

Users Manual for
Thorén Heatpump
THOR

THORÉN
VÄRMEPUMPAR



THORÉN
VÄRMEPUMPAR

Thorén Värmepumpar AB
Vintervägen 2 , 870 16 Ramvik, Sweden
Telefon +46(0)612-425 00
www.thorenvarmepumpar.se

Thorén Värmepumpar AB Vintervägen 2 , 870 16 Ramvik, Sweden
Telefon +46(0)612-425 00
www.thorenvarmepumpar.se

Thank you for buying a heat pump from Thorén!

You contribute to a better environment and at the same time decrease your heating costs. Thorén has manufactured heat pumps since 1965 and has a large number of satisfied customers. We have manufactured your heating system and we hope that you will be completely satisfied.

Quality norms

All Thorén heat pumps are manufactured according to current norms for refrigerants. Normally we use the environmentally friendly refrigerant HFC with the reference R 407 C. For some other applications other refrigerants are used, for instance R 134 a.

The compressor is lubricated by the environment adjusted ester oil Mobil EAL (Environmental Awareness Lubricants).



Thorén Värmepumpar AB is certified according to the environment guide-system the HN-modell.



Thorén Värmepumpar AB is member of, and was one of the founders of the Swedish Heat pump association SVEP 1979.

CE-declaration according to EU directives

Thorén certifies that the product covered by this certification is in compliance with the EU directive for machines 89/392/EEC with supplement directive 91/368/EEC, 93/94.

Glossary

Collector	The circuit consisting of for instance a polyethylene hose in the ground, rock or a lake taking up the heat. A collector can also take heat from the air, in for instance a heat exchanger for outgoing air.
Cold carrier	The liquid in the collector
Vaporizer	The heat exchanger that takes up the heat from the cold carrier and transfer it to the refrigerant
Refrigerant	The liquid that is being pumped by the compressor and transfers the heat from the vaporizer to the condenser
Condenser	The heat exchanger that take up heat from the refrigerant and transfers the heat to the heat carrier.
Heat carrier	The water that circulates in the heat pump and the radiator system. The condenser heats this water.
Heat factor	The relation between ingoing and outgoing energy. If the compressor, pumps etc consumes 1 kW and 3 kW heat is produced, then the heat factor is 3,0.
Heat factor COP	Coefficient of performance. Heat factor that only includes the effect of the compressor without including pumps etc.
Practical heat factor	Heat factor that considers all consumers. I.e. how much heat you get compared to how much energy you consume totally.
Yearly heat factor= Energy factor	Relation between produced energy (heat) during a year and consumed energy during a year.

Warranty and insurance

There is a two year warranty. Insurance valid for the first six years is also included. Thorén Energiprodukter AB has cooperation with the **Artic** insurance company. After six years, the insurance can be extended for a reasonable fee.

The insurance complements to your home insurance. In case of damage, you contact your insurance company who will settle the claim but charge a excess dependant upon your policy . Our insurance covers the excess and possible deduction for decreased value provided that the damage is covered by and exceeds the excess in the home insurance. The cover is limited to 3000 kr for the excess and 30 000 kr for the total damage.

The only thing you need to do in order to get the insurance is to fill in the reply card and send it to us within two months after the installation. Most of the information you will find in you purchase documents/invoice, but the serial number is indicated on the reference plate on the electrical centre in the heat pump.

Fill in the card now! You will get insurance for your heat pump for six years!

If you have questions, please contact us on phone or by e-mail.

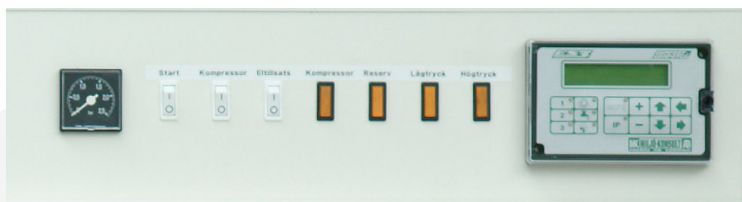
You can also contact Artic directly on phone number 08-746 05 60 or info@artic.se.

