# EV3402 PTC/NTC — Universal controllers with two regulation outputs for industrial applications

**EVCO**

**PLEASE READ CAREFULLY** and save this document
CONSIDER THE ENVIRONMENT

## EN ENGLISH

- 230 VAC, 115 VAC or 12-24 VAC/DC power supply (according to the model)
- analogue input (PTC/NTC/Pt 1000)
- multi-purpose input
- K1 relay, 16 A res. @ 250 VAC, K2 relay, 8 A res. @ 250 VAC
- alarm buzzer
- TTL MODBUS slave port for TTL/RS-485 serial interface
- hot or cold mode regulation
- neutral zone regulation.

## 1 MEASUREMENTS AND INSTALLATION

Measurements in mm (inches). To be fitted to a panel, snap-in brackets provided.

33.0 (1 5/16)
59.0 (2 5/16)
81.5 (3 3/16)
75.0 (2 15/16)
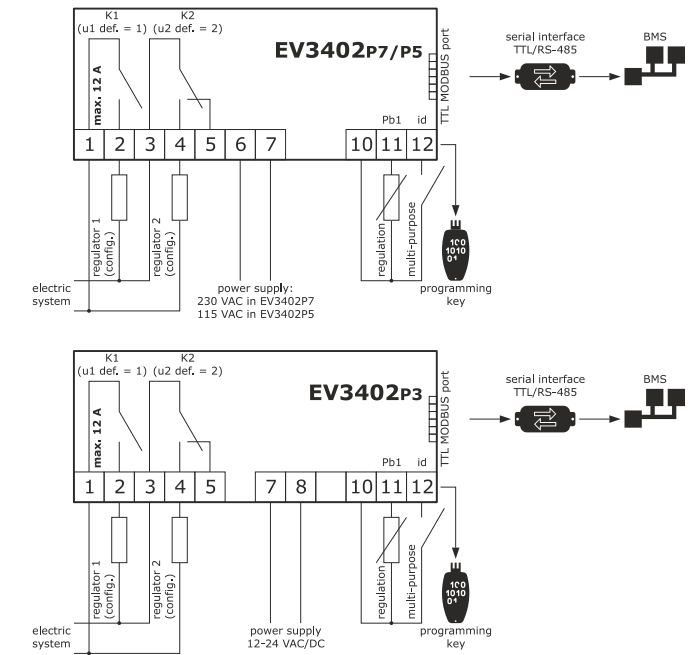
drilling template
29.0 (1 1/8)
71.0 (2 13/16)
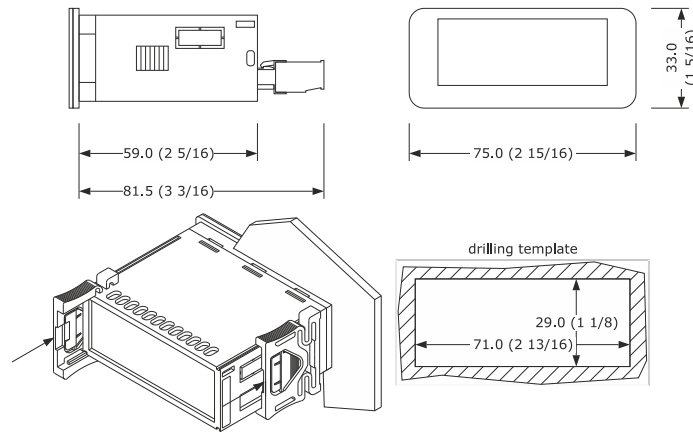
### INSTALLATION PRECAUTIONS

- the thickness of the panel must be between 0.8 and 2.0 mm (1/32 and 1/16 in);
- ensure that the working conditions are within the limits stated in the *TECHNICAL SPECIFICATIONS* section;
- do not install the device close to heat sources, equipment with a strong magnetic field, in places subject to direct sunlight, rain, damp, excessive dust, mechanical vibrations or shocks;
- in compliance with safety regulations, the device must be installed properly to ensure adequate protection from contact with electrical parts. All protective parts must be fixed in such a way as to need the aid of a tool to remove them.

## 2 ELECTRICAL CONNECTION

**N.B.**
- Use cables of an adequate section for the current running through them.
- To reduce any electromagnetic interference connect the power cables as far away as possible from the signal cables.

