

Chillers for Battery Energy Storage System

Operation and Maintenance Manual



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1. INTRODUCTION

This manual contains the installation, use and maintenance procedures for industrial liquid chillers. It has been specially compiled and developed to enable their safe and easy operation by the appropriate personnel.

All rights in this document are reserved.

 The manufacturer assumes no responsibility for any improper use of the machinery, modifications to it or failure to comply with the regulations in this manual or any other accompanying documents. Each piece of machinery is accompanied by a technical manual and a thermostat operation manual, intended to ensure its proper use. All manuals must be kept in a safe place and made available to the personnel responsible for operating and maintaining the chiller.

The CE marking is a guarantee that the appliances meet the safety requirements of the European Machinery Directive.

The manufacturer accepts no responsibility for inaccuracies contained herein due to printing or data entry errors.

The manufacturer reserves the right to make such modifications to its products as it deems necessary or useful without prior notice provided that their fundamental characteristics remain the same.

1.1 Symbols

Symbols in this manual:

 **DANGER:** Indicates immediate danger. Ignoring this symbol may result in serious accident or injury.

 **CAUTION:** Indicates a possible hazardous situation. Ignoring this symbol may result in accident or injury.

 **INFORMATION:** Indicates an important piece of information or advice on how to use the machinery.

2. EUROPEAN DIRECTIVES

The following directives were considered in the design and development of the chiller family:

European Community Directives:

2006/42/EC Machinery Directive

2014/30/EU EMC Directive

2014/35/EU Low Voltage Directive

Applicable Regulations:

- EN ISO 12100
- EN 60204-1
- EN 61439-1
- EN 60529
- EN 378-1_4
- EN ISO 3746
- EN ISO 13732-1
- EN ISO 13732-3
- EN ISO 13857
- EN 14511-1_4
- EN 12464
- EN ISO 7010

3. SAFETY MEASURES

These safety instructions describe the actions that must be observed at all times during the commissioning, operation and servicing of the product.

These instructions must be provided and made available at all times to the personnel responsible for installing, operating and maintaining the product.

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

- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.
- A copy of the manuals must always be kept near the machinery (Operation and Maintenance Manual, Technical Manual, Electronic Thermostat Manual); the utmost care must be taken in all routine maintenance operations.
- Worn or damaged parts should be replaced by qualified personnel and only original parts or parts recommended by the manufacturer should be used.
- For the proper operation of the unit and the safety of the operator, all panels must be kept closed when the unit is in operation.
- The electrical components present and the pressure in the circuits can create hazardous situations during installation or maintenance work. Qualified personnel performing ordinary and extraordinary maintenance are responsible for determining the appropriate tools and personal protective equipment for the task, also taking into account the manuals supplied with the machine.
- It is strictly forbidden to start the machine if the safety guards have been tampered with.
- It is strictly forbidden to start the machine with the electrical panel door open.
- It is strictly forbidden to start the machine unless it is installed and anchored to the ground or to properly designed supports.
- It is strictly forbidden to start the machine without ensuring a proper electrical connection. The electrical supply system must comply with all current regulations on correct sizing and electrical safety.
- It is strictly forbidden to start the machine without ensuring a proper hydraulic connection. The hydraulic system must comply with all current regulations on correct sizing and safety. The installation of safety components and a cut-off valve is recommended to allow electrical isolation during maintenance.
- The chillers must never be started without first having read the dimensional diagram attached to the machine. In particular, it must be ensured that the installation environment offers adequate ventilation and air exchange.
- Before installing the machine, check that the operation data on the nameplate (usually attached to the front of the machine or on a fixed part of the support structure) are compliant with the application.
- Before carrying out any work on the unit, ensure that the parts involved in the work have been electrically and mechanically isolated.
-  Ordinary and extraordinary maintenance must only be performed by qualified personnel with adequate personal protective equipment.
-  It is strictly forbidden to install the machinery in places where there is risk of explosion or fire.

 The manufacturer accepts no liability for damage to persons or property resulting from installation situations other than those indicated or from the reuse of individual parts of the machine. Replacing or tampering with any part of the machine without authorization is strictly forbidden.

3.1 General requirements

The machinery has been designed and built to minimize sources of danger to operators and their surroundings. In addition to improper use of the machine, residual risk may arise from:

- Risk due to loss of stability of the machine.
- Risk due to breakage of the machine (refer to Chapter 7 – Maintenance, and Chapter 8 – Malfunctions/Troubleshooting).
- Risk due to cleaning and/or handling the machine.
- Risk due to refrigerant gas leakage.
- Risk due to oil leakage from the cooling circuit.
- Leakage of water or oil under pressure from the hydraulic circuit.
- Risk due to operating noise exceeding the permitted limits or due to installation in unsuitable environments.
- Risk of abrasion due to sharp-edged sheet metal, high-temperature internal surfaces or low-temperature surfaces.

