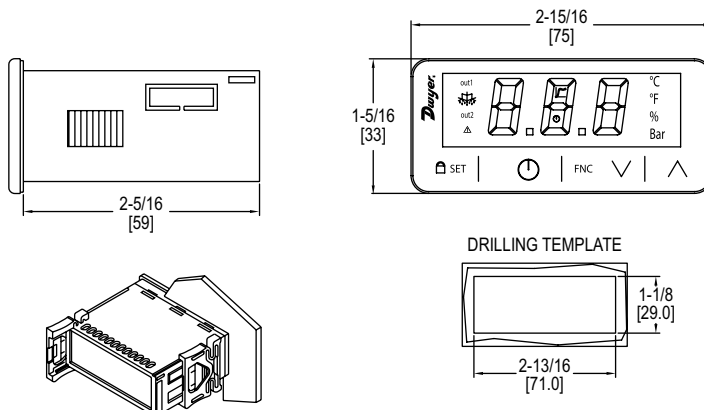




Series 40M2 Digital Temperature Controller

Specifications - Installation and Operating Instructions



The **Series 40M2 Digital Temperature Controller** accepts a variety of inputs for temperature measurements and set points up to 999°F/537°C. Observing the current status of the controller is made easy with the 3-digit, multi-color LED display that has alarm and output symbols. For added versatility, the temperature units can be field selected for °F or °C. A flashing alarm informs users when the current temperature exceeds preset limits. The On-Off/PID and PID with auto-tuning provide accurate and reliable control in complex applications. The Modbus® protocol TTL slave port can be used to communicate over a TTL/RS-485 interface. When programming multiple units, the 40X2-K programming key is available to reduce setup time.

INSTALLATION

Note: Unit must be mounted away from vibration, impacts, water and corrosive gases.

- Cut hole in panel 2-51/64 x 1.9/64 in (71 x 29 mm).
- The thickness of the panel must be between 1/32 and 5/64 in (0.8 and 2.0 mm).
- Insert unit into hole from the front side of the panel.
- Slide the mounting bracket securely against the panel from the rear of the unit.
- Wiring diagram is displayed on top of the switch.

SPECIFICATIONS

Sensor Input: RTD, thermocouple, thermistor, current, or voltage. 1 digital multipurpose dry contact.

Multipurpose Input: Dry contact 3.3 V, 1 mA (not available if sensor input is configured for Pt 100, Pt 1000, or Ni 120 3-wire input).

Sensor Input Types: Current: 0-20 mA/4-20 mA, configurable; Voltage: 0-10 V/2-10 V, configurable; PTC probe: -58 to 302°F (-50 to 150°C); NTC probe: -40 to 230°F (-40 to 110°C); PT100 probe*: -148 to 999°F (-100 to 650°C); PT1000 probe*: -148 to 999°F (-100 to 650°C); Ni120 probe: -112 to 572°F (-80 to 300°C); J T/C*: -130 to 999°F (-90 to 700°C); K T/C*: -130 to 999°F (-90 to 999°C).

Output: 0-10 VDC or PWM (12-24 VAC/DC model needs to be powered @ 24 VAC/DC for 0-10 VDC or PWM).

Control Type: On-Off/PID, PID with auto-tuning.

Power Requirements: 115-230 VAC or 12-24 VAC/DC depending on model.

Communication: TTL/RS-485 interface, Modbus® protocol port for programming or BMSF.

Display: 3 digit LED display.

Resolution: 1°F (0.1°C) for thermocouples; 1°F (0.1°C) for all other models.

Relay (K1) Output: 16 A in-rush res. @ 250 VAC, SPST, type 1.

Dry Contact: One multi-purpose, 3.3 V, 1 mA rating.

Alarm: Built in buzzer.

Temperature Limits: Operating: 23 to 131°F (-5 to 55°C).

Humidity Limits: 10-90% RH, non-condensing.

Storage Temperature: -13 to 158°F (-25 to 70°C).

Weight: 2.3 oz (65 g).

Front Panel Rating: IP65.

Compliance: CE, UKCA, cURus.

