

## Product manual EMCW

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# 1. About the manual

This manual contains valuable information regarding the Energy Machines™ EMCW machine. Please read it carefully and keep it in a safe place close to the machine.

## 1.1. Purpose of the manual

This manual:

- Describes the installation, operation, and maintenance of the machine.
- Provides important information on safe and efficient handling of the machine.
- Presents faultfinding and troubleshooting information.

Follow instructions in the order shown when presented as a numbered list. Items that do not require a specific order are shown as a bulleted list.

## 1.2. Explanation of symbols and warnings

Safety symbols and warnings are used throughout this manual:



### **DANGER**

Indicates a hazardous situation which, if not avoided, will result in a serious or life-threatening injury.



### **WARNING**

Indicates a potentially hazardous situation which, if not avoided, could result in a serious or life-threatening injury.



### **CAUTION**

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



### **NOTICE**

Indicates a possible risk to property, but no risk to people.



### **INFORMATION**

Indicates important information, but no risk to people or property.

## 2. Safety

This section contains important information on the safe operation of the machine. Read this information before using the machine.

The machine must only be used for its intended purpose. It must not be modified in any way. Energy Machines accepts no liability for damage due to incorrect installation, configuration, repair, service, or use.

### In the event of an emergency:

1. Disconnect the power supply to the machine if safe to do so.
2. In case of a fire, use a carbon dioxide fire extinguisher.
3. Raise the alarm and evacuate the building if necessary.



### **DANGER**

#### **Do not use water on machine fires**

- Using water on a machine fire can cause electric shock, electrocution, or death.
- ⇒ Only use a carbon dioxide fire extinguisher on machine fires.

## 2.1. Responsibilities

It is the responsibility of the operator to comply with all instructions in this manual. A thorough knowledge of the safety information and regulations is essential for safe handling and error-free operation of the machine.

### 2.1.1. Responsibility of the operator

Only authorized and experienced personnel may operate the machine. The maintenance, servicing, and dismantling of the machine are also restricted to authorized personnel.

The machine is not intended for use by people, including children, with reduced physical capabilities or lack of experience and knowledge. Children should be supervised while near the machine to prevent any play or interaction.

#### **The operator has the responsibility to ensure that work on the machine is only performed by individuals who:**

- Possess a knowledge of workplace safety information and accident prevention measures.
- Have received training in working with and operating the machine.
- Have read and understood this product manual.
- Possess the competence to install, maintain, and service heat pumps.
- Have expertise in electricity and/or refrigeration.

**It is also the operator's responsibility to:**

- Ensure that all safety signs on the machine remain legible.
- Replace safety signs that are damaged.

## 2.1.2. Responsibility of the user

**Users working with the machine have the responsibility to:**

- Comply with the workplace safety instructions and accident prevention measures.
- Follow all safety information within this manual.
- Read and understand the information regarding safety signs as presented in this manual.
- Follow the guidance displayed on the safety signs while operating the machine.
- Possess a comprehensive knowledge of how the machine functions.
- Read and understand the sections of this product manual related to the tasks being performed.
- Take action to resolve any fault or malfunction immediately.

## 2.1.3. Risks associated with machine operation

The machine has been constructed in accordance with the latest approved safety regulations.

As with any machine, there are risks associated with its operation. Follow the safety instructions and observe restrictions when operating, maintaining, servicing, and dismantling the machine.

**This chapter provides safety instructions and detailed operation risks including:**

- Risks to the health and safety of the user and others.
- Risks to the machine itself.
- Risks to property, goods, and equipment.

Only use the machine for its intended purpose and do not make modifications to it. Only use the machine when it is in proper working condition. Address any faults or malfunctions that could compromise safety immediately.

Energy Machines accepts no liability for damage caused by incorrect installation, configuration, repair, service, or use.

## 2.2. Safety information

**It is essential to adhere to the following safety precautions:**

- Installation, maintenance, and operation are restricted to authorized personnel only.
- Follow all warnings and instructions.
- Never bypass safety features.
- Only operate the machine when it is in proper working condition.
- Disconnect the power supply before any maintenance work.
- Do not rinse the machine with water.
- Keep all safety panels in place during installation to avoid water exposure to electrical components.

