

Digital controller with off cycle defrost and Fan Control

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1. GENERAL WARNING

1.1 PLEASE READ BEFORE USING THIS MANUAL

- This manual is part of the product and should be kept near the instrument for easy and quick reference.
- The instrument shall not be used for purposes different from those described hereunder. It cannot be used as a safety device.
- Check the application limits before proceeding.

1.2 SAFETY PRECAUTIONS

- Check the supply voltage is correct before connecting the instrument.
- Do not expose to water or moisture: use the controller only within the operating limits avoiding sudden temperature changes with high atmospheric humidity to prevent formation of condensation
- Warning: disconnect all electrical connections before any kind of maintenance.
- Fit the probe where it is not accessible by the End User. The instrument must not be opened.
- In case of failure or faulty operation send the instrument back to the distributor with a detailed description of the fault.
- Consider the maximum current which can be applied to each relay (see Technical Data).
- Ensure that the wires for probes, loads and the power supply are separated and far enough from each other, without crossing or intertwining.
- In case of applications in industrial environments, the use of mains filters (our mod. FT1) in parallel with inductive loads could be useful.

2. GENERAL DESCRIPTION

Model 30 format 32 x 74 mm, is a digital thermostat with off cycle defrost designed for refrigeration applications at normal temperature. It provides two relay outputs, one for the compressor, the other one can be used as light, for alarm signalling or as auxiliary output. It is also provided with 1 or 2 NTC probe inputs the first one for temperature control, the second one, optional, to connect to the HOT KEY terminals to signal the condenser temperature alarm or to display a temperature. The digital input can operate as third temperature probe.

The HOT KEY output allows to connect the unit, by means of an external module, to a network line compatible.

It allows to program the controller by means the HOT KEY programming keyboard.

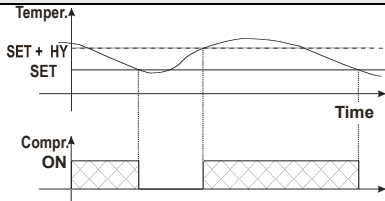
The instrument is fully configurable through special parameters that can be easily programmed through the keyboard.

3. CONTROLLING LOADS

3.1 COMPRESSOR

The regulation is performed according to the temperature measured by the thermostat probe with a positive differential from the set point: if the temperature increases and reaches set point plus differential the compressor is started and then turned off when the temperature reaches the set point value again.

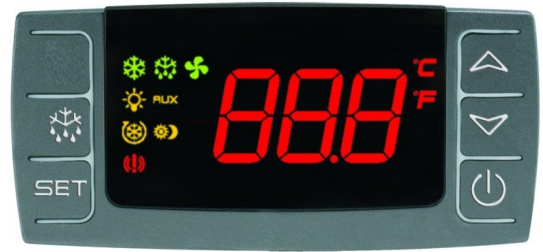
In case of fault in the thermostat probe the start and stop of the compressor are timed through parameters "CON" and "COF".



3.2 DEFROST

Defrost is performed through a simple stop of the compressor. Parameter "ldF" controls the interval between defrost cycles, while its length is controlled by parameter "MdF".

4. FRONT PANEL COMMANDS



SET: To display target set point; in programming mode it selects a parameter or confirm an operation.

(DEF) To start a manual defrost

(UP): To see the max. stored temperature; in programming mode it browses the parameter codes or increases the displayed value.

(DOWN) To see the min stored temperature; in programming mode it browses the parameter codes or decreases the displayed value.

O/I To turn ON or OFF the controller (if enabled)

KEY COMBINATIONS:

+ To lock & unlock the keyboard.

SET + To enter in programming mode.

SET + To return to the room temperature display.

4.1 CONTROL OF EVAPORATOR FANS

The fan control mode is selected by means of the "FnC" parameter:

FnC = C_n: fans will switch ON and OFF with the compressor and **not run** during defrost;

FnC = o_n fans will run even if the compressor is off, and not run during defrost;

After defrost, there is a timed fan delay allowing for drip time, set by means of the "Fnd" parameter.

FnC = C_Y fans will switch ON and OFF with the compressor and **run** during defrost;

FnC = o_Y fans will run continuously also during defrost

An additional parameter "FSt" provides the setting of temperature, detected by the evaporator probe, above which the fans are always OFF. This is used to make sure circulation of air only if his temperature is lower than set in "FSt".

