# Operating and service manual

STAR COOL

Model SC – MCI40 – WC

Version 810900A

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# 1. Preface

This version of the manual is dated July 2005, edited by Maersk Container industri A/S.


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While the information herein is assumed to be accurate, Maersk Container Industri A/S assumes no responsibility for any errors or omissions that may appear in this documentation.

## 1.1. Modelversion

This manual is valid for

STAR COOL

| | |
|---|---|
| Model | SC - MCI40 – WC. |
| Version | 2.0. |
| Release Date | 01.08.2005. |
| Part number | 810200B. |
| Softwareversion: | 0230 - 0239. |

# 2. Warnings

**Do not operate or maintain this refrigeration unit until you have familiarized yourself completely with the equipment and operating off this unit by reading the instruction in this manual.**

**Do not perform any welding on the unit before disconnecting the power plug.**

**Disconnect main power supply to unit before inspecting the interior of the controller box.**

**Unit is charged with R134a and ester oil BSE 55, do not use any other refrigerant or oil.**
**Do not use contaminated refrigerant or oil.**
**Do not evacuate R134a into the atmosphere, use recovery equipment according to present legislation.**
**Under maintenance please observe that R134a is operating with high and low temperatures in combination with high pressures, which may cause personal injuries if not handled properly.**
**During recovery and maintenance of R134a unit personal protection equipment has to be worn.**

**Do not trap any liquid refrigerant inside pipes during soldering work, this may lead to explosion of pipe.**

# 3. Legend

| Short name | Name |
|---|---|
| AirEx | Air Exchange |
| Bat | Battery |
| Pwr | Power |
| Com | Communication |
| Cpr | Compressor |
| FC | Frequency Converter |
| Fcpr | Compressor Frequency |
| FcprAct | Compressor Frequency actual |
| FcprReq | Compressor Frequency requested |
| CapAct | Actual capacity |
| CapReq | Requested capacity |
| Gnd | Ground |
| Hevap | Evaporator Heater |
| LED | Light Emitting Diode |
| Mcpr | Compressor Motor |
| Mcond | Condenser Motor |
| Mevap | Evaporator Motor |
| Mevap1 | Evaporator Motor 1 |
| Mevap2 | Evaporator Motor 2 |
| Mevap1OH | Evaporator Motor 1 overheat |
| Mevap2OH | Evaporator Motor 2 overheat |
| PhDir | Phase Direction |
| Fpower | Power supply Frequency converter |
| PCB | Printed Circuit Board |
| Pdis | Discharge Pressure |
| Peco | Economizer Pressure |
| Psuc | Suction Pressure |
| Shp | High pressure switch |
| PTI | Pre Trip Inspection |
| RH | Relative Humidity |
| RHset | Humidity Setpoint |
| RMM | Remote Monitoring Modem (powerline communication) |
| SH | Superheat |
| SHReq | Superheat Requested |
| SHEco | Superheat Economizer |
| SHEcoReq | Superheat Economizer Requested |
| T0 | Calculated Evaporator Temperature |
| T0eco | Calculated Economizer Temperature |
| TC | Calculated condenser Temperature |
| Tset | Temperature Setpoint |
| Tact | Actual temperature |

| Short name | Name |
|---|---|
| Tamb | Ambient Temperature |
| Tsup | Supply Air Temperature |
| Tsup1 | Supply Air Temperature 1 |
| Tsup2 | Supply Air Temperature 2 |
| Tret | Return Air Temperature |
| Tevap | Evaporator Temperature |
| Tsuc | Suction Temperature |
| Tdis | Discharge Temperature |
| Teco | Economizer Suction Temperature |
| Tusda1 | USDA 1 Temperature |
| Tusda2 | USDA 2 Temperature |
| Tusda3 | USDA 3 Temperature |
| Tcargo | Cargo Temperature |
| Tfc | Frequency converter Temperature |
| Ubat | Battery voltage |
| U12 | Voltage Phase 1-2 |
| U13 | Voltage Phase 1-3 |
| U23 | Voltage Phase 2-3 |
| I1 | Current Phase 1 |
| I2 | Current Phase 2 |
| I3 | Current Phase 3 |
| Veco | Economizer Valve |
| Vexp | Expansion Valve |
| Vhg | Hotgas Valve |

| Prefix | Description |
|---|---|
| H | Heater |
| I | Current |
| M | Motor |
| P | Pressure |
| RH | Relative humidity |
| T | Temperature |
| T0 | Saturated suction temperature |
| U | Voltage |
| V | Valve |
| F | Frequency |
| S | Switch / contact / key |
| SH | Super heat |
| Q | Power |

| Contraction | Full name |
|---|---|
| Amb | Ambient |
| Eco | Economizer |
| Evap | Evaporator |
| Cpr | Compressor |
| Cond | Condenser |
| Bat | Battery |
| Sup | Supply |
| Ret | Return |
| Pwr | Power |

| Suffix | Specification |
|---|---|
| Set | Setpoint |
| Act | Actual |
| Req | Requested |
| OH | Overheat |
| In | Input |
| Out | Output |

# 4. General description

The STAR COOL model SC - MCI40 - WC unit is an electric powered picture frame, cooling and heating unit operating on refrigerant R134a.
The unit is designed to maintain cargo temperatures in a range from –30°C (-22°F) to +30°C (86°F).
The unit is designed to operate in ambient temperatures from –30°C (-22°F) to +50°C (+122°F).
The outer front frame is constructed off marine grade aluminium, 5000 and 6000 series, designed to serve adequately as the container end wall.
The rear bulkhead is made off food-approved material.
The unit is designed to operate satisfactorily under sea going and environmental conditions as specified below:

- Salt –laden air, sea spray and high humidity.
- Rolling: amplitude of 30°each side, period of 13 seconds.
- Pitching: amplitude of 6°each side, period of 8 seconds.
- Permanent list: 15° on each side.
- Shock: 2g horizontal and 5g vertical.
- Vibrations: of the types encountered on ships, trucks and rail.

The unit consists of the following modules, please see exploded view.

- Frame module
- Condenser / compressor module
- Evaporator module
- Evaporator fan module

The cooling system of the unit is equipped with a two – stage compressor, electrically driven through a frequency converter.

The cooling system is also equipped with an economizer, which performs the task of sub-cooling the liquid from the receiver to the evaporator, thereby increasing the cooling capacity of the cooling unit.
The evaporators are controlled by electronically expansion valves.

The equipment is designed to operate on a nominal 400 / 460 Vac, 3 phase, 50/60 Hz, primary power source.
An integrated dual wound transformer supplies control circuit voltage.
An automatic system, power supply sensing and correction, is provided to ensure the correct direction of rotation for the fan motors. This is done regardless of the incoming phase sequence from the primary power supply, provided that all fan motors are wired correctly.

An optional water-cooled condenser is mounted in series with the air-cooled condenser. This water-cooled condenser allows operation of unit below deck, where no air ventilation is possible, provided that water connections are present.

The unit is controlled by an electronic controller manufactured by Lodam Electronics, controlling on the supply temperature probe in chilled mode (temperature setting above or equal to –10°C (14 °F)) and on the return temperature in the frozen mode (temperature setting below –10°C (14 °F)).
Controller accuracy is ±0,25°C (±0,45°F).

Unit can operate the evaporator fans in economy mode (low speed). This is chosen from the controller display, under operation menu.
At set point temperature above or equal to +32°F (0°C), humidity setpoint off and closed fresh air ventilation, the controller is default set to economy mode on the evaporator fans.

The air from the unit is delivered to the bottom of the container, with return air through the top of the evaporator coil section (bottom air delivery).

The unit is equipped with a de – humidification function controlled by the electronic controller of the unit. The humidity set point can be set in the range from 95 – 60 % RH. The unit can control to the lowest level. The de – humidification function is active as long as the temperature control is in set point range. The unit is equipped with heating elements, mounted under the evaporator coil, for the dehumidification.
The de – humidification system is disabled in economy mode.

The unit is equipped with a dual system for defrosting. There is installed a hot – gas valve, in the refrigeration system, for hot – gas defrosting of the evaporator coil. Furthermore the heating elements, mounted under the evaporator coil, are energized during defrost.
This dual system for defrosting ensures a fast defrost sequence and thereby only a very small input of heat to the container. This results in a very small temperature variations for the transported cargo, after a defrost sequence.
The dual system for defrost also ensures an even distribution of heat to the evaporator coil. The result of this is that there is no building up of ice in corners or other places of the evaporator coil.
The two defrost systems, hot – gas and heating elements, are independent. This ensures a defrost sequence to be carried out, even with one system failing.
The defrost interval can be set from 6 – 48 hours, default 6 hours. Furthermore a demand defrost system is integrated in the software ensuring that the evaporator coil will not ice up.

The unit is equipped with a datalogger, incorporated in the controller.

The logging interval is in pre-defined intervals, 15, 30, 60 or 120 minutes.
The logging of the USDA – sensors (3 pieces) and Cargo - sensor is done with a interval of one hour according to USDA requirements. With a logging interval of one hour, there is storage capacity for 365 days of temperature loggings.
Datalogger accuracy is ±0,25°C (±0,45°F).
The data – log can be retrieved with a PC – system Starview and Psion Logman, via high-speed serial communication port.
The controller has a battery back – up system for the datalogger, which after power switch off of the unit continues logging in battery mode 120 times and then stops.
The controller is prepared for communication with Remote Monitoring Modem (RMM), according to ISO standard 10368, for monitoring at the ship bridge or control room.

The following tables shows retrievable with Starview and Psion Logman software:

| File Download Info | | |
|---|---|---|
| F1 | Signature | Header |
| F2 | Container ID | |
| F3 | Controller ID | |
| F4 | Controller Software | |
| F5 | Retreiver Software | |
| F6 | Extraction date | |
| F7 | Comment | |

| Data log | | | |
|---|---|---|---|
| D1 | DT | Date | Stamp |
| D2 | | Time | |
| D3 | | Log Type [Event, Data, Log] | |
| D4 | | Event ID | Events + Alarms |
| D5 | | Param. 1 | |
| D6 | | Param. 2 | |
| D7 | | Param. 3 | |
| D8 | | Param. 4 | |
| D9 | | Param. 5 | |
| D10 | Tsup | Supply Air Temperature [°C] | Short Log |
| D11 | Tret | Return Air Temperature [°C] | |
| D12 | Tusda1 | USDA 1 Temperature [°C] | |
| D13 | Tusda2 | USDA 2 Temperature [°C] | |
| D14 | Tusda3 | USDA 3 Temperature [°C] | |
| D15 | Tcargo | Cargo Temperature [°C] | |
| D16 | Tset | Temperature Set Point [°C] | |
| D17 | Humidity | Relative Humidity [%] | |
| D18 | AirEx | Air Exchange [m3/h] | |
| D19 | Psuc | Suction Pressure [Bar] | Extended Log Type 1 |
| D20 | Pdis | Discharge Pressure [Bar] | |
| D21 | Fnet | Net frequency [Hz] | |
| D22 | Unet | Voltage Phase 1-2 [V] | |
| D23 | I1 | Current, Ph. 1 [A] | |
| D24 | I2 | Current, Ph. 2 [A] | |
| D25 | I3 | Current, Ph. 3 [A] | |
| D26 | Ifc | Frequency converter current [A] | |
| D27 | Fcpr | Compressor Frequency [Hz] | |
| D28 | Heater | Heating element [%] | |
| D29 | Mevap | Evaporator motor status | |
| D30 | Mcond | Condenser motor status | |
| D31 | Tfc | Frequency module Temperature [°C] | |
| D32 | Tamb | Ambient Temperature [°C] | |
| D33 D34 D35 D36 D37 D38 D39 D40 D41 D42 D43 | Extended Log Type 2 | | Extended Log Type 2 |

Header can be retrieved by Refcon, Logman, StarView and can be viewed in Refcon, LogView and StarView.
Events + Alarms and Short Log can be retrieved by Refcon, Logman, StarView and can be viewed by Refcon, LogView and StarView.
Extended Log Type 1 can only be retrieved by StarView and shown in LogView and StarView.
Extended Log Type 2 can only be retrieved and viewed in StarView.
StarView is the unique program designed for communication with a Star cool unit, through a serial connection to a PC.

# 5. Function description

## 5.1. Start-up procedure

The start-up procedure ensures that the system is started safely after mains failure, defrosting, PTI test, service and alarm mode.

The start-up procedure has 4 modes:

- Initialize.
- Stabilize. The evaporator fan operates at high speed for 10 sec.
- Stabilize mode ensures that temperature sensors are at the current temperature.
- Ramp up. The compressor is started at 50 Hz (ramp up time is depending on frequency converter set-up).
- Ramp up mode ensures correct oil lubrication of compressor and controlled system start-up.
- Terminate. The unit is set to temperature control mode and the temperature controller is applied.

## 5.2. Climate Control Function

### 5.2.1. Temperature Control

This function incorporates the container temperature controller.

The function has 2 modes: Chill and Frozen.

- Chill
  If Tset > 14F (-10°C) the chill mode is activated and Tact = Tsup.
- Frozen
  If Tset ≤ 14F (-10°C) the frozen mode is activated and Tact = Tret.

This function has four modes: Pull down, Pull up, Cool, and Heat.

Pull Down / Pull Up mode:
In Pull Up and Pull Down mode no in-range alarm is given.
Upon start-up, defrost or another mode deactivating temperature control (e.g. manual, set-point alternation, PTI) the temperature control is set to Pull Down or Pull Up mode depending on Tact being above or below Tset.
As long as temperature is not within Tset +/- ranges, the function remains in CoolPullDown or HeatPullUp mode. If temperature is within range “SET OK” will appear in the display. With the temperature having been within Tset +/- ranges for 30 min. Cool or Heat mode is entered.

Cool / Heat mode:
Temperature is within Tset +/- ranges and “IN-RANGE” is displayed. If temperature is in out-of-range condition for more than 5 min. an in-range alarm is given and CoolPullDown / HeatPullUp mode is entered.

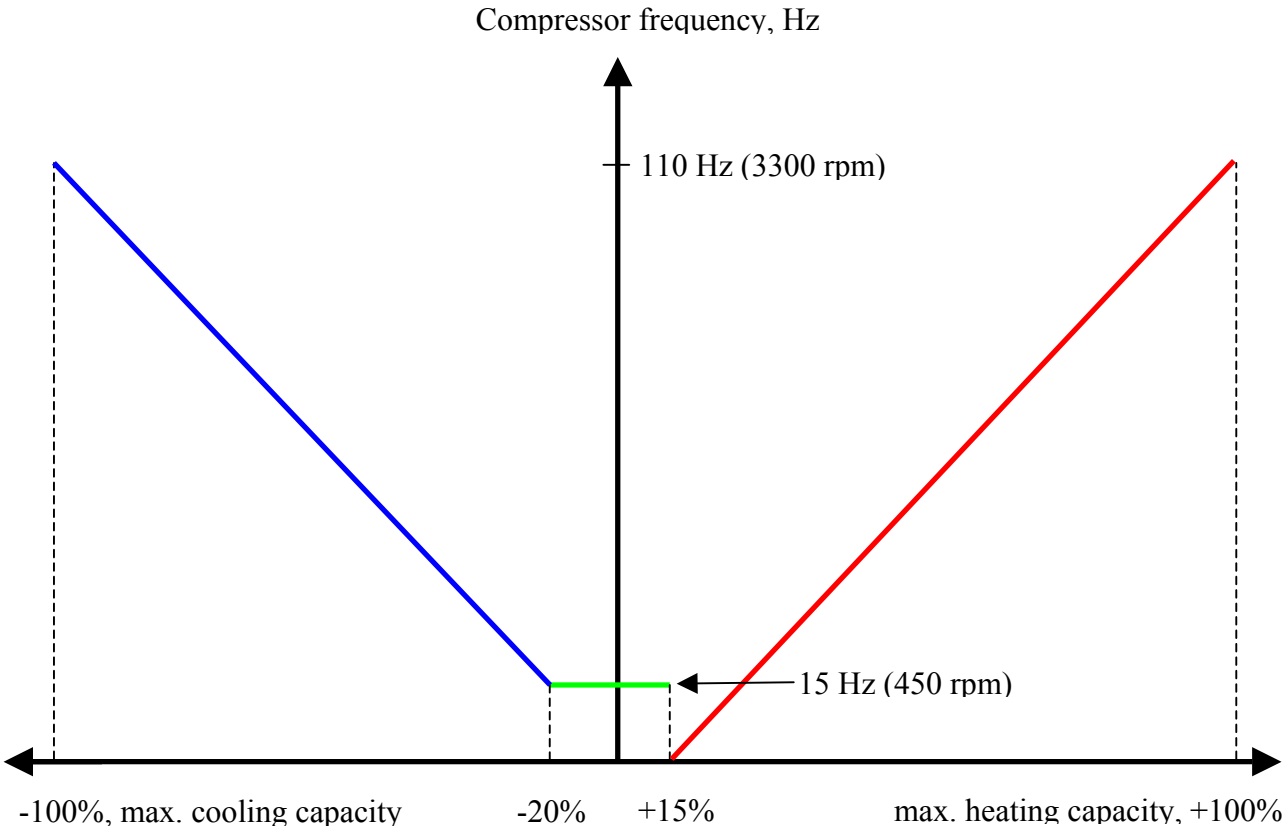
On the basis of Tact and Tset the function calculates the requested capacity (CapReq) value by means of a PID controller. CapReq is the desired chilling / heating capacity. CapReq value can range from –100% to +100%. –100% being maximum cooling and +100% being maximum heating.

### 5.2.2. Capacity Control

On the basis of requested capacity the function determines operation mode and actions of the individial system components (compressor, valves, heating elements) and ensures that compressor minimum off time is observed.
This function has 6 gear (modes). On the basis of requested capacity, the capacity gear is determined.
Compressor frequency and hotgas valve are directly dependent upon current mode. Evaporator heater, on the other hand, is gear independent.
There is overlap over the modes to maintain slow mode shifting.

| Gear | Function |
|---|---|
| Off | Everything is turned off. |
| CoolEco | Maximum cooling capacity with use of economizer. |
| Cool | Cooling without economizer. |
| Hotgas | Low cooling capacity with use of hotgas valve for better temperature control. |
| Heat | Only the heaters are used. May also be active in hotgas mode. |
| Defrost | Heaters are always used and hotgas valve is used if ambient temperature is above 5 ˚C. |
| Startup | If cooling is requered, the FC is starting at default frequency before shifting to correct cooling mode. |

The capacity of the unit is controlled between maximum cooling capacity (-100% capacity) and maximum heating capacity (+100% capacity). This is done by regulation of the compressorspeed by means of the frequency converter and the hotgas valve for minimum capacity control. In maximum capacity (+100% capacity) the unit is using the heating elements, by means of puls width modulation, to control the capacity.
Below figure indicates the ranges for the capacity and compressor speed (frequency).




The area where cooling is requested, controlled by the frequency
The area where hot gas valve is regulating minimum capacity.
The area where heating is requested, controlled by pulsing of

## 5.2.3. Limitor

The limitor function secures that the controller operates with valid settings to protect the unit in order to maintain the conditions for the cargo. To maintain the set point temperature, capacity control constantly monitors and adjusts the capacity. The limitor acts as a brake to the capacity change requests from capacity control and thereby controlling how fast the capacity can change, so that safe operation of the unit constantly is ensured..

The limitor monitors the following parameters from the unit and generates a limitor factor for each:

- IFC, to limit the maximum current draw from the FC.
- TFC, to limit the maximum internal FC temperature.
- Tc, to limit the maximum condenser pressure (and temperature).
- T0, to ensure a minimum evaporator pressure.
- Teco, to ensure a minimum middle pressure in the compressor.

The largest of the factors is used as the active limitor. If the limitor factor is higher than the requested capacity change, the capacity is actually reduced instead of increased.
If for example the ambient temperature is very high, the requsted capacity may increase the FC temperature over its limits and so the limitor would reduce the capacity until is a safe and stable operation condition for the FC has been reached.

### 5.2.4. Expansion Valve

This function ensures optimum evaporator superheat (SH) and calculates the percentage of opening (SHVod) and controls the valve. Function is active during compressor operation. Valve is closed during compressor turn off.

Expansion valve function includes the following sub-functions:
- MSS (Minimum Stable Superheat search).
- Superheat control.
- MOP (Maximum Operating Pressure).

MSS
This function searches for minimum stable superheat within the ranges SHmin and SHmax. With a stable T0, SHset is reduced and with an unstable T0, SHset is raised.
SHact: = Tsuc – T0

Superheating
Function output is the expansion valve opening rate (VexpOD).
At start-up the opening rate is 0%.
The electronic expansion valve is an on/off valve controlled on the basis of opening rate with a constant cycle time.

MOP function
The MOP function prevents the suction pressure from getting too high.

### 5.2.5. Economizer Valve

This function ensures optimum supercooling of liquid to the evaporator and cooling of the frequency converter.
In addition, the cooling capacity is increased, COP is enhanced and compressed gas temperature is reduced.
Function output is the economizer valve opening rate (VEonOd).

The economizer control has two modes:
- Superheat control
- Frequency converter cooler.

*Superheat control*
A PI controller is used for valve opening rate control.

*Frequency converter cooler*
This function is active during compressor operation.

The highest opening rate is used as current rate.

## 5.2.6. Dehumidification

The dehumidification function dehumidifies air in the container by means of a heater.
This function is only activatable if the temperature control function is active.

Dehumidification is achieved by decending evaporator surface temperature.
This is done through activation of the heater and letting the temperature control increase cooling capacity resulting in an evaporator temperature decending.

This function has 3 modes:
Off
Dehumidify
Override

Off
*The dehumidification function is in the OFF position. Set-point is zero.*

Dehumidify
The heater (Hevap) is activated when Rh > RhSet and deactivated when Rh < RhSet – 3%.
The humidity setpoint ca be set in the range 60% to 95% relative humidity.

Override
Accessing override mode if:
Tset – Tact > Tinrange (Tact is Out-Range)
Compressor frequency = 0 (on/off operation in emergency operation)
Temperature control is deactive (in case of defrost activation, PTI test or fatal alarm)

Other comments
With the set-point in the ”not zero” position the dehumitification icon is displayed in the user’s interface. The heat icon follows the current state of the heater.

## 5.2.7. Condenser Pressure

Condenser pressure control will reduce condenser pressure through condenser ventilation.
The condenser pressure control also monitors the compressor outlet pressure in case of water-cooling.
This function is activated when control is in the automatic mode.

Condenser pressure control has two primary modes:
Air-cooled
Water-cooled

Air-cooled
In the air-cooled mode ventilation takes place in the following way:
Depending on the compressor outlet pressure the fan is Off or runs on 2 different speeds: High and

Low.
If Tamb is > 48°C or the compressor outlet pressure remains constantly high, the condenser fan constantly runs at high speed.

Water-cooled
In water-cooled mode the set-point for condenser fan start is 58°C. If the condenser fan is constantly on for more than 1 hour, an alarm will be given.

### 5.2.8. Evaporator Fan

The evaporator fan function ensures correct fan speed.
The function is active in the automatic mode.

This function has 2 modes:
Normal
Economy

Normal
In the chill mode the fans run at high speed.
In the frozen mode the fans run at low speed.

Economy
The fans run at a constant low speed. By selecting Economy mode, dehumidification is turned off.

### 5.2.9. Defrost Function

Defrost function ensures regular evaporator defrosting. The function is active in automatic mode. Time-based defrosting takes places if T0 falls below a specified level and compressor has been running.

The defrost function has 4 modes:
Wait
Initialize
Execute
Terminate

*Wait*
In the wait mode the time is refreshed for the next defrost provided that the following conditions are satisfied:

- Compressor is running
- T0 < T0min.

Wait mode termination can be due to:
Elapse of time for next defrosting (Automatic defrost initiation)
Defrosting action initiated manually (Manual defrost initiation)

Initialize
Wait until condenser temperaure is above 122F (50°C), however no more than 300 sec.

Execute
In this mode the actual evaporator defrosting takes place:
A Defrost start event is made in the trip log.
Cooling system termination results in compressor initiation, only ramp up mode is executed.
Evaporator fan is stopped.
Evaporator and tray heating elements are turned on.
Compressor runs at a constant frequency at 83% of full speed.
Expansion valve control is deactivated.
Hotgas valve is used to heat the evaporator from the inside with the hot gas from the compressor.

Evaporator defrosting terminates when evaporator temperature, Tevap, is above defrost termination temperature for 2 min. or upon elapse of max. defrost time.
A defrost stop event is made in the data log with the current interval and Tevap temperature.

Terminate
Terminate mode is dividable into two parts:
Evaporator refreezing preventing remaining water drops on evaporator from blowing into container upon evaporator fan initiation.
Termination ensuring low evaporator fan speed to prevent shock boiling and to ensure that the temperature controller takes over in a controlled way.

After termination, the unit continues normal operation again with the same setpoint temperature as before defrost start.

<u>General information</u>
If the Tevap sensor is not ok, adaptive defrosting is deactivated and defrost interval is set to standard defrost interval.
In case of temperature set-point alteration the actual defrost interval is set to default defrost interval.
With manual defrost initiation the current defrost interval is set to default defrost interval.

<u>Manual defrost termination</u>
Upon manual defrost termination, termination state is entered. No adaptive adjustment takes place when defrosting is manually initiated.

Regarding user interface
Defrost icon is displayed during defrost function execution.

Other comments
If service mode or PTI mode is selected during a defrost, the defrost mode is terminated and the time for the next defrosting is set to the preset value as if a normal defrost end had ocurred.

If the unit is shut off for some reason during a defrost and the power disappears for less than 12 hours, the unit will start and try to finish the defrost again when the power returns.
If the unit is shut off for more than 12 hours, the active defrost is terminated and the defrost function enters the wait state.

## 5.3. Test

The unit has 2 test functions:
Function test

- PTI (Pre-Trip Inspection) test.
  The PTI test is a function test followed by a capacity test where the requested temperature must be reached within the time limit

At test initiation an event is generated in the log.

During function and PTI test the normal alarm system remains active. If an alarm is triggered during test operation, it appears in the display and will be written in the log as it is the case during normal operation.
In case of a fatal alarm during testing the test is terminated and the unit remains off.

Function or PTI sub-test failure causes an alarm ”PTI FAILURE” to be generated.
In case of function or PTI sub-test pass an event ”Test status” is displayed.
For more information, please see event list.

Clear the alarm list before starting a test. If there should be any active alarms in the alarmlist when a function or a PTI test is started, the test will always fail even if all the individual test steps PASS without failures.

PTI menu has a primary status and a status for each sub-test with own indexes.
Only the primary status for a PTI test is memorized when supply voltage is removed.

### 5.3.1. Function Test

Function test is a unit component test. (Non destructive)
Test is based on a GO/NO GO procedure. All tests must be executed without failure one by one for the function test result to be PASS.

Function test includes the following items:
1. PTI – init
2. Controller test
3. Power check
4. Evaporator fan (Mevap)
5. Condenser fan (Mcond)
6. Heating element (Hevap and Htray)
7. Probe check (is not implemented)
8. Compressor/valve test (Vexpansion, Vhotgas and Veconomizer)
9. Test completion / status

**NOTE: At ambient temperature above 40°C (104°F) and below –20°C (-4°F) the unit has to be running in normal operating mode with at setpoint of 0°C (32°F) for a time of 30 minutes before executing a function test or PTI test.**
**The reason for this is to ensure correct function of unit during function test or PTI test.**

### 5.3.2. PTI Test

The purpose of the PTI test is to verify the presence of cooling unit cooling performance.
The test is based on a GO/NO GO procedure. All tests must be executed without failure one by one for the PTI test results to be PASS.

PTI test includes the following test items:
1. Function test
2. 5°C (41F) test
3. 0°C (32F) test
4. -18°C (-0.4F) test
5. Defrosting
6. Test completion / status

## 5.4. Data Log

The controller has a data log to record operation of the unit. The data log includes 4 items:

- Data.
- Extended data.
- Event data.
- Alarms.

The logged data in the data log can be seen:

- On the display menu L01, the viewable temperatures are listed.
- Retrieved via the program RefCon and the RMM modem and the powerline.
- Retrieved via a program, LogMan, on a PSION pda using the retriever socket.
- Retrieved via the StarView program using the retriever socket.

The datalogger can hold approximately 10.000 logs or more than 1 year of loggings with default logging interval of one log per hour.

Explanations of datalog loggings:
Temperatures are stored in °C and are converted to Fahrenheit on retrieval or listing on the display.
Pressures are stored in Bar and are converted to Psi on retrival.

Data:

| No. | Name | Value | Unit |
|---|---|---|---|
| 1 | Tsupply temperature | Temperature from supply sensor | °C |
| 2 | Treturn temperature | Temperature from return sensor | °C |
| 3 | Tusda 1 temperature | Temperature from USDA sensor 1 | °C |
| 4 | Tusda 2 temperature | Temperature from USDA sensor 2 | °C |
| 5 | Tusda 3 temperature | Temperature from USDA sensor 3 | °C |
| 6 | Tcargo temperature | Temperature from cargo sensor | °C |
| 7 | Tset temperature | Set-point temperature | °C |
| 8 | Humidity % | Humidity from humidity sensor | % |
| 9 | AirEx airflow | Airflow from AirExchange sensor | $m^3/h$ |

Extended data:

| No. | Name | Value | Unit |
|---|---|---|---|
| 1 | Psuc pressure | Suction pressure (relative) | Bar |
| 2 | Pdis pressure | Discharge pressure (relative) | Bar |
| 3 | Fpower frequency | Power frequency | Hz |
| 4 | (reserved) | -- | -- |
| 5 | Upower voltage | Highest power voltage of U1, U2, U3 | V |
| 6 | I1 current | Current I1 | A |
| 7 | I2 current | Current I2 | A |
| 8 | I3 current | Current I3 | A |
| 9 | Ifc current | Current frequency converter | A |
| 10 | Fcpr frequency | Compressor frequency | Hz |
| 11 | Heater status | Heater on-time | % |
| 12 | (reserved) | | -- |
| 13 | Mevap status | Evaporator motor [OFF, LO, HI, ERR] | -- |
| 14 | Mcond status | Condenser motor [OFF, LO, HI, ERR] | -- |
| 15 | Tfc temperature | Temperature of frequency controller | °C |
| 16 | Tambient temperature | Ambient temperature [-30 – 96] | °C |

Events:

| No. | Name | Parameter explanation | | | | |
|---|---|---|---|---|---|---|
| | | No. 1 | No. 2 | No. 3 | No. 4 | No. 5 |
| 0 | Temperature set-point altered | Old set-point | New set-point | n/a | n/a | n/a |
| 1 | Humidity set-point altered | Old set-point | New set-point | n/a | n/a | n/a |
| 2 | Water-cooling Off | n/a | n/a | n/a | n/a | n/a |
| 3 | Water-cooling On | n/a | n/a | n/a | n/a | n/a |
| 4 | Function test Start | Version | n/a | n/a | n/a | Alarms count |
| 5 | Function test Pass | FT test ID | n/a | n/a | n/a | n/a |
| 6 | Function test Abort | FT test ID | n/a | n/a | time | Alarms count |
| 7 | n/a | | | | | |
| 8 | PTI Test Start | Version | n/a | n/a | n/a | Alarms count |
| 9 | PTI Test Pass | PTI test ID | n/a | n/a | n/a | n/a |
| 10 | PTI Test Abort | PTI test ID | n/a | n/a | Time | Alarms count |
| 11 | n/a | | | | | |
| 12 | Service Start | n/a | n/a | n/a | n/a | n/a |
| 13 | Service Stop | n/a | n/a | n/a | n/a | n/a |
| 14 | Defrost Start | 0: Auto start<br>1: Manual start | n/a | 0: Hotgas<br>1: Elec. | n/a | n/a |
| 15 | Defrost Stop | Current defrost interval [sec] | Tevap | 0: Hotgas<br>2: Elec. | n/a | n/a |
| 16 | Trip Start | 1: Auto trip-start<br>0: User trip-start | SW ver. low | SW ver. high | n/a | n/a |
| 17 | Sensor Calibrated | 1 = USDA 1<br>2 = USDA 2<br>3 = USDA 3<br>4 = CARGO | Old Cal. Value | New Cal. Value | n/a | n/a |
| 20 | Power Up | Unit run time [hours] | Compr. run time [hours] | Mevap run time [hours] | Mcond run time [hours] | Hevap run time [hours] |
| 21 | User Wake-up | n/a | n/a | n/a | n/a | n/a |
| 22 | Power Down | SW ver low byte | SW ver high | Vbatt. | Power up count | Reset count & WDT count |
| 23 | Down Load | Old sw ver low | Old sw ver high | New sw ver low | New sw ver high | n/a |
| 25 | Real time clock | Old date | Old time | New date | New time | n/a |
| 26 | FC type | Old | New | n/a | n/a | n/a |
| 27 | Datalog internal | Old | New | n/a | n/a | n/a |
| 28 | Defrost interval | Old [min.](*) | New [min.] (*) | n/a | n/a | n/a |
| 29 | FC unit ID change | Old Id (low) | Old ID (high) | New ID (low) | New ID (high) | n/a |
| 50 | Controller Internal Temperature | n/a | n/a | n/a | n/a | n/a |

(*) The time is stored as minutes: 360 min = 6 * 60 min. = 6 hours

Alarms:

Alarms which may occur and detailed explanation and troubleshooting are described in this manual.

.

# 6. Refrigeration system data

## 6.1. Refrigerant charge, R 134a.

4,5 kg, with water cooled condenser

## 6.2. General specification

| | | | |
|---|---|---|---|
| **Total unit weight** | 460 kg. | | |
| **Dimensions** | Height | Width | Depth |
| | 2235 mm | 2025 mm | 420 mm |
| **Noise level** | < 75 db (A) in 250 Hz band.<br>Measured 1,5 m in front of unit and 1,2 m above the ground, with the unit operating at 50 Hz. | | |

## 6.3. Compressor – motor assembly

| | |
|---|---|
| Make | Bitzer |
| Type | Semi – hermetic two-stage reciprocating. |
| Number of cylinders | 2 Low stages cylinders.<br>2 High stage cylinders. |
| Speed | Variabel, frequency converter controlled. |
| Model | S4BCF – 5.2Y. |
| Nominal power | 5,5 kW. |
| Compressor oil type | Reniso Triton SEZ 55 or equivalent |
| Compressor oil quantity | 1,5 liter |
| Compressor housing | Seawater resistant aluminium, unpainted. |
| Weight | 58 Kg. |

## 6.4. Frequency converter

| | |
|---|---|
| Make | Danfoss |
| Type | FCM 375 |
| Frequency range | 15 – 110 Hz (450 – 3300 rpm). |
| Converter housing | Seawater resistant aluminium, unpainted. |
| Tightness | IP 55 |

## 6.5. High Pressure cut – out switch

| | |
|---|---|
| Cut –out | 22,5 bar (326,3 psi) ± 0,7 bar (10,2 psi). |
| Cut – in | 15,9 bar (230,6 psi) ± 0,7 bar (10,2 psi). |

## 6.6. Fusible plug, receiver

| | |
|---|---|
| Blow temperature | 100 °C (212 °F). |

## 6.7. Economizer

| | |
|---|---|
| Make | SWEP / WTT |
| Type | Brazed plate heat exchanger |
| Material | Stainless steel, AISI 316 L |

## 6.8. Evaporator coil

| | |
|---|---|
| Make | ECO |
| Tube material | Copper, cross hatched |
| Fin Material | Aluminium, Hydrophilic treated |
| Fin spacing | 3,4 mm |
| Attitude | 45° from horizontal |

## 6.9. Condenser coil

| | |
|---|---|
| Make | ECO |
| Tube material | Copper, cross-hatched |
| Fin Material | Copper |
| Fin spacing | 2,0 mm |
| Coating, tube/fin | Cataphoresis treatment, with additional acrilic resin. |

## 6.10. Evaporator fan

| | |
|---|---|
| Hub material | Polyamid, glass reinforced |
| Type | Axial |
| Number of fans | 2 |
| Number of blades | 6 |
| Pitch | 25° |
| Diameter | ø315 mm |
| Blade material | Polypropylen, glass fibre reinforced |
| Drive | Direct on motor shaft |

## 6.11. Condenser fan

| | |
|---|---|
| Hub material | Polyamid, glass reinforced |
| Type | Axial |
| Number of fans | 1 |
| Number of blades | 4 |
| Pitch | 30° |
| Diameter | ø440 mm |
| Blade material | Polypropylen, glass fibre reinforced |
| Drive | Direct on motor shaft |

## 6.12. Water cooled condenser.

| | |
|---|---|
| Operating water pressure, max. | 8 bar (115 Psig). |
| Water temperature | 30°C (86°F). |
| Water flow rate | 22,7 – 30,2 l/min. (6 – 8 gpm). |
| Pressure drop | 0,9 bar (13,05 psi) – 1,2 bar (17,4 psi) @ above flow rate. |
| Connections | Inlet: Hansen B-66 or equivalent.<br>Outlet: Hansen B8-HP36-VAA or equivalent. |
| Condenser tubing | Cu – Ni (90/10). |
| Water specification | Fresh water or Salt water, without free chlorine. |

## 6.13. Defrosting

| | |
|---|---|
| Defrost initiation | Adjustable electronic timer, part off the controller. |
| Trip defrosting interval | Adjustable from 6 to 48 hours. Default 6 hours.<br>The first 6 defrost are done with an interval of 4 hours to prevent icing up of evaporator. Hereafter the defrost continues with the set defrost interval for the trip.<br>The demand defrost system is constantly monitoring the temperatures for the evaporator in order to prevent that the evaporator will block up with ice.<br>If a blocking up of the evaporator is registrered by the system a demand defrost will be initiated. |
| Defrosting method | Hot gas, combined with electrical heaters. |

## 6.14. Fresh air exchange

| | |
|---|---|
| Fresh air exchange | Adjustable 0 - 205 m3/h (0 –121 CFM) @ 60 Hz.<br>Adjustable 0 - 170 $m^3$/h (0 –100 CFM) @ 50 Hz. |

## 6.15. Refrigeration controls

| | |
|---|---|
| Expansionvalves | 2 solenoid valves, electronically controlled from controller. |
| Filter Drier | Danfoss DML 164 with O – ring or equivalent. |
| Hot – gas valve | Solenoid valve, electronically controlled from controller. |
| Moisture indicator | Incorporated in receiver sight glass.<br>Material: Brass acc. to EN 12164 / CW602N. |
| Piping | Solid copper tubes according to EN 12735 – 1. |
| Pipe coating | Primer: Epoxy resin zf – a120<br>Top coat: Polyurethane resin Hipon – 50. |

## 6.16. Electrical data

| | |
|---|---|
| Input power | 3 x 350 V / 3 x 500 V<br>50 Hz / 60 Hz ± 2,5 Hz. |
| Control circuit voltage | 24 Vac Nominal (varies with power supply).<br>19 Vac (350 V) – 29 Vac (500 V). |

## 6.17. Circuit Breaker

| | |
|---|---|
| Main power ampere | 25 A. |

## 6.18. Contactors

| | |
|---|---|
| Nominal: | 9 amp @ 40°C & 400 volt. |
| Max: | 7 amp @ 70°C & 520 volt. |
| Start current: | 6 x nominal |

## 6.19. Fuses

| | |
|---|---|
| Secondary main fuses | 10 A, tube fuse. |
| Control circuit | 0,4 A, tube fuse. |
| 24 Vac circuit | 6,3 A, tube fuse. |

## 6.20. Power plug

| | |
|---|---|
| Type | CEE 17, 4 pole, with earth. 32 amp.<br>400/460 V / 50/60 Hz |

## 6.21. Power Cable

| | |
|---|---|
| Type | 4 x 4 $mm^2$, 450 / 750 V, PU – sheath. |
| Length | 18 m |
| Colour | Yellow |
| Temperature Range | -37°C to +90°C |

## 6.22. USDA socket requirements

| | |
|---|---|
| Location | Rear left side |
| Number | 3 pieces + 1 cargo sensor |
| Type | Deutsch HD 10, female socket. Tin Plated. |

## 6.23. Evaporator fan motor

| | |
|---|---|
| Make | Grundfos dahlander motor. |
| Type | Enclosed, non – vented. |
| Frame size | 071B3. |
| Shaft material | Stainless steel, X20CrNi172. |
| No. of motors | 2 |
| Voltage | 3 – phases, 350 / 500 Vac, 50/60 Hz. |
| Nominal power | 0,45/0,07 kW @ 460V/60 Hz |
| Protection, electrical | Thermistors |
| Speed | Dual – speed<br>3460 / 2850 rpm (60/50 Hz).<br>1760 / 1425 rpm (60/50 Hz). |
| Rotation | Counter – clockwise, when viewed from shaft end. |
| Bearings | Permanently lubricated, sealed. |

| Bearing size | Drive end | Non - drive end |
|---|---|---|
| | 6304 2Z C3 | 6201 2Z C3 |

| | |
|---|---|
| Bearing lubricant | Lubricant |
| | Klüberquiet BQH 72 – 102<br>or equivalent.<br>Temperature range:<br>-40°C - +140°C. |

## 6.24. Condenser fan motor

| | |
|---|---|
| Make | Grundfos dahlander motor |
| Type | Enclosed, non – vented |
| Frame size | 071B3 |
| Shaft material | Stainless steel, X20CrNi172 |
| No. of motors | 1 |
| Voltage | 3 – phases, 350 / 500 Vac, 50/60 Hz. |
| Nominal power | 0,25/0,07 kW @ 460V/60 Hz |
| Protection, electrical | Thermistors |
| Speed | Dual – speed<br>1740 / 1460 rpm (60/50 Hz)<br>870 / 730 rpm (60/50 Hz). |
| Rotation | Counter – clockwise, when wiewed from shaft end. |
| Bearings | Permanently lubricated, sealed |

| Bearing size | Drive end | Non - drive end |
|---|---|---|
| | 6204 2Z C3 | 6201 2Z C3 |

| | |
|---|---|
| Bearing lubricant | Lubricant |
| | Klüberquiet BQH 72 – 102<br>or equivalent.<br>Temperature range:<br>-40°C - +140°C. |

## 6.25. Evaporator coil heaters

| | |
|---|---|
| Type | ø8,5 mm in stainless steel AISI 304 |
| Number | 6 |
| Rating | 750 W each @ 400V. |

## 6.26. Drain pan heaters

| | |
|---|---|
| Type | ø8,5 mm in stainless steel AISI 304 |
| Number | 1 |
| Rating | 400 W at 400V. |

## 6.27. Temperature sensors, including USDA.

| | |
|---|---|
| Type | NTC, 10 kohm @ 25°C |
| Operating temp. | -40°C to +100°C. |
| Accuracy | ±0,15°C, range -30°C to +100°C. |

## 6.28. Pressure transmitters

| | |
|---|---|
| Make | Danfoss AKS 32R |
| Range | 0 – 32 BarG. High pressure side.<br>-1 – 12 BarG. Low and intermediate pressure side. |
| Type | Ratiometric pressure transmitter, with sealed gauge measuring principle.<br>¼” in. female flare connection with deflator |

# 7. Miscellanous

Tin plated cables.
2 pieces of incorporated hinges.
2 pieces of removable evaporator hatches.
Auto PTI, with function test and fault diagnostics.
Bolt, screws and nuts in stainless steel.
Single viper peripheral seal.
Front frame is painted with polyester powder, colour Ral 9003.
Fresh air exchange is measured and logged in $m^3/h$, definition 5 $m^3/h$.

