

## Temperature Controllers

Selection Guide .....	1-2	
7SD, 7SM and 7SH	1/16 DIN 3-Digit Temperature Controllers .....	1-4
7SP	1/16 DIN 4-Digit Controller Programmer .....	1-6
7SF	1/16 DIN 4-Digit Dual Display Temperature Controller with Heat/Cool Output .....	1-8
7SC	1/16 DIN 4-Digit Dual Display Temperature Controller with Analog Output .....	1-10
7EM	1/8 DIN 3-Digit Dual Display Temperature Controller .....	1-12
7EF and 7HF	1/8 DIN 4-Digit Dual Display Temperature Controllers .....	1-14
7EC	1/8 DIN 4-Digit Dual Display Temperature Controller with Analog Output .....	1-16
7ES	1/8 DIN 4-Digit Dual Display Temperature Controller with Actuator Output .....	1-18

## Indicator & Alarm Units

7SI	1/16 DIN Compact Digital Indicator .....	2-2
7SL	1/16 DIN Limitrol FM Approved Safety Limit .....	2-4
7HI and 7HK	1/8 DIN 4-Digit Horizontal Digital Indicators .....	2-6
7HL	1/8 DIN High Performance Digital Indicator .....	2-8

# TEMPERATURE CONTROLLERS



# TEMPERATURE CONTROLLERS

## Series 7



7SD/7SM



7SH



7SP



7SF



**Simple Heating and Cooling**  
Small Ovens, Chillers,  
Trace Heating, Injection,  
Packaging, Hot Runner



**Food and Brewing**  
Blending, Baking,  
Refrigeration, Sterilization,  
Fermentation, Pasteurization



**Plastics and Rubber Extrusion**  
Solid, Film,  
Pipe,  
Wire



**Aerospace and Automotive**  
Environmental Chambers,  
Autoclaves, Annealing,  
Paint Drying

# DIN Controllers

Panel Size	1/16 DIN	1/16 DIN	1/16 DIN	1/16 DIN	
Display	3 Digit	3 Digit	4 Digit	4 Digit	
PID and Smart AT	●	●	●	●	
Heat/Cool		●	●	●	
Analog Output/Retransmission					
Motorized Valve					
Setpoint Programming			●		
Alarms (Maximum Number)	1	1	2	2	
Digital Communications				●	



7SC



7EM



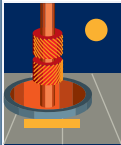
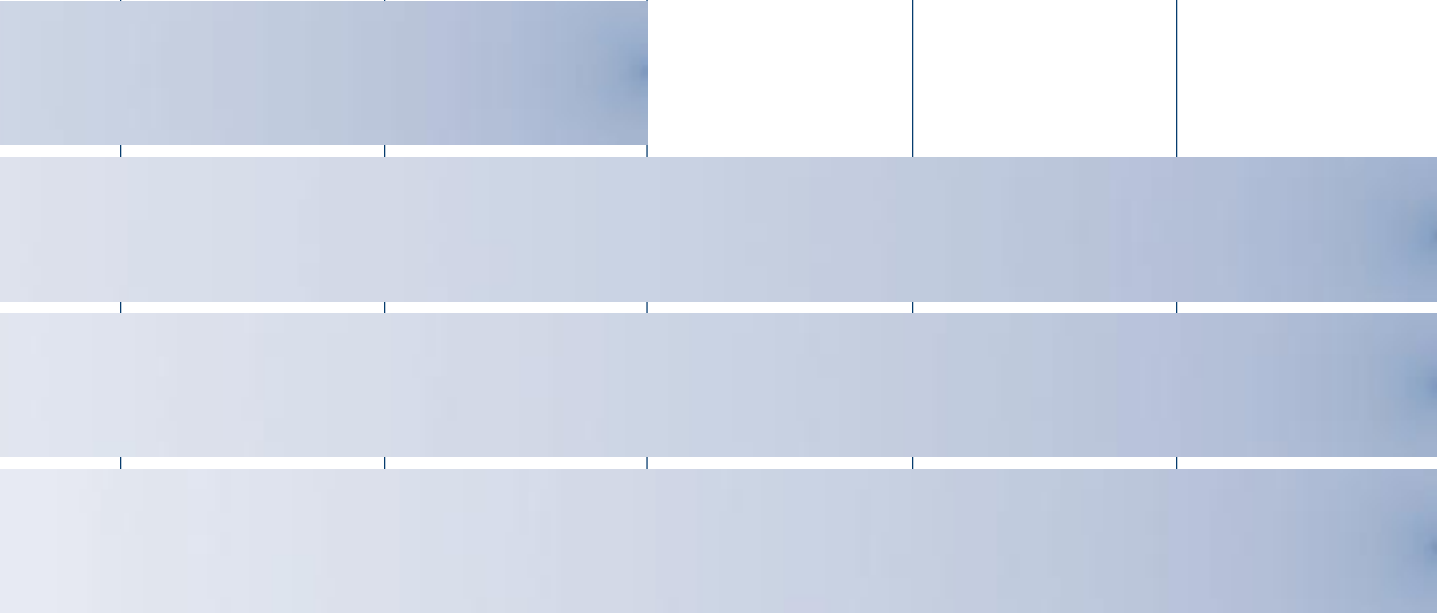
7EF/7HF



7EC



7ES



Heat Treatment  
Kilns, Ovens,  
Furnaces, Driers,  
Ceramics and Bricks



Heating and Ventilation  
Gas Burner,  
Glass

	1/16 DIN	1/8 DIN	1/8 DIN 1/8H DIN	1/8 DIN	1/8 DIN
	4 Digit	3 Digit	4 Digit	4 Digit	4 Digit
	●	●	●	●	●
	●	●	●	●	●
	●			●	
					●
	2	2	3	3	3
	●		●	●	●

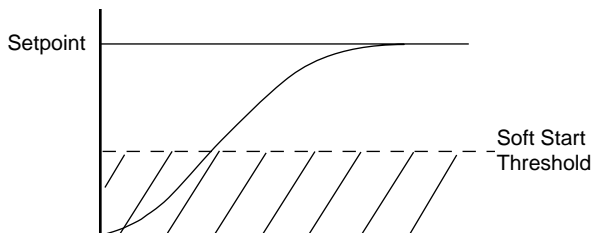
# TEMPERATURE CONTROLLERS

## 7SD, 7SM and 7SH 1/16 DIN 3-Digit Temperature Controllers

### Features:

- Thermocouple and RTD Input
- PID and Smart AT Autotuning
- NEMA 4X, IP65
- Programmable Soft Start Setpoint
- Alarm Standby
- Parameter Password Security
- Heat/Cool Control (7SH)

Designed specifically for equipment manufacturers who demand tight process control, the 7SD, 7SM and 7SH offer outstanding performance and a variety of features in a cost effective 1/16 DIN package. NEMA 4X faceplates allow these units to be used in applications in which washdowns and dust conditions exist. Thermocouple or RTD input and a 3 digit display provide complete coverage for plastics, packaging,

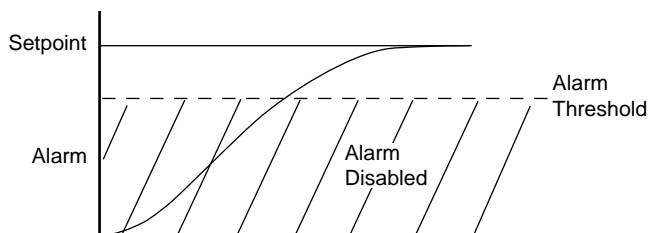


#### Soft Start Setpoint

A configurable threshold can be used to limit output power during initial startup (use this if the impedance of the heating load changes as the process temperature increases).



food, environmental chambers and other cost sensitive applications. The 7SD, 7SM and 7SH provide solutions for heating, heating plus alarm and heating/cooling applications. Alarms can be process, deviation or band type, direct or reverse, with manual reset. Easy to understand, set-up and use, these controllers provide exceptional value to the industrial user.



#### Alarm Standby

Alarm Standby can be used to mask alarm conditions if process low alarms are employed and the process has not yet reached the alarm threshold.

### Specifications:

<b>Control Modes:</b>	On/Off, PID with Smart AT Autotuning Heat, Heat-Cool (7SH) and Alarm
<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz or 24 Vac/Vdc (±10%)
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, L & N (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table A, page 1-21

#### Output Ratings:

Output 1:	Time Proportioning Relay, 3A/250V, SPDT, Resistive (Control)
Time Proportioning Logic SSR (unisolated)	
Logic Level 1:	14 Vdc ±20% @ 20 mA max. (700 Ω min.)
Logic Level 0:	24 Vdc max. ±20% @ 1mA Less than 0.5 Vdc
Output 2:	Time Proportioning Relay, 1A/250V, SPST, Resistive (Cooling - 7SH only)
Output 2:	Alarm Relay, 1A/250V, SPST, Resistive

**Mounting:** Panel Mount

### Model 7SD - Deviation Display

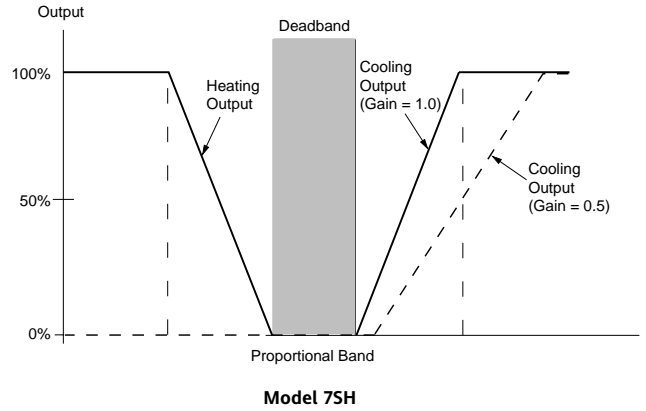
The 7SD is a 1/16 DIN heat (OP1) plus optional alarm (OP2) controller with a single 3 digit, 7 segment display, bargraph deviation display and front panel LED's to indicate heat ON, alarm ON and Autotune ENABLED. Configuration and calibration protection is afforded by both a configuration password and an internal jumper. When loss of sensor input occurs, the Auto Comp™ sensor break feature maintains control at the present percent output.

### Model 7SM - Dual Display

The 7SM has all the features of the 7SD (except the bargraph display) but with a dual 3 digit, 7 segment display to show both process value and setpoint.

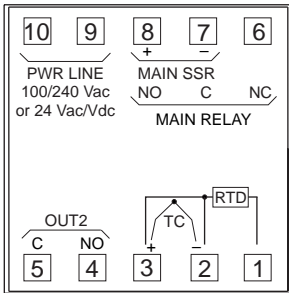
### Model 7SH - Heat/Cool

The 7SH controller is a 7SM with heat/cool capability (OP2 relay = Cool). The relative cooling gain can be set from 1.0 to 0.2 (1x to 5x the heating proportional band). Configurable overlap and deadband allows customization of the 7SH for unique process heat/cool requirements.



