

**BOXED DIGITAL THERMOSTAT  
FOR COLD ROOMS**



Simple Manual – Version 1  
[www.osakasolutions.com](http://www.osakasolutions.com)

**IMPORTANT**

Read this document carefully before the installation and the use of this device and respect all warnings; keep this document alongside the device to solve further consults. Use this device only as described in this document, and do not use this device as a safety device.

To obtain further information, please consult the extensive manual.



The device must be removed respecting the local laws regarding the recollection of electronic and electric devices.

**1 – USER'S INTERFACE**

**1.1 Observations**

Anytime you want to access the parameters or do an action, make sure beforehand that the device is ON, that the keyboard is not locked and that there isn't any other procedure taking place.

**1.2 Turn ON/OFF the device manually**

1. Press the  key for 1 second.

**1.3 The display**

During the normal operation, the display will show the selected temperature on the **P5** parameter, except during a defrosting, in which case the display will show the selected temperature on the **d6** parameter.

**1.4 See other probes' temperature**

1. Press the  key for 1 second: the display will show the first variable that it's available to be read.
2. Press the  key or the  key to select:
  1. "Pb1" room temperature or air input temperature (according to the value of the **P4** parameter)
  2. "Pb2" evaporator temperature
  3. "Pb3" auxiliary temperature

4. "Pb4" evaporation temperature
  5. "Pb5" low pressure
  6. "Pb6" CPT temperature ("Pb4" in SMART BOX, SMART BOX M, SMART BOX MD, SMART BOX SD, SMART BOX PLUS, SMART BOX PLUS M, SMART BOX PLUS MD and SMART BOX PLUS SD).
  7. "Pb7" auxiliary temperature 2
  8. "Pb8" auxiliary temperature 3
3. Press the  key to see the selected temperature.
4. Press the  key again to go back to the list.
- To exit the process:
5. Wait without pressing anything for 60 seconds or press the  key.

**1.4 Activate / deactivate the "Turbo" mode**

1. Make sure there is no ongoing defrosting, pre-dripping and / or evaporator's fan stoppage.
2. Press the  key: the  LED will flash, indicating its activation.

**1.5 Activate the defrosting manually**

1. Make sure that the "Turbo" mode is not running.
  2. Press the  key for 4 seconds.
- NOTE:** If the evaporator's temperature is not below the **d2** temperature, the defrosting won't be activated.

**1.6 Turn ON/OFF the led manually**

2. Press the  key: THE  LED will turn OFF/ON showing the status of the light.

**1.7 Activate anti-fogging resistance**

1. Press the  key for 1 second: the "AUX1" or "AUX2" LED will turn on and the resistance will be activated.
- Note:** a configurable output must be configured as "anti-fogging resistance".

**1.8 Activate/deactivate the auxiliary output manually**

1. Press the  key for 1 second: the "AUX1" or "AUX2" LED will turn on.
- NOTE:** a configurable input must be configured as "auxiliary output"

**1.9 Some values related to the electronic expansion valve (only available in SMART BOX VEX)**

1. Press the  key for 1 second: the display will show the first variable that it's available to be read.
  2. Press the  key or the  key to select:
    - "SH" (instantaneous superheating)
    - "POS" (valve's opening required percentage)
    - "POR" (valve's opening instantaneous percentage).
  3. Press the  key to see the data.
  4. Press the  key again to go back to the list.
- To exit the process:
5. Wait without pressing anything for 60 seconds or press the  key.

**1.10 Lock/Unlock the Keyboard**

1. Press the  and  keys: The display will show "Loc"/"UnL" whether it has been locked or unlocked.

**1.11 Mute the warning buzzer**

1. Press any key.

## 2 OPERATION DUE TO HIGH OR LOW RELATIVE HUMIDITY PERCENTAGE (Only if the F0 parameter equals 5)

### 2.1 Activate the operation due to high or low relative humidity percentage

1. Press the  and  keys for 4 seconds: The display will show "rhL" (operation due to low relative humidity percentage) or "rhH" (operation due to high relative humidity percentage) for 10 seconds.

To go back to the normal display without having to wait:

2. Press any key.

**Example:** If the room's ventilation is minimal (only the compressor is ignited), the humidity is minimal since it condenses in the evaporator.

However, if the ventilation is maximal (the fans are always active) the humidity is higher since it distributes around the room.

The parameters that ought to be considered are the F4 and F5, consider the power of the fans, if they are very powerful they could dehydrate the product.

### 2.2 See what operation mode is activated

1. Press the  and  keys: The display will show "rhL" (operation due to low relative humidity percentage) or "rhH" (operation due to high relative humidity percentage) for 10 seconds.

To go back to the normal display without having to wait:

2. Press any key.

## 3 - "HACCP" OPERATION

### 3.1 Show the HACCP alarms

1. Press the  key for 1 second: the display will show the first variable that it's available to be read.

2. Press the  or  keys to select "LS".

3. Press the  key to see the information.

4. Press the  or  keys to select (if it is present):

1. "AL" Minimum temperature alarm
2. "AH" Maximum temperature alarm
3. "id" Door switch alarm
4. "PF" Power Failure alarm (Only available in SMART BOX SD and SMART BOX PLUS SD).

5. Press the  key: the "HACCP" LED will turn off and the screen will start showing the alarm's information consecutively and automatically, for instance:

- 1 "8.0" The critical value is 8.0 °C/8 °F
- 2 "Sta" the display will show the time and date of the alarm (only available in SMART BOX SD and SMART BOX PLUS SD).
- 3 "y16" Alarm's year; in 2016
- 4 "n06" Alarm's month; in June
- 5 "d26" Alarm's day; the 26th
- 6 "h16" Alarm's hour; 16
- 7 "n30" Alarm's minute; 30
- 8 "dur" The display will show the alarm's duration
- 9 "h01" Alarm's hours; 1 h
- 10 "n15" Alarm's minutes; 15 min.

To exit the process:

6. Press the  key.

### 3.2 Delete the HACCP alarms

1. Press the  key for 1 second: the display will show the first variable that it's available to be read.

2. Press the  or  keys to select "rLS".

3. Press the  key.

4. Press the  or  keys to enter "149".

5. Press the  key or wait for 15 seconds: The display will flash and show "- - -" for 4 seconds, then the device will exit the process.

## 4 - DATA LOGGING IN COMPLIANCE WITH THE EN 12830 NORM

### 4.1 Activate the data logging "HACCP" operation mode

This operation mode is always activated.

### 4.2 Activate the "service" data logging operation mode

1. Press the  key for 1 second: the display will show the first variable that it's available to be read.

2. Press the  or  keys to select "SEr".

3. Press the  key.

4. Press the  or  keys to select "1".

5. Press the  key or wait 15 seconds: The display will flash and show "SEr" for 4 seconds, then the device will exit the process.

### 4.3 Show information of the data logger errors

1. Press the  key for 1 second: the display will show the first variable that it's available to be read.

2. Press the  or  keys to select "SEr".

3. Press the  key.

4. Press the  or  keys to select (if it is present):

1. "FUL" SD card storage is full.
2. "Sd" SD card not inserted or unrecognized.
3. "Pr7" auxiliary 2 temperature probe error
4. "Pr8" auxiliary 3 temperature probe error
5. "BAr" error in the data logger's battery.

To exit the process

5. Press the  key.

## 5 - OPERATION HOURS OF THE COMPRESSOR

### 5.1 See the operation hours of the compressor

1. Press the  key for 1 second: the display will show the first variable that it's available to be read.

2. Press the  or  keys to select:

- "CH1" operation hours of the compressor.
- "CH2" operation hours of the compressor 2.

3. Press the  key to see the operation hours.

To exit the process:

4. Wait without pressing anything for 60 seconds or press the  key.

### 5.2 Delete the operation hours of the compressor

1. Press the  key for 1 second: the display will show the first variable that it's available to be read.

2. Press the  or  keys to select "rCH".

3. Press the  key.

4. Press the  or  keys to enter "149".

5. Press the  key or wait for 15 seconds: The display will flash and show "- - -" for 4 seconds, then the device will exit the process.

## 6 – SETTINGS

### 6.1 Configure the date, hour and day of the week (only available in SMART BOX SD and SMART BOX PLUS SD)

To enter in the process:

1. Press the key for 1 second: the display will show the first variable that it's available to be read.

2. Press the or keys to select "rtc".

To adjust the year:

3. Press the key: the display will show "y" followed by the last two digits of the year, and the LED will start flashing.

4. Press the or keys to select the year (only the last two digits).

To adjust the month:

5. Press the key:

The display will show "n" followed by the month (01...12).

6. Press the or keys to select the month.

To adjust the day:

7. Press the key: The display will show "d" followed by the day (01...31).

8. Press the or keys to select the day.

To adjust the hour:

9. Press the key: The display will show "h" followed by the hour (00...23).

10. Press the or keys to select the hour.

To adjust the minutes:

11. Press the key: The display will show "n" followed by the minutes (00...59).

12. Press the or keys to select the minutes.

To adjust the day of the week:

13. Press the key.

14. Press the or keys to select:

1 "Mon" Monday

2 "tuE" Tuesday

3 "UEd" Wednesday

4 "thu" Thursday

5 "Fri" Friday

6 "SAt" Saturday

7 "Sun" Sunday.

15. Press the key: The LED will turn off, then the device will exit the process.

To exit the process immediately:

16. Do not touch anything for 60 seconds (all changes will be saved)

### 6.2 Configure the regulation Set Point

1. Press the key: The LED will start flashing.

2. Press the or keys to enter the desired Set Point.

3. Press the key or wait for 15 seconds: The LED will turn off, then the device will exit the process.

To exit the process immediately:

5. Wait for 15 seconds (all changes will be saved)

### 6.3 How to enter in the parameters

To enter in the process:

1. Make sure that there aren't any ongoing processes.

2. Press the and keys for 4 seconds: The display will show "PA".

3. Press the key.

4. Press the or keys to enter "-19".

5. Press the key.

6. Again, press the and keys for 4 seconds: The display will show "SP" (the first parameter of the list).

To move from parameter to parameter:

7. Press the or keys.

To configure a parameter:

8. Press the key in the desired parameter.

9. Press the or keys to select the desired value.

10. Press the key.

To exit the parameters:

11. Press the and keys for 4 seconds or wait 60 seconds (all changes will be saved).

Switch off the power from the device when the process is over.