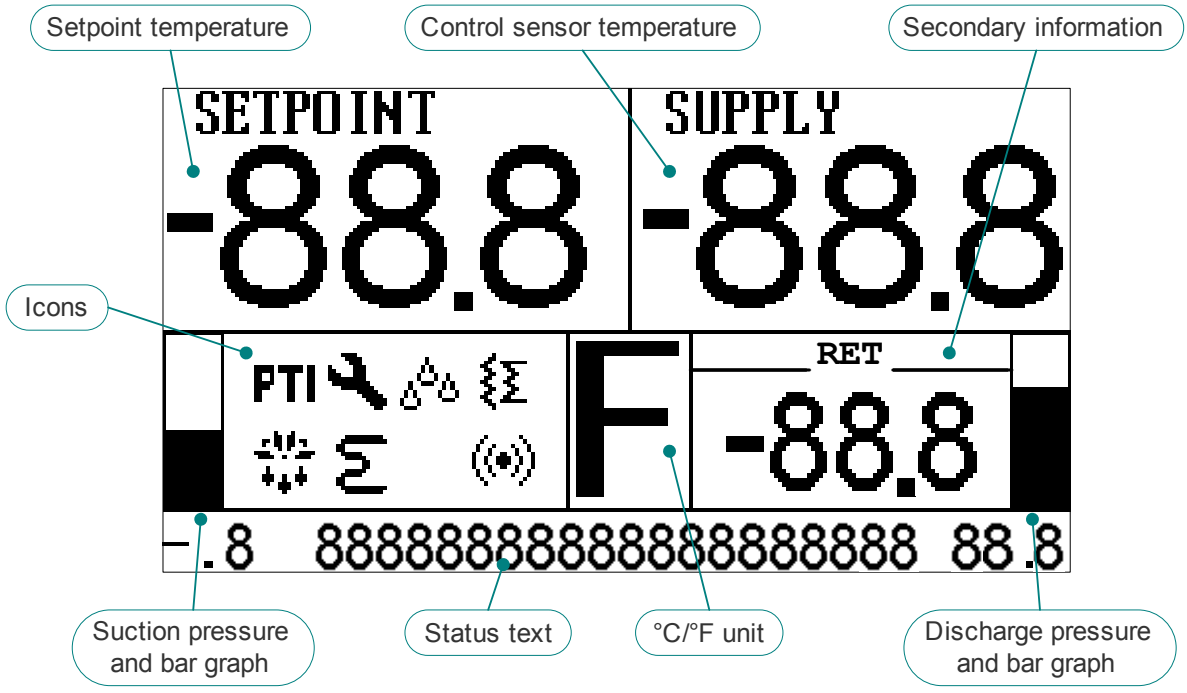
# 8. User Interface

## 8.1. Indicator lights

| Alarm indicator light | | | In-range indicator light |
|---|---|---|---|
| SLOW FLASH if there are active alarms.<br>QUICK FLASH if there are fatal alarms. | ALARM  | IN-RANGE  | BLINK when controlling temperature probe is inside the acceptable range<br>Constant ON after 30 min. in-range |

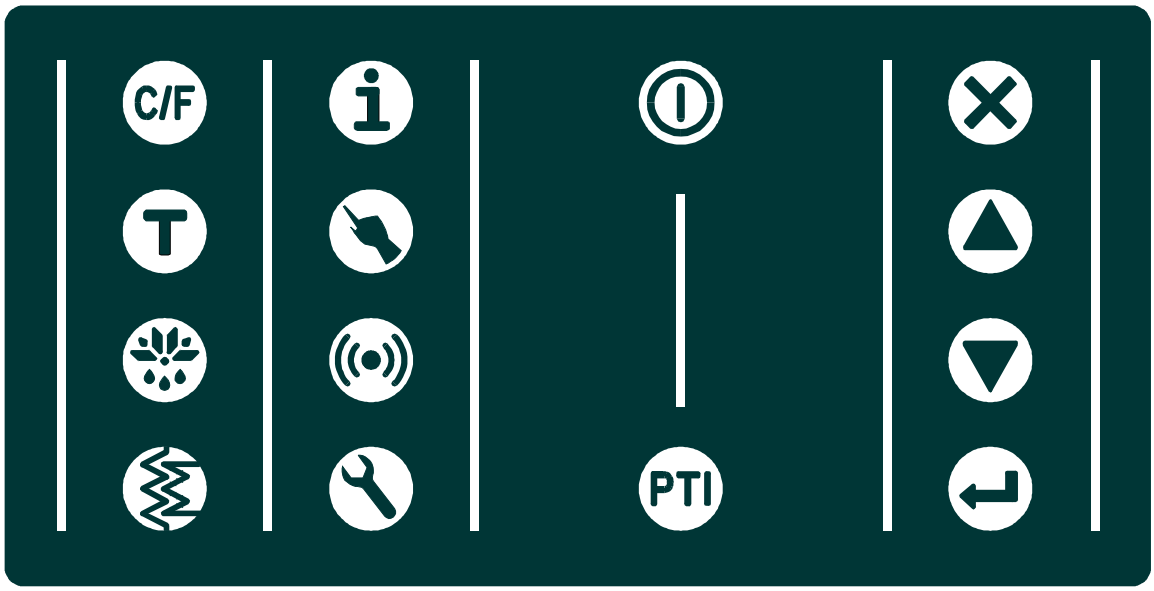
Both lights will be active only when the container is connected to a power supply line.
During power up both lights are shortly illuminated to verify their function.
A “Slow flash” is a short flash every 3 sec.. A “Quick flash” is a flash every 1 sec. A Blink es a flash every 1½ sec.

## 8.2. Display



| | |
|---|---|
| **C / F** | Temperature and pressure unit selection<br>Celsius + Bar or Fahrenheit + Psi |
| **PTI** | Pre Trip Inspection or Function Test is running |
| | Unit is operated in service mode |
| | Humidity control is activated |
| | Water cooled condenser is activated |
| | Defrosting is running |
| | Heater element is switched on |
| | Alarms are present in the alarm menu |

# 9. Key pad




| Navigation keys | | Use these keys to move menu display up / down and to change parameter values |
|---|---|---|
| | Cancel | Leave active sub menu<br>Cancel active parameter adjustment |
| | Up | Move menu one line up<br>Increment parameter value in menu<br>Increment setpoint on main display page |
| | Down | Move menu one line down<br>Decrement parameter value in menu<br>Decrement setpoint on main display page |
| | Enter | Select a sub menu<br>Activate a function (press twice)<br>Initiate parameter adjustment<br>Accept parameter adjustment when done |
| **Menu keys** | | **Press key to select menu display**<br>**Press again to move menu one whole page down** |
| | Wake-up | Turn on and off battery powered display operation<br>No display backlight will be active |
| | PTI | Show PRE TRIP INSPECTION menu (Start/stop test and view results) |
| | Info | Show INFORMATION menu (Actual data read out) |
| | Operation | Show OPERATION menu (Commonly used settings) |
| | Alarm | Show ALARM menu (View listing of present alarms) |
| | Service | Show SERVICE menu (Maintenance data and settings) |

| Function keys | | Direct activation and deactivation of commonly used functions |
|---|---|---|
| C/F | Unit | Switch temporarily between Celsius and Fahrenheit temperature display<br>Press 10 sec. to permanently change the display unit |
| T | Toggle | Temporarily change to other values in secondary information area |
| | Defrost | Press 3 sec. to start and stop a manual defrost cycle |
| | Water Cool | Press 3 sec. to activate and deactivate water cooled condenser |

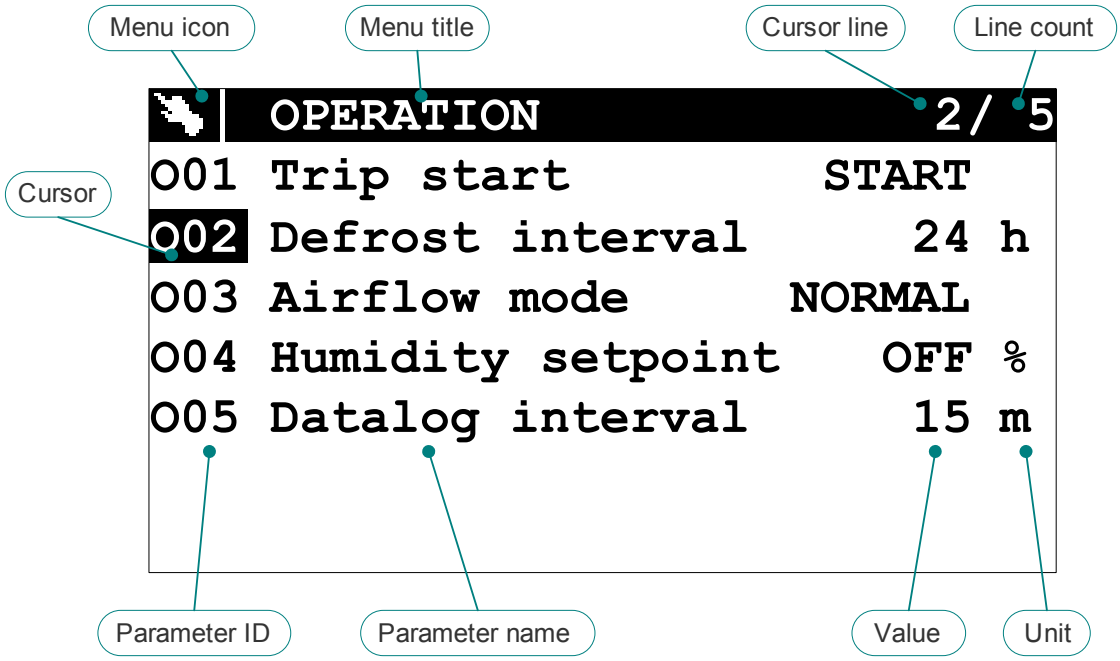
If no key is activated for a period of time, the controller will do this:

5 sec.: Cancel active parameter adjustment
10 sec.: Reset temporary unit and other selections
°C/°F and Bar/psi
30 sec.: Turn off battery powered display operation
when not connected to a power supply line
5 min.: Leave service mode operation and return to automatic mode
10 min.: Return to main window in display

# 10. Menu overview

Menus are selected by pressing a menu key or by pressing the Enter key on a sub menu line shown in the display.

## 10.1. General Page layout




## 10.2. Using the cursor

The parameter ID is used to uniquely identify each displayed line of the menu system.

Pressing the ▲ and ▼ arrow keys will move the highlighted cursor one menu line up or down.

In the upper right corner of the display is shown the actual line number of the cursor together with the total number of lines in the current menu.

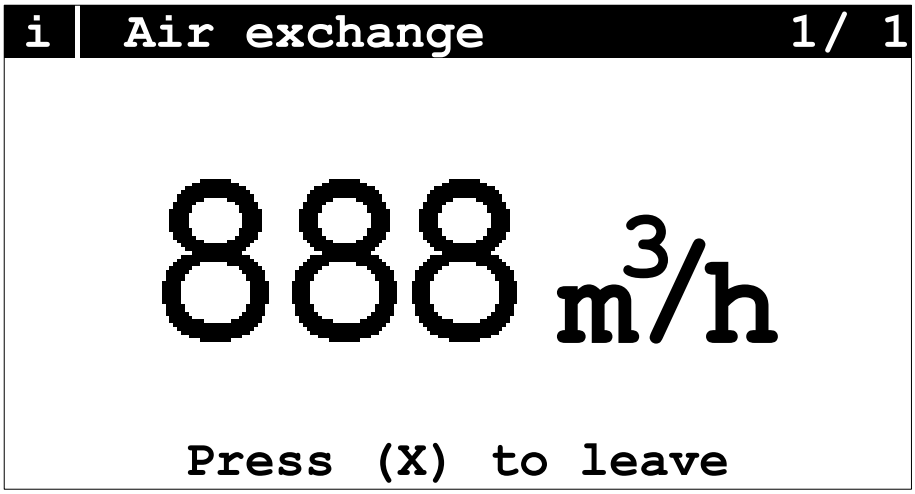
## 10.3. Changing a parameter value

1. First move the cursor Up press ▲ or Down press ▼ to the line of the parameter to be changed.
2. Then press the Enter key, ↵. The cursor will now highlight the parameter value instead of the ID.
3. Use the Up, ▲ or Down, ▼ arrow keys to increase or decrease the displayed value.
4. Accept the new parameter value by pressing the Enter key, ↵ once more.
5. If not pressing any key for 5 sec. or if pressing the Cancel key, ⊗ the value will not be changed.
6. The cursor returns to the ID column and can now be moved to other lines.

## 10.4. Activating a function

1. First move cursor Up, press ▲ or Down, press ▼ to the line of the function to be activated.
2. Then press the Enter key, ↵. The cursor will now highlight the function value instead of the ID.
3. Do the activation by pressing the Enter key, ↵ once more.
4. If not pressing any key for 5 sec. or if pressing the Cancel key, ⊗ no function will be activated.
5. The cursor returns to the ID column and can now be moved to other lines.

## 10.5. Air exchange page

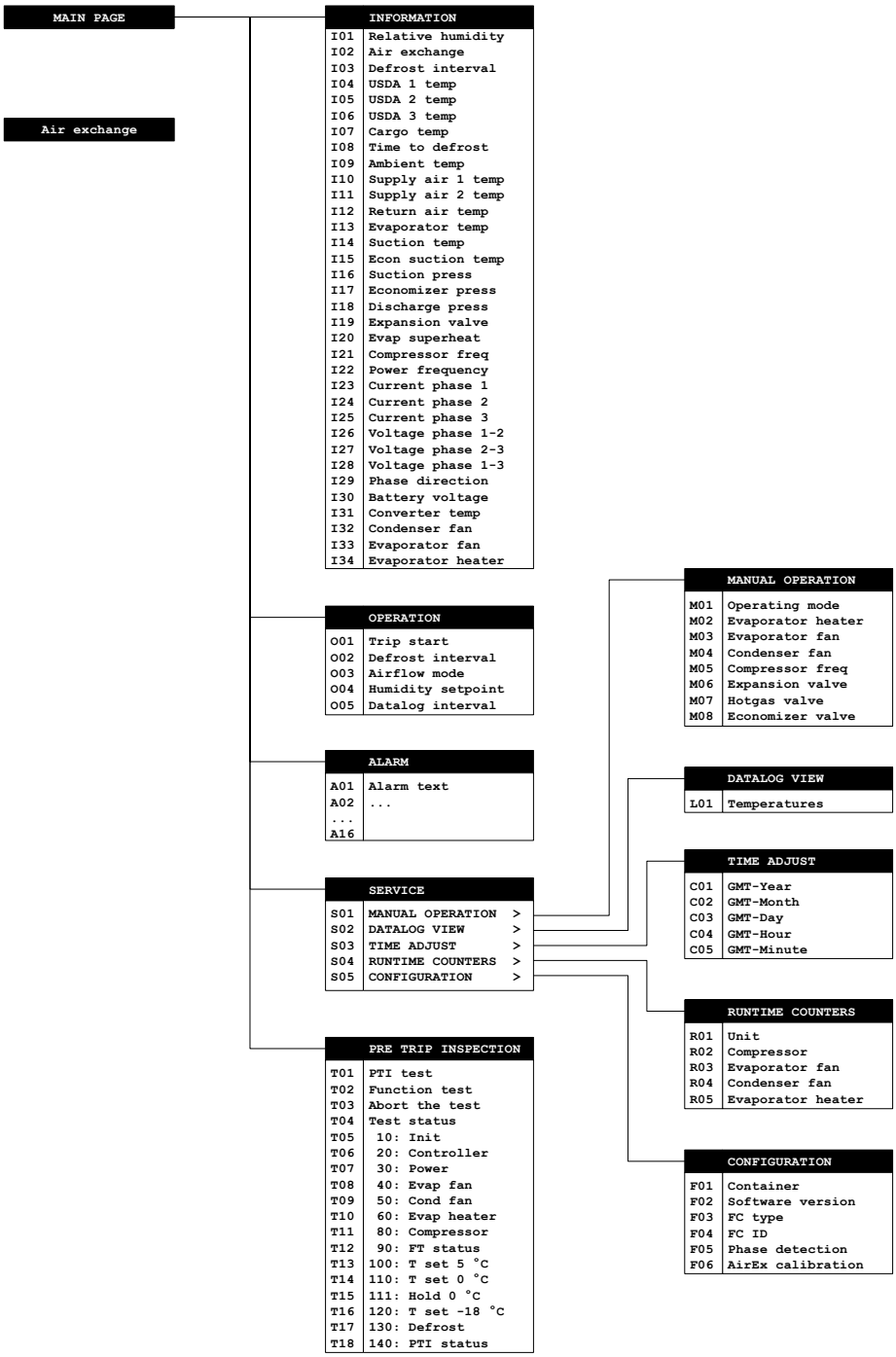



This page is automatically displayed when the user starts changing the air exchange valve position. The display returns to the main page after 10 min. or when the Cancel key is pressed.

To view actual airflow at a different time use information menu I02

# 11. Operation

## 11.1. Menu Structure



## 11.2. General Operation

The following text is a general description of operating menus and editing parameters.

By pressing a menu key the menu is selected and its icon is illuminated.
The lower part of the display shows parameter number, parameter value and a short information text in English.
After 30 sec. with no keyboard activities, the display returns to the main display menu. By pressing ⊗ the display returns to the previous menu level in the menu structure.
If one of the other menu keys is pressed, menu selection changes.

By pressing the ▲ and ▼ keys the individual parameters are scrollable.

For parameter change, press ↵ and the parameter is highlighted in inverse writing. By pressing ▲ and ▼ keys parameter values are changeable.
When desired value is set, press ↵ to accept value and parameter is shown in normal writing again.
As long as the parameter value is shown in inverse writing, setting is cancelable by pressing ⊗ and the previous parameter value is shown again.

If the keys ▲, ▼ or ↵ are not pressed for 5 sec., setting is cancelled and the previous parameter value is shown again.

## 11.3. Temperature Setting

Temperature set-point adjustment is directly made from the main display menu.

By pressing ▲ or ▼ the set-point is adjusted 0.1 F(0.1°C) and the set-point digits are highlighted in inverse writing.
If key is held, the set-point will automatically be incremented by 0.1F (0.1°C) until the key is no longer held. After approximately 3 sec. the set-point will be incremented by 1F (1°C) and after additionally 3 sec. by 10F (10°C).
Upon reaching desired temperature, press ↵. The set-point will be accepted and shown in normal writing again.
During inverse writing showing, the new temperature set-point is cancelable by pressing ⊗ and the previous set-point is shown again.

If the keys ▲, ▼ or ↵ are not pressed for 5 sec., current setting will be cancelled and previous set-point shown again.

## 11.4. Wake-up Mode ⏻

When no main power is present the controller is switched off.

The controller includes a battery for “StarCool” operation when no external voltage supply is present.
For battery saving in this situation, controller will turn itself off upon disappearance of external voltage supply.

By pressing ⏻ controller is enabled and controller operation will be possible. In case of no keyboard activities for 30 sec. controller will be turned off again.
Controller may be manually turned off in this mode by pressing ⏻ again.

## 11.5. Contrast adjustment of the display

Press ⊗ and hold and press ▲ or ▼ to adjust the contrast of the display. This can be done both in battery mode and when main power is applied.

## 11.6. PTI or Function Test Execution (PTI)

The test menu is opened by pressing (PTI). In the test menu, press keys (▲) or (▼) to scroll the menu. For a complete PTI test START must be highlighted by pressing (↵) at menu item T01. Pressing (↵) once more initiates the test. If (↵) is not pressed within 5 sec., the controller will cancel the operation and the cursor returns to the menu item – T01.

A complete PTI test may take several hours: First a complete function test with menu items T04 to T12 and then performance testing in menu items T13 to T17.

Function test is initiated in the same way by selecting menu T02. A function test performs menu items T04 to T12, without performance testing and takes about 10 – 15 min. to complete. The function test will continue through all the steps even if failures should occur.
A PTI or function test can be aborted at T03.

The PTI test is automatically terminated in case of no errors. Finally, temperature set-point will be set to the same value as before test initiation.

If any error occurs during the test, alarms will be shown in the alarm list. Active alarms in the alarm list before start of the PTI test will lead to failure of the PTI test:

1. One alarm for PTI or function test fail. Status are also listed in the menu items T04 – T12(FT)/T18(PTI).
2. One or more alarms for a specific error during the test. Only listed in alarm list.

Failures found during the tests are listed in the alarmlist and the results of the seperate PTI test steps are in menu items T04 to T18. Alarms found are logged in the datalog.

A detailed description and trouble shooting of an alarm can be found in this manual, together with a description of the specific test alarms. When the PTI test completes or is aborted, all alarms found during the test are set inactive in the alarm list.

If the alarm list is empty the unit is completely ok.
If the controller is switched off, only the main status of a PTI test is remembered – in menu item T04.

**T01 PTI test start (PTI test)**

Function:

Start Pre-Trip-Inspection test run to verify full functionality of the unit and performance test at different set point temperatures.

Value:

For starting PTI test, START must be highlighted by pressing ↵. Pressing ↵ once more initiates the test.
The PTI test is automatically terminated in case of no errors. Finally, temperature set-point will be set to the same value as before test initiation.

**T02 Function test start (Function test)**

Function:

Start function test run to verify full functionality of the unit without performance tests.

Value:

For starting function test, START must be highlighted by pressing ↵. Pressing ↵ once more initiates the test.

**T03 Abort the running test (Abort the test)**

Function:

Stop the running PTI or function- test.

Value:

To stop the running test, STOP must be highlighted by pressing ↵. Pressing ↵ once more stops the test.

**T04 Test status (Test status)**

Function:

Shows the status of the last/running test:

Value:

The value depends on the function running.
For PTI the values can be: “RUN” for running, “PASS” for test passed successfully, “ABORT” for test aborted by a user, “FAIL” for a failing PTI test – see the alarm list for specific reason.

**T05 Test result: 10 Init (10 Init)**

Function:

Show the status of the test initialization.

Value:

“-“ if not done yet. “RUN” if still running test. “PASS” if test finished successfully. “FAIL” if the test failed.
“ABORT” if the test was aborted by the user.

**T06 Test result: 20 Controller (20 Controller)**

Function:

Show the status of the test of the controller.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 801 in section 17.8.

**T07 Test result: 30 Power (30 Power)**

Function:

Show the status of the test of power consumption/connection.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 805 in section 17.8.

**T08 Test result: 40 Evap fan (40 Evap fan)**

Function:

Show the status of the test of the evaporator fans.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 810 - 813 in section 17.8.

**T09 Test result: 50 Condenser fan (50 Cond fan)**

Function:

Show the status of the test of the condenser fan.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 815 - 817 in section 17.8.

**T10 Test result: 60 Evaporator heater (60 Evap heater)**

Function:

Show the status of the test of the evaporator heater.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 820 - 821 in section 17.8.

**T11 Test result: 80 Compressor (80 Compressor)**

Function:

Show the status of the test of the compressor.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 845 in section 17.8.

**T12 Test result: 90 FT status (90 FT status)**

Function:

Show the status of the function test.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user.

**T13 Test result: 100 Temperature set point 5 °C (100 T set 5 °C)**

Function:

Show the status of the performance test with temperature set point of 5°C (41F)

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 855 in section 17.8.

**T14 Test result: 110 Temperature set point 0 °C (110 T set 0 °C)**

Function:

Show the status of the performance test with temperature set point of 0°C (32F).

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 860 in section 17.8.

**T15 Test result: 111 Hold temperature at 0 °C (111 Hold 0 °C)**

Function:

Show the status of the performance test with holding temperature set point of 0°C (32F).

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 860 in section 17.8.

### T16 Test result: 120 Temperature set point -18 °C (120 T set -18 °C)

Function:

Show the status of the performance test with temperature set point of -18°C (-0.4F).

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 870 in section 17.8.

### T17 Test result: 130 Testing of defrost. (130 Defrost)

Function:

Show the status of the performance test of defrost.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 870 in section 17.8.

### T18 Test result: 140 PTI status. (140 PTI status)

Function:

Show the status of the PTI test.

Value:

"-" if not done yet. "RUN" if still running test. "PASS" if test finished successfully. "FAIL" if the test failed.
"ABORT" if the test was aborted by the user. See specific description for alarm 850 in section 17.8.

## 11.7. Info Menu Viewing

By pressing the info menu is selected. The i icon is displayed.

The info menu includes the following parameters:

**I01 Relative humidity (Relative humidity)**

Function:

Showing current relative humidity in the container.

Value:

Shown as a percent value. Value is not user-changeable.

**I02 Air exchange in $m^3/h$ (Air airchange m3/h)**

Function:

Showing current opening of air exchange valve.

Value:

Shown as $m^3/h$. Value is not user-changeable.

**I03 Defrost interval (Defrost interval)**

Function:

Showing current interval between two defrostings.

Value:

Shown in hour's. Value is not user-changeable.

**I04 USDA 1 temperature (USDA 1 temp)**

Function:

Showing current temperature for USDA 1 sensor.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

**I05 USDA 2 temperature (USDA 2 temp)**

Function:

Showing current temperature for USDA 2 sensor.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

**I06 USDA 3 temperatur (USDA 3 temp)**

Function:

Showing current temperature for USDA 3 sensor.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

### I07 Cargo temperature (Cargo temp)

Function:

Showing current temperature for cargo sensor.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

### I08 Time to next defrosting (Time to defrost)

Function:

Showing current time to the next defrosting.

Value:

Shown in hours and minutes. Value is not user-changeable.

### I09 Ambient temperature (Ambient temp)

Function:

Showing current ambient temperature.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

### I10 Supply air 1 temperature (Supply air 1 temp)

Function:

Showing current temperature for supply 1 sensor.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

### I11 Supply air 2 temperature (Supply 2 air temp)

Function:

Showing current temperature for supply 2 sensor.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

### I12 Return air temperature (Return air temp)

Function:

Showing current temperature for return sensor.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

## I13 Evaporator temperature (Evaporator temp)

Function:

Showing current temperature for evaporator.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

## I14 Compressor suction temperature (Suction temp)

Function:

Showing calculated compressor suction temperature.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

## I15 Economizer suction temperature (Econ suction temp)

Function:

Showing calculated compressor economizer suction temperature.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

## I16 Compressor suction pressure (Suction press)

Function:

Showing current suction pressure for compressor.

Value:

Shown in units of Bar or PSI relative to atmosphere pressure. Switching by pressing C/F (at °C pressure is shown in Bar, at °F in PSI). Value is not user-changeable.

## I17 Economizer pressure (Economizer press)

Function:

Showing current pressure for economizer.

Value:

Shown in units of Bar or PSI relative to atmosphere pressure. Switching by pressing C/F (at °C pressure is shown in Bar, at °F in PSI). Value is not user-changeable.

## I18 Compressor discharge pressure (Discharge press)

Function:

Showing current discharge pressure for compressor.

Value:

Shown in units of Bar or PSI relative to atmosphere pressure. Switching by pressing C/F (at °C pressure is shown in Bar, at °F in PSI). Value is not user-changeable.

### I19 Expansion valve opening % (Expansion valve)

Function:

Showing current percentage of expansion valve opening.

Value:

Shown as a percent value. Value is not user-changeable.

### I20 Evaporator superheat (Evap superheat)

Function:

Showing current superheat of expansion valve.

Value:

Shown in temperature scale °C or °F. Switching by pressing (C/F). Value is only user-changeable with system in the service mode.

### I21 Compressor frequency (Compressor freq)

Function:

Showing current compressor frequency.

Value:

Shown in units of Hz. Value is not user-changeable.

### I22 Power frequency (Power frequency)

Function:

Showing current power (net) frequency.

Value:

Shown in units of Hz. Value is not user-changeable.

### I23 Current consumption phase 1 (Current phase 1)

Function:

Showing actual current consumption on phase 1.

Value:

Shown in units of ampere. Value is not user-changeable.

### I24 Current consumption phase 2 (Current phase 2)

Function:

Showing actual current consumption on phase 2.

Value:

Shown in units of ampere. Value is not user-changeable.

### I25 Current consumption phase 3 (Current phase 3)

Function:

Showing actual current consumption on phase 3.

Value:

Shown in units of ampere. Value is not user-changeable.

### I26 Voltage between phase 1 and 2 (Voltage phase 1->2)

Function:

Showing current voltage between phase 1 and 2.

Value:

Shown in units of volt. Value is not user-changeable.

### I27 Voltage between phase 2 and 3 (Voltage phase 2->3)

Function:

Showing current voltage between phase 2 and 3.

Value:

Shown in units of volt. Value is not user-changeable.

### I28 Voltage between phase 1 and 3 (Voltage phase 1->3)

Function:

Showing current voltage between phase 1 and 3.

Value:

Shown in units of volt. Value is not user-changeable.

### I29 Phase direction (Phase direction)

Function:

Showing current phase sequence.

Value:

Shown as CW or CCW. Value is not user-changeable.

### I30 Battery voltage (Battery voltage)

Function:

Showing current Battery voltage.

Value:

Shown as voltage. Value is not user-changeable.

### I31 Converter temperature (Converter temp)

Function:

Showing current converter temperature.

Value:

Shown in temperature scale °C or °F. Switching by pressing C/F. Value is not user-changeable.

### I32 Condenser fan speed (Condenser fan)

Function:

Showing current speed for condenser fan.

Value:

Shown as OFF, LO, HI or OH (overheat). Value is not user-changeable.

## I33 Evaporator fan speed (Evaporator fan)

Function:

Showing current speed for evaporator fan.

Value:

Shown as OFF, LO, HI or OH (overheat). Value is not user-changeable.

## I34 Evaporator heating element ON pct. (Evaporator heater)

Function:

Showing current duty-cycle of evaporator heating element.

Value:

Shown as a percent value “on”. Value is not user-changeable.

## 11.8. Operation Parameter Setting

By pressing the operation menu is selected. The icon is displayed.

Use the arrow keys and to navigate and the Enter key to select..

Operation menu includes the following parameters:

**O01 Trip start**
**(Trip start)**

Function:

The function starts a new trip start in the log. Note that there is a maximum of 5 trips in the log. If there are already 5 trips, the oldest will be deleted. If there is not enough room in the log, one or more trips will be deleted starting with the oldest.

When ”START” is displayed in inverse writing and is pressed, a trip start is marked in the log.

Value:

-

**O02 Defrost interval setting**
**(Defrost interval)**

Function:

Setting of interval between defrostings.

Value:

Interval set from 6 to 48 hours. Default is 6 hours.

**O03 Airflow mode**
**(Airflow mode)**

Function:

Setting the control modes: Normal or economy mode.

If economy mode is selected:

Evaporator fan will operate at low speed in the chill mode.

Dehumidification is turned off!

If set point temperature is > 32F (0 °C), and air exchange is closed and humidity setpoint = off, the evaporator fan is forced to Economy mode. Economy mode can be overrided with selecting Normal mode in this menu.

Value:

Function set to NORMAL, ECONOMY. Default is NORMAL.

**O04 Reference relative humidity setting**
**(Humidity setpoint)**

Function:

Setting of reference relative humidity. Note that container relative humidity is only reducable.

Value:

Shown as ‘Off” or a percent value. Value can be set to Off or values from 60% to 95% in 1% increments. Default = off.

## O05 Datalog interval setting (Datalog interval)

Function:

Setting of interval between loggings in the data log.
Setting the datalog interval to 60 min. (default value) allows logging of data for over a year.

Value:

Interval set to 15, 30, 60, 120 or 240 min. Default 60 min.

## 11.9. Alarms

The alarm list holds all active and inactive alarms.
By pressing the alarm menu is opened. The icon is displayed in upper left corner of the display.
With any alarms in the list the icon is displayed on the main menu.

Alarmhandling is to protect the unit with cargo and inform the user in case of error conditions, the main priority is to keep cargo safe.

Alarm handling is split in 2 parts:
1. Detect an abnormal situation and report it as an alarm.
2. React on the alarms and compensate for them (**AAS** - Alarm Action System).

An alarm can have 4 different levels.
- Log: Information for service. Only in the datalog, not on the display. ***No risk for the cargo.***
- Warning: Warning of an abnormal situation, but the unit continues to operate with unchanged or little change in functionality in actual running mode. ***No risk for the cargo.***
- Alarm: The unit operates with reduced or changed functionality. ***Risk for the cargo***.
- Fatal Alarm: The unit needs service now! ***Serious risk for the cargo!***

All errors in the 4 levels can have two states: Active or Inactive.
- Active: The alarm is active.
- Inactive: The alarm is no longer active. The alarm can be acknowledged from the alarmlist.

The 4 alarm levels will be treated by the controller in the following way:

| Alarmtype | Datalog | Alarmlist | Red LED | Cargo risk |
|---|---|---|---|---|
| Log | Yes | No | OFF | No risk for the cargo |
| Warning | Yes | Yes | OFF | No risk for the cargo |
| Alarm | Yes | Yes | SLOW FLASH 2% ON, 98 % OFF Duty time of 3 sec | Risk for the cargo |
| Fatal Alarm | Yes | Yes | QUICK FLASH 80% ON, 20 % OFF Duty time of 3 sec | ***Serious risk for the cargo!*** |

**Alarm handling** is made to detect abnormal situations, possibly solve problems and report the problems. The alarm types indicates for the operator how severe the problem is for the safety of the cargo.
Some problems are fluctuant where the problem may be fixed if the unit restarts. Some of the alarms are only warnings but will restart the unit to try to solve the problem. There is an individual timeout period for the alarms. A warning will not stop the unit permanently!
If a problem with warning type continues to be active over a period., the problem seems to be of a more stable and therefore more severe character and another alarm is triggered with alarmtype Alarm.
If a problem with warning type continues to be active over a period., the problem seems to be of a more stable and therefore more severe character and another alarm is triggered with alarmtype Alarm.

The **AAS - A**larm **A**ction **S**ystem will substitute a missing or malfunctioning sensor with one of the other sensors and thereby trying to keep the cargo safe and well as long as absolutely possible. The substitution may lead to a deteriorated control precision, especially in the freeze mode, but the unit is not stopped fully until there are no further sensors to substitute with. The unit may try to restart to see if the malfunctioning is fluctuant.
For example if there is no substitution for a sensor or the substitute sensor is also faulty, alarm "**611 Too many sensor err**" is raised and the specific sensor(s) are listed separately in the alarm list.

The alarm list can include a maximum of 16 active/inactive alarms.
In case of an empty alarm list, ☑ + "No alarms" is shown.

An active alarm is shown as Acc AAnnn, where cc is the list number from 01 to 16, and nnn is the actual alarm number.
An inactive alarm is shown as Acc IAnnn, where cc is the list number from 01 to 16, and nnn is the actual alarm number.

An active alarm is not deletable from the list, but may change to inactive state by eliminating the cause of the alarm.
An inactive alarm is deletable from the list by pressing ↵ during alarm displaying.

Alarm list

The following list includes a view of all alarms as listed on the display and a longer text.
A detailed description, criteria, consequences and troubleshooting can be found in this manual in section 17.

| Id | Display text | Description | Alarm type |
|---|---|---|---|
| **1. Temperature sensor alarms** | | | |
| 100 | Tret open | Return Air Temperature Sensor Open Circuit. | Warning |
| 101 | Tret short | Return Air Temperature Sensor Short Circuit. | Warning |
| 102 | Tret invalid | Return Air Temperature Sensor Invalid. | Warning |
| 103 | Tsup 1 open | Supply Air Temperature Sensor 1 Open Circuit. | Warning |
| 104 | Tsup 1 short | Supply Air Temperature Sensor 1 Short Circuit. | Warning |
| 105 | Tsup 1 invalid | Supply Air Temperature Sensor 1 Invalid. | Warning |
| 106 | Tsup 2 open | Supply Air Temperature Sensor 2 Open Circuit. | Warning |
| 107 | Tsup 2 short | Supply Air Temperature Sensor 2 Short Circuit. | Warning |
| 108 | Tsup 2 invalid | Supply Air Temperature Sensor 2 Invalid. | Warning |
| 109 | Tusda 1 open | USDA 1 Temperature Sensor Open Circuit. | Warning |
| 110 | Tusda 1 short | USDA 1 Temperature Sensor Short Circuit. | Warning |
| 111 | Tusda 1 invalid | USDA 1 Temperature Sensor Invalid.<br>*Not implemented yet* | Warning |
| 112 | Tusda 2 open | USDA 2 Temperature Sensor Open Circuit. | Warning |
| 113 | Tusda 2 short | USDA 2 Temperature Sensor Short Circuit. | Warning |
| 114 | Tusda 2 invalid | USDA 2 Temperature Sensor Invalid.<br>*Not implemented yet* | Warning |
| 115 | Tusda 3 open | USDA 3 Temperature Sensor Open Circuit. | Warning |
| 116 | Tusda 3 short | USDA 3 Temperature Sensor Short Circuit. | Warning |
| 117 | Tusda 3 invalid | USDA 3 Temperature Sensor Invalid.<br>*Not implemented yet* | Warning |
| 118 | Tcargo open | Cargo Temperature Sensor Open Circuit. | Warning |
| 119 | Tcargo short | Cargo Temperature Sensor Short Circuit. | Warning |
| 120 | Tcargo invalid | Cargo Temperature Sensor Invalid.<br>*Not implemented yet* | Warning |
| 121 | Tevap open | Evaporator Temperature Sensor Open Circuit. | Warning |
| 122 | Tevap short | Evaporator Temperature Sensor Short Circuit. | Warning |
| 123 | Tevap invalid | Evaporator Temperature Sensor Invalid. | Warning |
| 124 | Tsuc open | Suction Temperature Sensor Open Circuit. | Warning |
| 125 | Tsuc short | Suction Temperature Sensor Short Circuit. | Warning |
| 126 | Tsuc invalid | Suction Temperature Sensor Invalid. | Warning |
| 127 | Tamb open | Ambient Temperature Sensor Open Circuit. | Warning |
| 128 | Tamb short | Ambient Temperature Sensor Short Circuit. | Warning |
| 129 | Tamb invalid | Ambient Temperature Sensor Invalid. | Warning |
| 133 | Teco open | Economizer Suction Temperature Sensor Open Circuit. | Warning |
| 134 | Teco short | Economizer Suction Temperature Sensor Short Circuit. | Warning |
| 135 | Teco invalid | Economizer Suction Temperature Sensor Invalid. | Warning |

| | | | |
|---|---|---|---|
| **2. Pressure sensor alarms** | | | |
| 200 | Pdis open | Compressor Discharge Pressure Sensor Open Circuit. | Warning |
| 201 | Pdis short | Compressor Discharge Pressure Sensor Short Circuit. | Warning |
| 203 | Pdis invalid | Compressor Discharge Pressure Sensor Invalid. | Warning |
| 204 | Psuc open | Compressor Suction Pressure Sensor Open Circuit. | Warning |
| 205 | Psuc short | Compressor Suction Pressure Sensor Short Circuit. | Warning |
| 207 | Psuc invalid | Compressor Suction Pressure Sensor Invalid. | Warning |
| 208 | Peco open | Economizer Suction Pressure Sensor Open Circuit. | Warning |
| 209 | Peco short | Economizer Suction Pressure Sensor Short Circuit. | Warning |
| 210 | Peco invalid | Economizer Suction Pressure Sensor Invalid. | Warning |
| **3. Other sensors** | | | |
| 300 | RH open | Relative Humidity Sensor Open Circuit. | Warning |
| 301 | RH short | Relative Humidity Sensor Short Circuit. | Warning |
| 302 | RH invalid | Relative Humidity Sensor Invalid. | Warning |
| 303 | AirEx open | Air Exchange Sensor Open Circuit. | Warning |
| 304 | AirEx short | Air Exchange Sensor Short Circuit. *Not implemented yet* | Warning |
| 305 | AirEx invalid | Air Exchange Sensor Invalid. *Not implemented yet* | Warning |
| 306 | High press switch | High pressure switch is active. | Warning |
| **4. Power alarms** | | | |
| 400 | Mevap 1 over heat | Evaporator Motor 1 overheat. | Warning |
| 401 | Mevap 2 over heat | Evaporator Motor 2 overheat. | Warning |
| 402 | Mcond over heat | Condenser Motor overheat. | Warning |
| 411 | Unit over current | Unit overcurrent. | Log |
| 414 | U1-2 over voltage | U1-2 overvoltage. | **Fatal Alarm** |
| 415 | U2-3 over voltage | U2-3 overvoltage. | **Fatal Alarm** |
| 416 | U1-3 over voltage | U1-3 overvoltage. | **Fatal Alarm** |
| 417 | U1-2 under voltage | U1-2 undervoltage. | Warning |
| 418 | U2-3 under voltage | U2-3 undervoltage. | Warning |
| 419 | U1-3 under voltage | U1-3 undervoltage. | Warning |
| 420 | I1 over current | I1 overcurrent. | Log |
| 421 | I2 over current | I2 overcurrent. | Log |
| 422 | I3 over current | I3 overcurrent. | Log |
| 423 | No phase direction | Phase Direction Not Detectable. | **Fatal alarm** |
| 424 | Power frequency | Phase Frequency Error. | Log |
| **5. Frequency converter alarms** | | | |
| 500 | FC missing | Frequency Converter Missing. | **Fatal Alarm** |
| 501 | FC local control | Frequency Converter Local Mode Fault. | Alarm |
| 508 | FC TRIP short circ | Frequency Converter Short Circuit Fault Alarm. | Alarm |
| 509 | FC TRIP 24V fault | Frequency Converter Internal 24V Supply Fault Alarm. | Alarm |
| 510 | FC TRIP earth fault | Frequency Converter Earth Fault Alarm. | Alarm |
| 511 | FC TRIP over cur | Frequency Converter Overcurrent Fault Alarm. | Alarm |
| 512 | FC TRIP motor therm | Frequency Converter Compressor Motor Overtemperature. | Alarm |

| | | | |
|---|---|---|---|
| 513 | FC TRIP overload | Frequency Converter Inverter Overload Fault Alarm. | Alarm |
| 514 | FC TRIP under volt | Frequency Converter Voltage Low Fault Alarm. | Alarm |
| 515 | FC TRIP over volt | Frequency Converter Voltage High Fault Alarm. | Alarm |
| 516 | FC TRIP phase loss | Frequency Converter Phase Loss Fault Alarm. | Alarm |
| 517 | FC TRIP over temp | Frequency Converter Overtemperature Fault Alarm. | Alarm |
| 518 | FC TRIP inrush | Frequency Converter Inrush Fault Alarm. | Alarm |
| 519 | FC TRIP internal | Frequency Converter Internal Error Fault Alarm. | Alarm |
| 521 | FC high volt | Frequency Converter High Voltage Fault Warning. | Warning |
| 522 | FC high temp | Frequency Converter Overtemperature Fault Warning. | Warning |
| 523 | FC phase loss | Frequency Converter Phase Loss Fault Warning. | Warning |
| 524 | FC current limit | Frequency Converter Current Limit Fault Warning. | Warning |
| 525 | FC overload | Frequency Converter Inverter Overload Fault Warning. | Warning |
| 529 | FC setup error | Frequency Converter Setup Fault Warning. | Warning |
| 566 | FC undefined alarm | Frequency Converter Undefined Alarm. | Warning |
| 567 | FC unknown code | Frequency Converter Unknown Code Alarm. | Warning |
| 599 | FC Trip Lock | Frequency Converter has tripped and stopped. | Alarm |
| **6. Operation alarms** | | | |
| 600 | No control sensors | Supply Air Sensor 1, Supply Air Sensor 2, Return Air Sensor All Malfunctioning. | **Fatal Alarm** |
| 601 | No watercooling | Water-cooling fault. | Warning |
| 602 | Tset unreachable | Tset Unreachable. *Not implemented yet* | Alarm |
| 603 | In range fault | In-range Fault. | **Fatal Alarm** |
| 604 | High press trouble | High Pressure Safety Switch is active. | **Fatal Alarm** |
| 607 | AirEx open freeze | Air exchange valve open in the frozen mode. | **Fatal Alarm** |
| 610 | Defrost time exceed | Max. defrost time exceeded. | Warning |
| 611 | Too many sensor err | Too many (controlling) sensors have errors. | Alarm |
| 612 | FC trouble | There have been several FC alarms within short time. | Alarm |
| 613 | Motor trouble | Evaporator Motor 1 or 2 Overheated several times or permanently within short time. | Alarm |
| 614 | Humidity deactivate | Humidity control deactivated. | Alarm |
| 620 | Cpr start failed | *Not implemented yet.* | **Fatal Alarm** |
| 621 | Cpr restarted | The Compressor Has Been Restarted. | Warning |
| 630 | Manual phase dir | Manually Selected Phase Direction. | Alarm |
| 631 | Fuse blown | Blown Fuse In The Controller. | Warning |

| | | | |
|---|---|---|---|
| **8. Test alarms** | | | |
| 800 | Func test failed | Function Test Fault. | Alarm |
| 801 | Controller | Controller Internal Voltage Reference Fault. | Alarm |
| 805 | Idle current | Unit Idle Overcurrent Fault. | Alarm |
| 810 | Mevap cur LO speed | Evaporator Motor Low Speed Current Fault. | Alarm |
| 811 | Mevap cur HI speed | Evaporator Motor High Speed Current Fault. | Alarm |
| 812 | Mevap current OFF | Evaporator Motor Off Current Fault. | Alarm |
| 813 | Mevap direction | *Not implemented yet.* | Alarm |
| 815 | Mcond cur LO speed | Condenser Motor Low Speed Current Fault. | Alarm |
| 816 | Mcond cur HI speed | Condenser Motor High Speed Current Fault. | Alarm |
| 817 | Mcond current OFF | Condenser Motor Off Current Fault. | Alarm |
| 820 | Hevap current ON | Evaporator Heater On Current Fault. | Alarm |
| 821 | Hevap current OFF | Evaporator Heater Off Current Fault. | Alarm |
| 840 | Valve leaks | Valve Leak Fault. | Alarm |
| 842 | Expansion valve | Expansion Valve Fault. | Alarm |
| 843 | Economizer valve | Economizer Valve Fault. | Alarm |
| 844 | Hotgas valve | Hotgas Valve Fault. | Alarm |
| 845 | Cpr pump down | Compressor pump down fault. | Alarm |
| 850 | PTI test failed | PTI Test Fault. | Alarm |
| 855 | PTI Tset 5 | PTI 5°C Set Fault. | Alarm |
| 860 | PTI Tset 0 | PTI 0°C Set Fault. | Alarm |
| 870 | PTI defrost | PTI Defrost Fault. | Alarm |
| 880 | PTI Tset -18 | PTI –18 °C Set Fault. | Alarm |
| **9. Controller alarms** | | | |
| 900 | User stop | User stop was executed from PC-program. | **Fatal Alarm** |
| 902 | Battery malfunction | Battery Malfunctioning. | Alarm |
| 903 | Remote mon missing | Remote Monitor Modem Missing. *Not implemented yet* | Alarm |
| 904 | Datalog error | RCCU Data log Fault. | Alarm |
| 905 | Database corrupt | RCCU Database Fault. | Log |
| 907 | Realtime error | Real-time Clock Unreliable. | Alarm |
| 908 | Realtime invalid | Real-time Clock Unavailable. | Alarm |
| 909 | Display error | Display Unavailable. | Warning |
| 910 | Main power failure | Main Power Fault. | Log |
| 911 | Battery voltage LO | Low Battery Voltage. | Warning |
| 912 | Battery voltage HI | High Battery Voltage. | Log |
| 951 | Power ref LO | Controller Internal Voltage Reference Fault. | Log |
| 952 | Power ref HI | Controller Internal Voltage Reference Fault. | Log |
| 953 | Temp ref 1 LO | Controller Internal Voltage Reference Fault. | Log |
| 954 | Temp ref 1 HI | Controller Internal Voltage Reference Fault. | Log |
| 955 | Temp ref 2 LO | Controller Internal Voltage Reference Fault. | Log |

| | | | |
|---|---|---|---|
| 956 | Temp ref 2 HI | Controller Internal Voltage Reference Fault. | Log |
| 957 | Gnd ref LO | Controller Internal Voltage Reference Fault. | Log |
| 958 | Gnd ref HI | Controller Internal Voltage Reference Fault. | Log |
| 959 | RH sens sup LO | Controller Internal Voltage Reference Fault. | Log |
| 960 | RH sens sup HI | Controller Internal Voltage Reference Fault. | Log |
| 961 | Pdis sens sup LO | Controller Internal Voltage Reference Fault. | Log |
| 962 | Pdis sens sup HI | Controller Internal Voltage Reference Fault. | Log |
| 963 | Psuc sens sup LO | Controller Internal Voltage Reference Fault. | Log |
| 964 | Psuc sens sup HI | Controller Internal Voltage Reference Fault. | Log |
| 965 | Controller sup LO | Controller Internal Voltage Reference Fault. | Log |
| 966 | Controller sup HI | Controller Internal Voltage Reference Fault. | Log |
| 969 | AirEx sens sup LO | Controller Internal Voltage Reference Fault. | Log |
| 970 | AirEx sens sup HI | Controller Internal Voltage Reference Fault. | Log |
| 971 | Peco sens sup LO | Controller Internal Voltage Reference Fault. | Log |
| 972 | Peco sens sup HI | Controller Internal Voltage Reference Fault. | Log |
| 980 | Tinternal LO | Controller Internal Voltage Reference Fault. | Log |
| 981 | Tinternal HI | Controller Internal Voltage Reference Fault. | Log |
| 989 | Software test ver | Software test version. | Warning |
| 996 | Software CRC error | Prom CRC Fault. | Alarm |
| 997 | Eeprom error | EEPROM fault. | Alarm |

## 11.10. Service Function Setting/Viewing

By pressing the service menu is selected. The icon appears in the display.
Service menu consists of various sub-menus. Use the arrow keys and to navigate and the Enter key,
to open a sub-menu. By pressing , the display returns to service menu. See also sections 10.2 and 10.3.

