OPTYMA™ Control
Single-phase
AK-RC 101



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General

Description

The OPTYMA™ Control single-phase is a new control panel for cold rooms with a single-phase compressor up to 2 HP, specially designed for safety, protection, control and ease of installation.

It allows the user to control all the components on a refrigeration system: compressor, evaporator fans, defrosting elements, room light and thermostat-holder.

Applications

- Complete management of single-phase static or ventilated refrigeration systems up to 2 HP, with off-cycle or electrical defrosting and with direct or pump-down compressor stop.
- Control of single-phase evaporator unit only with solenoid valve or remote condensing unit.

Main characteristics

- Direct control of defrosting elements, evaporator fans, room light with outputs directly connectable to the various units.
- Automatic fuse protect the refrigeration unit.
- Stylish ABS housing with transparent cover for access to the automatic fuse, all with an IP65 protection rating so that panel can be used outside the room.
- LED indicators and large display show system status.
- User-friendly keypad.
- Display resolution to 0.1 °C.
- Modbus data communication that can be connected to an ADAP-KOOL® system unit.

Overall dimensions

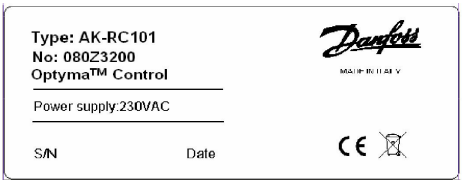


Dimensions in mm.

Identification data

The unit described in this manual has an ID label on the side showing all the relevant identification data:

- Name of Manufacturer
- Type and code number
- Product name
- Power supply
- Serial number (10 digits)
- Date (Day/Month/Year)



Installation

Important information for the installer.
Installation to be done by authorised person only!

1. Install the device in places where the protection rating is observed and try not to damage the housing when drilling holes for wire penetrations
2. Do not use multi-polar cables which have wires connected to inductive/power loads and signalling wires (e.g. sensors and digital inputs).
3. Do not fit power supply wiring and signal wiring (sensors and digital inputs) in the same raceways or ducts.
4. Minimise the length of connector wires so that wiring does not twist into a spiral shape as this could have a detrimental effect on the electronics.
5. Fit a general protection fuse before the electronic controller.
6. All wiring must be of a diameter suitable for relevant power levels.
7. If a sensor extension is required, the wires must have a diameter of at least 1 mm^2.
8. If data communication is used, it is important that the data communication cable is correctly installed. See separate literature, no. RC8AC...
9. If data communication is used, the alarm relay cannot be used.

Standard assembly kit

For the purposes of assembly and use, the electronic OPTYMA™ Control single-phase unit comes with:

- Three rubber washers, to be fitted between the fixing screws and the housing back panel
- One user's manual.
- Two temperature sensors

Installing the unit

1.
Lift the transparent cover.
Remove the screw cover on the right-hand side of the housing.



2.
Undo the 4 fixing screws at the front of the housing.

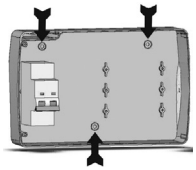


3.
Open the front of the housing, lift it and slide the two hinges out as far as they will go.

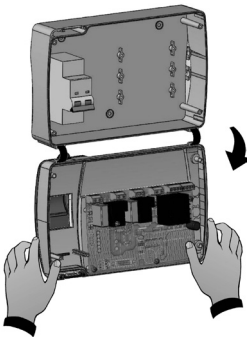
4.
Press on the sides of the hinges to remove them from their seats and then remove the front panel completely.



5.
Use the three existing holes to fix the housing back panel to the wall: use three screws of a suitable length for the thickness of the wall on which the panel will be mounted. Fit a rubber washer (supplied) between each screw and the housing back panel.



6.
Hook the front panel back up to the lower part of the housing by inserting the two hinges in their seats and, bending them, rotate downwards 180° to gain access to the electronic board.



If Modbus data communication is connected, see the JUMPER setting on page 14, preferably before all the wiring is connected.

