

Chiller Instruction Manual



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1. INTRODUCTION

This manual contains installation, use and maintenance instruction for industrial use, fluid chillers. It was specifically developed and written to enable personnel in charge to use the equipment easily and safely.

All rights of this document are reserved.



The manufacturer disclaims any and all responsibility for misuse of the machine or any changes made to it, or for non-compliance with the rules in this manual and any other accompanying document. Every machine is provided with a technical manual and the thermostat adjustment manual, for a correct use. All manuals must be kept in a safe place and made available to the staff responsible for the chiller's management and maintenance.

The  mark is a guarantee that the devices meet the requirements of the European Machinery Directive on safety.

The manufacturer disclaims any and all responsibility for any inaccurate information in this document due to printing or transcription errors.

The manufacturer reserves the right to make changes to its products as it deems appropriate or useful without prior notification, provided that the products retain their essential characteristics

1.1 Symbols

Symbols used throughout the manual:



DANGER: Indicates an immediate hazard. Not heeding this warning can lead to the risk of accident or serious injury.



CAUTION: Indicates the possibility of a hazardous situation. Not heeding this warning can lead to the risk of accident or injury.



NOTICE: Indicates an important piece of information or recommendation regarding the machine and its application

2. SAFETY REGULATIONS

The following regulations and directives were taken into account when designing and developing the family of chillers:

European Community Directives:

- 2006/42/EC Machinery Directive
- 2014/30/EU Electromagnetic Compatibility
- 2014/35/EU Low Voltage Directive
- 2014/68/EC Pressure Equipment Directive (PED)

Standards and Directives:

- UNI EN ISO 12100 Machine safety - General principles for design - risk assessment and reduction.
- UNI EN ISO 3746 Determination of sound power levels and sound energy levels of noise sources using sound pressure - Acoustics.
- CEI EN 60204-1 Machine safety - Electric equipment of the machines.
- CEI EN 60529 Degrees of Protection Provided by Enclosures (IP Code).
- CEI EN 61439-1 Low-voltage switchgear and control gear assemblies (LV panels)
- CEI EN 378-1÷4 Refrigerating systems and heat pumps - Safety and environmental requirements
- UNI EN ISO 13732-1 Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces
- UNI EN ISO 13732-3 Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces
- UNI EN ISO 13857 Machine safety - Safety distances to prevent hazard zones being reached by upper and lower limbs
- UNI EN 14511-1÷4 Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors, for space heating and cooling

3. SAFETY MEASURES

These instructions describe the actions that must be observed when starting up, operating and servicing the product.

It is important that these instructions are provided to installers, personnel in charge of operation and maintenance personnel, and that they are always accessible to them.

The chiller must be used in accordance with the following basic rules:

- Use and maintenance must be performed only by qualified personnel and according to the instructions in this manual.
- A copy of the manual must be kept near the machine (Operation and Maintenance Manual, Technical Manual, Electronic Thermostat Manual). Be scrupulous in carrying out ordinary maintenance operations.
- Have qualified personnel replace any damaged or worn parts; use original or manufacturer- recommended components.
 - The panels in the unit must all be closed for proper operation and the operator's safety.
- The pressure in the circuits and the installed electrical components can be a source of hazardous situations during installation or maintenance work. Qualified personnel in charge of ordinary and extraordinary maintenance work are responsible for evaluating which tools and personal protective equipment are most suited to the work, also based on the information in the manuals accompanying the machine.
 - It is strictly forbidden to start the machine if safety protections are altered.
 - It is strictly forbidden to start the machine when the electrical switchboard's door is open.
- It is strictly forbidden to start the machine if it has not been installed and anchored to the ground or to suitable supports.
- It is strictly forbidden to start the machine unless adequate electrical connections are in place. The power supply system must be compliant with all regulations in effect on electrical sizing and safety.
- It is strictly forbidden to start the machine unless adequate hydraulic connections are in place. The hydraulic system must be compliant with all regulations in effect on hydraulic system sizing and safety. Installation of safety components and a shut-off valve is recommended to isolate the electrical system during maintenance work.
- It is strictly forbidden to start air-cooled units prior to examining the dimensional diagram included with the machine. In particular, the place of installation should be assessed in order to provide proper ventilation and exchange of air.
- Before installing the machine, verify that the operation data included in the "Data Plate" (generally attached to the front of the machine or, in any case, always on a fixed part of the support structure) are compliant for the application.
- Before doing any work on the unit, make sure the parts involved have been electrically and mechanically isolated. It is strictly forbidden to install the machine on sloping surfaces. Install only on a level surface that can suitably accommodate the machine.



Only qualified personnel wearing suitable personal protective equipment are allowed to perform ordinary and extraordinary maintenance operations.