## Terminal Connections and Mounting:

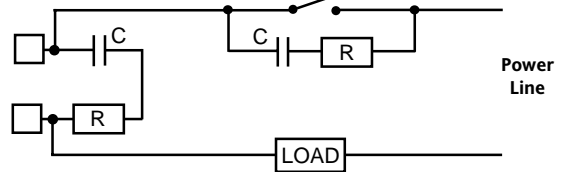
### 7SD, 7SH, 7SM



### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Non-isolated logic outputs depend on the SSR for isolation. The OP1 and OP2 relays are internally protected by a varistor. When inductive loads (such as mercury contactors) are

used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
Snubber Part Number: CZ140398

### Mounting

Dimensions: 48W x 48H x 100D mm

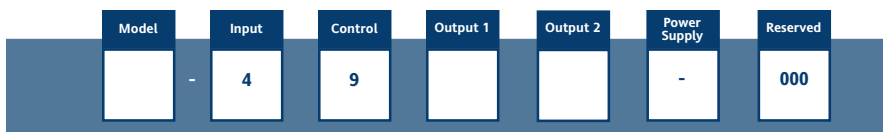
Cutout: 45W x 45H mm (-0, +0.6 mm)

60 mm min. center-to-center vertical spacing

75 mm min. center-to-center horizontal spacing

Weight: 160 gm

## Ordering Codes:



Model	
7SD	Deviation Display
7SH	Heat/Cool Controller
7SM	Dual Display Controller

Input	
4	T/C Type J, K, L & N (°C, °F) and Pt100 3W RTD (°C, °F)*

\* Ranges - See Table A, page 1-21

Control	
9	PID & Smart AT

Output 1	
1	Relay
6	SSR Drive

Output 2	
0	None
7SD & 7SM Only	
1	Relay (for Alarm)
7SH Only	
1	Relay (Cooling/Alarm)

Power Supply	
7SD & 7SM Only	
30	100 to 240 Vac
50	24 Vac/Vdc
7SH Only	
03	100 to 240 Vac
05	24 Vac/Vdc

# TEMPERATURE CONTROLLERS

## 7SP 1/16 DIN 4-Digit Controller Programmer

### Features:

- Universal Input (7 T/C, RTD, mV, V, mA)
- PID and Smart AT Autotuning
- NEMA 4X, IP65
- One 4 Segment Program with Initial Wait
- Tracking and Guaranteed Soak
- Logic Input for Program Start

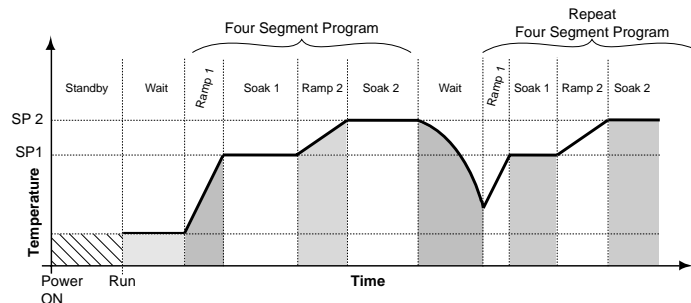


The 7SP 1/16 DIN Controller/Programmer provides fully configurable ramp/soak capability in a PID controller with autotuning in which multiple setpoints, soak duration and controlled ramps are required. It features a dual 4 digit display, 4 front panel pushbuttons and 9 status indicators, giving the operator full information and access to profile and control parameters. Programming features include logic input (SP1 or SP2 select) and front panel program start, event output during program

execution, guaranteed soak, ramp tracking, manual mode selection, end-of-cycle indication, and configurable number of repeats and soak times. Alarms can be process, deviation or band type, direct or reverse, with masking and automatic or manual reset. Light and compact, the 7SP is ideal for such applications as environmental chamber control in which multiple temperature cycles are required. A NEMA 4X faceplate enables its use in dust or washdown conditions.

### 4 Segment Program

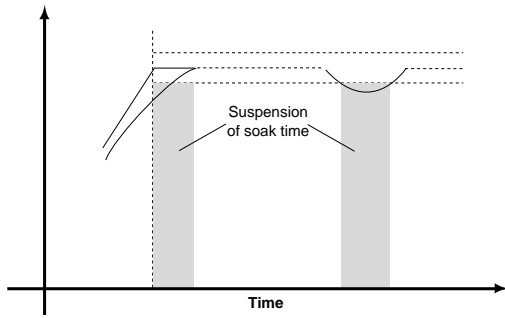
A single 4 segment program is available which can be repeated from 1 to 100 times. Separate delay segments can be defined for the first step and all "wait" steps after a repeat.



### Specifications:

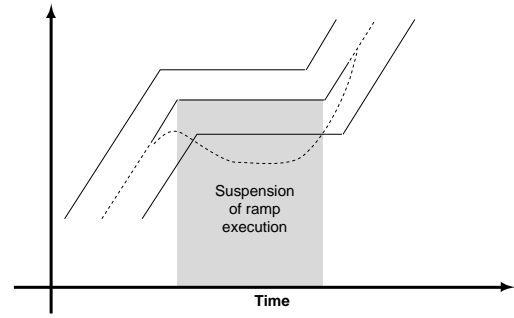
<b>Control Modes:</b>	PID with Smart AT Autotuning, Standby, Manual
<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, L, N, R, S & T (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table B, page 1-21; mA <sub>dc</sub> , mV <sub>dc</sub> , V <sub>dc</sub>
<b>Logic Input:</b>	for setpoint select (SP1 or SP2), requires contact rated at 0.5 mA, 5 Vdc minimum

<b>Output Ratings:</b>	
Output 1:	Time Proportioning Relay, 4A/250V, SPST, Resistive (Control)
Output 2:	Alarm 1 or Event 1, Relay, 2A/250V, SPST, Resistive
Output 3:	Alarm 2 or End-of-Cycle, Relay, 2A/250V, SPST, Resistive
<b>Mounting:</b>	Panel Mount



### Guaranteed Soak

Guaranteed Soak assures that the product receives adequate process time at all required setpoints. Internal comparators continually verify that process values are within acceptable ranges and only decrement timers when acceptable values are found.



### Ramp Tracking

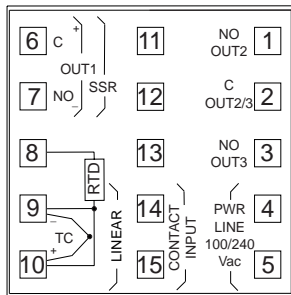
If the process is upset during a ramp, the controller will seek to apply the ramp after the process stabilizes.

### Other Features

The 7SP offers auto/manual selection, alarm standby, Auto Comp™ sensor break and password security.

## Terminal Connections and Mounting:

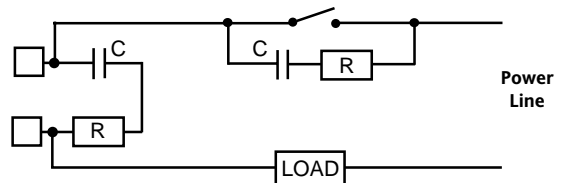
### 7SP



### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. For logic input, use an external contact with a rating >0.5 mA, 5 Vdc. Non-isolated logic outputs depend on the SSR for isolation. Relay outputs are internally protected by a

varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
Snubber Part Number: CZ140398

### Mounting

Dimensions: 48W x 48H x 122D mm  
Cutout: 45W x 45H mm (-0, +0.6 mm)  
60 mm min. center-to-center vertical spacing  
75 mm min. center-to-center horizontal spacing  
Weight: 450 gm

## Ordering Codes:

Model	Input	Control	Output 1	Output 2	Output 3	Power Supply	Reserved
7SP	9	3		1	1	3	000
Input	Control	Output 1	Output 2	Output 3	Power Supply		
9 T/C Type J, K, L, N, R, S & T (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 1 to 10 Vdc	3 PID & Smart AT	1 Relay 6 SSR Drive	1 Relay (Alarm 1/Event 1)	1 Relay (Alarm 2/ End-of-Cycle)	3 100 to 240 Vac		

\* Ranges - See Table B, page 1-21



# TEMPERATURE CONTROLLERS

## 7SF 1/16 DIN 4-Digit Dual Display Temperature Controller with Heat/Cool Output

### Features:

- Universal Input (6 T/C, RTD, mV, V, mA)
- PID and Smart AT Autotuning
- NEMA 4X, IP65
- Heat/Alarm or Heat/Cool Control
- Up to 2 Independent Alarms
- Optional RS-485 Communications
- Optional Heater Breakdown Alarm



The compact Model 7SF is a dual display general purpose 1/16 DIN PID controller with autotuning and 3 configurable outputs. OP1 (logic or relay) and OP2 (relay) are for heating + alarm or heating + cooling (air, oil or water) control and OP3 (relay) is an optional second alarm. Alarms can be process, band or deviation type, direct or reverse, with masking and automatic or manual reset. A logic input is fitted as standard, allowing remote selection of an auxiliary setpoint. The externally selected transfer between SP1 and SP2 can be a step or a ramp with two configurable rates of change (ramp

up/ramp down). Bumpless Auto/Manual control can be selected from the front panel. Detection of an out of range or sensor break forces the output to a safe value (Auto Comp™ sensor break). The 7SF is available with optically isolated RS-485 communications in three protocols for use with supervisory systems. This easy to use instrument comes from the factory with its inputs already calibrated and it can be configured either from the front panel or via the communications port. NEMA 4X sealing allows it to be used in washdown or dust conditions.

### Specifications:

<b>Control Modes:</b>	PID with Smart AT Autotuning, Manual Mode
<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, L, N, R & S (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table C, page 1-21; mA <sub>dc</sub> , mV <sub>dc</sub> , V <sub>dc</sub>
<b>Logic Input:</b>	for setpoint select (SP1 or SP2), requires contact rated at 0.5 mA, 5 Vdc minimum
<b>or</b>	
<b>Current Transformer Input:</b>	(Heater Breakdown Detection) 10 Ω impedance, 50 mA ac max.