4.1.1 Cyclical activation of the fans with compressor off.

When Fnc = c-n or c-Y (fans in parallel to the compressor), by means of the Fon and FoF parameters the fans can carry out on and off cycles even if the compressor is switched off. When the compressor is stopped the fans go on working for the Fon time. With Fon =0 the fans remain always off, when the compressor is off. This increases humidity in the system.

4.2 USE OF LEDS

Each LED function is described in the following table.

LED	MODE	FUNCTION
	ON	Compressor enabled
	Flashing	Anti-short cycle delay enabled
	ON	Defrost enabled
	ON	An alarm is occurring
°C/°F	ON	Measurement unit
°C/°F	Flashing	Programming phase

5. MAX & MIN TEMPERATURE MEMORIZATION

5.1 HOW TO SEE THE MIN TEMPERATURE

1. Press and release the key.
2. The "Lo" message will be displayed followed by the minimum temperature recorded.
3. By pressing the key again or by waiting 5s the normal display will be restored.

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5.2 HOW TO SEE THE MAX TEMPERATURE


1. Press and release the \blacktriangle key.
2. The "Hi" message will be displayed followed by the maximum temperature recorded.
3. By pressing the \blacktriangle key again or by waiting 5s the normal display will be restored.

5.3 HOW TO RESET THE MAX AND MIN TEMPERATURE RECORDED

1. Hold press the SET key for more than 3s, while the max. or min temperature is displayed. (rSt message will be displayed)
2. To confirm the operation the "rSt" message starts blinking and the normal temperature will be displayed.

6. MAIN FUNCTIONS


6.1 HOW TO SEE THE SETPOINT

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1. Push and immediately release the SET key: the display will show the Set point value;
 2. Push and immediately release the SET key or wait for 5 seconds to display the probe value again.

6.2 HOW TO CHANGE THE SETPOINT

1. Push the SET key for more than 3 seconds to change the Set point value;
2. The value of the set point will be displayed and the "°C" or "°F" LED starts blinking;
3. To change the Set value push the \blacktriangle or \blacktriangledown arrows within 10s.
4. To memorise the new set point value push the SET key again or wait 10s.

6.3 HOW TO START A MANUAL DEFROST

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- Push the DEF key for more than 2 seconds and a manual defrost will start.

6.4 HOW TO CHANGE A PARAMETER VALUE

To change the parameter's value operate as follows:

1. Enter the Programming mode by pressing the Set + \blacktriangledown keys for 3sec (the "°C" or "°F" LED starts blinking).
2. Select the required parameter. Press the "SET" key to display its value
3. Use "UP" or "DOWN" to change its value.
4. Press "SET" to store the new value and move to the following parameter.

To exit: Press SET + UP or wait 15sec without pressing a key.

NOTE: the set value is stored even when the procedure is exited by waiting the time-out to expire.

6.5 THE HIDDEN MENU (PR2)

The hidden menu Includes all the enabled parameters of the instrument.

6.5.1 HOW TO ENTER THE HIDDEN MENU

1. Enter the Programming mode by pressing the Set + \blacktriangledown keys for 3 sec. (the "°C" or "°F" LED starts blinking).
2. Released the keys, then push again the Set + \blacktriangledown keys for more than 7sec. The Pr2 label will be displayed immediately followed from the Hy parameter.

NOW YOU ARE IN THE HIDDEN MENU.

3. Select the required parameter.
4. Press the "SET" key to display its value
5. Use \blacktriangle or \blacktriangledown to change its value.
6. Press "SET" to store the new value and move to the following parameter.

To exit: Press SET + \blacktriangle or wait 15sec without pressing a key.

NOTE1: if no parameters are present in Pr1, after 3sec the "noP" message is displayed. Keep the keys pushed till the Pr2 message is displayed.

NOTE2: the set value is stored even when the procedure is exited by waiting the time-out to expire.

6.5.2 HOW TO MOVE A PARAMETER FROM THE HIDDEN MENU TO THE FIRST LEVEL AND VICEVERSA.

Each parameter present in the HIDDEN MENU can be removed or put into "THE FIRST LEVEL" (user level) by pressing "SET + \blacktriangledown ".

In HIDDEN MENU when a parameter is present in First Level the decimal point is on.