It is strictly forbidden to install the machine in environments with an atmosphere under risk of fire or explosion.



The manufacturer disclaims any and all responsibility for injury to persons or damage to property resulting from installation situations other than the ones indicated or from reuse of individual machine parts. Replacing or tampering with any part of the machine is prohibited unless authorized.

3.1 General rules

The machine was designed and built to minimize sources of danger for operators and the surrounding environment. In addition to improper use of the machine, the following are other possible residual risks:

- Risks due to loss of stability of the machine;
- Risks due to machine failure (refer to chapter 7 Maintenance and chapter 8 Operation Anomalies / Troubleshooting);
- Risks due to machine lifting/handling;
- Risks due to refrigerant gas leaks;
- Risks due to oil leaking from the refrigeration circuit;
- Water or pressurized oil leaking from the liquid circuit;
- Risks due to noise while running, not in compliance with permissible limits or resulting from installation in an unsuitable environment;
- Risk of abrasions due to sharp sheet metal edges and contact with very hot internal surfaces or very cold surfaces

3. SAFETY MEASURES

3.2 Prevention against mechanical risks

The machine is composed of moving and rotating components, sharp edges, and very cold and very hot components. These elements can all be a source of danger for operators. To minimize these sources of danger, the following instructions must be observed:

- Prior to removing any panel, make sure to cut off the power to the machine.
- Never start the machine with panels removed.
- Always verify that the surfaces of the circuit components (exchangers, copper piping, compressors, condenser coils, etc.) are at room temperature. The high or low temperature of the surfaces can cause burns.



- Be careful when handling components with a high-temperature symbol

- Before working on the refrigeration or liquid circuit, always wear personal protective equipment.
- The additives in the liquid circuit are corrosive and can burn the eyes and skin. Always wear safety goggles and gloves.
- Any refrigerant gas leaks from the refrigeration circuit are a source of danger due to very high temperature and/or pressure.



- Before accessing the machine for ordinary and/or extraordinary maintenance wear protective gloves.

3.3 Prevention against electrical risks

The electrically powered machine is a source of danger especially if basic safety regulations are not observed. To minimize the sources of danger, observe the following principles:

- Comply with applicable EN or current standards when making the electrical connections on the cooling unit. Observe the technical conditions for connection provided by the electricity distribution companies.
- Before working on the unit, remove power using the main disconnect switch.
- Only specialized personnel is allowed to work on the unit.
- Always replace worn or defective parts.
- Before working on the electrical system always read the machine's technical manual, which contains the specific circuit diagram.
- Always ensure that there is no voltage present in the system.
- Verify the earth continuity of the machine before starting it.
- Check all electrical connections, connection cables and, in particular, the cables' state of insulation. Replace cables that are visibly worn or damaged.
- For power supply, use appropriate section cables as provided by CEI EN ISO 60204-1 and by the existing regulations in the country of use, making reference to the strictest conditions.
- If the switch is on OFF position, the only part that is powered is the line provided by the user to the machine to operate it.



- If the pictogram with a black lightning sign is found on the electrical switchboard and/or branching boxes, be particularly careful because voltage tension might be present even if the disconnect switch is on OFF position.

3.4 Prevention against other kinds of risks

The refrigeration circuit contains eco-friendly HFC refrigerant (R134a / R410A / R407C / R449A/ R513a), which must be handled with care, always in accordance with the existing laws and regulations. Only competent personnel is allowed to do this work. If the refrigerant leaks out of the system, the hazard for the health of the operator is minor. In high concentrations, it can cause skin irritation, light-headedness and, especially, burns due to the low temperature.

Refrigerant leaking towards hot surfaces or naked flames may decompose into toxic substances. The refrigerant volatilizes immediately in the environment and, for this reason, it is important to quickly ventilate the area.

Do not install the machine in underground or mezzanine levels of buildings lacking a sufficient number of emergency exits.

The machine cannot be used in environments with an atmosphere under risk of fire or explosion.

Disposing of the refrigerant and all machine components is the responsibility of the entity in charge of them



- In case of routine and condition based maintenance always wear protective gloves.



- Install the machine in compliance with the regulations in effect in the country of installation

3. SAFETY MEASURES

In case of machine lifting always refer to the following pictograms:



Lift with hook: follow all the steps shown in the pictograms



Lift using at least two forks.

Machines with tank must be emptied prior to lifting.

4. CHILLER APPLICATION

The chillers were designed and intended exclusively for cooling water circuits, glycol solution circuits (water + ethylene glycol) or oil circuits. These machines are suited to operate in industrial environments where the air ranges between a minimum temperature of 59°F/15°C and a maximum temperature of 113°F/45°C. For operating temperatures falling out of this range, please contact the Manufacturer's sales department.