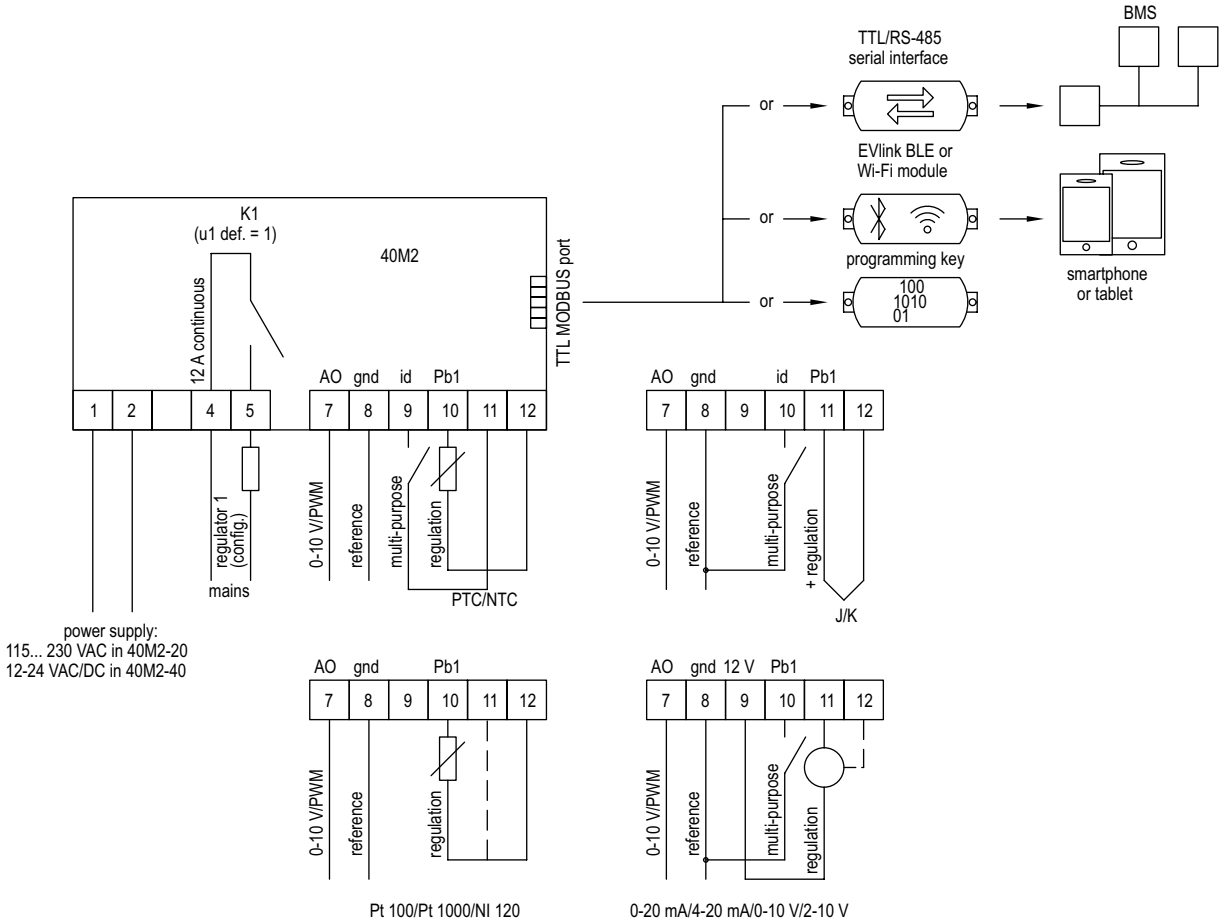
*Upper range limited by 3-digit display.

WIRING

Avoid installing the temperature probe cables in close proximity of any power cables. Maximum cable length of 10 m (32.8 ft) for all cables, except for the PWM analog output which is 1 m. A temperature offset adjustment may be made using the CA1 parameter. Connection methods include fixed and plug-in screw terminal blocks for wires up to 14 AWG (2.5 mm²) and pico-blade connector.

NOTICE To reduce any electromagnetic interference, mount the power cables as far away as possible from the signal cables.