### 6.4 Reset manufacturing parameters (by default)

1. Press the and for 4 seconds: The display will show "PA".

2. Press the key.

3. Press the or keys and enter "149".

4. Press the key.

5. Press the and keys again for 4 seconds: the display will show "dEF".

6. Press the key.

7. Press the or keys and enter "1".

8. Press the key: the display will flash and show "dEF" for 4 seconds, then the device will exit the process.

9. Switch off the power from the device when the process is over.

To exit the process immediately:

10. Press the and keys before entering "1" (there will be no resetting).

## 7 SIGNALS AND INDICATIONS

### 7.1 Signals

LED	MEANING
	Compressor LED
	Defrosting LED
	Evaporating Fan LED
	Room's light LED
AUX1	Auxiliary 1 LED
AUX2	Auxiliary 2 LED
	Real Time Clock LED
HACCP	HACCP LED
	Energy Saving LED
	Alarm LED
	Temperature LED
	Pressure LED

### 7.2 Indications

CODE	MEANING
Loc	The keyboard and/or the working Set Point are locked
- - -	The requested operation mode is not available
dEF	Defrosting in progress

### 7.3 Indications regarding the SD card

SD LED	MEANING
Green	The SD card can be removed: <ul style="list-style-type: none"> <li>- <b>Fixed:</b> there is no writing in progress and the data logger's battery is charged</li> <li>- <b>Flashing:</b> there is no writing in progress but the data logger's battery is not charging.</li> </ul>
Red	<ul style="list-style-type: none"> <li>- <b>Fixed:</b> there is writing in progress; the SD card cannot be removed.</li> <li>- <b>Flashing:</b> SD card not inserted/unrecognized</li> </ul>

## 8 – ALARMS

### 8.1 Alarms

Code	Meaning
AL	Minimum temperature alarm
AH	Maximum temperature alarm
id	Door switch alarm
PF	Power failure alarm
iA	Configurable input alarm
iSd	High pressure switch alarm
LP	Low pressure switch alarm
HSH	High overheating alarm
C1t	Thermal compressor alarm
C2t	Thermal compressor 2 alarm
MiC	Locked man alarm
COH	Condenser overheating alarm
CSd	Locked compressor alarm
dFd	Defrosting finished due to max. time alarm
Pd	Alarm of boost pump controlled through the digital input, finished due to maximum time

## 9 – ERRORS

### 9.1 Errors

Code	Meaning
Pr1	Room temperature probe error or air input temperature probe error (according to the P4 parameter).
Pr2	Evaporator's probe error
Pr3	Auxiliary probe error
Pr4	Evaporation probe error
Pr5	Low pressure probe error
Pr7	Auxiliary 2 probe error
Pr8	Auxiliary 3 probe error
FUL	SD card without storage room
Sd	SD card not inserted/unrecognized
rtc	Real Time Clock error
BAt	Data logger's battery error

## 10 – TECHNICAL DATA

### 10.1 Technical data

**Device's function:** Control device.

**Device's construction:** Incorporated electronic device.

**Case:** Self-extinguishing, grey.

**Heat and fire resistance category:** D

**Dimensions:** 262,0 x 179,0 x 95,6 mm (10,314 x 7,047 x 3,763 in; W x H x D).

**Mounting method:** wall mounting, with anchor and fixing screws.

**Protection degree:** IP65.

**Connection:** Fixed connection terminals with 6,35mm (0,25mm) pitch for conductors of up to 4mm<sup>2</sup> (0,0062 in<sup>2</sup>): power supply and digital outputs.

-Fixed connection terminals, pitch on thread of 5,0 mm (0,196 in) for conductors of up to 2,5 mm<sup>2</sup> (0,0038 in<sup>2</sup>): analog and digital inputs, and RS485 MODBUS port

-Removable terminal block (only male thread), 3,5 mm (0,137 in) pitch for conductors of up to 1,5 mm<sup>2</sup> (0,0028 in<sup>2</sup>) or JST connector (only male thread) with 6 pole-connectors of 2,5 mm (0,098 in) pitch: controller for unipolar stepper electronic expansion valves.

The maximum length of the connection cables are:

-Supply: 100m (328ft).

- Analog inputs: 100 m (328 ft).

- Transducers Power Supply: 100 m (328 ft).

- Digital inputs: 100 m (328 ft).

- Digital outputs: 100 m (328 ft).

- RS-485 MODBUS port: 1.000 m (3.280 ft);

- Controller for unipolar stepper electronic expansion valves: 3 m (9,842 ft).

Use cables of a section suitable to the flowing current.

In case of using the device fully charged and at a maximum working temperature, use cables with a maximum working temperature of  $\geq 90$  °C (194 °F).

**Working temperature:**

-From 0 to 45 °C (from 32 to 113 °F) for the units with a circuit breaker, with a differential circuit breaker.

-Otherwise, from 0 to 50 °C (from 32 to 122 °F).

**Storage temperature:** from -25 to 70°C (from -13 to 158°F).

**Working humidity:** from 10 to 90% of relative humidity without condensation.

**Contamination degree of the control device:** 2.

**Environmental compliance:**

- RoHS 2011/65/CE

- WEEE 2012/19/EU

- REACH (CE) n° 1907/2006 Norm.

**EMC compliance:**

- EN 60730-1

- IEC 60730-1.

**Supply:** 115... 230 VAC (+10 %, -15 %), 50... 60 Hz ( $\pm 3$  Hz), 35 VA max., supplied by a class 2 circuit. The maximum current allowed for the phase is 16A.

**Circuit Breaker:** Depending on which model [230 VAC, at 16A, Icn 4.500 A, unipolar + neutral, for conductors of up to 2,5 mm<sup>2</sup> (0,0387 in<sup>2</sup>)].

**Differential Circuit Breaker:** Depending on which model [230 VAC, at 16A, Icn 4.500 A, Id 300mA, unipolar + neutral, for conductors of up to 2,5 mm<sup>2</sup> (0,0387 in<sup>2</sup>)].

**Type of ground connection of the control device:** With ground terminal.

**Nominal pulse voltage:** 4KV

**Surge category:** III.

**Software's class and structure:** A.

**Real Time Clock:** Incorporated (with a secondary lithium battery; only available in the SMART BOX SD and SMART BOX PLUS SD models).

Battery's life span without a power supply: 6 months.

Deviation:  $\leq 30$  s/month at 25 °C (77 °F).

**Data logger's battery:** Incorporated (with a secondary nickel-metal hydride battery; only available in the units with data logging in compliance with the EN 12830 norm)

Battery's life span without a power supply: 72 h.

Battery's charging time: 24 h (the battery is charged with the device's power supply).

**Analog inputs:** up to 5 inputs:

- 2 that can be configured by parameter for PTC, NTC or Pt 1000 probes (room temperature or evaporator's temperature)

- 1 that can be configured by parameter for PTC, NTC or Pt 1000 probes (it can be configured by parameter for condenser).

- 1 that can be configured by parameter for PTC, NTC or Pt 1000 probes (evaporation's temperature; only available in the SMART BOX VEX).

- 2 that can be configured by parameter for NTC or Pt 1000 probes (auxiliary 2 and auxiliary 3 temperature; only available in the units with data logging in compliance with the EN 12830 norm).

- 1 for 4-20 mA transducers (low pressure; only available in the SMART BOX VEX).

Transducer's 4-20 mA supply: 12 VDC ( $\pm 10$  %), 30 mA max.

PTC analog inputs (990  $\Omega$  @ 25 °C, 77 °F)

Sensor type: KTY 81-121.

Working range: from -50 to 150 °C (from -58 to 302 °F).

Accuracy:  $\pm 0.5$  % of the full-scale.

Resolution: 0.1 °C (1 °F).

Protection: None.

NTC analog inputs (10 K $\Omega$  @ 25 °C, 77 °F)

Sensor type:  $\beta 3435$

Working range: from -50 to 120 °C (from -58 to 248 °F).

Accuracy:  $\pm 0.5$  % of the full-scale.

Resolution: 0.1 °C (1 °F).

Protection: None.

Pt 1000 analog inputs (1 K $\Omega$  @ 0 °C, 32 °F)

Working range: from -99 to 150 °C (from -99 to 300 °F).

Accuracy:  $\pm 0.5$  % of the full-scale.

Resolution: 0.1 °C (1 °F).

Protection: None.

4-20 mA analog inputs

Input's resistance:  $\leq 200 \Omega$ .

Accuracy:  $\pm 0.5$  % of the full-scale.

Resolution: 0.01 mA.

Protection: None; the maximum current allowed for this input is 25 mA.

**Digital inputs:** 3 inputs that can be configured by parameter by usually open or usually closed contact (open port, configurable and configurable 2)

5 VDC digital inputs, 2 mA (voltage free)

Power supply: None.

Protection: None.

**Digital outputs:** up to 6 inputs:

2 SPST electromechanical relays of 30 A resistant to 250 VAC (compressor and fan of the evaporator).

- 2 SPST electromechanical relays of 16 A resistant to 250 VAC (defrosting and ambient light).

- 1 SPST electromechanical relay of 8A resistant to 250VAC (configurable by parameter for anti-fogging resistance, auxiliary, alarm, port's resistance, resistants for the operation in a dead zone, condenser's fan, compressor 2, defrosting 2, evaporator's fan 2, liquid valve, on/stand-by or locked man; configuration by default, condenser0s fan.

- 1 SPST electromechanical relay of 8A resistant to 250VAC (configurable by parameter for anti-fogging resistance, auxiliary, alarm, port's resistance, resistants for the operation in a dead zone, condenser's fan, compressor 2, defrosting 2, evaporator's fan 2, liquid valve, on/stand-by or locked man; configuration by default, condenser0s fan.

The device guarantees a reinforced isolation in between each connector of the digital outputs and the rest of the parts of the device.

