Topvex SoftCooler TR09-15

GB Operation and Maintenance Instructions

-EN_GB
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Contents

1 Warnings

The following admonitions will be presented in the different sections of the document.

⚠ Danger

- Make sure that the Mains supply to the unit is disconnected before performing any maintenance or electrical work!
- All electrical connections must be carried out by an authorized installer and in accordance with local rules and regulations.
- Operation in the refrigerant circuit and handling refrigerants must be performed by certified personnel.

⚠ Warning

- Beware of sharp edges during mounting and maintenance. Use protective clothing.
- Skin contact with the refrigerant must be avoided. Use protective equipment such as protective goggles, gloves and suitable clothing's. God ventilation must be arranged.
- If freezing injury a doctor must be seen.
- If skin contact the exposed part of the body must be carefully washed.
- If eye contact use eye wash or lukewarmed water and wash for 20 minutes, visit a doctor.
- The units electrical connection to the mains supply must be preceded by an all pole circuit breaker with a minimum 3 mm gap.
- This product is not intended to be used by children or people with reduced physical or mental ability or lack of experience and knowledge, if no instruction concerning the use has been given by the person responsible for their safety or that this person is supervising the operation. Children should be supervised so that they can not play with the product.

2 Product Description

2.1 Internal components

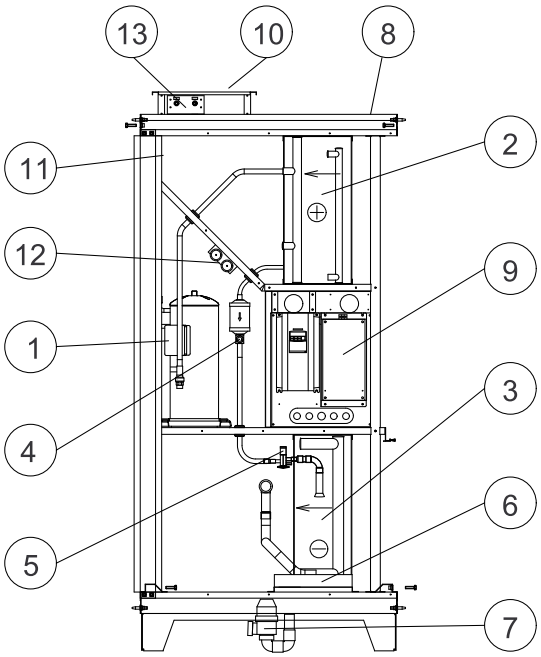

Fig. 1 Connections and basic components in left hand connected units

Position	Description
1.	Compressor
2.	Condenser coil
3.	Evaporator coil
4.	Filter drier with sight glass
5.	Expansion valve
6.	Drip-tray with drain
7.	Water seal
8.	Cable grommet for external cabling
9.	El. cabinet with frequency converter
10.	Exhaust air duct connection
11.	Exhaust air sensor, EHS
12.	Pressure/hot gas switches
13.	Measuring points refrigerant system high/low

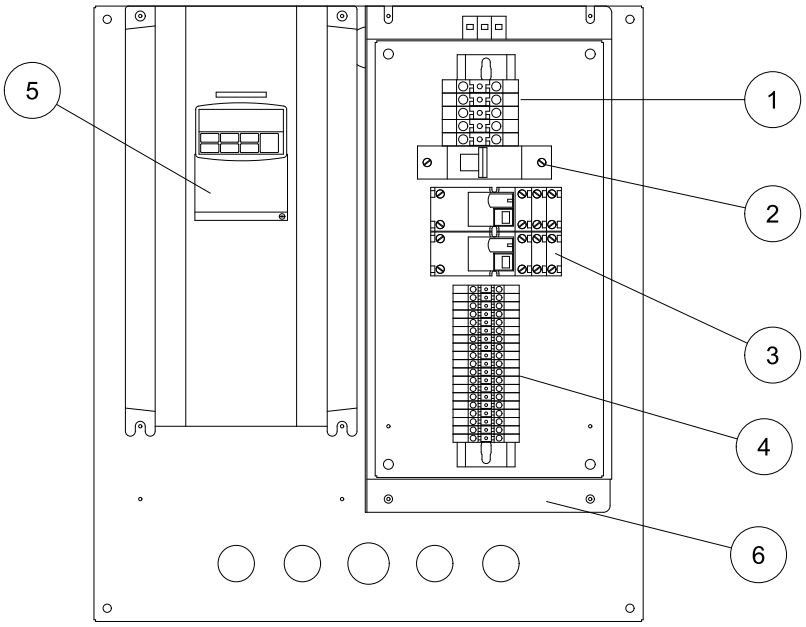

Fig. 2

Position	Description
1.	Terminal block, mains supply
2.	Circuit breaker (MCB) oil heaters
3.	Relays
4.	Terminal block, internal/external connections
5.	Frequency converter with display
6.	EMC filter