3.2 Preventing mechanical risk

The machine is composed of moving and rotating parts, sharp surfaces and components at low or high temperatures. All of these elements are possible sources of danger to the operator. To minimize these sources of danger, the following guidelines must be observed:

- Before removing any panels, be sure to turn off the power to the machine.
- Never start the machine with the paneling removed.
- Always check that the surfaces of the circuit components (heat exchangers, copper piping, compressors, condensed batteries, etc.) are at room temperature. High or low surface temperatures can cause burns.
- Pay attention to components where the high-temperature symbol is present.
-  Always use personal protective equipment before working on the cooling or hydraulic circuit.
- The additives present in the hydraulic circuit are corrosive and can cause burns to eyes and skin. Always wear safety goggles and gloves.
- Any refrigerant gas leakage from the cooling circuit is a source of danger due to high temperatures and/or pressure.
-  Wear protective gloves when accessing the machine for routine or extraordinary maintenance.

3.3 Preventing electrical risk

Electrical machinery is a source of danger, especially if basic safety regulations are not observed. To minimize sources of danger, the following basic guidelines must be observed:

- Observe the relevant EN or applicable standards when making electrical connections on the cooling unit. Observe the technical conditions for connection established by electricity distribution companies.
- Before performing any work on the unit, switch off the power supply via the main disconnect switch. Do not use the chiller's main switch or the operator is exposed to high-voltage risk. Remove high-voltage from the unit by the main switch on the fixed wiring.
- Work on the unit must be carried out only by specialized personnel.
- Always replace components that have deteriorated through use or are defective.

- Before working on the electrical system, always refer to the technical manual for the machine, which contains the specific technical diagram.
- Always ensure that there is no electrical voltage present in the system.
- Check the grounding continuity before starting the machine.
- Check all electrical connections, connection cables and, in particular, the condition of the cable insulation. Replace any cables that are obviously worn or damaged.
- For the power supply, use cables with a suitable cross-sectional area as required by IEC EN ISO 60204-1 and the regulations in force in the country of operation, referring to the more restrictive conditions.
-  If the yellow triangle with black thunderbolt is present on the electrical panel and/or junction boxes, be very careful as voltage may be present.

3.4 Preventing other risks

The refrigerated circuit contains HFC coolant (R134a/R410A/R404A/R407C/R449A/R513A/R452A), which is environmentally friendly and must be handled with care, subject to legal regulations and guidelines. Only qualified personnel may perform this work. If it leaks from the circuit, the coolant represents a very low health hazard for the operator. In high concentrations, it may cause skin irritation or light-headedness. However, most importantly, it may cause low-temperature burns.

If the coolant leaks onto hot surfaces or open flames, it can decompose into toxic substances. In the environment, the coolant evaporates immediately, so it is important to ventilate the area quickly.

Do not install the machinery on floors above or below ground level without adequate emergency exits.

The machinery cannot be used in environments where there is risk of explosion or fire.

The operator is responsible for disposing of the coolant and all parts that make up the machine.

-  Wear protective gloves for routine or extraordinary maintenance.
-  Always install the machine in accordance with the regulations in force in the country of installation.

When lifting the machine, please refer to the following symbols:

-  Lift by crane: use all lift points indicated by the symbols.
-  Lifting using at least two forks.

4. INTENDED USE OF THE CHILLER

The chillers have been designed and are intended exclusively for cooling water-based hydraulic circuits, glycol solutions (water + ethylene glycol). These machines are suitable for operation in industrial environments where the air temperature is between a minimum of -30°C and a maximum of 50°C . For operating temperatures outside this range, please contact the manufacturer's trade office.

STANDARD

Working fluid	Water or glycol solutions (water + ethylene glycol)
Ambient operating range	$-30^{\circ}\text{C} \div +50^{\circ}\text{C}$
Fluid operating range	$+20^{\circ}\text{C} \div +25^{\circ}\text{C}$

The WARRANTY will automatically become void in cases of unit failure caused by operation outside the above limits or failure to comply with this manual.

4.1 Improper use

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

- In a potentially explosive atmosphere.
- In a flammable atmosphere.
- In particularly dusty environments.

In addition, the use of the machine for prohibited uses is strictly forbidden. This includes:

- In a manner other than that provided for by the applicable law.
- Installed in a manner other than as prescribed in this manual.
- Installed outside the operational ranges.



It is strictly forbidden to use the machine for cooling flammable or explosive substances.

4.2 Recommended fluids

The water to be used in the cooling hydraulic circuit must comply with the values laid down in the drinking water regulations. If deionized water is used, the appropriate design changes must be made and requested from the manufacturer's technical office.

The water in the hydraulic circuit must not cause limestone scale or precipitation that might circulate throughout the system.

The liquid must be treated in an appropriate manner depending on the impurity of the liquid to be cooled and the size and structure of the recirculating cooling system.

In accordance with the drinking water regulation, the recommended limit values are:

Electrical conductivity at 25°C	80 ÷ 750 µS/cm
Total hardness	6° ÷ 20° dH
Appearance	Clear, without sediment
Color	Colorless
Bacterial load	<10,000 cfu/ml
PH value	4.5 ÷ 8.5



CAUTION: The water quality in the hydraulic circuit must be checked periodically. Due to the continuous evaporation of water, the concentration of the substances it contains may increase.