NOTE !
Make all the electrical connections as illustrated in the diagram for the corresponding model (see drawing on page 16).
To effect correct electrical connection and maintain the protection rating, use appropriate wire/raceway grips to ensure a good seal.
Route the wiring inside the unit in as tidy a fashion as possible: be especially careful to keep power wires away from signal wires. Use clips to hold wires in place.

7.
Close the front panel, making sure that all the wires are inside the housing and that the housing seal sits in its seat properly.
Tighten the front panel using the 4 screws, making sure the O-rings on the head of each screw are used.
Power up the panel and carry out thorough reading/programming of all the parameters.



NOTE !
Be careful not to over-tighten the closure screws as this could warp the housing and compromise proper operation of the membrane-type keypad.
Install short-circuit overload safety devices on all the power cables connected to the OPTYMA™ Control so as to prevent damage to the device. Work and/or maintenance must be carried out on the unit ONLY after disconnecting the panel from the power supply and from any inductive/power loads: doing so allows the worker to do his job safely.

Functions

OPTYMA™ Control single-phase:

- Display and adjustment of cold room temperature setting to 0.1 °C
- Display of evaporator temperature from parameter
- System control activation/deactivation
- System warnings (probe/sensor errors, minimum and maximum temperature warnings, compressor shutdown)
- Evaporator fans control
- Automatic and manual defrost (static, heating element, cycle inversion)
- Direct control of compressor unit up to 2 HP
- Room light, via panel key or door switch
- Alarms/auxiliary relay
- Defrosting, lights and alarms can be operated via data communication.

Technical characteristics of OPTYMA™ Control single-phase

Power supply

Voltage	230 V~ ± 10% 50Hz / 60Hz
Power consumption (electronics only)	~ 7 VA

Cold room conditions

Operating temperature	-5 to 50°C
Storage temperature	-10 to 70°C
Relative humidity	Less than 90% - Not condensed. No shock influence/vibration.

General characteristics

Type of sensors	EKS 221, code no.: 084N3210
Resolution	0.1 °K
Sensor read precision	± 0.5 °K
Read range	-45…+45 °C

Digital inputs

Requirements to contact	Gold plating

OPTYMA™ Control single-phase - Output characteristics - max. applicable load (230 V AC)

Compressor	1500W (AC3)
Defrost	3000W (AC1)
Fans	500W (AC3)
Room light	800W (AC1)
Alarm contact (non-powered contact)	100W
General electrical protection	Automatic fuse 16A Id=300 mA Disconnecting power 4.5 kA

Dimensions

Dimensions	168 mm x 97 mm x 262 mm (HxPxL)

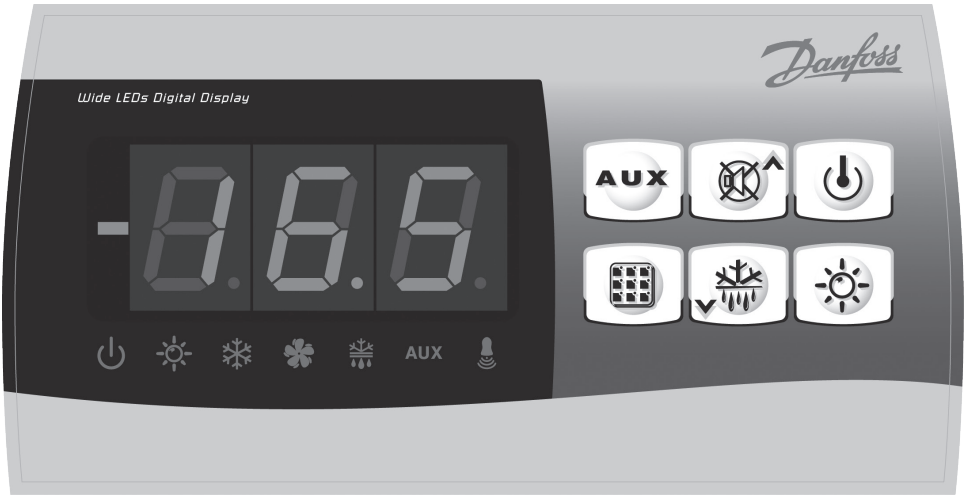
Insulation / mechanical characteristics

Housing protection rating	IP65
Housing material	Self-extinguishing ABS
Type of insulation	Class II