Content

	Page
Quality norms, CE-declaration	2
Instrument panel, Control unit	4
Light emitting diodes and keys	5-6
Stand-by-position, setting the clock	6
Temperature setting	7-9
Hot tap-water	9
Summer operation	9
Stored statistics	10
Switches	10
Warning lights	11
Manometer for the collector	11-12
Top up filling of the collector	12-15
Venting the collector	15
Image showing the position of components	16-17
Inspection glass for the refrigerant	18
Cleaning of the filter in the water circuit	18
Troubleshooting guide	19-22
Electrical drawing	24-25
Guarantee and insurance	26
Glossary	27

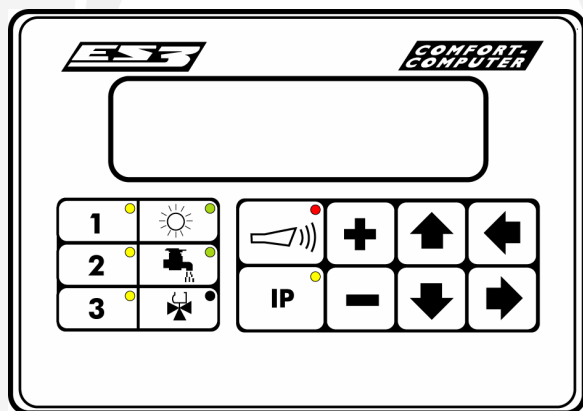
Instrument panel

On the instrument panel there is a manometer for the operating pressure in the collector, switch for start, compressor and added electrical heating, warning lights for the compressor and pressure guard as well as the control unit.



Control unit ES 3

The control unit controls the temperature in the heating system and the hot tap-water. It also keeps track of the energy consumption and how long different phases have been connected. It also shows, amongst other things, how many times the compressor has started and the temperatures in the radiators, hot tap-water and the outside temperature.