Water chillers: setting of the set-point according to the application

STANDARD

- Operation fluid Water or glycol solutions (water + ethylene glycol)
- Environmental operating temperature range +59°F/+15°C to +113°F/+45°C

POSITIVE COLD (Temperatures of the cooled fluid higher than +5°C)

- Ethylene glycol range 0% to 30% ±2%
- Operation range - machines with tank +46.4°F/+8°C to +77°F/+25°C
- Operation range - machines without tank +55.4°F/+13°C to +86°F/+30°C

NEGATIVE COLD (Temperatures of the cooled fluid lower than +5°C)

- Ethylene glycol range 30% to 50% ±2%
- Operation range - machines with tank -22°F/-30°C to +23°F/-5°C
- Operation range - machines without tank -13°F/-25°C to +32°F/+0°C

Oil chillers: setting of the set-point according to the application

- Operation fluid Oil ISO VG 32 range 5 cSt to 60 cSt
- Environmental operating temperature range +15°C to +45°C
- Operation range - machines with tank +68°F/+20°C to +95°F/+35°C
- Operation range - machines without tank +77°F/+25°C to +104°F/+40°C

Failures due to operation falling outside of the above-mentioned ranges or non-compliance with the instructions provided in this manual will automatically void the **WARRANTY**.

4.1 Improper uses

It is strictly forbidden to use the machine in environments not envisaged by the manufacturer, such as, for example:

- environments with potentially explosive atmospheres;
- environments with potentially flammable atmospheres;
- very dusty environments.

In addition, it is absolutely forbidden to use the machine in any other way than for what it was intended, such as, for example:

- in any way other than provided for in current standards and regulations;
- installed in a way other than shown in this manual;
- installed outside operational ranges



Using the machine to cool flammable or explosive substances is strictly prohibited

4.2 Recommended liquids

Water chillers:

The water to use in the hydraulic cooling circuit must comply with the parameters set by potable water regulations. If deionized water is used, changes must be made to the system and requested; contact the Manufacturer's Technical Department.

The water in the liquid circuit must not cause lime scale build-up or precipitation that can circulate throughout the system

4. CHILLER APPLICATION

Depending on the impurity level of the liquid being cooled as well as on the size and structure of the recirculation cooling system, an adequate procedure must be applied to the liquid.

In accordance with potable water regulations, recommended limits are:

- Electrical conductivity at 25°C 80 to 750 µS/cm
- Total hardness 6° to 20° dH
- Appearance clear, sediment-free
- Colour colourless
- Bacterial load < 10,000 cfu/ml
- pH 4.5 - 8.5



CAUTION: Check the quality of the water in the liquid circuit on a regular basis. Due to the continuous evaporation of the water, the concentration of contained substances may increase.
For compatibility of liquid circuit materials with substances other than those mentioned contact the manufacturer



CAUTION: Do not use liquids other than the ones prescribed.
Do not use Propylene Glycol in the liquid circuit.

Antifreeze

The needed percentage of glycol depends on the minimum temperature the fluid can reach. The table provides the needed amount of glycol as a volume percentage in relation to the minimum fluid temperature.

Minimum fluid temperature [°F/°C]	Needed amount of glycol [Vol-%]
> +41°F/+5°C	Antifreeze not necessary
5°F/-15 °C	30 Vol-% TEXA Fluid 903-TX
-4°F/-20 °C	35 Vol-%
-13°F/-25 °C	40 Vol-%
-22°F/-30 °C	45 Vol-%
-31°F/-35 °C	50 Vol-%



The concentration of ethylene glycol in the water affects the machine's cooling capacity. The higher the glycol concentration, the lower the cooling capacity. Circuit pressure drops also increase with a higher glycol concentration.

We recommend use of the following product: **TEXA Fluid 903-TX**

TEXA Fluid 903-TX has been specially developed for use in closed industrial circuits, either outdoor or indoor, with limited topping-up of water. It is compatible with the most common metals, such as iron, steel, copper and its alloys, aluminum and its alloys, and even with plastics and rubbers.

TEXA Fluid 903-TX was designed to protect liquid circuits in industrial machines, machine tools and all those systems requiring cold or hot water recirculation.

It is formulated with substances which provide three key actions to protect the system:

ANTIFREEZE ACTION: prevents the formation of ice at temperatures around zero and negative temperatures.

CORROSION INHIBITION: prevents corrosion by forming a protective film on metal surfaces

BIOCIDAL ACTION: inhibits growth of fungi, moulds and bacteria, limiting biofilm build-up.