6.6 HOW TO LOCK THE KEYBOARD

1. Keep pressed for more than 3 sec the UP + DOWN keys.
2. The "POF" message will be displayed and the keyboard will be locked. At this point it will be possible only to see the set point or the MAX or Min temperature stored
3. If a key is pressed more than 3s the "POF" message will be displayed.

6.7 TO UNLOCK THE KEYBOARD

Keep pressed together for more than 3s the \blacktriangle and \blacktriangledown keys, till the "Pon" message will be displayed.

7. PARAMETERS

REGULATION

Hy Differential: (0,1 ÷ 25,5°C / 1÷255 °F) Intervention differential for set point. Compressor Cut IN is Set Point + differential (Hy). Compressor Cut OUT is when the temperature reaches the set point.

LS Minimum set point: (- 50°C÷SET/-58°F÷SET): Sets the minimum value for the set point.

US Maximum set point: (SET÷110°C/ SET÷230°F). Set the maximum value for set point.

Ot Thermostat probe calibration: (-12.0÷12.0°C; -120÷120°F) allows to adjust possible offset of the thermostat probe.

COOn Compressor ON time with faulty probe: (0÷255 min) time during which the compressor is active in case of faulty thermostat probe. With COOn=0 compressor is always OFF.

COF Compressor OFF time with faulty probe: (0÷255 min) time during which the compressor is OFF in case of faulty thermostat probe. With COF=0 compressor is always active.

DISPLAY

CF Temperature measurement unit: °C=Celsius; °F=Fahrenheit. WARNING: When the measurement unit is changed the SET point and the values of the parameters Hy, LS, US, Ot, ALU and ALL have to be checked and modified if necessary).

rES Resolution (for °C): (in = 1°C; dE = 0.1 °C) allows decimal point display.

dLy Display delay: (0 ÷20.0m; res.10sec) when the temperature increases, the display is updated of 1 °C/1°F after this time.

DEFROST

IdF Interval between defrost cycles: (0÷120h) Determines the time interval between the beginning of two defrost cycles.

MdF (Maximum) length for defrost: (0÷255min) When P2P = n, (not evaporator probe: timed defrost) it sets the defrost duration, when P2P = y (defrost end based on temperature) it sets the maximum length for defrost.

dFd Temperature displayed during defrost: (rt = real temperature; it = temperature at defrost start; SET = set point; dEF = "dEF" label)

dAd MAX display delay after defrost: (0÷255min). Sets the maximum time between the end of defrost and the restarting of the real room temperature display.

FANS

Fnc Fans operating mode: C-n= runs with the compressor, OFF during defrost;

o-n = continuous mode, OFF during defrost;

C-y = runs with the compressor, ON during defrost;

o-y = continuous mode, ON during defrost;

Fon Fan ON time: (0÷15 min) with Fnc = C_n or C_y, (fan activated in parallel with compressor). it sets the evaporator fan ON cycling time when the compressor is off. With Fon = 0 and FoF ≠ 0 the fan are always off, with Fon=0 and FoF = 0 the fan are always off.

FoF Fan OFF time: (0÷15 min) with Fnc = C_n or C_y, (fan activated in parallel with compressor). it sets the evaporator fan off cycling time when the compressor is off. With Fon = 0 and FoF ≠ 0 the fan are always off, with Fon=0 and FoF = 0 the fan are always off.

ALARMS

ALC Temperature alarms configuration: (Ab; rE)

Ab= absolute temperature: alarm temperature is given by the ALL or ALU values. rE = temperature alarms are referred to the set point. Temperature alarm is enabled when the temperature exceeds the "SET+ALU" or "SET-ALL" values.

ALU MAXIMUM temperature alarm: (SET÷110°C; SET÷230°F) when this temperature is reached the alarm is enabled, after the "ALd" delay time.

ALL Minimum temperature alarm: (-50.0 ÷ SET°C; -58÷230°F when this temperature is reached the alarm is enabled, after the "ALd" delay time.

AFH Differential for temperature alarm recovery: (0,1÷25,5°C; 1÷45°F) Intervention differential for recovery of temperature alarm.

ALd Temperature alarm delay: (0÷255 min) time interval between the detection of an alarm condition and alarm signalling.

OTHER

Adr Serial address (1÷244): Identifies the instrument address when connected to a ModBUS compatible monitoring system.

dP1 Thermostat probe display

rSE Real set point: (readable only), it shows the set point used during the energy saving cycle or during the continuous cycle.

rEL Software release for internal use.