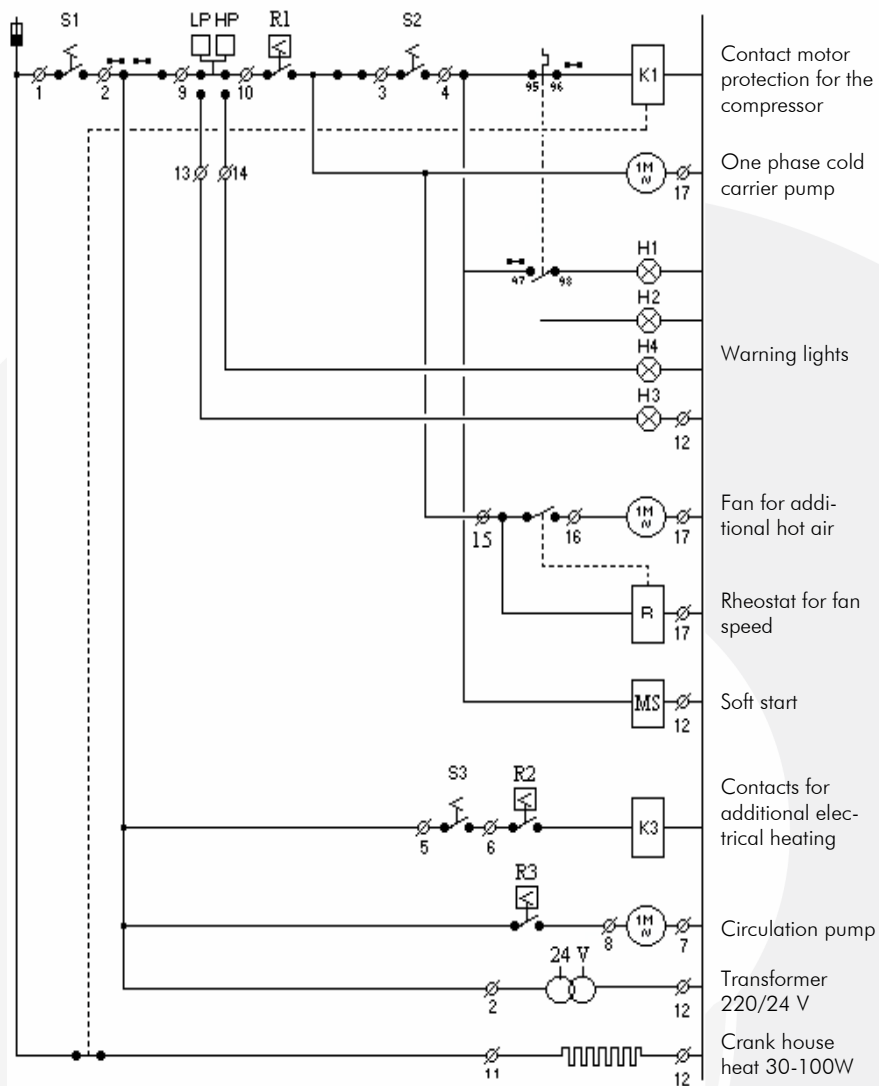
Electrical schedule

Explanations

S1	Start switch	H4	Red light for released high pressure guard
S2	Switch for the compressor	LP	Low-pressure guard
S3	Switch for additional electrical heating	HP	High-pressure guard
H1	Red light for released motor protection for the compressor	MS	Soft start
H2	Red light for released motor protection for the cold carrier pump (three-phase)	R1	ES3 relay 24V for start of the heat pump
H3	Red light for released low pressure guard	R2	ES3 relay 24V for start of the additional electrical heating
		R3	ES3 relay 24V for start of the circulation pump









Electrical schedule detail with three-phase cold carrier pump

Electrical schedule with one-phase cold carrier pump



Repair of the electrical equipment should only be carried out by authorised electricians

Light emitting diodes and keys

-  **1** Light emitting diodes 1,2, and 3 are lit when the respective phase is connected. Phase 1 is the compressor, phase 2 the added electrical heating and phase 3 is the circulation pump.
-  **2**
-  **3**
-  **The light emitting diode for summer use** is lit when the outdoor temperature exceeds a selected threshold, then only hot tap-water will be produced, no heating. It is also possible to lock the heat pump for summer use by pushing **the key**. By doing this you will avoid unnecessary heating if the temperature drops temporarily. Please read more on page 9.
-  **The light emitting diode for the hot tap-water** is lit when the heat pump is producing hot tap-water.
-  **The light emitting diode for the shunt** is not used in this system.
-  **When the light emitting diode for alarm** is flashing and the alarm signal can be heard, the cause of the alarm is indicated in the display. At multiple alarms you can see the alarm texts by pressing the right or left arrow. Reset by pushing **the key**. If there are multiple causes of the alarm, the key must be pushed several times. If the power has been cut off, the light emitting diode flashes without the sound signal. If the error that caused the alarm remains, the light emitting diode continues to be lit constantly.
-  **IP** **The IP key** is only used when the installation parameters are to be changed or the system is run manually. **The light emitting diode is flashing** when the control unit is in IP position. Then also the indicator in the display is flashing.