- Disconnect the power supply before carrying out any type of maintenance.



INITIAL SETUP

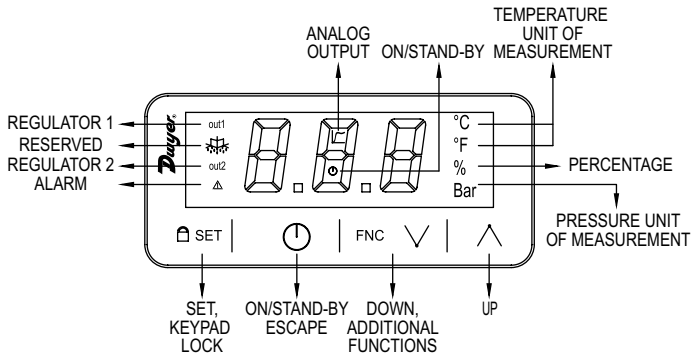
1. Install unit with the provided instructions above.
2. Electrically wire the device as described in the wiring section. A power on self test will begin once power is applied. This test will take a few seconds and the display will switch off when it's complete.
3. Configure the device as shown in the section SETTING CONFIGURATION PARAMETERS. The recommended parameters for first time use are listed in the chart below:

Parameter	Description	Range or Options	Factory Setting
SP	Set point	r1 to r2	0
P0	Type of input probe	0 = PTC	2
P0	Type of input probe	1 = NTC	2
P0	Type of input probe	2 = J Type Thermocouple	2
P0	Type of input probe	3 = K Type Thermocouple	2
P0	Type of input probe	4 = 3 wires Pt 100	2
P0	Type of input probe	5 = 2 wires Pt 100	2
P0	Type of input probe	6 = 3 wires Pt 1000	2
P0	Type of input probe	7 = 2 wires Pt 1000	2
P0	Type of input probe	8 = 4-20 mA	2
P0	Type of input probe	9 = 0-20 mA	2
P0	Type of input probe	10 = 2-10 V	2
P0	Type of input probe	11 = 0-10 V	2
P0	Type of input probe	12 = 3 wires Ni 120	2
P0	Type of input probe	13 = 2 wires Ni 120	2
P2	Display units	0 = °C	0
P2	Display units	1 = °F	0
r5	Cooling or heating for set point 1	0 = Cooling	0
r5	Cooling or heating for set point 1	1 = Heating	0
r10	Cooling or heating for set point 2	0 = Cooling	0
r10	Cooling or heating for set point 2	1 = Heating	0
uA	Analog output	0 = disabled	1
uA	Analog output	1 = proportional to regulation temperature	1
uA	Analog output	2 = regulator 1	1
uA	Analog output	3 = regulator 2	1
ub	Analog output type	0 = 0-10 V	0
ub	Analog output type	1 = PWM	0

USER INTERFACE AND MAIN FUNCTIONS

A. Switching the Device On and Off

Press the POWER key for 4 seconds. When the display is switched on, the display will show the P5 value.



B. Unlocking the Keypad

Touch any key for one second, until the display shows "UnL".

C. Setting the Set Point (if u0=0,3 or 4)

1. Ensure the keypad is not locked.

2. Press the SET key. The display should show the label "SP".

3. Press the UP or DOWN key within 15 seconds to set the value within the limits r1 and r2. The default on the unit will be 0 to 350.

4. Press the SET key or take no action for 15 seconds to set the set point.

D. Setting Set Point 1 and Set Point 2 (if u0=1 or 2)

1. Press the SET key. The display should show the label "SP".

2. Press the UP or DOWN key within 15 seconds to set the value within the limits r1 and r2. The default on the unit will be 0 to 350.

3. Press the SET key. The display will show the label "SP2".

4. Press the UP or DOWN key within 15 seconds to set the value of set point 2 within the limits r7 and r8. The default on the unit will be 0 to 350.