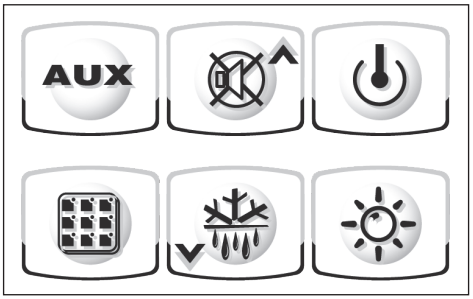
Capacitive load

The relays cannot be used for the direct connection of capacitive loads such as LEDs and on/off control of EC motors. All loads with a switch mode power supply must be connected with a suitable contactor or similar.

Control Panel



Front keypad



AUXILIARY RELAY CONTROL

(on the version with alarm relay controls the relay manual if parameter AU=1)

UP / MUTE WARNING BUZZER

STAND BY

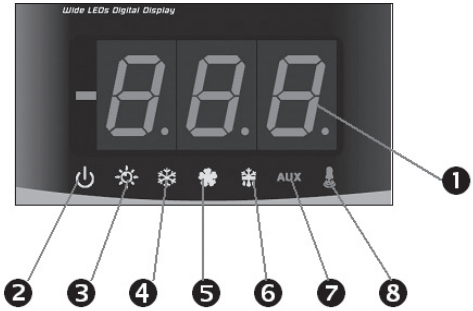
(The LED flashes if the system shuts down)

Room temperature SETTING / SET key

DOWN / MANUAL DEFROST

ROOM LIGHT

LED Display



1. Cold room temperature / parameters
2. Stand-by (flashes on stand-by). Outputs are de-activated
3. Room light (flashes if door switch activated)
4. Cold (indicates activation of compressor)
5. Fans
6. Defrosting
7. Auxiliary
8. Alarm/warning

General

To enhance safety and simplify the operator's work, the OPTYMA™ Control has two programming levels; the first level (Level 1) is used to configure the frequently-modified SETPOINT parameters. The second programming level (Level 2) is for general parameter programming of the various controller work modes.

It is not possible to access the Level 2 programming directly from Level 1: you must exit the programming mode first.

Symbols used

For practical purposes the following symbols are used:

- (▲) the UP key  is used to increase values and mute the alarm.
- (▼) the DOWN key  is used to decrease values and force defrosting.

Setting and displaying the setpoints

1. Press the SET key to display the current SETPOINT (temperature)

2. Hold down the SET key and press the (▲) or (▼) keys to modify the SETPOINT.

Release the SET key to return to cold room temperature display: the new setting will be saved automatically.

Level 1 - Programming (User Level)

To gain access to the Level 1 configuration menu proceed as follows:

1. Press the (▲) and (▼) keys simultaneously and keep them pressed for a few seconds until the first programming variable appears on the display.

2. Release the (▲) and (▼) keys.

3. Select the variable to be modified using the (▲) and (▼) key.

4. When the variable has been selected it is possible to:
   - display the setting by pressing the SET key
   - modify the setting by pressing the SET key together with the (▲) and (▼) key.

   When configuration values have been set, you can exit the menu by pressing the (▲) and (▼) keys simultaneously for a few seconds until the cold room temperature reappears.

