

7EM Temperature Controllers

ADVANTAGE EZ Series 7EM 1/8 DIN Temperature Controller

- *Dual 3 Digit LED Display*
- *Input (T/C, RTD)*
- *Autotuning*
- *NEMA 4X*
- *100 to 240 Vac Switching Power Supply*
- *Algorithms for Heat or Heat/Cool Control*
- *Up to 3 Outputs*
- *Up to 2 Independent Alarms Configurable with Automatic or Manual Reset*
- *Control Output Disable Function*



The Advantage EZ 7EM 1/8 DIN Controllers are configurable autotuning controllers for applications where input ranges do not exceed 999.

Optional Features

- 24 Vac/Vdc Supply
- Heater Breakdown Input
- Two Temperature Alarms
- Heater Breakdown Alarm and Load Current Display in Engineering Units

Introduction

The Barber-Colman Series 7 establishes a new class of microprocessor based temperature controllers. As part of the Series 7 family, the 7EM offers outstanding performance features in a cost effective package. Designed specifically for equipment manufacturers who demand tight process control, the 7EM has a variety of standard features commonly found as options on our competitors controllers. NEMA 4X faceplates allow these units to be used in severe conditions. The 3 digit display offers complete coverage for extrusion and environmental chamber applications without excess cost for unused digits.

The 7EM is easy to configure and use. Even operators without skills in temperature process control or knowledge of PID control parameters can obtain perfect control. For best results in control stability, simply:

- wire the instrument
- configure the setpoint and alarm thresholds
- initiate the autotune function

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Specifications

Case:	ABS black. Self-extinguishing degree V-0 according to UL, VDE and CSA.
Front Protection:	Designed and tested for IP54 according to IEC 529 and CEI 70-1.
Installation:	Panel mounting by means of brackets.
Rear Terminal Block:	Up to 21 screw terminals, with safety rear cover.
Dimensions:	48 x 96 mm (1.890 x 3.780 in.) according to DIN 43700; 89 mm (3.504 in.) deep.
Weight:	400 grams maximum (1 pound).
Power Supply	
(Switch Mode):	- 100 to 240 Vac. 50/60 Hz (10% to -15% of the nominal value). - 24 Vac/Vdc. ($\pm 10\%$ of the nominal value).
Power Consumption:	11 VA.
Insulation Resistance:	Greater than 2 G Ω for 500 Vdc according to IEC 348.
Isolation Voltage:	1500 Vrms according to IEC 348.
D/A Conversion:	Dual slope integration.
Noise Immunity:	a) Electrical fast transient/burst requirements: Severity Level 3 (according to IEC 801-4). b) Electric discharge requirements: Severity Level 8 (according to IEC 801-2).
Sampling Time:	500 ms.
Accuracy:	$\pm 0.2\%$ full scale span or $\pm 1^\circ\text{C}$, @ 25 $^\circ\text{C}$ and nominal power supply voltage.
Common Mode	
Rejection Ratio:	120 dB @ 50/60 Hz.
Normal Mode	
Rejection Ratio:	60 dB @ 50/60 Hz.
Operating Temperature:	From 0 to 50 $^\circ\text{C}$.
Storage Temperature:	From -20 to 70 $^\circ\text{C}$.
Humidity:	From 20% to 85% RH non-condensing.
Protection:	Internal jumper for configuration and calibration parameters.

Control Action

On/Off, PID or Smart AT Autotuning

Special Function: Standby alarm sequence.

Inputs (All inputs are factory calibrated and selectable from the keyboard.)

Types:	Thermocouples (J, K, L, N, T) or RTD Pt 100, keyboard configurable.
Engineering Units:	$^\circ\text{C}$ and $^\circ\text{F}$ keyboard configurable.
Reference Junction:	Automatic compensation for an ambient temperature between 0 and 50 $^\circ\text{C}$.
Line Impedance:	100 Ω maximum for TC input. 20 Ω /wire maximum for RTD input.
Reference Junction Drift:	0.1 $^\circ\text{C}/^\circ\text{C}$.
Input Impedance:	Greater than 1 M Ω .
Sensor Break:	Downscale or upscale programmable. On RTD inputs, an OVERRANGE is indicated when input resistance is less than 15 Ω (short circuit sensor detection.)
Calibration:	According to IEC 584-1 and DIN 43710-1977.