Contact the manufacturer for the compatibility of the materials within the hydraulic circuit with substances other than those indicated.



CAUTION: Do not use any liquids other than those specified. **Do not use propylene glycol in the hydraulic circuit.**

Antifreeze

The percentage of glycol required depends on the minimum achievable fluid temperature. The table gives the required amount of glycol as a volume percentage in relation to the minimum achievable fluid temperature.

Minimum fluid temperature [°C]	Amount of glycol needed [Vol-%]
> +5°C	No antifreeze required
-15°C	30 Vol-% TEXA Fluid 903-TX
-20°C	35 Vol-%
-25°C	40 Vol-%
-30°C	45 Vol-%
-35°C	50 Vol-%



The concentration of ethylene glycol in the water affects the cooling power of the machine. As the concentration of glycol increases, the cooling power decreases. Circuit load loss also increases as glycol concentration increases.

The use of the following product is recommended:

Fluid 903-TX

Fluid 903-TX is a product that has been specially designed for use in closed industrial circuits (indoor or outdoor), with limited topping-up of water. It is compatible with all common metals (iron, steel, copper and its alloys, aluminum and its alloys), as well as with plastics and rubbers. It has been designed to protect hydraulic circuits in industrial machines and machine tools, and in general in all systems requiring cold or hot water recirculation.

Its formula is composed of substances that allow for three fundamental actions to protect the system:

ANTI-FREEZE ACTION: prevents ice formation at temperatures around zero and lower;

ANTI-CORROSIVE ACTION: prevents corrosion by forming a protective film on metal walls;

BIOCIDE ACTION: prevents the growth of fungi, molds and bacteria by limiting the formation of biofilms.

C15001209 – Inhibited ethylene glycol, 25 kg can.

To be mixed with water



C15001218 – Water mix + Fluid 903-TX (30% concentration), 25 kg can.

READY-TO-USE product for temperatures down to -15°C



Fluid 903-TX must be mixed with pure water, not suitable for water with any material in suspension or brackish water. **NOT RECOMMENDED** for use with demineralized water or water treated by reverse osmosis. The concentration of **Fluid 903-TX** should be checked every six months and the solution should be clear.

Every 18 months, the water in the circuit must be completely replaced in order to ensure the optimum concentration of anti-corrosives and inhibitors, which degrade over time.

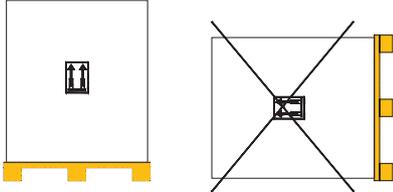
If liquids other than those mentioned above are used, the manufacturer's Technical Office must be informed of the type used and the operating conditions so that it can assess any compatibility or durability problems that could affect the hydraulic circuit components.

5. HANDLING AND STORAGE

5.1 Delivery checks

Upon receipt of the machine, carefully check the physical condition of the packaging. When unpacking (see the paragraph below for the unpacking), check that the machine has not suffered any impacts or damage during transit and that no oil is leaking from the circuit. Check that the machine has been transported in the correct position as indicated by the symbol on the packaging, as shown in the figure. Do not accept the goods if they arrived damaged – notify the manufacturer's offices immediately.

DO NOT accept the machinery if it has been damaged in transit.



5.2 Specifications for transportation and handling

The machinery must be transported upright as indicated on the packaging and without water. The machine is built to be handled using a forklift, pallet truck or crane.

The machinery must always be handled in such a way as to avoid any risk of damage.

Do not use unsuitable lifting equipment or lifting equipment that is inadequate given the total weight of the machine.

Before lifting the machine, carefully check that all removable panels are securely attached to the unit to prevent them from falling during lifting.

CAUTION: If the machine has not been transported in an upright position, the machine must be returned to an upright position and allowed up to three hours for the oil in the cooling system to drain into the compressor sump before starting.

CAUTION: The machine must be transported without liquid.

Important transport information:

Weight	(see "Technical data")
Dimensions	(see "Technical data")
Ambient temperature range	min -20°C ÷ max +65°C

If the machine is being transported in environments with a temperature below 0°C, ensure that the water circuit is completely drained.

5.3 Forklift handling

To transport the machine with a forklift, place the two forks under the unit at the front or rear (on larger models, use the longer side). The base is shaped to be carried by a forklift. Insert the two forks symmetrically to the center of gravity of the machine, inserting them along the entire length of the machine. The machine can then be lifted.



Use a very low speed when handling the machinery.

5.4 Pallet truck handling

A. Transport on front of the machine:

- The machine may only be handled from the front or rear by pallet truck if the following symbol is present:
- If the symbol is not present, only lift the machine using hooks and lift trucks and/or cranes. The crane forks must be longer than the length of the machine. **Use a very low speed when handling the machinery.**

B. Transport from the side of machine:

- The forks of the lift truck must only be inserted into the designated lifting holes on the side horizontally to the machine if the following symbol is present:
- If the symbol is not present, only lift the machine using hooks and lift trucks and/or cranes. The forks must protrude from the opposite side. Once this condition has been met, you are ready to lift the machine, taking into account the center of gravity. **Use a very low speed when handling the machinery.**

5.5 Crane handling

The machine can be lifted and transported by crane using all of the lifting points indicated by the following symbol.

