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ESC Electronics Case Temperature Controller

User's Guide

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General Information

The ESC series is a cost effective, electronic refrigeration controller that provides control of compressor, fan and defrost management. The ESC includes the functionality providing outputs for controlling for defrost and fans. This allows the ESC to be used in applications requiring a defrost signal (such as electric defrost systems).

Connection Information

All connections to the controller should be performed by a qualified installer and in accordance with all codes.

Power

Connect 230 VAC to the power supply connector (pins 8 and 9).

Inputs

There are two temperature inputs on the ESC. The first input is case temperature sensor input. This input provides the temperature which is used to control the compressor output. The case temperature input must be provided for proper operation of the ESC. The second input is a multifunction input that can be used as a defrost termination input or a product temperature input.

Outputs

The ESC has three relay outputs which can be used to control a compressor (or solenoid valve), fan and defrost.

Options

Network Module
Display

The ESC features a 3 digit LED display that shows the case temperature. Alternately, the display can be configured to display the product temperature if a product temperature probe is connected. The temperature can be displayed in either °C or °F.

Keypad

Three keys on the front panel provide an indication of operating status as well as allowing setpoints to be changed.

Alarm Key

The Alarm key illuminates when the controller has detected an alarm condition. This key is also used to reset an alarm condition and to enter the setup mode (allowing setpoints to be changed).

Compressor Key

The Compressor key illuminates when the compressor output is on. When the ESC is in setup mode, this key is used to select a setpoint to be modified and to change the value of the setpoint.

Defrost Key

The Defrost key illuminates when the ESC is in defrost mode. The key is also used in setup mode to select a setpoint to be modified and to change the value of the setpoint.

Operation

Temperature Control

Temperature control in the ESC is accomplished by comparing the temperature reading of the case temperature probe against the temperature setpoint. The compressor output is used to control the temperature. Note that the compressor output can also be used to control a refrigerate solenoid to regulate the temperature in a case.

Regulation Algorithm

If the temperature is above the temperatue setpoint (L1) + the hystersis setpoint (rd), the compressor output is turned on (subject to the conditions described in the compressor operation section). If the temperature is below the temperature setpoint – the hystersis setpoint, the compressor output is turned off.

Temperature Setpoint

The temperature setpoint is the comparison point for the control temperature input. It can be modified by pressing the Alarm key for more than 5 seconds. At this point the setpoint is displayed and blinking. Press the compressor key or defrost key to change the value of the setpoint. Press the Alarm key again to accept the new value.

Probe Calibration

The Probe Calibration setpoint (/C) determines the amount of "correction" to be applied to the temperature probe. This amount of "correction" will be used for both display and control.

Probe Stability

The Probe Stability setpoint (/2) determines how quickly the controller responds to temperature changes. Decreasing this number will cause the controller to respond slower to temperature variations. This allows the temperature reading to be filtered to eliminate "transisent" readings caused by noise sources.

Display Probe

The Display Probe setpoint (/4) determines which probe will be displayed, the control probe or the second probe.
Display Mode
The Display Mode setpoint (/5) deterimines if the controll will operate in degree C or degree F mode. Note that this affESCs both the display of the temperatures and the entry of setpoints.

Control Hystersis

The hysteresis setpoint (rd) determines the hystersis used on to apply to the temperature setpoint.

Minimum Allowable Setpoint

The Minimum Allowable Setpoint (r1) determines the lowest value that can be set for the temperature setpoint.

Maximum Allowable Setpoint

The Maximum Allowable Setpoint (r1) determines the lowest value that can be set for the temperature setpoint.

Compressor Operation

Several setpoints are available that allow the operation of the compressor output to be tailored to match individual needs. These include minimum on and off times, a compressor delay after the controller is powered on, and a continuous cycle feature that can be enabled in case of a probe failure.

Compressor power on delay

Compressor power on delay setpoint (c0) allows the user to specify a delay after the power up of the controller. The compressor output will not come on regardless of the temperature reading, until this amount of time has expired.