**Controller for unipolar stepper electronic expansion valves:** 12 VDC, 260 mA max.

**Type 1 or type 2 actions:** Type 1.

**Additional features of the type 1 or type 2 action:** C.

**Display:** 3 digits display with decimal point and operation icons.

**Communication ports:** 1 MODBUS RS-485 port (with MODBUS communication slave protocol).

**Signal and Alarm buzzer:** incorporated.

## 11 – PARAMETER LIST

PARAM.	MIN.	MAX.	U.M.	DEF	REGULATION SET POINT
SP	r1	r2	°C/°F (1)	-18.0	Regulation Set Point
PARAM.	MIN.	MAX.	U.M.	DEF	ANALOG INPUTS
CA1	25	25	°C/°F (1)	0.0	Room temperature calibration (if P4=0,1,2,3), air input temperature calibration (if P4=4)
CA2	25	25	°C/°F (1)	0.0	Evaporator's temperature calibration.
CA3	25	25	°C/°F (1)	0.0	Auxiliary temperature calibration.
CA4	25	25	°C/°F (1)	0.0	Evaporation's temperature calibration.
CA5	25	25	Pt:10 (2)	0.0	Low pressure calibration.
P0	0	2	----	1	Probe type (0 = PTC; 1 = NTC; 2 = PT100).
P1	0	1	----	1	Decimal point for temperature (only in °C).
P2	0	1	----	0	Temperature's unit of measurement (0 = °C; 1 = °F). (3)
P3	0	2	----	1	Function of the evaporator's temperature probe (0 = not used; 1 = evaporator's fan probe and defrosting; 2 = evaporator's fan probe).
P4	0	4	----	3	Function of the auxiliary probe 0 = not used; 1 = condenser's temperature; 2 = critical temperature; 3 = temperature of the evaporator 2; 4 = air output temperature).
P5	0	4	----	0	Visualized temperature during the normal operation ((0 = room temperature or CPT temperature; 1 = regulation set point; 2 = evaporator's temperature; 3 = auxiliary temperature; 4 = air input temperature).
P7	0	100	%	50	Percentage of the air input temperature in order to calculate the CPT temperature. (4)
P8	0	250	s/10	5	Visualization delay in temperature changes.
P9	-99.9	99.9	Pt:10 (2)	-0.5	Low pressure transducer's inferior limit.
P10	-99.9	99.9	Pt:10 (2)	7.0	Low pressure transducer's superior limit.
PARAM.	MIN.	MAX.	U.M.	DEF	REGULATION
r0	0.1 (5)	15	°C/°F (1)	2.0	Regulation differential (hysteresis), or dead zone differential (according to the number of compressors). (6)
r1	-99	R2	°C/°F (1)	-50.0	Minimal limit of the regulation Set Point.
r2	R1	99	°C/°F (1)	50.0	Maximal limit of the regulation Set Point.
r3	0	1	----	0	Lock the modification of the regulation Set Point (0 = NO; 1 = YES;).
r4	0	99	°C/°F (1)	0.0	Regulation Set Point increase during the "energy saving" operation mode.
r5	0	99	°C/°F (1)	0.0	Regulation Set Point decrease during the "turbo" operation mode.
r6	0	240	min	30	Duration of the "turbo" operation mode.
r12	0	1	----	1	Dead-band type or regulation differential type (0 = asymmetrical; 1 = symmetrical)
PARAM.	MIN.	MAX.	U.M.	DEF	ELECTRONIC EXPANSION VALVE (SMART BOX VEX MODEL)
h01	3.0	25	°C/°F (1)	6.0	Superheating
h02	10.0	40.0	°C/°F (1)	15.0	Superior temperature limit of the evaporation for a high superheating alarm (code "HSH"). (7)
h03	-70.0	40.0	°C/°F (1)	-70.0	Inferior temperature limit of the evaporation in order to activate the low pressure operation mode (the valve opens entirely; code "LOP"). (7)
h04	1.0	99.9	°C/°F (1)	50.0	Proportional band in PID control.
h05	0	999	s	50	Integral Time in PID control.
h06	0	999	s	10	Derivation time in PID control.
h07	1	250	s	30	Starting delay.
h08	-1	100	%	-1	Valve's opening percentage in manual mode (-1 = Automatic regulation and superheating alarm available).
h09	0	100	%	0	Opening percentage of the valve during the hot gas defrosting.
h10	0	45	Pt:10 (2)	1.0	Inferior limit of low pressure in order to stop the compressor during the liquid injection to the evaporator.
h11	0	250	min	3	High superheating alarm delay (code "HSH").
h12	0	1	----	0	Enable the low pressure alarm (code "LP"; 1 = YES)
h13	-0.5	45	Pt:10 (2)	0.5	Inferior limit in order activate the minimal low pressure alarm (code "LP"). (8)
h14	0	250	min	3	Minimal low pressure alarm delay (code "LP").

h15	0	7	----	2	Refrigerating gas: <b>0</b> = R-22; <b>1</b> = R-404A; <b>2</b> = R-507A; <b>3</b> = R-744; <b>4</b> = R-290; <b>5</b> = R-717; <b>6</b> = R1270; <b>7</b> = R-407F
h16	0	2	----	1	Type of electronic expansion valve: <b>0</b> = Generic valve; <b>1</b> = Sanhua DPF; <b>2</b> = Danfoss ETS 6
h17	0	100	%	30	Opening percentage of the valve during the evaporation temperature probe error (code "pr4") and/or during the low pressure probe error (code "pr5")
h18	0	490	Steps (pitch) x10	100	Maximum number of steps (pitch) of the generic electronic expansion valve.
h19	0	250	Steps (pitch)	30	Number of saturation steps (pitch) of the generic electronic expansion valve.
h20	25	999	Steps (pitch)	100	Frequency of the steps (pitch) of the generic electronic expansion valve.
<b>PARAM.</b>	<b>MIN.</b>	<b>MAX.</b>	<b>U.M.</b>	<b>DEF</b>	<b>COMPRESSOR'S PROTECTIONS</b>
C0	0	240	min	0	Delay in the compressor's start to the device's start.
C1	0	240	min	5	Minimum time between two consecutive starts of the compressor.
C2	0	240	min	3	Minimum time of the compressor's deactivation.
C3	0	240	s	0	Minimum time of the compressor's activation.
C4	0	240	min	10	Compressor's activation time during a room temperature's probe error or an input temperature's probe error (code "pr1").
C5	0	240	min	10	Compressor's activation time during a room temperature's probe error or an input temperature's probe error (code "pr1").
C6	0	199	°C/°F (1)	80.0	Superior temperature limit of the condenser in order to activate the condenser superheating alarm (code "COH").
C7	0	199	°C/°F (1)	90.0	Superior temperature limit of the condenser in order to activate the locked compressor alarm (code "CSd").
C8	0	15	min	1	Delay of the locked compressor alarm (code "Csd").
C10	0	999	hx10	0	Limit of working hours of the compressor in order to activate the maintenance request; <b>0</b> = Not used function.
C11	0	240	s	3	Minimum time in between the starts of two different compressors.
C12	0	10	----	2	Number of operation hours of the compressor in order to balance the starts/stops and the number of working hours in between two compressors.
C13	0	10	----	1	Number of start of the compressor in order to balance the starts/stops and the number of working hours in between two compressors.
C14	0	2	----	2	Type of compressor's; <b>0</b> = timed, see also u3; <b>1</b> = by digital input, see also u3; <b>2</b> = by low pressure (only available in model SMART BOX VEX).
<b>PARAM.</b>	<b>MIN.</b>	<b>MAX.</b>	<b>U.M.</b>	<b>DEF</b>	<b>DEFROSTING</b>
d0	0	99	h	8	Interval in between defrostings ( <b>0</b> = defrosting by intervals disabled); or maximum interval of defrosting (according to the <b>d8</b> parameter).
d1	0	2	----	0	Type of defrosting; <b>0</b> = electric; <b>1</b> = hot gas; <b>2</b> = compressor stoppage.
d2	-99	99	°C/°F (1)	3.0	End of defrosting temperature.
d3	0	99	min	30	Defrosting's maximum duration; according to the <b>P3</b> parameter; ( <b>0</b> = the defrosting is never activated).
d4	0	1	----	0	Defrosting when the device is started ( <b>0</b> = NO; <b>1</b> = YES).
d5	0	99	min	0	Minimum time in between the device's start and the defrosting's activation; or delay in the activation of the defrosting at the device's start (according to the <b>d4</b> parameter).
d6	0	2	----	1	Visualized temperature during the defrosting; <b>0</b> = room temperature or CPT temperature; <b>1</b> = "Regulation Set Point + t"; maximum room temperature or CPT temperature in the activation of the defrosting (according to the <b>P4</b> ); <b>2</b> = "dEf" indication.
d7	0	15	min	2	Dripping duration.
d8	0	4	----	0	Defrosting mode; <b>0</b> = by time intervals; <b>1</b> = by compressor start intervals; <b>2</b> = by evaporator's temperature intervals; <b>3</b> = dynamic; <b>4</b> = by real time.
d9	-99	99	°C/°F (1)	0.0	Superior temperature limit of the evaporator in order to stop counting the interval's time in between defrostings.
d11	0	1	----	0	Enable the alarm of end of defrosting due to maximum time (code "dFd"; <b>0</b> = NO; <b>1</b> = YES)
d15	0	99	min	0	Minimum time from the compressor's start to the activation of the defrosting in order for it to be activated (only if d1 = 1)
d16	0	99	min	0	Pre-dripping duration. (9)
d18	0	999	min	40	Defrosting's interval; ( <b>0</b> = the function isn't used).
d19	0	40	°C/°F (1)	3.0	Inferior temperature limit of the evaporator in order to activate the defrosting.
d20	0	500	min	180	Defrosting's start due to the continual operation of the compressor ( <b>0</b> = the function isn't used). (10)
d21	0	500	min	200	Minimal duration of consecutive starts of the compressor after the device is turned on and after the turbo operation mode is activated, which causes the defrosting's activation ( <b>0</b> = the function isn't used).