Service menu consists of the following sub-menus:

- Manual operation (M01 – M08) Manual start/stop of motors etc.
- Datalog view (L01) View of temperature log.
- Time adjust (C01 – C05) Setting of date and time.
- Runtime counters (R01 – R05) View of running hours for unit, comp. etc.
- Configuration (F01 – F06) Software version

### 11.10.1. Manual operations:

**M01 Operating mode (Operating mode)**

Function:

Start/stop of operating mode.
If operating mode is MANUAL, controller stops, and by means of menu items M02 to M08 heaters, motors and valves may be manually operated. In menu item M05 compressor frequency is set.
In case of no keyboard activities for 5 min., manual mode is automatically deactivated and unit starts automatically up.

**Note that the "StarCool" should only be set in the manual mode by trained service personnel!**

Value:

Set to MANUAL or AUTOMATIC.

**M02 Turn the evaporator heater on/off (Evaporator heater)**

Function:

Manual heater on/off. Note that value is only accepted if control is in the service mode (menu item M01 is MANUAL).

Value:

Set to ON or OFF.

**M03 Turn the evaporator fan on/off (Evaporator fan)**

Function:

Manual evaporator fan on/off. Note that value is only accepted if control is in the service mode (menu item M01 is MANUAL).

Value:

Set to OFF, LO (low speed) or HI (high speed).

### M04 Turn the condenser fan on/off (Condenser fan)

Function:

Manual condenser fan on/off . Note that value is only accepted if control is in the service mode (menu item M01 is MANUAL).

Value:

Set to OFF, LO (low speed) or HI (high speed).

### M05 Setting of compressor frequency/capacity (Compressor freq)

Function:

Manual setting of compressor frequency. Note that value is only accepted if control is in the service mode (menu item M01 is MANUAL).
MANUAL: Compressor frequency is set.

Value:

MANUAL: Set to OFF (compressor stop) or value between 15 and 110 Hz.

### M06 Setting of expansion valve % opening (Expansion valve)

Function:

Manual setting of expansion valve % opening. Note that value is only accepted if control is in the service mode (menu item M01 is MANUAL).

Value:

Set from 0 to 100%.

### M07 Setting of hotgas valve % opening (Hotgas valve)

Function:

Manual setting of hotgas valve % opening. Note that value is only accepted if control is in the service mode (menu item M01 is MANUAL).

Value:

Set from 0 to 100%.

### M08 Setting of economizer valve % opening (Economizer valve)

Function:

Manual setting of economizer valve % opening. Note that value is only accepted if control is in the service mode (menu item M01 is MANUAL).

Value:

Set from 0 to 100%.

## 11.10.2. Datalog view:

| L01 | Viewing log of temperatures (Temperatures) |
|---|---|

Function:

Viewing of logged temperatures.

Value:

The following temperatures can be viewed: Setpoint temperature, supply air temperature, return air temperature, relative humidity%, air exchange $m^3$/hour, USDA 1 +2 + 3 temperatures and cargo temperature.
When entering the menu, the newest logged temperatures are always shown.

Press ↵ to toggle between stored set of temperatures: Setpoint temperature + supply air temperature, return air temperature, relative humidity%, air exchange and the other set of temperatures: USDA 1 +2 + 3 temperatures and cargo temperature.

To move one page up, press ▲, or down, press ▼, to list the previous or next page of stored set of values from the data log.

## 11.10.3. Time adjust:

**C01 Setting of year (GMT-Year)**

Function:

Setting of year.

Value:

Set from 1999 to 2099.

**C02 Setting of month (GMT-Month)**

Function:

Setting of month.

Value:

Set from 1 to 12.

**C03 Setting of day (GMT-Day)**

Function:

Setting of day.

Value:

Set from 1 to 31.

**C04 Setting of hours (GMT-Hour)**

Function:

Setting of hours.

Value:

Set from 0 to 23.

**C05 Setting of min. (GMT-Minute)**

Function:

Setting of min. Note: when min. are set, sec. are set to 00.

Value:

Set from 0 to 59.

## 11.10.4. Runtime counters:

**R01 Viewing of operation hours for the StarCool unit (Unit)**

Function:

Viewing of StarCool unit operation hours.

Value:

Shown as hours.

**R02 Viewing of compressor operation hours (Compressor)**

Function:

Viewing of compressor operation hours.

Value:

Shown as hours.

**R03 Viewing of evaporator fan operation hours (Evaporator fan)**

Function:

Viewing of evaporator fan operation hours.

Value:

Shown as hours.

**R04 Viewing of condenser fan operation hours (Condenser fan)**

Function:

Viewing of condenser fan operation hours.

Value:

Shown as hours.

**R05 Viewing of heater operation hours (Evaporator heater)**

Function:

Viewing of heater operation hours.

Value:

Shown as hours.

## 11.10.5. Configuration:

**F01 Container ID viewing (Container)**

Function:

Viewing of container ID.

Value:

Shown in the lower display line. E.g. MCID 000 001 2

**F02 Software version viewing (Software version)**

Function:

Viewing of software version.

Value:

-

**F03 Compressor frequency converter type setting (FC type)**

Function:

Setting of actual frequency converter type.

Value:

Setting as DANFOSS for Danfoss VLT® and NONE for no frequency converter mounted (see Emergency Operation, section 11.15, for specific information).

**F04 Compressor frequency converter ID (FC ID)**

Function:

Viewing of ID for frequency converter for compressor.

Value:

-

**F05 Setting of phase direction. (Phase direction)**

Function:

Setting of phase direction.

Value:

Default setting is Auto for automatic phase detection – automatically selected when the unit has been switched off for more than 30 min. before switching it on again.

Can be used for manual phase setting: Setting as CW for clockwise rotation or CCW for counter-clockwise rotation.

**F06 Calibration of AirExchange sensor (AirEx calibration)**

Function:

Zero adjust of AirExchange sensor when the air inlet is **closed**

Value:

Actual value of sensor is set to zero when enter key, ↵, is pressed.

## 11.11. °C and °F Temperature Scale Showing, Alternately

If the display shows °C:
By pressing shortly °F is shown for 10 sec.; then display switches to °C showing.
By pressing and holding for 3 sec. °F is constantly shown.

If the display shows °F:

By pressing shortly °C is shown for 10 sec.; then display switches to °F showing.
By pressing and holding for 3 sec. °C is constantly shown.

Note that temperature and pressure showing go together. When °C is shown, pressure is displayed in units of Bar, and when °F is shown pressure is displayed in units of PSI.
Shown pressure is relative to atmosphere pressure.

## 11.12. Supply and Return Temperature Showing, Alternately

The large top right digits in the display show the current temperature, the control basis (i.e. the air supply temperature in the chill mode or the air return temperature in the frozen mode).

Display showing air supply temperature:
By pressing shortly the display shows the air return temperature for 10 sec.; then display switches to air supply temperature showing.

Display showing air return temperature:
By pressing shortly the display shows the air supply temperature for 10 sec.; then display switches to air return temperature.

## 11.13. Manual Defrost Initiation

Defrosting is manually initiated by pressing the key and holding it for 3 sec. The display shows the icon as an acceptance of defrost initiation.

A automatically or manually initiated defrosting may be terminated by pressing and holding it for 3 sec. The display will cancel the icon.

## 11.14. Water-cooling Activation/Deactivation

Water-cooling connecting is executed as follows:

- The container must be connected to the water-cooling system.
- Press and hold it for 3 sec. The display shows the icon as an acceptance of water-cooling operation. The condenser fan is deactivated.

Water-cooling turn-off is executed as follows:

- Press and hold it for 3 sec. The display turns off the icon as an acceptance of non-operating water- cooling. The condenser fan turns on automatically.
- The container can be disconnected from the water-cooling system.

If the water supply is insufficient (the water hose is jammed, the water is not running or the water temperature is too high), the temperature in the condenser will rise and cooling capacity is decreasing and thereby threatening the cargo.
If the condenser temperature rises above 136F (58˚C), the system will automatically switch to air-cooling of condenser by turning the condenser fan on. If the water flow is restoredm the controller d

If the temperature stays at the high temperature for more than 1 hour, an alarm is given.

The actual setting of water-cooling is remembered if the unit is switched off or there should be a power loss.
Water-cooling is only turned off when the set point temperature is changed or when water-cooling is turned off manually.

## 11.15. Emergency Operation

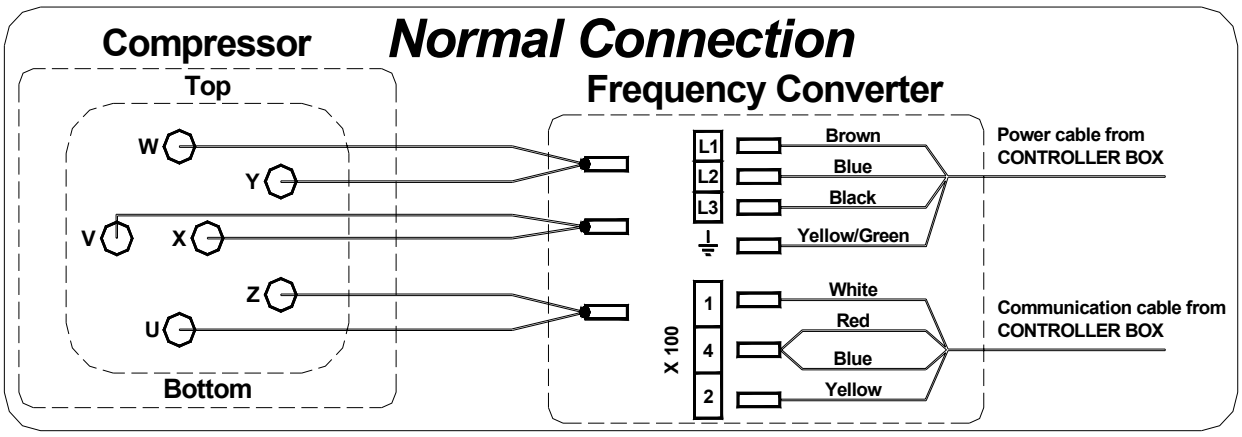
**Warning: High Voltage. Unit must be disconnected from power. Only to be done by trained personnel.**

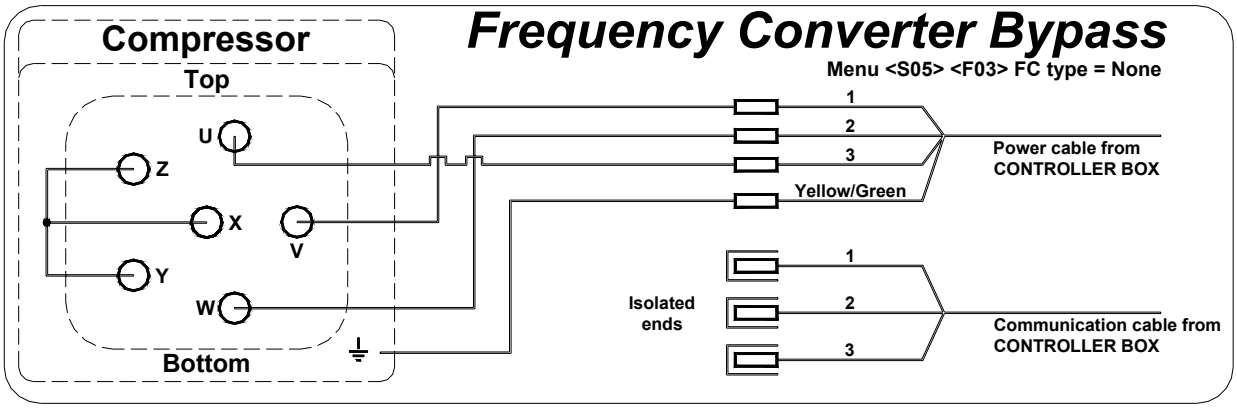
**Frequency converter dismounted.**

If frequency converter is defective and no replacement part is available, compressor may be run in the on / off mode.
Defective frequency converter is dismounted and the 3 phases are directly applied to the compressor supply terminals.
Also a wire-jumper has to be fitted on the remaining 3 terminals, see below figure.

In the service menu, **F03 FC TYPE**, the parameter **NONE** is selected. Unit will then run in the on / off mode with deteriorated temperature controlling performance.

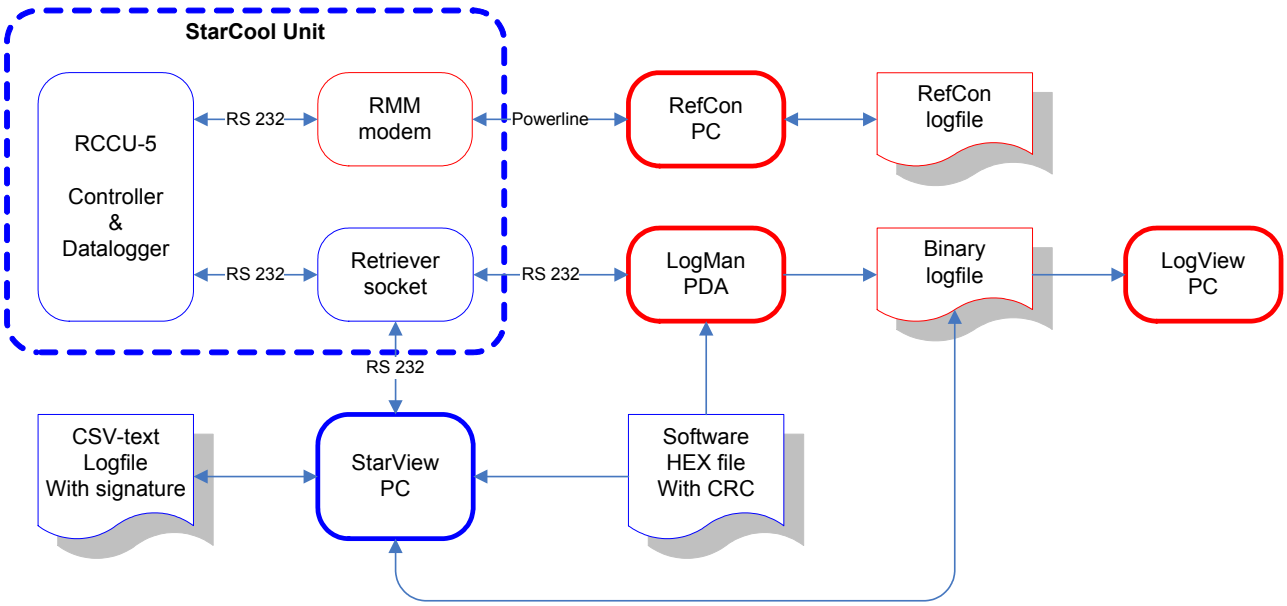
The connection for the frequency converter is shown on below drawings:



# 12. External interfaces

The Star Control can be accessed externally in the following ways:




## 12.1. General requirements

1. Serial port setup is 19200, 8, N, 1
2. Unless otherwise stated, byte order is low byte first

## 12.2. List of terms used for external interfaces

| Term | Description |
|---|---|
| LM | Local Monitor serial communication port on the container unit |
| LogMan | Hand held datalog retriever terminals |
| LogView | PC software viewer for container datalog files |
| RCCU | Reefer Container Controller Unit (Star Control) |
| RefCon | Powerline based container monitoring system and PC software |
| RMM | Remote Monitor Modem for power line communication |
| StarCool | Reefer container unit name |
| StarView | PC software StarCool unit monitor |

## 12.3. Functions overview

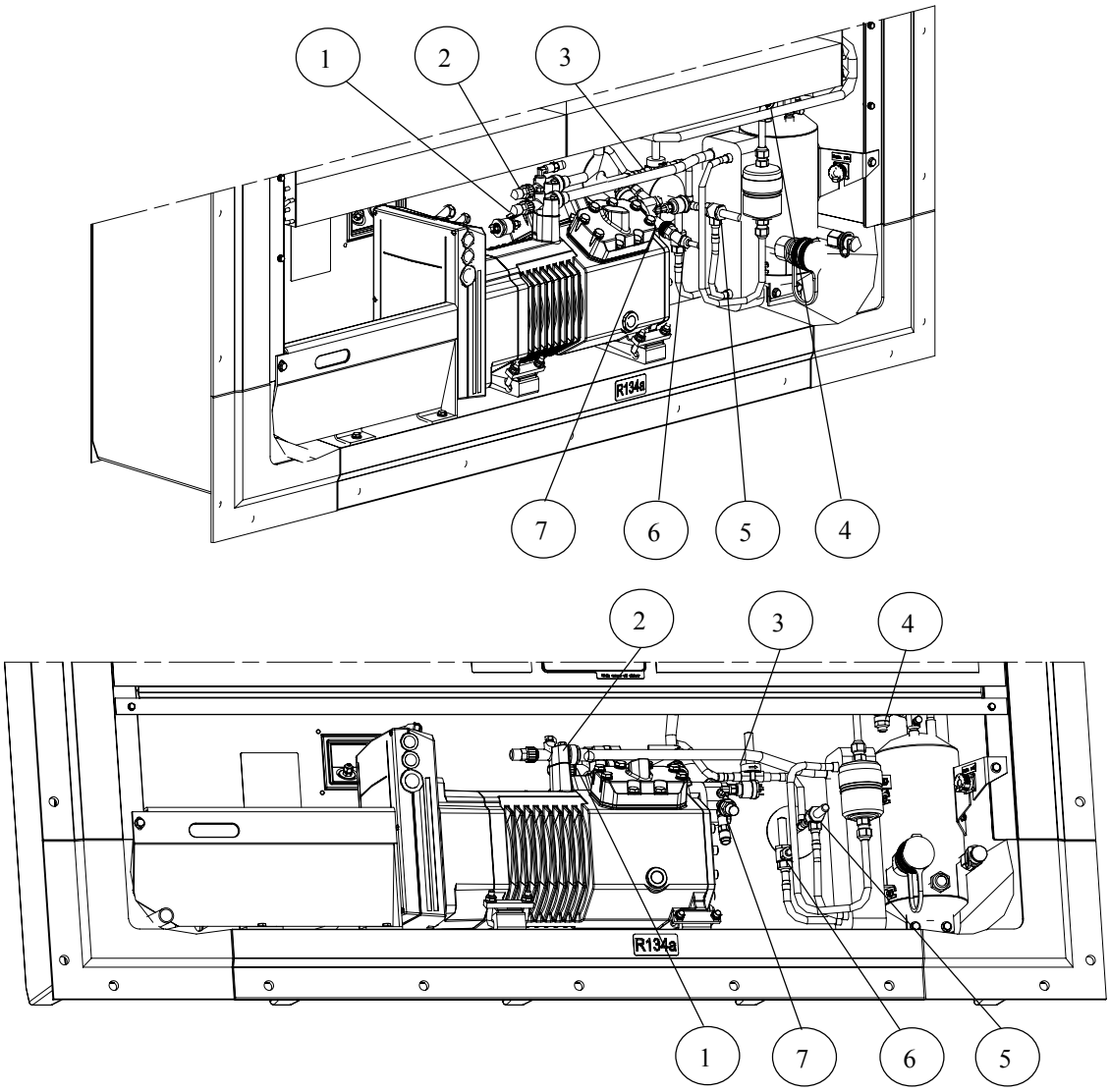
It is defined in the table below, which StarCool functions each device and system will support.

| Function | LogMan | LogView | RefCon | UMO | StarCool |
|---|---|---|---|---|---|
| Display basic data[1] | | | x | x | x |
| Display alarm list | | | x | x | x |
| Display controller information | | | x | x | (x) |
| | | | | | |
| Change container ID | x | | x | x | |
| Change temperature setpoint | | | x | x | x |
| Change humidity setpoint | | | x | x | x |
| Change defrost interval | | | x | x | x |
| Change controller date and time | x | | x | | x |
| | | | | | |
| Calibrate USDA and Cargo sensors | x | | | x | x |
| Acknowledge alarms | | | | x | x |
| Initiate manual defrost | | | x | x | x |
| Initiate Trip Start | x | | x | x | x |
| | | | | | |
| Initiate Function- and PTI test | | | x | x | x |
| Terminate Function- and PTI test | | | x | x | x |
| Display Function- and PTI test results | | | x | x | x |
| | | | | | |
| Retrieve datalog from unit | x | | x | x | |
| Save datalog file (binary) | x | | | x | |
| Save datalog file (RefCon) | | | x | | |
| Save datalog file (CSV text) | | | | x | |
| Display datalog file (binary) | | x | | x | |
| Display datalog file (RefCon) | | | x | | |
| Display datalog file (CSV text) | | | | x | |
| Erase datalog memory | | | | x | |
| | | | | | |
| Update controller software via bootloader | x | | | | |
| Update controller software via protocol | | | | x | |
| | | | | | |
| Operate controller in manual mode | | | | x | x |

(x) Not all information is visible on the controllers display.

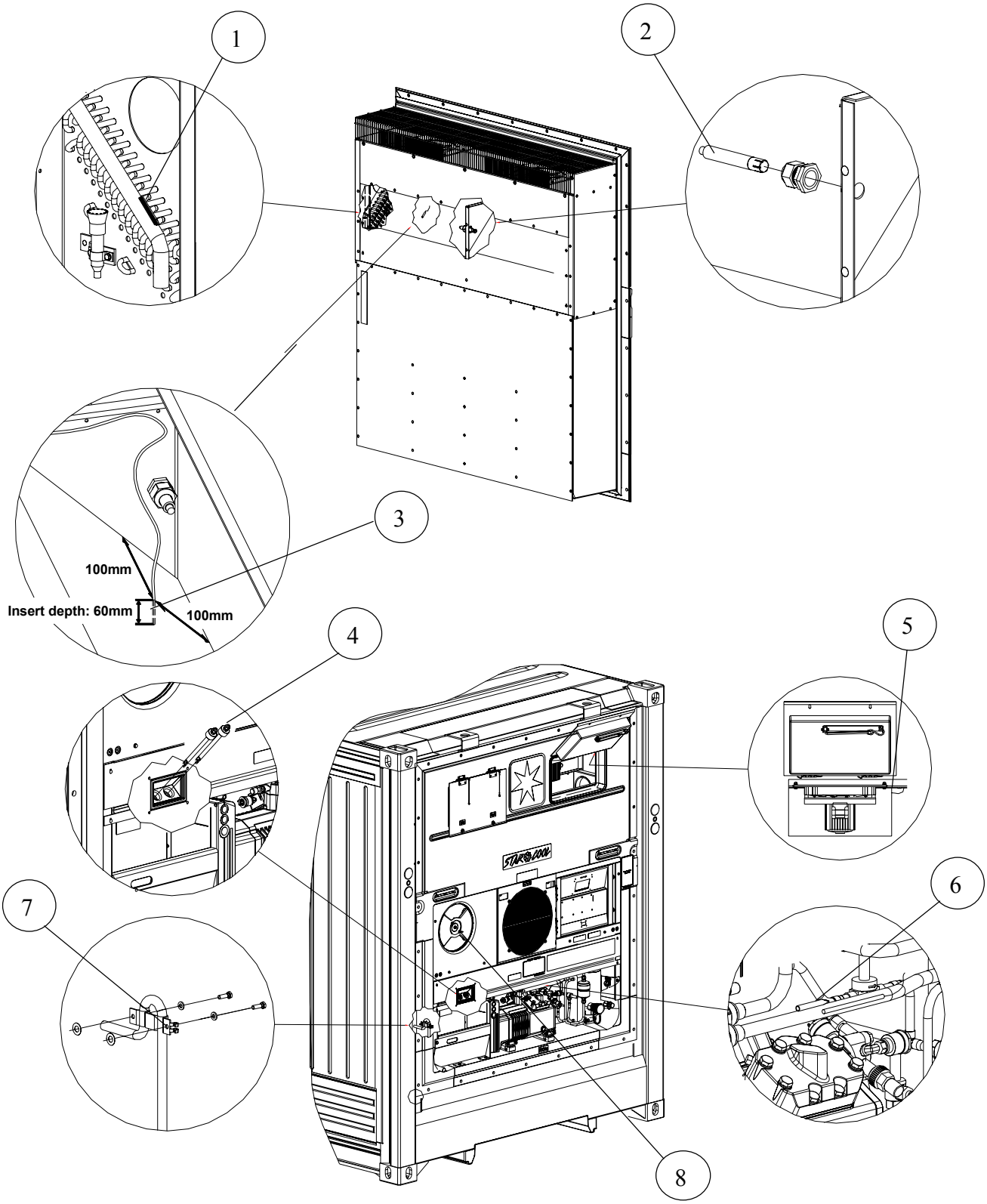
[1] **Basic data:** Tset, Tsup, Tret, RH, Tusda1..3, Tcargo, Operation mode, Tambient, Ubat

# 13. Location of valves



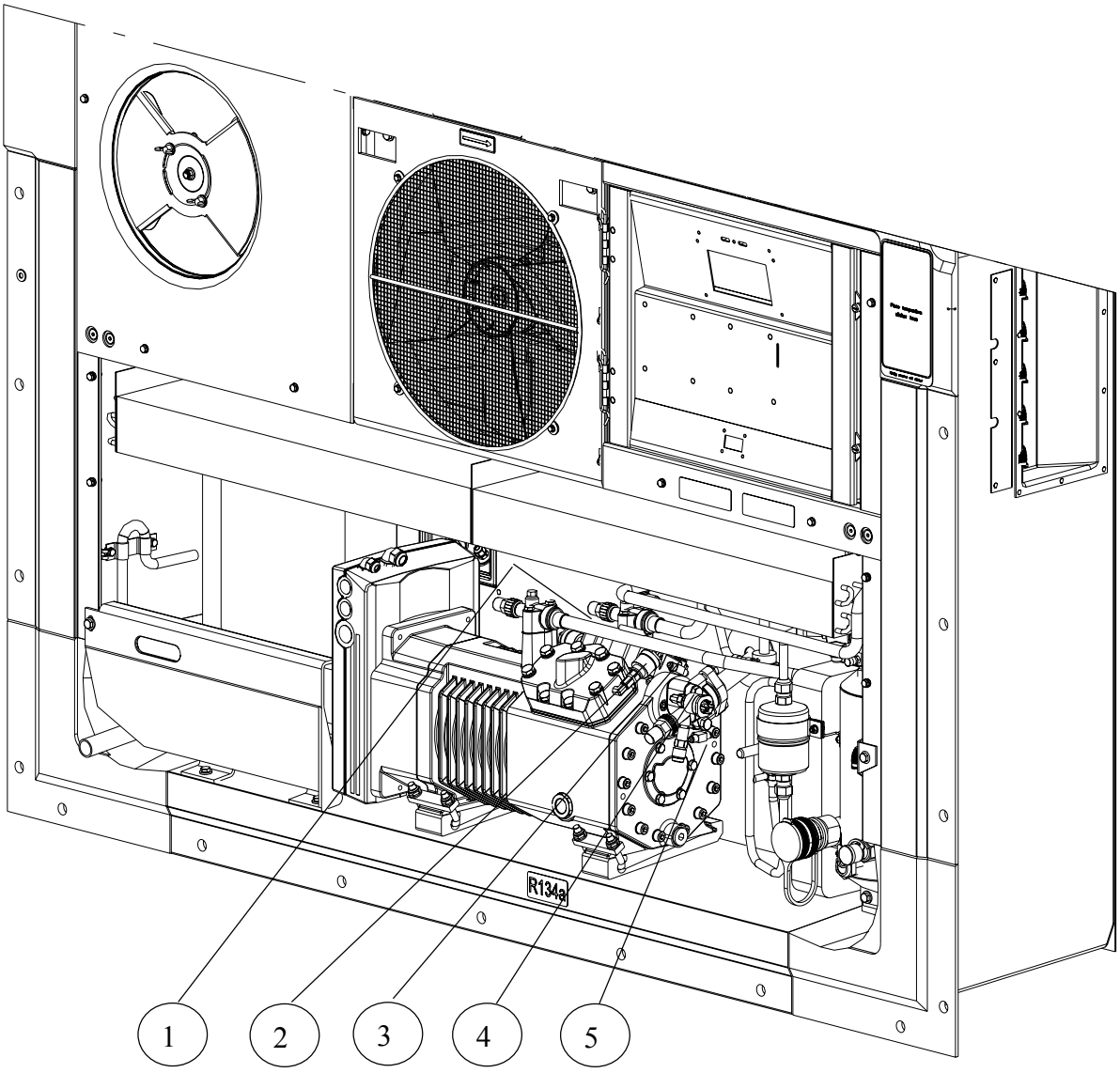

| Position | Description |
|---|---|
| 1 | Discharge pressure stop valve |
| 2 | Intermediate pressure stop valve |
| 3 | Hot gas valve |
| 4 | Service valve, economizer |
| 5 | Electronical expansionvalve, evaporator |
| 6 | Electronical expansionvalve, economizer |
| 7 | Suction pressure stop valve |

# 14. Location of temperature sensors, Humidity sensor and air exchange potentiometer



| Pos | Description | Short name | Number | Location | Accessibility |
|---|---|---|---|---|---|
| 1 | Suction temperature sensor | Tsuc | 1 | Inside | Through inspection hatch |
| 2 | Relative humidity sensor | RH | 1 | Inside | Through inspection hatch |
| 3 | Evaporator temperature sensor | Tevap | 1 | Inside | Through inspection hatch |
| 4 | Supply temperature sensor | Tsup | 2 | Outside | |
| 5 | Return temperature sensor | Tret | 1 | Inside | Through inspection hatch |
| 6 | Economizer Suction Temperature | Teco | 1 | Outside | |
| 7 | Ambient temperature sensor | Tamb | 1 | Outside | |
| 8 | Air Exchange potentiometer | AirEx | 1 | Outside | Behind fresh air cover panel |

# 15. Location of pressure transmitters, high pressure switch and oil outlet port.




| Pos | Description | Short name | Number | Location |
|---|---|---|---|---|
| 1 | Discharge Pressure transmitter | Pdis | 1 | Outside |
| 2 | Economizer Pressure transmitter | Peco | 1 | Outside |
| 3 | High pressure switch | Shp | 1 | Outside |
| 4 | Suction Pressure | Psuc | 1 | Outside |
| 5 | Oil outlet port | | 1 | Outside |

# 16. General trouble shooting

Hints for general trouble shooting.

1. Unit will not start up.
- Check that power is applied to the unit.
- Check that the power fuses are not blown.
- Check that 24VAC fuse (F6) is not blown.
- Check alarm list and clear alarms and alarm causes.
- The unit is wired for emergency operation but the parameter F03 FC type under service menu, is not set to NONE.
- The menu F03 under service menu, is set to NONE for emergency operation but the wires have not been correctly mounted for emergency operation.

2. Unit starts but stops shortly after.
   - Check that the condenser motor is rotating and that the air is blowing away from the unit.
   - Check if the high pressure switch alarm is active in the alarm list.
   - Temperature sensors not working properly. Check that they are placed on the pipes and are inside the isolation.

3. Unit is running but is not bringing the temperature down to temperature setpoint.
   - The cargo is very warm – it takes a long time to cool it down.
   - The ambient temperature is very high – the condenser can only cool a little so the cooling capacity is small and the cool down process takes longer time.
   - The hotgas valve may be leaking so that the hot gas is by-passing the condenser and is pumped into the evaporator and heating it up instead of cooling the evaporator.
   - The expansion valve is not opening and no cooling refrigerant is pumped into the evaporator. The condensor pressure will be very high.
   - The unit has been put in manual phase detecting mode and all motors are running the wrong way. The compressor will pump correctly but there is very little cooling capacity in the condenser and the air flow is wrong inside in the unit.
   - One of the motors (condenser or evaporator) is running in the opposite direction.

4. Liquid refrigerant is entering the compressor through the evaporator.
   - The temperature sensor, Tsuc is not working properly. Check that the sensor is mounted close to the pipe and is placed beneath the isolation.
   - The evaportor sensor, Tevap is not working properly.
   - The pressure sensor, Psuc is not working properly.

# 17. Detailed alarm description

Alarm list
In the following all alarms are listed with a description and their causes.

- Alarm text is the text shown in the controller display.
- A cross to the right of Log indicates that the alarm is logged into the data log.
- A cross to the right of alarm indicates that error is shown in the controller alarm list.
- To the right of **Light** the following texts can be shown:
  **Off** indicates that the alarm diodes are de-energized and there are **no active** alarms,
  **Slow flash** that the diodes are turned on shortly once every 3 sec. and that there are **active alarm**(s),
  **Quick flash** that the diodes are turned on 0.8 sec. every 1 sec. and that there are **active fatal alarm**(s).

When trouble shooting several alarms, it is generally advisible to start first with the active alarm number with the lowest number and then go on to the active alarms with higher numbers. Remember that some alarms have a timeout of 30 sec. and more.

## 17.1. Temperature Sensor Alarms

| 100 | Tret open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Return Air Temperature Sensor Open Circuit. | | | | | |
| **Criteria** | Value below low alarm limit -76F (-60°C). | | | | | |
| **Cause** | Indication of loose connection, defect or lack of return air temperature sensor. | | | | | |
| **Action** | Replaced by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Deteriorated control precision in the **freeze** mode. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tret or its cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 102.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is > 1.5 MΩ, the cable or the sensor is defect, replace the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tret, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

<table>
<tr><th>101</th><th colspan="5">Tret short</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="6">Return Air Temperature Sensor Short Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="6">Value above high alarm limit +284F (+140°C).</td></tr>
<tr><td>Cause</td><td colspan="6">Indication of short-circuited return air temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">Replacement by new value from AAS system.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6">Deteriorated control precision in the freeze mode.</td></tr>
<tr><td>Elimination</td><td colspan="6">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="2"></td></tr>
<tr><td>Trouble shouting</td><td colspan="6">
<u>Possible causes:</u><br>
• Temperature sensor Tret or its cable defective.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• AL 102.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is < 230 Ω, the cable or the sensor is defect, replace the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tret, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.
</td></tr>
</table>

<table>
<tr><th>102</th><th colspan="6">Tret invalid</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="7">Return Air Temperature Sensor Invalid.</td></tr>
<tr><td>Criteria</td><td colspan="7">Value below alarm limit -58F (-50°C) or above +158F (+70°C).<br>Value invalid for 30 sec. for alarm activation.</td></tr>
<tr><td>Cause</td><td colspan="7">Indication of defective return air temperature sensor or its measuring circuitry.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="7">Replacement by new value from AAS system.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td colspan="2">Off</td></tr>
<tr><td>Consequence</td><td colspan="7">Deteriorated control precision in the freeze mode.</td></tr>
<tr><td>Elimination</td><td colspan="7">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="3">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td></td><td></td><td></td><td colspan="3"></td></tr>
<tr><td>Trouble shooting</td><td colspan="7">Possible causes:<br>• Active alarms AL100 or AL101.<br>• Temperature sensor reading is out of valid range: -58F (-50°C) or above +158F (+70°C).<br><br>Accompanied alarms:<br>• AL 100 or 101 may also be active.<br><br>Trouble shooting:<br>1) If alarms AL100 or AL101 are active, check their trouble shooting section first.<br><br>2) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>3) Measure the resistance between the two wires.<br>a) If the resistance is out of range of the resistance and temperature table in section 26.1, the temperature sensor and cable are defect and should be replaced.</td></tr>
</table>

<table>
<tr><th>103</th><th colspan="5">Tsup 1 open</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="6">Supply Air Temperature Sensor 1 Open Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="6">Value below low alarm limit -76F (-60°C).</td></tr>
<tr><td>Cause</td><td colspan="6">Indication of loose connection, defect or lack of supply air temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">Replacement by new value from AAS system.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6">Deteriorated control precision in the chill mode.</td></tr>
<tr><td>Elimination</td><td colspan="6">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="2"></td></tr>
<tr><td>Trouble shouting</td><td colspan="6">
<u>Possible causes:</u><br>
• Temperature sensor Tsup1 or its cable defective.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• AL 105.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tsup1 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is > 1.5 MΩ, the cable or the sensor is defect, replace the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tsup1, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.
</td></tr>
</table>

| 104 | Tsup 1 short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Supply Air Temperature Sensor 1 Short Circuit. | | | | | |
| **Criteria** | Value above high alarm limit +284F (+140°C). | | | | | |
| **Cause** | Indication of short-circuited supply air temperature sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Deteriorated control precision in the **chill** mode. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tsup1 or its cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 105.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tsup1 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is < 230 Ω, the cable or the sensor is defect, replace the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tsup1, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

| 105 | Tsup 1 invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Supply Air Temperature Sensor 1 Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (-50°C) or above +158F (+70°C).<br>Value invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective supply air temperature sensor or its measuring circuitry. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Deteriorated control precision in the **chill** mode. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shouting** | Possible causes:<br>• Active alarms AL103 or AL104.<br>• Temperature sensor reading is out of valid range: -58F (-50°C) or above +158F (+70°C).<br><br>Accompanied alarms:<br>• AL 103 or 104 may also be active.<br><br>Trouble shooting:<br>1) If alarms AL103 or AL104 are active, check their trouble shooting section first.<br><br>2) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>3) Measure the resistance between the two wires.<br>a) If the resistance is out of range of the resistance and temperature table in section 26.1, the temperature sensor and cable are defect and should be replaced. | | | | | |

<table>
<tr><th>106</th><th colspan="6">Tsup 2 open</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="7">Supply Air Temperature Sensor 2 Open Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="7">Value below low alarm limit -76F (-60°C).</td></tr>
<tr><td>Cause</td><td colspan="7">Indication of loose connection, defect or lack of supply air temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="7">Replacement by new value from AAS system.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td colspan="2">Off</td></tr>
<tr><td>Consequence</td><td colspan="7">Deteriorated control precision in the chill mode.</td></tr>
<tr><td>Elimination</td><td colspan="7">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="2"></td></tr>
<tr><td>Trouble shouting</td><td colspan="7">
<u>Possible causes:</u><br>
• Temperature sensor Tsup2 or its cable defective.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• AL 108.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tsup2 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is > 1.5 MΩ, the cable or the sensor is defect, replace the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tsup2, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.
</td></tr>
</table>

<table>
<tr><th>107</th><th colspan="5">Tsup 2 short</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="6">Supply Air Temperature Sensor 2 Short Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="6">Value above high alarm limit +284F (+140°C).</td></tr>
<tr><td>Cause</td><td colspan="6">Indication of short-circuited supply air temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">Replacement by new value from AAS system.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6">Deteriorated control precision in the chill mode.</td></tr>
<tr><td>Elimination</td><td colspan="6">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="2"></td></tr>
<tr><td>Trouble shouting</td><td colspan="6">
<u>Possible causes:</u><br>
• Temperature sensor Tsup2 or its cable defective.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• AL 108.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tsup2 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is < 230 Ω, the cable or the sensor is defect, replace the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tsup2, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.
</td></tr>
</table>

| 108 | Tsup 2 invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Supply Air Temperature Sensor 2 Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (-50°C) or above +158F (+70°C).<br>Value invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective supply air temperature sensor or its measuring circuitry. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Deteriorated control precision in the **chill** mode. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shouting**

Possible causes:

- Active alarms AL106 or AL107.
- Temperature sensor reading is out of valid range: -58F (-50°C) or above +158F (+70°C).

Accompanied alarms:

- AL 106 or 107 may also be active.

Trouble shooting:

1) If alarms AL106 or AL107 are active, check their trouble shooting section first.

2) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

3) Measure the resistance between the two wires.
   a) If the resistance is out of range of the resistance and temperature table in section 26.1, the temperature sensor and cable are defect and should be replaced.