C15001209: Inhibited Ethylene Glycol, 25 kg container
To be mixed in water.



C15001218: Water + TEXA Fluid 903-TX mixture (30% concentration), 25 kg container
READY-TO-USE PRODUCT for temperatures down to -15°C

TEXA Fluid 903-TX must be mixed with pure water, not brackish water or water with suspended solids. Mixing with demineralized water or with water from osmosis system IS NOT RECOMMENDED. The concentration of TEXA Fluid 903-TX must be checked every 6 months and the solution must have a clear appearance.

The water in the circuit must be completely replaced every 18 months in order to always have the optimal concentration of corrosion inhibitors, which degrade over time

4. CHILLER APPLICATION

Oil chillers:

We recommend using mineral oil-based fluids specific for liquid circuits, with good anti-wear, anti-foaming, rapid deaeration, antioxidant, anti-corrosion and lubricating properties.

The kinematic viscosity of the fluid must fall within the range:

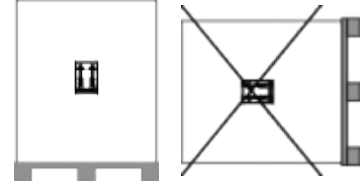
5 cSt to 60 cSt

In case of use of fluids other than the ones mentioned, inform the manufacturer's Technical Department about the type of fluid used and its operating conditions so that it can look into possible compatibility issues or durability problems for oil hydraulic circuit components

5. HANDLING AND STORAGE

5.1 Checks upon receiving the machine

Upon receiving the shipment, inspect the physical condition of the packaging thoroughly. Remove the packaging and make sure the machine shows no signs of dents or damage and that no oil is leaking from the circuit. Make sure the machine was shipped in the correct position indicated by the symbol on the packaging, as shown in the figure. In case of damage, do not accept the goods and report it to the Manufacturer immediately.



DO NOT accept the machine if an abnormality of the shipment is observed.

5.2 Transport and handling specifications

Transport the machine in a vertical position, as indicated in the packaging, and without water. The machine was designed to be handled with forklifts, lift-trucks or cranes.

When handling the machine, all risk of damage must be avoided.

Do not lift with inadequate equipment or equipment not rated for the machine's total weight.

Prior to lifting the machine, make sure all removable panels are securely fastened to the unit, to avoid that they fall off during lifting.



CAUTION: If the machine was not transported in a vertical position, place the machine back in its vertical position and wait at least 3 hours before starting it, to allow the oil in the refrigeration circuit to flow back in the compressor sump.



CAUTION: If the machine was not transported in a vertical position, place the machine back in its vertical position and wait at least 3 hours before starting

Important specifications for transport:

- Weight (see "Technical data")
- Dimensions (see "Technical data")
- Ambient temperature range min -4°F/-20°C to max +149°F/+65°C

If the machine is transported in environments with a temperature lower than 0°C, make sure the water circuit is completely empty. For water-cooled machines, make sure the condenser liquid circuit is completely empty.

5.3 Handling with a forklift

To transport the machine with a forklift, place the two forks under the front or back of the unit (in larger models, under the longest side). The bottom is specifically shaped for forklift handling. Centre the weight of the load between the forks, inserting them for the entire length of the load. Now it is possible to lift the load.

Travel at a very low speed when handling.

Handle the machine with the tank completely drained of water.

5.4 Handling with lift-truck

A. Transport from the front:

The machine can be transported with a lift-truck on the front or on the back only if the following symbol is present



If it is not present, lift the machine using the lifting hooks, therefore only use lift-truck and/or cranes. The forks of the crane must be longer than the length of the machine.

Travel at a very low speed when handling.

5. HANDLING AND STORAGE

B. Transport from the side:

The forks of the lift-truck must be inserted in the dedicated holes, horizontally to the machine on the side, only if the following symbol is present



If it is not present, lift the machine using the lifting hooks, therefore only use lift-truck and/or cranes. The forks must come out on the other side. The machine is ready to be lifted once this condition has been met, taking into account the load's center of weight.

Travel at a very low speed when handling.

5.5 Handling with a crane

The machine can be lifted and transported with a crane via all the lifting points shown in the following pictogram



Lifting gear: suitably rated chains or slings can be used. Both are suitable for the job, and to meet the lifting requirements, slings or chains have to be of the same length. Make sure that the weight shown on the lifting gear plates is compatible with the machine weight.

Travel at a very low speed when handling.

5.6 Storage

The machine must be stored in its original packaging. Before storing the unit, make sure to verify the characteristics below:

- Weight (see "Technical data")
- Dimensions (see "Technical data")
- Ambient temperature range min -4F/-20°C to max +149F/+65°C

If the machine is going to be stored in environments with temperatures below 0°C, check for water in the liquid circuit and, if any, drain it out completely. Likewise, in water-cooled machines, make sure the condenser liquid circuit is empty.