5. The new settings are saved automatically when you exit the configuration menu.

List of Level 1 variables (User Level)

Variables	Explanation	Value	Default
r0	**Differential** above main SETPOINT* * SETPOINT see page 9	0.2 - 10 K	2K
d0	**Defrost interval (hours)**	0 - 24 hours	4 hours
d2	**End-of-defrost setpoint.** Defrosting will not take place if the temperature detected by the defrost sensor is greater than d2 (If the sensor is faulty defrosting is timed)	-35 - 45 °C	15°C
d3	**Max defrost duration** (minutes)	1 - 240 min	25 min
d7	**Drip duration** (minutes) At the end of defrost, the compressor and fans remain at standstill for time d7 and the defrost LED on the front panel flashes.	0 - 10 min	0 min
F5	**Fan pause** after defrost (minutes) Allows fans to be kept at standstill for time F5 after dripping. This time begins at the end of dripping. If no dripping has been set, the fan pause starts directly at the end of defrost.	0 - 10 min	0 min
A1	**Minimum temperature alarm** Allows user to define a minimum temperature for the room being refrigerated. Below value A1 an alarm trips: the alarm LED flashes, the displayed temperature flashes and the buzzer sounds to indicate the problem.	-	-45°C
A2	**Maximum temperature alarm** Allows user to define a maximum temperature for the room being refrigerated. Above value A2 an alarm trips: the alarm LED flashes, the displayed temperature flashes and the buzzer sounds to indicate the problem.	-	+45°C
tEu	**Evaporator sensor temperature display**	Displays evaporator temperature (displays nothing if dE =1)	read only

Level 2 - Programming (Installer Level)
To access the second programming level press the UP (▲) and DOWN (▼) keys and the LIGHT key simultaneously for a few seconds.

When the first programming variable appears the system automatically goes to stand-by.

1. Select the variable to be modified by pressing the UP (▲) and DOWN (▼) keys.
   When the parameter has been selected it is possible to:
2. View the setting by pressing the SET key.
3. Modify the setting by holding the SET key down and pressing the (▲) or (▼) key.
4. When configuration settings have been completed you can exit the menu by pressing the (▲) and (▼) keys simultaneously and keep them pressed until the room temperature reappears.
5. Changes are saved automatically when you exit the configuration menu.
6. Press the STAND-BY key to enable electronic control.

List of Level 2 variables (Installer Level)

Variables	Explanation	Value	Default
AC	**Door switch status**	0 = normally open 1 = normally closed	0
F3	**Fan status with compressor off**	0 = fans run continuously 1 = fans only run when compressor is working	1
F4	**Fan pause during defrost**	0 = fans run during defrost 1 = fans do not run during defrost	1
dE	**Sensor presence** If the evaporator sensor is disabled defrosts are carried out cyclically with period d0: defrosting ends when an external device trips and closes the remote defrost contact or when time d3 expires.	0 = evaporator sensor present 1 = no evaporator sensor	0
d1	**Defrost type**, cycle inversion (hot gas) or with heater elements	1 = hot gas 0 = electric	0
bdr	Modbus baudrate (Danfoss System unit =19200 baud)	0=300. 1=600. 2=1200. 3=2400. 4=4800. 5=9600. 6=14400. **7=19200**. 8=38400 baud.	7
Ad	Modbus address	1 ... 247 (+ setting: AU must be set to 7) (+ move jumper: see page 14)	0
Ald	**Minimum and maximum temperature** Signalling and alarm display delay	1…240 min	120 min
C1	Minimum time between shutdown and **subsequent switching on of the compressor**.	0…15 min	0 min
CAL	**Correction of sensor signal**	-10…+10	0
Pc	**Compressor protection contact status**	0 = NO 1 = NC	0 = NO
doC	**Compressor safety time for door switch**: when the door is opened the evaporator fans shut down and the compressor will continue working for time doC, after which it will shut down.	0…5 minutes	0
tdo	**Restart time, if the door remains open**	0... 240 min. (0=no function)	0
Fst	**FAN shutdown TEMPERATURE** The fans will stop if the temperature value read by the evaporator sensor exceeds this value.	-45…+45°C	+45°C

Continued...

