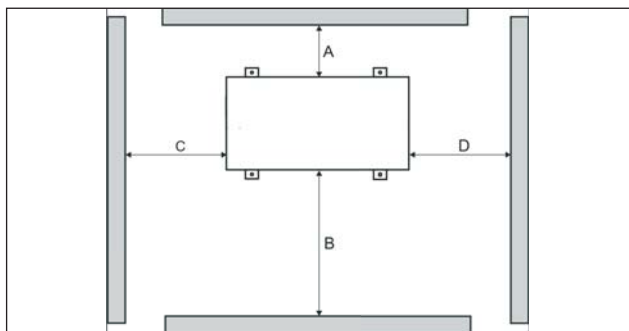


Fig. 8.1

The vertical distance from the unit to the obstacle must not be less than a height H (Fig. 8.2).

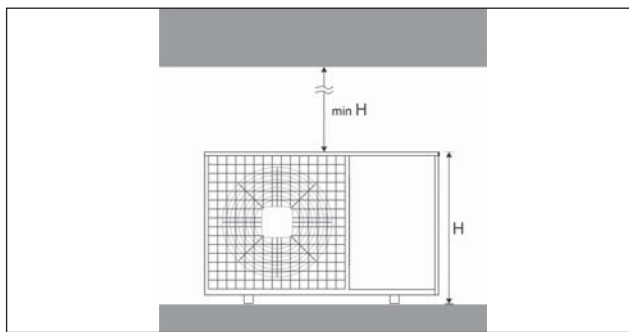


Fig. 8.2

8.2 Placement of units OA15

The distance between the capacitor and the obstacle (size D) must be at least 500 mm (Figure 8.3).

The distance between the side panel of the unit and the obstacle (dimension C) must be at least 500 mm.

The distance between the electrical panel door of the unit and the obstacle (size A) must be at least the width of the unit.

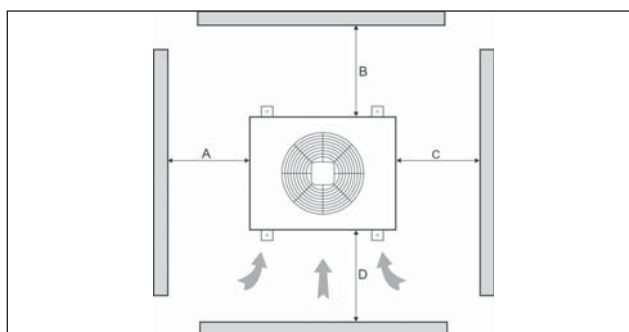


Fig. 8.3

The distance between the rear panel of the unit and the obstacle (size B) must be at least:

- for models with one fan – 100 mm;
- for models with two fans located on the frame (Fig.8.4) – 200 mm;
- for models with two fans without frame - 500 mm;

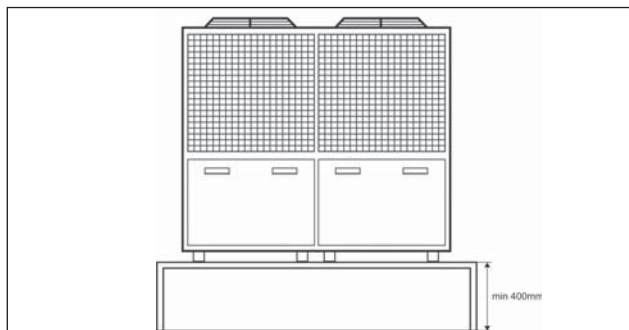


Fig. 8.4

The vertical distance from the unit to the obstacle must be at least the height H (Fig. 8.5).

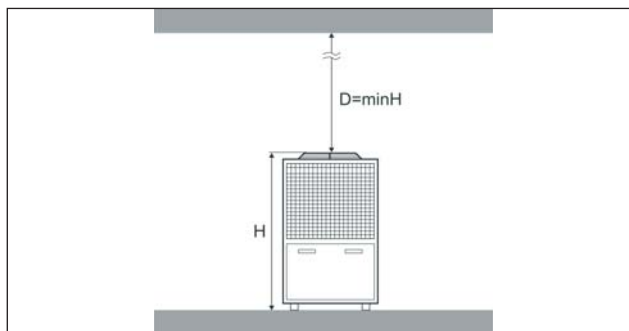


Fig. 8.5

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).