**EV3402P7/P5**
K1 (u1 def. = 1) K2 (u2 def. = 2)
max. 12 A
1 2 3 4 5 6 7
10 11 12
Pb1 id
serial interface TTL/RS-485
BMS
TTL MODBUS port
regulator 1 (config.)
regulator 2 (config.)
regulation
multi-purpose
electric system
power supply: 230 VAC in EV3402P7 / 115 VAC in EV3402P5
programming key

**EV3402P3**
K1 (u1 def. = 1) K2 (u2 def. = 2)
max. 12 A
1 2 3 4 5 | 7 8 | 10 11 12
Pb1 id
serial interface TTL/RS-485
BMS
TTL MODBUS port
regulator 1 (config.)
regulator 2 (config.)
regulation
multi-purpose
electric system
power supply 12-24 VAC/DC
programming key

### PRECAUTIONS FOR ELECTRICAL CONNECTION

- if using an electrical or pneumatic screwdriver, adjust the tightening torque;
- if the device has been moved from a cold to a warm place, humidity may have caused condensation to form inside. Wait about an hour before switching on the power;
- make sure that the supply voltage, electrical frequency and power are within the set limits. See the section *TECHNICAL SPECIFICATIONS*;
- disconnect the power supply before carrying out any type of maintenance;
- do not use the device as safety device;
- for repairs and for further information, contact the EVCO sales network.

## 3 FIRST-TIME USE

1. Install following the instructions given in the section *MEASUREMENTS AND INSTALLATION*.
2. Power up the device as set out in the section *ELECTRICAL CONNECTION*: an internal test will start up.
   The test normally takes a few seconds; when it is finished the display will switch off.
3. Configure the device as shown in the section *Setting configuration parameters*.
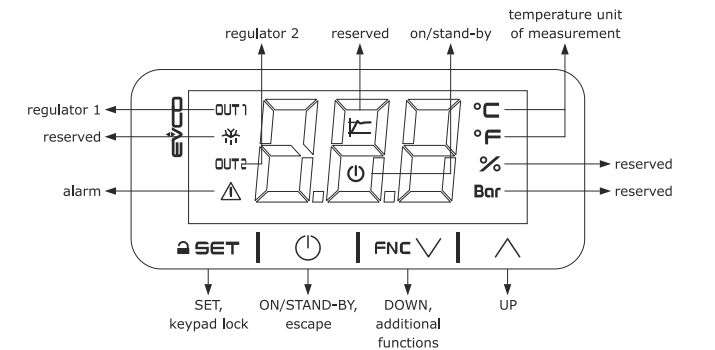   Recommended configuration parameters for first-time use.

| PAR. | DEF. | PARAMETER | MIN… MAX. |
|---|---|---|---|
| SP | 0.0 | setpoint 1 | r1… r2 |
| SP2 | 0.0 | setpoint 2 | r7… r8 |
| P0 | 0 | type of probe | 0 = PTC  1 = NTC 2 = Pt 1000 2-wire |
| P2 | 0 | temperature measurement unit | 0 = °C  1 = °F |
| u0 | 0 | operating logic | 0 = 1 setpoint (SP) 1 = 1 absolute setpoint and 1 relative setpoint (SP2 relative to SP) 2 = 2 absolute setpoints (SP and SP2) 3 = neutral zone (SP) 4 = 2 steps (SP) |
| r5 | 0 | hot or cold mode regulation setpoint 1 | 0 = cold mode 1 = hot mode |
| r10 | 0 | hot or cold mode regulation setpoint 2 | 0 = cold mode 1 = hot mode |

Then check that the remaining settings are appropriate; see the section *CONFIGURATION PARAMETERS*.

4. Disconnect the device from the mains.

---

5. Make the electrical connection as shown in the section *ELECTRICAL CONNECTION* without powering up the device.
6. When connecting to an RS-485 network, connect the EVIF22TSX interface; see the relevant instruction sheet.
7. Power up the device.

## 4 USER INTERFACE AND MAIN FUNCTIONS

regulator 2 — reserved — on/stand-by — temperature unit of measurement
regulator 1
reserved
alarm
OUT1
OUT2
°C
°F
%
Bar
reserved
reserved

SET, keypad lock
ON/STAND-BY, escape
DOWN, additional functions
UP

### 4.1 Switching the device on/off

1. ⏻ If POF = 1 (default), touch the ON/STAND-BY key for 2 s.