<table>
<tr><th>109</th><th colspan="5">Tusda 1 open</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="6">USDA 1 Temperature Sensor Open Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="6">Value below low alarm limit -76F (-60°C) and the sensor reading has been in the valid area since power-up.</td></tr>
<tr><td>Cause</td><td colspan="6">Indication of loose connection, defect or lack of USDA 1 temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">None.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>(X)</td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6">May be incomplete USDA data logging.</td></tr>
<tr><td>Elimination</td><td colspan="6">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="2"></td></tr>
<tr><td>Trouble shouting</td><td colspan="6">
<u>Possible causes:</u><br>
• Temperature sensor Tusda1 or its cable defective.<br>
• Defect plug inside in the unit.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• N/A.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tusda1 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is > 1.5 MΩ, the cable, the plug inside in the unit or the sensor is defect. Check plug before replacing the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tusda1, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.
</td></tr>
</table>

<table>
<tr><th>110</th><th colspan="5">Tusda 1 short</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="6">USDA 1 Temperature Sensor Short Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="6">Value is above high alarm limit +284F (+140°C) and the sensor reading has been in the valid area since power-up.</td></tr>
<tr><td>Cause</td><td colspan="6">Indication of short-circuited USDA 1 temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">None.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>(X)</td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6">May be incomplete USDA data logging.</td></tr>
<tr><td>Elimination</td><td colspan="6">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="2"></td></tr>
<tr><td>Trouble shouting</td><td colspan="6">
<u>Possible causes:</u><br>
• Temperature sensor Tusda1 or its cable defective.<br>
• Defect plug inside in the unit.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• N/A.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tusda1 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is < 230 Ω, the cable, the plug inside in the unit or the sensor is defect. Check the plug before replacing the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tusda1, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.
</td></tr>
</table>

| 111 | Tusda 1 invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | USDA 1 Temperature Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (50°C) or above +158F (+70°C). Value must be invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective UDSA 1 temperature sensor or its measuring circuitry. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | (X) | Alarm light | Off |
| **Consequence** | May be incomplete USDA data logging. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shouting** | *Alarm not implemented yet!* | | | | | |

| 112 | Tusda 2 open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | USDA 2 Temperature Sensor Open Circuit. | | | | | |
| **Criteria** | Value below low alarm limit -76F (-60°C) and the sensor reading has been in the valid area since power-up. | | | | | |
| **Cause** | Indication of loose connection, defect or lack of USDA 2 temperature sensor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | (X) | Alarm light | Off |
| **Consequence** | May be incomplete USDA data logging. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tusda2 or its cable defective.
- Defect plug inside in the unit.
- Controller PCB defective.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tusda2 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is > 1.5 MΩ, the cable, the plug inside in the unit or the sensor is defect. Check plug before replacing the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tusda2, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

| 113 | Tusda 2 short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | USDA 2 Temperature Sensor Short Circuit. | | | | | |
| **Criteria** | Value above high alarm limit +284F (+140°C) and the sensor reading has been in the valid area since power-up. | | | | | |
| **Cause** | Indication of short-circuited USDA 2 temperature sensor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | (X) | Alarm light | Off |
| **Consequence** | May be incomplete USDA data logging. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tusda2 or its cable defective.
- Defect plug inside in the unit.
- Controller PCB defective.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tusda2 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is < 230 Ω, the cable, the plug inside in the unit or the sensor is defect. Check the plug before replacing the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tusda2, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

| 114 | Tusda 2 invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | USDA 2 Temperature Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (50°C) or above +158F (+70°C). Value must be invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective USDA 2 temperature sensor or its measuring circuitry. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | (X) | Alarm light | Off |
| **Consequence** | May be incomplete USDA data logging. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shouting** | *Alarm not implemented yet!* | | | | | |

| 115 | Tusda 3 open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | USDA 3 Temperature Sensor Open Circuit. | | | | | |
| **Criteria** | Value below low alarm limit -76F (-60°C) and the sensor reading has been in the valid area since power-up. | | | | | |
| **Cause** | Indication of loose connection, defect or lack of USDA 3 temperature sensor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | (X) | Alarm light | Off |
| **Consequence** | May be incomplete USDA data logging. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tusda3 or its cable defective.
- Defect plug inside in the unit.
- Controller PCB defective.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tusda3 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is > 1.5 MΩ, the cable, the plug inside in the unit or the sensor is defect. Check plug before replacing the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tusda3, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

| 116 | Tusda 3 short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | USDA 3 Temperature Sensor Short Circuit. | | | | | |
| **Criteria** | Value above high alarm limit +284F (+140°C) and the sensor reading has been in the valid area since power-up. | | | | | |
| **Cause** | Indication of short-circuited USDA 3 temperature sensor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | (X) | Alarm light | Off |
| **Consequence** | May be incomplete USDA data logging. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tusda3 or its cable defective.
- Defect plug inside in the unit.
- Controller PCB defective.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tusda3 from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is < 230 Ω, the cable, the plug inside in the unit or the sensor is defect. Check the plug before replacing the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tusda3, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

| 117 | Tusda 3 invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | USDA 3 Temperature Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (50°C) or above +158F (+70°C). Value must be invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective USDA 3 temperature sensor or its measuring circuitry. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | (X) | Alarm light | Off |
| **Consequence** | May be incomplete USDA data logging. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shouting** | *Alarm not implemented yet!* | | | | | |

<table>
<tr><th>118</th><th colspan="6">Tcargo open</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="7">Cargo Temperature Sensor Open Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="7">Value below low alarm limit -76F (-60°C) and the sensor reading has been in the valid area since power-up.</td></tr>
<tr><td>Cause</td><td colspan="7">Indication of loose connection, defect or lack of cargo temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="7">None</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>(X)</td><td>Alarm light</td><td colspan="2">Off</td></tr>
<tr><td>Consequence</td><td colspan="7">May be incomplete cargo data logging.</td></tr>
<tr><td>Elimination</td><td colspan="7">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="3">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="3"></td></tr>
<tr><td>Trouble shouting</td><td colspan="7">
<u>Possible causes:</u><br>
• Temperature sensor Tcargo or its cable defective.<br>
• Defect plug inside in the unit.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• N/A.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tcargo from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is > 1.5 MΩ, the cable, the plug inside in the unit or the sensor is defect. Check plug before replacing the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tcargo, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.
</td></tr>
</table>

<table>
<tr><th>119</th><th colspan="6">Tcargo short</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="7">Cargo Temperature Sensor Short Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="7">Value above high alarm limit +284F (+140°C) and the sensor reading has been in the valid area since power-up.</td></tr>
<tr><td>Cause</td><td colspan="7">Indication of short-circuited cargo temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="7">None.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>(X)</td><td>Alarm light</td><td colspan="2">Off</td></tr>
<tr><td>Consequence</td><td colspan="7">May be incomplete cargo data logging.</td></tr>
<tr><td>Elimination</td><td colspan="7">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="2"></td></tr>
<tr><td>Trouble shouting</td><td colspan="7">
<u>Possible causes:</u><br>
• Temperature sensor Tcargo or its cable defective.<br>
• Defect plug inside in the unit.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• N/A.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tcargo from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is < 230 Ω, the cable, the plug inside in the unit or the sensor is defect. Check the plug before replacing the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tcargo, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.
</td></tr>
</table>

| 120 | Tcargo invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Cargo Temperature Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (-50°C) or above +158F (+70°C). Value must be invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective cargo sensor or its measuring circuitry. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | (X) | Alarm light | Off |
| **Consequence** | May be incomplete cargo data logging. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shouting** | *Alarm not implemented yet!* | | | | | |

| 121 | Tevap open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Temperature Sensor Open Circuit. | | | | | |
| **Criteria** | Value below low alarm limit -76F (-60°C). | | | | | |
| **Cause** | Indication of loose connection, defect or lack of evaporator temperature sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tevap or its cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 123.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tevap from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is > 1.5 MΩ, the cable or the sensor is defect, replace the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tevap, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again.
      Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down.
      Check other alarms before replacing controller door.

| 122 | Tevap short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Temperature Sensor Short Circuit. | | | | | |
| **Criteria** | Value above high alarm limit +284F (+140°C). | | | | | |
| **Cause** | Indication of short-circuited evaporator temperature sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tevap or its cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 123.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tevap from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is < 230 Ω, the cable or the sensor is defect, replace the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tevap, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

| 123 | Tevap invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Temperature Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (-50°C) or above +158F (+70°C). Value must be invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective evaporator temperature sensor or its measuring circuitry. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shouting**

Possible causes:

- Active alarms AL121 or AL122.
- Temperature sensor reading is out of valid range: -58F (-50°C) or above +158F (+70°C).

Accompanied alarms:

- AL 121 or 122 may also be active.

Trouble shooting:

1) If alarms AL121 or AL122 are active, check their trouble shooting section first.

2) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

3) Measure the resistance between the two wires.
   a) If the resistance is out of range of the resistance and temperature table in section 26.1, the temperature sensor and cable are defect and should be replaced.

| 124 | Tsuc open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Suction Temperature Sensor Open Circuit. | | | | | |
| **Criteria** | Value below low alarm limit -76F (-60°C). | | | | | |
| **Cause** | Indication of loose connection, defect or complete lack of suction temperature sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tsuc or its cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 126.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tsuc from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is > 1.5 MΩ, the cable or the sensor is defect, replace the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tsuc, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again.
      Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down.
      Check other alarms before replacing controller door.

| 125 | Tsuc short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Suction Temperature Sensor Short Circuit. | | | | | |
| **Criteria** | Value above high alarm limit +158F (+140°C). | | | | | |
| **Cause** | Indication of short-circuited suction temperature sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Superheat control deactivation. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Tsuc or its cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 126.

Trouble shooting:

1) Disconnect the sensor cable for sensor Tsuc from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is < 230 Ω, the cable or the sensor is defect, replace the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Tsuc, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

| 126 | Tsuc invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Suction Temperature Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (-50°C) or above +158F (+70°C). Value must be invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective suction temperature sensor or its measuring circuitry. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Superheat control deactivation. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shouting**

Possible causes:

- Active alarms AL124 or AL125.
- Temperature sensor reading is out of valid range: -58F (-50°C) or above +158F (+70°C).

Accompanied alarms:

- AL 124 or 125 may also be active.

Trouble shooting:

1) If alarms AL124 or AL125 are active, check their trouble shooting section first.

2) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

3) Measure the resistance between the two wires.
   a) If the resistance is out of range of the resistance and temperature table in section 26.1, the temperature sensor and cable are defect and should be replaced.

<table>
<tr><th>127</th><th colspan="6">Tamb open</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="7">Ambient Temperature Sensor Open Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="7">Value below low alarm limit -76F (-60°C).</td></tr>
<tr><td>Cause</td><td colspan="7">Indication of loose connection, defect or lack of ambient temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="7">Replacement by new value from AAS system.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td colspan="2">Off</td></tr>
<tr><td>Consequence</td><td colspan="7">No consequence as to control.</td></tr>
<tr><td>Elimination</td><td colspan="7">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td colspan="2">Parm 2</td><td colspan="2">Parm 3</td><td>Parm 4</td><td>Parm 5</td></tr>
<tr><td>Active/Inactive</td><td colspan="2">Low limit</td><td colspan="2">High limit</td><td>Current</td><td></td></tr>
<tr><td>Trouble shouting</td><td colspan="7">
<u>Possible causes:</u><br>
• Temperature sensor Tamb or its cable defective.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• AL 129.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tamb from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is > 1.5 MΩ, the cable or the sensor is defect, replace the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tamb, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again.<br>
Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down.<br>
Check other alarms before replacing controller door.
</td></tr>
</table>

<table>
<tr><th>128</th><th colspan="6">Tamb short</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="7">Ambient Temperature Sensor Short Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="7">Value above high alarm limit +284F (+140°C).</td></tr>
<tr><td>Cause</td><td colspan="7">Indication of short-circuited ambient temperature sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="7">Replacement by new value from AAS system.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td colspan="2">Off</td></tr>
<tr><td>Consequence</td><td colspan="7">No consequence as to control.</td></tr>
<tr><td>Elimination</td><td colspan="7">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td colspan="2">Parm 2</td><td colspan="2">Parm 3</td><td>Parm 4</td><td>Parm 5</td></tr>
<tr><td>Active/Inactive</td><td colspan="2">Low limit</td><td colspan="2">High limit</td><td>Current</td><td></td></tr>
<tr><td>Trouble shouting</td><td colspan="7">
<u>Possible causes:</u><br>
• Temperature sensor Tamb or its cable defective.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• AL 129.<br><br>
<u>Trouble shooting:</u><br>
1) Disconnect the sensor cable for sensor Tamb from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
2) Measure the resistance between the two wires.<br>
a) If the resistance is < 230 Ω, the cable or the sensor is defect, replace the sensor and cable.<br>
b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>
3) Measure the voltage over the connector for Tamb, it should be between 4.80 and 5.05<br>
a) If the voltage is inside the above range, connect sensor again.<br>
Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>
b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down.<br>
Check other alarms before replacing controller door.
</td></tr>
</table>

<table>
<tr><th>129</th><th colspan="5">Tamb invalid</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="6">Ambient Temperature Sensor Invalid.</td></tr>
<tr><td>Criteria</td><td colspan="6">Value below alarm limit -58F (-50°C) or above +158F (+70°C). Value must be invalid for 30 sec. for alarm activation.</td></tr>
<tr><td>Cause</td><td colspan="6">Indication of defective supply ambient sensor or its measuring circuitry.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">Replacement by new value from AAS system.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6">No consequence as to control.</td></tr>
<tr><td>Elimination</td><td colspan="6">When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. Value must be valid for 120 sec. to set alarm inactive.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Trouble shouting</td><td colspan="6">
<u>Possible causes:</u><br>
• Active alarms AL127 or AL128.<br>
• Temperature sensor reading is out of valid range: -58F (-50°C) or above +158F (+70°C).<br><br>
<u>Accompanied alarms:</u><br>
• AL 127 or 128 may also be active.<br><br>
<u>Trouble shooting:</u><br>
1) If alarms AL127 or AL128 are active, check their trouble shooting section first.<br><br>
2) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>
3) Measure the resistance between the two wires.<br>
a) If the resistance is out of range of the resistance and temperature table in section 26.1, the temperature sensor and cable are defect and should be replaced.
</td></tr>
</table>

| 133 | Teco open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Economizer Suction Temperature Sensor Open Circuit. | | | | | |
| **Criteria** | Value below low alarm limit -76F (-60°C). | | | | | |
| **Cause** | Indication of loose connection, defect or lack of economizer suction temperature sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in the alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shouting**

Possible causes:

- Temperature sensor Teco or its cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 135.

Trouble shooting:

1) Disconnect the sensor cable for sensor Teco from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

2) Measure the resistance between the two wires.
   a) If the resistance is > 1.5 MΩ, the cable or the sensor is defect, replace the sensor and cable.
   b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.

3) Measure the voltage over the connector for Teco, it should be between 4.80 and 5.05
   a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.
   b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door.

| 134 | Teco short | | | | | Warning |
|---|---|---|---|---|---|---|
| Description | Economizer Suction Temperature Sensor Short Circuit. | | | | | |
| Criteria | Value above high alarm limit +284F (+140°C). | | | | | |
| Cause | Indication of short-circuited economizer suction temperature sensor. | | | | | |
| Action | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| Consequence | | | | | | |
| Elimination | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| Log data | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |
| Trouble shouting | Possible causes:<br>• Temperature sensor Teco or its cable defective.<br>• Controller PCB defective.<br><br>Accompanied alarms:<br>• AL 135.<br><br>Trouble shooting:<br>1) Disconnect the sensor cable for sensor Teco from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.<br><br>2) Measure the resistance between the two wires.<br>a) If the resistance is < 230 Ω, the cable or the sensor is defect, replace the sensor and cable.<br>b) If the resistance matches the resistance and temperature in table in section 26.1, the temperature sensor and cable are ok.<br><br>3) Measure the voltage over the connector for Teco, it should be between 4.80 and 5.05<br>a) If the voltage is inside the above range, connect sensor again. Measure the voltage over the sensor and check voltage/temperature according to table in section 26.1.<br>b) If the voltage is outside the above range, the controller PCB is defect or another sensor may be defect and pulling the voltage down. Check other alarms before replacing controller door. | | | | | |

| 135 | Teco invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Economizer Suction Temperature Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -58F (-50°C) or above +158F (+70°C). Value must be invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective economizer suction temperature sensor or its measuring circuitry. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. Value must be valid for 120 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shouting**

Possible causes:

- Active alarms AL133 or AL134.
- Temperature sensor reading is out of valid range: -58F (-50°C) or above +158F (+70°C).

Accompanied alarms:

- AL 133 or 134 may also be active.

Trouble shooting:

1) If alarms AL133 or AL134 are active, check their trouble shooting section first.

2) Disconnect the sensor cable for sensor Tret from the connector on the interface PCB, according to the wiring schematics inside in the control cabinet.

3) Measure the resistance between the two wires.
   a) If the resistance is out of range of the resistance and temperature table in section 26.1, the temperature sensor and cable are defect and should be replaced.

## 17.2. Pressure Sensor Alarms

| 200 | Pdis open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Compressor Discharge Pressure Sensor Open Circuit. | | | | | |
| **Criteria** | Value above high alarm limit 462Psi (31.9 Bar). | | | | | |
| **Cause** | Indication of loose connection, defect or lack of compressor discharge pressure sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Connector for high pressure sensor Pdis not correct mounted.
- High pressure sensor Pdis defective.
- Cable for high pressure sensor Pdis defective.
- Controller PCB defective.

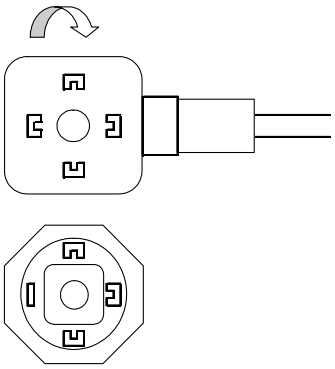
Accompanied alarms:

- AL 203.

Trouble shooting:

Disconnect the cable for Pdis from the connector PCB according to the wiring schematics inside the control cabinet and from the high pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Pdis in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 201 | Pdis short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Compressor Discharge Pressure Sensor Short Circuit. | | | | | |
| **Criteria** | Value below low alarm limit 2 Psi (0.1 Bar). | | | | | |
| **Cause** | Indication of short-circuited compressor discharge pressure sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Connector for high pressure sensor Pdis not correct mounted.
- High pressure sensor Pdis defective.
- Cable for high pressure sensor Pdis defective.
- Controller PCB defective.

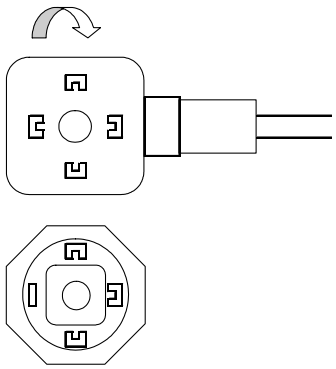
Accompanied alarms:

- AL 203.

Trouble shooting:

Disconnect the cable for Pdis from the connector PCB according to the wiring schematics inside the control cabinet and from the high pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Pdis in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 203 | Pdis invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Compressor Discharge Pressure Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit 7Psi (0.50Bar) or above 334Psi (23Bar). Value invalid for 30 sec.for alarm activation. | | | | | |
| **Cause** | Indication of defective compressor discharge pressure sensor or its measuring circuitry. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

Possible causes:

- Connector for high pressure sensor Pdis not correct mounted.
- High pressure sensor Pdis defective.
- Cable for high pressure sensor Pdis defective.
- Controller PCB defective.

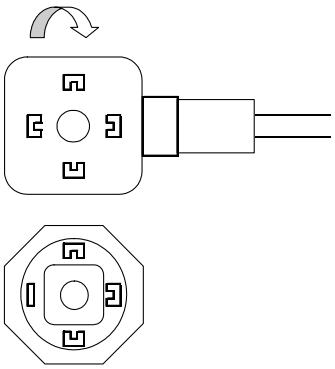
Accompanied alarms:

- AL 200 or AL 201 may also be active.

Trouble shooting:

Disconnect the cable for Pdis from the connector PCB according to the wiring schematics inside the control cabinet and from the high pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Pdis in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 204 | Psuc open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Compressor Suction Pressure Sensor Open Circuit. | | | | | |
| **Criteria** | Value above high alarm limit 172Psi (11.9 Bar). | | | | | |
| **Cause** | Indication of loose connection, defect or complete lack of compressor suction pressure sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Connector for suction pressure sensor Psuc not correct mounted.
- Suction pressure sensor Psuc defective.
- Cable for suction pressure sensor Psuc defective.
- Controller PCB defective.

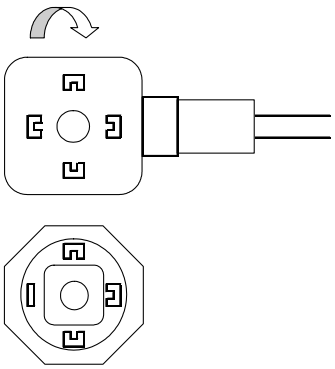
Accompanied alarms:

- AL 207.

Trouble shooting:

Disconnect the cable for Psuc from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Psuc in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 205 | Psuc short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Compressor Suction Pressure Sensor Short Circuit. | | | | | |
| **Criteria** | Value below low alarm limit -13 (relative)Psi (-0.9 relative Bar). | | | | | |
| **Cause** | Indication of short-circuited compressor suction pressure sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Connector for suction pressure sensor Psuc not correct mounted.
- Suction pressure sensor Psuc defective.
- Cable for suction pressure sensor Psuc defective.
- Controller PCB defective.

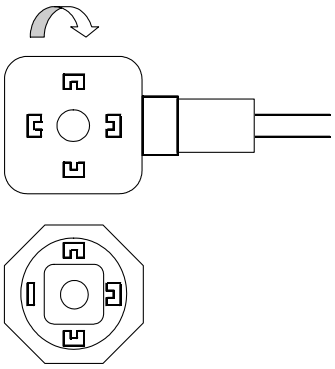
Accompanied alarms:

- AL 207.

Trouble shooting:

Disconnect the cable for Psuc from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Psuc in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 207 | Psuc invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Compressor Suction Pressure Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -10 (relative) Psi (-0.75 relative Bar) or above 162 (relative) Psi (11.2 relative Bar). Value invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective compressor suction pressure sensor or its measuring circuitry. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble ½shooting**

Possible causes:

- Connector for suction pressure sensor Psuc not correct mounted.
- Suction pressure sensor Psuc defective.
- Cable for suction pressure sensor Psuc defective.
- Controller PCB defective.

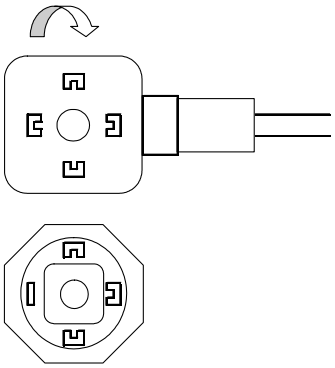
Accompanied alarms:

- AL 204 or AL 205 may also be active.

Trouble shooting:

Disconnect the cable for Psuc from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Psuc in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 208 | Peco open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Economizer Suction Pressure Sensor Open Circuit. | | | | | |
| **Criteria** | Value above high alarm limit 172(relative) Psi (11.9 relative Bar). | | | | | |
| **Cause** | Indication of loose connection, defect or lack of economizer suction pressure sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Connector for suction pressure sensor Peco not correct mounted.
- Suction pressure sensor Peco defective.
- Cable for suction pressure sensor Peco defective.
- Controller PCB defective.

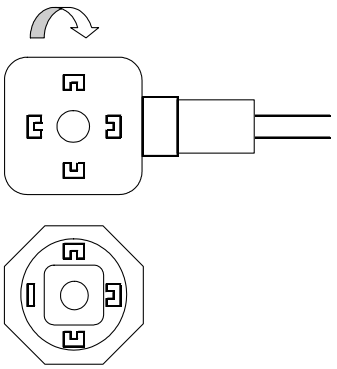
Accompanied alarms:

- AL 210.

Trouble shooting:

Disconnect the cable for Peco from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Peco in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 209 | Peco short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Economizer Suction Pressure Sensor Short Circuit. | | | | | |
| **Criteria** | Value below low alarm limit -13 (relative) Psi (-0.9 relative Bar). | | | | | |
| **Cause** | Indication of short-circuited economizer suction pressure sensor. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Connector for suction pressure sensor Peco not correct mounted.
- Suction pressure sensor Peco defective.
- Cable for suction pressure sensor Peco defective.
- Controller PCB defective.

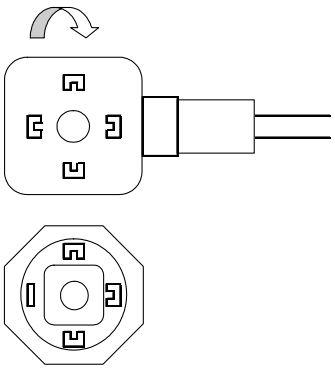
Accompanied alarms:

- AL 210.

Trouble shooting:

Disconnect the cable for Peco from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Peco in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 210 | Peco invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Economizer Suction Pressure Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit -10 (relative) Psi (-0.75 relative Bar) or above 162 (relative) Psi (11.2 relative Bar). Value invalid for 30 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective economizer suction pressure sensor or its measuring circuitry. | | | | | |
| **Action** | Replacement by new value from AAS system. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

Possible causes:

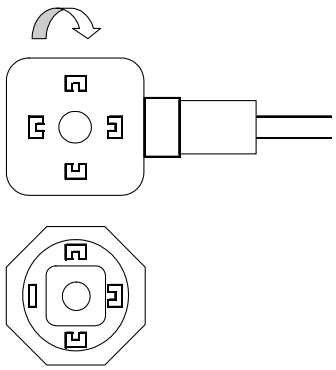
- Connector for suction pressure sensor Peco not correct mounted.
- Suction pressure sensor Peco defective.
- Cable for suction pressure sensor Peco defective.
- Controller PCB defective.

Accompanied alarms:

- AL 208 or AL 209 may also be active.

Trouble shooting:
Disconnect the cable for Psuc from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) Check that the connector is mounted correct according to the drawing.
   The earth stud must be on the opposite side of the cable:



2) Check the cable (measure the resistance in the cable).
   If the cable is defect, replace cable.

3) Mount the cable for Peco in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

## 17.3. Other Sensor Alarms

| 300 | RH open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Relative Humidity Sensor Open Circuit. | | | | | |
| **Criteria** | Value above high alarm limit 120%. | | | | | |
| **Cause** | Indication of loose connection, defect or lack of relative humidity sensor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Dehumidification impossible. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Relative humidity sensor RH or cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 302.

Trouble shooting:

Disconnect the cable for RH from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) If the cable by inspection is defect, replace cable.

2) Unmount the cable from the sensor and measure the resistance in the cable.
   If the resistance is < 230 Ω, the cable is defect and must be replaced.

3) Mount the cable for RH in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on the interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 10VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 10VDC and this alarm is still active, replace controller door.

<table>
<tr><th>301</th><th colspan="5">RH short</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="6">Relative Humidity Sensor Short Circuit.</td></tr>
<tr><td>Criteria</td><td colspan="6">Value below low alarm limit 5%.</td></tr>
<tr><td>Cause</td><td colspan="6">Indication of short-circuited relative humidity sensor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">None.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6">Dehumidification impossible.</td></tr>
<tr><td>Elimination</td><td colspan="6">When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Current</td><td colspan="2"></td></tr>
<tr><td>Trouble shooting</td><td colspan="6">
<u>Possible causes:</u><br>
• Relative humidity sensor RH or cable defective.<br>
• Controller PCB defective.<br><br>
<u>Accompanied alarms:</u><br>
• AL 302.<br><br>
<u>Trouble shooting:</u><br>
Disconnect the cable for RH from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.<br><br>
1) If the cable by inspection is defect, replace cable.<br><br>
2) Unmount the cable from the sensor and measure the resistance in the cable.<br>
If the resistance is < 230 Ω, the cable is defect and must be replaced.<br><br>
3) Mount the cable for RH in controller cabinet and on the sensor.<br>
Disconnect signal wire on interface PCB.<br>
Measure voltage between wire and GND on the interface PCB.<br>
If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.<br>
If voltage is between 0.5VDC and 10VDC, continue to 3).<br><br>
4) Mount signal wire.<br>
Measure voltage between SIGNAL and GND.<br>
If voltage is between 0.5VDC and 10VDC and this alarm is still active, replace controller door.
</td></tr>
</table>

| 302 | RH invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Relative Humidity Sensor Invalid. | | | | | |
| **Criteria** | Value below alarm limit 10% Rh or above 110% Rh.<br>Value invalid for 120 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective relative humidity sensor or its measuring circuitry. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Dehumidification impossible. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. Value must be valid for 120 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

Possible causes:

- Relative humidity sensor RH or cable defective.
- Controller PCB defective.

Accompanied alarms:

- AL 300 or AL301 may also be active.

Trouble shooting:

Disconnect the cable for RH from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) If the cable by inspection is defect, replace cable.

2) Unmount the cable from the sensor and measure the resistance in the cable.
   If the resistance is < 230 Ω, the cable is defect and must be replaced.

3) Mount the cable for RH in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on the interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 10VDC, continue to 3).

4) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 10VDC and this alarm is still active, replace controller door.

| 303 | AirEx open | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Air Exchange Sensor Open Circuit. | | | | | |
| **Criteria** | Value above high alarm limit 300 $m^3$/hour. | | | | | |
| **Cause** | Indication of loose connection, defect or lack of air exchange sensor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |
| **Trouble shooting** | Possible causes:<br>• Air exchange sensor AirEx or cable defective.<br>• Controller PCB defective.<br><br>Accompanied alarms:<br>• AL 305.<br><br>Trouble shooting:<br>Disconnect the cable for AirEx from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.<br><br>1) If the cable by inspection is defect, replace cable.<br><br>2) Mount the cable for AirEx in controller cabinet and on the sensor.<br>Disconnect signal wire on interface PCB.<br>Measure voltage between wire and GND on the interface PCB.<br>If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.<br>If voltage is between 0.5VDC and 4.5VDC, continue to 3).<br><br>3) Mount signal wire.<br>Measure voltage between SIGNAL and GND.<br>If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door. | | | | | |

| 304 | AirEx short | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Air Exchange Sensor Short Circuit. *Not implemented yet* | | | | | |
| **Criteria** | Value below low alarm limit 10 $m^3$/hour. | | | | | |
| **Cause** | Indication of short-circuited air exchange sensor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | | |

**Trouble shooting**

<u>Possible causes:</u>

- Air exchange sensor AirEx or cable defective.
- Controller PCB defective.

<u>Accompanied alarms:</u>

- AL 305.

<u>Trouble shooting:</u>

Disconnect the cable for AirEx from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) If the cable by inspection is defect, replace cable.

2) Mount the cable for AirEx in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on the interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

3) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 305 | AirEx invalid | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Air Exchange Sensor Invalid. *Alarm not implemented yet!* | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of defective air exchange sensor or its measuring circuitry. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted.<br>Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

<u>Possible causes:</u>

- Air exchange sensor AirEx or cable defective.
- Controller PCB defective.

<u>Accompanied alarms:</u>

- AL 303 or 304 may also be active.

<u>Trouble shooting:</u>

Disconnect the cable for AirEx from the connector PCB according to the wiring schematics inside the control cabinet and from the suction pressure sensor.

1) If the cable by inspection is defect, replace cable.

2) Mount the cable for AirEx in controller cabinet and on the sensor.
   Disconnect signal wire on interface PCB.
   Measure voltage between wire and GND on the interface PCB.
   If voltage is below 0.5VDC, sensor or connection between sensor and cable is defect.
   If voltage is between 0.5VDC and 4.5VDC, continue to 3).

3) Mount signal wire.
   Measure voltage between SIGNAL and GND.
   If voltage is between 0.5VDC and 4.5VDC and this alarm is still active, replace controller door.

| 306 | High press switch | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | High pressure switch is active | | | | | |
| **Criteria** | Pressure is above high pressure switch safety limit. Cut – out: 326,3 psi (22,5 bar) ± 10,2 psi (0,7 bar), cut – in: 223,4 psi (15,4 bar) ± 10,2 psi (0,7 bar). | | | | | |
| **Cause** | | | | | | |
| **Action** | Frequency controller is stopped and unit stops. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Unit restarts after 5 min. When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. Value must be valid for 60 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Pdis | Peco | Psuc | FCTemp | |

**Trouble shooting**

Possible causes:

- Fuse F6 blown.
- Ambient temperature over spec. limit +122F (+50˚C).
- Manual valve after compressor closed.
- HP pipe damaged.
- Condenser fan motor not running.
- High pressure switch or cable is defective.
- Condenser blocked.
- Expansion valve doesn't open.
- Controller PCB defective.

Accompanied alarms:

- AL 500 may be active, alarm AL 604 may be or get active.

Trouble shooting:

1) If alarm AL500 'FC missing' is also active, the fuse F6 inside in the control cabinet is most likely blown. Replace the fuse.

2) The unit uses cooling refrigerant R134A and it is very difficault to operate at temperatures above specification. The unit needs cooler surroundings, better ventilation or eventually water cooling.

3) If the pressure rises very quickly after start of the compressor, check that the valve after the compressor (discharge side) is not closed. If it is closed, open it.

4) Check that there are no damages to the pipes after the compressor. Repair if they are damaged and check cooling liquid level (R134A).

5) Check that there are no alarm for the condenser fan motor, AL402, and that the fan is rotating and that the condenser is not blocked for airflow.

6) If economizer pressure and condenser pressure are both very high the expansion valve may not oerate correctly. By holding on the pipe to the expansion valve, it is possible to feel if the valve is opening and closing.

Disconnect the cable for high pressure switch from the connector PCB according to the wiring schematics inside the control cabinet.

7) Check the cable (measure the resistance in the cable).
If the cable is defect, replace cable and high pressure switch.

8) Measure the voltage between the two connectors for the high pressure switch on the connector PCB.
If the voltage is below 15 VAC, replace the controller door.

9) Mount the cable for the high pressure switch again.
If this alarm is still active on the display, replace the controller door.

## 17.4. Power Alarms

| 400 | Mevap 1 overheat | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Motor 1 Overheat. | | | | | |
| **Criteria** | Value above high alarm limit 10 K Ohm. | | | | | |
| **Cause** | Indication of an overheated motor or a loose thermistor cable connection. | | | | | |
| **Action** | Both evaporator fan motors are stopped. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Air circulation in container stops causing unit to stop. | | | | | |
| **Elimination** | When overheating disappears, alarm will be marked as inactive in alarm list and may then be deleted. Control is again released, but fan motors will only be allowed to operate at low speed for the first 5 min. If the error does not reoccur, problem will be considered solved and evaporator fan high speed is again released. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Evaporator motor 1 defect.
- Cable for measuring evaporator motor 1 overheat defect.
- Controller PCB defective.

Accompanied alarms:

- N/A.

Trouble shooting:

Disconnect the cable for Mevap1OH from the connector PCB according to the wiring schematics inside the control cabinet.

1) Turn off unit!
   Open inspection hatch and see if the evaporator fan can turn freely.
   If it can not turn, remove ice or replace the motor.
   If the motor is hot it may be overloaded and jammed or defect.

2) If the cable for Mevap1OH by inspection is defect, replace cable.

3) Measure the resistance in the cable.
   If the resistance is > 1 MΩ, the cable or the motor is defect and should be replaced.
   If the resistance is < 5 kΩ, the cable and motor should be ok.

4) Turn unit on again.
   Measure the voltage over the connector for Mevap1OH, it should be between 4.80VDC and 5.05VDC.
   a) If the voltage is inside the above range, connect sensor again.
      Measure the voltage over the sensor and check the voltage.
      If the voltage is < 2.5VDC, the measurement is ok.
      If the alarm after 30 sec. is still active on the display, the controller PCB is defect - replace the controller door.
   b) If the voltage is outside the range, controller PCB is defect or another error might affect the voltage. Check other alarms before replacing controller door.

| 401 | Mevap 2 overheat | | | | | **Warning** |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Motor 2 Overheat. | | | | | |
| **Criteria** | Value above high alarm limit 10 K Ohm. | | | | | |
| **Cause** | Indication of an overheated motor or a loose thermistor cable connection. | | | | | |
| **Action** | Both evaporator fan motors are stopped. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Air circulation in container stops causing unit to stop. | | | | | |
| **Elimination** | When overheating ceases, alarm will be marked as inactive in alarm list and may then be deleted. Control is again released but fan motors will only be allowed to operate at low speed for the first 5 min. If error does not reoccur, problem will be considered solved and evaporator fan high speed is again released. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Evaporator motor 2 defect.
- Cable for measuring evaporator motor 2 overheat defect.
- Controller PCB defective.

Accompanied alarms:

- N/A.

Trouble shooting:

Disconnect the cable for Mevap2OH from the connector PCB according to the wiring schematics inside the control cabinet.

1) Turn off unit!
   Open inspection hatch and see if the evaporator fan can turn freely.
   If it can not turn, remove ice or replace the motor.
   If the motor is hot it may be overloaded and jammed or defect.

2) If the cable for Mevap2OH by inspection is defect, replace cable.

3) Measure the resistance in the cable.
   If the resistance is > 1 MΩ, the cable or the motor is defect and should be replaced.
   If the resistance is < 5 kΩ, the cable and motor should be ok.

4) Turn unit on again.
   Measure the voltage over the connector for Mevap2OH, it should be between 4.80VDC and 5.05VDC.
   a) If the voltage is inside the above range, connect sensor again.
      Measure the voltage over the sensor and check the voltage.
      If the voltage is < 2.5VDC, the measurement is ok.
      If the alarm after 30 sec. is still active on the display, the controller PCB is defect - replace the controller door.
   b) If the voltage is outside the range, controller PCB is defect or another error might affect the voltage. Check other alarms before replacing controller door.

| 402 | Mcond overheat | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Condenser Motor Overheat. | | | | | |
| **Criteria** | Value above top alarm limit 10 K Ohm. | | | | | |
| **Cause** | Indication of an overheated motor or a loose thermistor cable connection. | | | | | |
| **Action** | Condenser fan motors are stopped. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | High compressor discharge pressure is controlled by limiting compressor speed. | | | | | |
| **Elimination** | When overheating disappears, alarm will be marked as inactive in alarm list and may then be deleted. Control is again released, but fan motor will only be allowed to operate at low speed for the first 5 min. If the error does not reoccur, problem will be considered solved and evaporator fan high speed is again released. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | High limit | Current | | |

**Trouble shooting**

Possible causes:

- Condenser motor defect.
- Cable for measuring condenser motor overheat defect.
- Controller PCB defective.

Accompanied alarms:

- N/A.

Trouble shooting:

Disconnect the cable for McondOH from the connector PCB according to the wiring schematics inside the control cabinet.

1) Turn off unit!
   See if the condenser fan can turn freely.
   If it can not turn, replace the motor.
   If the motor is hot it may be overloaded and jammed or defect.

2) If the cable for McondOH by inspection is defect, replace cable.

3) Measure the resistance in the cable.
   If the resistance is > 1 MΩ, the cable or the motor is defect and should be replaced.
   If the resistance is < 5 kΩ, the cable and motor should be ok.

4) Turn unit on again.
   Measure the voltage over the connector for McondOH, it should be between 4.80VDC and 5.05VDC.
   a) If the voltage is inside the above range, connect sensor again.
      Measure the voltage over the sensor and check the voltage.
      If the voltage is < 2.5VDC, the measurement is ok.
      If the alarm after 30 sec. is still active on the display, the controller PCB is defect - replace the controller door.
   b) If the voltage is outside the range, controller PCB is defect or another error might affect the voltage. Check other alarms before replacing controller door.

| 411 | Unit over current | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Unit Over current | | | | | |
| **Criteria** | Maximum current consumption has been exceeded. | | | | | |
| **Cause** | Indication of short circuit. | | | | | |
| **Action** | Controller breaks supply. | | | | | |
| | Log | X | Alarm | | Alarm light | |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another current consumption measuring is below limit. It may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Phase no. | Current | Limit | | |
| **Trouble shooting** | Possible causes:<br>• The unit is using too much power.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) The voltage may have been too low for too long.<br><br>2) Check for loose connections.<br><br>3) When cargo is unloaded, run a PTI test and see if one of the motors or heater is using too much power.<br><br>4) Check power cables for short circuits and damages.<br><br>5) Check cables for heaters and motors for short circuits and damages. | | | | | |

This alarm is used for service purposes, the fuses are protecting the unit.

| 414 | U1-2 over voltage | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | U1-2 Over voltage. | | | | | |
| **Criteria** | Value above top alarm limit 525 Volt. | | | | | |
| **Cause** | Indication of error in container supply voltage between phases 1 and 2. | | | | | |
| **Action** | Controller breaks supply after 60 sec. After 30 sec. the unit restarts with a normal startup procedure. | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another phase voltage measuring is below limit. It may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Voltage | MeasureChannel | |
| **Trouble shooting** | Possible causes:<br>• The unit is supplied with a voltage above specified level.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Measure the voltage applied to the unit.<br><br>2) Apply correct voltage to the unit.<br><br>The FC will be destroyed if it is running at a too high voltage. | | | | | |

<table>
<tr><th>415</th><th colspan="6">U2-3 over voltage</th><th>Fatal Alarm</th></tr>
<tr><td>Description</td><td colspan="7">U2-3 Over voltage.</td></tr>
<tr><td>Criteria</td><td colspan="7">Value above top alarm limit 525 Volt.</td></tr>
<tr><td>Cause</td><td colspan="7">Indication of error in container supply voltage between phases 2 and 3.</td></tr>
<tr><td>Action</td><td colspan="7">Controller breaks supply after 60 sec. After 30 sec. the unit restarts with a normal startup procedure.<br>
<table>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td>Quick flash</td></tr>
</table></td></tr>
<tr><td>Consequence</td><td colspan="7">Unit stops.</td></tr>
<tr><td>Elimination</td><td colspan="7">Alarm will be marked as inactive if another phase voltage measuring is below limit. It may then be deleted.</td></tr>
<tr><td>Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td></td><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Voltage</td><td colspan="2">MeasureChannel</td></tr>
<tr><td>Trouble shooting</td><td colspan="7">Possible causes:<br>
• The unit is supplied with a voltage above specified level.<br><br>
Accompanied alarms:<br>
• N/A.<br><br>
Trouble shooting:<br>
1) Measure the voltage applied to the unit.<br><br>
2) Apply correct voltage to the unit.<br><br>
The FC will be destroyed if it is running at a too high voltage.</td></tr>
</table>

| 416 | U1-3 over voltage | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | U1-3 Over voltage. | | | | | |
| **Criteria** | Value above top alarm limit 525 Volt. | | | | | |
| **Cause** | Indication of error in container supply voltage between phases 1 and 3. | | | | | |
| **Action** | Controller breaks supply after 60 sec. After 30 sec.the unit restarts with a normal startup procedure. | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another phase voltage measuring is below limit. It may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Voltage | MeasureChannel | |
| **Trouble shooting** | Possible causes:<br>• The unit is supplied with a voltage above specified level.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Measure the voltage applied to the unit.<br><br>2) Apply correct voltage to the unit.<br><br>The FC will be destroyed if it is running at a too high voltage. | | | | | |

| 417 | U1-2 under voltage | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | U1-2 Under voltage. | | | | | |
| **Criteria** | Value below low alarm limit 335 Volt. | | | | | |
| **Cause** | Indication of error in container supply voltage between phases 1 and 2. | | | | | |
| **Action** | Controller breaks supply after 60 sec. After 30 sec.the unit restarts with a normal startup procedure. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another phase voltage measuring is above limit. It may then be deleted. | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | Low limit | High limit | Voltage | MeasureChannel |

**Trouble shooting**

Possible causes:

- The unit is supplied with a voltage below specified level.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Measure the voltage applied to the unit.

2) Apply correct voltage to the unit.

The FC will not be able to maintain stable speed of the compressor motor due to a too low voltage and therefore the unit will make a restart.

<table>
<tr><th>418</th><th colspan="5">U2-3 under voltage</th><th>Warning</th></tr>
<tr><td>Description</td><td colspan="6">U2-3 Under voltage.</td></tr>
<tr><td>Criteria</td><td colspan="6">Value below low alarm limit 335 Volt.</td></tr>
<tr><td>Cause</td><td colspan="6">Indication of error in container supply voltage between phases 2 and 3.</td></tr>
<tr><td>Action</td><td colspan="6">Controller breaks supply after 60 sec. After 30 sec.the unit restarts with a normal startup procedure.</td></tr>
<tr><td></td><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6">Unit stops.</td></tr>
<tr><td>Elimination</td><td colspan="6">Alarm will be marked as inactive if another phase voltage measuring is above limit. It may then be deleted.</td></tr>
<tr><td>Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td></td><td>Active/Inactive</td><td>Low limit</td><td>High limit</td><td>Voltage</td><td colspan="2">MeasureChannel</td></tr>
<tr><td>Trouble shooting</td><td colspan="6">Possible causes:<br>• The unit is supplied with a voltage below specified level.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Measure the voltage applied to the unit.<br><br>2) Apply correct voltage to the unit.<br><br>The FC will not be able to maintain stable speed of the compressor motor due to a too low voltage and therefore the unit will make a restart.</td></tr>
</table>

| 419 | U1-3 under voltage | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | U1-3 Under voltage. | | | | | |
| **Criteria** | Value below low alarm limit 335 Volt. | | | | | |
| **Cause** | Indication of error in container supply voltage between phases 1 and 3. | | | | | |
| **Action** | Controller breaks supply after 60 sec. After 30 sec.the unit restarts with a normal startup procedure. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another phase voltage measuring is above limit. It may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Voltage | MeasureChannel | |
| **Trouble shooting** | Possible causes:<br>• The unit is supplied with a voltage below specified level.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Measure the voltage applied to the unit.<br><br>2) Apply correct voltage to the unit.<br><br>The FC will not be able to maintain stable speed of the compressor motor due to a too low voltage and therefore the unit will make a restart. | | | | | |

| 420 | I1 over current | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | I1 Over current. | | | | | |
| **Criteria** | Value above upper alarm limit 20 Amp. | | | | | |
| **Cause** | Indication of short circuit in electric installations of StarCool unit. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another current consumption measuring is below limit. It may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | MeasureChannel | |
| **Trouble shooting** | Possible causes:<br>• The unit is using too much power on one phase.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) The voltage may have been too low for too long.<br><br>2) When cargo is unloaded, run a PTI test and see if one of the motors or heater is using too much power.<br><br>3) Check power cables for short circuits and damages.<br><br>4) Check cables for heaters and motors for short circuits and damages. | | | | | |

This alarm is used for service purposes, the fuses are protecting the unit.

| 421 | I2 over current | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | I2 Over current. | | | | | |
| **Criteria** | Value above upper alarm limit 20 Amp. | | | | | |
| **Cause** | Indication of short circuit in electric installations of StarCool unit. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another current consumption measuring is below limit. It may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | MeasureChannel | |
| **Trouble shooting** | Possible causes:<br>• The unit is using too much power on one phase.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) The voltage may have been too low for too long.<br><br>2) When cargo is unloaded, run a PTI test and see if one of the motors or heater is using too much power.<br><br>3) Check power cables for short circuits and damages.<br><br>4) Check cables for heaters and motors for short circuits and damages. | | | | | |

This alarm is used for service purposes, the fuses are protecting the unit.

| 422 | I3 over current | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | I3 Over current. | | | | | |
| **Criteria** | Value above upper alarm limit 20 Amp. | | | | | |
| **Cause** | Indication of short circuit in electric installations of StarCool unit. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another current consumption measuring is below limit. It may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Current | MeasureChannel | |
| **Trouble shooting** | Possible causes:<br>• The unit is using too much power on one phase.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) The voltage may have been too low for too long.<br><br>2) When cargo is unloaded, run a PTI test and see if one of the motors or heater is using too much power.<br><br>3) Check power cables for short circuits and damages.<br><br>4) Check cables for heaters and motors for short circuits and damages. | | | | | |

This alarm is used for service purposes, the fuses are protecting the unit.

| 423 | No phase direction | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | Phase Direction Not Detectable. | | | | | |
| **Criteria** | Impossible to detect phase sequence in power supply. | | | | | |
| **Cause** | Phases may be lacking or there may be extremely high noise in one or more phases in the detection moment. | | | | | |
| **Action** | Controller breaks supply. | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when phase sequence can be established. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | No. of CW | No. of CCW | Min no. OK | | |

**Trouble shooting**

Possible causes:

- The unit is supplied with a voltage which is unstable.
- The phase direction is unstable/unmeasureable.
- The power frequency is out of specified range.
- Phase measuring circuit defect

Accompanied alarms:

- AL 424 may also be active.

Trouble shooting:

1) Check if voltage on all 3 phases is within specified range.

2) Verify that all 3 phases are applied to the unit and for example not just 2 phases.

3) Verify that power frequency is within specified range.