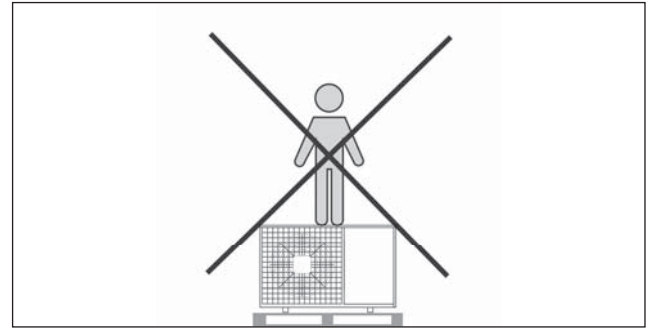


Fig. 9.1

1. The unit must be delivered to the installation site in its original packaging. Make sure that the package is not damaged (Fig. 9.2).

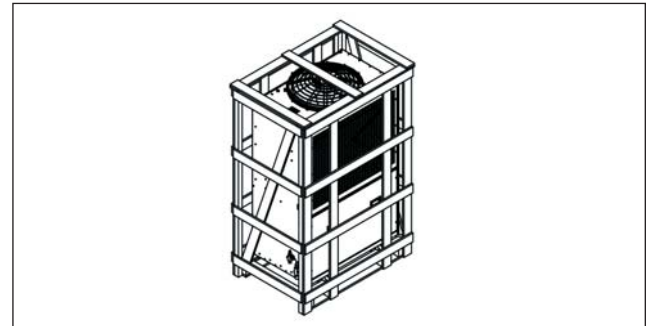


Fig. 9.2

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.

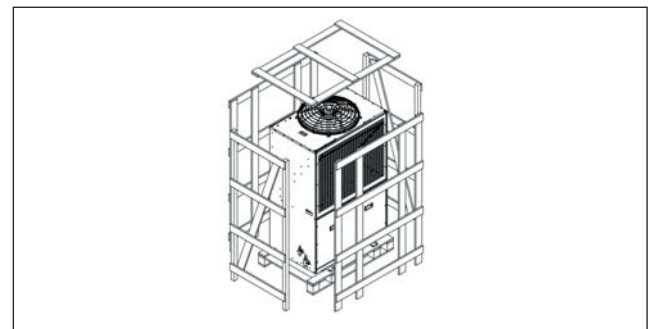


Fig. 9.3

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.

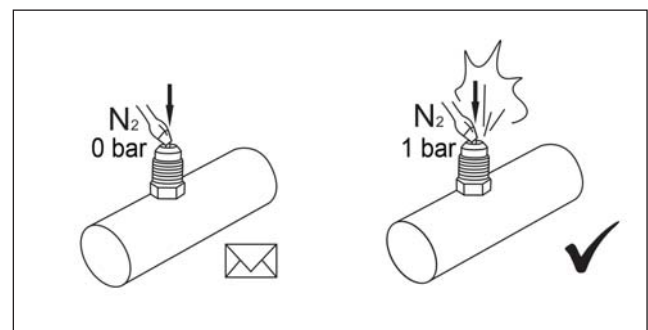


Fig. 9.4

9.3 Checking the oil level

Check the oil level in the compressor sight glass (if available). The oil level should be between 1/4 and 3/4 on the sight glass (Fig. 9.5). Add oil if necessary. The added oil should have the same characteristics as the oil in the compressor crankcase as well as be clean and free of water. If the oil level is below the minimum value, you must immediately reported to the delivering carrier and the supplier of the equipment in writing.