- Lifting equipment:** suitable chains or rope slings can be used. Both means of transport are suitable for lifting and ropes or chains must be equal in length to meet lifting requirements. Make sure that the nameplates of the lifting equipment are compatible with the weight of the machine.

Use a very low speed when handling the machinery.

5.6 Storage

The machine must be stored in its original packaging. Before storing the unit, carefully check the following characteristics:

Weight	(see "Technical data")
Dimensions	(see "Technical data")
Ambient temperature range	min -20°C ÷ max +65°C

If the machine is stored in environments with a temperature below 0°C, carefully ensure that all water is completely drained from the hydraulic circuit.

5.7 Unpacking and inspection

WARNING: Disconnect power before starting any work inside the switchboard.

WARNING: Installation of the machine must be performed only by authorized and qualified personnel using appropriate PPE.

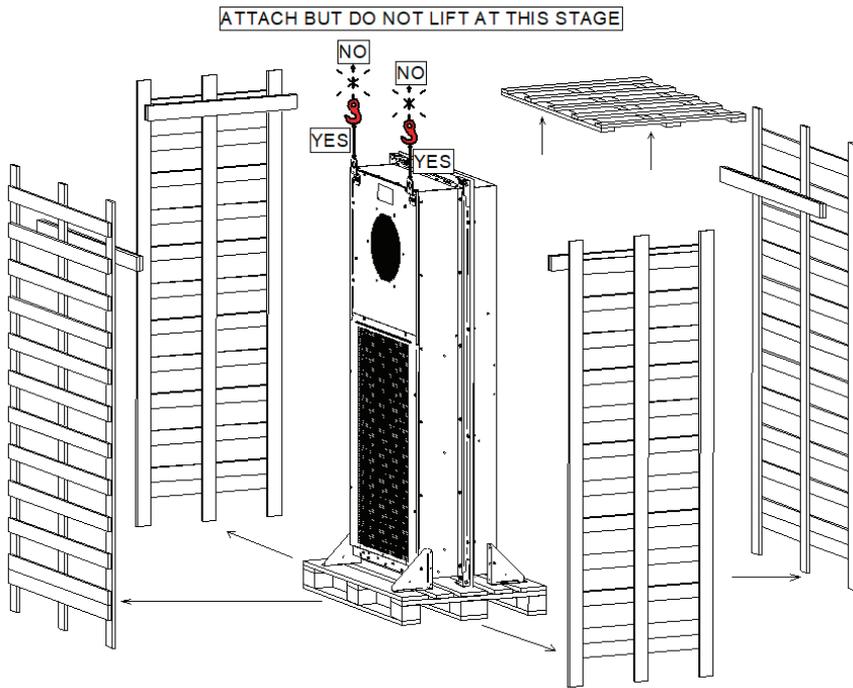
Inspection before unpacking:

Ensure that the chiller is placed upright, and is not allowed to lay flat or lie on its side. Please try to move the chiller to the place closest to the installation location before unpacking and disassembling to facilitate the movement of the chiller. Be careful to avoid scratching the surface of the unit during installation. If the product is not installed immediately, or the product needs to be transferred to other regions, repackage the chiller after the unpacking inspection is completed.

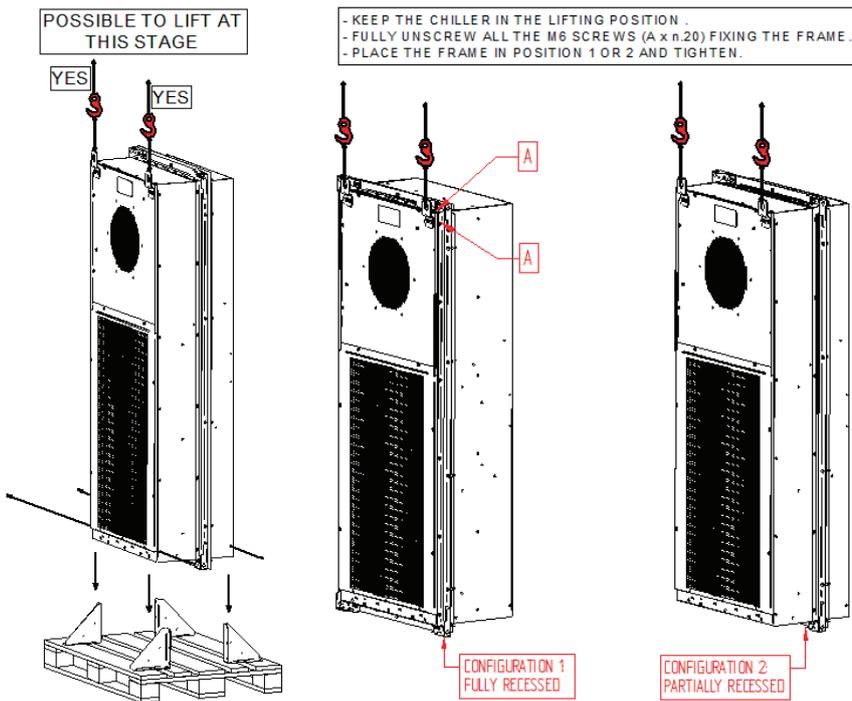
Do the following checks after unpacking:

Carefully check whether the chiller is damaged due to transportation, and pay particular attention to whether there are loose parts, pits, scratches, or liquid leakage. If any damage is found, please report it to the seller.

