

PROCESS CONTROLLERS

What is a process controller?

It is simply a controller that takes an input signal from a temperature device, such as a thermocouple or RTD, or from a pressure/flow/level sensor, and maintains a setpoint using an output signal. Process/temperature controllers are powerful control tools, but offer very simple operation. Our offering ranges from a simple on/off controller, known as a limit controller, to full-blown, isolated, 4-20mA autotune PID control units.

How do I know which controller is right for me?

Our selection of controllers provides you with many features to choose from at different pricing levels. Generally, selection is based on your application input and output needs along with the method of controlling your application. The table below briefly describes some of the key components involved in making your decision. The detailed selection guide on the facing page provides more detailed technical specifications for each controller.



Flexible and powerful

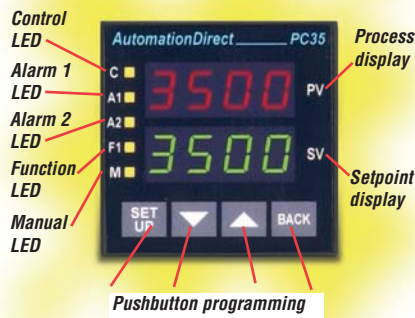
- **Universal sensor inputs.** How many times have you had to open a secret compartment with tiny dipswitches just to select your input range? This is even more difficult to do on a pre-installed controller. With all AUTOMATIONDIRECT process/temperature controllers, this difficulty is eliminated with the ability to select your inputs from the front panel.

- **Configurability.** Many controller manufacturers force the user to choose their input sensors and output control parameters before they can order the controller. Each controller has a pre-determined input, such as a J-type thermocouple. If your application changes, you must order a whole new controller.

With these process/temperature controllers, all inputs and outputs are configurable from the front panel. With a push of a button, switch from a thermocouple input to a RTD input to a voltage/current input.

- **Sensor break detection.** All models include built-in logic to detect if an input sensor is broken. If a wire is cut or the sensor just quits working, the controllers will turn on an alarm contact. This feature could save thousands of dollars in lost time.
- **Control logic.** TC33 and PC35 controllers offer full "PID Autotuning" in the automatic or manual control modes. Algorithms available range from simple on/off control to full PID control including P, PI, or even PID control. This selectability allows the controller to be used in almost all types of applications.

Process/temperature controllers with great features



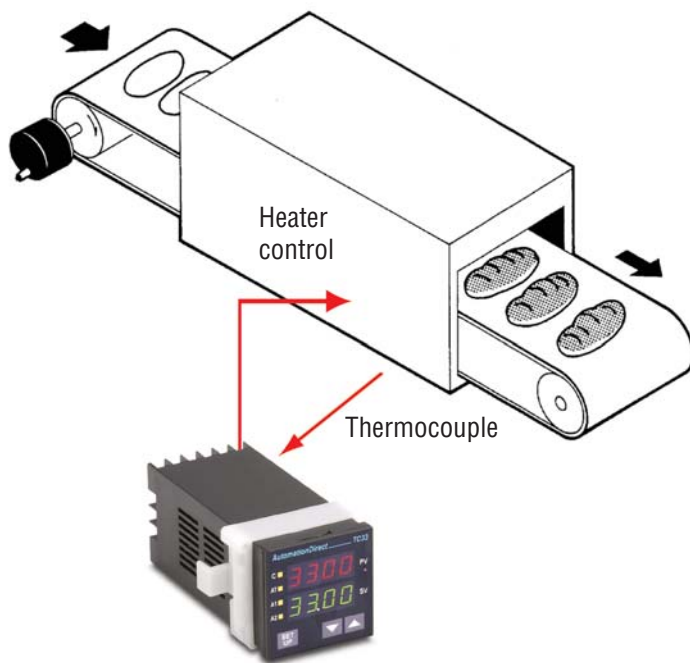
All controllers offer:

- LCD display(s)
- LED status indicators
- Programming keys for easy setup and monitoring.