d22	0	10	°C/°F (1)	2.0	Superior temperature limit of the evaporator in order to pause the interval's time in between defrostings.
d25	0	1	----	0	Enable the temperature of the air output as a defrosting probe during the evaporator's temperature probe error (code "Pr2").
d26	0	99	h	6	Defrosting interval due to the air input temperature probe which works as a defrosting probe during the evaporator's temperature probe error (code "Pr2"); (0 = the function isn't used).
<b>PARAM.</b>	<b>MIN.</b>	<b>MAX.</b>	<b>U.M.</b>	<b>DEF</b>	<b>TEMPERATURE ALARMS</b>
A0	0	1	----	0	Temperature associated to the low temperature alarm (code "AL"); 0 = Room temperature or CPT temperature; 1 = Evaporator's temperature.
A1	-99	99	°C/°F (1)	-10.0	Low temperature alarm set point (code "AL")
A2	0	2	----	0	Type of low temperature alarm; 0 = not used; 1 = relative to the set point; 2 = absolute.
A4	-99	99	°C/°F (1)	10.0	High temperature alarm set point (code "AL").
A5	0	2	----	0	Type of high temperature alarm; 0 = not used; 1 = relative to the set point; 2 = absolute.
A6	0	240	min	120	Delay of the high temperature alarm when the device is started.
A7	0	240	min	15	Delay of the temperature alarm.
A8	0	240	min	15	Delay of the high temperature alarm when the evaporator's fan's stoppage has finalized.
A9	0	240	min	15	Delay of the high temperature alarm when the open door input is deactivated.
A10	0	240	min	1	Duration of a power failure in order to memorize the power failure alarm (code "PF").
A11	0,1 (5)	15	°C/°F (1)	2.0	Temperature alarms differential.
A12	0	2	----	1	Type of power failure alarm signal (code "PF"); 0 = "HACCP" led; 1 = code "PF", the buzzer and the "HACCP" led; 2 = code "PF", the buzzer (if the power failure's duration is superior to the A10 time) and the HACCP led.
<b>PARAM.</b>	<b>MIN.</b>	<b>MAX.</b>	<b>U.M.</b>	<b>DEF</b>	<b>EVAPORATOR FAN AND CONDENSER FAN</b>
F0	0	5	----	1	Activity of the evaporator's fan during the normal operation; 0 = deactivated; 1 = turned on (11); 2 = according to the compressor (12); 3 = according to "F1" (13); 4 = Turned off if the compressor is deactivated, it depends on F1 if the compressor is activated (14); 5 = It depends on F6.
F1	-99	99	°C/°F (1)	-1.0	Superior temperature limit of the evaporator in order to deactivate the evaporator's fan.
F2	0	2	----	0	Activity of the evaporator's fan during the defrosting and the dripping; 0 = Deactivated; 1 = Turned on (it is recommended to configure the d7 parameter to 0); 2 = It depends on F0.
F3	0	15	min	0	Maximum duration of the stoppage of the evaporator's fan.
F4	0	240	s	60	Stoppage time of the evaporator's fan during the operation in low percentage of relative humidity when the compressor is deactivated.
F5	0	240	s	10	Activation time of the evaporator's fan during the operation in low percentage of relative humidity when the compressor is deactivated.
F6	0	1	----	0	Operation in low or high percentage of relative humidity; (only if F0 = 5; 0 = low; 1 = high).
F7	-99	99	°C/°F (1)	5.0	Temperature differential (relative to the working set point, or "working set point + F7"), inferior limit in order to activate the evaporator's fan.
F8	0.1 (5)	15	°C/°F (1)	2.0	Differential of the locking of the evaporator's fan.
F9	0	240	s	0	Delay in deactivating the evaporator's fan after the compressor is disconnected.
F11	0	99	°C/°F (1)	15.0	Superior temperature limit of the condenser in order to activate the condenser's fan ("F11 + 2,0 °C / 4 °F").
F12	0	240	s	30	Delay in deactivating the condenser's fan after the compressor is disconnected.
F13	0	240	sx10	30	Locking time of the evaporator's fan during the "saving energy" operation mode.
F14	0	240	sx10	30	Activation time of the evaporator's fan during the "saving energy" operation mode.
<b>PARAM.</b>	<b>MIN.</b>	<b>MAX.</b>	<b>U.M.</b>	<b>DEF</b>	<b>DIGITAL INPUTS</b>
i0	0	5	----	3	Open door digital input's function: 0 = not used; 1 = disconnect the compressor & the evaporator's fan; 2 = disconnect the evaporator's fan; 3 = turn on the room's light; 4 = disconnect the compressor, the evaporator's fan & turn on the room's light; 5 = disconnect the evaporator's fan & turn on the room's light.
i1	0	1	----	0	Open door input's type of contact (operation logic); 0 = NO (normally opened); 1 = NC (normally closed)
i2	-1	120	min	30	Delay in the open door input alarm signal (code "Id"); (-1 = the alarm is not signaled).
i3	-1	120	min	15	Duration of the open door input effect on the compressor and the evaporator's fan.
i4	0	1	----	0	Memorize the open door input alarm (code "Id"); 0 = NO; 1 = YES.
i5	0	9	----	7	Configurable input 1 function; 0 = no use; 1 = Activate the energy saving mode; 2 = digital input alarm, "iA" will be shown (16); 3 = High pressure switch alarm, "iA" and "iSd" will be shown; 4 = Activate the auxiliary output; 5 = Turn off the device; 6 = Low pressure switch, "LP" will be shown; 7 = Compressor's thermal protection, "C1t" will be shown; 8 = Compressor's 2 thermal protection, "C2t" will be shown; 9 = Locked man alarm, "MiC" will be shown.

i6	0	1	----	0	Type of contact (operation logic) of the configurable input 1; <b>0</b> = NO (normally opened); <b>1</b> = NC (normally closed).
i7	0	120	min	0	Delay in the configurable input alarm signal (code "iA"); delay of the compressor's start until the configurable input is deactivated (according to the i5 parameter).
i8	0	15	----	240	Number of configurable alarm inputs (code "iA") in order to activate the high pressure switch alarm (code "iSd"; <b>0</b> = not used).
i9	1	999	min	0	Time that must pass without configurable input alarms (code "iA") so that the alarm counter to be erased.
i10	0	999	min	180	Time that must pass without activations of the open door input (after the room or CPT temperature has reached the regulation set point) so that the "energy saving" mode to be activated; <b>0</b> = function not used.
i13	0	240	----	32	Number of activations of the open door input in order to activate the defrosting; <b>0</b> = the function isn't used.
i14	0	240	----	9	Minimal time the open door input must be active so that the defrosting is initiated; <b>0</b> = function not used.
i15	0	9	----	0	Configurable input 1 function; <b>0</b> = not used; <b>1</b> = Activate "energy saving" mode; <b>2</b> = Configurable input alarm, "iA" will be shown; <b>3</b> = High pressure switch, "iA" and "iSd" will be shown; <b>4</b> = Activate auxiliary output; <b>5</b> = Turn off the device; <b>6</b> = Low pressure switch, "LP" will be shown; <b>7</b> = Compressor's thermal protection, "C1t" will be shown; <b>8</b> = Compressor's 2 thermal protection, "C2t" will be shown; <b>9</b> = Locked man alarm, "MiC" will be shown.
i16	0	1	----	0	Type of contact (operation logic) of the configurable input 2; <b>0</b> = NO (normally opened); <b>1</b> = NC (normally closed).
i17	0	240	s	6	Delay in the activation of the alarm due to low pressure after turning on the device (code "LP").
PARAM.	MIN.	MAX.	U.M.	DEF	DIGITAL OUTPUTS
u1	0	12	----	0	Management of the K4 digital output (only available in SMART BOX, SMART BOX M, SMART BOX MD and SMART BOX SD); <b>0</b> = ambient light; <b>1</b> = anti-fogging resistances; <b>2</b> = auxiliary output; <b>3</b> = alarm; <b>4</b> = door resistances; <b>5</b> = dead-zone mode resistances; <b>6</b> = condenser's fan <b>7</b> = compressor 2; <b>8</b> = defrosting 2; <b>9</b> = evaporator's 2 fan; <b>10</b> = liquid valve; <b>11</b> = on/stand-by; <b>12</b> = locked man.
u1	0	12	----	6	Management of the K5 digital output (only available in SMART BOX VEX, SMART BOX VEX M and SMART BOX VEX MD); <b>0</b> = ambient light; <b>1</b> = anti-fogging resistances; <b>2</b> = auxiliary output; <b>3</b> = alarm; <b>4</b> = door resistances; <b>5</b> = dead-zone mode resistances; <b>6</b> = condenser's fan <b>7</b> = compressor 2; <b>8</b> = defrosting 2; <b>9</b> = evaporator's 2 fan; <b>10</b> = liquid valve; <b>11</b> = on/stand-by; <b>12</b> = locked man.
u1	0	12	----	6	Management of the K3 digital output (available in all models, except in SMART BOX VEX, SMART BOX VEX M and SMART BOX VEX MD); <b>0</b> = ambient light; <b>1</b> = anti-fogging resistances; <b>2</b> = auxiliary output; <b>3</b> = alarm; <b>4</b> = door resistances; <b>5</b> = dead-zone mode resistances; <b>6</b> = condenser's fan <b>7</b> = compressor 2; <b>8</b> = defrosting 2; <b>9</b> = evaporator's 2 fan; <b>10</b> = liquid valve; <b>11</b> = on/stand-by; <b>12</b> = locked man.
u2	0	1	----	0	Enable the turning on/off the ambient light or the auxiliary output manually when the device is off; <b>1</b> = YES.
u3	0	240	s	10	Delay in deactivating the compressor after the liquid valve has been deactivated; maximum time in between the deactivation of the liquid valve (according to the C14 parameter).
u4	0	1	----	1	Enable the deactivation of exiting the alarm and muting the buzzer; <b>0</b> = NO; <b>1</b> = YES.
u5	-99	99	°C/°F (1)	-1.0	Set point to activate the door resistances ("U5 – 2,0 °C/4 °F).
u6	1	120	min	5	Ignition time of the anti-fogging resistances.
u7	-99	99	°C/°F (1)	-5.0	Differential under the set point in order to activate the dead zone resistances. (17)
u9	0	1	----	1	Enable the buzzer; <b>0</b> = NO; <b>1</b> = YES.
u11	0	12	----	3	Management of the K3 digital output (only available in SMART BOX PLUS, SMART BOX PLUS M, SMART BOX PLUS MD and SMART BOX PLUS SD); <b>0</b> = reserved; <b>1</b> = anti-fogging resistances; <b>2</b> = auxiliary output; <b>3</b> = alarm; <b>4</b> = door resistances; <b>5</b> = dead-zone mode resistances; <b>6</b> = condenser's fan <b>7</b> = compressor 2; <b>8</b> = defrosting 2; <b>9</b> = evaporator's 2 fan; <b>10</b> = liquid valve; <b>11</b> = on/stand-by; <b>12</b> = locked man.
PARAM.	MIN.	MAX.	U.M.	DEF	REAL TIME CLOCK
Hr0	0	1	----	0	Enabling the real time clock and its functions; (only available in SMART BOX SD and SMART BOX PLUS SD); <b>0</b> = NO; <b>1</b> = YES.
PARAM.	MIN.	MAX.	U.M.	DEF	ENERGY SAVING
HE2	0	999	min	0	Maximum duration of the "energy saving" mode, it is activated when it receives no signal from the open door input; <b>0</b> = the mode will last until the input is activated.
H01	0	23	h	0	Hour of activation of the "energy saving" operation mode on Mondays.
H02	0	24	h	0	Duration of the "energy saving" operation mode on Mondays.
H03	0	23	h	0	Hour of activation of the "energy saving" operation mode on Tuesdays.
H04	0	24	h	0	Duration of the "energy saving" operation mode on Tuesdays.
H05	0	23	h	0	Hour of activation of the "energy saving" operation mode on Wednesdays.
H06	0	24	h	0	Duration of the "energy saving" operation mode on Wednesdays.
H07	0	23	h	0	Hour of activation of the "energy saving" operation mode on Thursdays.
H08	0	24	h	0	Duration of the "energy saving" operation mode on Thursdays.

