

TBC-41 Board PID Control

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Power

90-250 VAC, 47-63 Hz, 12VA, 5W max.
11-26 VAC / VDC, SELV, Limited Energy, 12VA, 5W max.

Input

Resolution: 18 bits

Sampling Rate: 5 samples/second

Max. Rating: -2 VDC min, 12 VDC max.
(1 minute for mA input)

Temperature Effect: $\pm 1.5\text{uV}/^\circ\text{C}$ for all inputs except mA
 $\pm 3.0\text{uV}/^\circ\text{C}$ for mA input

Sensor Lead Resistance Effect:

T/C: 0.2uV/ohm

3-wire RTD: 2.6°C/ohm of resistance difference of two leads

2-wire RTD: 2.6°C/ohm of resistance sum of two leads

Burn-out Current: 200 mA

Common Mode Rejection Ratio (CMRR): 120dB

Normal Mode Rejection Ratio (NMRR): 55dB

Sensor Break Detection:

Sensor open for TC, RTD and mV inputs

Sensor short for RTD input

Below 1 mA for 4-20 mA input

Below 0.25V for 1-5 V input

Unavailable for other inputs

Sensor Break Responding Time:

Within 4 seconds for TC, RTD and mV inputs

0.1 second for 4-20 mA and 1-5 V inputs

Output 1 / Output 2

Relay Rating: 2A/240 VAC, life cycles 200,000 for resistive load

Pulsed Voltage: Source Voltage 5V
current limiting resistance 66Ω

Linear Output

Resolution: 15 bits

Output Regulation: 0.02% for full load change

Output Settling Time: 0.1 sec. (stable to 99.9%)

Isolation Breakdown Voltage: 1000 VAC

Temperature Effect: $\pm 0.01\%$ of SPAN / °C

Triac (SSR) Output

Rating: 1A / 240 VAC

Inrush Current: 20A for 1 cycle

Min. Load Current: 50 mA rms

Max. Off-state Leakage: 3 mA rms

Max. On-state Voltage: 1.5 V rms

Insulation Resistance: 1000 Mohms min. at 500 VDC

Dielectric Strength: 2500 VAC for 1 minute

Alarm

Alarm Relay: Form C Rating

2A/240VAC, life cycles 200,000 for resistive load

Alarm Functions: Dwell timer, Deviation High / Low Alarm

Deviation Band High / Low Alarm

PV High / Low Alarm

Alarm Mode: Normal, Latching, Hold, Latching / Hold

Dwell Timer: 0.1-4553.6 minutes

Data Communication

Interface: RS-232 (1 unit), RS-485 (up to 247 units)

Protocol: Modbus Protocol RTU mode

Address: 1-247

Baud Rate: 2.4~38.4 Kbits/sec

Data Bits: 7 or 8 bits

Parity Bit: None, Even or Odd

Stop Bit: 1 or 2 bits

Communication Buffer: 160 bytes

Analog Retransmission

Output Signal: 4-20 mA, 0-20 mA, 0-5V

1 - 5V, 0 - 10V

Resolution: 15 bits

Accuracy: $\pm 0.05\%$ of span $\pm 0.0025\%$ / °C

Load Resistance:

0 - 500 ohms (for current output)

10 K ohms minimum (for voltage output)

Output Regulation: 0.01% for full load change

Output Settling Time: 0.1 sec. (stable to 99.9%)

Isolation Breakdown Voltage: 1000 VAC min.

Integral Linearity Error: $\pm 0.005\%$ of span

Temperature Effect: $\pm 0.0025\%$ of span / °C

Saturation Low: 0 mA (or 0V)

Saturation High: 22.2 mA (or 5.55V, 11.1V min.)

Linear Output Range: 0-22.2mA (0-20mA or 4-20mA)

0-5.55V (0-5V, 1-5V)

0-11.1 V (0-10V)

User Interface

Dual 4-digit LED Displays

Keypad: 4 keys

Programming Port: For automatic setup, calibration and testing

Communication Port: Connection to PC for supervisory control

Control Mode

Output 1: Reverse (heating) or direct (cooling) action

Output 2: PID cooling control, cooling P band 50~300%
of PB, dead band -36.0~36.0% of PB

ON-OFF: 0.1-90.0 (°F) hysteresis control (P band = 0)

P or PD: 0-100.0% offset adjustment

PID: Fuzzy Logic modified

Proportional band 0.1~900.0°F

Integral time 0-3600 seconds

Derivative time 0-360.0 seconds

Cycle Time: 0.1-90.0 seconds

Manual Control: Heat (MV1) and Cool (MV2)

Auto-tuning: Cold start and warm start

Failure Mode: Auto-transfer to manual mode while
sensor break or A-D converter damage

Ramping Control: 0-900.0°F/minute or

0-900.0°F/hour ramp rate

Digital Filter

Function: First order

Time Constant: 0, 0.2, 0.5, 1, 2, 5, 10, 20, 30, 60
seconds programmable