6. INSTALLATION

To install the machine, follow the safety rules described in section 3.

Before starting the system, we recommend observing a few simple procedures.

6.1 How to read Model Numbers

TAL	76	N	M	S	B	A	0000
1	2	3	4	5	6	7	8

1. Identifies the type/family of industrial chiller (i.e TCW = Mini Water Chiller, TAL = Water Chiller, TCO/TAO = Oil Chiller, TCI = Immersion Coil Chiller)
2. Chiller's listed cooling capacity in kW at rated conditions (i.e 76 = 8.1kW, A0 = 10.9kW, B5 = 24.8kW, C5 = 35.8kW, D9 = 47kW)
3. Hydraulic Configuration (i.e N = tank and pump, P = no tank with pump, D = no tank no pump)
4. Power Supply (i.e M = 400V 3ph 50hz, H = 400V 3ph 50Hz ~ 460V 3ph 60Hz, N = 460V 3ph 60Hz)
5. Pump (i.e S = standard water pump, H = high pressure water pump, R = max. pressure water pump, I = gear oil pump, V = screw oil pump)
6. Finish (i.e B = standard RAL7035, X = other RAL, 9 = stainless steel)
7. Configuration Type (i.e A = standard configuration, X = customized configuration)
8. Unique set of number for each chiller which identifies the accessories on a model (i.e 00000 = no options)

6.2 Positioning

Before installing the chiller, take care to follow these steps to determine the best position:

- A. Install in a place that will make it easy to access the machine at all times, for maintenance or assistance operations.
- B. Always install the machine as near to the user system as possible; this prevents loss of efficiency.
- C. Observe the distances shown on the dimensional drawing included with this manual, to prevent unit malfunctions.
 - a. **Distance for maintenance work:** at least 0.8 m for inspection and connection side
 - b. **Distance air intake side:** See enclosed dimensional drawing

6. INSTALLATION

- c. **Adjacent units coil** Maintain a space at least 3 times the size of the space specified in the dimensional drawing for a single machine. **WARNING:** Distances are for reference only, they must be observed nonetheless, but always assess the risks in case of particular positions and narrow locations. The specific dimensional drawings included in the manuals of each machine must be taken into account
- D. Observe the operation limits laid down by the manufacturer.
- E. Place the machine on a level horizontal surface that can support more than the weight of the machine.
- F. The place of installation must not be at risk of freezing temperatures.
- G. The chillers are designed to be installed indoors. If installed outdoors, they must be equipped with suitable accessories and protected from direct weather exposure.
- H. If the machine is positioned outdoors, avoid a position subject to strong winds as these could cause air recirculation in the condenser coil.
- I. Always provide for a fluid drainage point in case of accidental leaks from the machine or the system it is connected to

6.3 Electrical connection



Before making the electrical connection, carefully review the information in the machine's electrical nameplate. **Make sure the supply voltage is compatible with the voltage on the plate.** All installation operations are to be performed by qualified personnel.

Always check the machine's wiring diagram before making the connection.



CAUTION: Comply with the applicable standards and regulations when making the electrical connection. In addition, observe the technical connection conditions set out by the electricity distribution companies. Installing a protection upstream the chiller is recommended, rated for the input powers specified in the nameplate.



For machines with transformer, it is advisable to use protections specifically designed for transformers.

Connect the supply cables to the relevant terminals in the switchboard. Always connect the earth cable too. The cross-section of the power supply cables must be sized based on the machine's maximum input power, as specified in the nameplate. The maximum voltage drop on the line must not exceed 10%.

The supply voltage must conform to the one on the nameplate. The supply voltage must correspond to a +/- 5% nominal value, with maximum imbalance between phases of 3%.

For electrical connection:

- Remove the side panels.
- Use the dedicated insertions on the back, front, or side of the machine to convey the power supply.
- Access the switchboard from the bottom, through the specific holes.
- Connect the supply cables to the relevant terminals; connect the earth cable, which is required by law.

CAUTION: It is strictly forbidden to disable the machine protections.

Remote ignition of the machine: it is possible to turn the machine on from a remote switch using the two terminals inside the switchboard

WARNING! This type of connection **is not** voltage free. Make sure that these terminals cut off power to the secondary circuit, while the primary circuit remains powered. In single-phase versions, the switch must be sized as specified in the wiring diagram.

6.4 Hydraulic connection

When making the hydraulic system connections, carefully follow the instructions provided below and observe the regulations in force in the country of installation.