## 2.3. General safety instructions

Pay careful attention to the following instructions regarding safety, as they concern potential hazards that may arise during use of the machine.

### 2.3.1. Personal protective equipment

Personal protective equipment (PPE) must be worn while operating, installing, or repairing the machine. PPE should be designed to protect against heat, cold, hazardous chemicals, and electrical shock, as appropriate.

**PPE should include:**

- Protective clothing
- Protective gloves
- Safety glasses
- Protective shoes
- Hearing protection
- Protective respirator

### 2.3.2. Sources of ignition

All possible ignition sources, including cigarette smoking, should be kept away from the site of installation, repair, storage, and disposal.

Prior to work taking place, the area around the machine should be surveyed to ensure there are no flammable hazards or sources of ignition.

Display "*No smoking*" signs clearly near the installation site.

### 2.3.3. Dangers



#### **DANGER**

##### **High voltage electricity**

The following can cause electric shock, electrocution, or death:

- Touching live electrical parts
  - Direct contact to electrical equipment
  - Disruptive discharge from electrical equipment
  - Electric arcs from electrical equipment
- ⇒ Always disconnect from the power supply before maintenance.



#### **DANGER**

##### **Heavy machinery**

- Heavy machinery falling can cause injury or death.
- ⇒ Do not go under the machine while it is being lifted.



#### **DANGER**

##### **Unstable machinery**

- Unstable machinery can cause injury or death.
- ⇒ Keep a safe distance from an unstable machine.

### 2.3.4. Warnings



#### **WARNING**

##### **High voltage electricity**

- Touching live electrical components can cause injury or electric shock.
- ⇒ Wear appropriate PPE.
- ⇒ Always disconnect from the power supply before maintenance.



#### **WARNING**

##### **Extreme temperatures**

- Release of heat transfer fluid or discharge from safety valves can result in burns, scalds, frostbite, or other injuries.
- ⇒ Wear appropriate PPE.



**WARNING****Fluid leaks and fumes**

- Inhalation of fumes from heat transfer fluid can cause irritation, respiratory disease, or breathing difficulties:
- ⇒ Wear appropriate PPE.
- ⇒ Avoid working in confined spaces.

**WARNING****Entanglement**

- Getting caught or tangled in machine parts can cause physical injury.
- ⇒ Do not operate the machine while wearing loose-fitting clothing.
- ⇒ Prior to operating the machine, remove jewelry and secure long hair.

**WARNING****Risk of personal injury**

- Piercing or burning the machine can lead to hazardous emissions or fire.
- ⇒ Do not pierce or burn the machine, even after use.

### 2.3.5. Cautions

**CAUTION****Injury from fire**

Fire from the following can cause burns or scalds:

- Electrical equipment faults
  - Brazing, welding, grinding, or abrasion work
- ⇒ Wear appropriate PPE.
- ⇒ Follow the evacuation procedure if necessary.

**CAUTION****High voltage electricity**

- Short-circuit in electrical equipment can result in burns or scalds.
- ⇒ Always disconnect from the power supply before maintenance.

**CAUTION****Hot surfaces**

- Touching hot surfaces can cause burns or scalds.
- ⇒ Wear appropriate PPE.

**CAUTION****Cold surfaces**

- Touching cold surfaces can cause frostbite.
- ⇒ Wear appropriate PPE.
- 

**CAUTION****Risk of falling**

- Condensation of water on cold surfaces can result in slips or falls.
- ⇒ Wear appropriate PPE.
- ⇒ Be vigilant of water on floors and surfaces.
- 

**CAUTION****Sharp edges and hard surfaces**

- Negligent physical contact with the machine can result in bruising, cuts, or lacerations.
- ⇒ Wear appropriate PPE.
- ⇒ Do not strike the machine.
- 

**CAUTION****Risk of injury**

- Poor working posture can cause discomfort or pain.
- ⇒ Maintain proper working posture.
- 

**CAUTION****Loud noises**

- Loud noises can cause discomfort or hearing damage.
- ⇒ Wear appropriate PPE.
- 

**CAUTION****Injury from leaked fluid**

Leaked or spilled fluid can cause injuries, such as:

- Frostbite
  - Injuries from slips or falls
- ⇒ Wear appropriate PPE.
- ⇒ Stay vigilant for leaks or spills on surfaces and floors.
-

## 3. Machine overview

This chapter provides information regarding the machine and its intended operating environment.