3 Refrigerant Control/Reporting

Topvex SoftCooler TR comes pre-filled with refrigerants and belongs to the group "Piece units containing more than 3kg refrigerants per circuit". Before commissioning shall always a control report in respect of the installation be established by a cooling certified person. Leakage control with record keeping shall be done once per year. The installation of the Topvex SoftCooler TR is only duty to report if the property/enterprise where the installation occurs, all together after installation, has a total amount of refrigerants of 10 kg or more ("small Piece units" with refrigerants less than 3 kg, e.g. normal refrigerators/freezers does not includes). Reporting shall in occurring cases be done to major inspection authority (normally the municipal environmental office).

Different regulations can be valid in different countries. Check with your local government.

4 Function Description

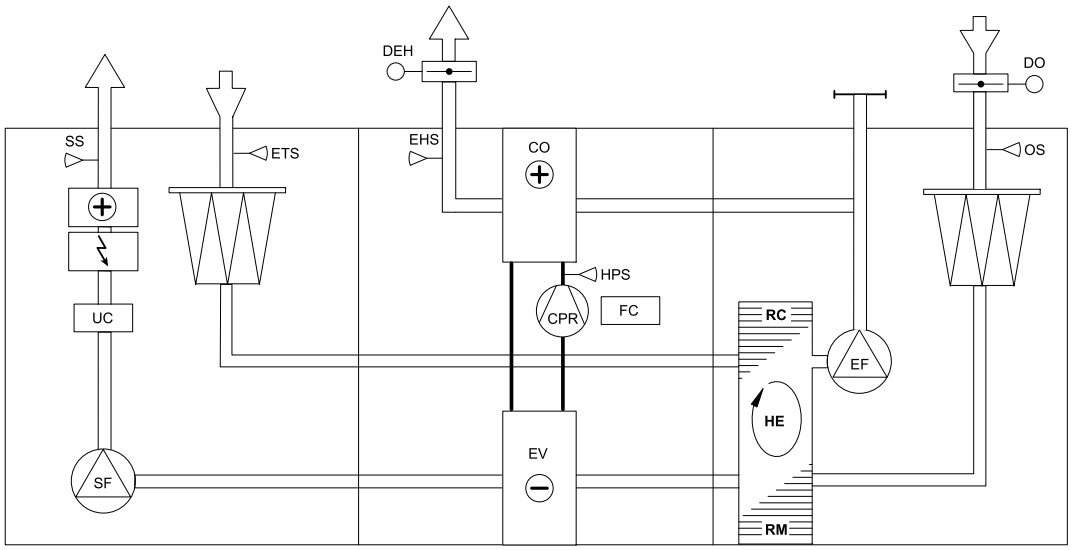

Fig. 3 Without by-pass, left hand unit

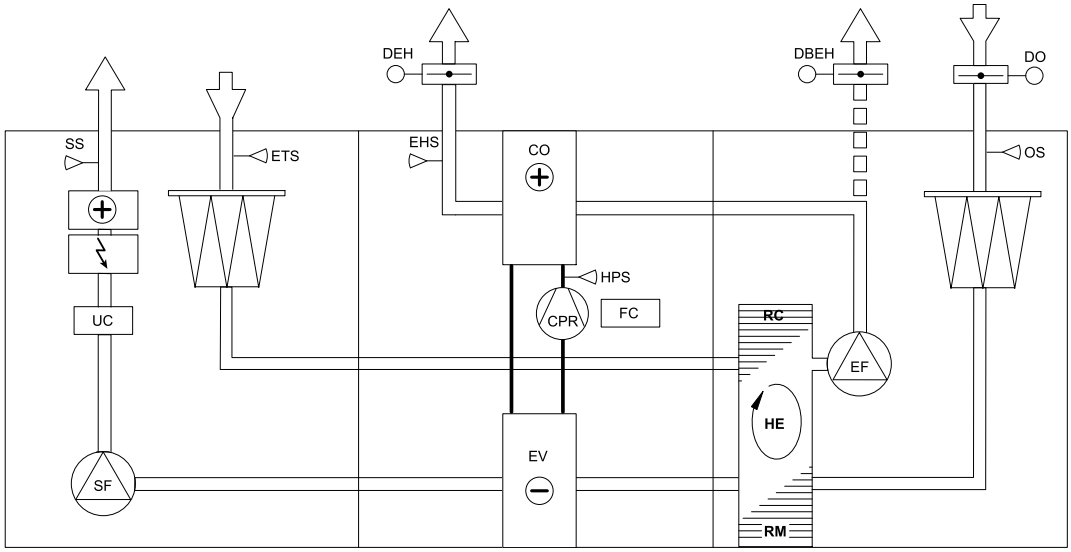

Fig. 4 With by-pass, left hand unit

Position	Description
EF	Extract air fan
SF	Supply air fan
SS	Temp. sensor supply air
OS	Temp. sensor outdoor air
ETS	Temp. sensor extract air
EHS	Temp. sensor exhaust air
UC	Controller E28
RC	Rotor control
RM	Rotor motor
HE	Exchanger

Position	Description
DO	Damper outdoor air (accessory)
DEH	Damper exhaust air (accessory)
DBEH	Damper by-pass exhaust air (accessory)
FC	Frequency converter
CPR	Compressor
EV	Evaporator
CO	Condenser
HPS	Condenser pressure sensor

4.1 General

Control unit E28 (UC) senses the temperature via the extract temperature sensor (ETS) and then keep the set extract temperature by sequence controlling the compressor (CPR), heat exchanger (HE) and hot water- /electrical heater (HWL/H, ELH). The temperature sensor in the supply air (SS) is min. and max. limiting the supply air temperature.

4.2 Cool recovering

Exchanger (HE) will automatically start to recover the cold in the extract air when the extract air is colder then the outdoor air.

4.3 Power control

The compressor (CPR) are step-less controlled between, in the frequency converter (FC), set minimum and maximum frequency.

4.4 Power limitation

The frequency converter (FC) is continuously sensing the condensing pressure via the high pressure sensor (HPS) and gradually slows down the speed of the compressor (CPR), if the pressure exceeds the set limitation value. This is done to avoid a high pressure alarm.

4.5 By-pass function (option)

To reduce the energy use for the extract fan when there is no cooling demand the exhaust by-pass damper (accessory) is opened and thereby the exhaust air does not pass the condenser (CO). At stopped unit all dampers are closed.