Unpacking procedure part. 1:



Unpacking procedure part. 2 and choice of mounting depth:



6.2 Electrical connection

! Check the machine's electrical nameplate carefully before making the electrical connection. **Make sure that the supply voltage is compatible with the nameplate voltage.** All installation operations must be carried out by qualified personnel.

Always refer to the machine wiring diagram before connecting.

! **WARNING:** The electrical connection and any work on the system or on electrical components must be performed solely by specialized and authorized personnel in compliance with electrical code and any other applicable regulations.

WARNING: Isolate the power to the enclosure during the connection phase.

WARNING: Ensure the machine is correctly earthed. Do not power on the device in the absence of a properly installed ground conductor.

! **WARNING:** Make sure the supply voltage is compatible with the voltage on the cooling unit's rating plate.

WARNING: Before removing any parts of the cooling unit, turn it off by disconnecting the supply voltage.

Disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.

WARNING: Before turning on the cooling unit, check the supply voltage and the transformer (T1) connection. See the wiring diagram for more details.

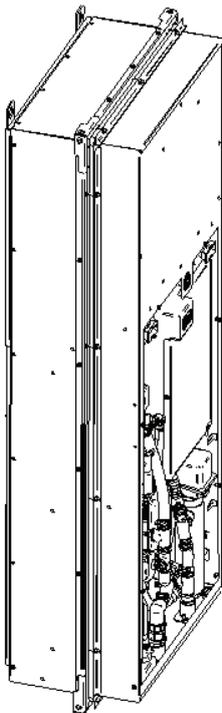
Connect the cooling unit to a three phase supply voltage. The neutral is not required. The cooling unit is rated:

The tolerance on all the supply voltages is $\pm 10\%$.

- 400 Vac 3 ph 50 Hz
- 460 Vac 3 ph 60 Hz

Connect the cooling unit to the supply line power by screwing the wires on the main magnetothermic switch, Q9, in the electrical panel inside the machine. Use an AWG10 wires for power supply with a tightening torque of 6 Nm (55 lb/inch). Use the GND terminal block near the magnetothermic switch (Q9) to connect the earth protection.

The wiring entrance is on the cooling unit's bottom. See the picture below.

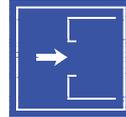


For the electrical panel's UL conformity, check the wiring diagram for the recommended protection on the distribution side and notes.

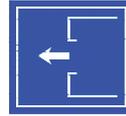
6.3 Hydraulic circuit filling and first start-up and regulation

When connecting the hydraulic system, it is good practice to follow the below guidelines and the current regulations of the country in which the machine is installed carefully.

Connect the hydraulic piping with isolating valves to the threaded sleeves at the rear of the machine, respecting the fluid inlet and outlet symbols:



Machine fluid intake **IN**



Machine fluid outlet **OUT**

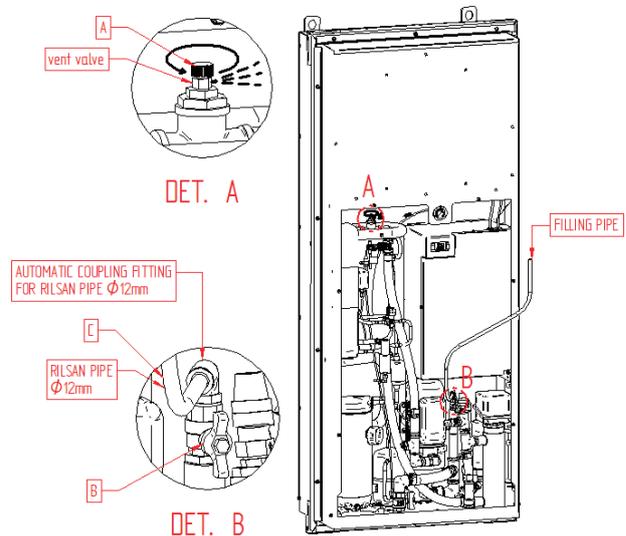
Prerequisites:

- The pipe connection of the coolant circulation system has been completed.
- Equip yourself with an automatic water pressure group as shown in the figure alongside.
- Equip yourself with a tank with a suitable volume of water and glycol to ensure complete filling of the entire circuit (refrigerator + destination system).