### 3.1. Machine description

The EMCW is a cohesive unit, where all exchanger pumps and valves are pre-connected and tested before leaving the factory. The machine is delivered factory-finished, requiring only on-site connection to pipework and electricity. Equipped with control valves and circulation pumps, the unit integrates into an energy system to fulfill the required temperature levels.

### 3.2. Intended use

The EMCW heat exchanger pump units are specifically intended for cooling purposes. They are designed to cool both spaces and water. The water can either be used directly or for other cooling purposes.

### 3.3. Prohibited use



#### **WARNING**

##### **Water not fit for human consumption**

- Hot or cold water produced by the machine can cause personal harm if consumed.

⇒ Do not consume water produced by the machine.

The machine must be installed in a location away from flammable materials and potentially explosive gas atmospheres.

Only authorized and experienced personnel may operate this machine. The maintenance, servicing, and dismantling of the machine are also restricted to authorized personnel.

The machine is not intended for use by persons, including children, with reduced physical capabilities or lack of experience and knowledge.

### 3.4. Key machine specifications



#### **INFORMATION**

For specific values, refer to the *project datasheet* and *dimensional drawing*.

Power supply depends on the customer's specification. Usually, it is a 3-phase system with either 400 V at 50 Hz or 480 V at 60 Hz.

## 3.5. Controls and displays

Use the machine's control panel to start the machine and acknowledge any alarms. Default parameters are set during factory testing. Project-specific parameters need to be set during commissioning. Modifying parameters is possible via the Energy Machines Cloud.

## 3.6. Operating environment

**Energy Machines units must be operated in the following conditions:**

- Operated indoors only, where the temperature is 16°C–30°C (60°F–86°F) and at no more than 60% relative humidity.
- Protected from wind, rain, and snow.
- Located in an area that is not accessible to the public, preferably in a separate machinery room, with adequate ventilation.
- Operated on flat ground with a maximum inclination of less than 3 millimeters per floor meter (or less than 0.11 inch per yard).
- Secured at its installation place according to the installation and commissioning instructions included in this manual.
- Kept away from flammable materials or potentially explosive gas atmospheres.

## 4. Transportation, handling, and storage

This chapter provides information about transporting, handling, and storing the machine.

### 4.1. Transportation

The machine is stored on a pallet for transportation and relocation. The pallet protects against damage to the machine.

#### Delivery inspection

- Review the packing slip to ensure the correct machine and accessories have been delivered. For more details, see the list of components provided along with the machine.
- The machine is delivered wrapped in plastic and bolted to a pallet.
- Inspect the machine for transport damage and report any damage to the delivery service immediately.

#### Unpacking

- Leave the protective plastic wrapping in place as long as possible to protect the machine.
- Only cut the plastic loose around the pallet and make holes in the plastic to access connection points for piping and electricity connections.

#### Location of accessories during transport

- Vibration dampers are bolted to the pallet on the same end as the control cabinet.
- Cable grommets can be found in the control cabinet.
- Pipe connections are either mounted on the machine or supplied in a separate box.
- External temperature sensors are supplied in a separate box if requested.