If the device is switched on, the display will show the P5 value ("regulation temperature" default): if the display shows an alarm code, see the section ALARMS.

| LED | ON | OFF | FLASHING |
|---|---|---|---|
| OUT1 | regulator 1 active | - | - regulator 1 protection active - setpoint 1 being set |
| (fan) | unused | - | - |
| OUT2 | regulator 2 active | - | - regulator 2 protection active - setpoint 2 being set |
| ⚠ | alarm active | - | - |
| (compressor) | unused | - | - |
| ⏻ | device switched off | device switched on | device being switched on/off |
| °C/°F | temperature display | - | - |
| % | unused | - | - |
| Bar | unused | - | - |

When 30 s have elapsed without the keys being pressed, the display will show the "**Loc**" label and the keypad will lock automatically.

### 4.2 Unlocking the keypad

Touch a key for 1 s: the display will show the label "**UnL**".

### 4.3.1 Setting the setpoint

Check that the keypad is not locked.

1. SET — Touch the SET key: the display will show the label "**SP**".
2. FNC/UP — Touch the UP or DOWN key within 15 s to set the value within the limits r1 and r2 (default "0… 35°).
3. SET — Touch the SET key (or take no action for 15 s).

### 4.3.2 Setting setpoint 1 and setpoint 2 (if u0 = 1 or 2)

Check that the keypad is not locked.

1. SET — Touch the SET key: the display will show the label "**SP**".
2. FNC/UP — Touch the UP or DOWN key within 15 s to set the setpoint 1 value within the limits r1 and r2 (default "0… 35°).
3. SET — Touch the SET key: the display will show the label "**SP2**".
4. FNC/UP — Touch the UP or DOWN key within 15 s to set the setpoint 2 value within the limits r7 and r8 (default "0… 35°).
5. SET — Touch the SET key (or take no action for 15 s).

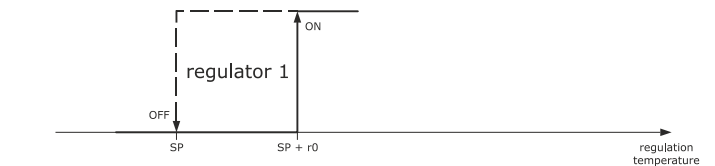### 4.4 Silencing the buzzer

Touch a key.
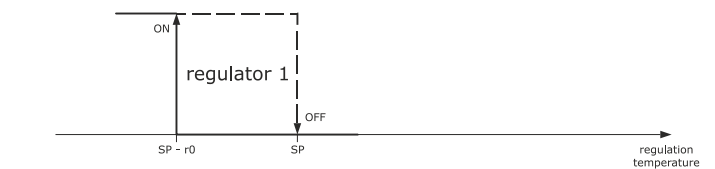If u1 or u2 = 3, the alarm output is deactivated.

## 5 OPERATING LOGIC

### 5.1 1 regulator (u0 = 0, default)
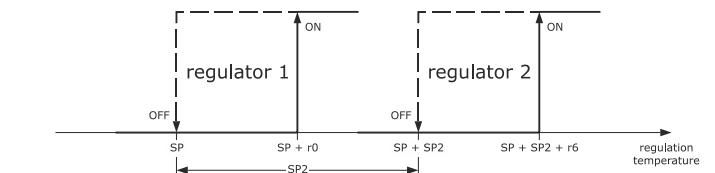Cold mode regulation (r5 = 0).

regulator 1
ON at SP, OFF at SP + r0
regulation temperature

Hot mode regulation (r5 = 1).

regulator 1
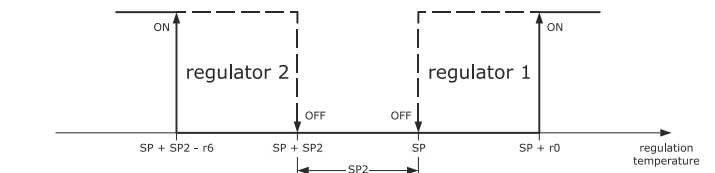ON at SP - r0, OFF at SP
regulation temperature

### 5.2 2 regulators with second setpoint relative to the first (u0 = 1)
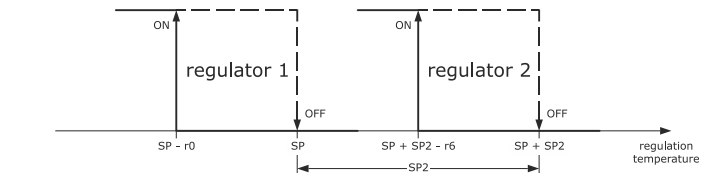Cold mode regulation setpoint 1 (r5 = 0) and cold mode regulation setpoint 2 (r10 = 0).