Minimum time between compressor cycles

This setpoint (c1) lets the user specify a minimum amount of time that will elapse between compressor cycles. For example, if this time is set to 10 minutes, when the compressor shuts off, it will not come on again until 10 minutes has elapsed. This setpoint can be used to reduce compressor cycling.

Minimum OFF time

The minimum OFF time setpoint (c2) will force the compressor to stay off for a minimum of this period of time. This setpoint can be used to reduce short cycling.

Minimum ON time

The minimum ON time setpoint (c2) will force the compressor to stay on for this period of time. This setpoint can be used to reduce short cycling.

Compressor Safety Cycle

The Compressor Safety Cycle setpoint (c4) specifies a cycle time that the compressor is to be cycled if the temperature sensor used for control fails. If this setpoint is 0, the compressor will be off. If this setpoint is 100, the compressor will be on. Any value between 1 and 99 will result in the compressor being on for that period of time. At the end of this time, the compressor will be shut off for approximately 15 minutes.

Fan Control

The fan output is controlled by the controller based on the current mode (defrost, cooling, etc.) and the setpoints which affect fan operation.

Fan Control

The Fan Control setpoint (F0) determines how the fans will be controlled during the various control modes. If the value is set to 0, the fans will stay on regardless of the temperature reading. If this setpoint is 1, the fans will be on, only when the temperature is TBD than the Fan setpoint (F1).

Fan Setpoint

The Fan Setpoint (F1) determines the temperature that the fans will come on at. Note that the Fan Control setpoint (F0) must be set appropriately for this setpoint to be enabled.

Fan Compressor State

The Fan Compressor State setpoint (F2) determines how the fans behave when the compressor is idle. If the setpoint is 0, the fans will run when the compressor is idle. If the setpoint is 1, the fans will be shut off when the compressor is idle.

Fan Defrost State

The Fan Defrost State setpoint (F3) determines how the fans behave when the controller is in defrost. If the setpoint is 1, the fans will be OFF during a defrost. It the setpoint is 0, the fans will be ON during a defrost.

Fan Drip Time

The Fan Drip Time (Fd) determines how long the fans will stay off after defrost to allow time for the coil to drip.

Defrost Control

The ESC can control the defrost function of a case. Electric, Off cycle and Hot Gas defrost types are supported. The defrost can be terminated on either time or temperature.

Type of Defrost

The Type of Defrost (/d0) setpoint is set to either electric heater (0), hot gas (1), Reserved (2), or hot gas with time termination (3).

Time interval between two defrost cycle

The Time interval between two defrost cycle (/d1) setpoint determines the length of time between two defrost cycles.

Defrost termination termperature

The Defrost termination temperature (dt) sets the temperature at which the defrost should terminate.

Max duration of defrost

The Max duration of defrost (dP) setpoint determines the maximum amount of time that a defrost will run. If d0 is set to Reserved or hot gas by time (3) the defrost will run this length of time.

Defrost after control power on

The Defrost after control power on (d4) setpoint determines if a defrost should be performed immediately after the controller has powered up.

Delay defrost after control power on

The Delay defrost after control power on (d5) setpoint sets an amount of time to delay the defrost after the control power has been switched on or if a defrost is initiated by the multifunction input.

Block display during defrost

The Block display during defrost (d6) setpoint allows the user to choose to have the controller not display the probe reading during defrost.

Defrost Probe Reading

The Defrost Probe Reading (d/) is the current reading on the defrost termination probe.

Time selection

The Time selection (dC) setpoint determines if setpoint d1 (time between defrosts) is in hours or minutes and the setpoint dP (Max duration) is in minutes or seconds.

Manual Defrost

A manual defrost may be initiated by pressing and holding the defrost key for more than 5 seconds.

Alarm Operation

The ESCx has several alarm functions. In addition to alarms based on air temperatures, it will alarm if a probe failure is detected.

Alarms and fan delta

The Alarms and fan delta (A0) setpoint determines the hystersis for the alarms and the fan setpoints.

Low temperature alarm

The Low temperature alarm (AL) setpoint determines, along with the temperature setpoint, when the controller will signal a low temperature alarm. If this setpoint is set to 0, there will be no low temperature alarms.