Variables	Explanation	Value	Default
Fd	**Fan differential below Fst**	0…+10K	2K
LSE	**Min. limit of set point setting**	-45...HSE	-45°C
HSE	**Max. limit of set point setting**	45... LSE	45°C
tA	**NO – NC** alarm relay switching	0 = activates when alarm is on 1 = deactivates when alarm is on	1
AU	**Auxiliary/alarm relay control**	0 = alarm relay 1 = manual auxiliary relay controlled via AUX key 2 = automatic auxiliary relay managed by StA temp. setting with 2°C differential 3 = not used 4 = pump-down function (see 5.15) 5 = free voltage contact for condensing unit (AUX relay and compressor relay in parallel) 6 = Relay used to control a heating element in the crankcase. The relay is on when the compressor is stopped. 7 = The relay function is cancelled and data communication is permitted	0
StA	**Temp. setting for aux. relay**	-45…+45°C	0
In1	**Man in cold room alarm** Select input INP1 on the board as compressor protection alarm or as man-in-room alarm (contact NC).	0 = compressor protection 1 = man-in-room alarm	0
P1	**Password type of protection** (active when PA does not equal 0)	0 = display set point only 1 = display set point, AUX, light access 2 = access to programming not permitted 3 = access to second level programming not permitted	3
PA	**Password** (see P1 for the type of protection)	0...999 0 = not active	0
reL	**Software release**	The version can be read	-

Switching on the OPTYMA™ Control single-phase
After wiring the electronic controller correctly, connect 230 V a.c.; the display panel will immediately emit a beep and all the LEDs will come on simultaneously for a few seconds.

Compressor activation/deactivation conditions
The OPTYMA™ Control single-phase activates the compressor when cold room temperature exceeds setting+differential (r0); it deactivates the compressor when the cold room temperature is lower than the setting.

Manual defrosting
To defrost just press the dedicated key (see page 8) to activate the elements relay. Defrosting will not take place if the end-of-defrost temperature setting (d2) is lower than the temperature detected by the evaporator sensor. Defrosting ends when the end-of-defrost temperature (d2) or maximum defrost time (d3) is reached.
When using data communication, the defrost cycle can be started from the system unit.

Hot-gas defrosting

Set parameter d1 =1 to defrost in cycle inversion mode.
The compressor relay and defrost relay are activated throughout the defrost phase.
To ensure proper control of the system the installer must use the defrost output: this must allow opening of the cycle inversion solenoid valve and closure of the liquid solenoid valve.
For capillary systems (without thermostat valve) the cycle inversion solenoid valve can be controlled via the defrost relay control.

Pump-down function

Pump-down function is activated when parameter AU=4 (for version with AUX/Alarm relay only).
Connect pump-down pressostat on the digital input INP-1.
The compressor is directly controlled by pressostat.
Connect evaporator solenoid valve on the AUX relay. The solenoid is controlled directly by the thermostat.

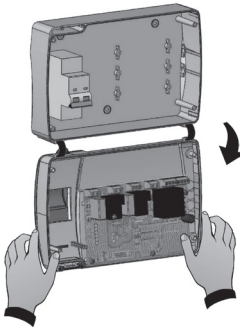
Password function

The protection function is activated when parameter PA is set to a value other than 0.
See parameter P1 for the different protection types.
When PA is set, protection starts after two minutes of inactivity. 000 appears on the display.
Use the up/down keys to change the number, and the set key to confirm it. If you have forgotten your password, use the universal number 100.

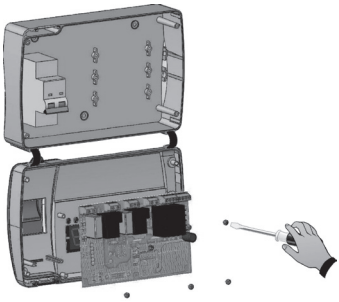
Alarm relay / Modbus

Factory setting = The relay functions as an alarm relay.
When using data communication, a JUMPER must be moved.
See the following:

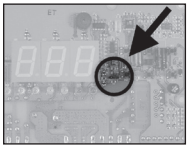
1. Open the front of the housing as described on page 5: rotate it downwards 180° to gain access to the electronic board.