### 4.2. Handling the machine



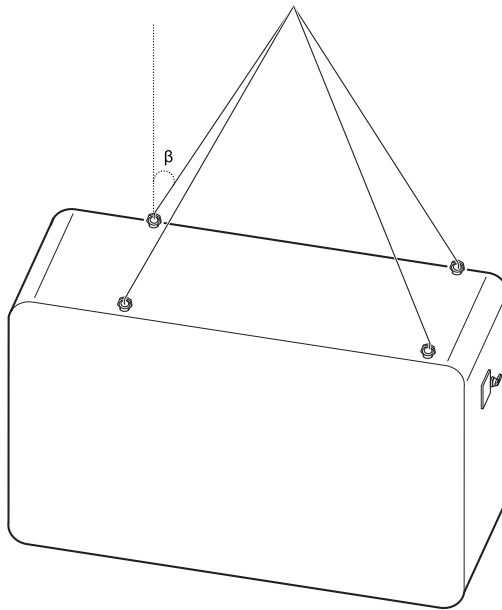
#### DANGER

##### Heavy machinery

- There is a risk of serious personal injury or death if the machine falls or tips over during transportation.
- ⇒ Only use appropriate lifting equipment that has been approved for the weight and dimensions of the machine.
- ⇒ Do not go under the machine while it is being lifted.

### Lifting from above

The machine can be lifted from above using a crane approved for the intended size and weight specifications. The angle  $\beta$  should not exceed  $45^\circ$  when lifting.



*Figure 1: Lifting from above*

## 4.3. Storing the machine

Follow these guidelines to prevent machine damage during storage:

- Store the machine in its protective plastic wrapping prior to installation.
- Maintain a storage temperature of over  $5^\circ\text{C}$  ( $41^\circ\text{F}$ ) and at no more than 60% relative humidity.
- Keep storage space adequately ventilated.
- Do not stack or store any objects on top of the machine.
- Do not climb, walk, or work on top of the machine.

## 5. Installation and commissioning

This chapter provides instructions for installing and setting up the machine.



### INFORMATION

Only authorized personnel are permitted to carry out installation and commissioning of the machine.



### INFORMATION

Do not install the machine at altitudes of 2000 meters (6562 feet) or above.



### NOTICE

#### Risk of machine damage

- Exposure to water can damage the machine.
- ⇒ Fit side panels onto the machine during installation to protect against water exposure.



### NOTICE

#### Risk of machine damage

- Hydraulic shock can damage the machine.
- ⇒ Design and install piping to minimize risk of hydraulic shock.

### 5.1. Installing the machine

**Energy Machines units must be installed in accordance with the following indoor conditions:**

- Kept where the temperature is 16°C–30°C (60°F–86°F) and the relative humidity does not exceed 60%.
- Protected from wind, rain, and snow.
- Located in an area with adequate ventilation.
- Located in an area that is not accessible to the public, preferably in a separate machinery room.



### CAUTION

#### Slippery surfaces

- Higher relative humidity can cause condensation on cold surfaces of the cooling system, which can lead to slippery surfaces.
- ⇒ Keep machine in conditions with no more than 60% relative humidity.

**The installation of the machine must meet the following conditions:**

- Installed, serviced, and maintained by authorized personnel only.
- Installed on flat ground with a maximum inclination of less than 3 millimeters per floor meter (or less than 0.11 inch per yard).
- Bolted permanently to the floor through vibration dampers.
- Connected permanently to electricity with fixed wiring.
- Secured in a specific location as instructed in the *dimensional drawing*.
- Installed away from flammable objects or potentially explosive gas atmospheres.

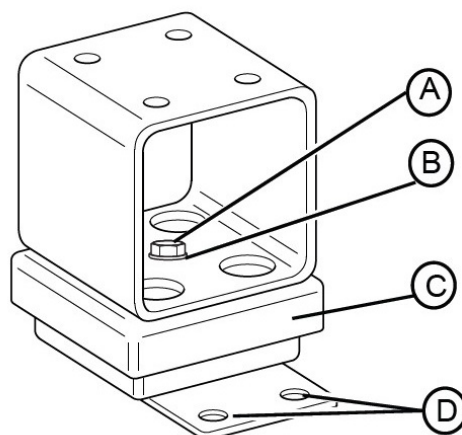
**INFORMATION**

The accessibility requirement for maintenance and servicing is presented in the *dimensional drawing*.