High temperature alarm

The Low temperature alarm (AH) setpoint determines, along with the temperature setpoint, when the controller will signal a high temperature alarm. If this setpoint is set to 0, there will be no high temperature alarms.

Temperature Alarm delay

The Temperature alarm delay (AD) setpoint determines the amount of time to delay before indicating an alarm.

Indications on the Display

 If the defrost, or compressor key blinks. It means that the corresponding function is delayed by a timing routine or inhibited.

If E0 is blinking on the display, it means that there is a problem with the air probe.

If E1 blinks it means there is a problem with the defrost termination (or product) probe.

IA blinking TBD.

If the display blinks LO, it means that there is a low temperature alarm (lower than the setpoint – AL setpoint). Note that this alarm is affected by the Ad (alarm delay) parameter and will reset itself when the temperature rises above the setpoint – AL.

If the display blinks HI, it means that there is a high temperature alarm (higher than the setpoint + AH). Note that this alarm is affected by the Ad (alarm delay) parameter and will reset itself when the temperature falls below the setpoint + AH.

If the display blinks Ed, a defrost timeout has occurred (did not terminate correctly).

If the display blinks dF, this is not an alarm, but shows that the controller is in defrost mode.

Changing Setpoints

There are two levels of setpoints in the ESC. The first level does not require a password to change (unless the buttons are locked out). The setpoints that can be changed in this manner are identified in table TBD as a USER setpoint. All other setpoints do require a password to change and are identified in table TBD as a OEM setpoint.

To change a USER setpoint, press and hold the alarm key until the display flashes the setpoint. At that point the temperature setpoint can be changed by pressing the compressor and defrost keys to increase or decrease the value. When the temperature setpoint is correct press the alarm key to confirm and the new setpoint will now be loaded. If you do not wish to change the setpoint, wait approximately 5 seconds and the setpoint will flash. Do not press any button until the display stops flashing. This will take approximately 60 seconds.

To change the other USER setpoints, press the alarm key and hold it until the letters PS are displayed. At this point press the compressor and defrost key to display the legend for the different setpoints. When the legend is displayed for the setpoint you wish to change, press the alarm key. The value for that setpoint will be displayed. Press the compressor or defrost key to change the value, then press the alarm key to go back to the legend. At this point you can press the alarm key to accept the change or press the compressor or defrost key to scroll to the next USER setpoint.   To accept the changes, press and hold the alarm key until the display stops flashing.

To change all other setpoints, the password must be entered. To do this press and hold the alarm key until the letters PS are displayed. When PS is displayed release the alarm key and 0 will be displayed. Press the compressor or defrost keys

to enter the password (22 is the default) then
press the alarm key. PS will be displayed again.
At this point, pressing the compressor or defrost
key will scroll through the legend for all
setpoints. To change the setpoints, use the
identical procedure that is used to change a
USER setpoint.