regulator 1: OFF at SP, ON at SP + r0
regulator 2: OFF at SP + SP2, ON at SP + SP2 + r6
SP2
regulation temperature

Cold mode regulation setpoint 1 (r5 = 0) and hot mode regulation setpoint 2 (r10 = 1).

regulator 2: ON at SP + SP2 - r6, OFF at SP + SP2
regulator 1: OFF at SP, ON at SP + r0
SP2
regulation temperature

---

Hot mode regulation setpoint 1 (r5 = 1) and cold mode regulation setpoint 2 (r10 = 0).

regulator 1: ON at SP - r0, OFF at SP
regulator 2: OFF at SP + SP2, ON at SP + SP2 + r6
SP2
regulation temperature

Hot mode regulation setpoint 1 (r5 = 1) and hot mode regulation setpoint 2 (r10 = 1).

regulator 1: ON at SP - r0, OFF at SP
regulator 2: ON at SP + SP2 - r6, OFF at SP + SP2
SP2
regulation temperature
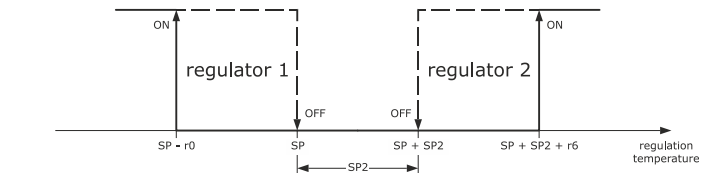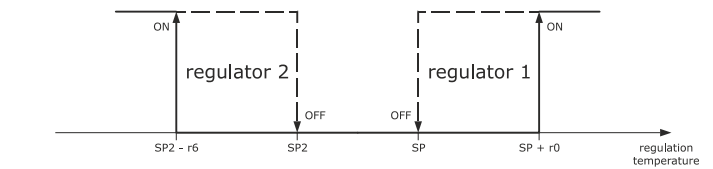
### 5.3 2 regulators with 2 independent setpoints (u0 = 2)
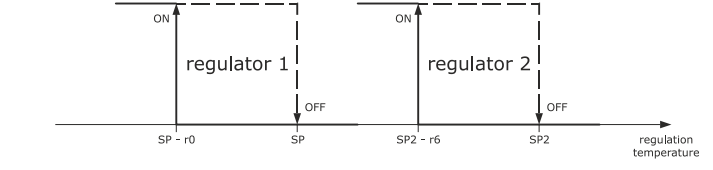Cold mode regulation setpoint 1 (r5 = 0) and cold mode regulation setpoint 2 (r10 = 0).
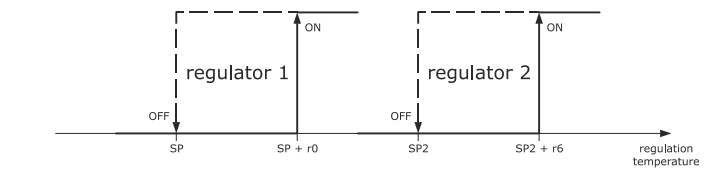
regulator 1: OFF at SP, ON at SP + r0
regulator 2: OFF at SP2, ON at SP2 + r6
regulation temperature

Cold mode regulation setpoint 1 (r5 = 0) and hot mode regulation setpoint 2 (r10 = 1).

regulator 2: ON at SP2 - r6, OFF at SP2
regulator 1: OFF at SP, ON at SP + r0
regulation temperature

Hot mode regulation setpoint 1 (r5 = 1) and cold mode regulation setpoint 2 (r10 = 0).

regulator 1: ON at SP - r0, OFF at SP
regulator 2: OFF at SP2, ON at SP2 + r6
regulation temperature

Hot mode regulation setpoint 1 (r5 = 1) and hot mode regulation setpoint 2 (r10 = 1).

regulator 1: ON at SP - r0, OFF at SP
regulator 2: ON at SP2 - r6, OFF at SP2
regulation temperature