<b>Output Ratings:</b>	
Output 1:	Time Proportioning Relay, 3A/250V, SPDT, Resistive (NO/NC Jumper Selectable)
(Control)	Time Proportioning Logic SSR (unisolated)
Logic Level 1:	14 Vdc ±20% @ 20 mA max. (700 Ω min.)
Logic Level 0:	24 Vdc max. ±20% @ 1mA
Logic Level 0:	Less than 0.5 Vdc
Output 2:	Time Proportioning Relay (Cooling) or or Alarm 1 Relay, 2A/250V, SPST, Resistive
Output 3:	Optional Alarm 2 Relay, 2A/250V, SPST, Resistive

**Serial Communications:** EIA RS-485 Modbus®, JBUS

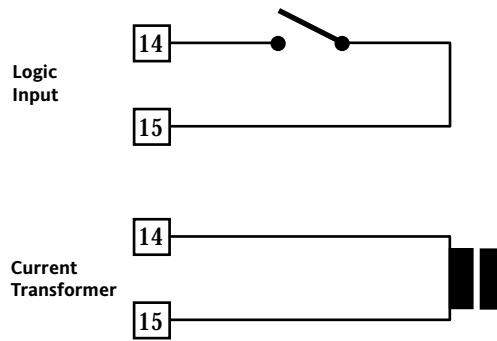
**Mounting:** Panel Mount or DIN Rail/Wall Mount

### Heater Breakdown Detection

The 7SF has an option for displaying load current and generating a heater breakdown alarm when current falls below a specified threshold. With this option, a current transformer input replaces the standard logic input.

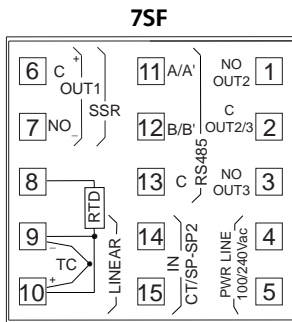
### Output Off Function

The 7SF also has an “output off” function, allowing the instrument to disable control and act as an indicator.



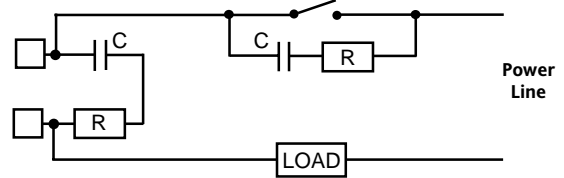
CT Part Number: 7ER-Rx000-0000  
 x = 1 (10A); x = 2 (25A); x = 4 (50A); x = 5 (100A)

## Terminal Connections and Mounting:



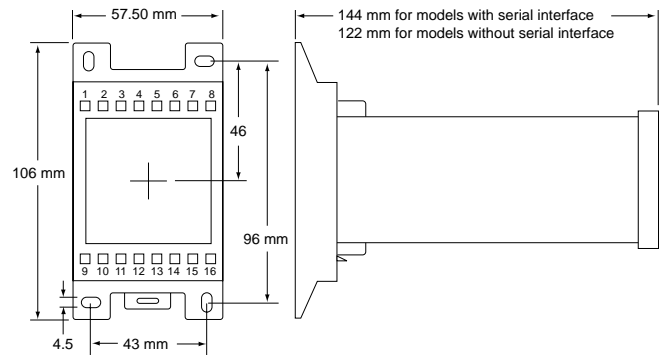
### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Non-isolated logic outputs depend on the SSR for isolation. Relay outputs are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
 Snubber Part Number: CZ140398

In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



DIN Rail or Wall Mounting

### Mounting (Panel)

Dimensions: 48W x 48H x 122D mm  
 Cutout: 45W x 45H mm (-0, +0.6 mm)  
 60 mm min. center-to-center vertical spacing  
 75 mm min. center-to-center horizontal spacing  
 Weight: 250 gm

## Ordering Codes:

Model	Input	Control	Output 1	Output 2	Options	Power Supply	Mounting	Reserved
7SF	9	3		1		3		00

Input	Control	Output 1	Output 2	Options
9 T/C Type J, K, L, N, R & S (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 2 to 10 Vdc	3 PID & Smart AT  <div style="background-color: #003366; color: white; padding: 2px; text-align: center;">Power Supply</div> 3 100 to 240 Vac	1 Relay 6 SSR Drive  <div style="background-color: #003366; color: white; padding: 2px; text-align: center;">Mounting</div> 0 Panel Mount R DIN Rail/Wall Mount	1 Relay (Cooling/Alarm)	0 None 1 Relay (Alarm) 2 Relay (Alarm) plus Hbd Input* 3 Relay (Alarm) plus RS-485 4 Relay (Alarm) plus RS-485 & Hbd Input*

\* Ranges - See Table C, page 1-21

\* Order current transformer separately. Logic Input for Aux Setpoint Selection is Disabled.

# TEMPERATURE CONTROLLERS

## 7SC 1/16 DIN 4-Digit Dual Display Temperature Controller with Analog Output

### Features:

- Universal Input (7 T/C, RTD, mV, V, mA)
- PID and Smart AT Autotuning
- NEMA 4X, IP65
- Heat or Heat/Cool Control
- Up to 2 Independent Alarms
- Optional RS-485 Communications
- Auxiliary Setpoint Selection
- 100 to 240 Vac or 24 Vac/Vdc Power Supply



The compact Model 7SC is a dual display general purpose 1/16 DIN PID controller with autotuning and 3 configurable outputs. It is similar to the 7SF, but with OP1 as a programmable analog output for heating, cooling or analog retransmission. OP2 (time proportioning relay) is used for heating/cooling (air, oil or water) or alarm. OP3 can be an alarm or a heat/cool output if OP2 is configured as an alarm. Alarms can be process, band or deviation type, direct or reverse, with masking and automatic or manual reset. A logic input is fitted as standard, allowing remote selection of an auxil-

ary setpoint. Bumpless Auto/Manual control can be selected from the front panel. Detection of an out of range or sensor break forces the output to a safe value (Auto Comp™ sensor break). The 7SC is available with optically isolated RS-485 communications in three protocols for use with supervisory systems. This easy to use instrument comes with factory calibrated inputs and can be configured from the front panel or via the communications port. NEMA 4X sealing allows use in washdown or dust conditions.

### Specifications:

<b>Control Modes:</b>	PID with Smart AT Autotuning, Manual Mode
<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz or 24 Vac/Vdc (±10%)
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, L, N, R, S & T (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table D, page 1-21; mAdc, mVdc, Vdc
<b>Logic Input:</b>	for setpoint select (SP1 or SP2), requires contact rated at 0.5 mA, 5 Vdc minimum

<b>Output Ratings:</b>	Output 1: 0 to 20 mA or 4 to 20 mA, isolated (500Ω max.) (Control) Heat, Cool or Retransmission of PV or SP
	Output 2: Time Proportioning Relay (Heat/Cool) or Alarm 1 Relay, (NO/NC Jumper Selectable), 2A/250V, SPST, Resistive
	Output 3: Time Proportioning Relay (Heat/Cool) or Alarm 2 Relay, 2A/250V, SPST, Resistive
<b>Serial Communications:</b>	EIA RS-485 Modbus®, JBUS
<b>Mounting:</b>	Panel Mount or DIN Rail/Wall Mount

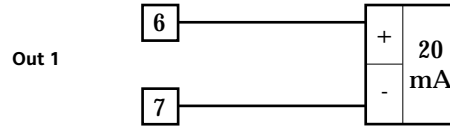
### Optically Isolated Analog Output

The 7SC has an optically isolated linear analog output, programmable as a control output for heating or cooling, or as a filtered retransmission of process variable or setpoint.

### Other Features

The externally selected (logic input) transfer between SP1 and SP2 can be a step or a ramp with two configurable rates of change (ramp up/ramp down). The 7SC also has an “output off” function, allowing the instrument to disable control and act as an indicator.

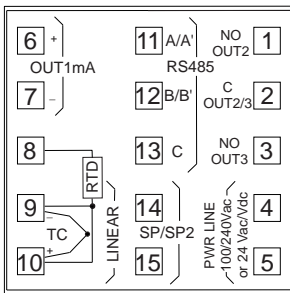
Main Output (Heating or Cooling),  
Secondary Output (Cooling),  
Analog Retransmission of the Process Variable or Setpoint



This is an isolated analog output with a maximum load of 500 Ω.

## Terminal Connections and Mounting:

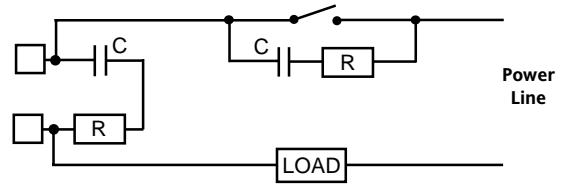
### 7SC



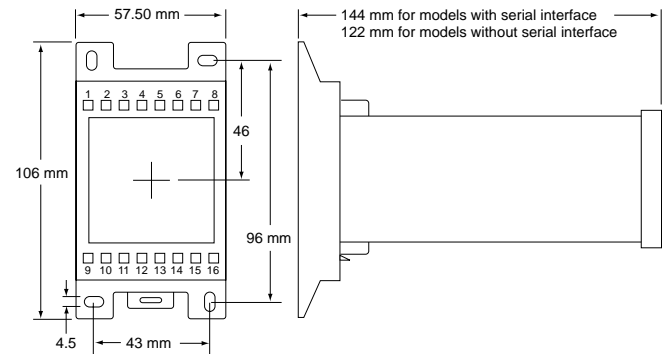
### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Relay outputs are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high

voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
Snubber Part Number: CZ140398



DIN Rail or Wall Mounting

### Mounting (Panel)

Dimensions: 48W x 48H x 122D mm  
Cutout: 45W x 45H mm (-0, +0.6 mm)  
60 mm min. center-to-center vertical spacing  
75 mm min. center-to-center horizontal spacing  
Weight: 250 gm

## Ordering Codes:

Model	Input	Control	Output 1	Output 2	Output 3	Power Supply	Mounting	Reserved
7SC	- 9	3	7	1		- 3		00

Input	Control	Output 1	Output 2
9	3	7	1
T/C Type J, K, L, N, R, S & T (°C, °F) Pt100 3W RTD (°C, °F) 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 1 to 10 Vdc	PID & Smart AT	0 to 20 mAdc or 4 to 20 mAdc, programmable as heating, cooling or analog retransmission	Relay (Heating/Cooling/Alarm)
Output 3	Power Supply	Mounting	
1	3	0	
Relay (Heating/Cooling/Alarm) Alarm plus RS-485*	100 to 240 Vac 24 Vac/Vdc	Panel Mount DIN Rail/Wall Mount	

\* Ranges - See Table D, page 1-21

\*Not available with 24V supply.

# TEMPERATURE CONTROLLERS

## 7EM 1/8 DIN 3-Digit Dual Display Temperature Controller

### Features:

- Thermocouple and RTD Input
- PID and Smart AT Autotuning
- NEMA 4X, IP65
- 100 to 240 Vac Switching Power Supply
- Algorithms for Heat or Heat/Cool Control
- Up to 3 Outputs
- Up to 2 Independent Alarms
- Control Output Disable Function
- Optional Heater Breakdown Detection



Designed specifically for equipment manufacturers who demand tight process control, the 7EM offers outstanding performance and a variety of features in an 1/8 DIN package. The cost effective 7EM is a configurable, Smart AT autotuning heat or heat/cool controller with thermocouple and RTD inputs. It is ideal for applications such as extrusion, food and environmental chambers in which the input range does not exceed 999. It has a bright dual display for process temperature and setpoint and 4 LED beacons for operating status. The 7EM has 3

outputs. OP1 can be a time proportioned relay or SSR for heating. OP2 features a relay or SSR for time proportioned cooling or Alarm 2. OP3 is an optional relay Alarm 2. Alarms can be process, deviation or band type, direct or reverse, with automatic or manual reset, plus a unique optional heater breakdown alarm. The 7EM is available with a 100-240 Vac switching power supply or an optional 24 Vac/Vdc supply. Easy to understand, configure and use, the 7EM provides exceptional value to the industrial user.