H09	0	23	h	0	Hour of activation of the "energy saving" operation mode on Fridays.
H10	0	24	h	0	Duration of the "energy saving" operation mode on Fridays.
H11	0	23	h	0	Hour of activation of the "energy saving" operation mode on Saturdays.
H12	0	24	h	0	Duration of the "energy saving" operation mode on Saturdays.
H13	0	23	h	0	Hour of activation of the "energy saving" operation mode on Sundays.
H14	0	24	h	0	Duration of the "energy saving" operation mode on Sundays.
PARAM.	MIN.	MAX.	U.M.	DEF	REAL TIME DEFROSTING
Hd1	h0	h--	h	0	Activation time of the first daily defrosting (h - - = not used).
Hd2	h0	h--	h	0	Activation time of the second daily defrosting (h - - = not used).
Hd3	h0	h--	h	0	Activation time of the third daily defrosting (h - - = not used).
Hd4	h0	h--	h	0	Activation time of the fourth daily defrosting (h - - = not used).
Hd5	h0	h--	h	0	Activation time of the fifth daily defrosting (h - - = not used).
Hd6	h0	h--	h	0	Activation time of the sixth daily defrosting (h - - = not used).
PARÁM.	MÍN.	MÁX.	U.M.	DEF	DATA LOGGING EXTENSION
Sd0	1	30	min	30	Writing interval in the "HACCP" type modes.
Sd1	1	30	min	1	Writing interval in the "service" type modes.
Sd2	1	240	min	60	Duration of the "service" type writing mode.
Sd3	0	1	----	0	Enable the auxiliary 3 temperature probe; <b>0</b> = NO; <b>1</b> = YES
Sd4	0	1	----	0	Enable the writing of the value of the room temperature; <b>0</b> = NO; <b>1</b> = YES
Sd5	0	1	----	1	Type of decimal separator; <b>0</b> = comma; <b>1</b> = Period
Sd6	0	2	----	1	Type of auxiliary 2 and auxiliary 3 probe; <b>0</b> = Reserved; <b>1</b> = NTC; <b>2</b> = Pt1000
PARAM.	MIN.	MAX.	U.M.	DEF	MODBUS RS-485
LA	1	247	----	247	Device's serial direction (node)
Lb	0	3	----	2	Transmission speed (Bauds); <b>0</b> = 2.400 bauds; <b>1</b> = 4.800 bauds; <b>2</b> = 9.600 bauds; <b>3</b> = 19.200 bauds
LP	0	2	---	2	Parity; <b>0</b> = None; <b>1</b> = Odd; <b>2</b> = Even

**Notes:**

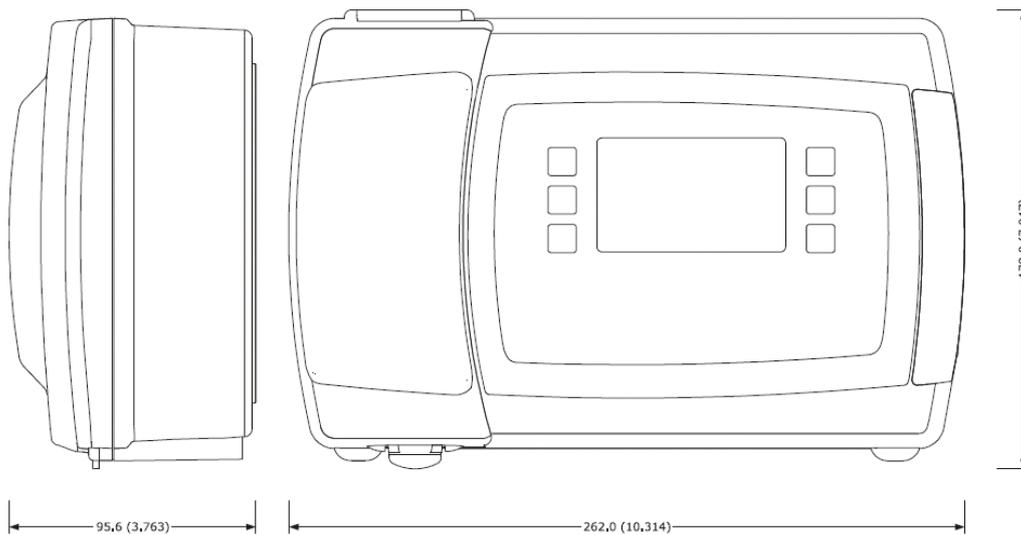
- (1) The unity of measurement depends on the P2 parameter.
- (2) The unity of measurement depends on the P9 and P10 parameters.
- (3) Properly configure the parameters considering the value of the P2 parameter.
- (4) The formula to calculate the CPT temperature is as follows:  

$$\text{CPT temperature} = \{[(P7 \text{ parameter}) \times (\text{air input temperature})] + [(100 - P7 \text{ parameter}) \times (\text{air output temperature})] : 100\}$$
- (5) The value depends on the P2 parameter (0.1 °C or 1 °C)
- (6) When working with only one compressor the parameter is the differential of the regulation Set Point. However, if one of the outputs is configured as compressor 2, r0 becomes the proportional band of a regulation with two stages.
  - Temperature below the SP, disconnected compressors.
  - Temperature above the SP+r0/2 (half of the band) the controller activates a compressor.
  - Temperature above the SP+r0, the controller activates both compressors.
- (7) The differential of the h02 and h03 parameters is 2.0 °C/4 °F
- (8) The differential of the h13 parameter is 2.0 bar g/PSI g
- (9) The pre-dripping is used with the hot gas defrostings and in parallel to the hot gas solenoid valve (which is controlled with the defrosting output); an electric resistance of "evaporator drying" is also controlled.  
How the regulation works:  
When a hot gas defrosting is initiated the controller activates the compressor's output and the defrosting output. This way the compressor, the hot gas solenoid valve and the drying resistance will be activated.  
When the defrosting finishes (when the evaporator has reached the "end of defrosting" temperature) the controller deactivates the compressor's output but keeps the defrosting output activated for the d16 time in order to keep the drying resistance activated for some minutes (usually it is 2 or 3 minutes).  
After this the controller starts the dripping, where all outputs are deactivated. In general, the pre-dripping is used instead of the dripping when the installation has this drying resistance.
- (10) Example: if the compressor is working for 180 minutes straight without reaching the SP, the controller will perform a defrosting cycle due to the suboptimal performance of the plant.
- (11) Ignited fan during the "energy saving" mode, it doesn't have an effect on the behavior during the defrosting. The F13 and F14 parameters have an effect when the compressor is turned off.
- (12) The F13 and F14 parameters have an effect when the compressor is ignited.
- (13) The F13 and F14 parameters have an effect when the evaporator's temperature is below the temperature set in the F1 parameter.
- (14) The F13 and F14 parameters have an effect when the compressor is turned off and the evaporator's temperature is below the temperature set in the F1 parameter.
- (15) This alarm is only a signal in the controller's display, the alarm output can be activated if it is configured.
- (16) This parameter only has a function if one of the outputs is configured as a resistance for a dead-zone operation. In such a case, u7 establishes at how many degrees below the working set point will the heat resistance be activated.

## 12 – DIMENSIONS AND INSTALLATION

### 12.1 Dimensions

The dimensions are expressed in mm (in).