### 5.4 Neutral zone regulation (u0 = 3)

regulator 2: ON, OFF at SP - (r13 / 2)
regulator 1: OFF at SP + (r13 / 2), ON at SP + (r13 / 2) + r0
SP - (r13 / 2) - r6
regulation temperature
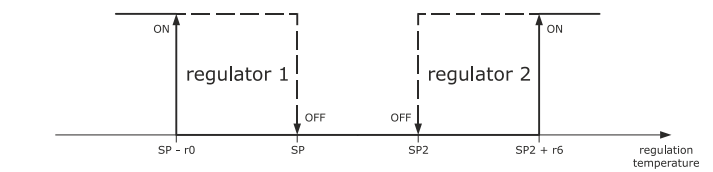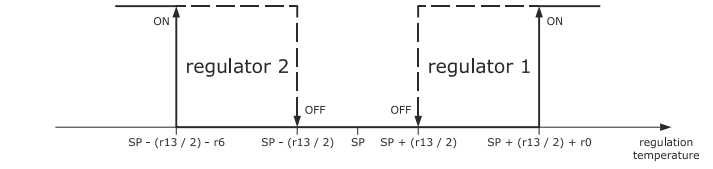
### 5.5 2 step regulation (u0 = 4)
Cold mode regulation (r5 = 0).

regulator 2: ON, OFF at SP + r13
regulator 1: OFF at SP, ON at SP + (r13 / 2)
regulation temperature

Hot mode regulation (r5 = 1).

regulator 2: ON, OFF at SP - (r13 / 2)
regulator 1: ON at SP - r13, OFF at SP
regulation temperature
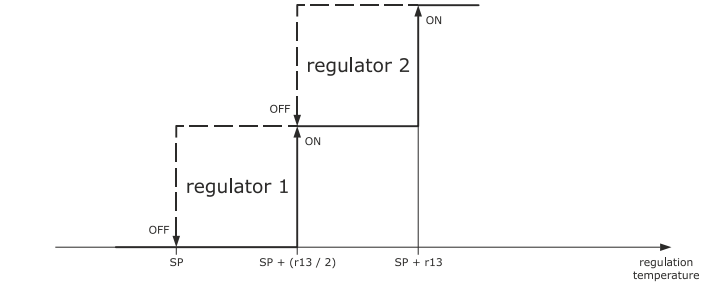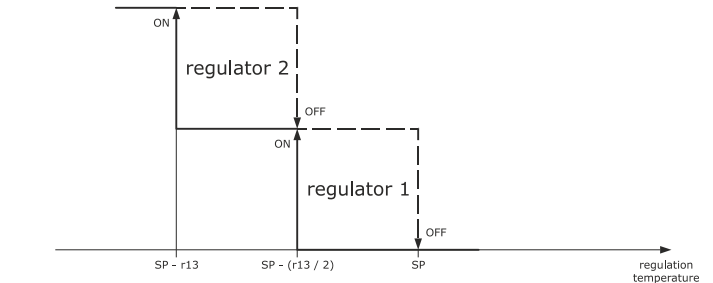
## 6 ADDITIONAL FUNCTIONS

### 6.1 Displaying the number of start ups of the relays
Check that the keypad is not locked.

1. FNC/DOWN — Touch the DOWN key for 4 s.
2. FNC/UP — Touch the UP or DOWN key within 15 s to select a label.

| LAB. | DESCRIPTION |
|---|---|
| nS1 | display of the number of start ups of the K1 relay in thousands |
| nS2 | display of the number of start ups of the K2 relay in thousands |

3. SET — Touch the SET key.
4. ⏻ — Touch the ON/STAND-BY key (or take no action for 60s) to exit the procedure.

### 6.2 Displaying the temperature detected by the regulation probe
Check that the keypad is not locked.

1. FNC/DOWN — Touch the DOWN key for 4 s.
2. FNC/UP — Touch the UP or DOWN key within 15 s to select a label.

| LAB. | DESCRIPTION |
|---|---|
| Pb1 | regulation temperature |

3. SET — Touch the SET key.

| | | |
|---|---|---|
| 4. |  | Touch the ON/STAND-BY key (or take no action for 60s) to exit the procedure. |