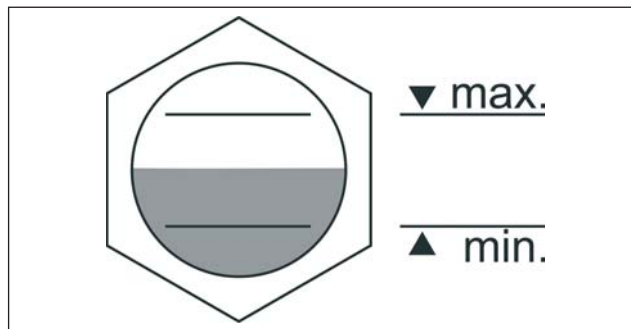


Fig. 9.5

9.4 Dismantle the transport mount of the compressor

In the units with the name: OA151-MS-E, OA151-LS-E, OA152-MS-E, OA152-LS-E, OA153-MS-E, the compressors are fixed in the delivery condition using transport mounts. To transfer the compressor from the transport position to the operating position, remove the compressor transport mount. The type of mounts depends on the model of the compressor.

Type 1 (Fig. 9.6):

Loosen the fixing nuts 2 and 3:

- remove transport mount 1 (red color);
- tighten the fixing nut 3.

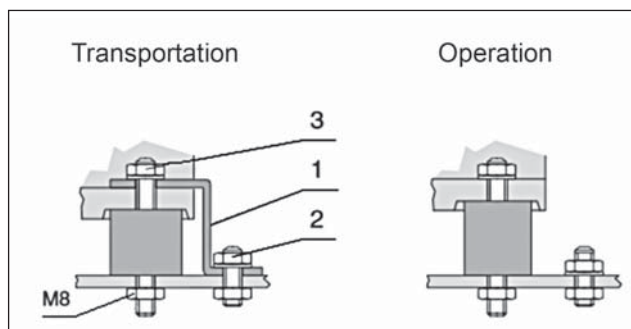


Fig. 9.6

Type 2 (Fig. 9.7):

- Loosen nuts 1 so that you can remove the washers 2.
- Remove the washers 2.

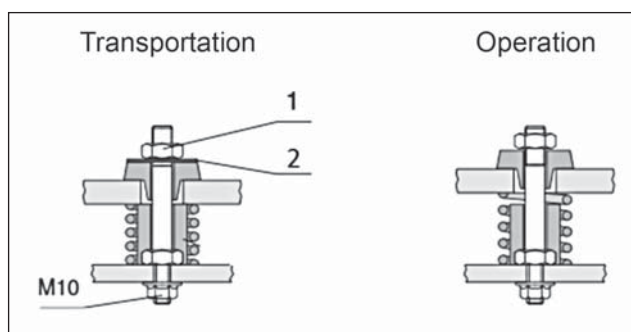


Fig. 9.7

9.5 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. 9.8).
 - 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 installation of the unit.

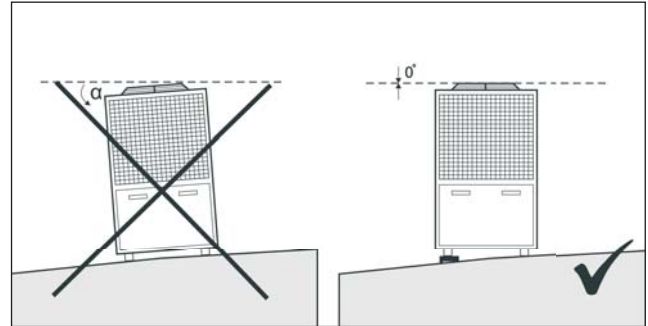


Fig. 9.8

3. Place the unit on the foundation (Fig. 9.9).
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. Tighten fastening bolts and 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. The nuts must not be overtightened or stripped.

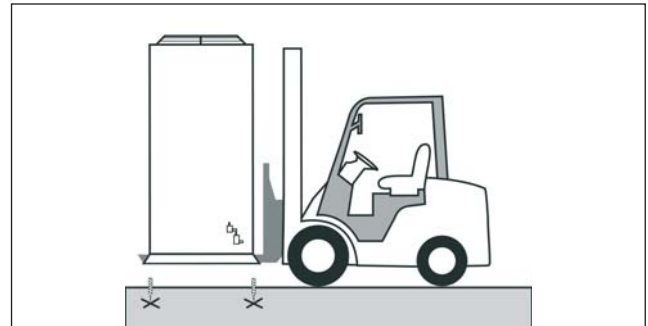


Fig. 9.9

9.6 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 overpressure relief, the unit must be immediately connected to the refrigeration system to prevent moisture from entering the refrigerant circuit.