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Specifications (continued)

Standard Ranges

Input	Ranges		
L	0 to 800 °C	0 to 999 °F	DIN 43710-1977
J	0 to 800 °C	0 to 999 °F	IEC 584-1
K	0 to 999 °C	0 to 999 °F	IEC 584-1
N	0 to 999 °C	0 to 999 °F	IEC 584-1
RTD Pt 100	-19.9 to 99.9 °C		DIN 43760
RTD Pt 100	-199 to 500 °C	-199 to 999 °F	DIN 43760

Current Transformer Input for OUT 1 Heater Breakdown Detection (Optional)

This feature allows measurement of the load current by means of a current transformer and signals an alarm condition when the current is below a pre-programmed threshold value.

Input Range:	50 mAac.
Scaling:	Configurable from 10 Amps to 100 Amps (with a 1 Amp step).
Resolution:	- for full scale up to 20 Amps: 0.1 Amp. - for full scale from 21 Amps to 100 Amps: 1 Amp.
Active Period:	- for relay output: NO or NC configurable. - for SSR output: logic level 1 or 0 configurable.
Minimum On Time to perform the measurement:	50 ms.

Outputs

Main Output:	(Heating) Relay or SSR (jumper selectable) <ul style="list-style-type: none">- Relay SPDT, contact rating 3 Amps @ 250 Vac on resistive load.- Logic output for SSR, 700 Ω maximum load, short circuit protected. Logic Level 1: <ul style="list-style-type: none">14 Vdc ±20% @ 20 mA max.24 Vdc ±20% @ 1 mA max. Logic Level 0: <ul style="list-style-type: none">Less than 0.5 Vdc
Output 2	(Cooling or Alarm 1) Relay or SSR (jumper selectable) <ul style="list-style-type: none">- Relay SPST, contact rating 2 Amp @ 250 Vac on resistive load.- Logic output for SSR, 700 Ω maximum load, short circuit protected. Logic Level 1: <ul style="list-style-type: none">14 Vdc ±20% @ 20 mA max.24 Vdc ±20% @ 1 mA max. Logic Level 0: <ul style="list-style-type: none">Less than 0.5 Vdc
Output 3	(Alarm 2 or Heater breakdown) <ul style="list-style-type: none">- Relay SPST, contact rating 2 Amp @ 250 Vac on resistive load. (normally open contact only)

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Specifications (continued)

Alarms

Alarm Functions:	Process Alarm Deviation Alarm Band Alarm
Type of Alarm:	- High/Low (Outside/Inside for band alarm) - Direct/Reverse - Standby Sequence/No Standby Sequence
Alarm Hysteresis:	0.1 to 10.0% of input span or 1 least significant digit.
Alarm Output:	Relay SPST 2 Amp @ 250 Vac resistive load.

Display Characteristics

Upper Display:	3 digit 7 segment green LED display; 10 mm high.
Lower Display:	3 digit 7 segment orange LED display; 7.6 mm high.
Indicators:	1 red LED when main (heating) output is ON. 1 red LED when cooling (or alarm 1) output is ON. 1 red LED when alarm 2 (or hbd alarm) output is ON. 1 red LED when Smart AT is enabled.

Operator Interface


Upper Display


Shows the actual measured value or (during configuration) the value of the selected parameter.


Lower Display



Shows the operating setpoint; the heater current (in Amps); and the abbreviated name of the selected parameter.