Note:

This instruction contains functions for the Topvex SoftCooler TR, for a complete description of functions see "Topvex TR09, 12, 15 Compact Air Handling Unit Installation instructions"

5 Cooling flow chart

5.1 The cooling function

The refrigerant is circulated in a completely closed system in the following order: Evaporator, Compressor, Condenser, and last expansion valve. The compressor keeps a low pressure in the evaporator, the refrigerants boiling point is thereby lowered and the incoming refrigerants from the expansion valve is vaporized (boiling) with absorption of heat as a result. The heat is taken from the supply air when passing the evaporator - supply air temperature is lowered. After a pressure increase in the compressor the refrigerant gas passing the condenser were the gas, thanks to the high pressure and thereby a high boiling point, is transformed into fluid through condensation and thereby heat emission. The heat is submitted to the exhaust air that passing the condenser. The heat has accordingly been transferred from supply air to exhaust air. After leaving the condenser in liquid state the refrigerant passes the expansion valve who controls the amount of refrigerants to the evaporator and thereby the cycle is completed.

5.2 Components and function

5.2.1 Compressor

The compressor in Topvex Soft Cooler is a high-efficiency, variable speed scroll compressor. It is designed especially for speed control and can not run without frequency converter. Speed and by that cooling capacity is regulated by changing the operating frequency, the maximum working range of the compressor is no less than 20 to 120 Hz. In the smaller unit sizes the maximum frequency is limited via a setting in the frequency converter. Controlling of the compressor is completely automatic according to the need of the premises and the signal comes via the control unit E28 to the frequency converter.

5.2.2 Frequency converter (FC)

The compressors frequency converter is located in the electrical cabinet. The converter receives a control signal (0-10 V DC) corresponding to the current cooling load from the control unit E28 and then regulates the compressors speed according to the actual cooling load. The converter has also a high pressure sensor (HPS) (4-20 mA) connected. This sensor continuously measuring the pressure in the cooling system. If the pressure exceeds the set value in the converter the output frequency are reduced and thereby the compressors speed will be reduced so that the pressure will not rise to th level were the high pressure switch (PSH) on the high pressure side will trigger. The compressor is protected from fast start and stops by an restart delay function (3 minutes) in the frequency converter.