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.

9.7 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 $\pm 10\%$.

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 water 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 (Fig. 10.1). 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. The compressor valves must be closed (if available). 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 Switch on the crankcase heater

The process of evacuating and charging of the refrigeration system must be performed while the compressor crankcase heater is switched on.

1. Check the power supply network parameters.
2. If the option «Winter package» is available, check the setting of the receiver heater control pressure switch (set point, differential) and the thermostat setting of the additional crankcase heater.
3. Switch on the circuit breaker for protection of the control circuit.
4. Set the power supply switch to «I» position (Fig. 10.1). Crankcase heater and additional heaters (if available) are automatically switched on. Make sure that the heater is running.

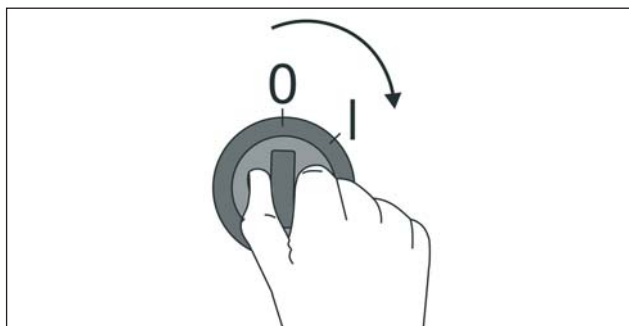


Fig. 10.1

10.4 Vacuum procedure

Before the beginning of evacuation, open the shut-off valves on the compressor (if available). Evacuate the system to remove any moisture or air. A vacuum pump must be used for the evacuation. Never use the compressor of the unit to evacuate the system as this may lead to damage of its windings and driving mechanism. During evacuation, the compressor must be switched off and the crankcase heater switched on (par. 10.3). It is forbidden to switch on the compressor under vacuum, as well as conduct any measurements in the electrical circuits of the unit.

Evacuate the system to $1.5 \div 2$ mbar absolute pressure. Failure to reach this value during a sufficient period indicates excess moisture or a small leak. Remove moisture with a charge of dry nitrogen or other suitable inert gas. If there are no leaks, continue evacuating the system until the required vacuum is obtained. Do not leave the refrigerator under vacuum for a long time.

10.5 Charge by a refrigerant

The units are designed for compression 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.

For the safe operation of the system, observe the exact refrigerant quantity while charging. Overcharging can result in sufficiently increased condensing temperature and even in liquid slugging. On the other hand, if the charge is too low, this may cause overheating of the compressor motor.

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 or directly

into the receiver. 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 and the crankcase heater switched on (Par. 10.3).

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.

Upon completion of the charging, create excess pressure on the compressor suction side.

10.6 Start up

When the unit is first started, especially during the cold season or after a long period of standing, it is necessary to turn on the compressor crankcase heater 12 hours before the start-up (Par. 10.3).

After 12 hours, make sure that the oil temperature in the compressor crankcase exceeds 10 °C and there is no dissolved refrigerant in the oil, set the power switch to the «0» position (Fig. 12.1).

Start the unit after warming up the oil in the compressor crankcase.

1. Turn on all the protection circuit breakers.
2. Check the settings of the pressure switch for compressor control (set point, differential) or compressor controller (set point, differential).
3. Check the external control system. Set the desired temperature in the cooled volume.
4. Set the power supply switch located on the terminal box to «I» position (Fig. 13.5). The unit will start automatically after the start time delay set by the timer or controller has expired provided that the signal from the external control system (on terminal 104) is active and the evaporating pressure has become higher than the control system setting.