Keyboard Description

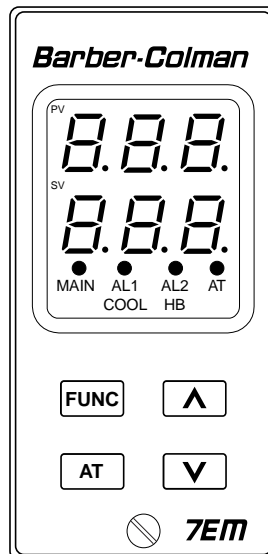
 Decreases the selected parameter.

 Increases the selected parameter.

 Displays in sequence all parameters and saves new settings or displays the output level and heater current.

 +  Starts the default parameter loading procedure.

 +  Enables/disables the output power OFF function.



Indicators

MAIN Lit during the ON period of the heating cycle.

AL1
COOL Lit when Alarm 1 is ON or during the ON period of the cooling cycle.

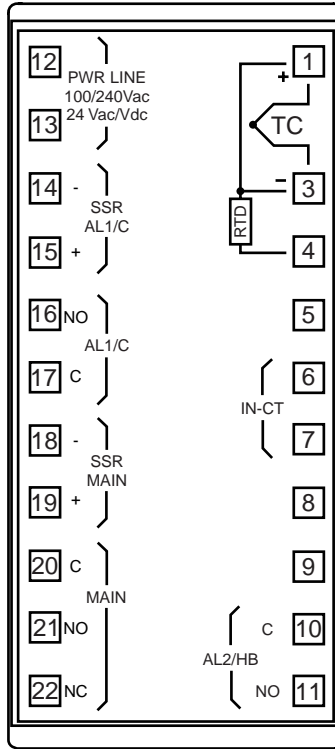
AL2
HB Lit when Alarm 2 is in ON or when the heater breakdown alarm is ON.

AT Flashes during startup autotuning. Lit steadily during adaptive autotuning.

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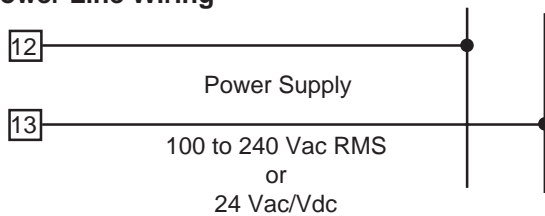
Wiring

Rear Terminal Block



Controller Wiring

Power Line Wiring

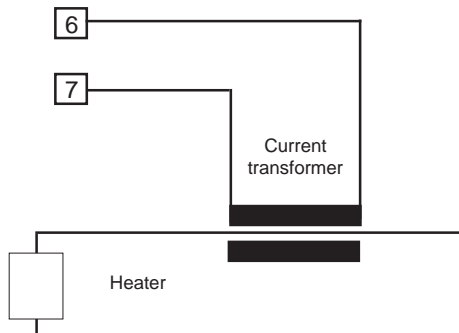


NOTE: Connect neutral to terminal 12.

Before connecting power to the instrument, make certain the line voltage corresponds to the model number.

To avoid electric shock, connect the power line at the end of the wiring procedure.

24 Vdc supplies are not polarity sensitive.



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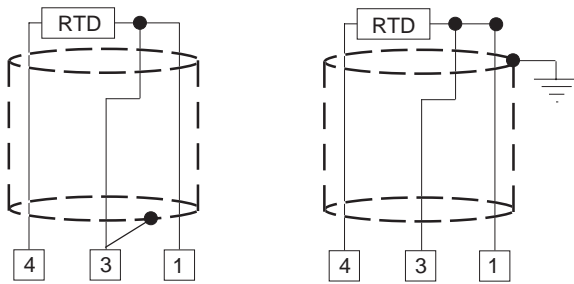
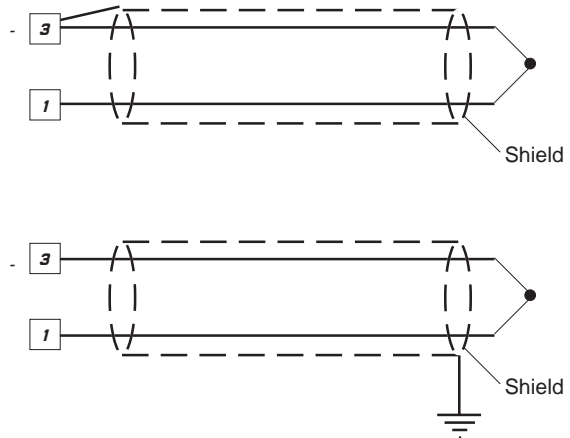
Wiring (continued)