Connect the hydraulic pipes with cut-off valves to the threaded sleeves on the back of the machine, complying with the fluid income and outcome symbols:



Machine fluid intake **IN**



Machine fluid outlet **OUT**

6. INSTALLATION

A. WATER CIRCUIT

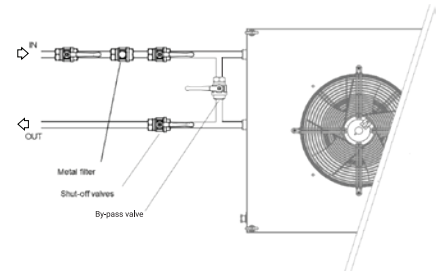


CAUTION: Hydraulic pipes must be rated for the nominal fluid flow rate and, in addition, they must be bracketed to avoid putting weight on the chiller. Use flexible tubing; rigid tubing require flexible couplings to set off thermal expansion and dampen possible machine vibration. The pipes must be rated to withstand the machine's maximum hydraulic pressure.

- Use 2 shut-off valves (gate valves) to isolate the machine from the liquid circuit.
- Use a wire mesh filter, with a degree of filtration not exceeding 1 mm, to protect the plate heat exchanger from debris or impurities in the pipes.
- Use a hydraulic bypass valve for flow control.



CAUTION: While the electric pump is running, do not close the delivery branch completely (with closed bypass) in order to avoid damage to the on-board electric pump.



The pressure gauge on-board the machine - together with the delivery valve - allows adapting the head to the liquid circuit.

CAUTION: Check the pump's maximum head before operating the shut-off valve

B. WATER CIRCUIT

Before starting the system for full operation, we recommend observing a few simple procedures



CAUTION: Oil hydraulic pipes must be rated for the nominal fluid flow rate and, in addition, they must be bracketed to avoid putting weight on the chiller. Use flexible tubing; rigid tubing require flexible couplings to set off thermal expansion and dampen possible machine vibration. The pipes must be rated to withstand the machine's maximum oil hydraulic pressure.

The gear pumps on standard oil units are rated for a **maximum pressure of 20 bar/290 psi**.

- During the first start-up, calibrate the pressure-limiting valve to the required value, if necessary; the valve is located on the pump body. Calibration range 0-20 bar/0-290 psi (nominal calibration 5 bar/72.5 psi).
- Avoid start-ups under load in low-temperature conditions or when the pump has been idle over a long period of time (avoiding or limiting start-ups under load is an excellent way to extend the life of the pump).
- Start the system for a few moments, activating all components; then, vent the circuit to ensure that it is correctly filled.
- If the collection tank is present, check the fluid level after the first filling and keep it periodically monitored

6.5 Commissioning the machine

A few preliminary checks are necessary before starting the machine:

- check that all panels are in place and secured with fastening screws;
- check the electrical connections to make sure they were made correctly and that all terminals are tight;
- check that fuses, where present, are in their fuse holder;
- check the IN and OUT hydraulic pipes to ensure they have been properly connected;
- check that the door/s of the electric switchboard is/are closed

Commissioning machines with standard liquid circuit:

A. FILLING AND DISCHARGING THE COLLECTION TANK: The first step before commissioning the machine is loading the collection tank (where present) through the filling cap, which is located on the top of the machine in the smaller versions and inside the tank in larger machines. The visual level gauge in front of the machine will help the filling operation to the maximum level.

Filling and emptying are marked with the following symbols:



Tank filling



Tank discharge. **A valve might be available in some machine versions - supplied standard or purchased as an add-on accessory - to facilitate the discharge operations.**

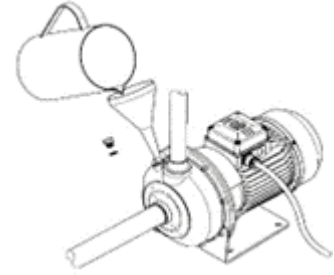
B. **STARTING UP THE MACHINE - WATER CIRCUIT:** when starting the machine for the first time, ensure that the motors are **rotating** in the right direction (only in three-phase versions). An arrow showing the direction of the rotation is affixed on each motor. The proper rotation of the fan can be verified through the air being expelled out of the condenser coil. If the temperature of the air coming out of the machine is higher than the ambient temperature, the compressor, too, is rotating in the right direction. The pump is rotating in the right direction when the water pressure gauge is showing pressure.

IMPORTANT: Testing and phase sequence of the motors is done at the factory.