Coolant filling:

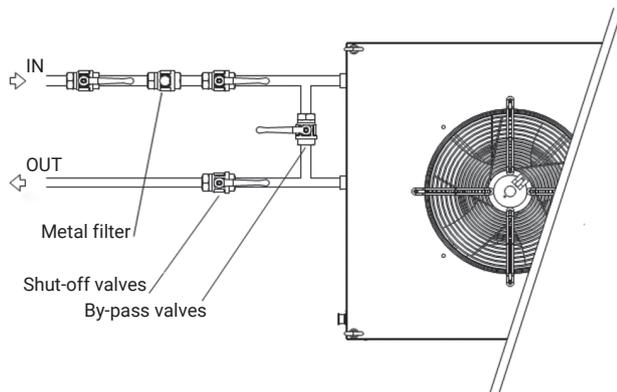
1. Rotate manual valve (B) to vertical position (OPEN).
2. Insert $\varnothing 12$ mm Rilsan type tube (C) into the automatic coupling and start filling.
3. Turn the vent valve (A) until only coolant comes out. Close the vent valve.



Hydraulic circuit:

! CAUTION: The hydraulic piping must be suitably sized for the nominal flow rate of the liquid and must also be bracket-mounted so as not to put weight on the chiller. The piping used must be flexible. Rigid piping must have flexible joints to balance the thermal expansion and absorb any vibration by the machine. The piping must be able to withstand the maximum hydraulic pressure of the machine.

- Provide two shut-off valves (sluices) to isolate the machine from the hydraulic circuit.
- Provide a metal mesh filter with a filtration rate of no more than 1 mm to protect the plate exchanger from debris or impurities in the pipes.
- Provide a hydraulic by-pass valve for flow control.



! CAUTION: While the electric pump is operating, do not close the delivery branch completely (with closed by-pass), otherwise the electric pump on the machine may become damaged.

With the on-board pressure gauge in conjunction with the delivery valve, it is possible to adjust the appropriate head for the hydraulic circuit. **CAUTION: Check the maximum pump head before operating the shut-off valve.**

6.4 Commissioning

Before starting the machine, some **preliminary checks** are necessary:

- Check that the rear panel are in place and secured by the appropriate fastening screws.
- Check that the electrical connections have been made correctly and that all terminals have been tightened.
- Check that the electrical panel is covered by its metal protection.
- Check that the fuses, if any, are in their housings (fuse holders).
- Check that the in and out hydraulic pipes have been connected correctly.
- Check that all the frame's screws and nuts are well tightened.

6.5 Extended periods of inactivity

If the system has to be stopped for an extended period during operation, it is essential to **fully drain the liquid**, not only from the collection tank but also from the pipes.

When restarting, it is important to take care when starting the pump, avoiding straining the electric motor in the event of a blockage. In this case, remove the cover located at the rear of the pump and use a tool on the impeller shaft.

6.6 Decommissioning and disposal

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

The machine is composed of materials that can be treated as secondary raw materials, and the following indications must be observed:

- a. The oil in the compressor sump must be removed, recovered and delivered to a specialist waste disposal service provider.
- b. Any antifreeze glycol must be recovered and must not be disposed of freely. It must be recovered and delivered to a specialist waste disposal service provider.
- c. Refrigerant must not be discharged into the atmosphere. It must be recovered and delivered to a specialist waste disposal service provider.
- d. Dehydrator filters and electronic components are special waste and must be recovered and delivered to a specialist waste disposal service provider.
- e. Insulation material must be removed and treated as municipal waste.

Legislation regulating the use of ozone-depleting substances forbids the discharge of refrigerant gases into the atmosphere and requires them to be recovered and delivered to specialized disposal centers.

 Particular care is recommended during all maintenance operations on the refrigeration system to minimize leakage of coolant gas into the atmosphere.

7. MAINTENANCE

 Before performing any activity on the unit or accessing internal parts, ensure that the power supply has been cut off.

Before working on the unit, carefully observe the safety instructions in chapter 3.

It is good practice to inspect the machine regularly to ensure it is working correctly. Routine maintenance does not require any

special conditions in terms of refrigeration engineering. It can therefore be carried out by trained and skilled personnel.

Maintenance operations are essential to keep the refrigeration unit in perfect working order, both from a functional point of view and from an energy-efficiency point of view.