Feature	PM24 Series	TC33 Series	PC35 Series
Temperature (T/C & RTD) inputs	Yes	Yes	Yes
Other process inputs	Yes	No	Yes
Digital input	No	No	Yes
On/off control	Yes	Yes	Yes
4-20mA control	No	Yes	Yes
Time proportioned control	No	Yes	Yes

Temperature/Process Controllers Selection Guide			
Description	Limit Controller PM Series Limit controller with two mechanical relays. Universal inputs include T/C, RTD, mA, mV, V. Fully scalable display	Temperature Controller TC Series Temperature controller with two mechanical relays and one 4-20mA output. Inputs include T/C and RTD. Autotune PID control with ramp and soak profile	Process Controller PC35 Series Process controller with two mechanical relays and one 4-20mA output. Inputs include T/C, RTD, mA, mV, V. Autotune PID control with 49 segment ramp/soak profile
Input (Universal PV)	T/C, RTD, mA, mV, V	T/C, RTD	T/C, RTD, mA, mV, V
Input (Digital)	N/A	N/A	Optional: One
Outputs (Control, Alarm)	Two mechanical relays	Two mechanical relays or one mechanical relay Optional: One 4-20mA output Optional: DC pulse output	Two mechanical or two solid state relays Optional: One 4-20mA output Optional: DC pulse output
Output Relay Ratings	Mechanical 3A @ 250VAC	Mechanical 3A @ 250VAC	Mechanical 3A @ 250VAC Solid state 1A @ 240VAC
4-20mA Load Rating	N/A	500Ω @ 12VDC	500Ω @ 24VDC
Input Power	90-260VAC	90-260VAC	90-260VAC
Control Routines	On/off control	PID, autotune, on/off control, Time proportioned	PID, autotune, time proportioned, ON, OFF
Security	Three level function protection via keypad	N/A	Seven level function protection via keypad
Enclosure Rating	Nema 1 - faceplate	Nema 1 - faceplate	Nema 1 - faceplate
Price	check	check	check
<i>Note: The manual for these products is available online. Please visit our Web site at www.automationdirect.com</i>			

Application example: oven temperature control



In the example to the left, an oven control system is shown. The thermocouple senses the temperature and the controller adjusts the heater to maintain a constant temperature.

PM24 SERIES CONTROLLERS SPECIFICATIONS

Overview

The PM24 is a smart process/temperature indicator with two standard relay output alarms. It is a high performance micro-processor-based instrument used for monitoring and temperature control, as well as for reading analog signals in industrial processes and laboratories.

Universal inputs on the PM24 are all standard, so you can select the input signal from the front panel, without internal dipswitches, jumpers or hardware changes. It accepts seven types of thermocouples and two types of Pt100-RTDs, with selectable °F/°C for all temperature sensors. The linear input accepts 4-20mA, 0-50mV and 0-10 Volt signals. It also accepts and linearizes nine types of 4-20mA input signals from non-linear thermocouples and RTD field transmitters. The voltage and current inputs are fully scalable to engineering units from -1999 to 9999 digital units, with a selectable decimal point, which makes the PM24 perfect for use with pressure transmitters, pH, flow level, strain-gage, and other linear process inputs.

Features

- Process and temperature multi-sensor selectable input, without dipswitches or hardware change
- Accepts seven types of thermocouples, two types of RTD-Pt100 temperature sensors, and DC mA, mV, and Volt signals
- RTD-Pt100 input with 0.1° or 1° temperature resolution
- Selectable °F/°C for all temperature sensors
- Linearizes 9 types of “non-linear 4-20mA” input signals from field non-linear temperature transmitters
- Two standard SPST output relay alarms with 11 function modes: process high/low, deviation high/low, differential, sensor break, and alarm inhibition at power-up
- Input sensor break alarm in any condition
- Fast 100ms (10Hz) sampling input improves the alarm loop control
- Universal power supply from 90 to 260 VAC