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

- Start-up current of the compressor and the condenser fans. (Indicated on the nameplates of compressors and fans, as well as in the technical catalogs OA14, OA15 on the website ostrov.com)
- Rotation direction of the compressor motor (in case of scroll compressor). Ensure that the suction pressure drops and the discharge pressure rises;
- Rotation direction of the condenser fans. The air flow should be directed from the air intake side towards the fans. The direction of rotation of the fans is indicated on the body of the unit (Fig. 10.2).

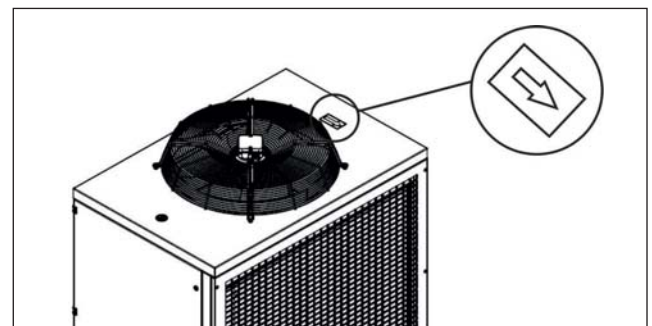


Fig. 10.2

10.7 Check after the unit is operational

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

- Ensure that there are no unusual noises.
- In units with the name OA153-MS-E, the compressor is connected via a frequency converter and can be operated over a wide range of speed. Under certain operating conditions, resonance phenomena may occur at certain frequencies. To avoid resonant vibrations, the system must be tested over the entire speed range. The frequencies at which resonance occurs must be eliminated by tuning the frequency converter (prohibiting operation at resonant frequencies).
- Check the refrigerant level by the liquid line sight glass. Bubbles in the sight glass mean a shortage of refrigerant. 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 the condenser fans.

- 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 (see Table 10.7).

When the compressor is switched off, check the oil level in the compressor sight glass (if available). Add oil if necessary. The added oil should have the same characteristics as the oil in the compressor crankcase as well as be clean and free of water.

Oil containers should remain sealed until the moment of adding oil. It is forbidden to use oil from a container which has already been opened for some time. Ensure that the container you use holds the proper amount of oil. The oil should be allowed to come into contact with air for no longer than 10 minutes.

Further use of residual oil from an opened container is not allowed.

Table 10.7

Name	Number of starts per hour
OA141-MS-H OA141-LS-H	6-8
OA141-MS-S OA141-LS-S	≤12
OA143-MS-S	≤10
OA151-MS-E OA151-LS-E	≤8
OA152-MS-H OA152-LS-H	≤12
OA152-MS-E OA152-LS-E	≤8
OA153-MS-E	≤8

11 Operation



The maximum allowable pressure on both the high and low pressure sides must not be exceeded.



The OA15 unit is intended for automatic operation. Switching on/off the unit is carried out by the signal from the external control system (terminal 104).

If there is a check valve before the refrigerant receiver (included in the «Winter package» option), there is a risk of exceeding the maximum permissible pressure caused by the expansion of the liquid.

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:

- evaporating temperature;
- suction gas superheat;
- discharge gas temperature;
- condensing temperature;
- air temperature at the condenser inlet and outlet;
- difference between condensing temperature and air inlet temperature;
- liquid subcooling;
- refrigerant charge (via the liquid line sight glass). If necessary, add or drain refrigerant (Par. 10.5);
- moisture content in refrigerant (if a moisture indicator is available). If slight presence of moisture is detected, replace the filter drier. In case the moisture content is high, the refrigerant and oil should also be replaced;
- oil level in the compressor sight glass (if available) when the compressor is switched off. Add oil if necessary;
- crankcase temperature of the compressor;
- 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 external control system (signal from terminal 104). The compressor will stop automatically.
2. Turn off power.

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

Emergency stop of the unit is carried out by switching the power switch to the «0» position.