### 5.1.1. Setting up the machine

**See the following instructions for setting up the machine:**

1. Remove the bolts holding the machine onto the pallet.
2. Ensure lifting equipment is approved for the size and weight specifications of the machine.
3. Once it has been lifted off the pallet, attach the vibration dampers to the machine (See *Figure 2: Vibration dampers*).
4. Position the machine in the installation location.
5. Ensure that all vibration dampers are evenly in contact with the floor.
6. Permanently secure the machine in place with securing bolts through the attachment holes of the vibration dampers. (See *Figure 2: Vibration dampers*, item D)



A: Securing bolt M12x20

B: Washer M12

C: Vibration dampers

D: Attachment holes

**Figure 2: Vibration dampers**



## 5.2. Commissioning

Energy Machines units should be connected to appropriate heating, cooling, or heat transfer circuits.

### 5.2.1. Piping connections

Only qualified personnel should perform pipe installation work. Follow all local regulations. For more information, see the *piping instrument diagram*.



#### INFORMATION

Pipe couplings and compensators that are needed for installation are not included with delivery.



#### INFORMATION

Safety valves on the secondary circuits are not included with delivery.



#### INFORMATION

The machine's heating and cooling systems are empty upon delivery. Install each system in accordance with the *piping instrument diagram*.

**Observe the following while performing pipe installation work:**

#### Heating and cooling systems

- Only use connection parts that are designed for use in the heating or cooling system.
- Avoid putting any strain on the machine when attaching the piping.
- Test the pressure of the heating and cooling systems in accordance with the applicable standard.
  - The test pressure should be at least 1.1 times the maximum operating pressure of the heating and cooling systems. For example, if the maximum operating pressure is 10 bar, then the test pressure should be 11 bar.
- Ensure the machine and electrical parts are not exposed to water during operation.
- Prior to filling the system with fluid, flush any impurities from the pipe system that may have accumulated during installation.
- Fill the system with fluid as stated in the project specifications.
- Install a strainer in the heating and cooling systems.
- Avoid excessive vibration or pulsation to the piping of the heating and cooling systems.

**Insulation of the heating and cooling systems**

- Steel pipes and components must be protected with rustproof coating prior to applying insulation.
- Insulate the heating and cooling systems entirely to prevent condensation, energy loss, and accumulation of debris.
- Be aware that long runs of piping may expand and contract during operation.

**Shut-off valves**

- Fit the shut-off valves as close to the machine as possible for ease of maintenance.
- Fit the shut-off valves on both sides of the filter for ease of cleaning.

## 5.2.2. Electrical installation

Only a qualified electrician should carry out electrical installation tasks. Follow local regulations during installation.

**WARNING****Risk of electric shock**

- Electric shock can cause serious personal injury or death.
- ⇒ Wear appropriate PPE.

Energy Machines units should be connected to electricity with fixed wiring.

**Observe the following during installation of the electrical system:**

- All circuit breakers in the machine are in the 0 position upon delivery.
- Check that the power supply to the machine matches the *electrical wiring and circuit diagram*.
  - The voltage level tolerance is  $\pm 10\%$  and the phase-to-phase voltage unbalance tolerance is  $\pm 3\%$ .
- Dimension main fuses and switches in accordance with the machine's specifications.
- Fill the circuits before turning on the machine's power supply to avoid dry running the pumps.
- Ensure the main power switch is turned off before measuring the insulation resistance in the electrical property.
- Run the external sensors cable via the top of the machine.
- Use automatic fuses and overload protectors to safeguard the internal circulation pumps, automation systems, and their cables.
- Refer to the component manufacturers' specifications for the required tightening torque values.

- Install components where they are unlikely to be exposed to any corrosive substances unless they are adequately protected.
- Ensure all cabling is protected from adverse environmental conditions such as wear, corrosion, excessive pressure, vibration, and sharp edges.

### 5.2.3. Inspection points during commissioning

Ensure that all the following inspection points have been performed prior to starting the machine for the first time.

#### Electricity inspection

- Ensure that all electrical connections have been installed correctly before turning the power on.
- Ensure that external connections and sensors are connected to the machine's control cabinet in accordance with the *electrical wiring and circuit diagram*.