## 7    SETTINGS

### 7.1    Setting configuration parameters

| | | |
|---|---|---|
| 1. | ⌂ SET | Touch the SET key for 4: the display will show the label "**PA**". |
| 2. | ⌂ SET | Touch the SET key. |
| 3. | FNC ∨ ∧ ↳ | Touch the UP or DOWN key within 15 s to set the PAS value (default "**-19**"). |
| 4. | ⌂ SET | Touch the SET key (or take no action for 15 s): the display will show the label "**SP**". |
| 5. | FNC ∨ ∧ ↳ | Touch the UP or DOWN key to select a parameter. |
| 6. | ⌂ SET | Touch the SET key. |
| 7. | FNC ∨ ∧ ↳ | Touch the UP or DOWN key within 15 s to set the value. |
| 8. | ⌂ SET | Touch the SET key (or take no action for 15 s). |
| 9. | ⌂ SET | Touch the SET key for 4 s (or take no action for 60s) to exit the procedure. |

### 7.2    Restoring factory settings (default) and saving customised settings

N.B.
- Check that the factory settings are appropriate; see the section *CONFIGURATION PARAMETERS*.
- saving customised settings overwrites the factory settings.

| | | |
|---|---|---|
| 1. | ⌂ SET | Touch the SET key for 4 s: the display will show the label "**PA**". |
| 2. | ⌂ SET | Touch the SET key. |
| 3. | FNC ∨ ∧ ↳ | Touch the UP or DOWN key within 15 s to set the value. |

| VAL. | DESCRIPTION |
|---|---|
| **149** | value for restoring factory information (default) |
| **161** | value for saving customised settings |

| | | |
|---|---|---|
| 4. | ⌂ SET | Touch the SET key (or take no action for 15 s): the display will show the label "**dEF**" (for setting the "**149**" value) or the label "**MAP**" (for setting the "**161**" value) |
| 5. | ⌂ SET | Touch the SET key. |
| 6. | FNC ∨ ∧ ↳ | Touch the UP or DOWN key within 15 s to set "**4**". |
| 7. | ⌂ SET | Touch the SET key (or take no action for 15 s): the display will show "**- - -**" flashing for 4 s, after which the device will exit the procedure. |
| 8. | Disconnect the device from the power supply. | |
| 9. | ⌂ SET | Touch the SET key for 2s before action 6 to exit the procedure beforehand. |

## 8    CONFIGURATION PARAMETERS

| No. | PAR. | DEF. | SETPOINT | MIN… MAX. |
|---|---|---|---|---|
| 2 | SP | 0.0 | setpoint 1 | r1… r2 |
| 3 | SP2 | 0.0 | setpoint 2 | r7… r8 not available if u0 = 0, 3 or 4 |

| No. | PAR. | DEF. | ANALOGUE INPUTS | MIN… MAX. |
|---|---|---|---|---|
| 4 | CA1 | 0.0 | regulation probe offset | -25… 25 °C/°F |
| 5 | P0 | 0 | type of probe | 0 = PTC    1 = NTC 2 = Pt 1000 2-wire |
| 6 | P1 | 0 | enable decimal point °C | 0 = no    1 = yes |
| 7 | P2 | 0 | temperature measurement unit | 0 = °C    1 =°F |
| 8 | P5 | 0 | value displayed | 0 = regulation temperature 1 = setpoint 1 |
| 9 | P8 | 5 | display refresh time | 0… 250 s : 10 |

| No. | PAR. | DEF. | DIGITAL OUTPUTS | MIN… MAX. |
|---|---|---|---|---|
| 10 | u0 | 0 | operating logic | 0 = 1 regulator 1 = 2 regulators with second setpoint relative to the first 2 = 2 regulators with 2 independent setpoints 3 = neutral zone regulation 4 = 2-step regulation |
| 11 | U1 | 1 | K1 output configuration type | 0 = disabled 1 = regulator 1 2 = regulator 2 3 = alarm |
| 12 | U2 | 2 | K2 output configuration type | 0 = disabled 1 = regulator 1 2 = regulator 2 3 = alarm |