6. INSTALLATION

STARTING THE MACHINE - OIL CIRCUIT: Before starting the machine, we recommend monitoring the cleanliness of the oil used in the starting stage frequently and adopting regular maintenance practices during use. Preventive actions include cleaning the system thoroughly during installation, removing resulting fluid residues and, most of all, filtering the oil on a continuous basis during operation. There are two parameters that determine a good choice of filter: absolute rating and β ratio. Low absolute ratings combined with high β ratios are an indication of good filtering properties. Therefore, it is very important to limit not only the size of the largest particle but also the number of smaller-sized particles passing through the filter.

Recommended level of filtration: 25 μm
Recommended β ratio: >75



For machines included in the TCU range ("waste" oil cooling machines), the maximum impurity degree is 150 μm .

In this case the evaporator area features an air bleeding point that should be used during the machine's commissioning (the positioning is shown on the SCI hydraulic diagrams of the relevant technical manual provided with the machine).

- C. BLEEDING THE PUMP - WATER CIRCUIT:** If upon starting the machine there is no pressure in the hydraulic system, even after ascertaining that the motors are rotating in the right direction, the pump might not be properly primed. An air pocket trapped between the volute and impeller has to be removed by bleeding. Loosen the vent screw on the pump body and, if necessary, fill the pump volute with water to facilitate the priming operation.
- D. TOPPING UP THE COLLECTION TANK:** at the first start-up, the fluid inside the tank has to fill the entire liquid circuit so the level will drop. It is important to top up the collection tank with the same liquid (or same mixture) to the maximum level.

Commissioning machines with internal recirculation liquid circuit:

To commission a unit with internal recirculation liquid circuit, the same collection tank filling operations are required.

6.6 Extended period of inactivity

If the system has to be stopped for an extended period of time, it is necessary to **completely empty the collection tank, pipes and electric pump of fluid.**

Upon restart, take care not to force the pump's electric motor if it jams. If this occurs, remove the pump's top cover and operate on the impeller shaft with a tool.

6.7 Decommissioning and disposal



Decommissioning and extraordinary maintenance operations on the refrigeration circuit must be performed in compliance with relevant environmental regulations regarding recovery, use and disposal of liquids, supplies and components. The unit must be dismantled by a service provider specialized in the collection of obsolete machinery.

The machine is composed of materials that can be treated as secondary raw material, therefore, you must follow the prescriptions below:

- the oil in the compressor sump must be removed, recovered and delivered to a specialized waste disposal service provider;
- recover any antifreeze glycol and by no means dispose of it as ordinary waste: it must be recovered and delivered to a specialized waste disposal service provider;
- do not release refrigerant in the atmosphere; recover and deliver refrigerant to a specialized waste disposal service provider;
- dehydrator filters and electronic components are special waste and must be recovered and delivered to a specialized waste disposal service provider;
- insulating material must be removed and treated as municipal solid waste.

Laws regulating the use of ozone-depleting substances prohibit the release of refrigerant gases in the environment and requires their recovery and delivery to centers specialized in their disposal.



Be extra careful when doing maintenance work on the refrigeration system, to minimize leaks of refrigerant gas in the atmosphere.

7. MAINTENANCE



Before performing any operation on the unit or accessing internal parts, make sure the power supply has been cut off.

Before doing any work on the unit, observe the safety instructions provided in chapter 3.

It is good practice to inspect the machine on a regular basis to ensure it is working correctly. No particular refrigeration engineering conditions are required when doing ordinary maintenance. Therefore, it can be performed by personnel that have been instructed and possessing the specific skills.

Maintenance is essential to keep the refrigeration unit in a perfect state of efficiency, not only from a purely functional point of view, but also from an energy-savings point of view.

7.1 Extended period of inactivity

ROUTINE MAINTENANCE		
Assemblies / Components	Operation	Frequency
Cooling air circuit / Framework	AIR FILTER – Clean or replace the air filter (where fitted)	Monthly
	CONDENSER – Clean with compressed air and specific solvents, taking care not to damage the aluminum fins	When necessary
	STRUCTURE – Visual check on the condition of the framework (corrosion or damage)	Monthly
Chiller in general	VISUAL CHECK OF SYSTEM – Visual check on the machine's operation via the digital thermostat (presence of alarms) and any fluid leaks in the plumbing.	Daily
	ELECTRICAL PARAMETERS – Check the current draw and the connections of the electrical cables.	Yearly
	DOCUMENTATION – Check that the documentation is present on board the machine.	Yearly
	COMPONENTS – Visual check on the condition of the machine's components. If there is a centrifugal fan, check the condition of the belt/pulley transmission.	Yearly
Liquid circuit	PIPES – Visual check that the circuit is sealed	Daily
	LIQUID LEVEL – Check the level of the liquid in the collection tank; top up if necessary using the same mixture.	Daily
	FLUID – Check the quality of the fluid in the tank, the cleanliness and the glycol content, where used.	Monthly
	PRESSURE – Check the pressure of the circuit using the water pressure gauge. This pressure must be compatible with the specifications of the installed pump.	Monthly

7.2 Electrical connection



Condition-based maintenance operations must be performed only by specialized personnel properly trained to work on refrigerating systems.