5. Press the SET key or take no action for 15 seconds to set the set point.

E. PID Control Activation with Auto-tuning (if r20=1, default)

1. Press the DOWN key for 4 seconds.

2. Press the UP or DOWN key within 15 seconds to select the label "tun".

3. Press the SET key.

4. Press the UP or DOWN key within 15 seconds to set "1".

5. Press the SET key.

6. Press the ON/STAND-BY key (or take no action for 60 seconds) to exit.

F. Silencing the Buzzer (if A13 = 1)

1. Touch any key. If u1, u2, or u3 = 3, the alarm output is deactivated.

ADDITIONAL FUNCTIONS

A. Displaying/setting the value delivered by the analog output.

1. Press the DOWN key for 4 seconds.

2. Press the UP or DOWN key within 15 seconds to select a label.
a) uA – displaying the value from the analog output
b) uM – modifying the value from the analog output

3. Press the SET key.

4. Press the UP or DOWN key to select uM and set the value.

5. Press the SET key.

6. Press the ON key or take no action for 60 seconds to exit the procedure.

B. Displaying the number of start-ups of the relay.

1. Press the down key for four seconds.

2. Press the UP or DOWN key within 15 seconds to select a label. nS1 = display the number of start-ups of the K1 relay in thousand.

3. Press the SET key.

4. Press the ON/STANDBY key (or take no action for 60 seconds) to exit the procedure.

C. Displaying the temperature detected by the compressor probe.

1. Press the DOWN key for four seconds.

2. Press the UP or DOWN key within 15 seconds to select a label. Pb1 = regulation temperature.

3. Press the SET key.

4. Press the ON/STANDBY key (or take no action for 60 seconds) to exit the procedure.

D. Displaying the temperature detected by the regulation probe.

1. Press the DOWN key for four seconds.

2. Press the UP or DOWN key within 15 seconds to select a label.

3. Touch the SET key.

4. Press the ON key or take no action for 60 seconds to exit the procedure.

SETTINGS

A. Setting Configuration Parameters

1. Press the SET key for four seconds. The display will then show the label "PA".

2. Press the SET key.

3. Press the UP or DOWN key within 15 seconds to set the PAS value. *Default is "-19".

4. Press the SET key or take no action for 15 seconds and the screen will show the label "SP".

5. Press the UP or DOWN key to select a parameter.

6. Press the SET key.

7. Press the UP or DOWN key within 15 seconds to set the value.

8. Press the SET key or take no action for 15 seconds.

9. Hold the SET key for 4 seconds or take no action for 60 seconds to exit the procedure.

B. Restoring to Default Factory Settings and Saving Customized Settings

1. Hold the SET key for 4 seconds. The display will show the label "PA".

2. Press the SET key.

3. Press the UP or DOWN key within 15 seconds to set the value.
a) Value: 149 – value for restoring the factory information (default)

b) Value: 161 – value for saving customized settings

4. Press the SET key or take no action for 15 seconds.

5. Press the SET key.

6. Press the UP or DOWN key within 15 seconds to set "1".

7. Press the SET key or take no action for 15 seconds. The display will show "--" flashing for 4 seconds and then it will exit the procedure.

8. Press the SET key.

9. Disconnect the device from the power supply.

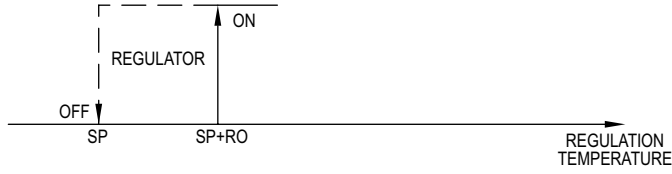
10. Hold the SET key for 2 seconds before action 6 if to exit the procedure.

FUNCTIONAL MODES

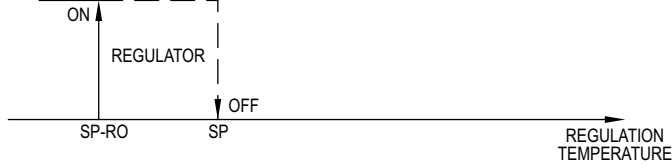
A. On-Off Operating Logic

1. One regulator

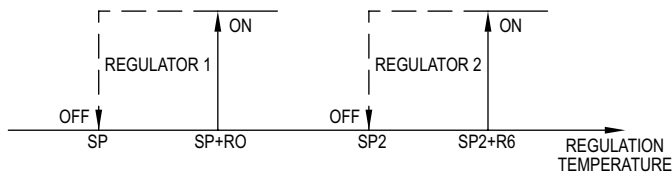
COLD MODE REGULATION [R5 = 0].