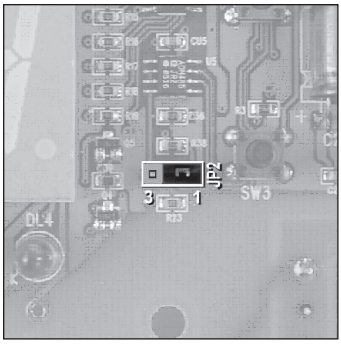
2. Undo the 6 CPU board fixing screws: remove the board from the front part of the housing in ABS.



3. Remove the jumper from JUMPER JP2.



4. Insert the jumper in JUMPER JP2 in position: 3-2: to select data communication Modbus (2-1: is the alarm relay position).

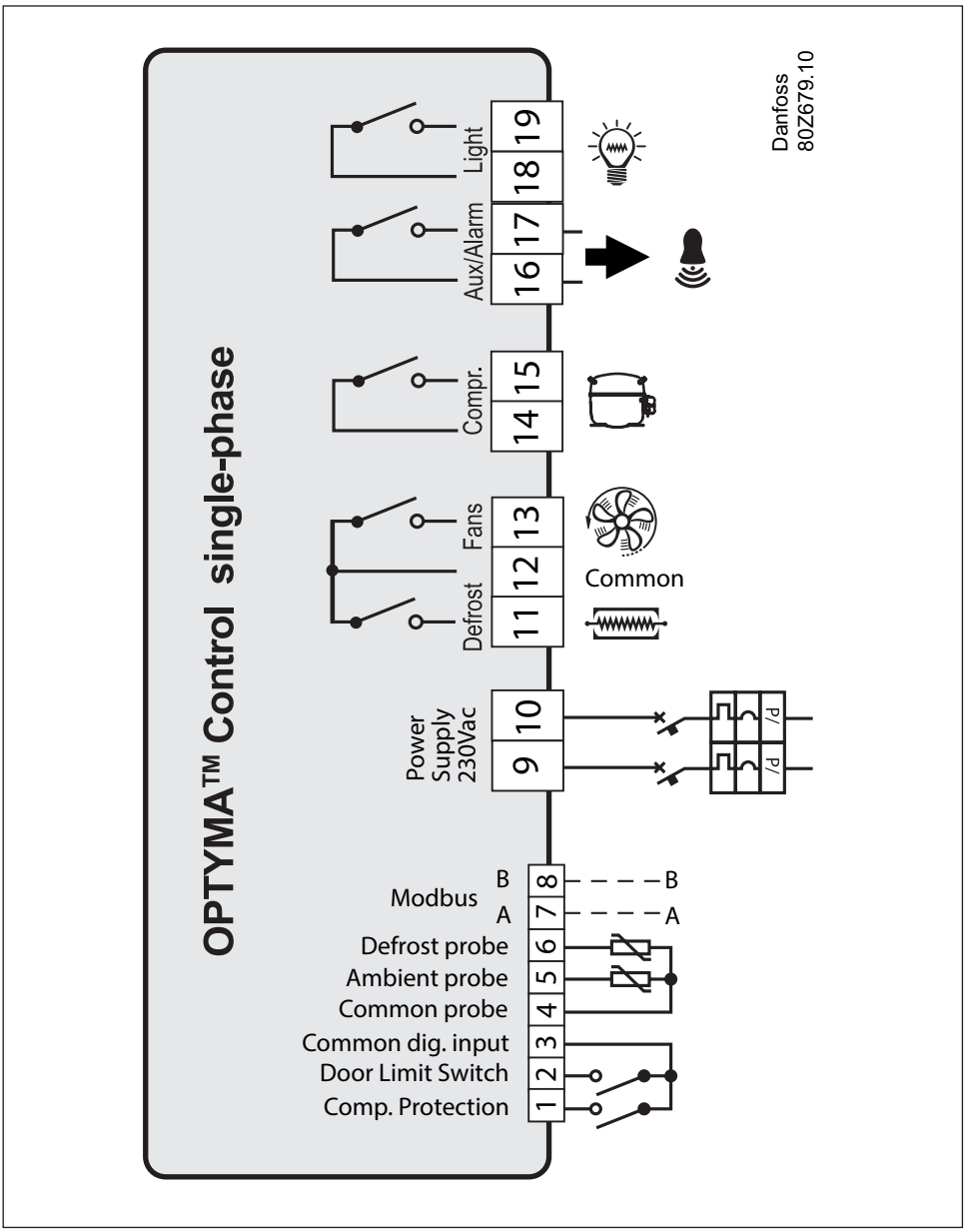


Trouble shooting / Alarm list

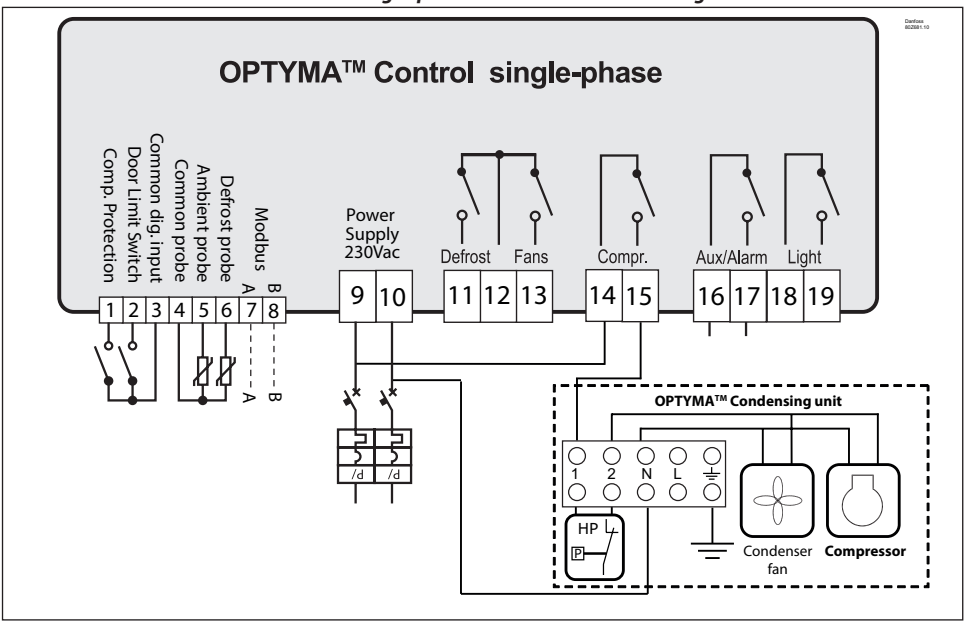
In the event of any anomalies the OPTYMA™ Control warns the operator by displaying alarm codes and sounding the warning buzzer inside the control panel. If an alarm is tripped the display will show one of the following messages.

Alarm code	Possible cause	Solution
E0	Cold room temperature sensor not working properly	• Check that cold room temperature sensor is working properly • If the problem persists replace the sensor
E1	Defrost sensor not working properly (In this case defrosts will last time d3)	• Check that defrost sensor is working properly • If the problems persists replace the sensor
E2	Eeprom alarm An EEPROM memory alarm has been detected (All outputs except the alarm one are deactivated)	• Switch unit off and then back on again
E8	Man-in-room alarm	• Reset the alarm input inside the cold room
Ec	Compressor protection tripped (e.g. thermal protection or max pressure switch) (All outputs except the alarm one – where applicable – are deactivated)	• Check that compressor is working properly • Check compressor absorption • If the problem persists contact the technical assistance
Ed	Open door - alarm (Open door and tdo-time has expired)	Check door / door contact
Temperature shown on display is flashing	*Minimum or maximum temperature alarm.* The temperature inside the cold room has exceeded the min. or max. temperature alarm setting (see variables **A1** and **A2**, user programming level)	• Check that the compressor is working properly. • Sensor not reading temperature properly or compressor start/stop control not working.