Ptb Parameter table code: readable only.

8. TTL SERIAL LINE – FOR MONITORING SYSTEMS

The TTL serial line, available through the HOT KEY connector, allows by means of the external converter, to connect the instrument to a monitoring system.

9. X-REP OUTPUT – OPTIONAL

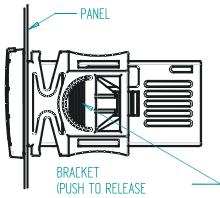
As optional, an X-REP can be connected to the instrument, through the HOY KEY connector. The X-REP output EXCLUDES the serial connection.



To connect the X-REP to the instrument the following connectors must be used CAB-51F(1m), CAB-52F(2m), CAB-55F(5m),

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10. INSTALLATION AND MOUNTING



Instrument shall be mounted on vertical panel, in a 29x71 mm hole, and fixed using the special bracket supplied. The temperature range allowed for correct operation is 32 - 140 °F. Avoid places subject to strong vibrations, corrosive gases, excessive dirt or humidity. The same recommendations apply to probes. Let air circulate by the cooling holes.

11. ELECTRICAL CONNECTIONS

The instrument is provided with screw terminal block to connect cables with a cross section up to 2,5 mm². Before connecting cables make sure the power supply complies with the instrument's requirements. Separate the probe cables from the power supply cables, from the outputs and the power connections. Do not exceed the maximum current allowed on each relay, in case of heavier loads use a suitable external relay.

11.1 PROBE CONNECTION

The probes shall be mounted with the bulb upwards to prevent damages due to casual liquid infiltration. It is recommended to place the thermostat probe away from air streams to correctly measure the average room temperature. Place the defrost termination probe among the evaporator fins in the coldest place, where most ice is formed, far from heaters or from the warmest place during defrost, to prevent premature defrost termination.

12. HOW TO USE THE HOT KEY

12.1 HOW TO PROGRAM A HOT KEY FROM THE INSTRUMENT (UPLOAD)

1. Program one controller with the front keypad.
2. When the controller is **ON**, insert the "Hot key" and push \blacktriangle key; the "uPL" message appears followed a by flashing "End"
3. Push "SET" key and the End will stop flashing.
4. Turn **OFF** the instrument remove the "Hot Key", then turn it ON again.

NOTE: the "Err" message is displayed for failed programming. In this case push again \blacktriangle key if you want to restart the upload again or remove the "Hot key" to abort the operation.

12.2 HOW TO PROGRAM AN INSTRUMENT USING A HOT KEY (DOWNLOAD)

1. Turn OFF the instrument.
2. Insert a programmed "Hot Key" into the 5 PIN receptacle and then turn the Controller ON.
3. Automatically the parameter list of the "Hot Key" is downloaded into the Controller memory, the "doL" message is blinking followed a by flashing "End".
4. After 10 seconds the instrument will restart working with the new parameters.
5. Remove the "Hot Key".

NOTE the message "Err" is displayed for failed programming. In this case turn the unit off and then on if you want to restart the download again or remove the "Hot key" to abort the operation.

13. ALARM SIGNALS

Message	Cause	Outputs
"P1"	Room probe failure	Compressor output acc. to par. "Con" and "COF"
"HA"	Maximum temperature alarm	Outputs unchanged.
"LA"	Minimum temperature alarm	Outputs unchanged.
"CA"	Serious external alarm (i1F=bAL)	All outputs OFF.

13.1 ALARM RECOVERY

Probe alarms **P1**, start a few seconds after the fault in the related probe; they automatically stop a few seconds after the probe restarts normal operation. Check connections before replacing the probe. Temperature alarms "HA", "LA" automatically stop as soon as the temperature returns to normal value.

Alarm "CA" (with i1F=PAL) recovers only by **switching off and on** the instrument.

13.2 OTHER MESSAGES

Pon	Keyboard unlocked.
PoF	Keyboard locked
noP	In programming mode: none parameter is present in Pr1 On the display or in dP2, dP3, dP4: the selected probe is nor enabled
noA	None alarm is recorded.

14. TECHNICAL DATA

Housing: self extinguishing ABS.