During the machine's life cycle, some condition-based operations to regenerate the machine become necessary. If there are no specific regulations in place in the country where the machine is installed, reference is to be made to the prescriptions set out in standard EN 378-2 "Annex C – Inspection while in service".

Type of service	Inspection	Check		
	Visual check	Pressure test	Refrigerant leaks	HP pressure switch Max. pressure valve
A	x	x	x	x
B	x		x	x
C	x		x	
D	x			x

Inspections and checks must be made by personnel qualified to undertake them.

Description of servicing criteria:

A: regeneration is to be performed only after servicing the refrigeration circuit, in case of repair and assistance (replacement of components, elimination of leaks, replacement of dehydrator filters, etc.).

B: regeneration is to be performed prior to putting the machine back in operation after an inactivity period longer than 2 years.

C: regeneration is to be performed if the machine is moved to another location, subsequent to the first start-up.

D: periodic regeneration is to be performed once a year.

A visual check includes all the operations listed under section 7.1 covering routine maintenance

8. OPERATION ANOMALIES / TROUBLESHOOTING

To troubleshoot the machine, keep the specific documentation handy:

- wiring diagram
- hydraulic diagram
- digital thermostat manual
- digital thermostat's parameterization

For the alarm indicator lights on the digital thermostat, refer to the thermostat's manual attached.

TROUBLESHOOTING TABLE		
Fault	Potential cause	Observations
THE SYSTEM IS NOT WORKING No device is operating.	Check the electric power supply. Check connection of remote ON/OFF terminals. Faulty electromechanical protections	Check operation of the electricity line and the switchboard supplying the machine.
LOW PRESSURE ALARM / INSUFFICIENT COOLING Temperature of air coming out of the condenser low. No refrigerant gas in the circuit.	Lack of refrigerant gas causes a drastic drop in the machine's cooling capacity. There is a leak in the gas circuit.	Service by competent personnel (refrigeration technician) required. Contact the Service Department.
HIGH PRESSURE ALARM/ PRESSURE INCREASE in refrigeration circuit – If the refrigeration circuit's maximum pressure is exceeded, the high- pressure switch is triggered and disconnects the machine's cooling function. An alarm will appear on the panel display.	The minimum distances were not complied with (check dimensional drawing) Ambient temperature is too high (check Technical Data for limits) The water temperature in the return branch is too high (check Technical Data for limits) The water outlet temperature is outside permitted range (check the Technical Data) The water supply in the condenser is insufficient in water-cooled versions (check Technical Data) The digital thermostat that manages the machine is faulty	To restore the unit to normal operating conditions, contact the Service Department
COMPRESSOR TURNING ON/OFF TOO OFTEN (SHORT CYCLING)	The machine's cooling capacity too high than actually necessary Lack of thermal flywheel suitable for the operation. Compressor's start/stop differential too small (standard value +/- 2°C)	Check parameter settings on the digital thermostat.
COMPRESSOR IS NOT WORKING Fault signal on the digital thermostat	Compressor's thermal protection switch triggered	Refrigeration circuit's working pressure too high. Check the state of efficiency of the air filter (if there is one) - Check that the minimum operation distances have been complied with and that the expelled warm air is not being recirculated. Ambient temperature is too high.
THE FAN IS NOT WORKING Fault signal on the digital thermostat	Fan's thermal protection switch triggered	High pressure drop of the fan, caused by obstacles to air flow. Fan damaged or jammed. Start capacitor damaged (in single-phase versions)
ELECTRIC PUMP IS NOT WORKING Fault signal on the digital thermostat	Electric pump's thermal protection switch triggered	Pump failure Check the pressure of the pump against the technical data on the label
MACHINE IS WORKING BUT AT LIMITED COOLING CAPACITY Compressor, fan and pump(s) are working but the machine is not cooling.	Condenser air flow short circuit. Obstacles at condenser air intake or outlet. Clogged or dirty air condenser or air filter	Remove any obstacles to regular air flow. Position the machine according to minimum installation distances. Clean the condenser coil; clean or replace the dirty air filter
LIMITED COOLING CAPACITY AND CONDENSATION ON COMPRESSOR with risk of ice	Insufficient water flow on evaporator.	Check the operation of the electric pump and pressure of the liquid circuit.

9. WARRANTY AND RETURN POLICY LINK

<https://HOFFMAN.nVent.com/en-us/cooling-warranty-registration>



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