5.2.2.1 Frequency converter, quick guide

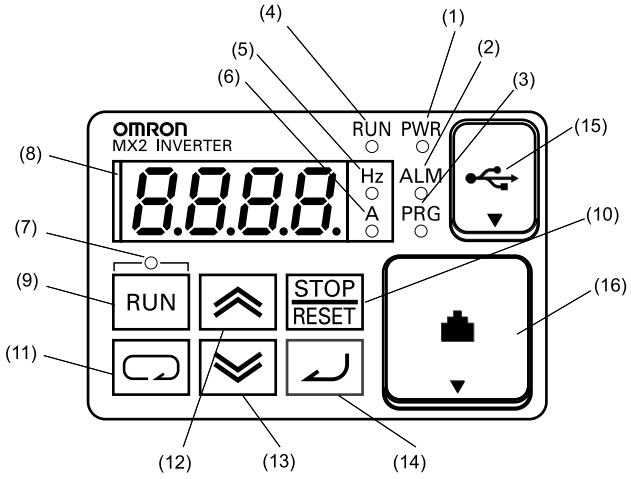

Fig. 5 The display is used in programming the inverter's parameters, as well as monitoring specific parameter values during operation

Items	Contents
(1) Power LED	Turns ON (Green) while the inverter is powered up.
(2) Alarm LED	Turns ON (Red) when the inverter trips.
(3) Program LED	Turns ON (Green) when the display shows changeable parameter. Blinks when there is a mismatch in setting.
(4) RUN LED	Turns ON (Green) when the inverter is driving the motor.
(5) Monitor LED [Hz]	Turns ON (Green) when the displayed data is frequency related.
(6) Monitor LED [A]	Turns ON (Green) when the displayed data is current related.
(7) Run command LED	Turns ON (Green) when a Run command is set to the operator. (Run key is effective.)
(8) 7-seg LED	Shows each parameter, monitors etc.
(9) Run key	Makes inverter run.
(10) Stop/reset key	Makes inverter decelerates to a stop. Reset the inverter when it is in trip situation.
(11) CYCLE key	Go to the top of next function group, when a function mode is shown Cancel the setting and return to the function code, when a data is shown Moves the cursor to a digit left, when it is in digit-to-digit setting mode Pressing for 1 second leads to display data of `d001`, regardless of current display.
(12) Up key (13) Down key	Increase or decrease the data. Pressing the both keys at the same time gives you the digit-to-digit edit.
(14) SET key	Go to the data display mode when a function code is shown Stores the data and go back to show the function code, when data is shown. Moves the cursor to a digit right, when it is in digit-to-digit display mode.
(15) USB connector	Connect USB connector (mini-B) for using PC communication.
(16) RJ45 connector	Connect RJ45 jack for remote operator.

Table 1: Codes

d001	Output frequency Hz
d002	Output current Hz
d003	Rotation direction
d004	Process variable (PV), PID feedback
d005	Input terminal status
d005	Output terminal status

Table 2: Error codes

E01-E04	Overcurrent
E05	Overload
E07	Overvoltage DC
E08	Memory error
E09	Undervoltage DC
E10	Internal power failure
E11	CPU error
E14	Grounding error
E15	Overvoltage IN
E21	Overheating
E50.1	Pressure/temperature alarm (Induced pressure or hot gas switch)

5.2.3 Power controlling

Control unit E28 in the air handling unit gives a demand signal ("Y3-cooling", 0-10V DC) in proportion to the current cooling demand in the extract air (or room). The signal is, via a relay (R1), connected to an analog input in the frequency converter. When the signal is connected (R1) actuates and the compressor starts when the demand signal exceeds 1.0V and the speed are then controlled according to the demand signal between min. frequency (20 Hz) and max. frequency (depends on unit size but still max. 120Hz). The compressor stops at a demand signal lower then 0.5 V.

5.2.4 Compressor protection

The compressor is protected by the following:

- Motor protection in the frequency converter (FC)
- High pressure switch in the high pressure side (PSH)
- Low pressure switch on the low pressure side (PSL)
- Hot gas thermostat on the hot gas tube (HGS)
- If any of the above protections is triggered control unit E28 will show `Alarm Cooling pump`. Manual acknowledgment and reset must be done before the compressor can start again.

5.2.5 Refrigerant

The refrigerant is of type R407C, the system comes pre-filled and tested at the factory. On top of the Topvex SoftCooler are the high- and low pressure side measuring points (tappings). Concerning the control and reporting of the refrigerant installation, see chapter 3.

5.2.6 Condenser/Evaporator

The condenser and evaporator coil is made of copper tubes with aluminium fins.

5.2.7 Drip tray

The drip tray is located under the evaporator coil and collects the water condense that periodically occur during the cooling operation. The drip tray is made of stainless steel and has a 32 mm connection for connecting the drain pipe (plastic) which, via a water seal leads the water to a floor drain.