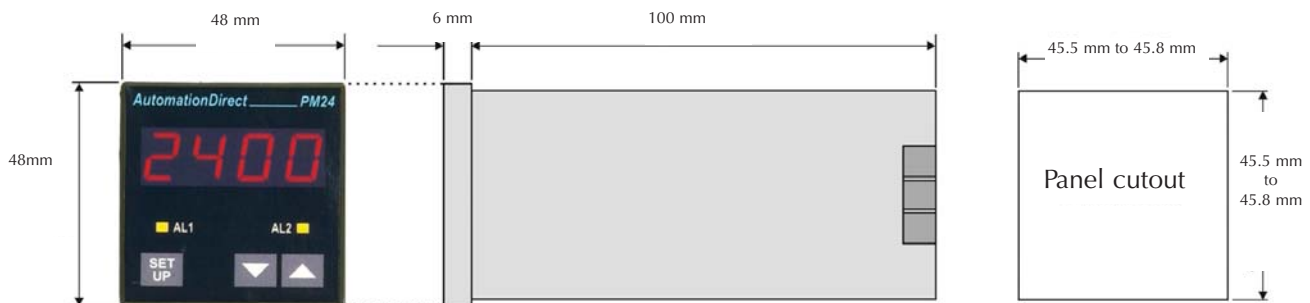
Specifications		
Controller Series	PM24 Series	
Dimensions	48x48x106 mm (1/16 DIN), weight 200g (approximate)	
Panel Cutout	45.5x45.5mm (+/-0.3 mm)	
Terminal Connection	Screws accepting 16-24 AWG wires or 6.3 mm fork lug	
Power	90 to 260 VAC - 7VA maximum	
Operating Environment	0 to 50°C (32° to 122°F), humidity: 10 to 90% RH, non-condensing	
Instrument Case	1/16 DIN size, flame-retardant ABS plastic case	
Warm-up Time	15 minutes maximum	
Input	Display Resolution	0.1°F/C or 1°F/C (RTD-Pt100); 1°F/C (thermocouples)
	Input Sample Rate	10 per second (100 ms)
	Accuracy	Thermocouples J, K, N, T and E: 0.2% of span ±1°C Thermocouple R and S: 0.25% of span ±3°C Pt100, mA mV and Volts: 0.2% of span ± 1 digit
	Impedance	0-50mV and thermocouples: >10 MΩ 0-10 Volts DC: >1 MΩ 4-20 mA DC: 100Ω
Output	Pt100 Measurement	DIN 43760 standard (a=0.00385) 3-wire circuit, cable resistance compensation Excitation current: 170µA
	Resistive	3A @ 250VAC/3A @ 125VAC/3A @ 30VDC
	Inductive	2A @ 250VAC/2A @ 30VDC

PM24 SERIES CONTROLLERS SPECIFICATIONS

Part Number Selection Guide								
Part Number	Input Power	PV Universal Sensor Input	Remote SP Analog Input	Digital Input	Discrete Output	Analog Output	Pulse Output	Price
PM24-2000-AC	90-260VAC	Table 1	None	None	2 mechanical relays	None	None	check
Accessories								
Part Number	Description							Price
PANEL-16	Mounting clip for 1/16th DIN timers and temperature/process controllers. Package of 5 clips. (One clip included with each controller)							check

Table 1 - Selectable Input types	
Input Type	Range
Thermocouple J (1°C resolution)	-166 to 1400°F (-110 to 760°C)
Thermocouple K (1°C resolution)	-238 to 2498°F (-150 to 1370°C)
Thermocouple S (1°C resolution)	32 to 3200°F (0 to 1760°C)
Thermocouple T (1°C resolution)	-256 to 752°F (-160 to 400 °C)
Thermocouple E (1°C resolution)	-130 to 1328°F (-90 to 720°C)
Thermocouple N (1°C resolution)	-238 to 2372°F (-150 to 1300°C)
Thermocouple R (1°C resolution)	32 to 3200°F (0 to 1760°C)
RTD Pt100 (0.1°C resolution)	-199.9 to 986.0°F (-199.9 to 530°C)
RTD Pt100 (1°C resolution)	-326 to 986°F (-199 to 530°C)
4 to 20 mA	Linearized J: -166 to 1400°F (-110 to 760°C)
4 to 20 mA	Linearized K: -238 to 2498°F (-150 to 1370°C)
4 to 20 mA	Linearized T: -256 to 752°F (-160 to 400 °C)
4 to 20 mA	Linearized S: 32 to 3200°F (0 to 1760°C)
4 to 20 mA	Linearized E: -130 to 1328°F (-90 to 720°C)
4 to 20 mA	Linearized N: -238 to 2372°F (-150 to 1300°C)
4 to 20 mA	Linearized R: 32 to 3200°F (0 to 1760°C)
4 to 20 mA	Linearized Pt100: -199.9 to 986.0°F (-199.9 to 530.0°C)
4 to 20 mA	Linearized Pt100: -326 to 986°F (-199 to 530°C)
0 to 50mV	Linear. Programmable range from -1999 to 9999
4 to 20 mA	Linear. Programmable range from -1999 to 9999
0 to 10V	Linear. Programmable range from -1999 to 9999

Main dimensions and panel cutout



TC33 AND PC35 SERIES CONTROLLERS

Overview

The TC33 and PC35 series are powerful 1/16 DIN size PID autotune micro-processor-based controllers. A dual LED display offers optimum process information at a glance.

Individual LEDs identify the status of the controller and the tactile keyboard makes it easy to configure inputs, outputs and setup data, without internal dipswitch or jumper changes.