LIST OF PARAMETERS

Parameter	Type	Min	Max	U.M	Def
PS PASSWORD	F	00	199	-	22
PROBE PARAMETERS					
/C Calibration	F	-127	127	°C/°F	0
/2 Reading stability	C	1	15	-	4
/4 Display probe:					
0 = regulation probe					
1 = food probe	C	0	1	-	0
/5 °C /°F (0=°C, 1=°F)	C	0	1	flag	0
r REGULATOR PARAMETERS					
rd Regulator differential	F	0	19	°C/°F	2
r1 Minimum allowable set	C	-60	r2	°C/°F	-50
r2 Maximum allowable set	C	r1	+27	°C/°F	60
r3 Enabling Ed alarm: max duration of defrost is reached (0=no, 1=yes)	C	0	1	flag	0
r4 Automatic variation of the Set-Point with curtain-switch closed (A4 or A5=7)	C	0	+20	°C/°F	3
c COMPRESSOR PARAMETERS					
c0 Delay compressor insertion after control reset	C	0	15	min	0
c1 Minimum time between two insertions	C	0	15	min	0
c2 Minimum OFF routine	C	0	15	min	0
c3 Minimum ON routine	C	0	15	min	0
c4 Safety relay (0=OFF, 100=ON)	C	0	100	min	0
cc Continuous cycle duration	C	0	15	hours	4
c6 Alarm delay after continuous cycle	C	0	15	hours	2
d DEFROST PARAMETERS					
d0 Type of defrost (0=heater, 1=hot gas, 2= water or resistance, 3= hot gas by time)	C	0	3	flag	0
dI Time interval between two defrost cycles	F	0	199	hours	8
dt End defrost temperature	F	-50	127	°C/°F	4
dP Max duration of the defrosting or effective duration if d0=2 or 3	F	1	199	min	30
d4 Defrost after control Switch-On (0=no, 1=yes)	C	0	1	flag	0
d5 Delay defrost after control Switch-On or from Multi fun. input (A4 or A5=4)	C	0	199	min	0
d6 Block of display during defrost (0=no, 1=yes)	C	0	1	flag	1
dd Dripping time	F	0	15	min	2
d8 Alarm delay after defrost and/or if A4 or A5=5, when door is open	F	0	15	hours	1
d9 Priority of the defrost over anticogging (0=no, 1=yes)	C	0	1	flag	0
d/ Defrost probe reading	F	-	-	°C/°F	-
dCTime selection (0=hours/min, 1=min/s)	C	0	1	flag	0
A ALARM PARAMETERS					
A0 Alarms and fan delta	C	0	19	°C/°F	0
AL Low temperature alarm (respect to Set-Point)	F	0	127	°C/°F	0
AH High temperature alarm (respect to Set-Point)	F	0	127	°C/°F	0
Ad Temperature alarm delay C 0 199 min 0					
A4 Configuration of the digital input No. 1	C	0	4	-	0
A7 External alarm delay (A4 or A5=2)	C	0	199	min	0
F FAN PARAMETERS					
F0 Management of fans:					
0=fans always ON, specific phases excluded (see F2, F3 and Fd parameters)					
1=fans ON on the basis of the set-point F1	C	0	1	flag	1
F1 Set-point fans	F	-50	199	°C/°F	5
F2 STOP fans when compressor idle (0=no, 1=yes)	C	0	1	flag	1
F3 Fans OFF during defrost (0=no,1=yes)	C	0	1	flag	1
Fd Stop after dripping	F	0	15	min	1
H OTHER SELESCIONS					
H0 Serial address	C	0	199	-	1
H1 PJ32S Defrost enable (0=disable, 1=enable)	C	0	1	flag	1
H2 0=buttons disabled	C	0	1	flag	1
H4 1=buzzer disables	C	0	1	flag	0

| H5 Identification code for programming key | C | -99 | +99 | - | 0 |

Access to the HACCP parameters

Specifications

TECHNICAL SPECIFICATIONS
• Power supply : 230Vac +10/-15% 50/60Hz
• Consumption 2VA
• Operation conditions 10÷50°C (-10T50)
• Storage conditions -20÷70°C (-20T70) - humidity <90% rH not condensing.
• Range of measurement from -50 to +90°C (from -50 to +127 °F)
• Index of protection: IP65 - front panel mounting with gasket inserted
• Case plastic 75x33x62mm
• Mounting by means of screws on the front panel or bracket on the back.
To be integrated in Class I or II devices.
• Classification according to To be integrated in Class II devices in NORMAL-type
protection against electric installation ambient
shock
• Connections screw terminal for cables from 0.5 mm2 (min.) to 1.5 mm2 (max)
section. Plug-in terminal for screw or clamp connectors
(max cross section 2.5mm2)
• Display LED display 2 1/2 digits and sign -50÷199
• NTC or PTC probes, 1 or 2 inputs
Digital input: alternative to the second probe
• Probes type Standard NTC 10K at 25°C,
Standard PTC 985Ohm at 0°C
• Relay output depending on the models:
8A Resistive Vde0435: 8(2)A Vde0631: 6(4)A
16A Resistive Vde0435: 16A
5A Resistive Vde0435: 5(2)A
Environmental pollution: normal
Software class and structure: class A
Note 1: keep separated the cable from the low part of the controller and probes at least 3 cm.
Note 2: when cleaning the display use only water and neutral detergent.
Note 3: use only copper cables for connections.