Malfunction or observation	
The cold carrier pump does not start, the compressor is not working	
Possible cause	Action
The motor protection has been damaged	Contact authorised electrician to change the motor protection
The cable has been damaged	Contact authorised electrician to change the cable
The motor or the pump has difficulties running (clash together)	Examine the cause. Change the motor or the pump.
The motor is overloaded for another reason	Check the manometer for the collector. Fill and vent if needed. Se page 15.
Malfunction or observation	
The additional electrical heating does not work	
Possible cause	Action
The switch on the control panel is in the off position	Turn on the switch
The control for the additional electrical heating is set at a too low temperature	Check the setting. Possibly adjust to 75 deg. C.
The overheating protection has been released	Reset the overheating protection through the hole in the lid of the electric cartridge.
The contactors contact surfaces are dirty or have been burnt	Contact authorised electrician to change the contactor
The cable has been damaged	Contact authorised electrician to change the cable

Notes

Regulating the temperature

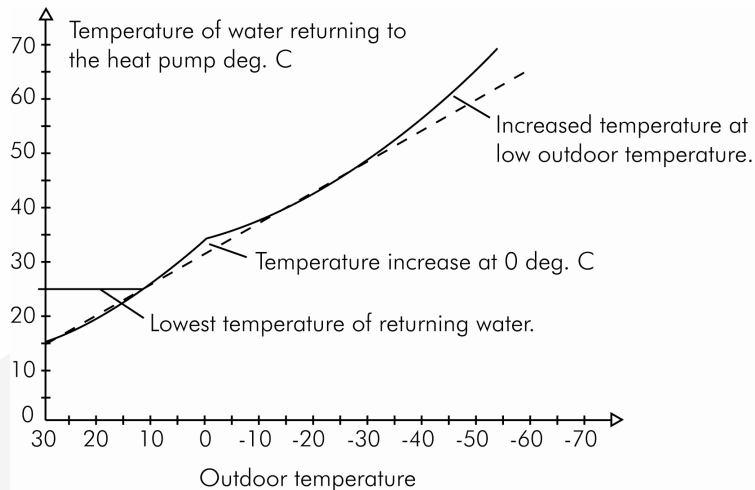
In order to get the right inside temperature, the control unit automatically adjusts the level of the heating according to the variations of the outside temperature. This is called “controlled condensation”. The relation between the outdoor temperature and the water temperature depends on several factors, such as the insulation of the house, the size of the radiators, if you have floor heating etc. The relation is also different at various outdoor temperatures. This relation is defined by a graph stored in the control unit. This graph can be modified. We define the initial parameters when we install your equipment, but you can also make adjustments yourself. If it is too warm in one room you can adjust the setting of the radiator in that room, but if it is too warm or too cold in the whole house, the temperature graph must be adjusted.

Temporary changing of the temperature

By pushing + or – when the control unit is in stand-by-position, the whole temperature graph is moved while its shape is unaltered. The change is indicated in the display and can easily be reset. If the temperature is altered in this way it could be too cold or too warm when the outdoor temperature changes.

Temperature graph

The control unit can initially be set on five different linear normal graphs depending on which temperature the heating system needs. If you have floor heating a lower temperature is enough while you need a higher temperature if you have small radiators. We select the best initial graph when we install your heat pump. The fine adjustment can be done by yourself.



The dotted line in the graph is the normal graph for a house with a need of +55°C temperature on the radiators at an outdoor temperature of -35°C. The heating temperature is measured at the return circuit to the heat pump. The full line is after fine adjustment. The return temperature is prevented to fall below +25°C even if the outdoor temperature exceeds +10°C. The return temperature has been increased at 0°C outdoor temperature and the return temperature has been increased when the outdoor temperature falls under -35°C.

Changing the temperature graph

The heating temperature can be changed for every five degrees of outdoor temperature. In order to change the temperature graph, first push the downward arrow twice to reach **Outdoor temperature** in order to find out what the outdoor temperature is. Continue by moving down four levels to **Temperature graph**. The temperature 0°C is indicated. The text **VAR** indicates that the function is variable – possible to adjust. Move right or left to the outdoor temperature at which you want to change the heating temperature. Change