### Specifications:

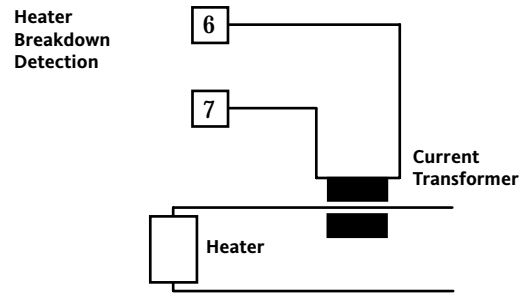
<b>Control Modes:</b>	PID with Smart AT Autotuning, Standby Alarm Sequence
<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz or 24 Vac/Vdc ( $\pm 10\%$ )
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, L, and N (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table E, page 1-21
<b>Current Transformer Input:</b>	(Heater Breakdown Detection) 10 $\Omega$ impedance, 50 mA ac max.

<b>Output Ratings:</b>	
Output 1:	Relay, 3A/250V, SPDT, Resistive Time Proportioning Heating Jumper Selectable Logic SSR (unisolated) Logic Level 1: 14 Vdc $\pm 20\%$ @ 20 mA max. (700 $\Omega$ min.) 24 Vdc max. $\pm 20\%$ @ 1mA Logic Level 0: Less than 0.5 Vdc
Output 2:	Relay, 2A/250V, SPST, Resistive Time Proportioning Cooling, Alarm 1 Jumper Selectable Logic SSR (unisolated) Logic Levels as OP1
Output 3:	Relay, 2A/250V, SPST, Resistive, NO only Optional Alarm 2 Relay or Heater Breakdown

**Mounting:** Panel Mount

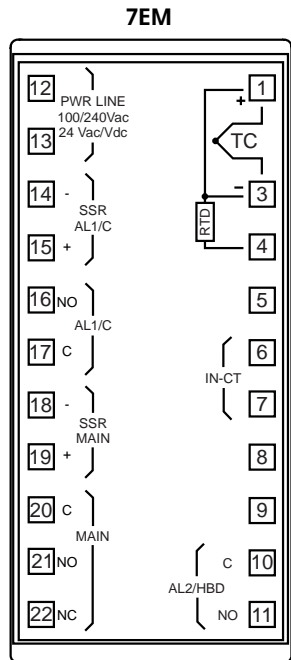
### A Variety of Standard and Optional Features

Among the 7EM's standard features are ramp to setpoint, soft start power limiting, sensor break protection, and a standby alarm sequence to mask alarm conditions until the PV reaches the low alarm threshold. There is also an "output off" function which disables the control output, allowing the 7EM to operate as an indicator. The optional Heater Breakdown Detection feature allows measurement of the load by a current transformer, displaying the full scale load current and signaling an alarm condition to Alarm 2 when the current is below a programmed threshold.



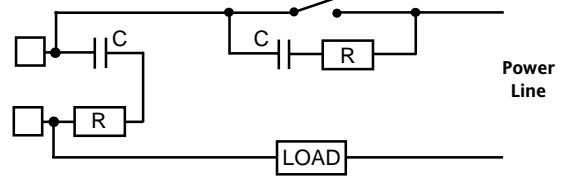
CT Part Number: 7ER-Rx000-000  
 x = 1 (10A); x = 2 (25A); x = 4 (50A); x = 5 (100A)

## Terminal Connections and Mounting:



### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Non-isolated logic outputs depend on the SSR for isolation. Relay outputs are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
 Snubber Part Number: CZ140398

### Mounting

Dimensions: 48W x 96H x 89D mm  
 Cutout: 45W (-0, +0.6) x 92H (-0, +0.8) mm  
 125 mm min. center-to-center vertical spacing  
 60 mm min. center-to-center horizontal spacing  
 Weight: 400 gm max.

## Ordering Codes:

Model	Input	Control	Output 1	Output 2	Output 3	Power Supply	Reserved
7EM	4	3	1	1			000

Input	Control	Output 1	Output 2	Output 3
4 T/C Type J, K, L & N (°C, °F) Pt100 3W RTD (°C, °F)*	3 PID & Smart AT	1 Jumper Selectable SPDT Relay or SSR Drive (Heating)	1 Jumper Selectable SPST Relay or SSR Drive (Cooling/Alarm 1)	0 None 1 Relay (Alarm 2) 2 Relay (Alarm 2) plus Hbd Input*
Power Supply				
3 100 to 240 Vac 5 24 Vac/Vdc				

\* Ranges - See Table E, page 1-21

\*Order current transformer separately.

# TEMPERATURE CONTROLLERS

## 7EF and 7HF 1/8 DIN 4-Digit Dual Display Temperature Controllers

### Features:

- Universal Input (6 T/C, RTD, mV, V, mA)
- PID and Smart AT Autotuning
- NEMA 4X, IP65
- Algorithms for Heat or Heat/Cool Control
- Up to 4 Outputs, 3 Independent Alarms
- Setpoint Select from External Contact
- Control Output Disable Function
- Optional Heater Breakdown Alarm
- Optional Digital Communications

Designed for equipment manufacturers who demand tight process control and a full suite of advanced features, the 7EF/7HF offers outstanding performance as a 4-digit 1/8 DIN controller in a choice of vertical and horizontal format. Identical in features, the 7EF and 7HF are configurable for heat or heat/cool PID controllers with Smart AT auto or adaptive tuning, universal inputs, up to 4 outputs and up to 3 independent configurable alarms. They are ideal for demanding applications such as laboratory furnaces and ovens, autoclaves and chambers where 4 digits are required. The 7EF/7HF have bright dual displays for process temperature and setpoint and 10 LED



7HF



7EF

beacons for operating status. Three outputs can be programmed as heating + 2 alarms or heating/cooling + 1 alarm. Optional OP4 can be configured as Alarm 3 or as the heater breakdown alarm. Alarms can be process, deviation or band type, direct or reverse, with masking and programmable automatic or manual reset. Both units have 2 setpoints, selectable by a logic input. Transfer between setpoints can be step or ramp (2 selectable ramp rates). Optional RS-485 digital communications are available for connection to supervisory computers. A NEMA 4X front panel allows these instruments to work in severe environments.

### Specifications:

<b>Control Modes:</b>	PID with Smart AT Autotuning
<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, L, N, R & S (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table F, page 1-21; mAdc, mVdc, Vdc
<b>Current Transformer Input:</b>	(Heater Breakdown Detection) 10 Ω impedance, 50 mA ac max.
<b>Logic Input:</b>	for setpoint select (SP1 or SP2), requires contact rated at 0.5 mA, 5 Vdc minimum

**Serial Communications:** EIA RS-485 Modbus®, JBUS

### Output Ratings:

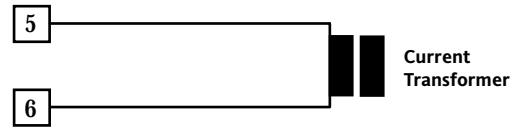
<b>Output 1:</b>	Relay, 3A/250V, SPDT, NO/NC, Resistive Time Proportioning Heating Logic SSR (unisolated) Logic Level 1: 14 Vdc ±20% @ 20 mA max. (700 Ω min.) 24 Vdc max. ±20% @ 1mA Logic Level 0: Less than 0.5 Vdc Time Proportioning Heating
<b>Output 2:</b>	Relay, 2A/250V, SPST, Resistive Time Proportioning Cooling, Alarm 1
<b>Output 3:</b>	Relay, 2A/250V, SPST, Resistive Alarm 1, Alarm 2 or Heater Breakdown
<b>Output 4:</b>	Relay, 2A/250V, SPST, Resistive Optional Alarm 2, Alarm 3 or Heater Breakdown

**Mounting:** Panel Mount



### A Variety of Standard and Optional Features

Among the 7EF/7HF standard features are bumpless auto/manual transfer, password security and Auto Comp™ sensor break. An alarm standby feature allows masking of alarm conditions until the PV reaches the low alarm threshold. The 7EF/7HF also have an “output off” function which disables the control output, allowing the instrument to operate as an indicator but return smoothly to control when the output is again enabled. The optional Heater Breakdown Detection feature allows measurement of the load by a current transformer, displaying the full scale load current, and signaling an alarm condition to an alarm OP when the current is below a programmed threshold.

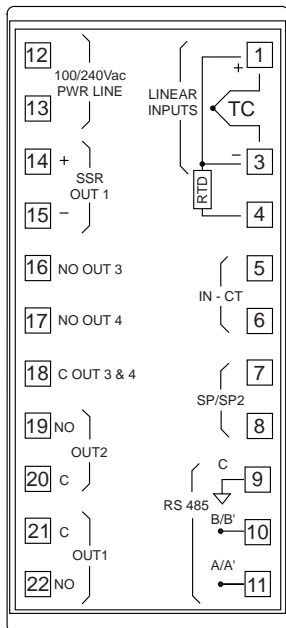


CT Part Number: 7ER-Rx000-0000  
 x = 1 (10A); x = 2 (25A); x = 4 (50A); x = 5 (100A)

Heater Breakdown Detection

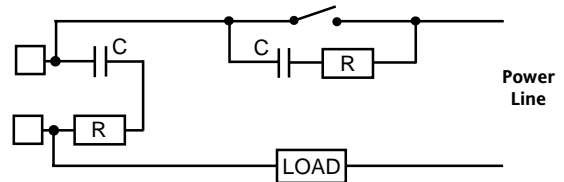
## Terminal Connections and Mounting:

### 7EF



### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Non-isolated logic outputs depend on the SSR for isolation. Relay outputs are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
 Snubber Part Number: CZ140398

### Mounting 7EF

Dimensions: 48W x 96H x 116D mm  
 Cutout: 45W (-0, +0.6) x 92H (-0, +0.8) mm  
 125 mm min. center-to-center vertical spacing  
 60 mm min. center-to-center horizontal spacing

### Mounting 7HF

Dimensions: 96W x 48H x 116D mm  
 Cutout: 92W (-0, +0.8) x 45H (-0, +0.6) mm  
 60 mm min. center-to-center vertical spacing  
 125 mm min. center-to-center horizontal spacing

Weight: 400 gm max.