| No. | PAR. | DEF. | REGULATION | MIN… MAX. |
|---|---|---|---|---|
| 13 | r0 | 2.0 | setpoint 1 differential | 1… 99 °C/°F if u0 = 3, cold mode regulation differential |
| 14 | r1 | 0.0 | setpoint 1 minimum | -99 °C/°F… r2 |
| 15 | r2 | 35.0 | setpoint 1 maximum | r1… 300 °C/°F |
| 16 | r5 | 0 | hot or cold mode regulation regulator 1 | 0 = cold mode 1 = hot mode |
| 17 | r6 | 2.0 | setpoint 2 differential | 1… 99 °C/°F if u0 = 3, hot mode regulation differential |
| 18 | r7 | 0.0 | setpoint 2 minimum | -99 °C (r8 °F). |
| 19 | r8 | 35.0 | setpoint 2 maximum | r7… 300 °C/°F |
| 20 | r9 | 0 | block setpoint 2 adjustment | 0 = no    1 = yes |
| 21 | r10 | 0 | hot or cold mode regulation regulator 2 | 0 = cold mode 1 = hot mode |
| 22 | r11 | 0.0 | digital input second setpoint 1 | -99… 199 °C/°F setpoint 1 + r11 |
| 23 | r12 | 0.0 | digital input second setpoint 2 | -99… 199 °C/°F setpoint 2 + r12 |
| 24 | r13 | 5.0 | neutral zone value | 1… 199 °C/°F if u0 = 4, two steps |

| No. | PAR. | DEF. | REGULATOR PROTECTION | MIN… MAX. |
|---|---|---|---|---|
| 25 | C1 | 0 | minimum time between two power-ons of regulator 1 | 0… 240 min |
| 26 | C2 | 0 | minimum time off and delay from power-on of regulator 1 | 0… 240 min |
| 27 | C3 | 0 | minimum time on regulator 1 | 0… 240 s |
| 28 | C4 | 0 | regulator 1 activity during regulation probe alarm | 0 = off    1 = on |
| 29 | C5 | 0 | minimum time between two power-ons of regulator 2 | 0… 240 min |
| 30 | C6 | 0 | minimum time off and delay from power-on of regulator 2 | 0… 240 min |
| 31 | C7 | 0 | minimum time on regulator 2 | 0… 240 s |
| 32 | C8 | 0 | regulator 2 activity during regulation probe alarm | 0 = off    1 = on |

| No. | PAR. | DEF. | ALARMS | MIN… MAX. |
|---|---|---|---|---|
| 33 | A1 | 0.0 | temperature 1 alarm threshold | -99… 300 °C/°F |
| 34 | A2 | 0 | temperature 1 alarm type | 0 = disabled 1 = absolute minimum 2 = absolute maximum 3 = minimum relative to SP 4 = maximum relative to SP |
| 35 | A3 | 0 | temperature 1 alarm delay | 0… 999 min |
| 36 | A4 | 0.0 | temperature 2 alarm threshold | -99… 300 °C/°F |
| 37 | A5 | 0 | temperature 2 alarm type | 0 = disabled 1 = absolute minimum 2 = absolute maximum 3 = minimum relative to SP2 4 = maximum relative to SP2 |
| 38 | A6 | 0 | temperature 2 alarm delay | 0… 999 min |
| 39 | A7 | 0 | temperature alarm delay after modifying setpoint and power-on | 0… 999 min |
| 40 | A8 | 0 | additional alarm signal delay after silencing if the condition persists | 0… 999 min |
| 41 | A9 | 0 | alarm relay activation | 0 = with alarm active 1 = with alarm not active |
| 42 | A11 | 2.0 | temperature alarm switch off differential | 1… 99 °C/°F |

| No. | PAR. | DEF. | DIGITAL INPUTS | MIN… MAX. |
|---|---|---|---|---|
| 43 | i5 | 0 | multi-purpose input function | 0 = disabled 1 = alarm iA 2 = alarm iA + regulator 1 off + regulator 2 off 3 = alarm iA1 + regulator 1 off 4 = alarm iA2 + regulator 2 off 5 = switches device on/off 6 = modifies setpoint 1 and setpoint 2 |
| 44 | i6 | 0 | multi-purpose input activation | 0 = with contact closed 1 = with contact open |
| 45 | i7 | 0 | multi-purpose input alarm delay | 0… 999 s |

| No. | PAR. | DEF. | SECURITY | MIN… MAX. |
|---|---|---|---|---|
| 46 | POF | 1 | enable ON/STAND-BY key | 0 = no        1 = yes |
| 47 | PAS | -19 | password | -99… 999 |

| No. | PAR. | DEF. | MODBUS | MIN… MAX. |
|---|---|---|---|---|
| 48 | LA | 247 | MODBUS address | 1… 247 |
| 49 | Lb | 2 | MODBUS baud rate | 0 = 2,400 baud 1 = 4,800 baud 2 = 9,600 baud 3 = 19,200 baud even |