#### Heating and cooling system inspection

- Check that the external components (pumps, valves, etc.) are correctly installed in accordance with the project specifications.
- Check that the heating and cooling systems are filled with fluid.
- Check that the cooling system filter has been cleaned after de-aeration.
- Ensure there is pressure in the heating and cooling systems and that they have been vented.

#### Prior to starting the machine

1. Turn the machine main switch to the ON position.
2. Turn the pump switches to the ON position.

#### Starting the machine

1. Start the machine by pressing the ON button on the control panel.

## 6. Handling fluids

This chapter provides instructions regarding the handling of fluids required for machine operation.



### WARNING

#### Risk of personal injury

- Negligence to obey safety instructions can cause serious personal injury.
- ⇒ Obey all safety instructions.



### WARNING

#### Risk of fire

- Machine fluids can be flammable.
- ⇒ Ensure proper earthing and bonding while emptying and filling fluids to reduce the risk of fire.



### NOTICE

#### Risk of machine damage

- Using incorrect fluids can cause system inefficiency or machine failure.
- ⇒ Only use fluids recommended by the manufacturer.



### NOTICE

#### Risk of machine damage

- Fluids and systems are sensitive to contamination.
- ⇒ Ensure the surrounding area and tools are clean while performing maintenance work.

### 6.1. Heat transfer fluid

Follow all safety instructions included on the heat transfer fluid label.



### INFORMATION

Verify the heat transfer fluid details within the project documentation.



### NOTICE

#### Risk of machine damage

- Using incorrect fluids can damage the machine.
- ⇒ Refer to the *material safety datasheet* for comprehensive information on the heat transfer fluid.

### 6.1.1. Storing and handling heat transfer fluid

Follow all local regulations when storing and handling heat transfer fluid.

**When storing or handling heat transfer fluid, always:**

- Wear appropriate PPE.
- Store in original packaging in a dry location, away from direct sunlight, at a temperature below 40°C (104°F).
- Handle and store fluid separate from hot or flammable conditions.
- Ensure adequate ventilation.
- Wash hands after handling heat transfer fluid.
- Eliminate and prevent static electricity.
- Ensure proper earthing and bonding while emptying and filling.

### 6.1.2. Transporting heat transfer fluid

Follow all local regulations when transporting heat transfer fluid. Refer to the heat transfer fluid *material safety datasheet* for more information.

### 6.1.3. Filling the heat transfer fluid

**Equipment**

- Refractometer
- Heat transfer fluid

**Instructions**

1. Use the project specifications to determine the correct concentration of heat transfer fluid.
2. Fill the fluid until the required amount can be observed in the expansion tank.
3. Check the freezing point of the heat transfer fluid with the refractometer.

### 6.1.4. Draining the heat transfer fluid

**Equipment**

- Container (50–200 liters)

**Instructions**

1. Connect the container to the system.
2. Ensure the cover of the container is open to allow air to come in.
3. Drain the system.

### 6.1.5. Checking the freezing point (cold side only)

Monitor the heat transfer fluid's freezing point at least once a year as part of regular maintenance.

**Equipment**

- Refractometer

**Instructions**

1. Take a sample of the fluid from the cooling circuit.
2. Test the freezing point of the fluid using a refractometer.
3. Confirm the desired freezing point value within the project specifications.
4. If the freezing point does not meet the desired value, adjust the freezing point:
  - If the freezing point is too high, add concentrated heat transfer fluid to the cooling system.
  - If the freezing point is too low, add water to the cooling system.
5. Test the freezing point again.
6. Continue adjusting until desired freezing point is achieved.

## 6.2. Recycling and disposing of fluids

Collect used fluids in tightly sealed containers for disposal at a local hazardous waste recycling station.

Do not mix different types of heat transfer fluids.

The containers with used fluids should be delivered to a certified recycling center in accordance with local regulations.

## 7. Original machine manufacturer settings

The settings for the specific unit delivered are programmed at the factory during the unit functionality assurance test. It is only possible to make changes to the manufacturer settings via the Energy Machines Cloud.