Same Terminal Numbers  
 for Horizontal 7HF

## Ordering Codes:

Model	Input	Control	Output 1	Outputs 2 & 3	Options	Power Supply	Reserved
	9	3	1	1		3	000

Model	Input	Control	Output 1	Outputs 2 & 3
7EF Vertical Mount 7HF Horizontal Mount	9 T/C Type J, K, L, N, R & S (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 1 to 10 Vdc	3 PID & Smart AT	1 Jumper Selectable SPDT Relay or SSR Drive (Heating)	1 SPST Relay (Cooling/Alarm) and SPST Relay (Alarm/Hbd)

\* Ranges - See Table F, page 1-21

Options	Power Supply
1 None 2 Relay (Alarm) plus Hbd Input* 3 Relay (Alarm) plus RS-485 4 Relay (Alarm) plus RS-485 & Hbd Input*	3 100 to 240 Vac

\*Order current transformer separately.



# TEMPERATURE CONTROLLERS

## 7EC 1/8 DIN 4-Digit Dual Display Temperature Controller with Analog Output

### Features:

- Universal Input (7 T/C, RTD, mV, V, mA)
- PID and Smart AT Autotuning
- NEMA 4X, IP65
- Algorithms for Heat or Heat/Cool Control
- Up to 4 Outputs, 3 Independent Alarms
- Control Output Disable Function
- Remote Selection of up to 4 Setpoints
- Digital Communications

Designed for equipment manufacturers requiring analog process control functions and a full suite of advanced features, the 7SC offers outstanding performance as a 4-digit 1/8 DIN controller. The 7SC is configurable for heat or heat/cool PID control with Smart AT auto or adaptive tuning, universal inputs, up to 4 outputs (including one analog output) and up to 3 independent alarms. It is ideal for demanding applications in plastics, rubber fibers, annealing, small ovens, and other processes requiring 4 digit accuracy. The 7SC has a bright dual display for process temperature and setpoint, and 10 LED beacons for operating status. The analog and two relay outputs can be programmed as heating +2



alarms or heating/cooling + alarm. Alternately, OP2 can be an SSR logic output. The isolated analog output can alternatively be programmed as a re-transmission of the PV or operating SP. OP4 can be configured as Alarm 3. Alarms can be process, deviation or band type, direct or reverse, with masking and programmable automatic or manual reset. An alarm standby feature allows masking of alarm conditions until the PV reaches the low alarm threshold. A non-isolated 24 Vdc transducer power supply is a standard feature. Optional RS-485 communications are available for connection to supervisory computers. A NEMA 4X front panel allow the 7SC to work in washdown or dusty environments.

### Specifications:

<b>Control Modes:</b>	PID with Smart AT Autotuning
<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, L, N, R, S & T (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table G, page 1-21; mAdc, mVdc, Vdc
<b>Logic Inputs (2):</b>	for setpoint select (SP, SP2, SP3, SP4), requires contacts rated at 0.5 mA, 5 Vdc min.
<b>Aux Transducer Power Supply:</b>	Non-isolated 24 Vdc (±10%) rated at 25 mAdc, short circuit protected
<b>Mounting:</b>	Panel Mount or DIN Rail

#### Output Ratings:

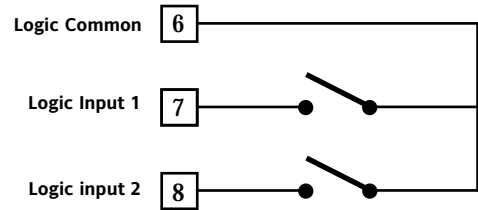
Output 1:	0 to 20 mA or 4 to 20 mA, isolated (500Ω max.) Control Out (Heat or Cool) or Retran of PV or SP
Output 2:	Relay, 3A/250V, SPST, NO/NC Selectable, Resistive Time Proportioning Heat or Cool, Alarm 1 Jumper Selectable Logic SSR (unisolated) Logic Level 1: 14 Vdc ±20% @ 20 mA max. (700 Ω min.) 24 Vdc max. ±20% @ 1mA Logic Level 0: Less than 0.5 Vdc Time Proportioning Heat or Cool
Output 3:	Relay, 2A/250V, SPST, Resistive Time Proportioning Heat or Cool, Alarm 2
Output 4:	Relay, 2A/250V, SPST, Resistive Optional Alarm 3

#### Serial

**Communications:** EIA RS-485 Modbus®, JBUS

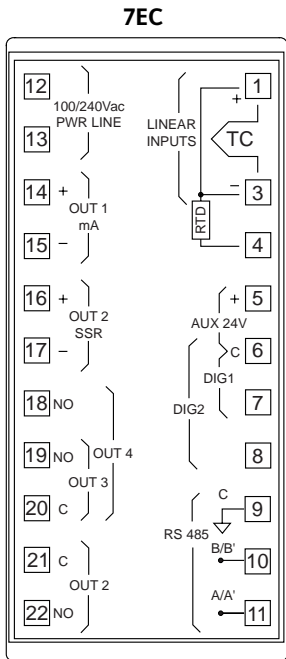
### A Variety of Standard and Optional Features

Among the 7EC's standard features are bumpless auto/manual transfer, password security and Auto Comp® sensor break. The 7EC also has an "output off" function which disables the control output, allowing the instrument to operate as an indicator but return smoothly to control when the output is again enabled. The 7EC is equipped with 2 logic inputs used to select between up to 4 setpoints. Transfer can be step or ramp, with different configurable rates for ramp up and ramp down.



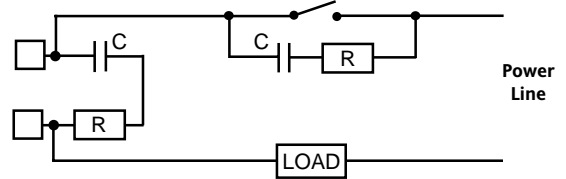
SP1 - SP4 Select

## Terminal Connections and Mounting:



### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Non-isolated logic outputs depend on the SSR for isolation. Relay outputs are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
Snubber Part Number: CZ140398

### Mounting

Dimensions: 48W x 96H x 116D mm  
 Cutout: 45W (-0, +0.6) x 92H (-0, +0.8) mm  
 125 mm min. center-to-center vertical spacing  
 60 mm min. center-to-center horizontal spacing  
 Weight: 400 gm max.

## Ordering Codes:

Model	Input	Control	Output 1	Outputs 2 & 3	Options	Power Supply	Reserved	
7EC	-	9	3	7	1	-	3	000

Input	Control	Output 1	Outputs 2 & 3								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #003366; color: white; text-align: center;">9</td> <td>T/C Type J, K, L, N, R, S &amp; T (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc &amp; 4 to 20 mAdc 0 to 60 mVdc &amp; 12 to 60 mVdc 0 to 5 Vdc &amp; 1 to 5 Vdc 0 to 10 Vdc &amp; 1 to 10 Vdc</td> </tr> </table>	9	T/C Type J, K, L, N, R, S & T (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 1 to 10 Vdc	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #003366; color: white; text-align: center;">3</td> <td>PID &amp; Smart AT</td> </tr> </table>	3	PID & Smart AT	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #003366; color: white; text-align: center;">7</td> <td>0 to 20 mAdc or 4 to 20 mAdc, programmable as heating, cooling or analog retransmission</td> </tr> </table>	7	0 to 20 mAdc or 4 to 20 mAdc, programmable as heating, cooling or analog retransmission	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #003366; color: white; text-align: center;">1</td> <td>OP2 Jumper Selectable SPST Relay or SSR (Control/Alarm) and OP3 SPST Relay (Control/Alarm)</td> </tr> </table>	1	OP2 Jumper Selectable SPST Relay or SSR (Control/Alarm) and OP3 SPST Relay (Control/Alarm)
9	T/C Type J, K, L, N, R, S & T (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 1 to 10 Vdc										
3	PID & Smart AT										
7	0 to 20 mAdc or 4 to 20 mAdc, programmable as heating, cooling or analog retransmission										
1	OP2 Jumper Selectable SPST Relay or SSR (Control/Alarm) and OP3 SPST Relay (Control/Alarm)										

\* Ranges - See Table G, page 1-21

Options	Power Supply						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #003366; color: white; text-align: center;">2</td> <td>OP4 Relay (Alarm)</td> </tr> <tr> <td style="background-color: #003366; color: white; text-align: center;">3</td> <td>OP4 Relay (Alarm) plus RS-485</td> </tr> </table>	2	OP4 Relay (Alarm)	3	OP4 Relay (Alarm) plus RS-485	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #003366; color: white; text-align: center;">3</td> <td>100 to 240 Vac</td> </tr> </table>	3	100 to 240 Vac
2	OP4 Relay (Alarm)						
3	OP4 Relay (Alarm) plus RS-485						
3	100 to 240 Vac						

# TEMPERATURE CONTROLLERS

## 7ES 1/8 DIN 4-Digit Dual Display Temperature Controller with Actuator Output

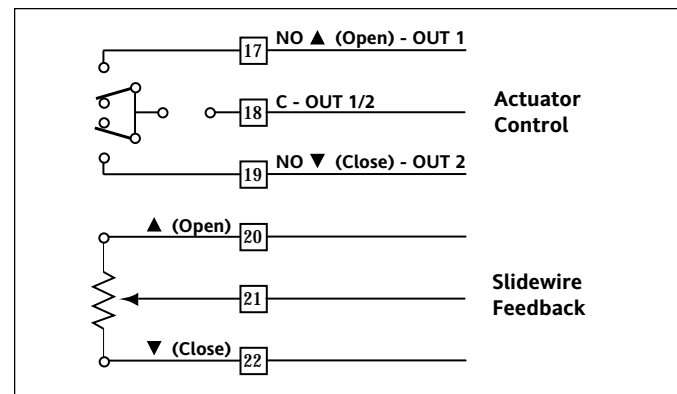
### Features:

- Universal Input (7 T/C, RTD, mV, V, mA)
- PID and Smart AT Autotuning
- NEMA 4X, IP65
- Open/Close Actuator or Servomotor Control
- Algorithms for Heat or Heat/Cool Control
- Up to 4 Outputs, 3 Independent Alarms
- Up to 3 Logic Inputs for Function Select
- Control Output Disable Function
- Optional Digital Communications

The full-featured 7ES is designed for customers requiring 3-wire valve positioning with slidewire feedback and a full suite of advanced functions. The NEMA 4X rated 7ES is configurable for valve positioning or PID control with Smart AT auto or adaptive tuning, universal inputs, up to 4 outputs, and up to 3 independent alarms. The 7ES has a bright dual display for process temperature and setpoint, and 10 LED beacons to enhance operator information. OP1 and OP2 are interlocked relays for adjusting actuator position based on a slidewire feedback potentiometer. Alternately, OP1 can be used as a time proportioned relay output (heat) and OP2 the same (cool) or an alarm. OP3 and optional OP4 can be configured as alarms. Alarms can be process high/low, deviation or band, direct or reverse, with masking and programmable automatic or manual reset.



tion or band, direct or reverse, with masking and programmable automatic or manual reset.