7.1 Routine maintenance

Routine maintenance		
Groups/Components	Operation	Frequency
Cooling air circuit/ Framework	AIR FILTER – Clean or replace air filter (if present).	Monthly
	CONDENSER – Clean with compressed air and specific solvents, taking care not to damage the aluminum fins.	When needed
	STRUCTURE – Visually inspect the condition of the framework (points of corrosion or dents) and the fasteners.	Monthly
Chiller in general	VISUAL SYSTEM INSPECTION – Visually inspect machine operation using the digital thermostat (presence of alarms) and any fluid leaks in the hydraulic system.	Daily
	ELECTRICAL PARAMETERS – Check the current draw and that the electric motor terminals are properly connected.	Annually
	DOCUMENTATION – Check for documentation on the machine.	Annually
	COMPONENTS – Visually inspect the condition of the components on board the machine.	Annually
Hydraulic circuit	LINES – Visually check that the hydraulic circuit is properly sealed.	Daily
	FLUID LEVEL – Check the level of liquid in the collection tank and top up if necessary with the same mixture as originally used.	Daily
	FLUID – Check the quality of the fluid in the tank, the cleanliness and the concentration of any glycol.	Monthly
	PRESSURE – Check the circuit pressure through the water pressure gauge. This pressure must be compatible with the characteristics of the installed pump.	Monthly
Electrical circuit	VISUAL INSPECTION – Visually check that the components in the electrical panel are intact, and check the continuity of the earth conductors on the metal structures. Check the condition of the framework, door seals, direct contact protection structures, interlocks and locks. Visually inspect for dust or dirt.	Annually
	CLEANING – Clean the electrical panel as thoroughly as possible, removing all dust and dirt from cables, connections, components and framework. Avoid using compressed air. We strongly recommend carrying out cleaning without voltage present.	Annually
	CHECK CONNECTIONS – Check the condition of the power and auxiliary connections and tighten all connections. If there are signs of overheating on the connections and/or cables, such as burns or blackening, remove the defective part and restore it to its original condition. Ensure that the cables on the terminal block are not moving excessively and have not come away.	Annually

7.2 Condition based maintenance

 Condition based maintenance must only be performed by specialized personnel who are properly trained to work on refrigeration 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."

Intervention Type	Inspection	Control/Check		
	Visual inspection	Pressure test	Coolant leaks	HP pressure switch Max pressure valve
A	x	x	x	x
B	x	–	x	x
C	x	–	x	–
D	x	–	–	x

Inspection and monitoring operations are to be carried out by qualified personnel.

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.

The visual inspection operation includes all operations listed in paragraph 7.1 on routine maintenance.

7.3 Service Department

For any problem concerning machine malfunctions, technical information or installation advice, you can contact our Service Department.

Tel: 763.422.2211

Email: cooling.service@nVent.com

Download Field Service Request (FSR) from:

<http://HOFFMAN.nVent.com/en-us/cooling-field-service-request>

Before contacting the manufacturer's Service Department, always ensure that you have:

- A. The complete machine code.
- B. The machine serial number.

All repair requests must be sent to the manufacturer in writing by email.

! **CAUTION:** Machines may only be returned to the manufacturer following a written request and acceptance for return by the manufacturer

8. MALFUNCTIONS/TROUBLESHOOTING

Keep the specific accompanying documentation to hand for troubleshooting:

- Wiring diagram
- Hydraulic diagram

- Digital thermostat manual
- List of digital thermostat parameters

Refer to the attached digital thermostat manual for the warning lights on the digital thermostat.



FAULTS – TROUBLESHOOTING TABLE

Fault	Potential cause	Comments
THE SYSTEM IS NOT FUNCTIONING – No device is functioning	<ul style="list-style-type: none"> • Check the power supply. • Check the connection of the dedicated ignition terminals/remote shutdown. • Faulty electromechanical protections. 	<ul style="list-style-type: none"> • Check the operation of the electrical line and the electrical panel intended for powering the machine.
LOW PRESSURE ALARM/ INSUFFICIENT COOLING POWER The air leaving the condenser is a low temperature. Lack of coolant gas in the circuit.	<ul style="list-style-type: none"> • The lack of coolant gas causes a sharp drop in the cooling potential of the machine. There is a leak in the gas circuit. 	<ul style="list-style-type: none"> • Service by qualified personnel (refrigeration technician) must take action. • Contact Service Department.
HIGH PRESSURE ALARM/ COOLANT CIRCUIT PRESSURE INCREASE – If the maximum pressure of the cooling circuit is exceeded, the high pressure switch is triggered and switches off the cooling function of the machine. An alarm will appear on the electrical panel display.	<ul style="list-style-type: none"> • Failure to observe minimum separation distances (check diagram). • Ambient temperature too high (check environmental limits in technical data). • The temperature of the water on the hydraulic return line is too high (check limits in technical data). • Water outlet temperature outside the permitted limits (check technical data). • Insufficient water supply to condenser in water-cooled versions (check technical data). • Digital thermostat that manages the machine is faulty. 	<ul style="list-style-type: none"> • Contact the Service Department to restore the unit to normal operating conditions.
COMPRESSOR TURNING ON TOO OFTEN	<ul style="list-style-type: none"> • Cooling power of the machine is too high compared to the necessary level. • Lack of thermal flywheel in the system suitable for operation. • Start/stop differential of compressor too small (standard value +/-2°C). 	<ul style="list-style-type: none"> • Check the setup of the digital thermostat parameters.