The universal inputs accept thermocouples and RTD-Pt100. No dipswitches are required to make changes as the units are fully keypad programmable.

The units operate on a universal power supply from 90 to 260VAC.

TC33 Features

- Temperature multi-sensor selectable PV input without hardware change
- Multi-sensor input accepts seven types of thermocouples and two types RTD-Pt100
- Full PID and auto-tune temperature control - available algorithms: P, PI, PD, PID or ON/OFF with hysteresis
- RTD input with 0.1° or 1° resolution
- Selectable °F/°C temperature units
- Sensor break protection in any condition
- Output options include relay, 4-20 mA out, or isolated DC pulse output
- Ramp and soak: one controlled ramp and one timed soak are standard

PC35 Features

- Universal multi-sensor selectable PV input without hardware change
- Programmable ramp and soak: Seven 7-segment profiles can be linked to make longer programs up to 49 segments
- Square root function
- Sensor break protection in any condition
- Output options: relay, SSR, isolated linear 4-20mA, 0-20mA or isolated DC pulse output*
- Up to 3 alarms, 2 programmable timer alarms.
- Process variable or setpoint 0-20mA, 4-20mA isolated analog retransmission*
- Auto/manual “bumpless” transfer
- One isolated digital input with programmable functions*
- Linear remote setpoint input*
- Programmable soft start (0 to 9999 sec)

***Refer to “Part Number Selection Guide” on the following pages for specific I/O availability information.**

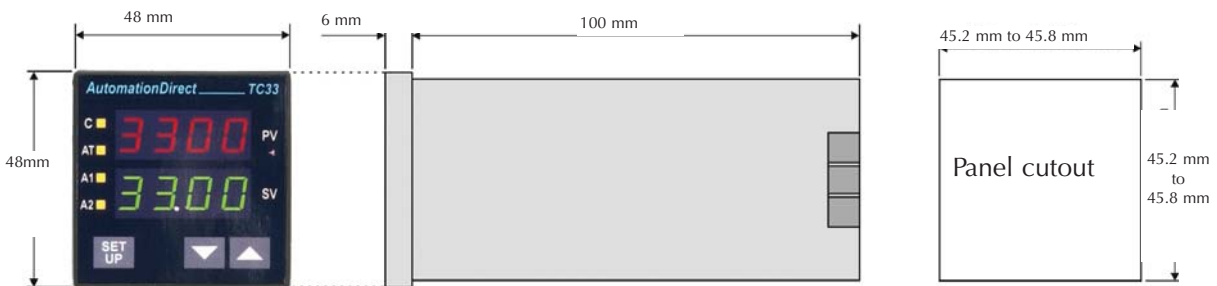
Specifications				
Controller Series	TC33 Series	PC35 Series		
Dimensions	48x48x106 mm (1/16 DIN), weight 200g (approximate)	48x48x106 mm (1/16 DIN), weight 200g (approximate)		
Panel Cutout	45.5mmx45.5mm (+/- 0.3mm)	45.5mmx45.5mm (+/- 0.3mm)		
Terminal Connection	Screws accepting 16 to 24 AWG wires or 6.3 mm fork lugs	Screws accepting 16 to 24 AWG wires or 6.3 mm fork lugs		
Power	90 to 260VAC - 7VA maximum	90 to 260VAC - 7VA maximum		
Operating Environment	Temperature: 0 to 50°C (32 to 122°F), humidity: 10 to 85% RH, non-condensing	Temperature: 0 to 50°C (32 to 122°F), humidity: 10 to 85% RH, non-condensing		
Instrument Case	Flame-retardant ABS plastic case	Flame-retardant ABS plastic case		
Warm-up Time	15 minutes maximum	15 minutes maximum		
Input	Display Resolution	0.1°F/C or 1°F/C (RTD-Pt100)	0.1°F/C or 1°F/C (RTD-Pt100)	
	Input Sample Rate	10 per second (100 ms)	5 per second (200 ms)	
	Accuracy	Thermocouples J, K, N, E, and T : 0.2% of span ±1°C Thermocouples R and S: 0.25% of span ±3°C Pt100: 0.2% of span (+/-0.5°C)	Thermocouples J, K and T: 0.2% of span ±1°C Thermocouple S: 0.25% of span ±3°C Pt100: 0.2% of span (+/-0.5°C) Current (4-20mA) and voltage (50mV or 5V): 0.2% of span	
	Impedance	Thermocouple: >10 MΩ	Thermocouple: >10 MΩ	
	Pt100 Measurement	DIN 43760 standard (α=0.00385) 3-wire circuit, cable resistance compensation Excitation current: 170µA	DIN 43760 standard (α=0.00385) 3-wire circuit, cable resistance compensation Excitation current: 170µA	
Output	Mechanical	Resistive	3A @ 250VAC/3A @ 30VDC	3A @ 250VAC/3A @ 30VDC
		Inductive	2A @ 250VAC/2A @ 30VDC	2A @ 250VAC/2A @ 30VDC
	Solid State - Triac		none	1A @ 20 to 240VAC
	Solid State - DC Pulse		12VDC pulsed @ 15mA maximum	12VDC pulsed @ 15mA maximum
	Analog		4-20mA sourcing @ 500Ω maximum load	0/4-20mA sourcing @ 500Ω maximum load