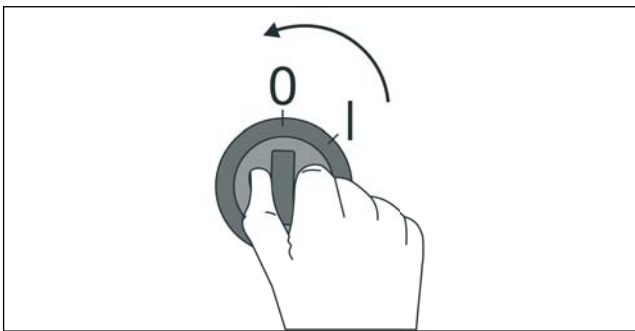


Fig. 12.1

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 expansion valve as well as control and protection devices are properly set;
- 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.		+
Check flash gas via liquid line sight glass.	+	
Control crankcase heater.	+	
Check additional crankcase heater (if available).	+	
Check oil separator heater (if available).	+	
Check the functioning of the electric panel heater (if available).	+	
Check oil for acidity. In case of high acidity, replace oil and filter drier.		+
Check pressure and temperature drop across all filters. If necessary, replace filters.		+
Cleaning unit of dust and dirt.	+	
Check electrical connections, tightening if necessary. Checking wires for kinks and wear. Checking wire insulation for damage and discoloration.	+	
Check supply voltage.	+	
Measuring start-up and operating current of compressor motor.		+
Check set points of expansion valve as well as of control and protection devices.		+
Check grounding resistance.		+

Air cooled condenser		
Visual inspection of condenser heat exchange surface and fan blades for dirt deposits, rust and mechanical damage.	+	
Check fastenings of condenser fans. If fastenings are loose, tighten them.	+	
Check fan bearings.		+
Cleaning of condenser surface of dust and dirt.	+	
Measuring start-up and operating current of condenser fan motors.		+

14 Cleaning



Electrical connections and motors must not be wet during cleaning.



In order to ensure the correct operation of the unit, the condenser must be regularly checked for clogging and, if necessary, cleaned. Otherwise, clogging of the condenser will result in increased condensing temperature, reduced cooling capacity and ultimately overheating of the compressor and/or condenser fans.

Clean the condenser with warm water (approximately +25 °C) or compatible cleaning agents which must be neither aggressive nor corrosive. Do not use acidic solutions or solvents. Remove surface dust, dirt and leaves with soft brushes, pressurized air/water (against the direction of air movement) or using a powerful industrial vacuum cleaner equipped with a brush or other soft attachment. 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 condenser (Fig.14.1) Mechanical cleaning with hard tools (for example, screwdrivers or wire brushes) is prohibited because it will damage the equipment.

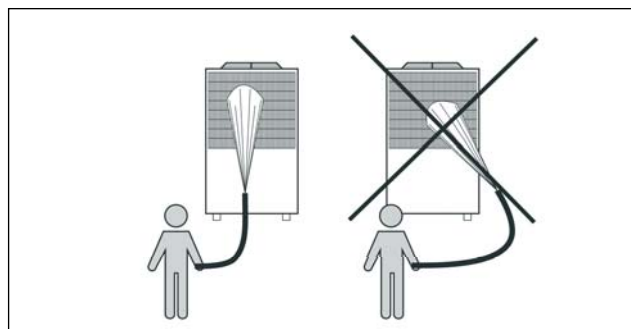


Fig. 14.1

After cleaning, the fins should be brushed lightly with an appropriate tool. If cleaning agents were used, thoroughly rinse the condenser housing with water.

15 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 valves on the compressor (if available).
4. Close the shut-off valve on the suction line on the unit housing.

Set the power supply switch to «0» position

Set all circuit breakers to «OFF» position.

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

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»).

16 Decommissioning and disposal



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



- Close the shut-off valve after the liquid receiver.
- Wait until the low pressure switch stops the compressor.
- Turn off power.
- Disconnect the unit from the power supply.
- Pump-out the refrigerant.
- Disconnect the unit's pipelines from the system.
- Drain the oil.
- Seal the pipelines of the unit.
- Remove the unit from its mounting place.
- Dispose of the unit, its components, its packaging as well as the refrigerant, oil and glycol solutions or similar fluids in accordance with the regulations in force in the country where the unit is installed.

17 Declaration of conformity

We hereby declare that the OSTROV OA14, OA15 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 ostov.com and on request.

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