### 7.1. Safety features of the machine

The machine is equipped with safety features. All safety features are set at the factory during the unit functionality assurance test. Safety features can be adjusted via the Energy Machines Cloud.

Safety feature	Description
Flow switch	The flow switch monitors and controls the flow rate if there is a lack of flow detected.
Safety valves	These valves protect the circuit from overpressure, preventing potential damage to the machine.
Pump motor protection	Pump motor protection monitors the functions of the pump motor while in operation. It provides protection against motor overheating and overloading. If the motor is found to operate outside its normal parameters, the system will shut down.



## 8. Operation

Energy Machines units are self-contained, independently operating machines. These units do not require the continuous presence of an operator.



### DANGER

#### Risk of personal safety

- Failure to follow instructions can lead to serious personal injury or damage to property and materials.
- ⇒ Follow all instructions regarding machine operation.



### INFORMATION

The side panels around the machine act as a safety feature and help to reduce noise emitted from the machine. Keep side panels in place during use.

### 8.1. Starting the machine

Before starting the machine, ensure the machine is in good working condition by checking the following points.

Category	Ensure the following:
Correct installation	<ul style="list-style-type: none"> <li>• All external components (pumps, valves, etc.) are correctly installed.</li> <li>• All safety valves have discharge pipes installed.</li> <li>• All safety features are working correctly (pressure switches, flow switch, and freeze protection switch).</li> <li>• The heating and cooling systems have safety valves installed.</li> <li>• The heating and cooling systems have been vented.</li> </ul>
Flow and pressure	<ul style="list-style-type: none"> <li>• The heat transfer fluid flows freely through the heat exchangers.</li> <li>• There are no leaks in the heating and cooling systems.</li> <li>• There is pressure in the heating and cooling systems.</li> </ul>

Category	Ensure the following:
Electrical connection	<ul style="list-style-type: none"><li>• All electrical connections have been installed correctly.</li><li>• External connections are connected to the machine control cabinet in accordance with the <i>electrical wiring and circuit diagram</i>.</li><li>• The electrical wiring has the correct phase sequence.</li></ul>

When each of the points above is acknowledged, press the ON button on the machine's display.

## 8.2. Switching off the machine

To switch off the machine, press the OFF button on the machine's display or via the Energy Machines Cloud. After shutting off the machine, the pumps will run for a short period of time before stopping.

## 8.3. Standby

**Check the following when the machine is on standby:**

- Set the motor protection breaker to the OFF position to ensure the machine does not start while on standby.
- In the case of extended standby, the power supply should be switched off via the machine's main switch.
- Store the machine at a temperature of at least 5°C (41°F).

## 9. Maintenance

This chapter provides information regarding maintenance of the machine.



### DANGER

#### Risk of personal safety

- Failure to follow instructions can lead to serious personal injury or damage to property and materials.
- ⇒ Always read the safety information before use, maintenance, or repair of the machine.

### 9.1. General maintenance instructions

The machine should be serviced at least once every 6 months.

Maintenance should only be carried out by authorized personnel.

**The following inspections should be performed regularly:**

- Ensure the unit is working correctly and there are no visible signs of damage.
- Ensure that the machine does not make any abnormal noises during operation.
- Check for any leaks.
- Ensure there is no smoke, fire, or burning smell.
- Check for ice, corrosion, or fouling on visible pipework.
- Address any fault codes presented on the machine's control panel. See the chapter regarding troubleshooting for details on the fault codes.



### WARNING

#### Risk of personal injury

- Repairing or changing electrical components incorrectly can lead to personal injury.
- ⇒ Do not repair sealed electrical components.
- ⇒ Always follow the manufacturer's maintenance and service guidelines when changing electrical components.



### NOTICE

#### Risk of machine damage

- Removing ice mechanically can cause damage to the machine.
- ⇒ Do not remove ice using machinery or mechanical devices.



### INFORMATION

For detailed information on individual components, refer to the manufacturer's documentation for that specific component.

## 9.2. Service interval

Perform preventive maintenance on the machine at least once every 6 months.

## 9.3. Avoiding overpressure

A smooth flow through the heat exchangers must be ensured to prevent overpressure.