Case: frontal 32x74 mm; depth 60mm;

Mounting: panel mounting in a 71x29mm panel cut-out

Protection: IP20; **Frontal protection:** IP65

Connections: Screw terminal block \leq 2,5 mm² wiring.

Power supply: 110Vac \pm 10%, 50/60Hz

Power absorption: 3VA max

Display: 3 digits, red LED, 14,2 mm high; **Inputs:** Up to 3 NTC.

Digital input: free voltage contact

Relay outputs: compressor SPST 16A/96A 250Vac **FAN:** SPDT 8(3) A, 250Vac

Data storing: on the non-volatile memory (EEPROM).

Kind of action: 1B; **Pollution grade:** 2; **Software class:** A.;

Rated impulsive voltage: 2500V; **Overvoltage Category:** II

Operating temperature: 0÷60 °C; **Storage temperature:** -30÷85 °C.

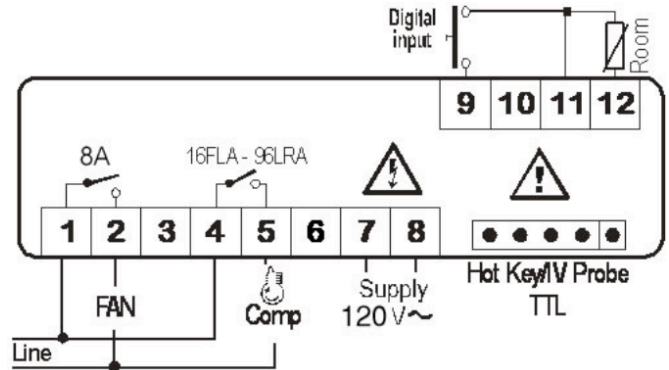
Relative humidity: 20÷85% (no condensing)

Measuring and regulation range: NTC probe: -40÷110°C (-40÷230°F);

Resolution: 0,1 °C or 1°C or 1 °F (selectable); **Accuracy (ambient temp. 25°C):** \pm 0,7 °C \pm 1 digit

15. CONNECTIONS

15.1 16A COMPRESSOR



120Vac supply: connect to the terminals 7 and 8.

16. DEFAULT SETTING VALUES

Label	Name	Range	°F	
Set	Set point	LS÷US	55	---
Hy	Differential	0,1÷25,5°C/ 1÷ 255°F	4	Pr2
LS	Minimum set point	-50°C÷SET/-58°F÷SET	50	Pr2
US	Maximum set point	SET+110°C/ SET + 230°F	65	Pr2
Ot	Thermostat probe calibration	-12÷12°C /-120÷120°F	0	Pr2
COn	Compressor ON time with faulty probe	0 ÷ 255 min	15	Pr2
COF	Compressor OFF time with faulty probe	0 ÷ 255 min	30	Pr2
CF	Temperature measurement unit	°C ÷ °F	°F	Pr2
rES	Resolution (only in °C)	in=integer; dE= dec.point	in	Pr2
dLy	Display temperature delay	0 ÷ 20,0 min (10 sec.)	1:00	Pr2
ldF	Interval between defrost cycles	1 + 120 hours	24	Pr2
MdF	(Maximum) length for defrost	0 + 255 min	30	Pr2
dFd	Displaying during defrost	rt, it, SET, DEF	it	Pr2
dAd	MAX display delay after defrost	0 ÷ 255 min	30	Pr2
Fnc	Fan operating mode	C-n, o-n, C-y, o-Y	c-n	Pr2
Fon	Fan on time with compressor off	0÷15 (min.)	5	Pr2
FoF	Fan off time with compressor off	0÷15 (min.)	15	Pr2
ALc	Temperat. alarms configuration	rE= related to set; Ab = absolute	rE	Pr2
ALU	MAXIMUM temperature alarm	Set+110.0°C; Set+230°F	10	Pr1
ALL	Minimum temperature alarm	-50.0°C÷Set/ -58°F÷Set	10	Pr1
AFH	Differential for temperat. alarm recovery	(0,1°C÷25,5°C) (1°F÷45°F)	5	Pr2
ALd	Temperature alarm delay	0 ÷ 255 min	120	Pr2
Adr	Serial address	0÷247	1	Pr2
onF	on/off key enabling	nu, oFF; ES	OFF	Pr2
dP1	Room probe display	--	--	Pr2
rEL	Software release	--	--	Pr2
Ptb	Map code	--	--	Pr2