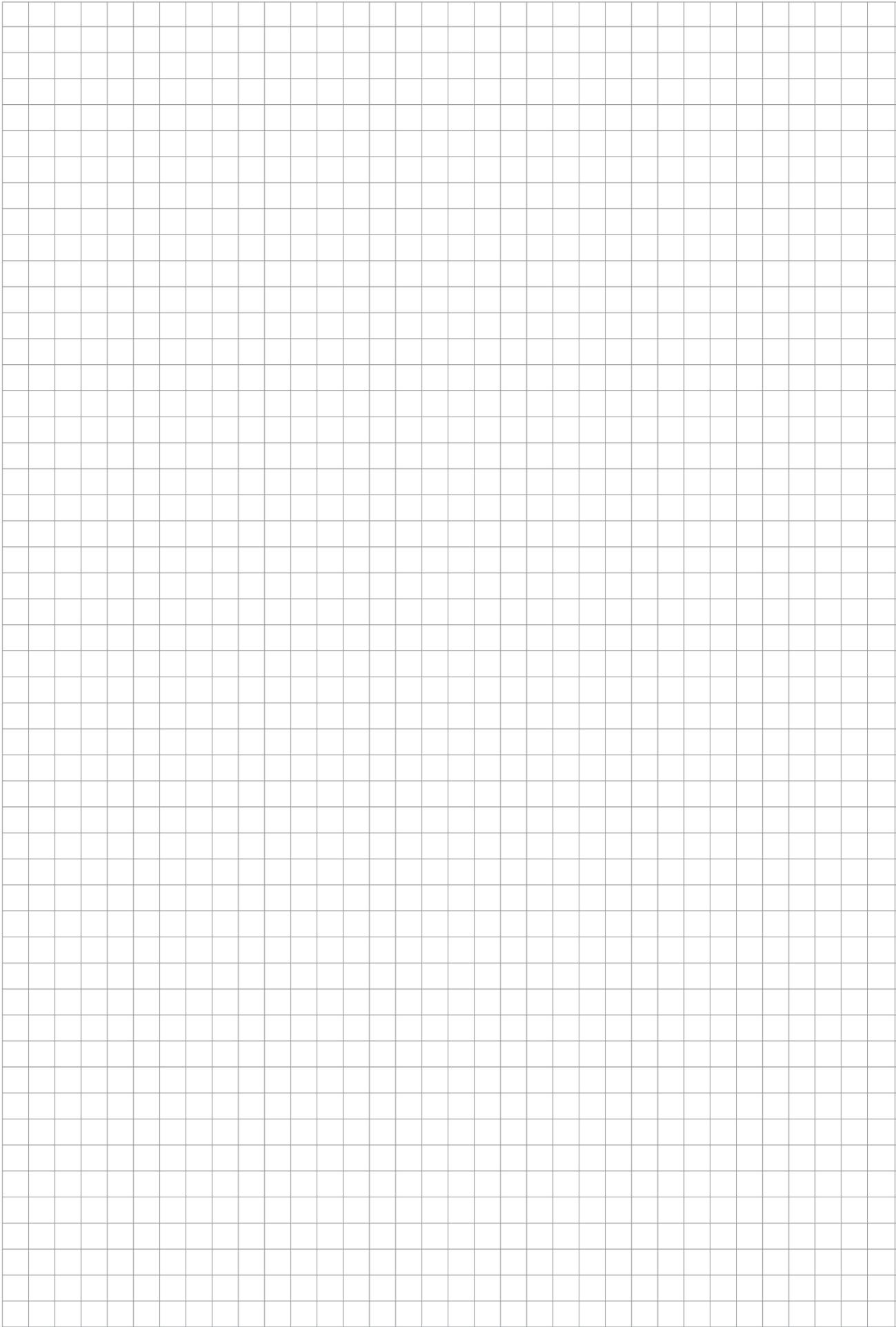


FAULTS – TROUBLESHOOTING TABLE

Fault	Potential cause	Comments
COMPRESSOR NOT RUNNING – Fault signal on the digital thermostat	<ul style="list-style-type: none">Compressor thermal protection trip	<ul style="list-style-type: none">Cooling circuit working pressure too high. Check the efficiency of the air filter (if fitted) – Check that the minimum operating distances are observed, and that there is no recirculation of expelled hot air.Ambient temperature too high.
FAN NOT WORKING – Fault signal on the digital thermostat	<ul style="list-style-type: none">Fan thermal protection tripping	<ul style="list-style-type: none">High pressure loss of ventilator, caused by obstructions to air flow. Fan damaged or blocked.Damaged electric in-rush capacitor (for single-phase versions)
ELECTRICAL PUMP NOT WORKING – Fault signal on the digital thermostat	<ul style="list-style-type: none">Tripping of electric pump thermal protection	<ul style="list-style-type: none">Pump is faultyCheck the pump pressure with the technical data given on the label
MACHINE RUNNING BUT LIMITED COOLING POWER – Compressor, fan and pump(s) are running but machine cannot cool down.	<ul style="list-style-type: none">Condensation air flow short circuited.Obstructions to the intake or outlet of condensation air.Clogged or dirty air condenser or air filter	<ul style="list-style-type: none">Remove any obstructions from the regular air flow.Position the machine within the minimum installation distances.Clean the condenser or replace the dirty air filter.
LIMITED COOLING POWER AND CONDENSATION ON THE COMPRESSOR – With risk of icing	<ul style="list-style-type: none">Insufficient water flow over the evaporator	<ul style="list-style-type: none">Check the operation of the electric pump, the pressure of the hydraulic circuit.

9. NOTES

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