Malfunction or observation	
The compressor does not start	
Possible cause	Action
The compressors internal protection in the motor has released (the compressor is hot). Only the pumps are running.	Turn off the compressor with the switch and let it cool off. Possibly lower the water temperature on the control unit.
Bad circulation in the vaporiser	Check the manometer of the collector. If needed, top up and vent, see page 15.
The control unit is set at a too high temperature	Decrease the temperature, see page 8
The warning light indicates that the motor protection has released	See page 11
The contactors contact surfaces are dirty or have been burnt	Contact authorised electrician to change the contactor
The motor protection has been damaged	Contact authorised electrician to change the motor protection
The cable has been damaged	Contact authorised electrician to change the cable

Malfunction or observation	
The cold carrier pump does not start, the compressor is not working	
Possible cause	Action
The start switch on the control panel is turned off	Turn on the switch
The control unit is set at a too high temperature	Decrease the temperature, see page 8
The warning light indicates that the motor protection has released	See page 11
The contactors contact surfaces are dirty or have been burnt	Contact authorised electrician to change the contactor
<i>To continue...</i>	

Malfunction or observation	
The warning light on the control panel indicates that the high pressure guard has released	
Possible cause	Action
Clogging in the pollution filter at the return circuit	Stop the heat pump and clean the filter, see page 18
To little water in the system	Fill water and vent
The control unit is set at a too high temperature	Decrease the temperature, see page 8
Insufficient cooling in the condenser. The circulation pump has stopped	Check the voltage and condenser of the pump, tap lightly on the pump and possibly clean it.

Malfunction or observation	
The warning light on the control panel indicates that the low pressure guard has released	
Possible cause	Action
The vaporiser is frozen. Can be caused by air or too low pressure in the collector	Check the pressure on the manometer on the operating panel. Possibly fill and vent the system, see page 15
The vaporiser is frozen	Check the freezing temperature of the collector liquid. Should be at least -12°C
Malfunctions in the refrigerant circuit	Check the inspection glass, see page 18
Stop in the drying filter, big difference in temperature on in and out in the drying filter	Contact authorised cooling technician to change the drying filter


Malfunction or observation	
The compressor does not start	
Possible cause	Action
The switch on the control panel is in the off position	Switch it on
To continue...	

the temperature with the plus or minus keys. Don't change to many degrees on one point without also adjusting on adjacent points. The graph should not vary too sharply.

Changing the temperature of the hot tap-water

The hot water temperature is initially set at 48°C. This temperature gives the best economy and comfort. The temperature is measured at the return circuit to the heat pump, that is why the temperature of the water in the upper part of the boiler is hotter, around 55°C. Furthermore the electric cartridge heater increases the hot water temperature once a week to around 65°C in order to prevent Legionnaire Disease bacteria from developing. To change the hot water temperature, move fifteen steps down to **Hot Water**. Push the **IP** key and step right to adjust the temperature. Finish by pushing the **IP** key, thereby extinguishing the diode light. *The temperature of the domestic hot water should not be set at a higher temperature than 50°C.*

Summer operation

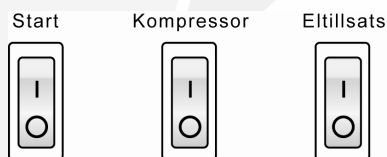
When the outdoor temperature exceeds an adjustable value, the heat pump switches to summer operation. Then only hot water is produced, no heating. It is also possible to lock the heat pump to summer operation by pushing the **Summer operation key**, thereby avoiding unnecessary heating if the temperature falls temporarily.  Standard outdoor temperature for automatic switch to summer operation is 20°C. To change this move one step down to **Clock**, then move five steps to the right to **Automatic summer operation**. It is then possible to change the temperature with the plus and minus keys.

Stored statistics

The control unit stores the values for energy consumption, operating time, number of start-ups, alarms and power cuts. For accessing the statistics move down seven steps to **Total Energy take out**. One step right shows **Number of days** and further steps right shows the energy take out for each respective step. One step down gives **Operating time** for each step and hot water production (step right). One more step down give **Number of starts** for each respective step and hot water as well as **Number of alarms** and **Power cuts**.