## 9    ALARMS

| CODE | DESCRIPTION | RESET | TO CORRECT |
|---|---|---|---|
| Pr1 | regulation probe alarm | automatic | - check P0 - check probe integrity - check electrical connection |
| AL1 | temperature 1 alarm | automatic | check A1, A2 and A3 |
| AL2 | temperature 2 alarm | automatic | check A4, A5 and A6 |
| iA | multi-purpose input alarm | automatic | check i5 and i6 |
| iA1 | regulator 1 protection alarm | automatic | check i5 and i6 |
| iA2 | regulator 2 protection alarm | automatic | check i5 and i6 |

## 10    TECHNICAL SPECIFICATIONS

| | | |
|---|---|---|
| Purpose of the control device: | operating control. | |
| Construction of the control device: | incorporated control. | |
| Container: | black, self-extinguishing. | |
| Category of heat and fire resistance | D. | |
| Measurements: | | |
| 75.0 x 33.0 x 59.0 mm (2 15/16 x 1 5/16 x 2 5/16 in) with fixed screw terminal blocks | 75.0 x 33.0 x 81.5 mm (2 15/16 x 1 5/16 x 3 3/16 in) with plug-in screw terminal blocks. | |
| Mounting methods for the control device: | to be fitted to a panel, snap-in brackets provided. | |
| Degree of protection provided by the covering: | IP65 (front). | |
| Connection method: | | |
| fixed screw terminal blocks for wires up to 2.5 mm² | plug-in screw terminal blocks for wires up to 2.5 mm²: on request | Pico-Blade connector. |
| Maximum permitted length for connection cables: | | |
| power supply: 10 m (32.8 ft) | analogue inputs: 10 m (32.8 ft) | |
| digital inputs: 10 m (32.8 ft) | digital outputs: 10 m (32.8 ft). | |
| Operating temperature: | From -5 to 55 °C (from 23 to 131 °F) | |
| Storage temperature: | From -40 to 70 °C (from -40 to 158 °F) | |
| Operating humidity: | relative humidity without condensate from 10 to 90%. | |
| Pollution status of the control device: | 2. | |
| Compliance: | | |
| RoHS 2011/65/EC | WEEE 2012/19/EU | REACH (EU) regulation No 1907/2006 |
| EMC 2014/30/EU | LVD 2014/35/EU. | |
| Power supply: | | |
| 230 VAC (+10% -15%), 50/60 Hz (±3 Hz), max. 4 VA insulated in EV3… P7 | | |
| 115 VAC (+10% -15%), 50/60 Hz (±3 Hz), max. 4 VA insulated in EV3… P5 | | |
| 12-24 VAC/DC (+10% -15%), 50/60 Hz (±3 Hz), max. 5 VA/3W in EV3… P3. | | |
| Earthing methods for the control device: | none. | |
| Rated impulse-withstand voltage: | 2.5 KV. | |
| Over-voltage category: | II. | |
| Software class and structure: | A. | |
| Analogue inputs: | 1 for PTC, NTC or Pt 1000 probes (regulation probe). | |
| PTC probes: | Sensor type: | KTY 81-121 (990 Ω @ 25 °C, 77 °F) |
| | Measurement range: | from -50 to 150 °C (from -58 to 302 °F) |
| | Resolution: | 0.1 °C (1 °F). |
| NTC probes: | Sensor type: | ß3435 (10 KΩ @ 25 °C, 77 °F) |
| | Measurement range: | from -40 to 105 °C (from -40 to 121 °F) |
| | Resolution: | 0.1 °C (1 °F). |
| Pt 1000 probes: | Measurement range: | from -120 to 155 °C (from -184 to 311 °F) |
| | Resolution: | 0.1 °C (1 °F). |
| Digital inputs: | 1 dry contact (multi-purpose). | |
| Dry contact: | Contact type: | 5 VDC, 1.5 mA |
| | Power supply: | none |
| | Protection: | none. |
| Digital outputs: | 2 with electromechanical relay (K1 relay and K2 relay). | |
| K1 relay: | SPST, 16 A res. @ 250 VAC | |
| K2 relay: | SPDT, 8 A res. @ 250 VAC. | |
| Type 1 or Type 2 Actions: | type 1. | |
| Additional features of Type 1 or Type 2 actions: | C. | |
| Displays: | LED display, 3 digit, with function icons. | |
| Alarm buzzer: | built-in. | |
| Communications ports: | 1 TTL MODBUS slave port for TTL/RS-485 serial interface. | |