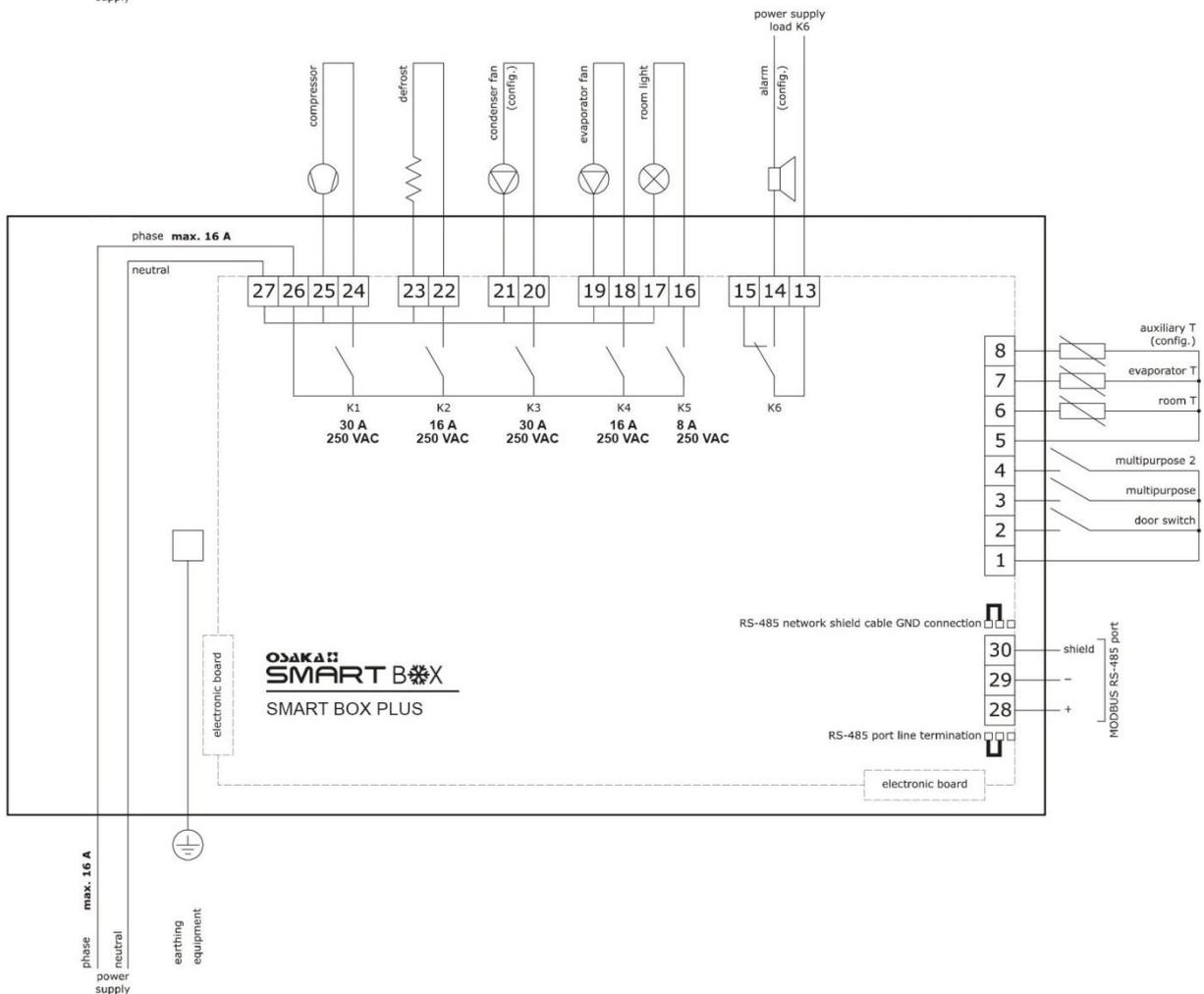
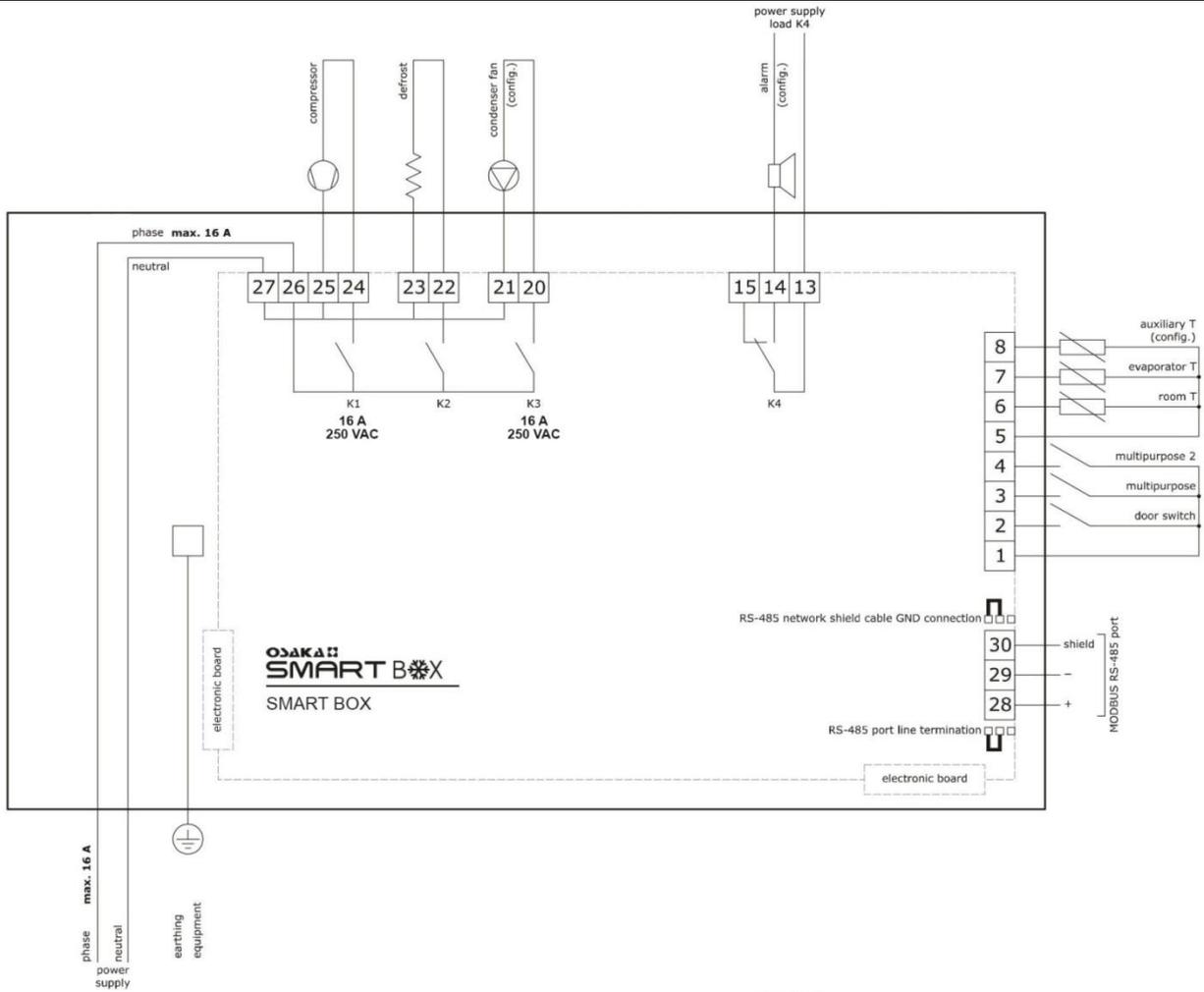


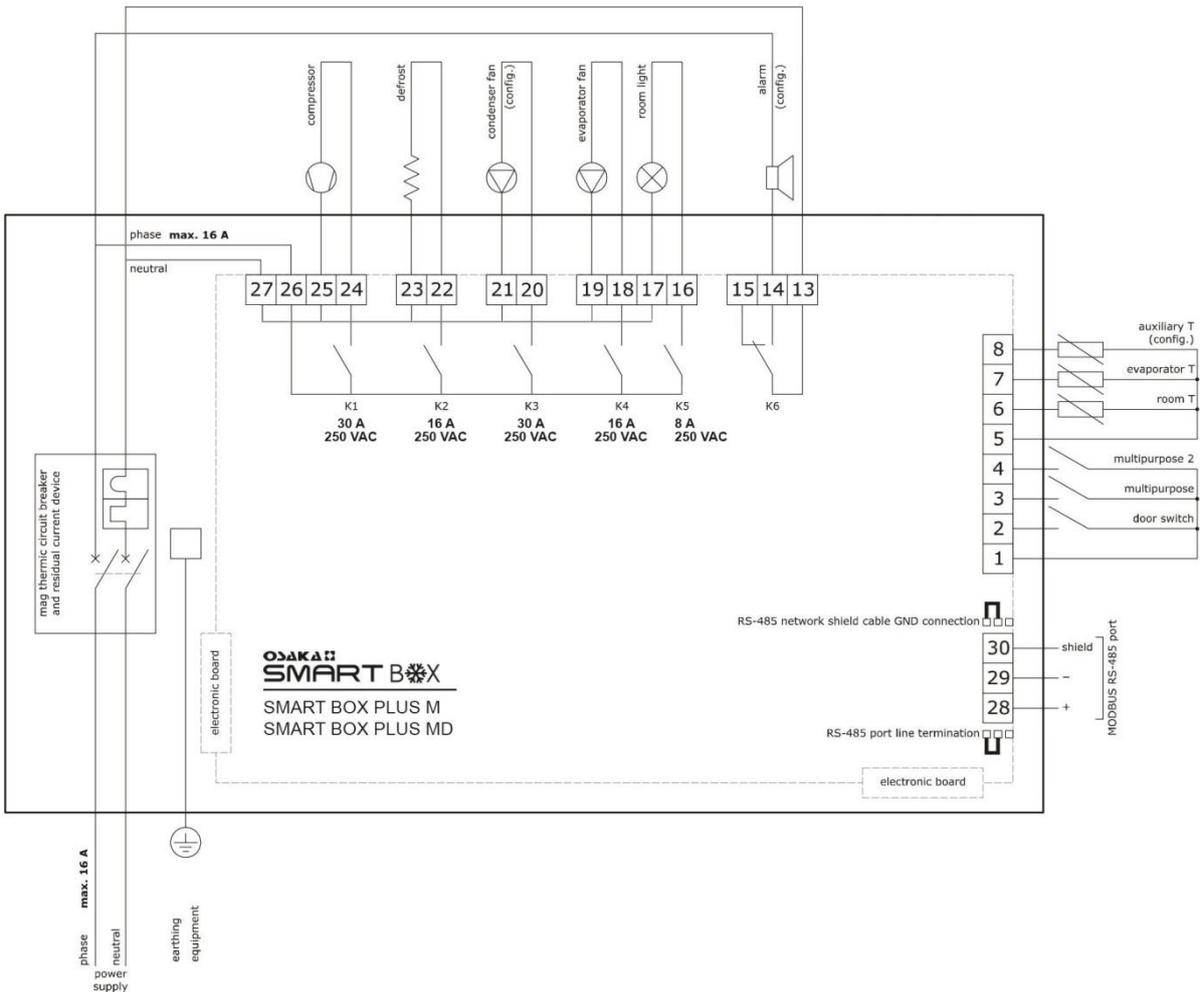
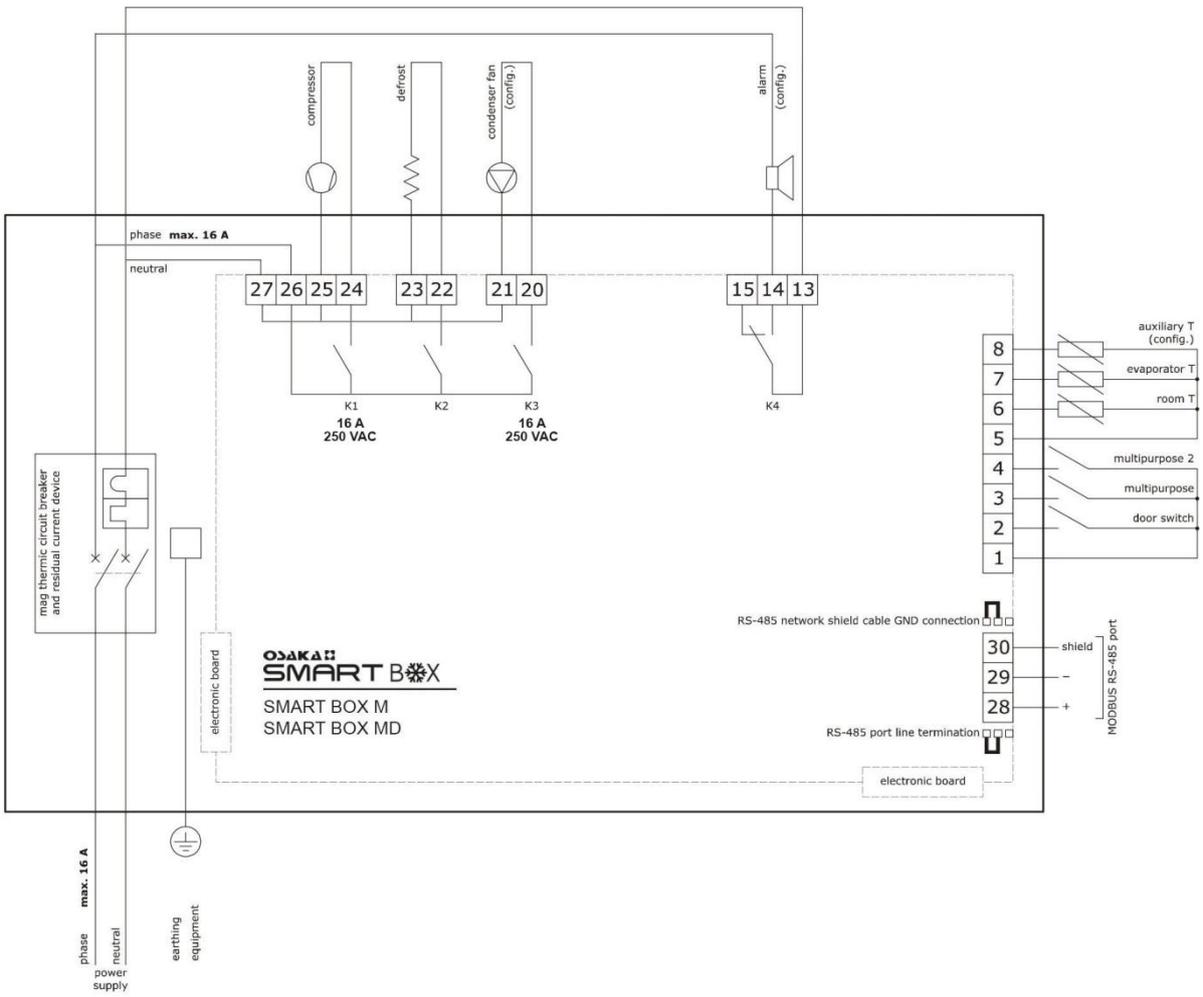
### 12.2 Additional information for the installation