All above mentioned values can be reset to zero independently by pushing the minus key for five seconds at the value you want to reset. To the far right of each row the whole row can be reset in the same way.

Switches



The **Start**, **Compressor** and **Additional electrical heating** switches should always be on. The control unit controls the compressor and

the added electrical heating. If the start-switch has been disconnected, the control unit indicates that there has been a power cut.

The additional heating should always be switched on and set to 75°C. It is controlled by the control unit. Furthermore, the added electrical heating is used for the protection against Legionnaire Disease bacteria.

Troubleshooting guide

If your installation does not work properly, the troubleshooting guide will help you find out if it is a simple malfunction that you can fix yourself. If the malfunction is more serious, you can guide the service technician on the phone and give him relevant information.

Service during the guarantee time shall always be ordered from the importer or manufacturer, telephone +46 612 425 00 or e-mail: info@thorenvarmepumpar.se.

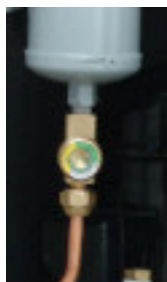
Thorén Energiprodukter AB does not take responsibility for any cost that is incurred by service sourced from anywhere other than our factory.

Top up filling of the collector and cleaning of the pollution filter in the return water circuit etc, is part of normal maintenance and is not included in the guarantee.

We can ourselves, or through our service partners always help you. Please consider a service agreement with us or with service partner certified by us. You can find a list over our service partners on our web site www.thorenvarmepumpar.se or call us at +46 612 425 00.

Please note that repairs in the electrical system or in the cooling system can only be carried out by authorised personnel.

Inspection glass for the refrigerant



An inspection glass for the refrigerant is located behind the front cover on the copper tube under the drying filter. When the collector is working constantly, the liquid in the inspection glass will be transparent; there should be no bubbles or foam. When the compressor starts and before the pressure has stabilized, bubbles and foam can be seen.

If there are bubbles or foam when the compressor is working constantly, the compressor should be stopped and an authorised technician should be called in.

Cleaning of the pollution filter in the water circuit



In order to protect the condenser there is a pollution filter in the return circuit. It's located behind the front panel under the pump for the heating circuit. If the warning lamp for the high-pressure alarm lights, it could be that the filter is clogged. This sometimes occurs shortly after the installation of the heat pump if there is dirt in the old circuits.

The filter is easy to clean

- Turn the heat pump off with the start switch.
- Shut the valve on the filter, open the lid, take out the filter and clean it with water.
- Put the filter back, close the lid and open the valve.
- Control the pressure in the radiator system, if needed add water by opening and then closing the filling tap.
- Vent the system.
- Reset the pressure alarm if it has been released.
- Start the heat pump with the start key.

Warning lights

Kompressor Köldbärarpump



The warning lights for **Compressor** and **Cold carrier pump** indicate that the respective motor protection has been released. This can be due to external disturbances in the power network or overload. One or several fuses might also be out of order. Turn off the heat pump with the start switch, check and change the defective fuses. Reset the motor protection by pushing the respective blue reset button on the lid of the electrical centre at the right behind the front cover. Start the heat pump with the start button.

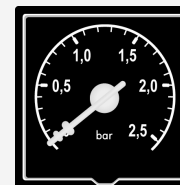
On heat pumps with one-phase cold carrier pump there is no warning light for the cold carrier pump.

Lågtryck Högtryck



The warning lamps for **Low pressure** and **High pressure** are lit when the respective pressure guard is released. The reset buttons for the pressure guard are located down behind the front cover, low pressure to the left and high pressure to the right. See the pictures on pages 16 - 17. If the pressure control is released again some problem has occurred and must be solved. Read more in the problem-solving schedule on page 20.