4) Verify that correct voltage is applied to the unit

5) Check/replace power meas PCB.

6) If 1) to 5) are ok, then replace the controller door.

| 424 | Power frequency | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Phase Frequency Error. | | | | | |
| **Criteria** | Value out of limits. Power frequency must be between 47.5Hz and 62.5Hz. | | | | | |
| **Cause** | Indication of error on StarCool unit power supply voltage. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | At very low frequencies this error will lead to 423 NO PHASEDIR. Otherwise, normal operation can take place; the measuring system, however, will perform badly. | | | | | |
| **Elimination** | Alarm will be marked as inactive if another frequency measuring is within limits. It may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Sample U1 | Sample U2 | Sample U3 | | |
| **Trouble shooting** | Possible causes:<br>• The unit is supplied with a voltage which is unstable.<br>• The power frequency is out of specified range.<br><br>Accompanied alarms:<br>• AL 423 may also be active.<br><br>Trouble shooting:<br>1) Check if voltage on all 3 phases is within specified range.<br><br>2) Verify that all 3 phases are applied to the unit and for example not just 2 phases.<br><br>3) Verify that power frequency is within specified range.<br><br>4) Apply correct voltage to the unit. | | | | | |

## 17.5. Frequency Converter Alarms

For some of the alarms in this section, the FC may be faulty and must be replaced. For continuing operation until replacement is possible, the unit can be rewired and started for emergency operation:

| 500 | FC missing | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Missing. | | | | | |
| **Criteria** | Communication with frequency converter not possible. | | | | | |
| **Cause** | Indication of defect frequency converter, lack of or improperly connection. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | Unit stop. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Bytes Gf | Bytes Df | | | |

**Trouble shooting**

Possible causes:

- Communication with FC broken.
- Power voltage to the FC not applied (wired for emergency operation?).
- Defect FC.
- Controller PCB defective.

Accompanied alarms:

- AL 306 or one or more AL 5XX may also be active.

Trouble shooting:

1) If alarm AL306 'High press switch' is also active, the fuse F6 inside in the control cabinet is most likely blown. Replace the fuse.

2) Verify that cable FC-com is mounted correct according to wiring diagram inside the controller cabinet and is not damaged.

3) Check that power to the FC is not wired for emergency operation.

4) Verify that there is correct voltages on all 3 phases for the FC.

5) Measure with a multimeter that there is a small AC signal on the connector PCB for cable FC-com.
   a) If there is no signal: The controller PCB is defective. Replace the controller door.
   b) If there is signal: The FC is defect and must be replaced. If there is no FC replacement available, the unit can be rewired for emergency operation.

| 501 | FC local control | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Local Mode Fault. | | | | | |
| **Criteria** | Frequency converter in the local mode. | | | | | |
| **Cause** | Indication of frequency converter set in the local control mode. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when local mode is reset on frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

Possible causes:

- Cable FC-com periodically defective.
- Internal fault in the FC.
- Defect FC.

Accompanied alarms:

- One or more AL 5XX may also be active.

Trouble shooting:

1) Check that the cable FC-com is connected and not damaged.

2) Switch off the unit and wait 10 min. before switching the unit on again.

3) If the alarm is then still active, the FC is defective and must be replaced.

If there is no FC replacement available, the unit can be rewired for emergency operation.

<table>
<tr><th>508</th><th colspan="6">FC TRIP short circ</th><th>Alarm</th></tr>
<tr><td>Description</td><td colspan="7">Frequency Converter Short Circuit Fault Alarm.</td></tr>
<tr><td>Criteria</td><td colspan="7">Short circuit in compressor or its terminals.</td></tr>
<tr><td>Cause</td><td colspan="7">Indication of defective compressor motor.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="7">Frequency converter shut-down.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td>X</td><td>Alarm light</td><td colspan="2">Slow flash</td></tr>
<tr><td>Consequence</td><td colspan="7">Unit stops.</td></tr>
<tr><td>Elimination</td><td colspan="7">Alarm will be marked as inactive in alarm list when reset by frequency converter.<br>Alarm may then be deleted.</td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td>Freq FC</td><td>I FC</td><td>Psuc</td><td colspan="2">Pdis</td></tr>
<tr><td>Trouble shooting</td><td colspan="7">Possible causes:<br>• Short-circuit on the FC power output.<br>• Defect FC.<br><br>Accompanied alarms:<br>• One or more AL 5XX may also be active.<br><br>Trouble shooting:<br>1) There is a short-circuit on the compressor motor (Mcpr) terminals or in the motor.<br>Check the cable and replace if it is defect.<br><br>2) The FC is defective and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation.</td></tr>
</table>

| 509 | FC TRIP 24V fault | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Internal 24V Supply Fault Alarm. | | | | | |
| **Criteria** | Internal 24V supply error. | | | | | |
| **Cause** | Indication of problems with frequency converter. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• Internal fault in the FC.<br>• Defect FC.<br><br>Accompanied alarms:<br>• One or more AL 5XX may also be active.<br><br>Trouble shooting:<br>1) Switch off the unit and wait 10 min. before switching the unit on again.<br><br>2) If the alarm is then still active, the FC is defective and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 510 | FC TRIP earth fault | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Earth Fault Alarm. | | | | | |
| **Criteria** | Leakage current from outlets to ground of frequency converter. | | | | | |
| **Cause** | Indication of problems with compressor or frequency converter. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• Isolation damaged on the FC power output to the compressor.<br>• Defect FC.<br><br>Accompanied alarms:<br>• One or more AL 5XX may also be active.<br><br>Trouble shooting:<br>1) The power cable for the compressor motor (Mcpr) may have defect isolation. Check the cable and replace if it is defect.<br><br>2) The FC is defective and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 511 | FC TRIP over cur | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Overcurrent Fault Alarm. | | | | | |
| **Criteria** | Frequency converter overloaded. | | | | | |
| **Cause** | Indication of problems with compressor. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |

**Trouble shooting**

Possible causes:

- The compressor motor draws too much current.
- Defect FC.

Accompanied alarms:

- One or more AL 5XX may also be active. Check these alarm also before replacing anything.

Trouble shooting:

1) The compressor motor draws too much current from the FC. The motor may be jammed or defect.
2) Turn off unit and wait 10 min. before turning the unit on again.
3) When the unit starts up again, verify that the compressor starts again and is running.
4) If the compressor can not run or runs very short time before this alarm comes again, the compressor is defective and must be replaced.
5) If the compressor can run several min. without alarm, the FC may be defective and must be replaced if the alarm comes again.
   If there is no FC replacement available, the unit can be rewired for emergency operation.

| 512 | FC TRIP motor therm | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter- Compressor Motor Overtemperature. | | | | | |
| **Criteria** | Overtemperature in compressor motor. | | | | | |
| **Cause** | Indication of defective compressor or lack of oil. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | *This alarm is not used at the moment.* | | | | | |

| 513 | FC TRIP overload | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Inverter Overload Fault Alarm. | | | | | |
| **Criteria** | Frequency converter overloaded. | | | | | |
| **Cause** | Indication of problems with compressor. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops | | | | | |
| **Elimination** | The FC will be restarted after 10 min. Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |

**Trouble shooting**

Possible causes:

- The FC can not deliver enough power to the compressor.
- Insufficient cooling for the FC.
- Defect FC.

Accompanied alarms:

- AL 522 or AL 525 may also be active and should be checked first.

Trouble shooting:

At very high ambient temperatures and very low setpoint temperatures, the FC may get to hot to generate enough power. It can therefore be cooled by the refrigerant in the compressor.

1) Check that all bolts fixing the FC to the compressor are properlys fastened and nothing is jammed between the FC and the compressor.

2) The power cable for the compressor motor (Mcpr) may have been mounted incorrectly and therefore there is not good enough cooling contact between the FC and the compressor.
   Check the motor cable and replace it if it is defect. Fasten bolts properly for better cooling.

3) The compressor is wearing down and drawing increasingly power from the FC. Check other alarms if there have been more alarms from the FC.
   a. If the ambient temperature is not high, the compressor must be replaced.
   b. If the ambient temperature is high, the compressor and FC should be ok but close to operating limit. Monitor unit and see if problem continues.

4) The FC is defective and must be replaced.

If there is no FC replacement available, the unit can be rewired for emergency operation.

| 514 | FC TRIP under volt | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Undervoltage Fault Alarm. | | | | | |
| **Criteria** | Supply voltage to frequency converter too low. | | | | | |
| **Cause** | Indication of problems with supply voltage. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• The FC is supplied with too low voltage for contiuous operation.<br>• Defect FC.<br><br>Accompanied alarms:<br>• AL 417, 418 or 419 may be active.<br><br>Trouble shooting:<br>1) Supply unit with correct power voltage according to specification.<br><br>2) If voltage is within specification and not unstable, the FC may be defective and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 515 | FC TRIP over volt | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Overvoltage Fault Alarm. | | | | | |
| **Criteria** | Supply voltage of frequency converter too high. | | | | | |
| **Cause** | Indication of problems with supply voltage. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |

**Trouble shooting**

Possible causes:

- The FC is supplied with too high voltage for contiuous operation.
- Defect FC.

Accompanied alarms:

- AL 414, 415, 416 or 521 may be active.

Trouble shooting:

1) Supply unit with correct power voltage according to specification. The FC will be destroyed at too high voltages and is therefore being shut down.

2) If voltage is within specification and not unstable, the FC may be defective and must be replaced.

If there is no FC replacement available, the unit can be rewired for emergency operation.

| 516 | FC TRIP phase loss | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Phase Loss Fault Alarm. | | | | | |
| **Criteria** | Frequency converter cannot maintain DC filter voltage. | | | | | |
| **Cause** | Indication of defective frequency converter or lack of phase. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• One or more phases are not applied to the FC.<br>• Defect FC.<br><br>Accompanied alarms:<br>• AL 417, 418, 419, 523 may be active.<br><br>Trouble shooting:<br>1) Verify that there is correct voltages for all 3 phases to the FC.<br><br>2) Supply unit with correct power voltage according to specification.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 517 | FC TRIP over temp | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Overtemperature Fault Alarm. | | | | | |
| **Criteria** | Frequency converter temperature exceeds +90 °C. | | | | | |
| **Cause** | Indication of problems with compressor or frequency converter. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops and restarts when FC is cooled down. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• FC operates at operating limits.<br>• Insufficient cooling for the FC.<br>• Defect FC.<br><br>Accompanied alarms:<br>• AL 522.<br><br>Trouble shooting:<br>1) The FC is getting to hot. Verify that supply voltage is not too high.<br><br>2) Check that the frequency converter is mounted and tightened correctly to the compressor motor cover. If the frequency converter is mounted correctly it should not be possible to insert an air gap gauge between frequency converter and compressor motor cover.<br><br>3) Motor cable between FC and compressor may be jammed between FC and compressor. Cooling of FC is unsufficient. If this alarm comes more than once: Unmount FC and check motor cable before the FC is mounted again. Fasten bolts properly for better cooling.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 518 | FC TRIP inrush | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Inrush Fault Alarm. | | | | | |
| **Criteria** | May occur if frequency converter is activated too many times during a one minute period (the primary side). | | | | | |
| **Cause** | Indication of problems with supply voltage. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops and restarts after some min. | | | | | |
| **Elimination** | Alarm will be marked as inactive in the alarm list when reset by the frequency converter. The alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |

**Trouble shooting**

<u>Possible causes:</u>

- The FC has had too many restarts within short time.
- Loose power connection for the FC.
- Loose FC-com cable for communication with the FC.
- Defect FC.

<u>Accompanied alarms:</u>

- There may be other AL 5XX alarms.

<u>Trouble shooting:</u>

1) Verify that supply power for the unit is stable and within specification.

2) Check the FC-com cable for damages and fix a loose connection.

3) Check supply power cables for the FC and fix if loose.

4) The FC may be defect and should be replaced.

If there is no FC replacement available, the unit can be rewired for emergency operation.

| 519 | FC TRIP internal | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Internal Error Fault Alarm. | | | | | |
| **Criteria** | Internal error in frequency converter. | | | | | |
| **Cause** | Indication of problems with frequency converter. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm reset requires that supply voltage is disconnected from frequency converter. Alarm will be marked as inactive in alarm list when reset by frequency converter. The alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• Defect FC.<br><br>Accompanied alarms:<br>• There may be other AL 5XX alarms.<br><br>Trouble shooting:<br>1) The FC reports an internal failure.<br>See if there should be other FC alarms (AL 5XX) and if they can be removed first.<br><br>2) Turn the unit off for 10 min. and then start it again.<br>If this alarm becomes active again, the FC has a permanent internal fault and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 521 | FC high volt | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter High Voltage Fault Warning. | | | | | |
| **Criteria** | Supply voltage of frequency converter has exceeded warning limit. | | | | | |
| **Cause** | Indication of problems with supply voltage. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | If not solved, this problem can cause frequency converter to stop due to alarm 515. | | | | | |
| **Elimination** | Warning will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |

**Trouble shooting**

Possible causes:

- The unit is supplied with voltage above specification.
- Defect FC.

Accompanied alarms:

- AL 515.

Trouble shooting:

1) Measure if the power voltage to the unit is within specification.
   Apply correct voltage if the voltage is too high.

2) Turn the unit off for 10 min. and then start it again.
   If this alarm becomes active again, the FC has a internal fault and must be replaced.

If there is no FC replacement available, the unit can be rewired for emergency operation.

| 522 | FC high temp | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Overtemperature Fault Warning. | | | | | |
| **Criteria** | Frequency converter temperature has exceeded warning limit +78°C. | | | | | |
| **Cause** | Indication of problems with compressor or frequency converter. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | If not solved, this problem can cause frequency converter to stop due to alarm 517. | | | | | |
| **Elimination** | Warning will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |

**Trouble shooting**

Possible causes:

- FC operates at operating limits.
- Insufficient cooling for the FC.
- Defect FC.

Accompanied alarms:

- AL 522.

Trouble shooting:

1) The FC is getting to hot. Verify that supply voltage is not too high.

2) Check that the frequency converter is mounted and tightened correctly to the compressor motor cover. If the frequency converter is mounted correctly it should not be possible to insert an air gap gauge between frequency converter and compressor motor cover.

3) Motor cable between FC and compressor may be jammed between FC and compressor. Cooling of FC is unsufficient. If this alarm comes more than once: Unmount FC and check motor cable before the FC is mounted again. Fasten bolts properly for better cooling.

If there is no FC replacement available, the unit can be rewired for emergency operation.

| 523 | FC phase loss | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Phase Loss Fault Warning. | | | | | |
| **Criteria** | Frequency converter cannot maintain DC filter voltage above warning limit 440 VDC. | | | | | |
| **Cause** | Indication of defective frequency converter or lack of phase. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | If not solved, this problem can cause frequency converter to stop due to alarm 516. | | | | | |
| **Elimination** | Warning will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• One or more phases are not applied to the FC.<br>• Defect FC.<br><br>Accompanied alarms:<br>• AL 417, 418, 419, 516 may be active.<br><br>Trouble shooting:<br>1) Verify that there is correct voltages for all 3 phases to the FC.<br><br>2) Supply unit with correct power voltage according to specification.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 524 | FC current limit | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Current Limit Fault Warning. | | | | | |
| **Criteria** | Frequency converter current has exceeded warning limit of 160% of motor rating current. | | | | | |
| **Cause** | Indication of problems with compressor. Error may be seen during pull-down. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | If not solved, this problem can cause frequency converter to stop due to alarm 511. | | | | | |
| **Elimination** | Warning will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |

**Trouble shooting**

Possible causes:

- The compressor motor draws too much current.
- Defect FC.

Accompanied alarms:

- One or more AL 5XX may also be active. Check these alarm also before replacing anything.

Trouble shooting:

1) The compressor motor draws too much current from the FC. The motor may be jammed or defect.
2) Turn off unit and wait 10 min. before turning the unit on again.
3) When the unit starts up again, verify that the compressor starts again and is running.
4) If the compressor can not run or runs very short time before this alarm comes again, the compressor is defective and must be replaced.
5) If the compressor can run several min. without alarm, the FC may be defective and must be replaced if the alarm comes again.
   If there is no FC replacement available, the unit can be rewired for emergency operation.

| 525 | FC overload | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Inverter Overload Fault Warning. | | | | | |
| **Criteria** | Frequency converter load has exceeded warning limit of 160% of motor rating current. | | | | | |
| **Cause** | Indication of problems with compressor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | If not solved, this problem can cause frequency converter to stop due to alarm 513. | | | | | |
| **Elimination** | Warning will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |

**Trouble shooting**

Possible causes:

- The FC can not deliver enough power to the compressor.
- Insufficient cooling for the FC.
- Defect FC.

Accompanied alarms:

- AL 522 or AL 525 may also be active and should be checked first.

Trouble shooting:

At very high ambient temperatures and very low setpoint temperatures, the FC may get to hot to generate enough power. It can therefore be cooled by the refrigerant in the compressor.

1) Check that all bolts fixing the FC to the compressor are fastened and nothing is jammed between the FC and the compressor.

2) The power cable for the compressor motor (Mcpr) may have been mounted incorrectly and therefore there is not good enough cooling contact between the FC and the compressor.
   Check the motor cable and replace it if it is defect. Fasten bolts properly for better cooling.

3) The compressor is wearing down and drawing increasingly power from the FC. Check other alarms if there have been more alarms from the FC.
   a. If the ambient temperature is not high, the compressor must be replaced.
   b. If the ambient temperature is high, the compressor and FC should be ok but close to operating limit. Monitor unit and see if problem continues.

4) The FC is defective and must be replaced.

If there is no FC replacement available, the unit can be rewired for emergency operation.

| 529 | FC setup error | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Setup Fault Warning. | | | | | |
| **Criteria** | Frequency Converter error reports its setup data. | | | | | |
| **Cause** | The setup of the FC is rejected by the FC. Either communication problems or phase fault. | | | | | |
| **Action** | Frequency converter shut-down. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | The compressor will not start | | | | | |
| **Elimination** | Warning will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• Defect FC.<br><br>Accompanied alarms:<br>• There may be other AL 5XX alarms.<br><br>Trouble shooting:<br>1) The FC reports a failure in its factory setup data.<br>See if there should be other FC alarms (AL 5XX) and if they can be removed first.<br><br>2) Turn the unit off for 10 min. and then start it again.<br>If this alarm becomes active again, the FC has a permanent internal fault and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 566 | FC undefined alarm | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Undefined Alarm. | | | | | |
| **Criteria** | Undefined alarm has occurred. | | | | | |
| **Cause** | Common fatal alarm. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• Defect FC.<br><br>Accompanied alarms:<br>• There may be other AL 5XX alarms.<br><br>Trouble shooting:<br>1) The FC reports an undefined alarm.<br>See if there should be other FC alarms (AL 5XX) and if they can be removed first.<br><br>2) Turn the unit off for 10 min. and then start it again.<br>If this alarm becomes active again, the FC has a permanent internal fault and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 567 | FC unknown code | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Frequency Converter Unknown Code Alarm. | | | | | |
| **Criteria** | Undefined warning has occurred. | | | | | |
| **Cause** | Undefined warning has occurred. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• Defect FC.<br><br>Accompanied alarms:<br>• There may be other AL 5XX alarms.<br><br>Trouble shooting:<br>1) The FC reports an unknown alarm/warning. See if there should be other FC alarms (AL 5XX) and if they can be removed first.<br><br>2) Turn the unit off for 10 min. and then start it again. If this alarm becomes active again, the FC has a permanent internal fault and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

| 599 | FC Trip Lock | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | The frequency converter has tripped and stopped. | | | | | |
| **Criteria** | The frequency converter has stopped due to an error and must be reset. | | | | | |
| **Cause** | Alarm indicate problem with compressor or frequency controller. | | | | | |
| **Action** | FC is being reset. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | There is no cooling until the FC is ready again. The FC may need to cool down before restarting. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when reset by frequency converter. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Freq FC | I FC | Psuc | Pdis | |
| **Trouble shooting** | Possible causes:<br>• Other alarms have tripped (stopped) the FC.<br>• Defect FC.<br><br>Accompanied alarms:<br>• There may be other alarms, especially AL 5XX alarms.<br><br>Trouble shooting:<br>1) The FC has tripped due to another AL 5XX alarm and then stopped. See if there should be other FC alarms (AL 5XX) and if they can be removed first.<br><br>2) Turn the unit off for 10 min. and then start it again. If this alarm becomes active again, the FC may have an internal fault and must be replaced.<br><br>If there is no FC replacement available, the unit can be rewired for emergency operation. | | | | | |

## 17.6. Operation Alarms

| 600 | No control sensors | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | Supply Air Sensor 1, Supply Air Sensor 2, Return Air Sensor All Malfunctioning. | | | | | |
| **Criteria** | No valid control sensor values. | | | | | |
| **Cause** | Alarm indicates that all control-relevant sensors are defective or unreliable. | | | | | |
| **Action** | Control not possible. | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | Unit stops. | | | | | |
| **Elimination** | When one of the control sensor values enters into the valid area, it is again possible to control container temperature. For reliability reasons at least one of the control sensor values must be valid for 30 sec. before sensor may be used as control reference again. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Supply Air Sensor 1, Supply Air Sensor 2, Return Air Sensor are all malfunctioning.<br>• Controller PCB defective.<br><br>Accompanied alarms:<br>• AL 100 to AL 108.<br><br>Trouble shooting:<br>1) Verify all other sensor alarms AL 100 to A3XX and try to remove these alarms.<br><br>2) If this alarm remains active, replace controller PCB. | | | | | |

| 601 | No watercooling | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Water-cooling fault. | | | | | |
| **Criteria** | Compressor discharge temperature exceeds limit for water-cooling. | | | | | |
| **Cause** | Lack of water-cooling. | | | | | |
| **Action** | Water-cooling is deactivated. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list next time water-cooling is activated. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Tc | Wc off | | | |
| **Trouble shooting** | Possible causes:<br>• Water cooling selected and no water cooling active.<br>• Insufficient water cooling capacity.<br><br>Accompanied alarms:<br>• AL 100 to AL 108.<br><br>Trouble shooting:<br>1) Verify that water cooling pipes are applied and water is running when water cooling is selected.<br><br>2) Verify that the water is not to hot and not able to be used for cooling the unit. | | | | | |

| 602 | Tset unreachable | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Tset Unreachable. | | | | | |
| **Criteria** | Tset unreachable within time limit. | | | | | |
| **Cause** | Indication of insufficient yield. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | If error is detected during PTI-test, PTI-test will fail. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when Tset is reached. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

Possible causes:

- Container doors are open.
- Other alarms active.
- Cargo too hot to be cooled down within limit.
- Not enough refrigerant for the compressor.
- Defect or jammed evaporator motors.
- Defect or jammed condenser motor.

Accompanied alarms:

- Other alarms may be active.

Trouble shooting:

The unit will continue the cooling but the next steps could be checked anyway.

1) Close container doors.

2) Check and clear other alarms first.

3) Check if there is enough refrigerant in the unit.

4) Check if the condenser is filled with dirt and blocking air circulation.

5) Check if evaporator motors can rotate. Watch fingers – turn unit off first!

6) Check if condenser motor can rotate. Watch fingers – turn unit off first!

| 603 | In range fault | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | In-range Fault. | | | | | |
| **Criteria** | Temperature no longer in-range. | | | | | |
| **Cause** | Indication of insufficient yield or defective controller. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | If error is detected during PTI-test, PTI-test will fail. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when in-range is reached and alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Tset | Tact | | | |

**Trouble shooting**

Possible causes:

- Container doors are open.
- Other alarms active.
- Not enough refrigerant for the compressor.
- Defect or jammed evaporator motors.
- Defect or jammed condenser motor.

Accompanied alarms:

- Other alarms may be active.

Trouble shooting:

The unit will continue the cooling but the next steps could be checked anyway.

1) Close container doors.

2) Check and clear other alarms first.

3) Check if there is enough refrigerant in the unit.

4) Check if the condenser is filled with dirt and blocking air circulation.

5) Check if evaporator motors can rotate. Watch fingers – turn unit off first!

6) Check if condenser motor can rotate. Watch fingers – turn unit off first!

| 604 | High press trouble | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | High Pressure Safety Switch is active. | | | | | |
| **Criteria** | Pressure is above safety limit | | | | | |
| **Cause** | Hotgas valve, ekspansion valve and economizer valves are all closed and compressor is running. | | | | | |
| **Action** | Control not possible. | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | Unit stops | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when alarm disappears after 30 min restart delay and alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Repeated high pressure alarms.<br><br>Accompanied alarms:<br>• Alarm AL 306.<br><br>Trouble shooting:<br>1) See and clear error for alarm AL 306. | | | | | |

| 607 | AirEx open freeze | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | Air exchange valve open in the frozen mode. | | | | | |
| **Criteria** | Air exchange is open while unit is in the frozen mode. | | | | | |
| **Cause** | Indication of user having left air exchange open. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | Deteriorated control precision in the frozen mode. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when air exchange is closed and may then be deleted. | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- AirExchange valve open in freeze mode.
- Cable or airexchange sensor defect.

Accompanied alarms:

- Alarm AL 305.

Trouble shooting:

1) See and clear error for alarm AL 305.

2) Close air exchange.
   If air exchange is closed, cable for air exchange sensor or sensor is defect see AL 305 for trouble shooting.

| 610 | Defrost time exceed | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Max. defrost time exceeded. | | | | | |
| **Criteria** | Defrost time has exceeded 45 min. | | | | | |
| **Cause** | | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | All the ice may not have been melted with a deteriorated yield. | | | | | |
| **Elimination** | Alarm will be marked as inactive when a new defrosting is terminated on temperature and may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Max defrost time | | | | |
| **Trouble shooting** | Possible causes:<br>• There has been too much ice in the evaporator.<br>• The heaters are not working/defect.<br>• Defect Pdis pressure sensor.<br>• Defect Tevap evaporator temperature sensor.<br><br>Accompanied alarms:<br>• Maybe alarm AL 203 is active.<br><br>Trouble shooting:<br>1) Check and clear other alarms first.<br>Condenser temperature is used and is calculated from Pdis.<br><br>2) Start a manual defrost time to remove remaining ice now.<br>See if there is being used current for the heaters on the information menu - Current phase 1, 2 and 3 should be above 6 A when the heater symbol, Σ, is shown on the display.<br>If current is lower, check if there is power for the heaters.<br><br>3) Run a PTI test **after** the cargo is unloaded. | | | | | |

| 611 | Too many sensor err | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Too many (controlling) sensors have errors. | | | | | |
| **Criteria** | Can't substitute faulty sensors with other sensors measurements. | | | | | |
| **Cause** | If too many (controlling) sensors have error, the controller can't maintain correct temperature. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Deteriorated control precision in the frozen mode. | | | | | |
| **Elimination** | When a sensors value becomes valid, it is marked as inactive in alarm list and may then be deleted. Values must be valid for 120 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• One or more temperature sensors are defect.<br>• One or more pressure sensors are defect.<br><br>Accompanied alarms:<br>• Alarms AL 1XX or AL2XX are active.<br><br>Trouble shooting:<br>This alarm is only raised when one or more controlling sensors have failure and there are no sensors to substitute with.<br><br>1) Se alarm list for the specific sensors. | | | | | |

| 612 | FC trouble | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | There have been several FC alarms within short time. | | | | | |
| **Criteria** | There have been several FC errors within the last 30 min or a constant FC error. | | | | | |
| **Cause** | The FC reports unstable operation within 30 min or a permanent FC error within the last 15 min. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Restart time for the FC is extended to 15 min. | | | | | |
| **Elimination** | When the FC has been without errors for more than 1 hours, this alarm is marked inactive and can be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Repeated FC errors.<br><br>Accompanied alarms:<br>• Alarms AL 5XX are/have been active.<br><br>Trouble shooting:<br>1) Check and clear other FC alarms first – AL 5XX.<br>Then this alarm should disappear. Turn unit off and turn it on again to make a quicker start up after alarms have been removed.<br><br>If this alarms continues, the FC must be replaced and the unit can meanwhile run in emergency mode. | | | | | |

| 613 | Motor trouble | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Motor 1 or 2 Overheated several times or permanently within short time. | | | | | |
| **Criteria** | There have been several overheating or a permanent overheating signal from evaporator motor 1 or 2 within 30 min. | | | | | |
| **Cause** | One or both evaporater motors are overheating either permanently or repeatedly generated overheat alarm within the last 30 min. | | | | | |
| **Action** | Restart delay increased to 10-12 min. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | There is no or limited air circulation in the container. | | | | | |
| **Elimination** | When the evaporator motors have been without errors for more than 1 hours, this alarm is marked inactive and can be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Repeated evaporator motor trouble.<br><br>Accompanied alarms:<br>• Alarms AL 400 or AL 401 are/have been active.<br><br>Trouble shooting:<br>1) Check and clear AL 400 or AL 401 first.<br><br>2) Start a manual defrost to remove the ice there may be in the motor(s). | | | | | |

| 614 | Humidity deactivate | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Humidity control deactivated. | | | | | |
| **Criteria** | Value below alarm limit 5% or above 110%. Value invalid for 120 sec. for alarm activation. | | | | | |
| **Cause** | Indication of defective relative humidity sensor or its measuring circuitry. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Dehumidification impossible. | | | | | |
| **Elimination** | When sensor value becomes valid, it is marked as inactive in alarm list and may then be deleted. Value must be valid for 120 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Defect humidity sensor.<br><br>Accompanied alarms:<br>• Alarms AL 302 are/have been active.<br><br>Trouble shooting:<br>1) Check and clear AL 400 or AL 401 first. | | | | | |

| 620 | Cpr start failed | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | *Not implemented yet.* | | | | | |
| **Criteria** | | | | | | |
| **Cause** | | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | No cooling of the cargo. | | | | | |
| **Elimination** | | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | | | | | | |

| 621 | Cpr restarted | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | The Compressor Has Been Restarted. | | | | | |
| **Criteria** | The compressor did not start on the first attempt within 3 min. | | | | | |
| **Cause** | Not enough pressure in Peco and/or no signal from FC that motor is running. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | There will be a longer start delay. | | | | | |
| **Elimination** | When the compressor has started, the alarm is marked inactive and can be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

Possible causes:

- Too high discharge pressure at start up, unit will restart after a delay.
- Unit in emergency mode, but cables not rewired for emergency mode.
- Compressor defect.

Accompanied alarms:

- There may be other alarms, ex. AL 306.

Trouble shooting:

1) Check and clear AL306 first (high pressure alarm).

2) The discharge pressure is too high at start up, unit will restart after a delay.

3) Check and clear AL5XX (FC) alarms first.

4) Check wiring for the compressor motor, especially if unit is in emergency mode.

5) If this alarm remain active after several restarts, the compressor is defect and should be replaced.

| 630 | Manual phase dir | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Manually Selected Phase Direction. | | | | | |
| **Criteria** | User has manually selected phase direction. | | | | | |
| **Cause** | | | | | | |
| **Action** | Use the selected phase direction. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | User controls the rotation direction of the motors. | | | | | |
| **Elimination** | When switched to automatic, the alarm is marked as inactive and can be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | Manual phase dir. CW/CCW | Measured net direction. | | |

**Trouble shooting**

Possible causes:

- The user has seleced a manual phase direction.

Accompanied alarms:

- AL 423 should have been active before manual phase direction has been used.

Trouble shooting:

1) The quality of the power frequency is so poor that the user must decide phase direction.
   Apply valid power supply to the unit.
   Ensure condenser fan is running the right direction if no better power supply is available.

2) There is a failure in the power wiring for the unit.
   Check that there is 3 valid phases for the unit.

3) There is a fault in the phase direction detection circuit.
   Turn unit off and on again and see if the phase can be detected now.
   If phases still can't be detected replace the power meas PCB.

4) The controller pcb is defect.
   Replace controller door.

| 631 | Fuse blown | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Blown Fuse In The Controller. | | | | | |
| **Criteria** | Supply voltages U1, U2, U3 are ok. Power consumption too high! The average current of the 2 highest currents is more than the double of the lowest current of I1, I2 or I3. Not checked during defrost and the evaporator motors must run. | | | | | |
| **Cause** | Indication of blown fuse in the controller. | | | | | |
| **Action** | FC will soon trip with error 516 and stop compressor. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | Deteriorated control precision and capacity. | | | | | |
| **Elimination** | When currents are normal, it is marked as inactive in alarm list and may then be deleted. Value must be valid for 30 sec. to set alarm inactive. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

Possible causes:

- Fuse blown.
- Unit has used too much power.
- There is a short-circuit in the power used in the unit.

Accompanied alarms:

- There may be other alarms.

Trouble shooting:

1) Check the 3 fuses in the control cabinet.
   Replace a defect fuse **but only one time**! If it blows again, there is a short circuit!

2) Remove short circuits in the power supply or cables before applying power again.

## 17.7. Alarms Not Used

Alarms AL 7XX are not used.

## 17.8. Test Alarms

| 800 | Func test failed | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Function Test Fault. | | | | | |
| **Criteria** | One or more of the individual test steps have failed. | | | | | |
| **Cause** | | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| Log data | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | ID | | Test time [sec] | Alarms |

**Trouble shooting**

Possible causes:

- One or more of the individual test steps have failed.

Accompanied alarms:

- AL 8XX.

Trouble shooting:

1) See individual AL 8XX alarms for cause.

| 801 | Controller | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | One or more of the internal reference voltages are out of limits. | | | | | |
| **Cause** | | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Step no. | | | | |

**Trouble shooting**

Possible causes:

- Power supply for controller PCB defect.
- Controller PCB defect.

Accompanied alarms:

- There may be other alarms with open or short.

Trouble shooting:

1) Clear other active alarms with sensors.

2) The power supply or power-cable for controller pcb defect.
   Measure voltage for the controller PCB.
   a. If voltage is ok, the controller PCB is defect and controler door must be replaced.
   b. If voltage is not ok, remove power to controller pcb and measure voltage to the controller pcb at trafo T1 and at connector for controller pcb.
   If the voltage at T1 is ok, the trafo T1 is ok.
   If the voltage at the controller pcb is ok, the power cable to the controller is ok and the controller pcb is defect. Replace the controller door.

| 805 | Idle current | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Unit Idle Overcurrent Fault. | | | | | |
| **Criteria** | Idle current exceeds limit of 0.3A with only controller running. | | | | | |
| **Cause** | | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |
| **Trouble shooting** | Possible causes:<br>• There is a short-circuit in the controller pcb.<br>• The power measument pcb is defect.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Check cables for sensors for damages.<br><br>2) The controller pcb is defect.<br>Replace the controller door. | | | | | |

| 810 | Mevap cur LO speed | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Motor Low Speed Current Fault. | | | | | |
| **Criteria** | Evaporator fan motors have exceeded current limit at low speed. | | | | | |
| **Cause** | Indication of defective motor or defective supply cables to motor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |

**Trouble shooting**

Possible causes:

- Evaporator motor jammed or defect.
- Evaporator motor cables defect.
- Evaporator motor cables wired wrong in controller cabinet.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Check the evaporator motor fans can rotate freely. **Turn of power first!** Replace motor or make it turn freely again.

2) Check evaporator motor cables for damages.

3) Check that the evaporator motor cables are mounted correct.

| 811 | Mevap cur HI speed | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Motor High Speed Current Fault. | | | | | |
| **Criteria** | Evaporator fan motors have exceeded current limit at high speed. | | | | | |
| **Cause** | Indication of defective motor or defective supply cables to motor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |

**Trouble shooting**

Possible causes:

- Evaporator motor jammed or defect.
- Evaporator motor cables defect.
- Evaporator motor cables wired wrong in controller cabinet.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Check the evaporator motor fans can rotate freely. **Turn of power first!** Replace motor(s) or make it turn freely again.

2) Check evaporator motor cables for damages.

3) Check that the evaporator motor cables are mounted correct.

| 812 | Mevap current OFF | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Motor Off Current Fault. | | | | | |
| **Criteria** | Evaporator fan motors have exceeded off current limit. | | | | | |
| **Cause** | Indication of defective motor relay or relay driver circuitry. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |
| **Trouble shooting** | Possible causes:<br>• Defect evaporator motor relay.<br>• Defect relay driver circuit.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Check the evaporator motor relay for defects. Replace the relay.<br><br>2) Check that the evaporator motor cables are mounted correct. | | | | | |

| 813 | Mevap direction | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | *Not implemented yet.* | | | | | |
| **Criteria** | | | | | | |
| **Cause** | | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | | | | | | |

| 815 | Mcond cur LO speed | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Condenser Motor Low Speed Current Fault. | | | | | |
| **Criteria** | Condenser fan motors have exceeded current limit at low speed. | | | | | |
| **Cause** | Indication of defective motor or defective supply cables to motor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |
| **Trouble shooting** | Possible causes:<br>• Condenser motor jammed or defect.<br>• Condenser motor cables defect.<br>• Condenser motor cables wired wrong in controller cabinet.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Check the Condenser motor fans can rotate freely. **Turn of power first!** Replace motor or make it turn freely again.<br><br>2) Check motor cables for damages.<br><br>3) Check that the condenser motor cables are mounted correct. | | | | | |

| 816 | Mcond cur HI speed | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Condenser Motor High Speed Current Fault. | | | | | |
| **Criteria** | Condenser fan motors have exceeded current limit at high speed. | | | | | |
| **Cause** | Indication of defective motor or defective supply cables to motor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |

**Trouble shooting**

Possible causes:

- Condenser motor jammed or defect.
- Condenser motor cables defect.
- Condenser motor cables wired wrong in controller cabinet.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Check the Condenser motor fans can rotate freely. **Turn of power first!** Replace motor or make it turn freely again.

2) Check motor cables for damages.

3) Check that the condenser motor cables are mounted correct.

| 817 | Mcond current OFF | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Condenser Motor Off Current Fault. | | | | | |
| **Criteria** | Condenser fan motors have exceeded off current limit. | | | | | |
| **Cause** | Indication of defective motor relay or defective relay driver circuitry. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |
| **Trouble shooting** | Possible causes:<br>• Defect condenser motor relay.<br>• Defect relay driver circuit.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Check the condenser motor relay for defects.<br>Replace the relay.<br><br>2) Check that the condenser motor cables are mounted correct. | | | | | |

| 820 | Hevap current ON | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Heater On Current Fault. | | | | | |
| **Criteria** | Evaporator heater has exceeded on current limit. | | | | | |
| **Cause** | Indication of defective heater or defective supply cables to heater. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |

**Trouble shooting**

Possible causes:

- Heaters defect.
- Heater power cables defect.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Check the power cables for the heaters for defects.
   Replace cables if they are defect.

2) The heater(s) are defect.
   Unmount the power for the heaters one by one to find the defect heater, see wiring schematics inside in the controller cabinet.
   Replace the defect heater.

| 821 | Hevap current OFF | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Evaporator Heater Off Current Fault. | | | | | |
| **Criteria** | Evaporator heater has exceeded off current limit. | | | | | |
| **Cause** | Indication of defective heater relay or defective relay driver circuitry. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | INom | I1 | I2 | I3 | |
| **Trouble shooting** | Possible causes:<br>• Defect heater relay.<br>• Defect relay driver circuit.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Check the heater relay for defects.<br>Replace the relay.<br><br>2) Check that the heater power cables are mounted correct. | | | | | |

| 840 | Valve leaks | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Valve Leak Fault. | | | | | |
| **Criteria** | Temperature indicates cooling. | | | | | |
| **Cause** | Indication of leakage of one or more of the valves or problems with the compressor. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | T0 | T0 old | T0eco | T0eco old | |
| **Trouble shooting** | Possible causes:<br>• One or more valves have leaks (defect)<br><br>Accompanied alarms:<br>• See other AL 84X alarms for valve failures.<br><br>Trouble shooting:<br>1) Check and clear other valve alarms, AL 84X. | | | | | |

| 842 | Expansion valve | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Expansion Valve Fault. | | | | | |
| **Criteria** | Teco not changed at least 77F (25°C) when opening expansion valve a certain time. | | | | | |
| **Cause** | Indication of non-operating electronic expansion valve. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | T0 | T0 diff. | T0eco diff. | Pdis diff. | |

**Trouble shooting**

Possible causes:

- Cable for expansion valve mounted on wrong valve.
- Cable for expansion valve defect.
- Expansion valve defect.
- Driver circuit for expansion valve defect.

Accompanied alarms:

- N/A.

Trouble shooting:

1) If there are more than one valve failure, the cables for the valves are presumably switched.
   Mount cables for valves on the correct valve.

2) Listen if the expansion valve is opening and closing.
   If the valve is opening and closing, the valve is not working properlys and should be replaced.

3) Check that the cable for the expansion valve is not defect.
   Replace cable if it is damaged.

4) Unmount the cable for valve and measure that there is voltage on the output for the expansion valve when it should open.
   a. If there is no voltage, the controller pcb is defect. Replace the controller door.
   b. If there is voltage, the valve is operating but is not working properly and must be replaced.

| 843 | Economizer valve | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Economizer Valve Fault. | | | | | |
| **Criteria** | Tsuc not changed at least 50F (10°C) when opening economizer valve a certain time. | | | | | |
| **Cause** | Indication of non-operating economizer valve. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | T0 | T0 diff. | T0eco diff. | Pdis diff. | |

**Trouble shooting**

Possible causes:

- Cable for economizer valve mounted on wrong valve.
- Cable for economizer valve defect.
- Economizer valve defect.
- Driver circuit for economizer valve defect.

Accompanied alarms:

- N/A.

Trouble shooting:

1) If there are more than one valve failure, the cables for the valves are presumably switched.
   Mount cables for valves on the correct valve.

2) Listen if the economizer valve is opening and closing.
   If the valve is opening and closing, the valve is not working properlys and should be replaced.

3) Check that the cable for the expansion valve is not defect.
   Replace cable if it is damaged.

4) Unmount the cable for valve and measure that there is voltage on the output for the expansion valve when it should open.
   a. If there is no voltage, the controller pcb is defect. Replace the controller door.
   b. If there is voltage, the valve is operating but is not working properly and must be replaced.

| 844 | Hotgas valve | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Hotgas Valve Fault. | | | | | |
| **Criteria** | Teco not changed at least 77F (25°C) when opening hotgas valve a certain time. | | | | | |
| **Cause** | Indication of non-operating hotgas valve. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | T0 | T0 diff. | T0eco diff. | Pdis diff. | |

**Trouble shooting**

Possible causes:

- Cable for hotgas valve mounted on wrong valve.
- Cable for hotgas valve defect.
- Hotgas valve defect.
- Driver circuit for hotgas valve defect.

Accompanied alarms:

- N/A.

Trouble shooting:

1) If there are more than one valve failure, the cables for the valves are presumably switched.
   Mount cables for valves on the correct valve.

2) Listen if the hotgas valve is opening and closing.
   If the valve is opening and closing, the valve is not working properlys and should be replaced.

3) Check that the cable for the hotgas valve is not defect.
   Replace cable if it is damaged.

4) Unmount the cable for valve and measure that there is voltage on the output for the hotgas valve when it should open.
   a. If there is no voltage, the controller pcb is defect. Replace the controller door.
   b. If there is voltage, the valve is operating but is not working properly and must be replaced.

| 845 | Cpr pump down | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Compressor pump down fault. | | | | | |
| **Criteria** | Economizer pressure, Peco, must be between 10% and 90% of the pressure difference<br>(Pdis – Psuc). | | | | | |
| **Cause** | Indication of insufficient performance in the compressor. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | T0 | Psuc | Peco | Pdis | |
| **Trouble shooting** | Possible causes:<br>• One or more valves defect.<br>• Sensor defect.<br>• Compressor needs repair.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Check and clear other alarms first.<br>If a valve or a (pressure) sensor is defect, detection of this alarm will not work.<br><br>2) The compressor needs repair and should be replaced before a long trip. | | | | | |

| 850 | PTI test failed | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | PTI Test Fault. | | | | | |
| **Criteria** | One or more of the individual PTI test steps have failed. | | | | | |
| **Cause** | Normal function will be affected. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | ID | | Test time [sec] | Alarm count |

| **Trouble shooting** | Possible causes:<br>• There is one or more alarms.<br><br>Accompanied alarms:<br>• AL 8XX and maybe other alarms.<br><br>Trouble shooting:<br>1) There are other AL8XX alarms.<br>Check and clear the other alarms first, then a new PTI test can be run. |
|---|---|

| 855 | PTI Tset 5 | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | PTI 5°C Set Fault. | | | | | |
| **Criteria** | Set-point +5 °C was not reached within the 3 hour time limit. | | | | | |
| **Cause** | Indication of insufficient performance. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Tset | Tact | Tevap | Tret | |

**Trouble shooting**

Possible causes:

- Doors are open.
- The heaters do not operate normally.
- The cooling capacity is too limited.
- There may not be enough cooling refrigerant in the unit.

Accompanied alarms:

- N/A.

Trouble shooting:

1) Verify that the doors are closed.

2) If start temperature was below +5 °C, the heaters may be defect.
   Start the heaters in manual mode and see if the current consumption is higher than 5 A per phase.