Input Wiring

NOTE: Do not run input wires together with power cables. For TC wiring use proper compensating cable, preferably shielded. If shielded cable is used, it should be grounded at one point only.

Do not run RTD wires together with power cables. If shielded cable is used, it should be grounded at one point only. Use copper wires of the appropriate size (see "Specifications"). The resistance of the 3 wires must be the same.

Thermocouple Input Wiring



RTD Input Wiring

NOTE: Any external components (like zener diodes etc.) connected between sensor and input terminals may cause errors in measurement due to excessive or unbalanced line resistance, or possible leakage currents.

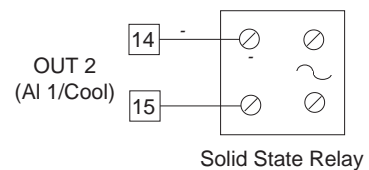
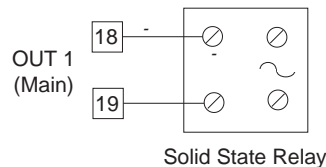
Voltage Output for SSR Drive

Logic voltage for SSR drive.

Logic status 1: 24V \pm 20% @ 1 mA
14 V \pm 20% @ 20 mA

Logic status 0: Less than 0.5 V

NOTE: This output is not isolated. Isolation between instrument output and power supply must be assured by the external solid state relay.

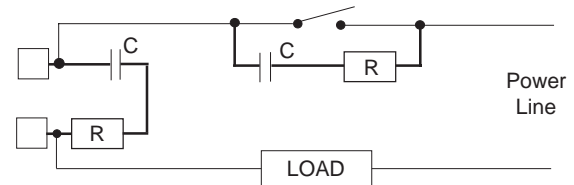
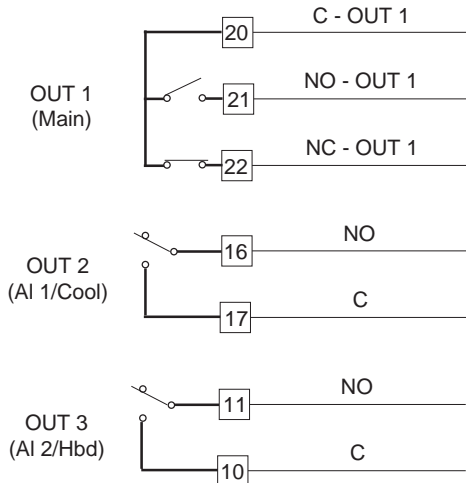


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Wiring (continued)

Relay Output Wiring

The relay outputs are protected by a varistor. Refer to the specifications for contact ratings of individual relays.



External Switch in Series with the Internal Contact

Inductive Loads

High voltage transients may occur when switching inductive loads. These transients may introduce disturbances which can affect the performance of the instrument. The internal varistor assures protection up to 0.5 Amp of inductive component of the load. The same problem may occur when a switch is used in series with the internal contacts. In this case, it is recommended to install an additional RC network across the external contact as shown.

The value of capacitor (C) and resistor (R) are shown in the following table.

Load Current	C (uF)	R (W)	Resistor Power (W)	Resistor and Capacitor Voltage
Less than 150 mA	0.1	22	2	260
Less than 0.5 Amp	0.33	47	2	260
Less than 1 Amp	0.47	47	2	260

Relay output wiring must be as far away as possible from input or communication cables.

See "Controller Mounting Dimensions" at the end of this section.