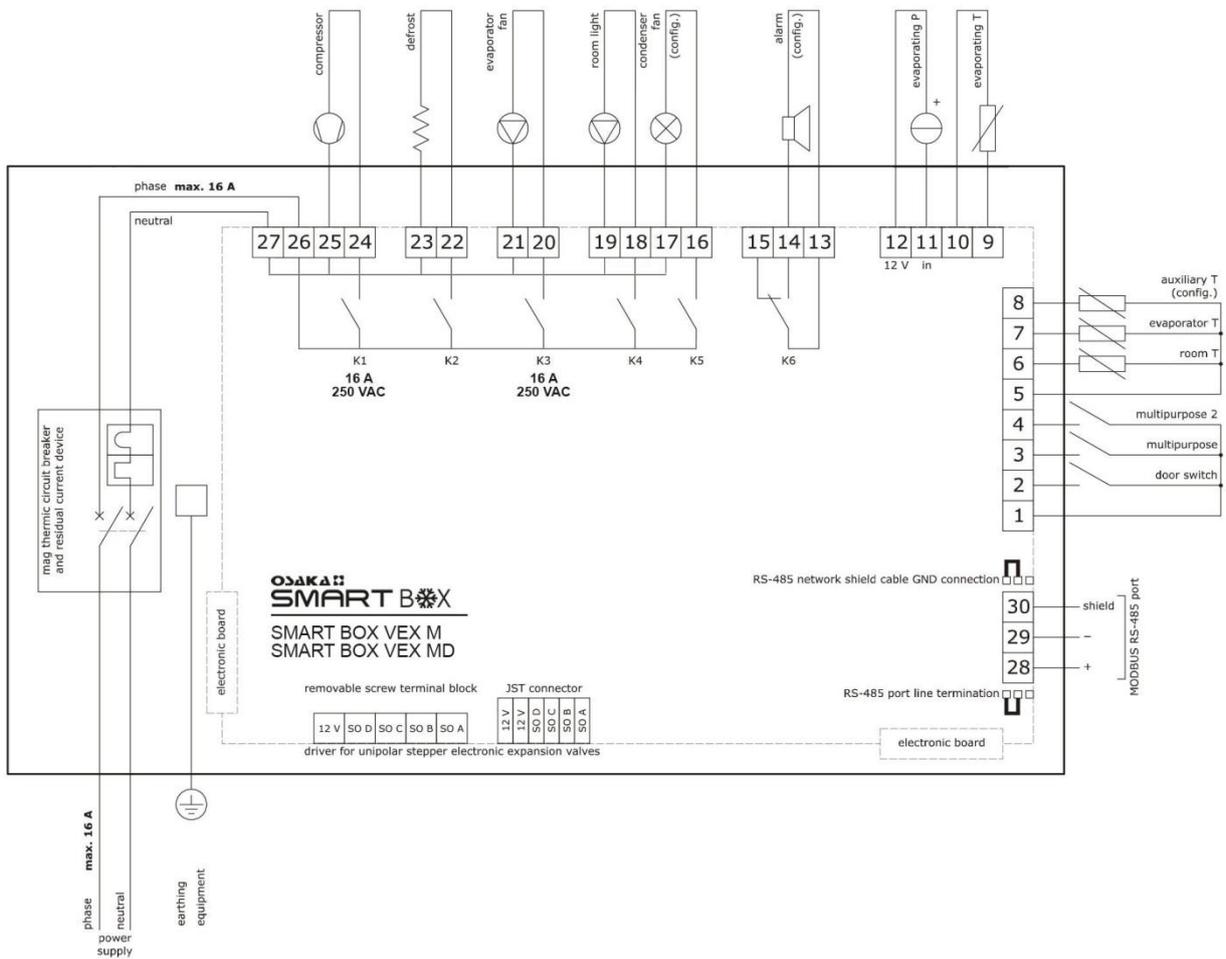
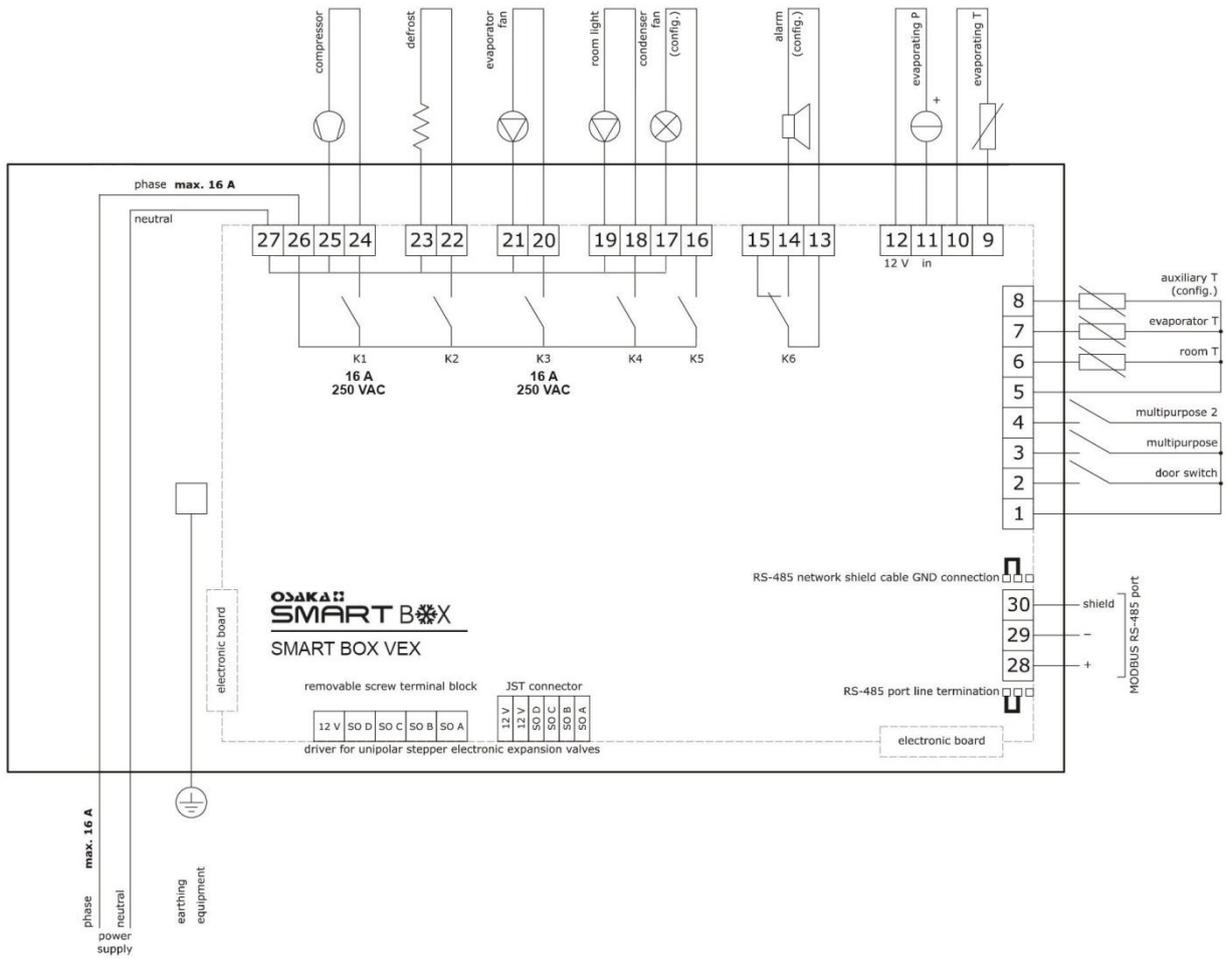
Make sure that the device's working conditions (temperature of operation, humidity of operation, etc.) are within the aforementioned limits; consult the TECHNICAL DATA chapter of the extensive manual.