**Flow occurs when:**

- All valves in the heating and cooling systems are open.
- The external strainers are clean.

To protect the circuit against overpressure, the machine has factory-fitted safety valves.

Safety valves should also be fitted in the heating and/or cooling systems.

**Perform the following during regular maintenance:**

- Visually inspect the safety valves.
- Check that the external strainers are clean.
- Ensure that all valves are open and in the ON position after a service.

## 9.4. Cleaning and sanitizing

Energy Machines units do not require regular cleaning or sanitizing. There is no obligation to clean the machine during normal use.

If cleaning is necessary, the machine must first be disconnected from the power supply. The machine may be wiped with a soft, dry cloth. Do not splash the machine with water. Do not use detergent or solvents.



### DANGER

**Risk of electrocution**

- Splashing or washing the machine with water can cause electric shock.
- ⇒ Do not splash or rinse the machine with water.



### NOTICE

**Risk of machine damage**

- Washing the machine with corrosive detergent or solvent can damage the machine.
- ⇒ Do not use corrosive detergent or solvent on the machine.

## 10. Troubleshooting and repair

When troubleshooting, check the alarm codes presented on the machine's control panel.



### NOTICE

#### **Risk of machine damage**

- Addressing alarm codes incorrectly can result in potential damage to the machine.
- ⇒ Unless stated otherwise, only authorized technicians should handle alarm codes.
-

# 11. Dismantling and decommissioning

Only authorized personnel should handle the dismantling and decommissioning of the system and its components.

- **Ensure the following during dismantling and decommissioning:**
  - Appropriate personal protective equipment (PPE) is worn.
  - Electrical power is available while recovering the heat transfer fluid.
  - Appropriate handling equipment is available to handle the heat transfer containers.
  - All equipment and containers meet local and national regulations.

**The machine should be dismantled in the following order:**

1. Drain the fluid from the heating and cooling circuits.
2. Disconnect the unit from the power supply.
3. Dispose of fluids and components according to local regulations.

For more information on these points, see the chapter concerning the handling of fluids.

## 12. Additional documents

**The following documents are provided with the machine:**

- Product datasheet
- Product manual
- Component list
- Material safety datasheets (MSDS)
- Dimensional drawing
- Piping instrument diagram
- Electrical wiring and circuit diagram
- Declaration of conformity

## 13. Glossary

Term	Definition
De-aerate	The removal of air from the heating or cooling systems.
Heat exchanger	A device that facilitates the transfer of heat between two mediums, such as the refrigerant and the heat source.
Manifold	A piece of equipment that is used to either split or combine mediums such as liquids or gases.
Manometer	A device used to measure the pressure of mediums such as liquids or gases.
Refractometer	A device used to measure the concentration of a particular substance in fluids.



## 13.1. Abbreviations

Abbreviation	Definition
Al	Aluminum
BMS	Building management system
°C	Celsius Denotes temperature in the Celsius scale
Cu	Copper
°F	Fahrenheit Denotes temperature in the Fahrenheit scale
Hz	Hertz
In Hg	Inch mercury Denotes pressure in the Imperial system
K	Kelvin Denotes temperature difference in the Kelvin scale
LAN	Local area network
Pa	Pascal Denotes pressure in the SI system
PPE	Personal protective equipment
V	Volt Denotes voltage of the electrical system



**Energy Machines ApS Denmark** Nicolai Eigtveds Gade 26, 1402 Copenhagen | Niels Jernes Vej 14, 9220 Aalborg Ø  
**Energy Machines Oy Finland** Emäsalontie 271, 06950 Emäsalo **Energy Machines Inc. USA** 110 East 25th Street, New York, NY 10010  
**Energy Machines AB Sweden** Norra Skeppsbron 7A, 803 10 Gävle | Regnbågsgatan 3, 417 55 Gothenburg  
Mariehällsvägen 37 F, 168 65 Bromma | Hyllie Boulevard 34, 21532 Malmö  
[hello@energymachines.com](mailto:hello@energymachines.com) | [energymachines.com](http://energymachines.com)