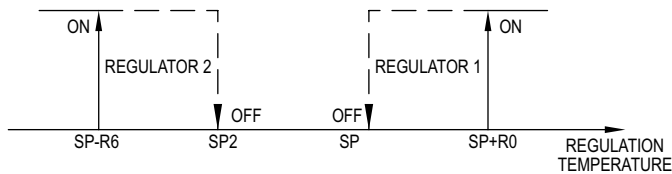
HOT MODE REGULATION [R5 = 1].



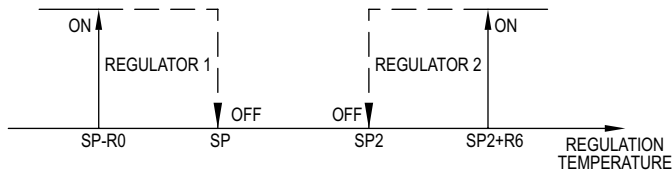
2. Two regulators with two independent set points Cold mode regulation set point 1 (r5 = 0) and cold mode regulation set point 2 (r10 = 0).



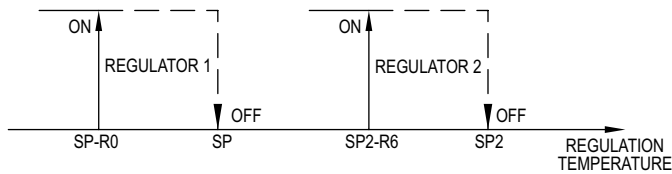
Cold mode regulation set point 1 (r5 = 0) and hot mode regulation set point 2 (r10 = 1).



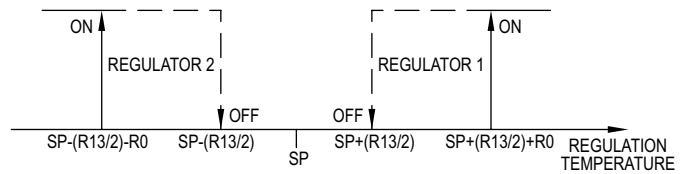
Hot mode regulation set point 1 (r5 = 1) and cold mode regulation set point 2 (r10 = 0).



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

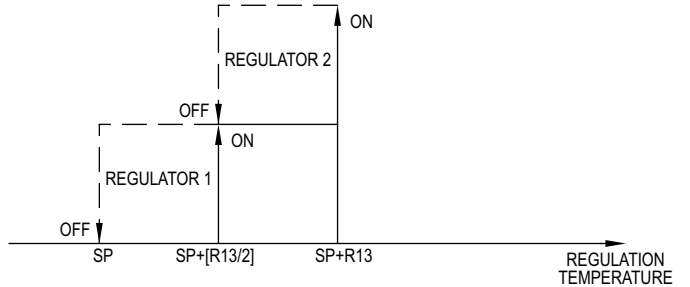


B. Neutral zone regulation (u0 = 3)

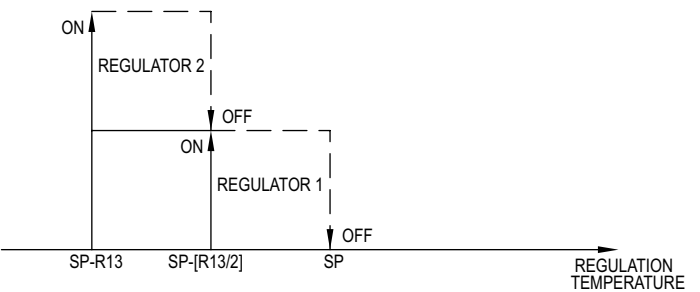


C. Two step regulation (u0 = 4)

Cold mode (r5 = 0)



Hot mode (r5 = 1)