Do not install this device near heat sources (heaters, hot air conductors, etc.), devices with big magnets (speakers, etc.), in places without direct light exposure, rain, dust, humidity, mechanical vibrations or pumps.

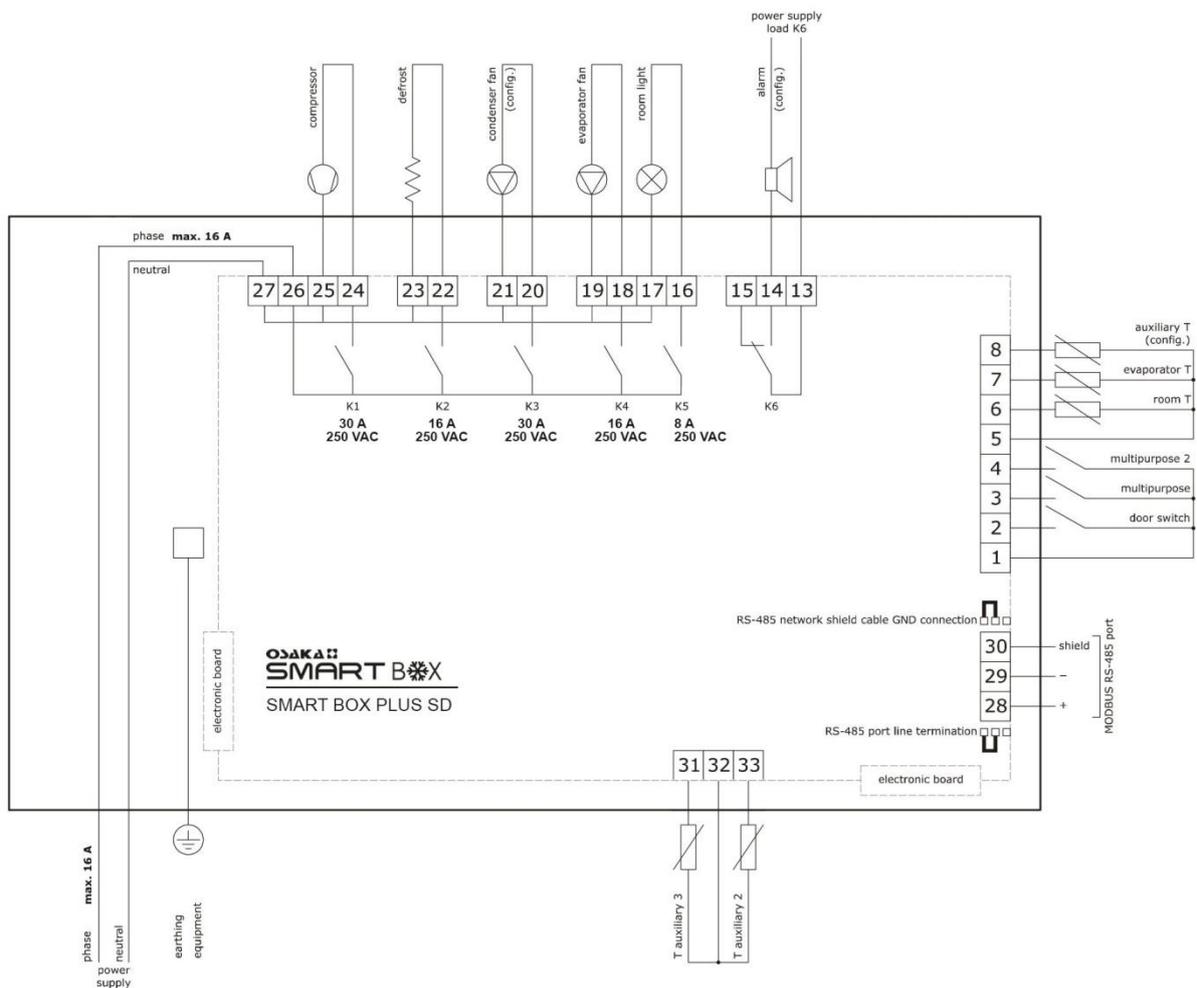
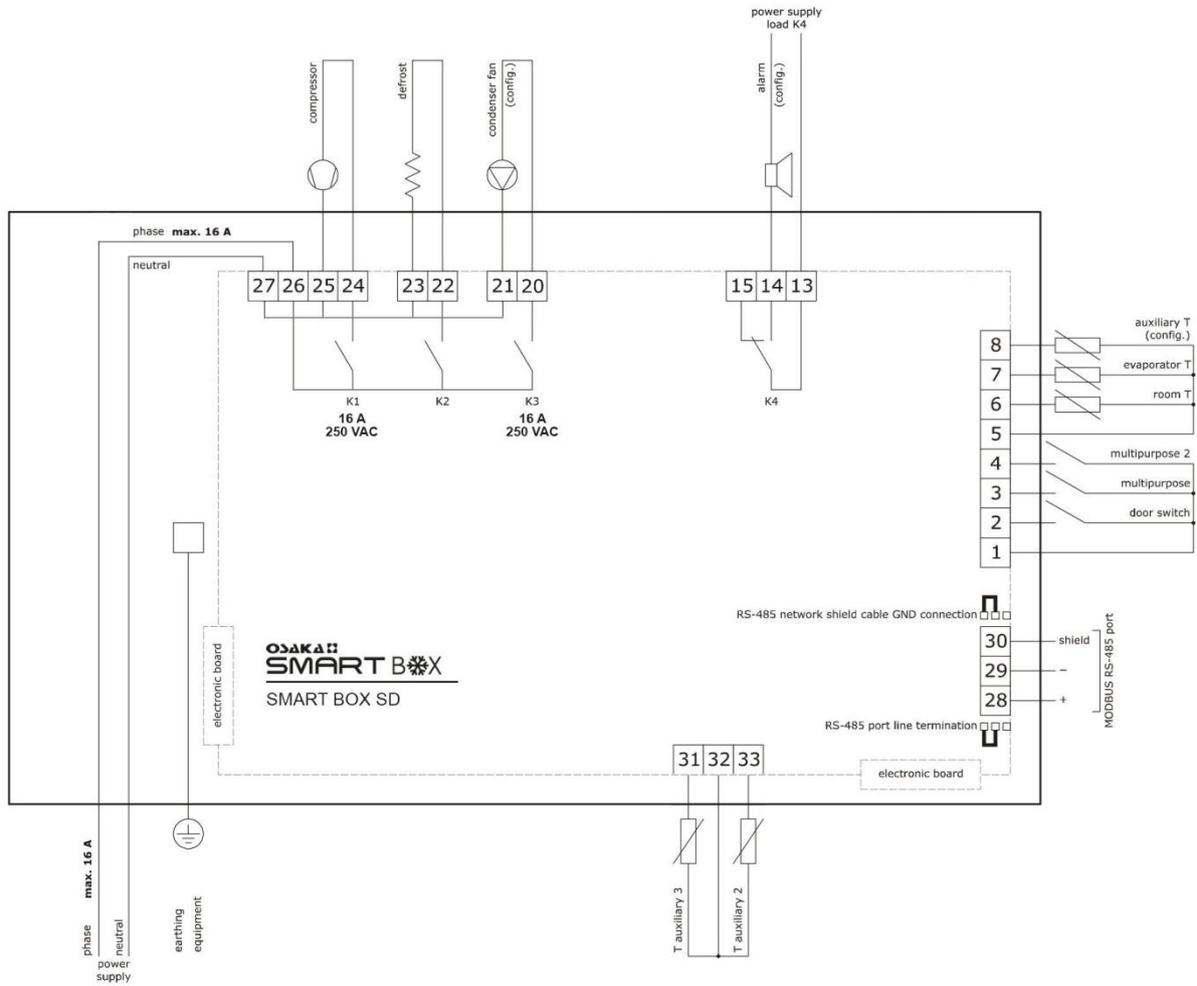
In compliance with the safety legislation, the protection against possible contacts with electric components must be ensured through the correct installation of the device; all components that ensure protection must be fixed in such a way that they won't be able to be moved unless tools are used.







Connection for the models with data logging in compliance with the EN 12830 norm.



### 13.2 Additional information for the electric connection

Do not operate with the device's terminal block using electric screwdrivers or pneumatics.

If the device has been moved from a cold place to a hot one, the humidity can condense in its interior; wait for approximately an hour before connecting it to the power supply.

Make sure that the power's supply voltage, and the device's electric frequency and the power are proper with the local power supply; consult the TECHNICAL DATA chapter of the extensive manual.

Connect the device to the MODBUS RS-485 network by using a twisted wire.

Place the supply cables as far as possible from the signaling cables.

## 14 – WARRANTY AND REPAIR

The controller has a repairing or replacement warranty due to manufacturing defects of 12 months from the purchasing date.

OSAKA SOLUTIONS will automatically cancel aforementioned warranty and will not be held accountable for possible damages that result from:

- The use, installation, usage or improper handling that differs from the one previously stated, and specially if it differs from the safety prescriptions established by the law.
- The use in applications, machines or frames that do not guarantee an adequate protection against liquids, dust, grease and electric shocks in the performed mounting conditions.
- The inexpert handling and/or the modification of the product.
- The installation/use in application, machines or frames that do not comply with the current regulations set by the law.

In case of having a defective product under warranty time or out of warranty time, it is necessary to contact the post-sales service to perform the appropriate procedures. Request the "RMA" reparation document (by email or fax) and fill it, it is necessary to send the RMA and the controller to the SAT OSAKA (Technical Assistance Service) by prepaid freight.