### Specifications:

- Control Modes:** PID with Smart AT Autotuning
- Supply Voltage:** 100-240 Vac (+10%, -15%), 50/60 Hz
- Operating Ambient:** 0-50°C, 20-85% RH non-condensing
- Inputs:** T/C Types J, K, L, N, R, S & T (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table H, page 1-21; mA<sub>dc</sub>, mV<sub>dc</sub>, V<sub>dc</sub>

**Feedback**  
**Potentiometer Input:** 100 to 10k Ω

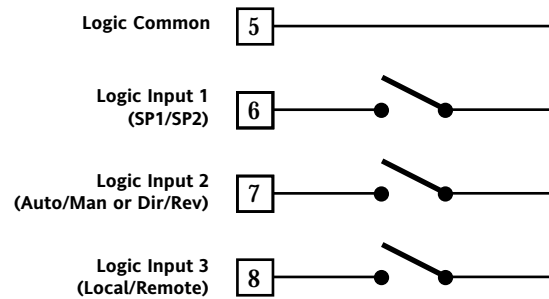
**Logic Inputs (3):** for setpoint select (SP, SP2), Auto/Man or Rev/Dir and Local/Remote. Requires contacts rated at 0.5 mA, 5 V<sub>dc</sub> minimum

- Output Ratings:**
- Output 1: Relay, 3A/250V, SPST, NO, Resistive  
 Actuator Output linked to OP2 (Open/Close) or Time Proportioning (Heat)
- Output 2: Relay, 3A/250V, SPST, NO, Resistive  
 Actuator Output linked to OP1 (Open/Close) or Time Proportioning (Cool) or Alarm 1
- Output 3: Relay, 3A/250V, SPST, NO, Resistive  
 Alarm 2 and Alarm 3 (Logically OR'ed)

**Mounting:** Panel Mount

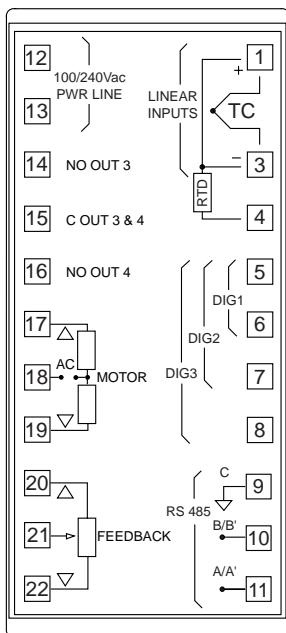
### A Variety of Standard and Optional Features

Among the 7ES's standard features are bumpless auto/manual transfer, password security, alarm standby and Auto Comp sensor break, which freezes the controller output in the event of a detected sensor break. The 7ES also has an "output off" function which disables the control output, allowing the instrument to operate as an indicator but return smoothly to control when the output is again enabled. The 7ES is equipped with 3 logic inputs. Logic Input 1 is used to transfer between SP1 and SP2 by step or ramp (2 rates). Logic Input 2 can be configured to select Auto/Manual or Reverse/Direct control action. Logic Input 3 selects between Local/Remote (computer) operation. Optional RS-485 digital communications with Modbus®, JBUS or proprietary Barber-Colman protocol is available for computer supervision.



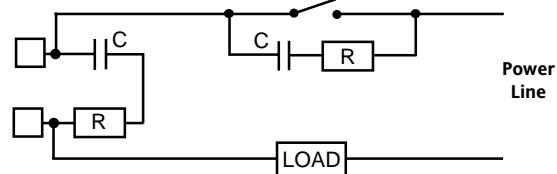
## Terminal Connections and Mounting:

7ES



### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Non-isolated logic outputs depend on the SSR for isolation. Relay outputs are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
Snubber Part Number: CZ140398

### Mounting

Dimensions: 48W x 96H x 89D mm  
 Cutout: 45W (-0, +0.6) x 92H (-0, +0.8) mm  
 125 mm min. center-to-center vertical spacing  
 60 mm min. center-to-center horizontal spacing  
 Weight: 400 gm max.

## Ordering Codes:

Model	Input	Control	Outputs 1 & 2	Output 3	Options	Power Supply	Reserved
7ES	- 9	3	2	1		- 3	000

Input	Control	Outputs 1 & 2	Output 3
9 T/C Type J, K, L, N, R, S & T (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 1 to 10 Vdc	3 PID & Smart AT	2 Two interlocked SPST relays (open/close) programmable as actuator control outputs or time proportioning outputs	1 SPST Relay (Control/Alarm)
	Options	Power Supply	
	2 Relay (Alarm) 3 Relay (Alarm) plus RS-485	3 100 to 240 Vac	

\* Ranges - See Table H, page 1-21

# INDICATOR & ALARM UNITS



# INDICATOR & ALARM UNITS

## 7SI 1/16 DIN Compact Digital Indicator

### Features:

- Four Digit Display
- T/C, RTD, mV, mA or V Input
- NEMA 4X, IP65
- Up to 2 Independent Alarms
- Logic Input for Alarm Reset
- Alarm Standby on Start-up
- Optional Digital Communications
- Optional 24 Vac/Vdc Supply



The 7SI is a compact 1/16 DIN digital indicator/ alarm unit with a 4-digit process variable display designed for equipment manufacturers who need these functions in a small package. Inputs are factory calibrated and selectable from the front panel. Fifteen thermocouple types, 3-wire Platinum RTD's and several ranges of linear mV, mA and voltage inputs are available. The 7SI has one standard alarm relay output and an optional second alarm relay output. Relays can be programmed to energize or deenergize in an alarm condition. Both alarms can be configured as process high or low at independent thresholds within the readout range

and with an adjustable hysteresis of 0.1 to 10% of span. Alarms can be acknowledged automatically or manually via a front panel key, optional logic input or RS-485 communications link. LED beacons for each alarm flash to annunciate new alarms. The alarm LED's stay steady ON for alarms that are present but acknowledged, and are OFF when no alarm is present. Optional RS-485 digital communications with Modbus® or JBUS is available for computer supervision. The 7SI is NEMA 4X rated for operation in severe environments.

### Specifications:

<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz or 24 Vac/Vdc (±10%)
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types B, C, D, E, G, L, J, K, N, Platinel II, R, S, T and U (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table A, page 2-10; mA <sub>dc</sub> , mV <sub>dc</sub> , V <sub>dc</sub>
<b>Logic Input:</b>	for Alarm Acknowledgement, requires contact rated at 0.5 mA, 5 Vdc minimum

<b>Output Ratings:</b>
Output 1: Relay, 3A/250V, SPDT, Resistive Direct or Reverse operation
Output 2: (Optional) Relay, 2A/250V, SPST, NO, Resistive Direct or Reverse operation

**Serial Communications:** EIA RS-485 Modbus®, JBUS

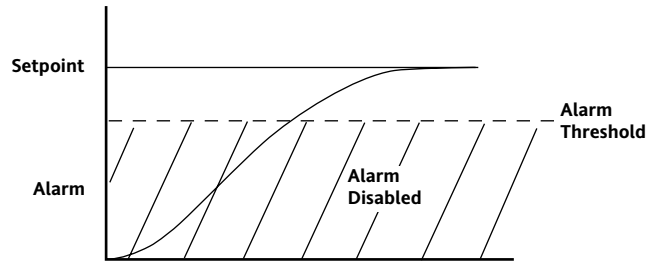
**Mounting:** Panel Mount

### Alarm Standby Function

The 7SI can be programmed with an alarm masking function (Alarm standby), which puts the alarm in a standby condition during instrument powerup, when process low alarms are subject to false activation. Once the low alarm threshold is traversed for the first time the instrument reverts to standard operation.

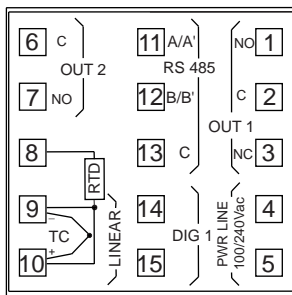
### Data Memory Function

The 7SI also has a “data memory” function which is enabled at powerup. It is able to store in memory the minimum and maximum measured value, which, by pushbutton or serial link, can be displayed on the front panel. This function can also be reset by pushbutton or link, deleting the old values and starting a new memorization period.

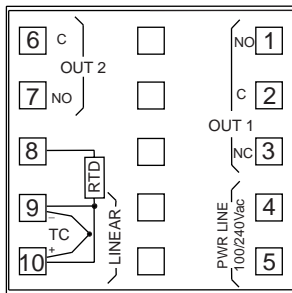


Alarm Standby

## Terminal Connections and Mounting:



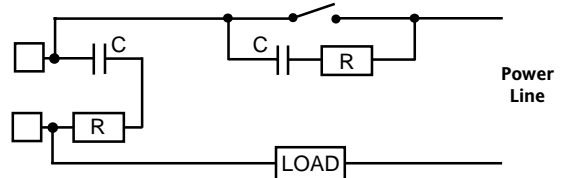
7SI with RS-485



7SI without RS-485

### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Relays are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
Snubber Part Number: CZ140398

### Mounting

- Dimensions: 48W x 48H x 105D mm (without RS-485)  
48W x 48H x 122D mm (with RS-485)
- Cutout: 45W x 45H mm (-0, +0.6 mm)  
60 mm min. center-to-center vertical spacing  
75 mm min. center-to-center horizontal spacing
- Weight: 250 gm

## Ordering Codes:

Model	Input	Output 1	Output 2	Options	Power Supply	Reserved
7SI	-	9	1			- 0000

Input	Output 1	Output 2	Options	Power Supply																
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">9</td> <td>T/C Type B, C, D, E, G, L, J, K, N, Platinel II, R, S, T, &amp; U (°C, °F) Pt100 3W RTD (°C, °F) 0 to 20 mAdc &amp; 4 to 20 mAdc 0 to 60 mVdc &amp; 12 to 60 mVdc 0 to 5 Vdc &amp; 1 to 5 Vdc 0 to 10 Vdc &amp; 2 to 10 Vdc</td> </tr> </table>	9	T/C Type B, C, D, E, G, L, J, K, N, Platinel II, R, S, T, & U (°C, °F) Pt100 3W RTD (°C, °F) 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 2 to 10 Vdc	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">1</td> <td>Relay</td> </tr> </table>	1	Relay	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td>None</td> </tr> <tr> <td style="width: 20px; text-align: center;">1</td> <td>Relay</td> </tr> </table>	0	None	1	Relay	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td>None</td> </tr> <tr> <td style="width: 20px; text-align: center;">1</td> <td>RS-485 Communications and Logic Input</td> </tr> </table>	0	None	1	RS-485 Communications and Logic Input	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">3</td> <td>100 to 240 Vac</td> </tr> <tr> <td style="width: 20px; text-align: center;">5</td> <td>24 Vac/Vdc</td> </tr> </table>	3	100 to 240 Vac	5	24 Vac/Vdc
9	T/C Type B, C, D, E, G, L, J, K, N, Platinel II, R, S, T, & U (°C, °F) Pt100 3W RTD (°C, °F) 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 2 to 10 Vdc																			
1	Relay																			
0	None																			
1	Relay																			
0	None																			
1	RS-485 Communications and Logic Input																			
3	100 to 240 Vac																			
5	24 Vac/Vdc																			