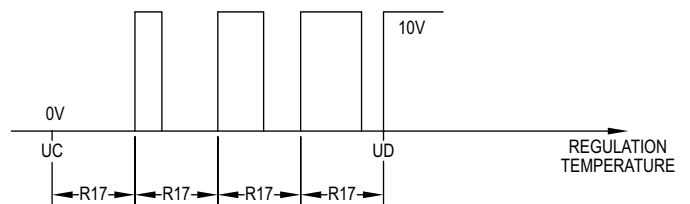
D. Operation with analog output proportional to regulation temperature

Note: ua = 1, default

Analog output 0-10 V (ub = 0, default)



Analog output PWM (ub = 1)



Parameter	Description	Units	Range or Options	Factory Setting
SP	Set point	Degrees	r1 to r2	0.0
SP2	Set point 2	Degrees	r7 to r8 (not avail if u0=0,3 or 4)	0.0
CA1	Probe adjustment	Degrees	-25 to 25 C/F	0.0
P0	Type of input probe	Option	0-PTC, 1-NTC, 2-J Type, 3-K Type, 4-3 wires Pt 100, 5-2 wires Pt 100, 6-3 wires Pt 1000, 7-2 wires Pt 1000, 8-4 to 20 mA, 9- 0 to 20 mA,10-2 to 10 V, 11-0 to 10 V, 12-3 wires Ni 120, 13-2 wires Ni 120	2
P1	Decimal point enable	Option	0-disabled,1-enable if P0=2 or 3, not effective if P0=8,9,10 or 11, position of decimal point 0-n/a, 1 tens digit	0
P2	Engineering units	Option	0-C, 1-F, 2-%, 3-bar, 4-blank, options 2, 3 and 4 effective only on LEDS and if P0=8,9,10 or 11	0
P3	Minimum process input value	Counts	-199 to 999	0.0
P4	Maximum process input value	Counts	-198 to 999	100
P5	Value displayed during normal operation	Option	0-probe temp, 1-set point (SP)	0
P8	Display refresh time	Tenths of a second	0 to 250	5
u0	Operating logic	Option	0 - 1 regulator, 2 - 2 regulators with SP2 relative to SP, 3 - 2 regulators with independent SP & SP2, 3 - neutral zone regulation, 4 - 2-step regulation	0
u1	K1 output configuration	Option	0 - disabled, 1 - regulator 1, 2 - regulator 2, 3 - alarm	1
uA	Analog output configuration	Option	0 - disabled, 1 - proportional to probe temperature, 2 - regulator 1, 3 - regulator 2	1
ub	Type of analog output	Option	0 - 0-10VDC, 1 - PWM	0
uc	Regulation temperature for minimum analog output value	Degrees or Points	-199 to ud C/F/points	0.0
ud	Regulation temperature for maximum analog output value	Degrees or Points	uc to 199 C/F/points	100
rA	PID control configuration	Option	0 - disabled, 1 - regulator 1, 2 - regulator 2, effective only u0=1 or 2	0
r0	Set point differential	Degrees	1 to 99.9 C/F, if u0= 3 then cold mode regulation differential	2.0
r1	Minimum set point value	Degrees	-199.0 C/F to r2	0.0
r2	Maximum set point value	Degrees	r1 to 999 C/F	350.0
r5	Cooling or heating	Option	0-cooling, 1-heating	0
r6	Differential for set point 2	Degrees	1 to 99 if u0=3 then heating mode regulation differential	2.0
r7	SP2 minimum value	Degrees	-199 C/F to r8	0.0
r8	SP2 maximum value	Degrees	r7 to 999 C/F	350
r9	Lock SP2 for adjustments	Option	0 - no, 1 - yes	0
r10	Regulator 2 heating or cooling operation	Option	0 - cooling, 1 - heating	0
r11	Digital input for SP	Degrees	-199 to 999 C/F (set point) + r11	0.0
r12	Digital input for SP2	Degrees	-199 to 999 (set point 2) + r12	0.0
r13	Neutral zone value	Degrees	1 to 999 C/F If u0 = 4 then two steps	5.0
r14	Proportional band	Degrees	1 to 999 C/F	50
r15	Integral action time	Seconds	0 to 999	60
r16	Derivative action time	Seconds	0 to 999	30
r17	Cycle time on for PID regulator PWM relay or analog output	Seconds	1 to 999	180
r18	Minimum time on for PID regulator PWM relay or analog output	Seconds	0 to 240	0
r19	Minimum time off for PID regulator PWM relay or analog output	Seconds	0 to 240	0
r20	Enable auto-tuning	Option	0 - disable, 1 - enable	1
r21	Maximum duration for auto-tuning	Minutes	2 to 240	240