5.2.8 By-pass damper (accessory)

The by-pass damper is controlled by a relay (R2) that, via the control unit E28, actuates at cooling demand and thereby closing the damper (DBEH) so that the exhaust air is forced through the condenser coil.

6 Maintenance

> **⚠ Caution**
>
> Maintenance of the Topvex SoftCooler is of great importance for the whole installations environmental influence, operating economy, durability, security and functions.
>
> Read the Warnings chapter 1 and Refrigerant Control/Reporting chapter 3 before doing any work on the SoftCooler unit.

Maintenance should be carried out two times a year, apart from general cleaning the following should be done:

1. **Leakage control with registration (Legal requirements: at least 1 time a year)**

   Different regulations can be valid in different countries. Check with your local government.

2. **General control.**

   When unit is running listen for abnormal sounds and vibrations. Inspect occurrence of oil leakage (can be a symptom on refrigerant leakage). Inspect occurrence of corrosion, fretting damages, loosen pipe suspensions.

3. **Control of the cooling coil (evaporator coil) and condenser coil.**

   After a long time of use the coils can obtain a deposit that obstructs the heat transfer and airflow. Vacuum clean the coils carefully from the dirty side.

4. **Control of the drip tray.**

   After a long time of use the drip tray and the drain can obtain a deposit that obstructs the drain of the condensation water. Clean the drip tray, drain, water seal and pipes from dirt and deposits.

5. **Control of the air filter for the frequency converter.**

   The filter is located in the inspection door. After a long time of use the filter can be clogged so that the cooling airflow decreases and thereby causes a to high temperature for the frequency converter which results in operational disturbance. Loosen the filter from outside of the unit (snap locking of the cover), if the filter is dirty exchange it with a new (filter mat G5).

7 Troubleshooting

⚠ Warning

Read the Warnings chapter 1 and Refrigerant Control/Reporting chapter 3 before doing any work on the SoftCooler unit.

If operational disturbance would occur, the below schedule should be followed before contacting service personnel. Always check if there is any alarm indications in the air handling units control panel. Observe that the compressor has a restart delay of minimum 3 minutes.

Table 3: The compressor do not start

<table>
<tr><td colspan="6">Is there an Alarm indication <code>Run Error P1-Cooler</code> in the AHU´s control panel display?</td></tr>
<tr><td colspan="3">Yes</td><td colspan="3">No</td></tr>
<tr><td colspan="3">Is there an indication <code>E50.1</code> in the frequency converters ("INV") display?</td><td colspan="3">Main supply (400 V 3~) to the Cooler is missing?</td></tr>
<tr><td>Yes</td><td colspan="2">No</td><td>Yes</td><td colspan="2">No</td></tr>
<tr><td>The compressor pressure switch (2 of them) or the hot gas switch has tripped. Inspect the following:
- Air filter clogged?
- Supply/Extract coils clogged?
- Supply/Extract fan running?
Reset the pressure switches and hot gas switch by pushing the reset buttons. Then reset the frequency converter by pushing its reset button <code>Stop/Reset</code>. Finally reset the control unit (E28) by pushing the alarm button on the control panel and then push the OK button twice when <code>Run Error P1-Cooler</code>is shown. At repetitive alarms send for service!</td><td colspan="2">Is there an indication <code>E01</code>to <code>E45</code> in the frequency converters (<code>INV</code>) display?</td><td>Inspect and take care of:
- External fuses
- Safety switch</td><td colspan="2">Is there a control signal Cooling from the control unit (E28), more than 1.0 V.</td></tr>
<tr><td></td><td>Yes</td><td>No</td><td></td><td>Yes</td><td>No</td></tr>
<tr><td></td><td>The compressors frequency converter ("FC") have tripped on overcurrent, overheat etc. (see "Frequency converter quick guide") Inspect the following: - External fuses and main supply is OK? Reset the frequency converter by turning of the voltage for 30 sec (turn off the safety switch for the SoftCooler). Then turn on the safety switch again and reset the frequency converter by pushing its reset button <code>Stop/Reset</code>. Finally reset the control unit (E28) by pushing the alarm button on the control panel and then push the OK button twice when <code>Run Error P1-Cooler</code>is shown. At repetitive alarms send for service!</td><td>Send for service!</td><td></td><td>Send for service!</td><td>To low cooling demand! At lower signal then 1.0 V the compressor will not start. Read the signal in the control unit (E28) display: <code>Running mode - Input/Output - Analog output - AO3:__Y3-Cooling</code>"</td></tr>
</table>

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