\* Ranges - See Table A, page 2-10

# INDICATOR & ALARM UNITS

## 7SL 1/16 DIN Limitrol FM Approved Safety Limit

### Features:

- 4-Digit LED Display
- Universal Input (T/C, RTD, mV, mA or V)
- 3 Level Passcode Security
- High Limit, Low Limit or High/Low Limit
- Time in Reset Display
- Peak Temperature Display
- FM Approved
- NEMA 4X, IP65
- Optional Digital Communications

The compact and cost effective 7SL Limitrol provides a process safety limit in a 1/16 DIN package. The 7SL is designed specifically for equipment manufacturers who require an FM approved high limit safety. NEMA 4X faceplates allow these units to be used in severe environments. The red 4-digit, 7-segment numeric and 2-digit alphanumeric displays allow the operator to configure the 7SL with easy to use codes. The 7SL has an FM approved Form C relay output that can be configured for a high (heating process), low (cooling process) or high/low limit (special process). In the high/low mode, the process must be within the two independent setpoints or the relay resets. The FM alarm can be configured for



automatic or manual restart on power-up. The 7SL has an optional additional alarm that can be configured as a process high, low, band or deviation alarm with direct or reverse action. This alarm acts as a process event to begin data acquisition or recording as the process nears an unsafe condition. It can also be configured for automatic or manual reset and for a standby sequence to mask alarms on start-up. Options include a digital input for alarm acknowledgement, serial Modbus® or JBUS communications and a 24 Vac/Vdc power supply. The unit can be either panel mounted, or wall or DIN rail mounted using the DIN Rail mounting accessory.

### Specifications:

<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz or 24 Vac/Vdc (±10%)
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, T, E, N, S, R, B, L, U, G, D, C & Platinel II (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table B, page 2-10; mAdc, mVdc, Vdc
<b>Logic Input:</b>	requires contact rated at 0.5 mA, 5 Vdc minimum

#### Output Ratings:

- Output 1: Relay, Form C, 3A/250V, Resistive High Limit, Low Limit, High/Low Limit Alarm 1, Failsafe, FM Approved
- Output 2: Optional Relay, Form A, 2A/250V, Resistive Process, Band, Deviation Alarm Alarm 2, Direct or Reverse Acting

#### Serial

**Communications:** EIA RS-485 Modbus®, JBUS

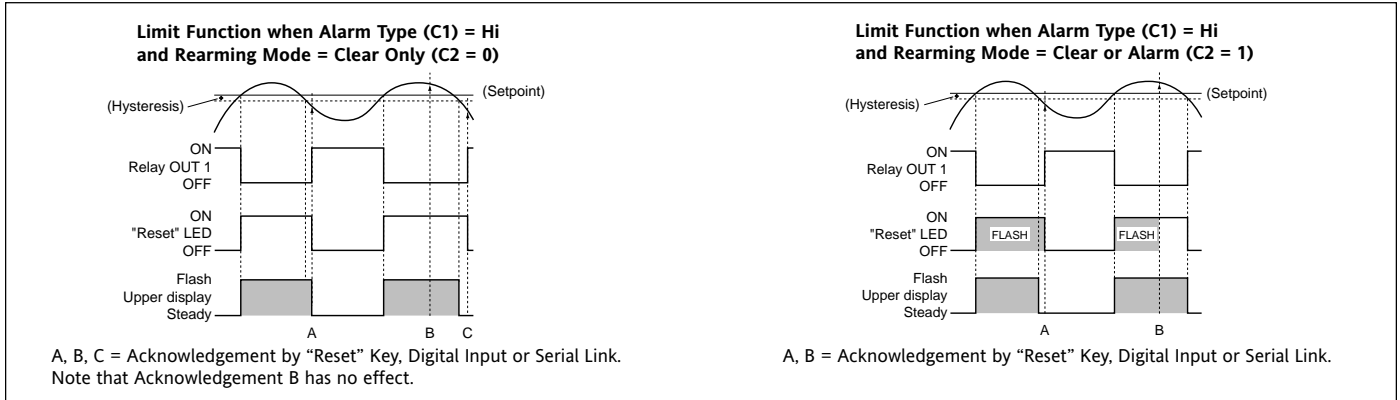
**Mounting:** Panel Mount or optional DIN Rail/Wall Mount



### Failsafe Mode

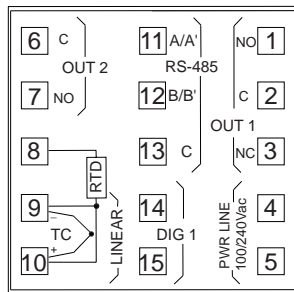
The FM approved Form C relay operates in a failsafe mode. During powerup, the relay is off and can be selected to restart either manually or automatically. In normal operation when an alarm occurs and the relay resets, the process can be restarted

by operator actions as prescribed by process and configuration conditions. In order to restart, the process must return within setpoint AND the operator must acknowledge the process either by the front panel, digital input or serial link.



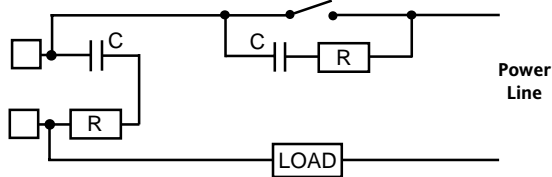
## Terminal Connections and Mounting:

### 7SL



### Wiring

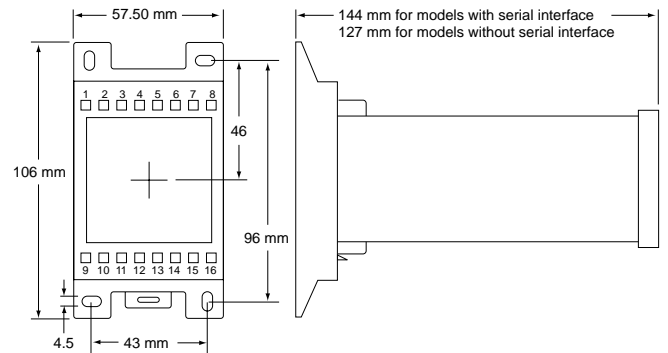
When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.



External Switch in Series with the Internal Contact  
Snubber Part Number: CZ140398

### Mounting (Panel)

Dimensions: 48W x 48H x 105D mm (without RS-485)  
48W x 48H x 122D mm (with RS-485)  
Cutout: 45W (-0, +0.6 mm) x 45H mm (-0, +0.6 mm)  
60 mm min. center-to-center vertical spacing  
75 mm min. center-to-center horizontal spacing  
Weight: 250 gm



DIN Rail or Wall Mounting

## Ordering Codes:

Model	Input	Output	Options	Power Supply	Reserved	Mounting	Reserved
7SL	9	1			0		00

Input	Output	Options	Power Supply	Mounting
9 T/C Type J, K, T, E, N, S, R, B, L, U, G, D, C & Platine II (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 2 to 10 Vdc	1 Form C Relay	00 None 10 RS-485 Communications* and 1 Logic Input 11 RS-485 Communications*, 1 Logic Input and 1 Form A Alarm Relay	3 100 to 240 Vac 5 24 Vac/Vdc	0 Panel Mount R Wall or Rail Mount

\* RS-485 Communications requires longer case - see Mounting Dimensions.

\* Ranges - See Table B, page 2-10

# INDICATOR & ALARM UNITS

## 7HI & 7HK 1/8 DIN 4-Digit Horizontal Digital Indicators

### Features:

- Four Digit LED Display
- Universal Input (T/C, RTD, mV, mA or V)
- NEMA 4X, IP65
- Up to 3 Independent Alarms (7HI)
- Configurable Automatic or Manual Reset
- High & Low Peak Reading Memory
- Measurement Offset Function
- Optional 24 Vac/Vdc Supply
- Analog Retransmission (7HK)



The 7HI/7HK 1/8 DIN horizontal indicators offer outstanding performance in a cost effective package. Designed specifically for equipment manufacturers who need process monitoring and alarm, the 7HI/7HK are easy to configure and use. Factory calibrated, they accept thermocouples, 3-wire Platinum RTD, and mV, mA and Vdc inputs, selectable from the front panel and programmable with filtering and sensor break indication. High or low process alarm setpoints can be programmed and password protected. Alarms can be acknowledged automatically, or manually from the keypad. A bright 4-digit LED display and 6 panel beacons provide process variable, alarm status and other important process information to the operator. Both models are NEMA 4X rated. Both have a peak high/peak low feature

that remembers the highest and lowest detected process variable readings. This sequence can be reset and restarted from the front panel.

**7HI** - The 7HI has up to 3 independent latching alarm relays (2 SPDT and 1 SPST) programmed for high or low process alarms. The 7HI is also available with an optional 24 Vac/Vdc supply.

**7HK** - The 7HK is available with 2 SPDT alarm relays for high or low process alarms. In addition, as a third output, the 7HK has a linear analog retransmission output of the process variable. This output is programmable for 0 to 20 mA or 4 to 20 mA and can have a programmable filter applied.