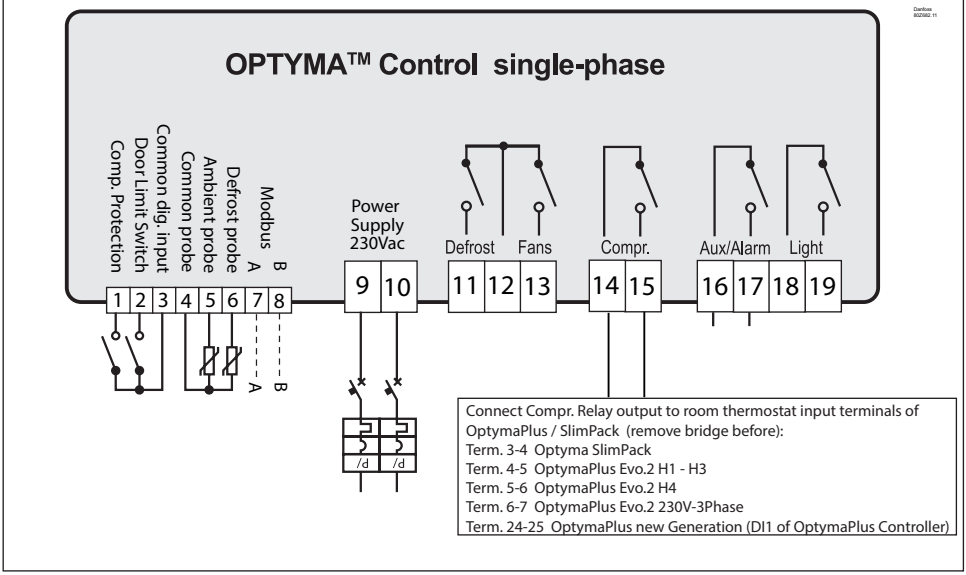
Connection diagram



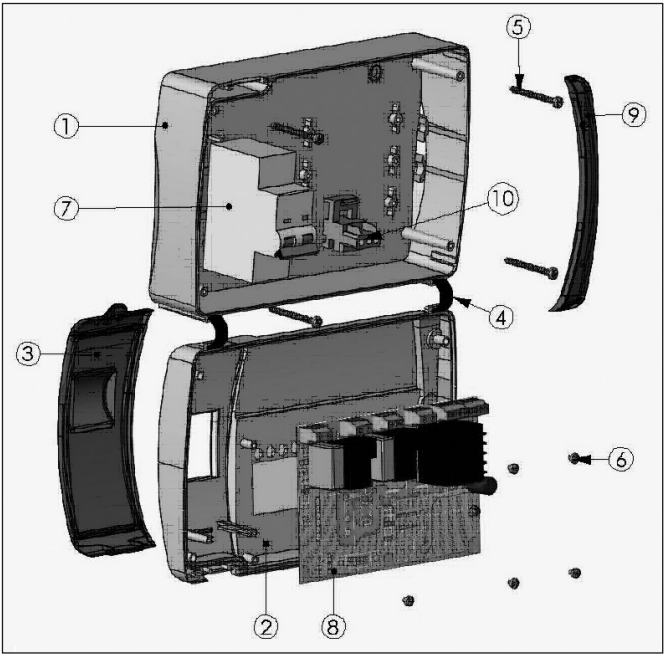
How to connect the OPTYMA™ Control single-phase to OPTYMA™ condensing unit



How to connect the OPTYMA™ Control single-phase to OPTYMA PLUS™ and SlimPack condensing unit



Parts list



1	Housing back panel in ABS
2	Housing front panel in ABS
3	Front cover in transparent polycabonate
4	Front panel opening hinge
5	Front panel closure screws
6	Board fixing screws
7	Automatic fuse/ Cut out switch
8	CPU board
9	Polycarbonate screw cover
10	Terminal for earth connections

Ordering

Type	Code no.
OPTYMA™ Control single-phase (2 HP) including two sensors	080Z3200
Sensor EKS 221 (spare part)	084N3210

Notes

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