3) The unit may be needing cooling refrigerant. Check if the small red balls in the viewing glass in the receiver (water cooing unit) are not at the bottom when the unit is turned off.
   Refill with cooling refrigerant.

| 860 | PTI Tset 0 | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | PTI 0°C Set Fault. | | | | | |
| **Criteria** | Set-point 0 °C was not reached within the 3 hour time limit. | | | | | |
| **Cause** | Indication of insufficient performance. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Tset | Tact | Tevap | Tret | |
| **Trouble shooting** | Possible causes:<br>• Doors are open.<br>• The heaters do not operate normally.<br>• The cooling capacity is too limited.<br>• There may not be enough cooling refrigerant in the unit.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Verify that the doors are closed.<br><br>2) If start temperature was below 0 °C, the heaters may be defect.<br>Start the heaters in manual mode and see if the current consumption is higher than 5 A per phase.<br><br>3) The unit may be needing cooling refrigerant. Check if the small red balls in the viewing glass in the receiver (water cooing unit) are not at the bottom when the unit is turned off.<br>Refill with cooling refrigerant. | | | | | |

| 870 | PTI defrost | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | PTI Defrost Fault. | | | | | |
| **Criteria** | Defrost terminated on 45 min. time-out . | | | | | |
| **Cause** | | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | Tset | Tact | Tevap | Tret |

**Trouble shooting**

Possible causes:

- Defect Tevap temperature sensor.
- Defect Psuc pressure sensor.
- Defect heaters.
- Defect hotgas valve.
- Evaporator was filled with too much ice.

Accompanied alarms:

- N/A.

Trouble shooting:

1) The defrost is terminated when Tevap rises above +59F (+15°C).
   Check Tevap and Psuc sensors according to trouble shooting in alarms AL 123 and AL 207.

2) The heaters may be defect.
   Start the heaters in manual mode and see if the current consumption is higher than 5 A per phase else the heaters or the power cables for the heaters may be defect.

3) The hotgas valve is not working properly and the heaters may be defective.
   Check trouble shooting for the hotgas valve in alarm AL844.

4) See if the evaporator is filled with ice (through the inspection holes). **Be carefull with the fans of the evaporators!**

| 880 | PTI Tset -18 | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | PTI –18 °C Set Fault. | | | | | |
| **Criteria** | Set-point -18 °C was not reached within the 3 hour time limit. | | | | | |
| **Cause** | Indication of insufficient performance. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Test failed. | | | | | |
| **Elimination** | Alarm may then be deleted after test completed. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Tset | Tact | Tevap | Tret | |
| **Trouble shooting** | Possible causes:<br>• Doors are open.<br>• The cooling capacity is too limited.<br>• There may not be enough cooling refrigerant in the unit.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Verify that the doors are closed.<br><br>2) The unit may be needing cooling refrigerant. Check if the small red balls in the viewing glass in the receiver (water cooing unit) are not at the bottom when the unit is turned off.<br>Refill with cooling refrigerant. | | | | | |

## 17.9. Controller Alarms

| 900 | User stop | | | | | Fatal Alarm |
|---|---|---|---|---|---|---|
| **Description** | User stop was executed from PC-program. | | | | | |
| **Criteria** | User stop was executed from PC-program. | | | | | |
| **Cause** | | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Quick flash |
| **Consequence** | Unit stops | | | | | |
| **Elimination** | User stop may be deleted from alarm list by means of PC-program. Unit will then restart. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active | | | | | |

| 902 | Battery malfunction | | | | Alarm |
|---|---|---|---|---|---|
| **Description** | Battery Malfunctioning. | | | | |
| **Criteria** | Battery voltage is below limit for low battery alarm 6V. | | | | |
| **Cause** | Indication of defective battery. | | | | |
| **Action** | None. | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Logging in the battery mode not possible. When detected during test, test will fail. | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when voltage reoccurs on battery. Alarm may then be deleted. | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
| | Active/Inactive | Low limit | High limit | Current | |
| **Trouble shooting** | Possible causes:<br>• The battery used for logging is defect.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) The battery is defect.<br>Replace controller door. | | | | |

| 903 | Remote mon missing | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Remote Monitor Modem Missing. | | | | | |
| **Criteria** | Powerline monitor communication not possible. | | | | | |
| **Cause** | Indication of missing or defective modem. | | | | | |
| **Action** | None | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Container may drop out off remote monitor system. | | | | | |
| **Elimination** | Check / replace modem or connection. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |

**Trouble shooting**

Possible causes:

- The communication cable, RMM-com, defect or unplugged.
- Remote Monitor Modem, RMM, defect.
- Power not connected to the RMM.

Accompanied alarms:

- AL306, AL 500AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check that the RMM-com cable is intact and installed.

2) If alarm AL306 ‘High press switch’ or AL500 ‘FC missing’ are also active, the fuse F6 inside in the control cabinet is most likely blown. Replace the fuse.

3) If there is no light in the *Power* LED of the RMM:
   Check that power is applied to the RMM.
   If power is applied, the RMM is defect and must be replaced.

4) Check the status LEDs of the RMM. *Power* must be ON, *Error* must be off.
   Replace RMM if not ok.

| 904 | Datalog error | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | RCCU Data log Fault. | | | | | |
| **Criteria** | Controller data log corrupted. | | | | | |
| **Cause** | Circuit for storing the datalog is faulty. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Data logging unreliable. Temperature control is functioning. | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | 1 = R, W = 2 | | | |

**Trouble shooting**

Possible causes:

- Datalog in controller has become defect.

Accompanied alarms:

- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

The unit will continue its temperature control, but the logging of data is unreliable.

1) Controller PCB is defect.
   Replace controller door.

| 905 | Database corrupt | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | RCCU Database Faulty. | | | | | |
| **Criteria** | Controller database corrupted. | | | | | |
| **Cause** | Failed validation of EEPROM backup. | | | | | |
| **Action** | Default value preset. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | Parameters may have changed. | | | | | |
| **Elimination** | | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Controller pcb defect.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Controller PCB is defect.<br>Replace controller door. | | | | | |

| 907 | Realtime error | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Real-time Clock Unreliable. | | | | | |
| **Criteria** | No acknowledge from real time clock. | | | | | |
| **Cause** | Real-time clock battery defect. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Invalid date/time setting in datalog. | | | | | |
| **Elimination** | Check / replace real-time clock battery. Set time. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Real-time clock battery defect.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Real-time clock battery defect.<br>Replace controller door. | | | | | |

| 908 | Realtime invalid | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Real-time Clock Unavailable. | | | | | |
| **Criteria** | Invalid reply from real time clock. | | | | | |
| **Cause** | Real-time clock battery defect. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | Invalid date/time setting in datalog. | | | | | |
| **Elimination** | Check / replace real-time clock battery. Set time. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Real-time clock battery defect.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Real-time clock battery defect.<br>Replace controller door. | | | | | |

| 909 | Display error | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Display Unavailable. | | | | | |
| **Criteria** | Display communication not possible. | | | | | |
| **Cause** | Indication of defective display or defective display driver circuitry. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | Cannot show data for user (use PC-program or RMM). Every 30 sec. retry to reinitiate the display is made. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list if the error disappears. Alarm may then be deleted. | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect cable from controller pcb to display.
- Defect display.
- Defect controller pcb

Accompanied alarms:

- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

The unit will continue temperature control, but settings and operation is not visible on the display.

1) Turn unit off, wait 2 min. and turn it on again.
   If the problem is still there, replace the controller door.

| 910 | Main power failure | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Mains Power Fault. | | | | | |
| **Criteria** | Supply voltage below warning limit. | | | | | |
| **Cause** | Indication of insufficient supply voltage. | | | | | |
| **Action** | Controller tries safe close-down. If power reappears, system restarts and triggers this alarm. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list if error disappears. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Unstable or insufficient power supply.<br><br>Accompanied alarms:<br>• N/A.<br><br>Trouble shooting:<br>1) Supply unit with power according to specification. | | | | | |

| 911 | Battery voltage LO | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Low Battery Voltage. | | | | | |
| **Criteria** | Battery voltage below warning limit for low battery voltage 7V. | | | | | |
| **Cause** | Indication of defective battery. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | If main power is removed, data logging may not be possible. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when battery voltage reoccurs. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Actual | | |
| **Trouble shooting** | Possible causes:<br>• Battery to old, defective or used.<br>• Battery cables defective.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Check that connectors/cables for the battery are not damaged. Else replace the battery. | | | | | |

| 912 | Battery voltage HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | High Battery Voltage. | | | | | |
| **Criteria** | Battery voltage above warning limit for high battery voltage 10V. | | | | | |
| **Cause** | | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | If main power is removed, data logging may not be possible. | | | | | |
| **Elimination** | Alarm will be marked as inactive in alarm list when battery voltage is inrage again. Alarm may then be deleted. | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | Low limit | High limit | Actual | | |
| **Trouble shooting** | Possible causes:<br>• Battery defect.<br>• Battery cables defect.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Check that cables for the battery are not damaged and in contact with other voltages..<br>Else replace the battery. | | | | | |

## 17.10. Internal Voltage Reference Alarms

| 951 | Power ref LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Defect power supply for controller pcb.<br>• Defect sensor pulling power supply down.<br>• Defect controller pcb.<br><br>Accompanied alarms:<br>• There may be sensor alarms.<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Check if there are other active (sensor) alarms.<br>Clear these alarms first using their trouble shooting.<br><br>2) Check voltage level of 24VAC and 5V signals to see if power supply has a short circuit or other damages.<br>If ok the controller pcb is defect.<br>Replace controller door. | | | | | |

| 952 | Power ref HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.
   If voltages are ok, the controller pcb is defect.
   Replace controller door.

| 953 | Temp ref 1 LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect sensor pulling power supply down.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a short circuit or other damages.
   If ok the controller pcb is defect.
   Replace controller door.

<table>
<tr><th>954</th><th colspan="5">Temp ref 1 HI</th><th>Log</th></tr>
<tr><td>Description</td><td colspan="6">Controller Internal Voltage Reference Fault.</td></tr>
<tr><td>Criteria</td><td colspan="6"></td></tr>
<tr><td>Cause</td><td colspan="6">Indication of controller internal voltage reference fault.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">None.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td></td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6"></td></tr>
<tr><td>Elimination</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Trouble shooting</td><td colspan="6">Possible causes:<br>• Defect power supply for controller pcb.<br>• Defect controller pcb.<br><br>Accompanied alarms:<br>• There may be sensor alarms.<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>3) Check if there are other active (sensor) alarms.<br>Clear these alarms first using their trouble shooting.<br><br>4) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.<br>If voltages are ok, the controller pcb is defect.<br>Replace controller door.</td></tr>
</table>

| 955 | Temp ref 2 LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Defect power supply for controller pcb.<br>• Defect sensor pulling power supply down.<br>• Defect controller pcb.<br><br>Accompanied alarms:<br>• There may be sensor alarms.<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Check if there are other active (sensor) alarms.<br>Clear these alarms first using their trouble shooting.<br><br>2) Check voltage level of 24VDC and 5V signals to see if power supply has a short circuit or other damage.<br>If ok the controller pcb is defect.<br>Replace controller door. | | | | | |

| 956 | Temp ref 2 HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Defect power supply for controller pcb.<br>• Defect controller pcb.<br><br>Accompanied alarms:<br>• There may be sensor alarms.<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Check if there are other active (sensor) alarms.<br>Clear these alarms first using their trouble shooting.<br><br>2) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.<br>If voltages are ok, the controller pcb is defect.<br>Replace controller door. | | | | | |

| 957 | Gnd ref LO | | | | Log | |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a short circuit or other damages.
   If voltages are ok, the controller pcb is defect.
   Replace controller door.

| 958 | Gnd ref HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

3) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

4) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.
   If voltages are ok, the controller pcb is defect.
   Replace controller door.

| 959 | RH sens sup LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect relative humidity sensor.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms, especially AL302.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Access the "special menu" by pressing  for more than 3 sec.
   Scroll down until you see the label "**U RH**" in the display.
   The value of "**U RH**" should be in the range between 16 and 28.

   While displaying "**U RH**", disconnect RH from the terminals.
   - If "**U RH**" is now inside the above range the RH sensor is defect.
     Replace the relative humidity sensor, RH.
   - If "**U RH**" is still outside the above range, the controller pcb is defect.
     Replace the controller door.

| 960 | RH sens sup HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Too high voltage for the unit.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check if power supply voltage for the unit is within specification.
   - If the voltage is too high, temperature control and humidity control will be affected and the unit may get damaged. Supply unit with power according to specification.
   If the voltage is ok, the controller pcb is defect. Replace controller door.

3) Access the "special menu" by pressing  for more than 3 sec.
   Scroll down until you see the label "**U RH**" in the display.
   The value of "**U RH**" should be in the range between 16 and 28.

   While displaying "**U RH**", disconnect RH from the terminals.
   - If "**U RH**" is now inside the above range the RH sensor is defect. Replace the relative humidity sensor, RH.
   - If "**U RH**" is still outside the above range, the controller pcb is defect. Replace the controller door.

| 961 | Pdis sens sup LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect Pdis pressure sensor.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms, especially AL203.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Access the "special menu" by pressing  for more than 3 sec.
   Scroll down until you see the label "**U Pdis**" in the display.
   The value of "**U Pdis** " should be in the range between 4.90 and 5.05.

3) While displaying "**U Pdis** ", remove the connector at Pdis.
   - If "**U Pdis**" is now inside the above range, the Pdis pressure sensor is defect.
     Replace the Pdis pressure sensor.
   - If "**U Pdis**" is still outside the above range, proceed to next step.

4) While displaying "**U Pdis** ", disconnect Pdis from the terminals according to wiring schematics inside in the control cabinet.
   - If "**U Pdis**" is now inside the above range the cable for Pdis is defect or the connector was mounted in a wrong position.
     Mount connector correct or replace connector cable for Pdis.
   - If "**U Pdis**" is still outside the above range, the controller pcb is defect.
     Replace the controller door.

| 962 | Pdis sens sup HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.
   If voltages are ok, the controller pcb is defect.
   Replace controller door.

| 963 | Psuc sens sup LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect Psuc pressure sensor.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms, especially AL207.
- AL 801 will be activated during FT- or PTI test.
-

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Access the "special menu" by pressing  for more than 3 sec.
   Scroll down until you see the label "**U Psuc**" in the display.
   The value of "**U Psuc** " should be in the range between 4.90 and 5.05.

3) While displaying "**U Psuc** ", remove the connector at Psuc.
   - If "**U Psuc**" is now inside the above range, the Psuc pressure sensor is defect.
     Replace the Psuc pressure sensor.
   - If "**U Psuc**" is still outside the above range, proceed to next step.

4) While displaying "**U Psuc** ", disconnect Pdis from the terminals according to wiring schematics inside in the control cabinet.
   - If "**U Psuc**" is now inside the above range the cable for Psuc is defect or the connector was mounted in a wrong position.
     Mount connector correct or replace connector cable for Psuc.
   - If "**U Psuc**" is still outside the above range, the controller pcb is defect.
     Replace the controller door.

| 964 | Psuc sens sup HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

<u>Possible causes:</u>

- Defect power supply for controller pcb.
- Defect controller pcb.

<u>Accompanied alarms:</u>

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

<u>Trouble shooting:</u>

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.
   If voltages are ok, the controller pcb is defect.
   Replace controller door.

| 965 | Controller sup LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms, especially AL1XX and AL 2XX.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) The controller pcb is defect.
   Replace the controller door.

| 966 | Controller sup HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

<u>Possible causes:</u>

- Defect power supply for controller pcb.
- Defect controller pcb.

<u>Accompanied alarms:</u>

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

<u>Trouble shooting:</u>

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.
   If voltages are ok, the controller pcb is defect.
   Replace controller door.

| 969 | AirEx sens sup LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect sensor pulling power supply down.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a short circuit or other damages.
   If ok the controller pcb is defect.
   Replace controller door.

| 970 | AirEx sens sup HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.
   If voltages are ok, the controller pcb is defect.
   Replace controller door.

| 971 | Peco sens sup LO | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect Peco pressure sensor.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms, especially AL210.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Access the "special menu" by pressing  for more than 3 sec.
   Scroll down until you see the label "**U Peco**" in the display.
   The value of "**U Peco** " should be in the range between 4.90 and 5.05.

3) While displaying "**U Peco** ", remove the connector at Peco.
   - If "**U Peco**" is now inside the above range, the Peco pressure sensor is defect.
     Replace the Psuc pressure sensor.
   - If "**U Peco**" is still outside the above range, proceed to next step.

4) While displaying "**U Peco** ", disconnect Peco from the terminals according to wiring schematics inside in the control cabinet.
   - If "**U Peco**" is now inside the above range the cable for Peco is defect or the connector was mounted in a wrong position.
     Mount connector correct or replace connector cable for Peco.
   - If "**U Peco**" is still outside the above range, the controller pcb is defect.
     Replace the controller door.

<table>
<tr><th>972</th><th colspan="5">Peco sens sup HI</th><th>Log</th></tr>
<tr><td>Description</td><td colspan="6">Controller Internal Voltage Reference Fault.</td></tr>
<tr><td>Criteria</td><td colspan="6"></td></tr>
<tr><td>Cause</td><td colspan="6">Indication of controller internal voltage reference fault.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">None.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td></td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6"></td></tr>
<tr><td>Elimination</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Trouble shooting</td><td colspan="6">Possible causes:<br>• Defect power supply for controller pcb.<br>• Defect controller pcb.<br><br>Accompanied alarms:<br>• There may be sensor alarms.<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Check if there are other active (sensor) alarms.<br>Clear these alarms first using their trouble shooting.<br><br>2) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.<br>If voltages are ok, the controller pcb is defect.<br>Replace controller door.</td></tr>
</table>

<table>
<tr><th>980</th><th colspan="5">Tinternal LO</th><th>Log</th></tr>
<tr><td>Description</td><td colspan="6">Controller Internal Voltage Reference Fault.</td></tr>
<tr><td>Criteria</td><td colspan="6"></td></tr>
<tr><td>Cause</td><td colspan="6">Indication of controller internal voltage reference fault.</td></tr>
<tr><td rowspan="2">Action</td><td colspan="6">None.</td></tr>
<tr><td>Log</td><td>X</td><td>Alarm</td><td></td><td>Alarm light</td><td>Off</td></tr>
<tr><td>Consequence</td><td colspan="6"></td></tr>
<tr><td>Elimination</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Log data</td><td>Parm 1</td><td>Parm 2</td><td>Parm 3</td><td>Parm 4</td><td colspan="2">Parm 5</td></tr>
<tr><td>Active/Inactive</td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Trouble shooting</td><td colspan="6">Possible causes:<br>• Defect power supply for controller pcb.<br>• Defect controller pcb.<br><br>Accompanied alarms:<br>• There may be sensor alarms, especially AL1XX and AL 2XX.<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) Check if there are other active (sensor) alarms.<br>Clear these alarms first using their trouble shooting.<br><br>2) The controller pcb is defect.<br>Replace the controller door.</td></tr>
</table>

| 981 | Tinternal HI | | | | | Log |
|---|---|---|---|---|---|---|
| **Description** | Controller Internal Voltage Reference Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of controller internal voltage reference fault. | | | | | |
| **Action** | None. | | | | | |
| | Log | X | Alarm | | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |

| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 |
|---|---|---|---|---|---|
| | Active/Inactive | | | | |

**Trouble shooting**

Possible causes:

- Defect power supply for controller pcb.
- Defect controller pcb.

Accompanied alarms:

- There may be sensor alarms.
- AL 801 will be activated during FT- or PTI test.

Trouble shooting:

1) Check if there are other active (sensor) alarms.
   Clear these alarms first using their trouble shooting.

2) Check voltage level of 24VDC and 5V signals to see if power supply has a open circuit or other damages.
   If voltages are ok, the controller pcb is defect.
   Replace controller door.

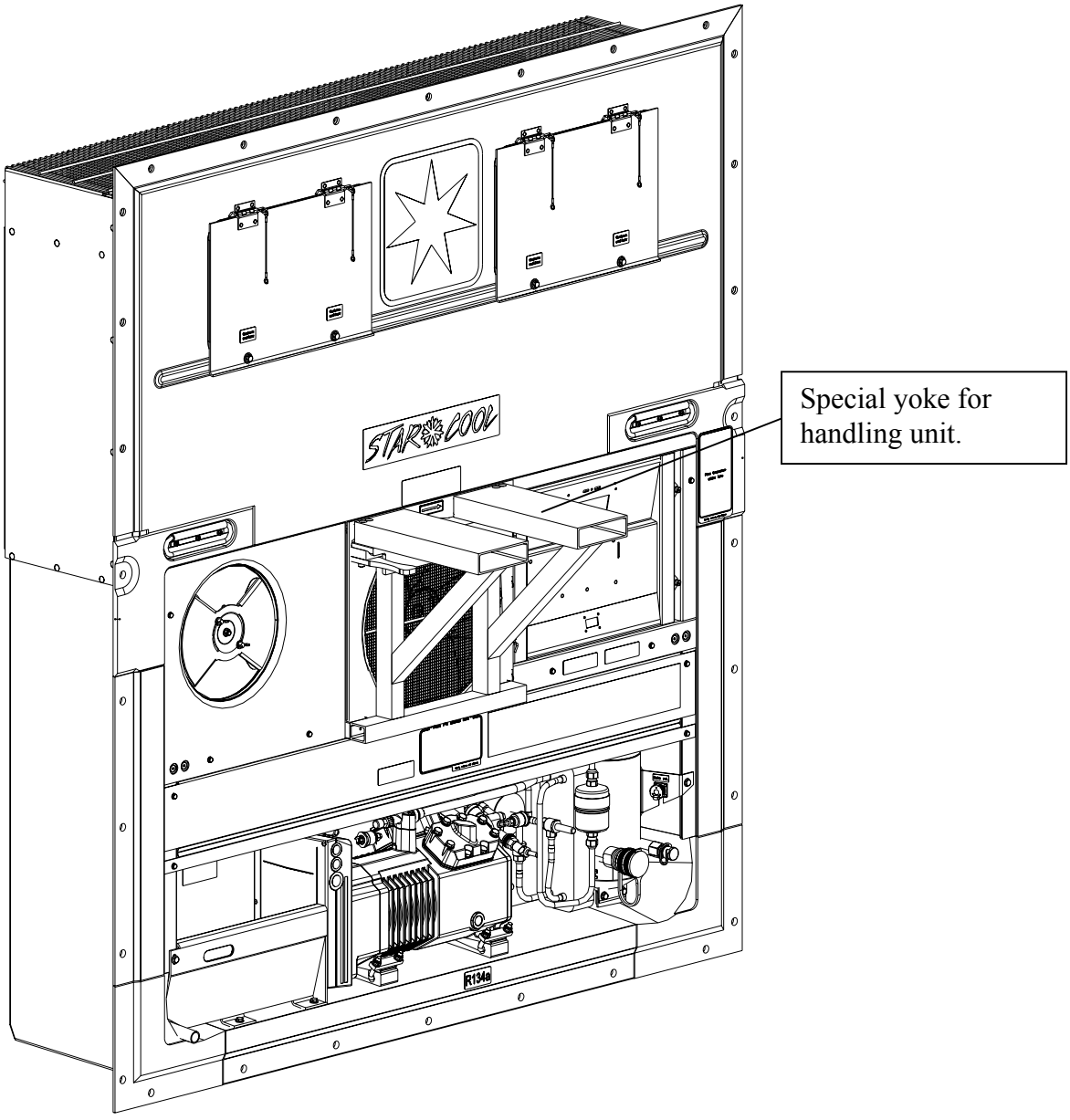
| 989 | Software test ver | | | | | Warning |
|---|---|---|---|---|---|---|
| **Description** | Software test version. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | Indication of Software test version loading into controller. | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Off |
| **Consequence** | | | | | | |
| **Elimination** | Replace software | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | | | | | |
| **Trouble shooting** | Possible causes:<br>• Test sw in the controller pcb.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) There is a wrong sw version in the controller pcb. Replace the controller door. | | | | | |

| 996 | Software CRC error | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | Prom CRC Fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | CRC sum | CRC check | | | |
| **Trouble shooting** | Possible causes:<br>• Validity check of the program failed.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) There is a fault on the controller pcb.<br>Replace the controller door. | | | | | |

| 997 | Eeprom error | | | | | Alarm |
|---|---|---|---|---|---|---|
| **Description** | EEPROM fault. | | | | | |
| **Criteria** | | | | | | |
| **Cause** | | | | | | |
| **Action** | | | | | | |
| | Log | X | Alarm | X | Alarm light | Slow flash |
| **Consequence** | | | | | | |
| **Elimination** | | | | | | |
| **Log data** | Parm 1 | Parm 2 | Parm 3 | Parm 4 | Parm 5 | |
| | Active/Inactive | 1 = R 2 = W | | | | |
| **Trouble shooting** | Possible causes:<br>• Check of validity of program storage failed.<br><br>Accompanied alarms:<br>• AL 801 will be activated during FT- or PTI test.<br><br>Trouble shooting:<br>1) There is a fault on the controller pcb.<br>Replace the controller door. | | | | | |

# 18. Replacing of unit

Handling of unit during replacement is done by means of a special yoke, see below sketch.




Information regarding this yoke can be obtained at Maersk Sealand home page or at Maersk Container Industri AS home page.

# 19. Replacing Evaporator motor and fan

**Note: Turn off main power supply for unit before replacing evaporator motor and fan.**

Remove the 4 x M8 bolts that holds the evaporator motor bracket, incl. motor and fan.
Then the evaporator motor bracket with motor and fan can slide right through the inspection hatch of the unit, by dragging it towards your self.
The evaporator bracket has to be tilted slightly downwards, to pass by the gasket.

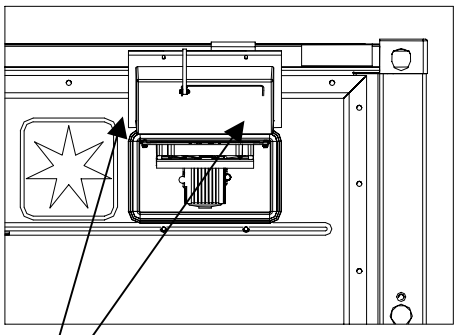


Fig. 1

4 x M8 Bolts

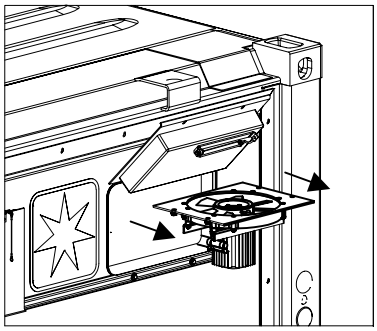


Fig. 2

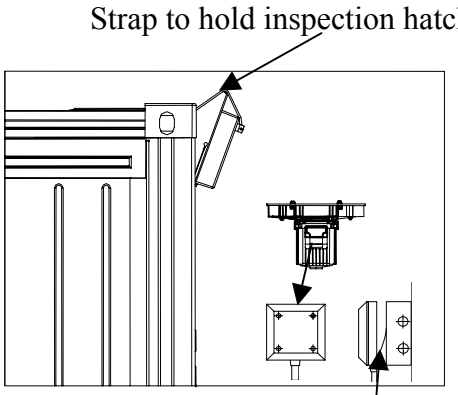



Fig. 3

Disconnect the power supply to the motor by removing the electrical box lid and unscrew the earthed wire, which is placed on the centre bolt. Do not remove the other wires in the cable from the plug. See Figure 3

Replace the defect parts and reinstall the evaporator fan unit.

Prior to mounting the electrical box lid, check the sealing for any damages.

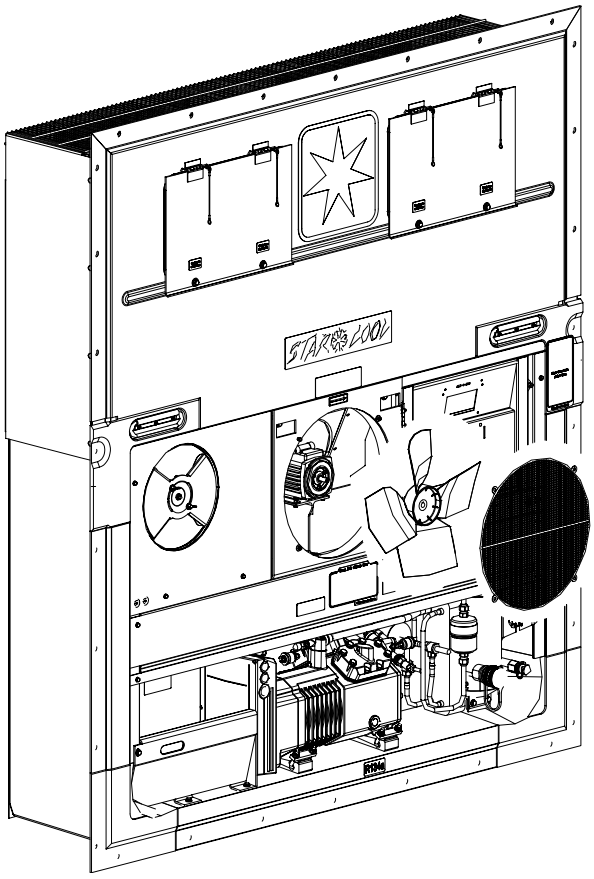
# 20. Replacing condenser motor and fan

**Note: Turn off main power supply for unit before replacing condenser motor and fan.**

Disconnect the power supply to the motor by removing the electrical box lid and unscrew the earthed wire, which is placed on the centre bolt. Do not remove the other wires in the cable from the plug Remove the condenser grill and replace the defective part.

Replace the defect parts and reinstall.

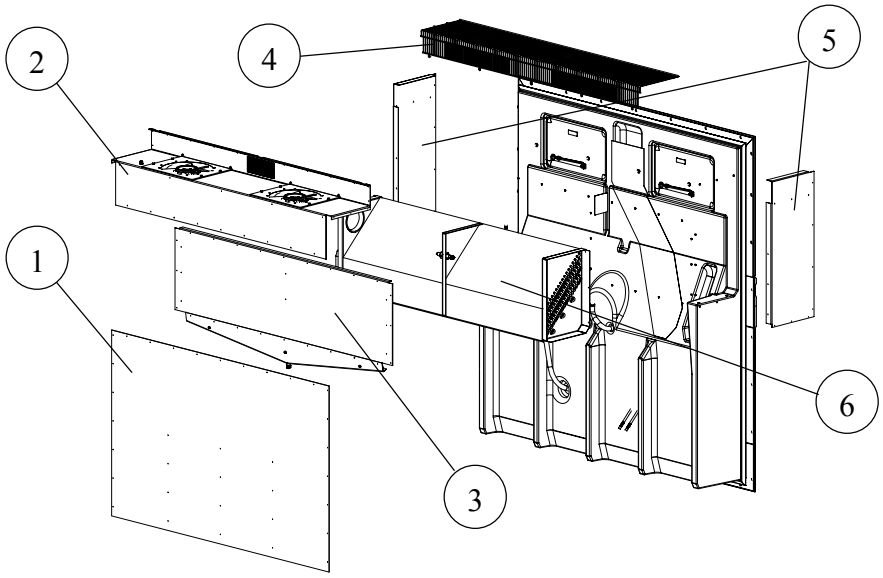
Prior to mounting the electrical box lid, check the sealing for any damages.



# 21. Replacing of evaporator

In order to replace the evaporator the unit has to dismounted from the container, as described in this manual.

After the unit is dismounted there is free access to all parts on the backside of the unit.




| Position | Description |
|---|---|
| 1 | Back plate, unit |
| 2 | Evaporator fan module, complete |
| 3 | Evaporator back plate |
| 4 | Fan grill |
| 5 | Side cover, left and right |
| 6 | Evaporator |

The replacing of evaporator is done in the following steps:

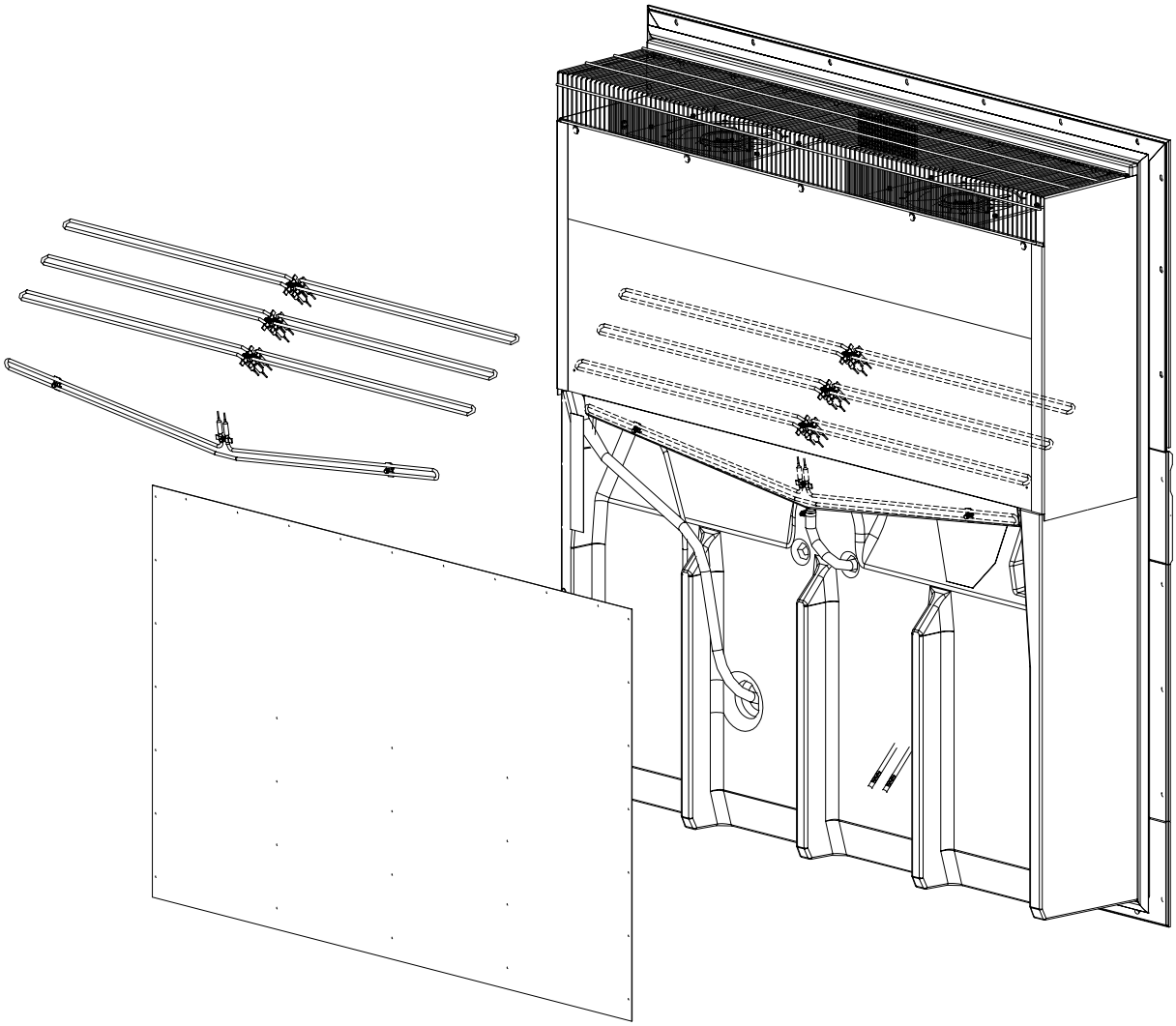
1. Remove pos. 5.
2. Remove pos. 1.
3. Remove pos. 4.
4. Remove heating elements below evaporator and on backside of evaporator back plate.
5. Remove the evaporator temperature sensor and suction temperature sensor
6. Desolder the suction and liquid pipe for pos.6.
7. Remove pos.6.
8. Remove pos. 3 from pos. 6 and reinstall pos. 3 on new evaporator.
9. Mount new evaporator on chassis with appropriate rivets.

10. Solder the suction and liquid pipe to the new evaporator according to soldering instruction in this manual.
11. Reinstall pos. 2.
12. Reinstall the heating elements.
13. Reinstall the evaporator temperature sensor and suction temperature sensor.
14. Reinstall pos. 1, 4 and 5.
15. Evacuate unit as described in this manual.
16. Charge unit as described in this manual.

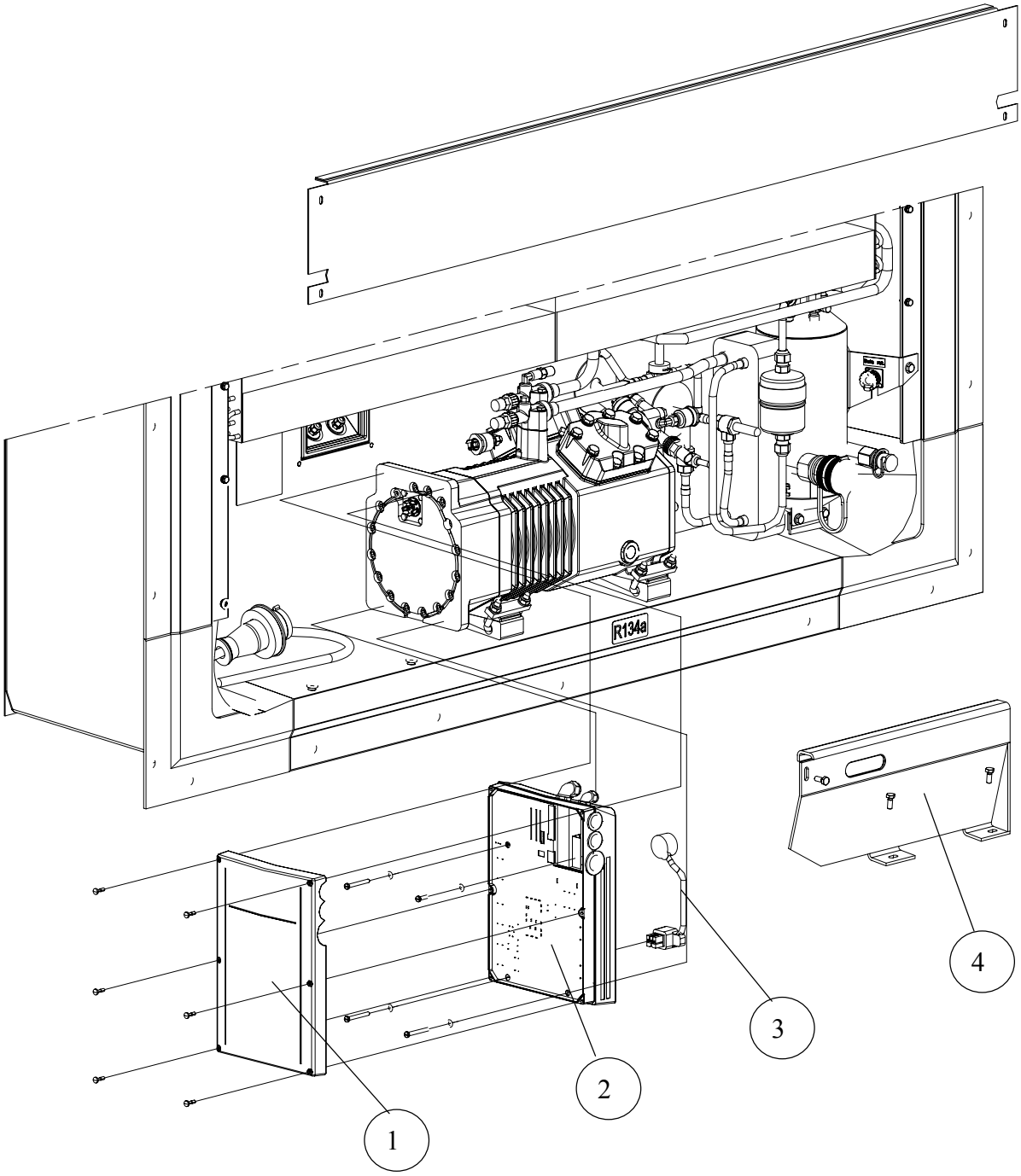
# 22. Replacing of heating elements

Dismount the back plate for the unit and replace the defect heating element.

After replacing of the heating elements reinstall back plate for unit.



# 23. Replacing of Frequency converter

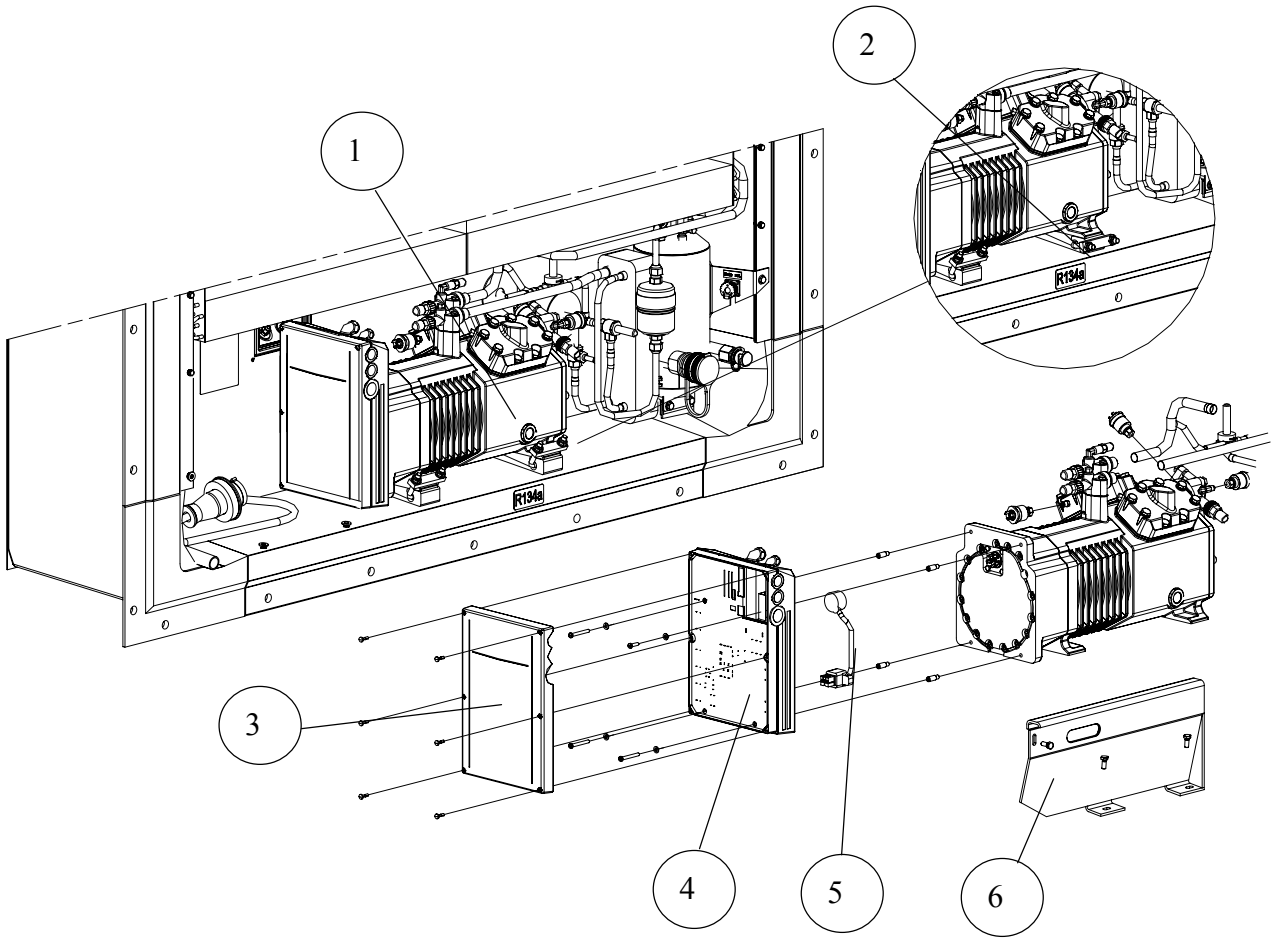


| Position | Description |
|---|---|
| 1 | Cover for frequency converter |
| 2 | Frequency converter |
| 3 | Motor cable |
| 4 | Cable room cover |

The procedure for replacing the frequency converter is as follows:

1. Dismount the cable room cover, pos. 4.
2. Remove the cover for frequency converter, pos. 1.
3. Remove the frequency converter, pos. 2 and motor cable, pos. 3.
4. Reinstall motor cable, please observe that the motor cable is not damaged and squeezed between compressor and frequency converter, please observe correct tightening torque.
5. Mount new frequency converter. Make sure that the frequency converter is mounted correctly on the compressor and that there is no air gap between frequency converter and compressor. Please observe correct tightening torque.
6. Reinstall cover for frequency converter and cable room cover, please observe correct tightening torque.

# 24. Replacing of compressor




| Position | Description |
|---|---|
| 1 | Compressor |
| 2 | Bracket for compressor |
| 3 | Cover for frequency converter |
| 4 | Frequency converter |
| 5 | Motor cable |
| 6 | Cable room cover |

The procedure for replacing the compressor is as follows:

1. Dismount the cable room cover, pos. 6.
2. Remove the cover for frequency converter, pos. 3.
3. Remove the frequency converter, pos. 4 and motor cable, pos. 5.
4. Dismount all pressure transmitters, high pressure switch and temperature sensors.
5. Loosen all bolts for compressor stop valves.

6. Loosen bracket for compressor and turn it downwards.
7. Slide compressor out.
8. Slide new compressor in place, observe that the backmost compressor foot is inserted into the bracket slot.
9. Reinstall the compressor brackets, please observe correct tightening torque.
10. Reinstall all pressure transmitters, high pressure switch and temperature sensors, please observe correct tightening torque.
11. Fasten all bolts for compressor stop valves, please observe correct tightening torque.
12. Reinstall motor cable, please observe that the motor cable is not damaged and squeezed between compressor and frequency converter, please observe correct tightening torque.
13. Reinstall frequency converter. Make sure that the frequency converter is mounted correctly on the compressor and that there is no air gap between frequency converter and compressor. Please observe correct tightening torque.
14. Reinstall cover for frequency converter and cable room cover, please observe correct tightening torque.
15. Evacuate the compressor before starting up, as described in this manual.