C1	Minimum time between two power ons for regulator 1	Minutes	0 to 240	0
C2	Minimum time off and delay from power up of regulator 1	Minutes	0 to 240	0
C3	Minimum time on regulator 1	Seconds	0 to 240	0
C4	Behaviour of regulator 1 during probe alarm	Option	0 - off, 1 - on	0
C5	Minimum time between two power ons of regulator 2	Minutes	0 to 240	0
C6	Minimum time off and delay from power up of regulator 2	Minutes	0 to 240	0
C7	Minimum time on regulator 2	Seconds	0 to 240	0
C8	Behaviour of regulator 2 during probe alarm	Option	0 - off, 1 - on	0
A1	Temperature alarm 1 set point	Degrees	-199 to 999 C/F	0.0
A2	Temperature alarm 1 type	Option	0 - disabled, 1 - abs min, 2 - abs max, 3 - min relative to SP, 4 - max relative to SP	0
A3	Temperature alarm 1 delay	Minutes	0 to 999	0
A4	Temperature alarm 2 set point	Degrees	-199 to 199 C/F	0.0
A5	Temperature alarm 2 type	Option	0 - disabled, 1 - abs min, 2 - abs max, 3 - min relative to SP2, 4 - max relative to SP2	0
A6	Temperature alarm 2 delay	Minutes	0 to 999	0
A7	Temperature alarm delay upon set point modification & power on	Minutes	0 to 999	0
A8	Temperature alarm delay after silencing and persistent alarm condition	Minutes	0 to 999	0
A9	Enable alarm output logic	n/a	0- with alarm active, 1-with alarm not active	0
A11	Temperature alarm switch off from set point	Degrees	1 to 99	2.0
A13	Enable alarm buzzer	Option	0-disabled, 1-enable	1
i5	Multi-purpose input function	Option	0-disabled, 1-alarm iA, 2-alarm iA+both regulators off, 3-alarm iA1 & regulator 1 off, 4-alarm iA2 & regulator 2 off, 5-switches device on/off, 4-modifies SP & SP2	0
i6	Multi-purpose input activation	Option	0-contact closed, 1-contact open	0
i7	Multi-purpose input alarm delay	Seconds	0 to 999	0
POF	Enable "ON/Standby" button	Option	0-disabled, 1-enable	1
PAS	Set password	Number	-99 to 999	-19
PA1	Set first level password	Number	-99 to 999	426
PA2	Set second level password	Number	-99 to 999	824
bLE	Enable Bluetooth	Option	0-disabled, 1-enable	1
rE0	Data logger sampling interval	Minutes	0 to 240	15
LA	Modbus® protocol address	Number	1 to 247	247
Lb	Modbus® protocol baud rate	Option	0-2,400 baud, 1-4800 baud, 2-9600 baud, 3-19,200 baud even	3

ALARMS			
Code	Description	Reset	How to Correct
Pr1	Compressor probe alarm	Automatic	Check P0 Check integrity of the probe 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
tu0	Auto-tuning alarm failed	Manual	Touch any key
tu1	Auto-tuning timeout alarm	Manual	Touch any key, check r21

MAINTENANCE/REPAIR

Upon final installation of the Series 40M2, no routine maintenance is required. The Series 40M2 is not field serviceable and is not possible to repair the unit. Field repair should not be attempted and may void warranty.



This symbol indicates waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your Local Authority or retailer for recycling advice.



WARRANTY/RETURN

Refer to "Terms and Conditions of Sale" in our catalog and on our website. Contact returns@dwyermail.com to receive a Return Materials Authorization number before shipping the product back for repair. Be sure to include a brief description of the problem, PO#/Order#/or Invoice# that this unit was purchased on plus any additional application notes.