Manometer for the collector



On the panel there is a gauge for the operating pressure in the collector. The pressure when the heat pump is not running should be between 0,5 and 2,5 bar. If the pressure falls below 0,5 bar a top up filling should be done.

If the heat pump is installed for recycling in exhaust air ventilation the working pressure in the circuit shall exceed the elevation of the highest point of the recycling installation. Our heat pumps are normally delivered with a security valve at 2,5 bar corresponding to an elevation of 25 meters.

In order to avoid failure of the pump top up filling must be done if the pressure falls under 0,2 bar.

Top up filling of the collector

For topping up the collector you need pressure. This can be achieved with an external pump, but the water circuit of the house can also be used.

Since normally only a small amount of liquid is needed it is advisable to use concentrated ethanol. If the manometer is not completely down to zero, less than one litre is needed.

You need:

- A couple of meters of transparent 3/4" plastic hose.
- A hose connection with an external thread R 20.
- A water hose connected to a water tap.
- Connections to connect the two hoses. Normal connections for garden hoses can be used.
- Hose clamp

To fix:

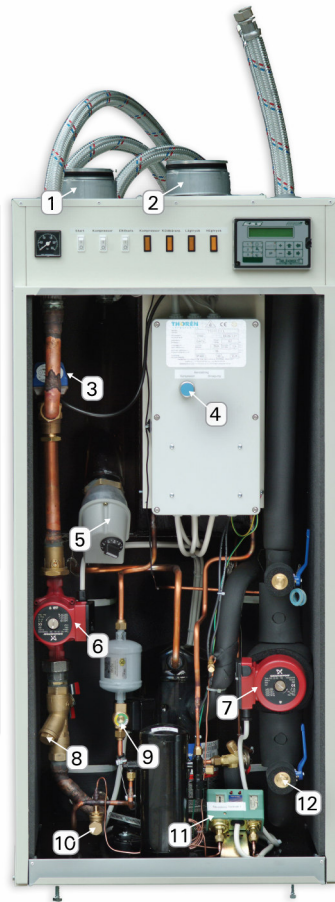
- Remove the plug on the fill valve (positioned at the bottom, see the pictures on pages 16 - 17) and screw in the hose connection.
- Fix the transparent hose onto the hose connection and secure with a hose clamp.

Thor with three-phase cold carrier pump



- | | |
|---|--------------------------------|
| 1 Safety valve for the collector | 7 Tap for heating water |
| 2 Air intake | 8 Shut valve for the collector |
| 3 Hot air outlet | 9 Fill valve for the collector |
| 4 Heat carrier pump | 10 Cold carrier pump |
| 5 Electrical centre with reset buttons for motor protection | 11 Pressure guard |
| 6 Inspection glass for refrigerant | |

Thor with one-phase cold carrier pump



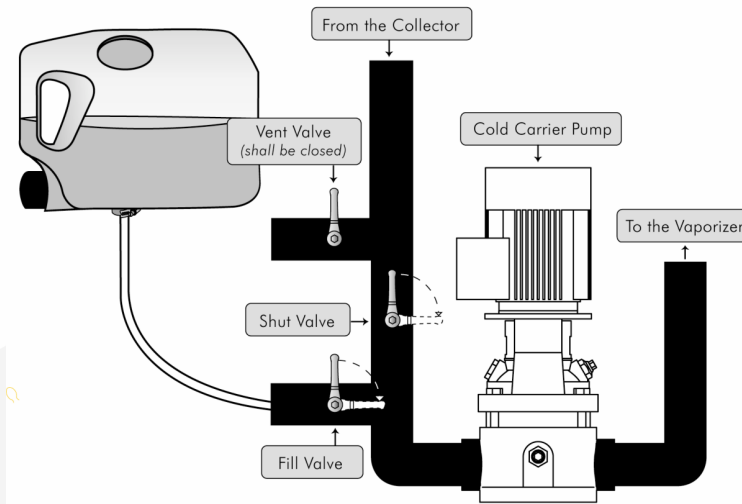
- | | |
|--|--|
| 1 Air intake | 7 Cold carrier pump |
| 2 Hot air outlet | 8 Pollution filter in the return circuit |
| 3 Alternating valve | 9 Inspection glass for refrigerant |
| 4 Electrical centre with reset button for motor protection | 10 Tap for heating water |
| 5 Electric cartridge heater with overheating thermostat | 11 Pressure guard |
| 6 Heat carrier pump | 12 Fill valve for the collector |