# 25. Service and maintenance

## 25.1. Evacuation of refrigerant

Evacuation of refrigerant for the unit is done by the following procedure:

1. Install a service gauge manifold on the unit to the two evacuation points, pos. 6 & 27 (P & I – diagram).
2. Connect the recovery station with weight measurement to the service gauge manifold.
3. Remove the electrical coils and mount permanent magnet on the two electronically expansionsvalves,
   pos. 16 & 18 ( P & I – diagram ).
4. Vapor recovery:
   a. Turn unit off.
   b. Close/open the discharge pressure stopvalve, pos. 5 ( P & I diagram ), approx. 4 turns
   c. Recovery equipment is set for vapor recovery.
   d. Open both service gauge manifold valves.
   Liquid recovery:
   a. Continue operation of unit.
   b. Close outlet valve, pos. 14 ( P & I – diagram ), from receiver and do a pump down of the low
      pressure side of the unit to approx – 0,8 bar.
   c. Turn the unit off.
   d. Set recovery equipment for liquid recovery.
   e. Open high pressure stopvalve on service gauge manifold.
5. Remove the permanent magnets and reinstall the electrical coils on the two electronically expansionsvalves, pos. 16 & 18 ( P & I – diagram ).
6. Start and operate the recovery equipment as long as necessary to evacuate desired amount of refrigerant from the unit.

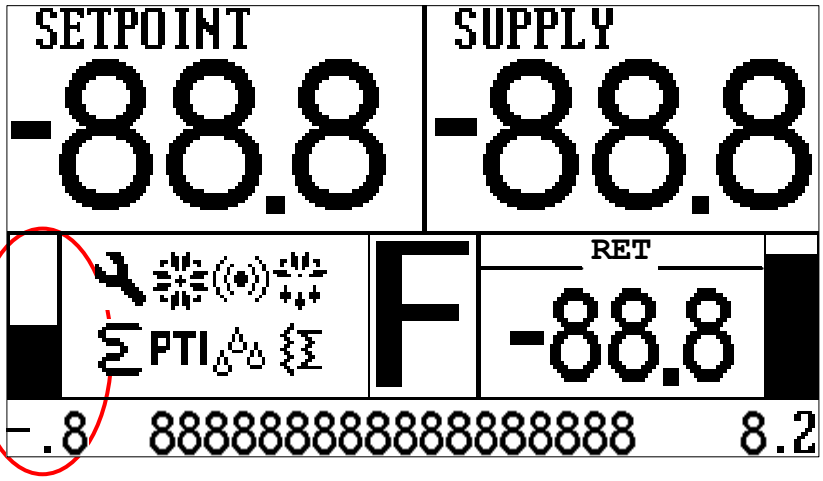
Note: refer to operating and service manuals for the recovery equipment.

## 25.2. Compressor pump down, operation.

The pump down of the compressor is done by the following procedure:

1. Connect the vacuum pump to the two evacuation points, pos. 6 & 27 ( P & I – diagram ).
2. Ensure that the valves on the vacuum pump are closed.
3. Close the compressor suction pressure stopvalve and compressor intermediate pressure stopvalve, pos. 26 & 30 ( P & I – diagram ).
4. Close the compressor discharge pressure stopvalve, pos. 5 ( P & I diagram ), approx. 4 turns.
5. Run the compressor in manual operation on 50 Hz, as described in manual operation section.
6. Observe the pressure indication on the display for the suction pressure, when the suction pressure reaches – 0,5 bar (-7,3 psi) in value, close the compressor discharge pressure stopvalve entirely and turn off the power to the unit.

Suction pressure




7. Open the valves for the vacuum pump.
8. The evacuation points, pos. 6 & 27 ( P & I – diagram ), are open when the compressorstopvalves, pos. 26 & 5, ( P & I – diagram ), are closed.
9. Evacuate the compressor through the vacuum pump for a minimum of 2 hours.
10. Switch off the vacuum pump and close the stopvalve for the suction line to the vacuum pump on the service gauge manifold. Observe the vacuum for minimum ½ hour. If the vacuum is maintained then the compressor can be either changed, see replacing of compressor or the unit can be started in normal operation.
    If the vacuum pressure is not maintained there is a possible leak somewhere, check all hose connections
    between unit and vacuumpump. If these are ok, check the unit.
11. Open compressor suction stopvalve, compressor intermediate pressure stopvalve and compressor discharge stopvalve, pos. 5, 25 & 30, ( P & I – diagram ).
12. Disconnect the service gauge manifold.

## 25.3. Compressor pump down, replaced.

Pump down of a new / replaced compressor is done by the following procedure:

1. Connect a vacuum pump with a service gauge manifold to the two evacuation points, pos. 6 & 27
   ( P & I – diagram ).
2. Close the compressor discharge and compressor suction servicevalves, pos. 5 & 26, ( P & I – diagram ).
3. Pump down the pressure in the compressor to vacuum, indicated on the gauges of the service gauge manifold.
4. Continue vacuum – pumping for at least 2 hours.
5. Switch off the vacuum pump and close the stopvalve for the suction line to the vacuum pump on the service gauge manifold. Observe the vacuum for minimum ½ hour.
6. If the vacuum is maintained then the compressor discharge servicevalve and compressor suction servicevalve, pos. 5 & 26, ( P & I – diagram ), can be fully opened.
   If the vacuum pressure is not maintained there is a possible leak somewhere, check all hose connections
   between compressor and vacuumpump. If these are ok, check the compressor.
7. Disconnect the service gauge manifold and operate the unit as normal.

## 25.4. Pump down of unit.

Main power supply to unit shall be switched off during pump down of unit.

Pump down of unit is done by the following procedure:

1. Connect a vacuum pump with a service gauge manifold to the two evacuation points, pos. 6 & 27 ( P & I – diagram ).
2. Close the compressor discharge and compressor suction servicevalves, pos. 5 & 26, ( P & I – diagram ), 4 turns.
3. Remove the electrical coils and mount permanent magnet on the two electronically expansionsvalves, pos. 16 & 18 ( P & I – diagram ).
4. Pump down the unit pressure to vacuum, indicated on the gauges of the service gauge manifold.
5. Continue vacuum – pumping for at least 2 hours.
6. Switch off the vacuum pump and close the stopvalve for the suction line to the vacuum pump on the service gauge manifold. Observe the vacuum for minimum ½ hour.
7. If the vacuum is maintained then the unit can be charge as described this manual.
   If the vacuum pressure is not maintained there is a possible leak somewhere, check all hose connections
   between unit and vacuumpump. If these are ok, check the unit.
8. Close the compressorstopvalves, pos. 5 & 26, ( P & I – diagram ).
9. Remove the permanent magnets and reinstall the electrical coils on the two electronically expansionsvalves, pos. 16 & 18 ( P & I – diagram ).
10. Disconnect the service gauge manifold.

## 25.5. Pressure Test

After performing a major repair to the piping system of the unit it is recommended to perform a pressure test.
Pressuretest has the purpose of checking the piping system for leakages.

The pressuretest is done by means of a high pressurized gas, ex. $N_2$, which is let into the piping system through the two evacuation points, pos. 6 & 27 ( P & I – diagram ). The procedure for this is as follows:

**NOTE: DO NOT USE OXYGEN ($O_2$) FOR A PRESSURE TEST**

1. Install a service gauge manifold on the unit to the two evacuation points, pos. 6 & 27 ( P & I – diagram ).
2. Close the compressor discharge stopvalve and compressor suction stopvalve, pos. 5 & 26 ( P & I – diagram ), 4 turns
3. Connect the pressurized gas bottle (ex. $N_2$) to the discharge stopvalve of the service gauge manifold.
4. Remove the electrical coils and mount permanent magnet on the two electronically expansionsvalves, pos. 16 & 18 ( P & I – diagram ).
5. Open the discharge stopvalve of the service gauge manifold.
6. Carefully open the hand valve of the pressurized gas bottle until the two gauges of the service gauge manifold shows a pressure of 12 bar.
7. Close the discharge stopvalve of the service gauge manifold.
8. Do a leakage detection as described in this manual.
9. Leave the unit pressurized for minimum 2 hours. If the pressure gauges still shows 12 bar after 2 hours, the unit is without any leakages.
10. If the pressure gauges are below 12 bar, perform a leakage detection as described in this manual
11. Disconnect the pressurized gas bottle.
12. Open the discharge stopvalve on the service gauge manifold to release the pressure form the unit.
13. Do a pump down of unit as described in this manual.
14. Charge the unit as described in this manual.

# 25.6. Charging of refrigerant

## 25.6.1. Charging of empty unit

### The power to the unit shall be off.

The charging of a empty unit is done by weight, by the following procedure:

1. Pump down unit as described in this manual.
2. Install a service gauge manifold on the unit to the two evacuation points, pos. 6 & 27 ( P & I – diagram ).
3. Place a refrigerant bottle on scale for weighing. Record the weight of the refrigerant bottle.
4. Connect manifold service hose to refrigerant bottle and purge as needed.
5. Set refrigerant bottle for liquid charging and open refrigerant bottle hand valve.
6. Open discharge stop valve, pos. 5 ( P & I – diagram ), 1 turn.
7. Open the high pressure stop valve on the service gauge manifold.
8. Observe the scale and close the hand valve at the refrigerant bottle when the correct amount of refrigerant has been charged. The unit refrigerant charge is **4,5** kg **R134a**.
9. Close the valves on the service gauge manifold.
10. Open the servicestop valves on the compressor, pos. 5 & 26 ( P & I – diagram ).
11. Operate the unit as normal.

**Note: If the correct amount of refrigerant is not charged by this procedure, follow the procedure described in charging of unit low on charge in this manual.**

### 25.6.2. Charging of unit low on charge.

If during normal stable inrange operation it is observed that the setpoint temperature cannot be maintained this might be an indication of missing refrigerant. Please observe the unit for a period of at least 6 hours to ensure a stable tendency. During this observation time please observe following:

1. The red balls in the sight glass for the receiver is constantly at bottom level.
2. Veco is more than 80% open for ½ hour.
3. Vexp will steadily increase to 100%.
4. Psuc (T0) is steadily going down

If based on above it is determined that the unit is to low on refrigerant charge, additional refrigerant may be charge following this procedure:

1. Install a service gauge manifold on the unit to the two evacuation points, pos.6 & 26 ( P & I – diagram ).
2. Connect the low pressure valve of the service gauge manifold to the suction stop valve, pos. 26 ( P & I – diagram ).
3. Connect the service gauge manifold to the refrigerant bottle, purge as needed.
4. Close the compressor suction stop valve, pos. 26 ( P & I – diagram ) fully and open approx. 4 turns.
5. Set the refrigerant bottle for liquid charging.
6. Operate compressor in manual mode, as described in this manual, compressor speed 25 Hz.
7. Open the low pressure valve of the service gauge manifold.
8. Read the suction pressure.
9. Open hand valve on refrigerant bottle slowly, allowing the suction pressure to increase with 1,5 bar.
10. Add refrigerant until the sight glass balls floats in top of the sight glass.
11. Close hand valve on refrigerant bottle.
12. Open the compressor suction stop valve, pos. 26 ( P & I – diagram ), fully.
13. Set the unit for automatic operation, as described in this manual.
14. Observe the unit running in a stable condition, add or remove refrigerant if necessary.
15. When refrigerant charge is correct, remove service gauge manifold and cap the two evacuation points, pos. 6 & 27 ( P & I – diagram ).

## Caution: Do not overcharge the unit.

# 25.7. Leakage detection

Leakage detection is done under pressure test, as described in this manual.
While the unit is pressurized it is possible to check all soldered and screwed joints of the piping system.
This is done with a leakage detection agent or with a solution with high foambuilding soap.
The agent or water / soap solution is sprayed upon the joints. If there is a leakage bubbling of the foam will occur.
This leakage detection test can also be done while the unit is running charged with refrigerant by means of a refrigerant detector or soap solution.

Leakage detection is also done during pump down of unit or compressor, as described in this manual.

# 25.8. Drying filter

## 25.8.1. Replacing of drying filter

**Before replacing of the drying filter the power plug to the unit has to disconnected.**

The drying filter has to be changed every time the compressor is changed or if the moisture indicators indicates that to much moitsure is in the refrigerant circuit.
To change the drying filter follow the following procedure:

1. Close the stop – valve, pos. 14 (P & I – diagram ).
2. Carefully loosen the two union nuts for the drying filter.
   Beware of pressurized escaping refrigerant. Always wear protective goggles.
3. Replace the drying filter with a Danfoss DML 164 O - ring or equivalent.
   Before mounting of the filter, put some drops of compressor esteroil on the flare in order to ensure correct tightness.
4. Tighten the two union nuts for the drying filter, see torque values in tables.
5. Remove the electrical coils and mount permanent magnet on the two electronically expansionsvalves,
   pos. 16 & 18 ( P & I – diagram ).
6. Careful loosen the upper union nut for the drying filter, allowing a little amount of refrigerant gas to escape.
7. Tighten the union nut.
8. Remove the permanent magnets and reinstall the electrical coils on the two electronically expansionsvalves, pos. 16 & 18 ( P & I – diagram ).
9. Power up the unit

# 25.9. Compressor

## 25.9.1. Check of oil level

The oil level can be checked on the sight glass of the compressor.
During normal operation the oil level should be between 1/3 and 2/3 sight glass full.
Normal operation is when the unit has being running on setpoint in a steady condition for minimum 6 hours.

If the oil level is below sight glass after a period of minimum 6 hours normal operation, additional oil may be added, as decribed in this manual

**Note: Do not overfill the compressor with oil.**

## 25.9.2. Charging of oil

If during normal operation is has been observed that there is to little oil charge on the compressor, additional oil may be charged.
The compressor is filled with 1,5 liter Reniso Triton SEZ 55 or equivalent oil from the factory.

The procedure for adding oil is as follows:

1. Pump down the compressor, as described in this manual.
2. Remove plug on top of the stop valve for the intermediate pressure.
3. Start by adding 0,25 liter of compressor oil.
4. Reinstall plug on top of the stop valve for the intermediate pressure.
5. Evacuate the compressor as described in this manual
6. Open the compressorstopvalves, pos. 5,26 and 30 ( P & I – diagram ).
7. Disconnect the vacuum pump.
8. Start up the unit.
9. Check the oil level during start up and after 6 hours in normal stable operation.
10. If oil is still missing, repeat above.

### 25.9.3. Draining of oil from compressor

If the compresor has been overcharged with oil, the procedure for drainage is as follows:

1. The two oil outlet are placed on a tee-piece located on the compressor end opposite of the frequency converter end, please observe that only one of the oil outlet ports is equipped with a schräder valve.
2. Connect a service gauge manifold to the outlet port with schräder valve of the oil pump.
3. Only connect the discharge hose to the outlet port of the oil pump.
   Make sure that all stopvalves on the service gauge manifold are closed.
4. Open the discharge gauge stopvalve on the service gauge manifold.
5. Insert the hose from the suction gauge on the service gauge manifold into a small measuring cup.
6. Run the compressor in manual operation on 25 Hz.
7. Carefully open the suction gauge stopvalve on the service gauge manifold.
8. While observing the oil level in the sight glass of the compressor, carefully let out oil, until the oil level in the sight glass has reached a mid – level.
9. Close the suction gauge stopvalve and discharge gauge stopvalve on the service gauge manifold.
10. Disconnect the service gauge manifold.
11. Cap the oil outlet from the oil pump.
12. Set the controller to ”AUTOMATIC” operation.
13. Run the unit in normal operation.
14. Observe the oil level when the unit is running minimum 6 hours in a stable condition.

## 25.10. Soldering

When soldering and desoldering components on the unit, please observe following:

1. Use the following material for soldering:

   **For Copper - Copper (all pipes):**

   Soldering rod: L - Ag15P according to DIN 8513 or B - CuP5 according to AWS A 5.8.

   example for product name: Chem - weld product 550 or Castolin RB 5283
   Soldering flux: Due to the high content of Phosphor in the soldering rod no flux is needed.

   **For Copper - Stainless (connections for water cooled condenser and economizer):**

   Soldering rod: L - Ag40Cd according to DIN 8513 or B - Ag 1 according to AWS A 5.8.

   example for product name: Chem - weld product 511B or Castolin 1802 or 1802 F.

   Soldering flux: F - SH 1 according to DIN 8511 or FB 3A according to AWS A 5.31.

   example for product name: Chem - weld product 110 or Castolin 1802 N - Atmosin.

2. Use wet cloths to protect sensitive valves and other equipment against heat input during soldering and desoldering.

3. Use inert back gas as Nitrogen ($N_2$) during soldering and desoldering.

# 26. Tables

## 26.1. Temperature Sensor [°C] - Resistance Table

| R[ohm] | °C | R[ohm] | °C | R[ohm] | °C | R[ohm] | °C | R[ohm] | °C |
|---|---|---|---|---|---|---|---|---|---|
| 3.095.611 | -70 | 138.322 | -26 | 13.682,60 | 18 | 2.315,20 | 62 | 570,82 | 106 |
| 2.851.363 | -69 | 130.243 | -25 | 13.052,80 | 19 | 2.234,70 | 63 | 554,86 | 107 |
| 2.627.981 | -68 | 122.687 | -24 | 12.493,70 | 20 | 2.156,70 | 64 | 539,44 | 108 |
| 2.423.519 | -67 | 115.613 | -23 | 11.94330 | 21 | 2.082,30 | 65 | 524,51 | 109 |
| 2.236.398 | -66 | 108.991 | -22 | 11.420 | 22 | 2.010,80 | 66 | 510,06 | 110 |
| 2.064.919 | -65 | 102.787 | -21 | 10.922,70 | 23 | 1.942,10 | 67 | 496,08 | 111 |
| 1.907.728 | -64 | 96.974 | -20 | 10.449,90 | 24 | 1.876 | 68 | 482,55 | 112 |
| 1.763.539 | -63 | 91.525 | -19 | 100 | 25 | 1.812,60 | 69 | 469,45 | 113 |
| 1.631.173 | -62 | 86.415 | -18 | 9.572 | 26 | 1.751,60 | 70 | 456,76 | 114 |
| 1.509.639 | -61 | 81.621 | -17 | 9.164,70 | 27 | 1.693 | 71 | 444,48 | 115 |
| 1.397.935 | -60 | 77.121 | -16 | 8.777 | 28 | 1.636,63 | 72 | 432,58 | 116 |
| 1.295.239 | -59 | 72.895 | -15 | 8.407,70 | 29 | 1.582,41 | 73 | 421,06 | 117 |
| 1.200.732 | -58 | 68.927 | -14 | 8.056 | 30 | 1.530,28 | 74 | 409,90 | 118 |
| 1.113.744 | -57 | 65.198 | -13 | 7.720,90 | 31 | 1.480,12 | 75 | 399,08 | 119 |
| 1.033.619 | -56 | 61.693 | -12 | 7.401,70 | 32 | 1.431,87 | 76 | 388,59 | 120 |
| 959.789 | -55 | 58.397 | -11 | 7.097,20 | 33 | 1.385,37 | 77 | 378,44 | 121 |
| 891.689 | -54 | 55.298 | -10 | 6.807 | 34 | 1.340,68 | 78 | 368,59 | 122 |
| 828.865 | -53 | 52.380 | - 9 | 6.530,10 | 35 | 1.297,64 | 79 | 359,05 | 123 |
| 770.880 | -52 | 49.663 | - 8 | 6.266,10 | 36 | 1.256,17 | 80 | 349,79 | 124 |
| 717.310 | -51 | 47.047 | - 7 | 6.014,20 | 37 | 1.216,23 | 81 | 340,82 | 125 |
| 667.828 | -50 | 44.610 | - 6 | 5.773,70 | 38 | 1.177,75 | 82 | 332,11 | 126 |
| 622.055 | -49 | 42.314,60 | - 5 | 5.544,10 | 39 | 1.140,71 | 83 | 323,67 | 127 |
| 579.718 | -48 | 40.149,50 | - 4 | 5.324,90 | 40 | 1.104,99 | 84 | 315,48 | 128 |
| 540.530 | -47 | 38.108,50 | - 3 | 5.115,60 | 41 | 1.070,58 | 85 | 307,53 | 129 |
| 504.230 | -46 | 36.182,80 | - 2 | 4.915,50 | 42 | 1.037,40 | 86 | 299,82 | 130 |
| 470.609 | -45 | 34.366,10 | - 1 | 4.724,30 | 43 | 1005,40 | 87 | 292,34 | 131 |
| 439.445 | -44 | 32.650,80 | - 0 | 4.541,60 | 44 | 974,56 | 88 | 285,08 | 132 |
| 410.532 | -43 | 31.030,40 | 1 | 4.366,90 | 45 | 944,81 | 89 | 278,03 | 133 |
| 383.712 | -42 | 29.500,10 | 2 | 4.199,90 | 46 | 916,11 | 90 | 271,19 | 134 |
| 358.806 | -41 | 28.054,20 | 3 | 4.040,10 | 47 | 888,41 | 91 | 264,54 | 135 |
| 335.671 | -40 | 26.687,60 | 4 | 3.887,20 | 48 | 861,70 | 92 | 258,09 | 136 |
| 314.179 | -39 | 25.395,50 | 5 | 3.741,10 | 49 | 835,93 | 93 | 251,82 | 137 |
| 294.193 | -38 | 24.172,70 | 6 | 3.601 | 50 | 811,03 | 94 | 245,74 | 138 |
| 275.605 | -37 | 23.016 | 7 | 3.466,90 | 51 | 786,99 | 95 | 239,82 | 139 |
| 258.307 | -36 | 21.921,70 | 8 | 3.338,60 | 52 | 763,79 | 96 | 234,08 | 140 |
| 242.195 | -35 | 20.885,20 | 9 | 3.215,60 | 53 | 741,38 | 97 | 228,50 | 141 |
| 227.196 | -34 | 19.903,50 | 10 | 3.097,90 | 54 | 719,74 | 98 | 223,08 | 142 |
| 213.219 | -33 | 18.973,60 | 11 | 2.985,10 | 55 | 698,82 | 99 | 217,80 | 143 |
| 200.184 | -32 | 18.092,60 | 12 | 2.876,90 | 56 | 678,63 | 100 | 212,68 | 144 |
| 188.026 | -31 | 17.257,40 | 13 | 2.773,20 | 57 | 659,10 | 101 | 207,70 | 145 |
| 176.683 | -30 | 16.465,10 | 14 | 2.673,90 | 58 | 640,23 | 102 | 202,86 | 146 |
| 166.091 | -29 | 15.714 | 15 | 2.578,50 | 59 | 622 | 103 | 198,15 | 147 |
| 156.199 | -28 | 15.120 | 16 | 2.487,10 | 60 | 604,36 | 104 | 193,57 | 148 |
| 146.959 | -27 | 14.324,60 | 17 | 2.399,40 | 61 | 587,31 | 105 | 189,12 | 149 |

## 26.2. Temperature Sensor [F] - Resistance Table

| R[ohm] | F | R[ohm] | F | R[ohm] | F | R[ohm] | F | R[ohm] | F |
|---|---|---|---|---|---|---|---|---|---|
| 3.095.611 | -94 | 138.322 | -15 | 13.682,60 | 64 | 2.315,20 | 144 | 570,82 | 223 |
| 2.851.363 | -92 | 130.243 | -13 | 13.052,80 | 66 | 2.234,70 | 145 | 554,86 | 225 |
| 2.627.981 | -90 | 122.687 | -11 | 12.493,70 | 68 | 2.156,70 | 147 | 539,44 | 226 |
| 2.423.519 | -89 | 115.613 | -9 | 11.943,30 | 70 | 2.082,30 | 149 | 524,51 | 228 |
| 2.236.398 | -87 | 108.991 | -8 | 11.420 | 72 | 2.010,80 | 151 | 510,06 | 230 |
| 2.064.919 | -85 | 102.787 | -6 | 10.922,70 | 73 | 1.942,10 | 153 | 496,08 | 232 |
| 1.907.728 | -83 | 96.974 | -4 | 10.449,90 | 75 | 1.876 | 154 | 482,55 | 234 |
| 1.763.539 | -81 | 91.525 | -2 | 10.000 | 77 | 1.812,60 | 156 | 469,45 | 235 |
| 1.631.173 | -80 | 86.415 | 0 | 9.572 | 79 | 1.751,60 | 158 | 456,76 | 237 |
| 1.509.639 | -78 | 81.621 | 1 | 9.164,70 | 81 | 1.693 | 160 | 444,48 | 239 |
| 1.397.935 | -76 | 77.121 | 3 | 8.777 | 82 | 1.636,63 | 162 | 432,58 | 241 |
| 1.295.239 | -74 | 72.895 | 5 | 8.407,70 | 84 | 1.582,41 | 163 | 421,06 | 243 |
| 1.200.732 | -72 | 68.927 | 7 | 8.056 | 86 | 1.530,28 | 165 | 409,90 | 244 |
| 1.113.744 | -71 | 65.198 | 9 | 7.720,90 | 88 | 1.480,12 | 167 | 399,08 | 246 |
| 1.033.619 | -69 | 61.693 | 10 | 7.401,70 | 90 | 1.431,87 | 169 | 388,59 | 248 |
| 959.789 | -67 | 58.397 | 12 | 7.097,20 | 91 | 1.385,37 | 171 | 378,44 | 250 |
| 891.689 | -65 | 55.298 | 14 | 6.807 | 93 | 1.340,68 | 172 | 368,59 | 252 |
| 828.865 | -63 | 52.380 | 16 | 6.530,10 | 95 | 1.297,64 | 174 | 359,05 | 253 |
| 770.880 | -62 | 49.663 | 18 | 6.266,10 | 97 | 1.256,17 | 176 | 349,79 | 255 |
| 717.310 | -60 | 47.047 | 19 | 6.014,20 | 99 | 1.216,23 | 178 | 340,82 | 257 |
| 667.828 | -58 | 44.610 | 21 | 5.773,70 | 100 | 1.177,75 | 180 | 332,11 | 259 |
| 622.055 | -56 | 42.314,60 | 23 | 5.544,10 | 102 | 1.140,71 | 181 | 323,67 | 261 |
| 579.718 | -54 | 40.149,50 | 25 | 5.324,90 | 104 | 1.104,99 | 183 | 315,48 | 262 |
| 540.530 | -53 | 38.108,50 | 27 | 5.115,60 | 106 | 1.070,58 | 185 | 307,53 | 264 |
| 504.230 | -51 | 36.182,80 | 28 | 4.915,50 | 108 | 1.037,40 | 187 | 299,82 | 266 |
| 470.609 | -49 | 34.366,10 | 30 | 4.724,30 | 109 | 1.005,40 | 189 | 292,34 | 268 |
| 439.445 | -47 | 32.650,80 | 32 | 4.541,60 | 111 | 974,56 | 190 | 285,08 | 270 |
| 410.532 | -45 | 31.030,40 | 34 | 4.366,90 | 113 | 944,81 | 192 | 278,03 | 271 |
| 383.712 | -44 | 29.500,10 | 36 | 4.199,90 | 115 | 916,11 | 194 | 271,19 | 273 |
| 358.806 | -42 | 28.054,20 | 37 | 4.040,10 | 117 | 888,41 | 196 | 264,54 | 275 |
| 335.671 | -40 | 26.687,60 | 39 | 3.887,20 | 118 | 861,70 | 198 | 258,09 | 277 |
| 314.179 | -38 | 25.395,50 | 41 | 3.741,10 | 120 | 835,93 | 199 | 251,82 | 279 |
| 294.193 | -36 | 24.172,70 | 43 | 3.601 | 122 | 811,03 | 201 | 245,74 | 280 |
| 275.605 | -35 | 23.016 | 45 | 3.466,90 | 124 | 786,99 | 203 | 239,82 | 282 |
| 258.307 | -33 | 21.921,70 | 46 | 3.338,60 | 126 | 763,79 | 205 | 234,08 | 284 |
| 242.195 | -31 | 20.885,20 | 48 | 3.215,60 | 127 | 741,38 | 207 | 228,50 | 286 |
| 227.196 | -29 | 19.903,50 | 50 | 3.097,90 | 129 | 719,74 | 208 | 223,08 | 288 |
| 213.219 | -27 | 18.973,60 | 52 | 2.985,10 | 131 | 698,82 | 210 | 217,80 | 289 |
| 200.184 | -26 | 18.092,60 | 54 | 2.876,90 | 133 | 678,63 | 212 | 212,68 | 291 |
| 188.026 | -24 | 17.257,40 | 55 | 2.773,20 | 135 | 659,10 | 214 | 207,70 | 293 |
| 176.683 | -22 | 16.465,10 | 57 | 2.673,90 | 136 | 640,23 | 216 | 202,86 | 295 |
| 166.091 | -20 | 15.714 | 59 | 2.578,50 | 138 | 622 | 217 | 198,15 | 297 |
| 156.199 | -18 | 15.001,20 | 61 | 2.487,10 | 140 | 604,36 | 219 | 193,57 | 298 |
| 146.959 | -17 | 14.324,60 | 63 | 2.399,40 | 142 | 587,31 | 221 | 189,12 | 300 |

## 26.3. Temperature [°C] – Pressure[Bar] Table R134a

| Bar | °C | Bar | °C | Bar | °C | Bar | °C | Bar | °C | Bar | °C | Bar | °C | Bar | °C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -0,9 | -67,34 | 2,3 | 3,35 | 5,5 | 24,22 | 8,7 | 38,30 | 11,9 | 49,27 | 15,1 | 58,41 | 18,3 | 66,32 | 21,5 | 73,35 |
| -0,8 | -56,75 | 2,4 | 4,20 | 5,6 | 24,73 | 8,8 | 38,68 | 12,0 | 49,58 | 15,2 | 58,67 | 18,4 | 66,55 | 21,6 | 73,55 |
| -0,7 | -49,95 | 2,5 | 5,03 | 5,7 | 25,24 | 8,9 | 39,06 | 12,1 | 49,89 | 15,3 | 58,93 | 18,5 | 66,78 | 21,7 | 73,76 |
| -0,6 | -44,80 | 2,6 | 5,84 | 5,8 | 25,74 | 9,0 | 39,43 | 12,2 | 50,19 | 15,4 | 59,19 | 18,6 | 67,01 | 21,8 | 73,97 |
| -0,5 | -40,62 | 2,7 | 6,64 | 5,9 | 26,23 | 9,1 | 39,81 | 12,3 | 50,50 | 15,5 | 59,45 | 18,7 | 67,24 | 21,9 | 74,17 |
| -0,4 | -37,07 | 2,8 | 7,42 | 6,0 | 26,72 | 9,2 | 40,17 | 12,4 | 50,80 | 15,6 | 59,71 | 18,8 | 67,47 | 22,0 | 74,38 |
| -0,3 | -33,97 | 2,9 | 8,18 | 6,1 | 27,20 | 9,3 | 40,54 | 12,5 | 51,10 | 15,7 | 59,97 | 18,9 | 67,70 | 22,1 | 74,58 |
| -0,2 | -31,21 | 3,0 | 8,93 | 6,2 | 27,68 | 9,4 | 40,90 | 12,6 | 51,40 | 15,8 | 60,23 | 19,0 | 67,92 | 22,2 | 74,79 |
| -0,1 | -28,71 | 3,1 | 9,67 | 6,3 | 28,16 | 9,5 | 41,27 | 12,7 | 51,70 | 15,9 | 60,48 | 19,1 | 68,15 | 22,3 | 74,99 |
| 0,0 | -26,43 | 3,2 | 10,39 | 6,4 | 28,62 | 9,6 | 41,63 | 12,8 | 51,99 | 16,0 | 60,74 | 19,2 | 68,37 | 22,4 | 75,19 |
| 0,1 | -24,32 | 3,3 | 11,10 | 6,5 | 29,09 | 9,7 | 41,98 | 12,9 | 52,29 | 16,1 | 60,99 | 19,3 | 68,60 | 22,5 | 75,40 |
| 0,2 | -22,36 | 3,4 | 11,79 | 6,6 | 29,55 | 9,8 | 42,34 | 13,0 | 52,58 | 16,2 | 61,24 | 19,4 | 68,82 | 22,6 | 75,60 |
| 0,3 | -20,52 | 3,5 | 12,48 | 6,7 | 30,00 | 9,9 | 42,69 | 13,1 | 52,87 | 16,3 | 61,49 | 19,5 | 69,04 | 22,7 | 75,80 |
| 0,4 | -18,79 | 3,6 | 13,15 | 6,8 | 30,45 | 10,0 | 43,04 | 13,2 | 53,16 | 16,4 | 61,74 | 19,6 | 69,27 | 22,8 | 76,00 |
| 0,5 | -17,16 | 3,7 | 13,81 | 6,9 | 30,90 | 10,1 | 43,38 | 13,3 | 53,45 | 16,5 | 61,99 | 19,7 | 69,49 | 22,9 | 76,20 |
| 0,6 | -15,61 | 3,8 | 14,46 | 7,0 | 31,34 | 10,2 | 43,73 | 13,4 | 53,74 | 16,6 | 62,24 | 19,8 | 69,71 | 23,0 | 76,40 |
| 0,7 | -14,14 | 3,9 | 15,10 | 7,1 | 31,78 | 10,3 | 44,07 | 13,5 | 54,02 | 16,7 | 62,49 | 19,9 | 69,93 | 23,1 | 76,60 |
| 0,8 | -12,73 | 4,0 | 15,74 | 7,2 | 32,22 | 10,4 | 44,41 | 13,6 | 54,30 | 16,8 | 62,74 | 20,0 | 70,15 | 23,2 | 76,80 |
| 0,9 | -11,38 | 4,1 | 16,36 | 7,3 | 32,65 | 10,5 | 44,75 | 13,7 | 54,59 | 16,9 | 62,98 | 20,1 | 70,36 | 23,3 | 76,99 |
| 1,0 | -10,09 | 4,2 | 16,97 | 7,4 | 33,07 | 10,6 | 45,08 | 13,8 | 54,87 | 17,0 | 63,23 | 20,2 | 70,58 | 23,4 | 77,19 |
| 1,1 | -8,84 | 4,3 | 17,57 | 7,5 | 33,49 | 10,7 | 45,42 | 13,9 | 55,15 | 17,1 | 63,47 | 20,3 | 70,80 | 23,5 | 77,39 |
| 1,2 | -7,64 | 4,4 | 18,17 | 7,6 | 33,91 | 10,8 | 45,75 | 14,0 | 55,43 | 17,2 | 63,71 | 20,4 | 71,01 | 23,6 | 77,58 |
| 1,3 | -6,49 | 4,5 | 18,75 | 7,7 | 34,33 | 10,9 | 46,08 | 14,1 | 55,70 | 17,3 | 63,95 | 20,5 | 71,23 | 23,7 | 77,78 |
| 1,4 | -5,37 | 4,6 | 19,33 | 7,8 | 34,74 | 11,0 | 46,41 | 14,2 | 55,98 | 17,4 | 64,19 | 20,6 | 71,44 | 23,8 | 77,97 |
| 1,5 | -4,29 | 4,7 | 19,90 | 7,9 | 35,15 | 11,1 | 46,73 | 14,3 | 56,25 | 17,5 | 64,43 | 20,7 | 71,66 | 23,9 | 78,17 |
| 1,6 | -3,24 | 4,8 | 20,47 | 8,0 | 35,55 | 11,2 | 47,06 | 14,4 | 56,53 | 17,6 | 64,67 | 20,8 | 71,87 | 24,0 | 78,36 |
| 1,7 | -2,22 | 4,9 | 21,02 | 8,1 | 35,96 | 11,3 | 47,38 | 14,5 | 56,80 | 17,7 | 64,91 | 20,9 | 72,08 | 24,1 | 78,55 |
| 1,8 | -1,23 | 5,0 | 21,57 | 8,2 | 36,35 | 11,4 | 47,70 | 14,6 | 57,07 | 17,8 | 65,15 | 21,0 | 72,30 | 24,2 | 78,75 |
| 1,9 | -0,26 | 5,1 | 22,12 | 8,3 | 36,75 | 11,5 | 48,02 | 14,7 | 57,34 | 17,9 | 65,38 | 21,1 | 72,51 | 24,3 | 78,94 |
| 2,0 | 0,67 | 5,2 | 22,65 | 8,4 | 37,14 | 11,6 | 48,33 | 14,8 | 57,61 | 18,0 | 65,62 | 21,2 | 72,72 | 24,4 | 79,13 |
| 2,1 | 1,59 | 5,3 | 23,18 | 8,5 | 37,53 | 11,7 | 48,65 | 14,9 | 57,88 | 18,1 | 65,85 | 21,3 | 72,93 | 24,5 | 79,32 |
| 2,2 | 2,48 | 5,4 | 23,70 | 8,6 | 37,92 | 11,8 | 48,96 | 15,0 | 58,14 | 18,2 | 66,09 | 21,4 | 73,14 | 24,6 | 79,51 |

## 26.4. Temperature [F] – Pressure[Psi] Table R134a

| Psi | F | Psi | F | Psi | F | Psi | F | Psi | F | Psi | F | Psi | F | Psi | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -13,05 | -89,21 | 33,36 | 38,03 | 79,77 | 75,60 | 126,18 | 100,94 | 172,59 | 120,69 | 219,01 | 137,14 | 265,42 | 151,38 | 311,83 | 164,03 |
| -11,60 | -70,15 | 34,81 | 39,56 | 81,22 | 76,51 | 127,63 | 101,62 | 174,05 | 121,24 | 220,46 | 137,61 | 266,87 | 151,79 | 313,28 | 164,39 |
| -10,15 | -57,91 | 36,26 | 41,05 | 82,67 | 77,43 | 129,08 | 102,31 | 175,50 | 121,80 | 221,91 | 138,07 | 268,32 | 152,20 | 314,73 | 164,77 |
| -8,70 | -48,64 | 37,71 | 42,51 | 84,12 | 78,33 | 130,53 | 102,97 | 176,95 | 122,34 | 223,36 | 138,54 | 269,77 | 152,62 | 316,18 | 165,15 |
| -7,25 | -41,12 | 39,16 | 43,95 | 85,57 | 79,21 | 131,98 | 103,66 | 178,40 | 122,90 | 224,81 | 139,01 | 271,22 | 153,03 | 317,63 | 165,51 |
| -5,80 | -34,73 | 40,61 | 45,36 | 87,02 | 80,10 | 133,43 | 104,31 | 179,85 | 123,44 | 226,26 | 139,48 | 272,67 | 153,45 | 319,08 | 165,88 |
| -4,35 | -29,15 | 42,06 | 46,72 | 88,47 | 80,96 | 134,89 | 104,97 | 181,30 | 123,98 | 227,71 | 139,95 | 274,12 | 153,86 | 320,53 | 166,24 |
| -2,90 | -24,18 | 43,51 | 48,07 | 89,92 | 81,82 | 136,34 | 105,62 | 182,75 | 124,52 | 229,16 | 140,41 | 275,57 | 154,26 | 321,98 | 166,62 |
| -1,45 | -19,68 | 44,96 | 49,41 | 91,37 | 82,69 | 137,79 | 106,29 | 184,20 | 125,06 | 230,61 | 140,86 | 277,02 | 154,67 | 323,43 | 166,98 |
| 0 | -15,57 | 46,41 | 50,70 | 92,82 | 83,52 | 139,24 | 106,93 | 185,65 | 125,58 | 232,06 | 141,33 | 278,47 | 155,07 | 324,88 | 167,34 |
| 1,45 | -11,78 | 47,86 | 51,98 | 94,27 | 84,36 | 140,69 | 107,56 | 187,10 | 126,12 | 233,51 | 141,78 | 279,92 | 155,48 | 326,33 | 167,72 |
| 2,90 | -8,25 | 49,31 | 53,22 | 95,72 | 85,19 | 142,14 | 108,21 | 188,55 | 126,64 | 234,96 | 142,23 | 281,37 | 155,88 | 327,79 | 168,08 |
| 4,35 | -4,94 | 50,76 | 54,46 | 97,18 | 86 | 143,59 | 108,84 | 190 | 127,17 | 236,41 | 142,68 | 282,82 | 156,27 | 329,24 | 168,44 |
| 5,80 | -1,82 | 52,21 | 55,67 | 98,63 | 86,81 | 145,04 | 109,47 | 191,45 | 127,69 | 237,86 | 143,13 | 284,27 | 156,69 | 330,69 | 168,80 |
| 7,25 | 1,11 | 53,66 | 56,86 | 100,08 | 87,62 | 146,49 | 110,08 | 192,90 | 128,21 | 239,31 | 143,58 | 285,72 | 157,08 | 332,14 | 169,16 |
| 8,70 | 3,90 | 55,11 | 58,03 | 101,53 | 88,41 | 147,94 | 110,71 | 194,35 | 128,73 | 240,76 | 144,03 | 287,17 | 157,48 | 333,59 | 169,52 |
| 10,15 | 6,55 | 56,56 | 59,18 | 102,98 | 89,20 | 149,39 | 111,33 | 195,80 | 129,24 | 242,21 | 144,48 | 288,63 | 157,87 | 335,04 | 169,88 |
| 11,60 | 9,09 | 58,02 | 60,33 | 104,43 | 90 | 150,84 | 111,94 | 197,25 | 129,74 | 243,66 | 144,93 | 290,08 | 158,27 | 336,49 | 170,24 |
| 13,05 | 11,52 | 59,47 | 61,45 | 105,88 | 90,77 | 152,29 | 112,55 | 198,70 | 130,26 | 245,11 | 145,36 | 291,53 | 158,65 | 337,94 | 170,58 |
| 14,50 | 13,84 | 60,92 | 62,55 | 107,33 | 91,53 | 153,74 | 113,14 | 200,15 | 130,77 | 246,56 | 145,81 | 292,98 | 159,04 | 339,39 | 170,94 |
| 15,95 | 16,09 | 62,37 | 63,63 | 108,78 | 92,28 | 155,19 | 113,76 | 201,60 | 131,27 | 248,01 | 146,25 | 294,43 | 159,44 | 340,84 | 171,30 |
| 17,40 | 18,25 | 63,82 | 64,71 | 110,23 | 93,04 | 156,64 | 114,35 | 203,05 | 131,77 | 249,46 | 146,68 | 295,88 | 159,82 | 342,29 | 171,64 |
| 18,85 | 20,32 | 65,27 | 65,75 | 111,68 | 93,79 | 158,09 | 114,94 | 204,50 | 132,26 | 250,92 | 147,11 | 297,33 | 160,21 | 343,74 | 172 |
| 20,31 | 22,33 | 66,72 | 66,79 | 113,13 | 94,53 | 159,54 | 115,54 | 205,95 | 132,76 | 252,37 | 147,54 | 298,78 | 160,59 | 345,19 | 172,35 |
| 21,76 | 24,28 | 68,17 | 67,82 | 114,58 | 95,27 | 160,99 | 116,11 | 207,40 | 133,25 | 253,82 | 147,97 | 300,23 | 160,99 | 346,64 | 172,71 |
| 23,21 | 26,17 | 69,62 | 68,85 | 116,03 | 95,99 | 162,44 | 116,71 | 208,85 | 133,75 | 255,27 | 148,41 | 301,68 | 161,37 | 348,09 | 173,05 |
| 24,66 | 28 | 71,07 | 69,84 | 117,48 | 96,73 | 163,89 | 117,28 | 210,30 | 134,24 | 256,72 | 148,84 | 303,13 | 161,74 | 349,54 | 173,39 |
| 26,11 | 29,79 | 72,52 | 70,83 | 118,93 | 97,43 | 165,34 | 117,86 | 211,76 | 134,73 | 258,17 | 149,27 | 304,58 | 162,14 | 350,99 | 173,75 |
| 27,56 | 31,53 | 73,97 | 71,82 | 120,38 | 98,15 | 166,79 | 118,44 | 213,21 | 135,21 | 259,62 | 149,68 | 306,03 | 162,52 | 352,44 | 174,09 |
| 29,01 | 33,21 | 75,42 | 72,77 | 121,83 | 98,85 | 168,24 | 118,99 | 214,66 | 135,70 | 261,07 | 150,12 | 307,48 | 162,90 | 353,89 | 174,43 |
| 30,46 | 34,86 | 76,87 | 73,72 | 123,28 | 99,55 | 169,69 | 119,57 | 216,11 | 136,18 | 262,52 | 150,53 | 308,93 | 163,27 | 355,34 | 174,78 |
| 31,91 | 36,46 | 78,32 | 74,66 | 124,73 | 100,26 | 171,14 | 120,13 | 217,56 | 136,65 | 263,97 | 150,96 | 310,38 | 163,65 | 356,79 | 175,12 |