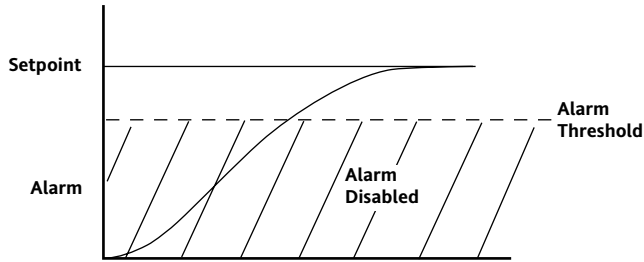
### Specifications:

<b>Supply Voltage:</b>	100-240 Vac (+10%, -15%), 50/60 Hz or 24 Vac/Vdc ( $\pm 10\%$ )
<b>Operating Ambient:</b>	0-50°C, 20-85% RH non-condensing
<b>Inputs:</b>	T/C Types J, K, L, R, S, T and N (°C, °F); Pt 100 3W RTD (°C, °F) Ranges: See Table C, page 2-10; mA <sub>dc</sub> , mV <sub>dc</sub> , V <sub>dc</sub>
<b>Mounting:</b>	Panel Mount

<b>Output Ratings:</b>	
Output 1:	Relay, 3A/250 Vac, 3A/30 Vdc, SPDT, Resistive Alarm 1, Direct or Reverse Acting
Output 2:	Relay, 3A/250 Vac, 3A/30 Vdc, SPDT, Resistive Alarm 2, Direct or Reverse Acting
Output 3:	Relay, 2A/250 Vac, 2A/30 Vdc, SPST, NO, Resistive (7HI) Optional Alarm 3, Direct or Reverse Acting
Output 3:	Isolated 0 to 20 mA or 4 to 20 mA, (500 $\Omega$ max.) (7HK) Isolated 0 to 10 Vdc (by solder jumper - recalibration required), (5k $\Omega$ min.) Optional Retransmission of PV

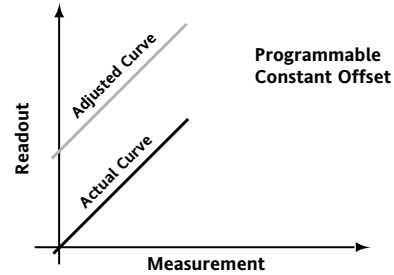
### Alarm Standby Function

The 7HI/7HK have an Alarm Standby function to allow masking of the process low alarm condition if the process variable has not traversed the low alarm threshold for the first time.

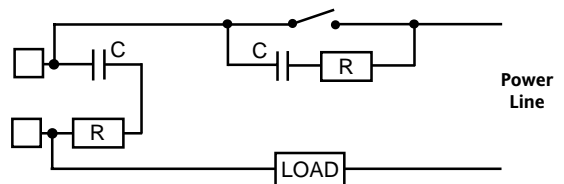
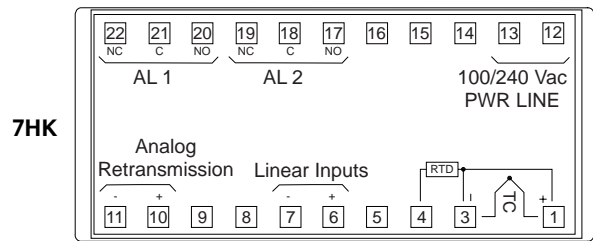
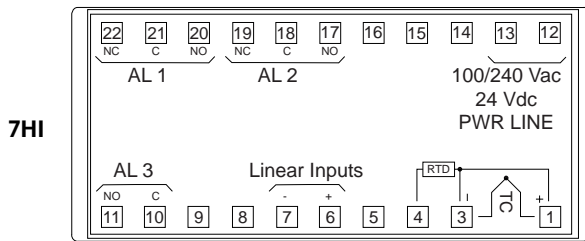


### Measurement Offset

A programmable sensor offset is provided for instances when it is not possible to locate the sensor in the ideal location. This offset can be applied to all inputs and is programmable for °C or °F.



## Terminal Connections and Mounting:



**External Switch in Series with the Internal Contact**  
Snubber Part Number: CZ140398

### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Relays are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.

### Mounting

Dimensions: 96W x 48H x 89D mm  
 Cutout: 92W (-0, +0.8 mm) x 45H mm (-0, +0.6 mm)  
 60 mm min. center-to-center vertical spacing  
 125 mm min. center-to-center horizontal spacing  
 Weight: 250 gm

## Ordering Codes:

Model	Input	Reserved	Outputs	Power Supply	Reserved
		000			000

Model	Input	Outputs	Power Supply
7HI Digital Panel Indicator 7HK Digital Panel Indicator with Analog Retransmission	4 T/C Type J, K, L, N, R, S, & T (°C, °F) Pt100 3W RTD (°C, °F)* 8 T/C Type J, K, L, N, R, S, & T (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 2 to 10 Vdc	0 None 1 Two Alarm Relays 2 Two Alarm Relays plus 0 - 20 or 4 - 20 mAdc Analog Retransmission (7HK only) 3 Three Alarm Relays (7HI only)	3 100 to 240 Vac 5 24 Vac/Vdc (7HI only)

\* Ranges - See Table C, page 2-10

# INDICATOR & ALARM UNITS

## 7HL 1/8 DIN High Performance Digital Indicator

### Features:

- Four Digit Display, 0.1% Accuracy
- 3 Color Backlit Liquid Crystal Display
- Universal Input (T/C, RTD, mV, mA or V)
- IP54 Protection
- Up to 2 Independent Alarms
- Configurable Automatic or Manual Reset
- High/Low Peak Reading Memory
- Configurable 10 Segment Linearizations
- Optional Analog Retransmission
- Optional Digital Communications
- Optional Auxiliary Power Supply

Designed specifically for equipment manufacturers who require high accuracy process monitoring and alarm, the 7HL is easy to configure and use. Factory calibrated, the 7HL accepts universal inputs selectable from the front panel and programmable with filtering and sensor break indication. Additionally, a 10 segment linearization can be programmed over the entire span. Display accuracy is 0.1% of span ( $\pm 1$  digit). The 7HL has 2 independent latchable alarm relays, programmed with password protection for high or low process alarms with a hysteresis of 0.1 to 5% of span. Alarms can be acknowledged



automatically, or manually from the keypad. A bright 4-digit LCD numeric display, a 2-digit LCD alphanumeric display and 6 panel beacons provide process variable, engineering units, alarm status and other important process and configuration information to the operator. There is also a peak high/peak low detection feature that remembers the highest and lowest detected process variable reading. This sequence can be reset and restarted from the front panel. The 7HL is IP54 rated for dusty environments.

### Specifications:

**Supply Voltage:** 100-240 Vac (+10%, -15%), 50/60 Hz

**Operating Ambient:** 0-50°C, 20-85% RH non-condensing

**Inputs:** T/C Types B, E, J, Fe-CuNi, K, R, S, T, Cu-CuNi, N, W, W3, W5, Ni/Ni-Mo and Platinel II (°C, °F); Pt 100 3W RTD (°C, °F)  
Ranges: See Table D, page 2-10; mAdc, mVdc, Vdc

**Logic Input:** (Open = Local Front Panel; Closed = Remote Serial Link) requires contact rated at 0.5 mA, 5 Vdc minimum

**Serial Communications:** EIA RS-485 Modbus®, JBUS

**Aux. Power Supply:** Isolated 5, 10, 12 or 24 Vdc (Jumper Selectable), 25 mA dc max. current, Accuracy  $\pm 5\%$  of nominal

#### Output Ratings:

**Output 1:** Relay, 2A/30 Vdc; 0.6A/110 Vdc; 0.5A/250 Vac SPST, NO or NC Jumper Selectable, Resistive  
Relay, 0.3A/110 Vdc, SPST, NO or NC Jumper Selectable, Inductive  
Alarm 1, Direct or Reverse

**Output 2:** Relay, 2A/30 Vdc; 0.6A/110 Vdc; 0.5A/250 Vac SPST, NO or NC Jumper Selectable, Resistive  
Relay, 0.3A/110 Vdc, SPST, NO or NC Jumper Selectable, Inductive  
Alarm 2, Direct or Reverse

#### Retransmission

**Output:** 0 to 20 mA or 4 to 20 mA, Isolated (500 $\Omega$  max.)  
0 to 10 Vdc, Isolated (5k $\Omega$  min.)  
Retransmission of PV

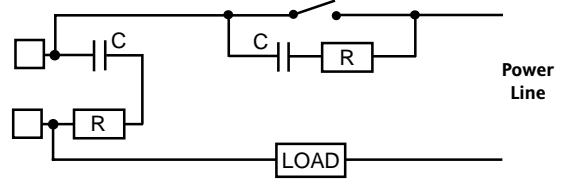
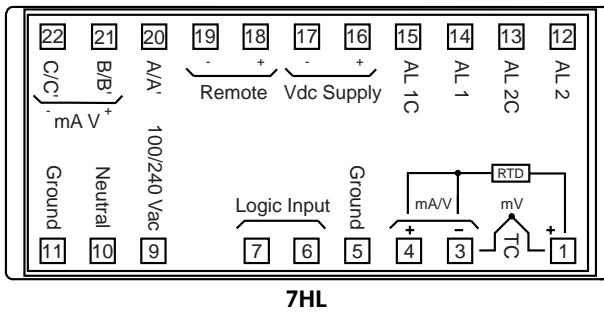
**Mounting:** Panel Mount

### Optional Features

In addition to its standard features, the 7HL has 3 important optional features:

- Digital communications featuring an opto-isolated EIA RS-485 communications port with Modbus® or JBUS protocol (this option is not available with the retransmission output). A closed logic input enables remote operation from the serial link; an open logic input enables local operation from the front panel.
- An auxiliary power supply for powering external transducers. Jumper selected isolated outputs at 5, 10, 12 or 24 Vdc (25 mA max.) are available.
- A linear analog retransmission output of the process variable is available as an isolated, 0 to 20 mA, 4 to 20 mA or 0 to 10 Vdc signal. This output is programmable and can have a digital filter applied to the retransmission.

## Terminal Connections and Mounting:



External Switch in Series with the Internal Contact  
Snubber Part Number: CZ140398

### Wiring

Do not run input wires with power cabling. Ground shields at one point only. Use compensating cable for thermocouple wiring. Relays are internally protected by a varistor. When inductive loads (such as mercury contactors) are used, or external switches are connected in series with internal contacts, high voltage transients may affect performance of the instrument. In this case it is recommended to install an additional RC snubber network across the contacts as shown. Contact Barber-Colman.

### Mounting

Dimensions: 96W x 48H x 149D mm  
 Cutout: 92W (-0, +0.6 mm) x 45H mm (-0, +0.6 mm)  
 60 mm min. center-to-center vertical spacing  
 125 mm min. center-to-center horizontal spacing  
 Weight: 600 gm

## Ordering Codes:

Model	Power Supply	Input	Reserved	Outputs	Options	Reserved
7HL	3	9	0	1		0000

Power Supply	Input	Outputs
3 100 to 240 Vac	9 T/C Type B, E, J, Fe-CuNi, K, R, S, T, Cu-CuNi, N, W, W3, W5, Ni/Ni-Mo & Platinel II (°C, °F) Pt100 3W RTD (°C, °F)* 0 to 20 mAdc & 4 to 20 mAdc 0 to 60 mVdc & 12 to 60 mVdc 0 to 5 Vdc & 1 to 5 Vdc 0 to 10 Vdc & 2 to 10 Vdc	1 Two Alarms, SPST Relays, NO or NC (Jumper Selectable)

Options
1 Auxiliary Power Supply: 5, 10, 12 or 24 Vdc
2 0 to 20 mAdc or 4 to 20 mAdc Retransmission plus Auxiliary Power Supply
3 RS-485 Communications plus Auxiliary Power Supply
4 RS-485 Communications
5 0 to 20 mAdc or 4 to 20 mAdc Retransmission

\* Ranges - See Table D, page 2-10