- Hold up the free end of the hose and fill it with ethanol to half its length. Stretch the hose upwards in order to let the air rise. Make sure the lower part of the hose is full with ethanol without air bubbles.
- Turn off the start-switch to stop the heat pump (or to make sure it does not start if it is not running).
- Open the top up valve and let any remaining air bubbles move upwards in the hose. If there is a slight over pressure in the refrigerant, the level in the hose will rise.
- Top up with more ethanol to the brim and make sure that all air comes out.
- Flush out all air in the hose connected to the tap to make sure that the hose is completely filled with water. Turn off the tap.
- Connect the hoses.
- Open the tap to push the ethanol into the collector.
- Close the top up valve when the pressure has increased to the correct value (see above).
- Close the tap and let the pressure decrease, take care of any surplus of ethanol, take off the hose connection, put back the plug on the filling valve and start the heat pump with the start button.

For heat pumps with a standing 3-phase cold carrier pump, the cold carrier pump can be used for top up filling.

Use a transparent plastic container of approximately five litres and Thoréns Top-up kit containing a reinforced transparent hose, hose connections and hose clamps.

- First put together the device for top-up filling according to the drawing in the top-up filling kit.
- Put the switches for **start** and **compressor** on the control panel in the off position.
- Remove the plug on the top-up vent and screw on the hose connection in the top-up filling kit.



- Connect the hose between the hose connection and the ethanol container. Secure with the hose clamps from the top-up filling kit.
- Fill up the container with a couple of litres of ethanol and place it on top of the heat pump with the hose connection turned downwards allowing the ethanol to run downwards towards the top-up vent while the air bubbles rises in the container. The hose must be completely filled with ethanol as there must be no air in the hose.
- Close the closing vent placed between the top-up vent and the airing vent (see drawing).
- Open the top-up vent and let any remaining air bubbles ascend through the container.
- Use the control panel to start the cold carrier pump. First put the **Start** switch in the on position while leaving the **Compressor** in the off position. Open the lid of the control panel and push the **down arrow** ten steps to **Manual**. Then push the **IP** bottom making it flash.

- Start **Step 1** and **be prepared to quickly close the top-up vent and to simultaneously open the closing vent when the security vent opens or the pressure gauge is stable.**
- **Please note! The top-up vent must be closed and the closing vent be opened while there is still ethanol in the jug preventing air to get in to the system.** If this happens, more ethanol has to be added in the jug and the process has to start from the beginning. If air has got in to the system it has to be vented (see below).
- Stop **Step 1**, push **IP** stopping the flashing and return to automatic operation. Turn on the switch for the compressor.
- Take away the hose and the hose clamp on the top-up filling vent and reinstall the plug.

Venting the collector

If unusual noises are heard from the pump for the refrigerant, and the manometer shows a falling or rising pressure, this indicates that air could be in the circuit that has to be vented. Venting shall be done at the highest point of the system which could be found in the room of the heat pump, in the ground or at a convector for outgoing air.

- Turn off the start and compressor switches on the panel.
- Wait for five minutes to allow the refrigerant to stop circulate and the air to aggregate at the highest point.
- Open the air valves on both the hoses/tubes.
- Shut the respective air valves when fluid comes out without air or if the manometer of the collector goes down to zero.

If the pressure falls under the limit (see above) the collector has to be filled up.

If there is a lot of air in the collector it could be necessary to vent and refill several times.