## 26.5. Airexchange Sensor table

| Vout [Volt] | Air exchange [$m^3/h$] |
|---|---|
| 0,0 | 0,0 |
| 0,1 | 9,9 |
| 0,2 | 19,9 |
| 0,3 | 29,9 |
| 0,4 | 39,7 |
| 0,5 | 49,4 |
| 0,6 | 58,8 |
| 0,7 | 68,0 |
| 0,8 | 76,9 |
| 0,9 | 85,4 |
| 1,0 | 93,5 |
| 1,1 | 101,2 |
| 1,2 | 108,5 |
| 1,3 | 115,4 |
| 1,4 | 121,8 |
| 1,5 | 127,8 |
| 1,6 | 133,3 |
| 1,7 | 138,4 |
| 1,8 | 143,1 |
| 1,9 | 147,3 |
| 2,0 | 151,3 |
| 2,1 | 154,9 |
| 2,2 | 158,2 |
| 2,3 | 161,2 |
| 2,4 | 164,1 |
| 2,5 | 166,8 |
| 2,6 | 169,5 |
| 2,7 | 172,1 |
| 2,8 | 174,9 |
| 2,9 | 177,8 |
| 3,0 | 181,0 |
| 3,1 | 184,5 |
| 3,2 | 188,4 |
| 3,3 | 193,0 |
| 3,4 | 198,1 |
| 3,5 | 204,1 |
| 3,6 | 211,0 |
| 3,7 | 218,9 |

## 26.6. Relative Humidity Sensor table %RH - Voltage

| Relative humidity % | Voltage |
|---|---|
| 0 | 0 |
| 10 | 1 |
| 20 | 2 |
| 30 | 3 |
| 40 | 4 |
| 50 | 5 |
| 60 | 6 |
| 70 | 7 |
| 80 | 8 |
| 90 | 9 |
| 100 | 10 |

## 26.7. Voltage – Pressure Table, -1 Bar – 12 Bar

Vcc = 5V.

| Voltage | Bar | Voltage | Bar |
|---|---|---|---|
| 0,50 | -1,000 | 2,55 | 5,663 |
| 0,55 | -0,838 | 2,60 | 5,825 |
| 0,60 | -0,675 | 2,65 | 5,988 |
| 0,65 | -0,513 | 2,70 | 6,150 |
| 0,70 | -0,350 | 2,75 | 6,313 |
| 0,75 | -0,188 | 2,80 | 6,475 |
| 0,80 | -0,025 | 2,85 | 6,638 |
| 0,85 | 0,138 | 2,90 | 6,800 |
| 0,90 | 0,300 | 2,95 | 6,963 |
| 0,95 | 0,463 | 3,00 | 7,125 |
| 1,00 | 0,625 | 3,05 | 7,288 |
| 1,05 | 0,788 | 3,10 | 7,450 |
| 1,10 | 0,950 | 3,15 | 7,613 |
| 1,15 | 1,113 | 3,20 | 7,775 |
| 1,20 | 1,275 | 3,25 | 7,938 |
| 1,25 | 1,438 | 3,30 | 8,100 |
| 1,30 | 1,600 | 3,35 | 8,263 |
| 1,35 | 1,763 | 3,40 | 8,425 |
| 1,40 | 1,925 | 3,45 | 8,588 |
| 1,45 | 2,088 | 3,50 | 8,750 |
| 1,50 | 2,250 | 3,55 | 8,913 |
| 1,55 | 2,413 | 3,60 | 9,075 |
| 1,60 | 2,575 | 3,65 | 9,238 |
| 1,65 | 2,738 | 3,70 | 9,400 |
| 1,70 | 2,900 | 3,75 | 9,563 |
| 1,75 | 3,063 | 3,80 | 9,725 |
| 1,80 | 3,225 | 3,85 | 9,888 |
| 1,85 | 3,388 | 3,90 | 10,050 |
| 1,90 | 3,550 | 3,95 | 10,213 |
| 1,95 | 3,713 | 4,00 | 10,375 |
| 2,00 | 3,875 | 4,05 | 10,538 |
| 2,05 | 4,038 | 4,10 | 10,700 |
| 2,10 | 4,200 | 4,15 | 10,863 |
| 2,15 | 4,363 | 4,20 | 11,025 |
| 2,20 | 4,525 | 4,25 | 11,188 |
| 2,25 | 4,688 | 4,30 | 11,350 |
| 2,30 | 4,850 | 4,35 | 11,513 |
| 2,35 | 5,013 | 4,40 | 11,675 |
| 2,40 | 5,175 | 4,45 | 11,838 |
| 2,45 | 5,338 | 4,50 | 12,000 |
| 2,50 | 5,500 | | |

## 26.8. Voltage – Pressure Table, -14,5 Psi – 174Psi

Vcc = 5V.

| Voltage | Psi | Voltage | Psi |
|---|---|---|---|
| 0,50 | -14,50 | 2,55 | 82,13 |
| 0,55 | -12,15 | 2,60 | 84,48 |
| 0,60 | -9,79 | 2,65 | 86,85 |
| 0,65 | -7,44 | 2,70 | 89,20 |
| 0,70 | -5,08 | 2,75 | 91,56 |
| 0,75 | -2,73 | 2,80 | 93,91 |
| 0,80 | -0,36 | 2,85 | 96,28 |
| 0,85 | 2,00 | 2,90 | 98,63 |
| 0,90 | 4,35 | 2,95 | 100,99 |
| 0,95 | 6,72 | 3,00 | 103,34 |
| 1,00 | 9,06 | 3,05 | 105,70 |
| 1,05 | 11,43 | 3,10 | 108,05 |
| 1,10 | 13,78 | 3,15 | 110,42 |
| 1,15 | 16,14 | 3,20 | 112,77 |
| 1,20 | 18,49 | 3,25 | 115,13 |
| 1,25 | 20,86 | 3,30 | 117,48 |
| 1,30 | 23,21 | 3,35 | 119,84 |
| 1,35 | 25,57 | 3,40 | 122,19 |
| 1,40 | 27,92 | 3,45 | 124,56 |
| 1,45 | 30,28 | 3,50 | 126,91 |
| 1,50 | 32,63 | 3,55 | 129,27 |
| 1,55 | 35,00 | 3,60 | 131,62 |
| 1,60 | 37,35 | 3,65 | 133,99 |
| 1,65 | 39,71 | 3,70 | 136,34 |
| 1,70 | 42,06 | 3,75 | 138,70 |
| 1,75 | 44,43 | 3,80 | 141,05 |
| 1,80 | 46,77 | 3,85 | 143,41 |
| 1,85 | 49,14 | 3,90 | 145,76 |
| 1,90 | 51,49 | 3,95 | 148,13 |
| 1,95 | 53,85 | 4,00 | 150,48 |
| 2,00 | 56,20 | 4,05 | 152,84 |
| 2,05 | 58,57 | 4,10 | 155,19 |
| 2,10 | 60,92 | 4,15 | 157,55 |
| 2,15 | 63,28 | 4,20 | 159,90 |
| 2,20 | 65,63 | 4,25 | 162,27 |
| 2,25 | 67,99 | 4,30 | 164,62 |
| 2,30 | 70,34 | 4,35 | 166,98 |
| 2,35 | 72,71 | 4,40 | 169,33 |
| 2,40 | 75,06 | 4,45 | 171,70 |
| 2,45 | 77,42 | 4,50 | 174,05 |
| 2,50 | 79,77 | | |

## 26.9. Voltage – Pressure Table, 0 Bar – 32 Bar

Vcc = 5V.

| Voltage | Bar | Voltage | Bar |
|---|---|---|---|
| 0,50 | 0,00 | 2,55 | 16,40 |
| 0,55 | 0,40 | 2,60 | 16,80 |
| 0,60 | 0,80 | 2,65 | 17,20 |
| 0,65 | 1,20 | 2,70 | 17,60 |
| 0,70 | 1,60 | 2,75 | 18,00 |
| 0,75 | 2,00 | 2,80 | 18,40 |
| 0,80 | 2,40 | 2,85 | 18,80 |
| 0,85 | 2,80 | 2,90 | 19,20 |
| 0,90 | 3,20 | 2,95 | 19,60 |
| 0,95 | 3,60 | 3,00 | 20,00 |
| 1,00 | 4,00 | 3,05 | 20,40 |
| 1,05 | 4,40 | 3,10 | 20,80 |
| 1,10 | 4,80 | 3,15 | 21,20 |
| 1,15 | 5,20 | 3,20 | 21,60 |
| 1,20 | 5,60 | 3,25 | 22,00 |
| 1,25 | 6,00 | 3,30 | 22,40 |
| 1,30 | 6,40 | 3,35 | 22,80 |
| 1,35 | 6,80 | 3,40 | 23,20 |
| 1,40 | 7,20 | 3,45 | 23,60 |
| 1,45 | 7,60 | 3,50 | 24,00 |
| 1,50 | 8,00 | 3,55 | 24,40 |
| 1,55 | 8,40 | 3,60 | 24,80 |
| 1,60 | 8,80 | 3,65 | 25,20 |
| 1,65 | 9,20 | 3,70 | 25,60 |
| 1,70 | 9,60 | 3,75 | 26,00 |
| 1,75 | 10,00 | 3,80 | 26,40 |
| 1,80 | 10,40 | 3,85 | 26,80 |
| 1,85 | 10,80 | 3,90 | 27,20 |
| 1,90 | 11,20 | 3,95 | 27,60 |
| 1,95 | 11,60 | 4,00 | 28,00 |
| 2,00 | 12,00 | 4,05 | 28,40 |
| 2,05 | 12,40 | 4,10 | 28,80 |
| 2,10 | 12,80 | 4,15 | 29,20 |
| 2,15 | 13,20 | 4,20 | 29,60 |
| 2,20 | 13,60 | 4,25 | 30,00 |
| 2,25 | 14,00 | 4,30 | 30,40 |
| 2,30 | 14,40 | 4,35 | 30,80 |
| 2,35 | 14,80 | 4,40 | 31,20 |
| 2,40 | 15,20 | 4,45 | 31,60 |
| 2,45 | 15,60 | 4,50 | 32,00 |
| 2,50 | 16,00 | | |

## 26.10. Voltage – Pressure Table, 0 Psi – 464 Psi

Vcc = 5V.

| Voltage | Psi | Voltage | Psi |
|---|---|---|---|
| 0,50 | 0,00 | 2,55 | 237,86 |
| 0,55 | 5,80 | 2,60 | 243,66 |
| 0,60 | 11,60 | 2,65 | 249,46 |
| 0,65 | 17,40 | 2,70 | 255,27 |
| 0,70 | 23,21 | 2,75 | 261,07 |
| 0,75 | 29,01 | 2,80 | 266,87 |
| 0,80 | 34,81 | 2,85 | 272,67 |
| 0,85 | 40,61 | 2,90 | 278,47 |
| 0,90 | 46,41 | 2,95 | 284,27 |
| 0,95 | 52,21 | 3,00 | 290,08 |
| 1,00 | 58,02 | 3,05 | 295,88 |
| 1,05 | 63,82 | 3,10 | 301,68 |
| 1,10 | 69,62 | 3,15 | 307,48 |
| 1,15 | 75,42 | 3,20 | 313,28 |
| 1,20 | 81,22 | 3,25 | 319,08 |
| 1,25 | 87,02 | 3,30 | 324,88 |
| 1,30 | 92,82 | 3,35 | 330,69 |
| 1,35 | 98,63 | 3,40 | 336,49 |
| 1,40 | 104,43 | 3,45 | 342,29 |
| 1,45 | 110,23 | 3,50 | 348,09 |
| 1,50 | 116,03 | 3,55 | 353,89 |
| 1,55 | 121,83 | 3,60 | 359,69 |
| 1,60 | 127,63 | 3,65 | 365,50 |
| 1,65 | 133,43 | 3,70 | 371,30 |
| 1,70 | 139,24 | 3,75 | 377,10 |
| 1,75 | 145,04 | 3,80 | 382,90 |
| 1,80 | 150,84 | 3,85 | 388,70 |
| 1,85 | 156,64 | 3,90 | 394,50 |
| 1,90 | 162,44 | 3,95 | 400,30 |
| 1,95 | 168,24 | 4,00 | 406,11 |
| 2,00 | 174,05 | 4,05 | 411,91 |
| 2,05 | 179,85 | 4,10 | 417,71 |
| 2,10 | 185,65 | 4,15 | 423,51 |
| 2,15 | 191,45 | 4,20 | 429,31 |
| 2,20 | 197,25 | 4,25 | 435,11 |
| 2,25 | 203,05 | 4,30 | 440,91 |
| 2,30 | 208,85 | 4,35 | 446,72 |
| 2,35 | 214,66 | 4,40 | 452,52 |
| 2,40 | 220,46 | 4,45 | 458,32 |
| 2,45 | 226,26 | 4,50 | 464,12 |
| 2,50 | 232,06 | | |

## 26.11. Temperature Sensor [°C] - Voltage Table

Temperature sensors except for reference temperature sensor.

Vcc = 5V.

| °C | Voltage | °C | Voltage | °C | Voltage |
|---|---|---|---|---|---|
| -40 | 4,55 | -9 | 3,07 | 22 | 1,29 |
| -39 | 4,52 | -8 | 3,00 | 23 | 1,24 |
| -38 | 4,50 | -7 | 2,94 | 24 | 1,20 |
| -37 | 4,47 | -6 | 2,87 | 25 | 1,16 |
| -36 | 4,43 | -5 | 2,81 | 26 | 1,12 |
| -35 | 4,40 | -4 | 2,74 | 27 | 1,09 |
| -34 | 4,37 | -3 | 2,68 | 28 | 1,05 |
| -33 | 4,33 | -2 | 2,62 | 29 | 1,02 |
| -32 | 4,29 | -1 | 2,55 | 30 | 0,98 |
| -31 | 4,25 | 0 | 2,49 | 31 | 0,95 |
| -30 | 4,21 | 1 | 2,42 | 32 | 0,92 |
| -29 | 4,17 | 2 | 2,36 | 33 | 0,88 |
| -28 | 4,13 | 3 | 2,30 | 34 | 0,86 |
| -27 | 4,08 | 4 | 2,24 | 35 | 0,83 |
| -26 | 4,04 | 5 | 2,17 | 36 | 0,80 |
| -25 | 3,99 | 6 | 2,11 | 37 | 0,77 |
| -24 | 3,94 | 7 | 2,05 | 38 | 0,74 |
| -23 | 3,89 | 8 | 2,00 | 39 | 0,72 |
| -22 | 3,84 | 9 | 1,94 | 40 | 0,69 |
| -21 | 3,78 | 10 | 1,88 | 41 | 0,67 |
| -20 | 3,73 | 11 | 1,83 | 42 | 0,65 |
| -19 | 3,67 | 12 | 1,77 | 43 | 0,63 |
| -18 | 3,62 | 13 | 1,72 | 44 | 0,60 |
| -17 | 3,56 | 14 | 1,66 | 45 | 0,58 |
| -16 | 3,50 | 15 | 1,61 | 46 | 0,56 |
| -15 | 3,44 | 16 | 1,56 | 47 | 0,55 |
| -14 | 3,38 | 17 | 1,51 | 48 | 0,53 |
| -13 | 3,32 | 18 | 1,47 | 49 | 0,51 |
| -12 | 3,26 | 19 | 1,42 | 50 | 0,49 |
| -11 | 3,19 | 20 | 1,37 | | |
| -10 | 3,13 | 21 | 1,33 | | |

## 26.12. Temperature Sensor [F] - Voltage Table

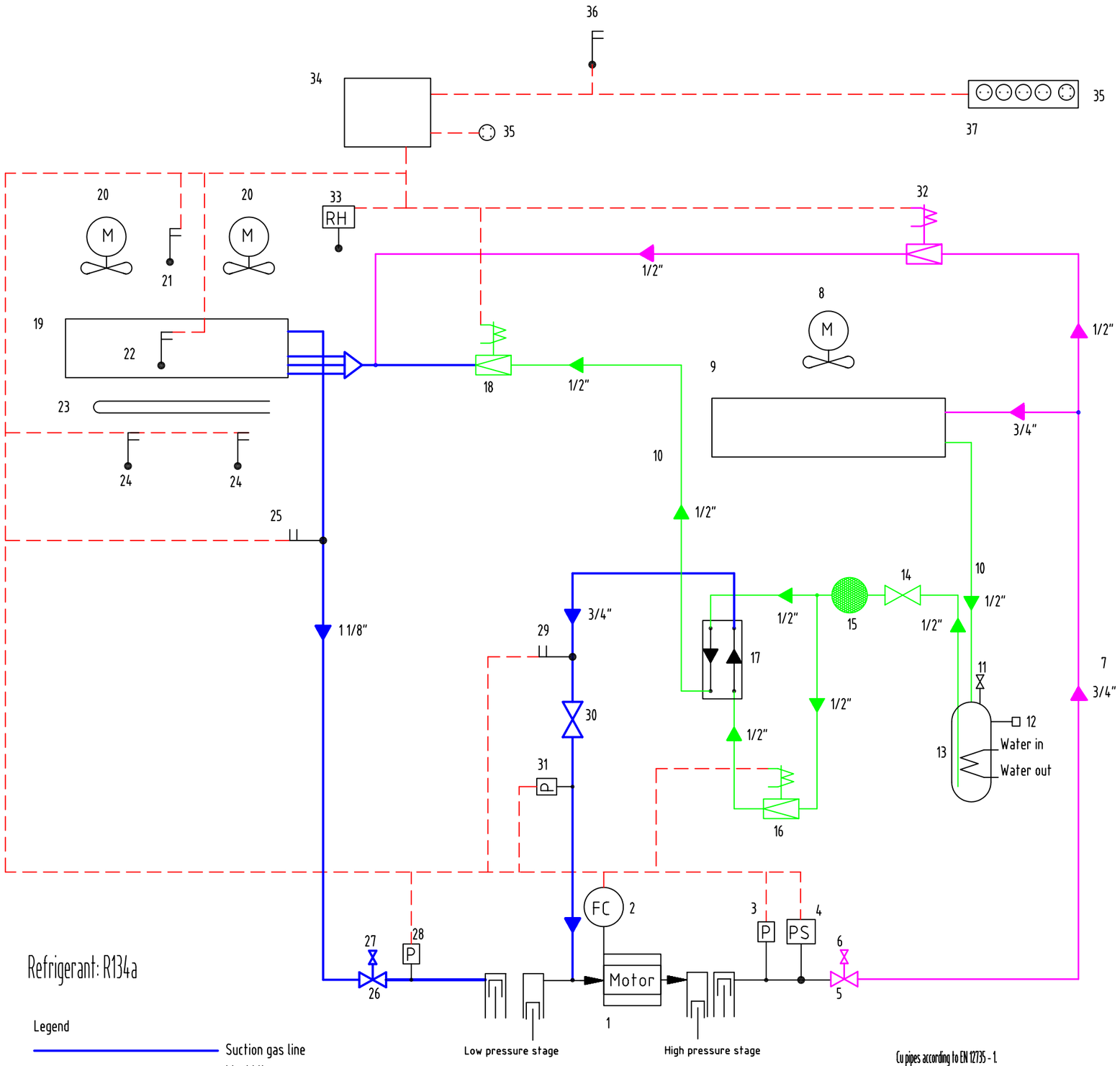
Temperature sensors except for reference temperature sensor.

Vcc = 5V.

| F | Voltage | F | Voltage | F | Voltage |
|---|---|---|---|---|---|
| -40,0 | 4,55 | 15,8 | 3,07 | 71,6 | 1,29 |
| -38,2 | 4,52 | 17,6 | 3,00 | 73,4 | 1,24 |
| -36,4 | 4,50 | 19,4 | 2,94 | 75,2 | 1,20 |
| -34,6 | 4,47 | 21,2 | 2,87 | 77,0 | 1,16 |
| -32,8 | 4,43 | 23,0 | 2,81 | 78,8 | 1,12 |
| -31,0 | 4,40 | 24,8 | 2,74 | 80,6 | 1,09 |
| -29,2 | 4,37 | 26,6 | 2,68 | 82,4 | 1,05 |
| -27,4 | 4,33 | 28,4 | 2,62 | 84,2 | 1,02 |
| -25,6 | 4,29 | 30,2 | 2,55 | 86,0 | 0,98 |
| -23,8 | 4,25 | 32,0 | 2,49 | 87,8 | 0,95 |
| -22,0 | 4,21 | 33,8 | 2,42 | 89,6 | 0,92 |
| -20,2 | 4,17 | 35,6 | 2,36 | 91,4 | 0,88 |
| -18,4 | 4,13 | 37,4 | 2,30 | 93,2 | 0,86 |
| -16,6 | 4,08 | 39,2 | 2,24 | 95,0 | 0,83 |
| -14,8 | 4,04 | 41,0 | 2,17 | 96,8 | 0,80 |
| -13,0 | 3,99 | 42,8 | 2,11 | 98,6 | 0,77 |
| -11,2 | 3,94 | 44,6 | 2,05 | 100,4 | 0,74 |
| -9,4 | 3,89 | 46,4 | 2,00 | 102,2 | 0,72 |
| -7,6 | 3,84 | 48,2 | 1,94 | 104,0 | 0,69 |
| -5,8 | 3,78 | 50,0 | 1,88 | 105,8 | 0,67 |
| -4,0 | 3,73 | 51,8 | 1,83 | 107,6 | 0,65 |
| -2,2 | 3,67 | 53,6 | 1,77 | 109,4 | 0,63 |
| -0,4 | 3,62 | 55,4 | 1,72 | 111,2 | 0,60 |
| 1,4 | 3,56 | 57,2 | 1,66 | 113,0 | 0,58 |
| 3,2 | 3,50 | 59,0 | 1,61 | 114,8 | 0,56 |
| 5,0 | 3,44 | 60,8 | 1,56 | 116,6 | 0,55 |
| 6,8 | 3,38 | 62,6 | 1,51 | 118,4 | 0,53 |
| 8,6 | 3,32 | 64,4 | 1,47 | 120,2 | 0,51 |
| 10,4 | 3,26 | 66,2 | 1,42 | 122,0 | 0,49 |
| 12,2 | 3,19 | 68,0 | 1,37 | | |
| 14,0 | 3,13 | 69,8 | 1,33 | | |

## 26.13. Tightening torques

| Description | Tightening torque ± 5% [Nm] |
|---|---|
| Hexagon M5 bolt + nut | 5,5 |
| Hexagon M6 bolt + nut | 9 |
| Hexagon M8 bolt + nut | 23 |
| Hexagon M10 bolt + nut | 47 |
| Hexagon socket countersunk head M6 | 9 |
| Hexagon socket countersunk head M8 | 23,5 |
| Flare nut ½" brass | 70 |
| Schräder valve, straight | 24 |
| Schräder valve, angle | 24 |
| Wing screw | 5 |
| Slotted cheese head screw M3 | 1 |
| Slotted cheese head screw M6 | 9 |
| Pressure transmitter | 18 |
| Pressure switch | 14 |
| Suction valve bolts | 50 |
| Flange for suction pipe | 50 |
| Discharge valve bolts | 30 |
| Intermediate valve bolts | 30 |




1 Compressor
2 Frequency converter
3 Discharge pressure transmitter
4 High pressure transmitter
5 Discharge service valve
6 Evacuation point
7 Discharge line
8 Condenser fan
9 Air cooled condenser
10 Liquid line
11 Evacuation point
12 Fusible plug
13 Receiver / water cooled condenser
14 Service valve, economizer
15 Drying filter
16 Electronical expansion valve, economizer
17 Economizer
18 Electronical expansion valve, evaporator
19 Evaporator
20 Evaporator fan
21 Return air sensor
22 Evaporator temperature sensor
23 Drying filter
24 Supply air sensor
25 Suction temperature sensor
26 Suction service valve
27 Evacuation point
28 Suction pressure transmitter
29 Economizer suction temperature sensor
30 Economizer suction service valve
31 Intermediate pressure transmitter
32 Hot gas valve
33 Humidity sensor
34 Controller
35 communication slot
36 Ambient temperature sensor
37 Plug for cargo temperature sensor

Cu pipes according to EN 12735 - 1

| Pipe size | Wall dimension in mm |
|---|---|
| 1/2" | 0,8 |
| 3/4" | 0,9 |
| 1 1/8" | 1,02 |

| Rev. | Date | Name | Description |
|---|---|---|---|
| | 16-09-04 | | Item list renumbered, pipesize added. 2 - stage by-pass deleted. |

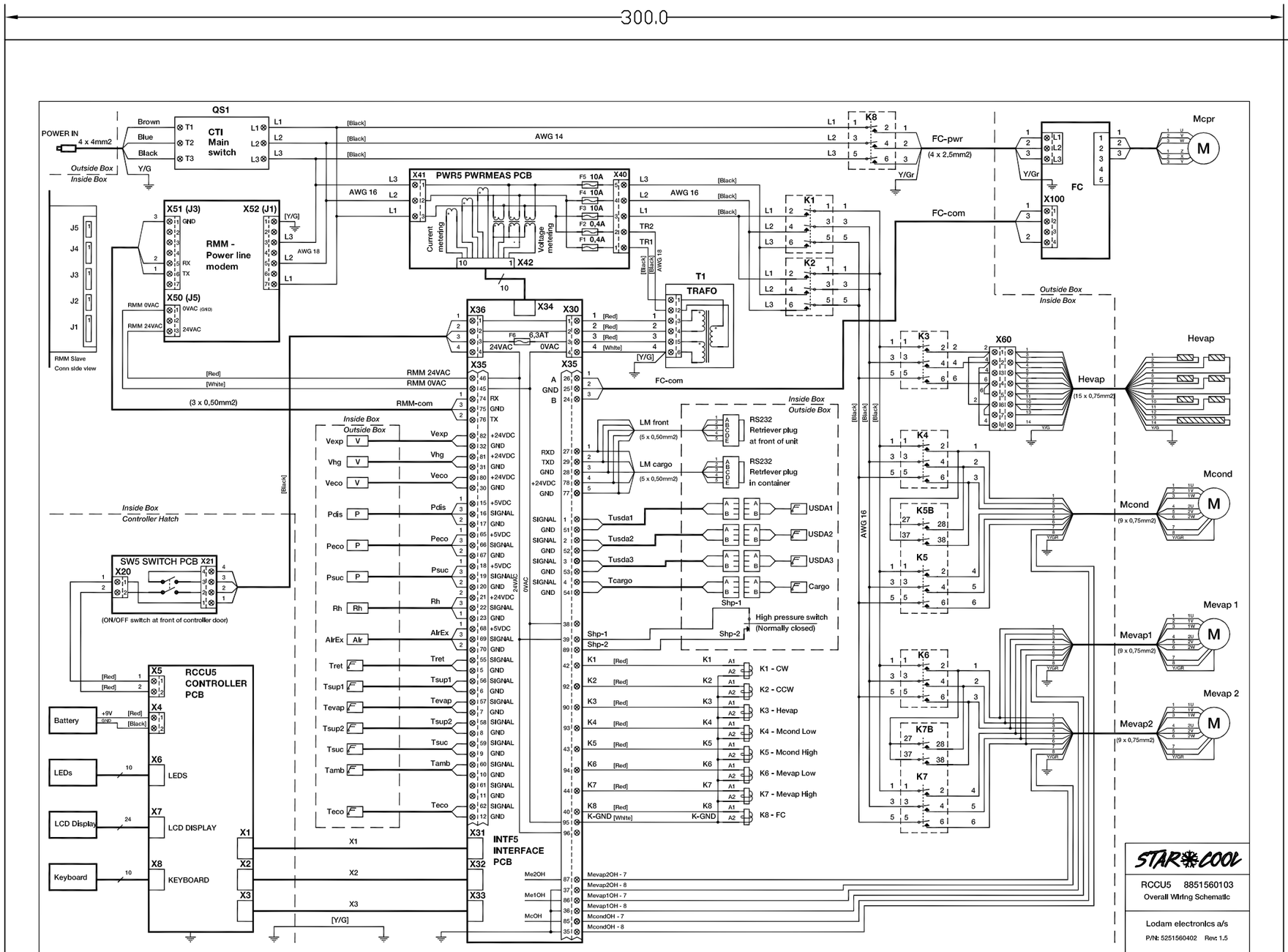
General Tolerance:
Surface:
Material:
Geometric Tolerance:
Other standards:
Drawn: 03-04-2001 by: HEJ
Checked: by:
Approv.: by:
Title: P & I diagram Star Cool
Projection:
Scale: 2:1
Units: mm
Drawing number: 810101B007
MAERSK CONTAINER INDUSTRI AS
Drawing filename:



Size: A1

| MATERIALE:FasCal 400 hvid super Tackl | | |
|---|---|---|
| FARVE SPECIFIKATION: | | |
| FARVE: | SPEC: | FORBEHOLDT SETIKET |
| Sort | | |

| FONT SPECIFIKATION: | | | |
|---|---|---|---|
| FONTNAVN(E): | STR (CAD): | EKS: | CAD NAVN: |
| Helvetica 65 Medium | 1, 1.25 og 1.5mm | ABC 123 | HLM |
| Helvetica 65 Medium Italic | 1.25mm | *ABC 123* | HLMI |




| !! MÅ KUN ÆNDRES I CAD-SYSTEM !! | GEN. TOLERANCE: HVOR INTET ANDET ANGIVET DS/ISO 2768-m | TEGNET: INIT: | DATO: | GODKENDT SETIKET: INIT: | DATO: | KUNDE GODKENDELSE: IKKE GODK. (sæt X): | GODKENDT (sæt X): | UNDERSKRIFT: | DATO: |
|---|---|---|---|---|---|---|---|---|---|
| | SKALA: 1:1 | | | | | | | | |
| | ALLE MÅL I MM | HF | 22.02.05 | | | | | | |

| REV. | ÆNDRING: |
|---|---|
| - | ORIGINAL TEGNING |
| A | – |
| B | – |

TEKST / TITEL: Vinyl transfers - Eldiagram

KUNDE P/N: Eldiagram

KUNDE: Lodam Electronics A/S, Grundtvigs Allé 163, 6400 Sønderborg, TLF 73 42 37 37

Setiket A/S, P.O.Box 4073, DK-6715 Esbjerg N, Tel. +45 76 14 76 00, Fax +45 76 14 76 01, E-mail: mail@setiket.com

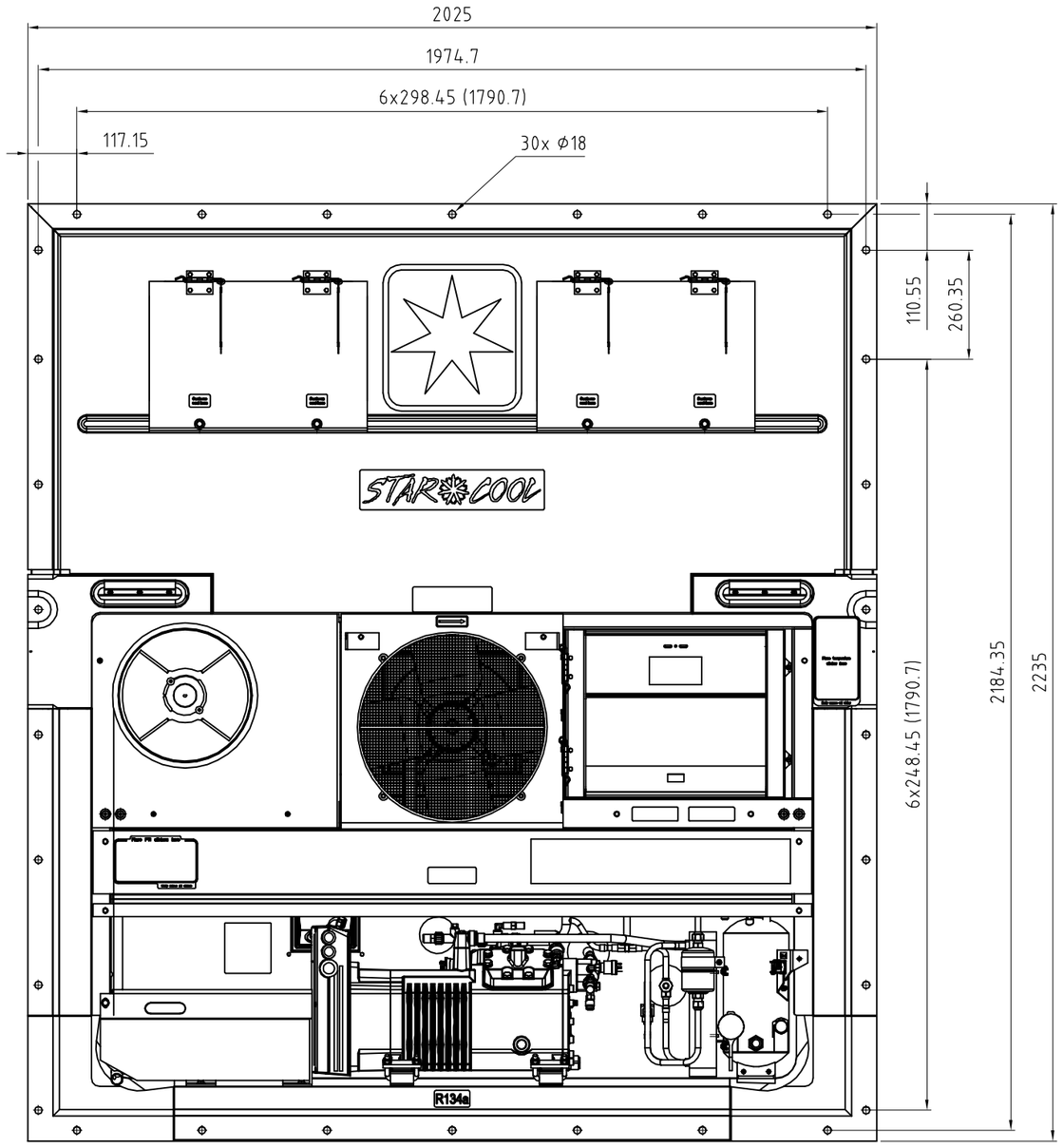
SETIKET P/N: C10-0629

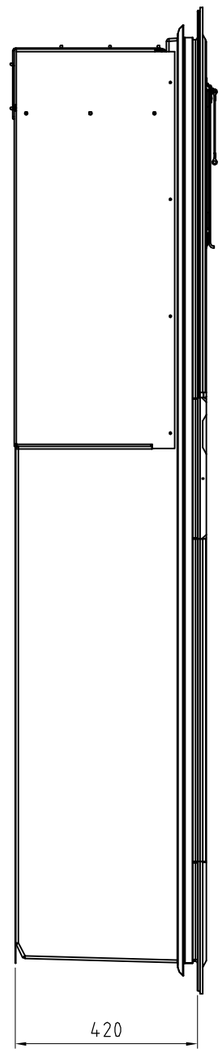
SETIKET TEGNINGNR.: C10-0629 REV.: -

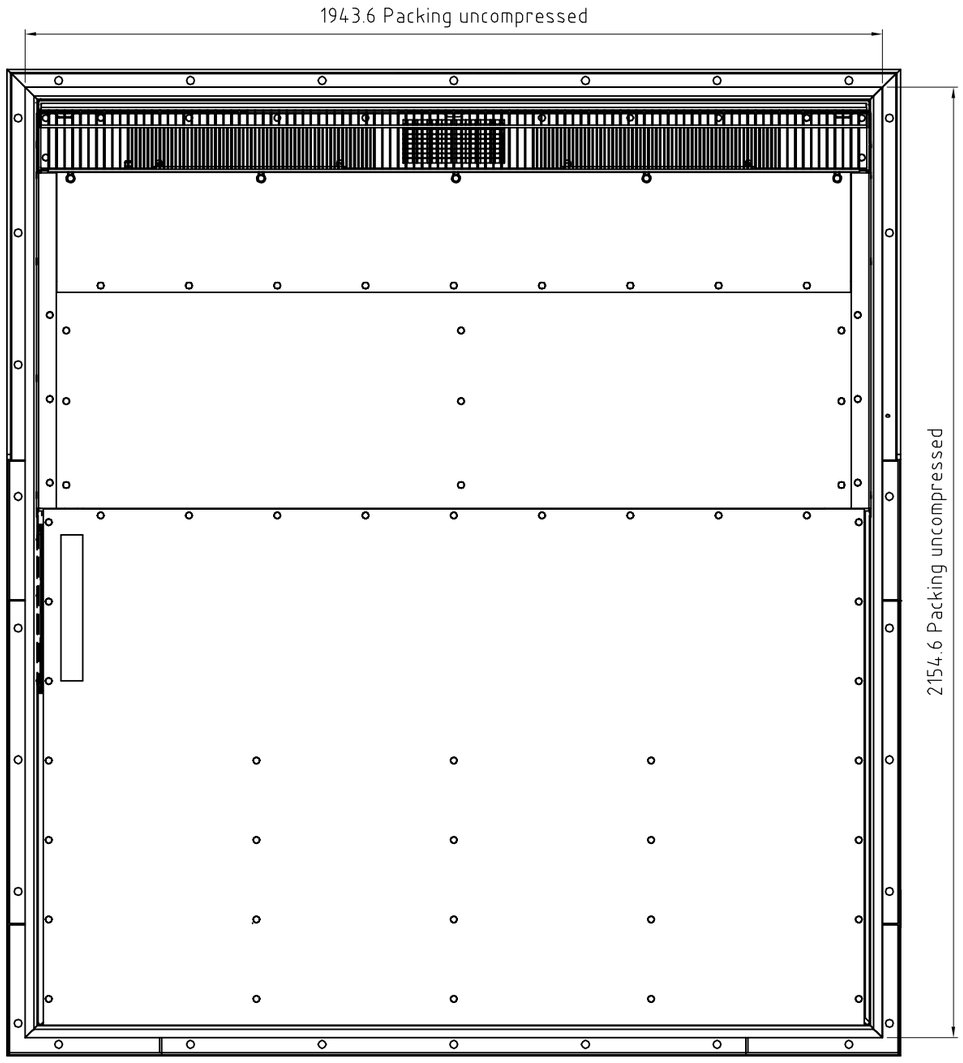


SIDE 2 AF 2 | SIDE 1 ER FØLGEBREV | DWG

QF.2004-0




| Rev. | Date | Name | Description |
|---|---|---|---|

| | | |
|---|---|---|
| General Tolerance: | Surface: | Material: |
| Geometric Tolerance: | Other standards: | Drawn: 05-07-2005 by OHB<br>Checked: by<br>Approv.: by |

Title:

# Star Cool Unit, Installation Dimensions

Star Cool

Projection:

Scale: 1:10

Units: mm

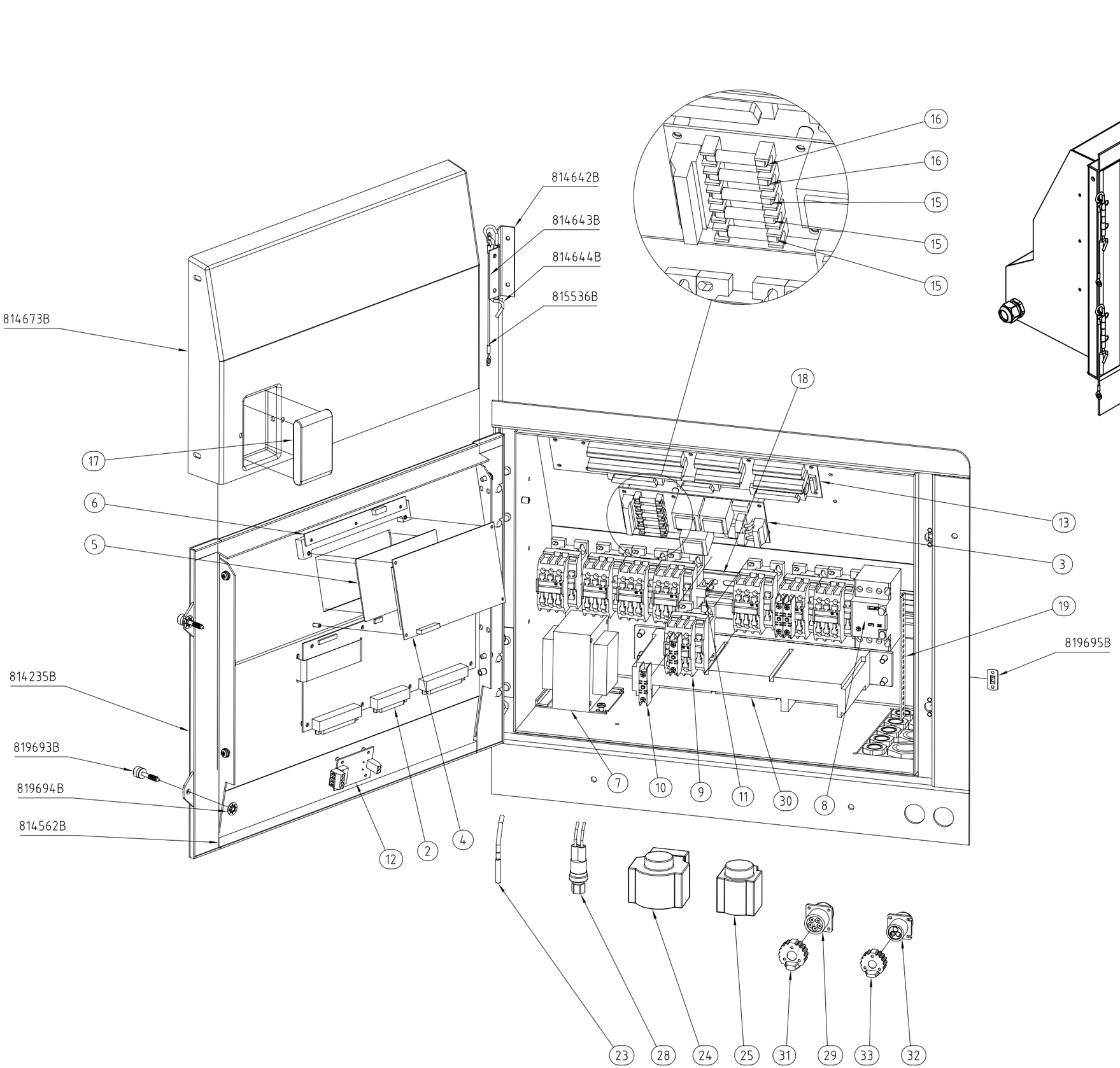
MÆRSK CONTAINER INDUSTRI AS

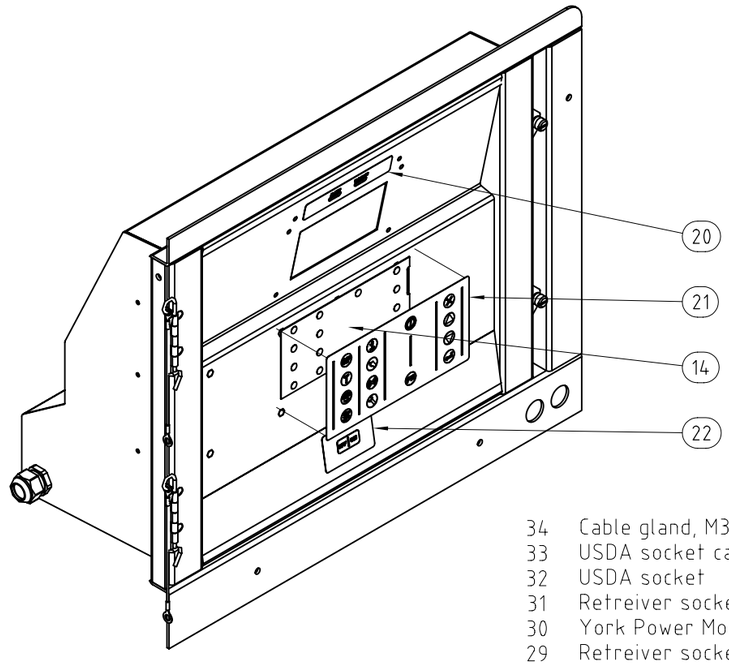
Drawing number: 810202B001

Drawing filename: P:\MCI unit dokumentation\Tegninger\Produktion\2D instruction d



Size: A2




| Pos. | Item Description |
|---|---|
| 34 | Cable gland, M32x1.5 |
| 33 | USDA socket cap |
| 32 | USDA socket |
| 31 | Retreiver socket cap |
| 30 | York Power Modem |
| 29 | Retreiver socket |
| 28 | High Pressure Switch |
| 27 | Cable gland, M25x1.5 |
| 26 | Cable gland, M20x1.5 |
| 25 | Solenoid coil, 18W, 24VDC |
| 24 | Solenoid coil, 14W, 24VDC |
| 23 | Temperature sensor |
| 22 | Cover foil, on/off switch |
| 21 | Cover foil, keyboard |
| 20 | Cover foil, LED |
| 19 | Neutral terminal rail |
| 18 | DIN rail |
| 17 | Battery Pack |
| 16 | Fuse, 400 mAmp. |
| 15 | Fuse, 10 Amp. |
| 14 | Keyboard |
| 13 | Terminal block PCB |
| 12 | On/Off PCB |
| 11 | Mech. interlock for contactors |
| 10 | Auxiliary contact |
| 9 | Contactor, CI 9 |
| 8 | Main circuit breaker |
| 7 | Transformer, 145 VA |
| 6 | LED PCB |
| 5 | Display Cover |
| 4 | Display PCB |
| 3 | Power Meas PCB |
| 2 | Controller PCB |
| 1 | Controller cabinet, complete |

| Rev. | Date | Name | Description |
|---|---|---|---|
| | | | |

General Tolerance:
Surface:
Material:
Geometric Tolerance:
Other standards:
Drawn: 16-03-2005 by OHB
Checked: by
Approv.: by
Title:

# Controller Unit Instruction

Star Cool

Projection:
Scale: 1:5
Units: mm

MÆRSK CONTAINER INDUSTRI AS

Drawing number: 810120B001

Drawing filename: P:\MCI unit dokumentation\Tegninger\Produktion\810120B001.dwg



Size: A2