TC33 SERIES CONTROLLERS SPECIFICATIONS

Part Number Selection Guide							
Part Number	Input Power	PV Multi-Sensor Input	Digital Input	Discrete Outputs	Analog Outputs	Pulsed Output	Price
TC33-1100-AC	90-260VAC	Table 2	None	1 Mechanical relay	None	12VDC	check
TC33-2010-AC	90-260VAC	Table 2	None	2 Mechanical relays	4-20mA	none	check
Accessories							
Part Number	Description						Price
PANEL-16	Mounting clip for 1/16th DIN timers and temperature/process controllers. Package of 5 clips. (One clip included with each controller)						check

Table 2 - Selectable Input types	
Input Type	Range
Thermocouple J (1°C resolution)	-50 to 760°C (-58 to 1400 °F)
Thermocouple K (1°C resolution)	-90 to 1370°C (-130 to 2498°F)
Thermocouple S (1°C resolution)	0 to 1760°C (32 to 3200°F)
Thermocouple T (1°C resolution)	-100 to 400°C (-148 to 752°F)
Thermocouple N (1°C resolution)	-90 to 1300°C (-130 to 2372°F)
Thermocouple E (1°C resolution)	-30 to 720°C (-22 to 1328°F)
Thermocouple R (1°C resolution)	0 to 1760°C (32 to 3200° F)
RTD Pt100 (0.1°C resolution)	-199.9 to 530.0 °C (-199.9 to 986.0°F)
RTD Pt100 (1°C resolution)	-200 to 530°C (-328 to 986°F)

Main dimensions and panel cutout



PC35 SERIES CONTROLLERS SPECIFICATIONS

Part Number Selection Guide								
Part Number	Input Power	PV Universal Sensor Input	Remote SP Analog Input	Digital Input	Discrete Outputs	Analog Output	Pulsed Output	Price
PC35-2000-AC	90-260VAC	See Table 3	None	None	2 Mechanical relays	None	None	check
PC35-2010-AC	90-260VAC	See Table 3	Voltage ¹	Dry Contact ²	2 Mechanical relays	Current ³	None	check
PC35-0210-AC	90-260VAC	See Table 3	Voltage ¹	Dry Contact ²	2 Solid State relays	Current ³	None	check
PC35-2110-AC	90-260VAC	See Table 3	Voltage ¹	Dry Contact ²	2 Mechanical relays	Current ³	12VDC	check
Accessories								
Part Number	Description							Price
PANEL-16	Mounting clip for 1/16th DIN timers and temperature/process controllers. Package of 5 clips. (One clip included with each controller)							check

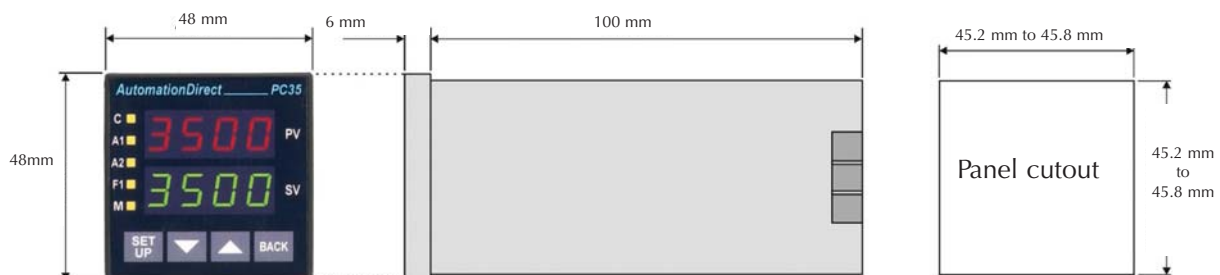
Note 1: Remote set point analog input: 0.4 to 2.0 VDC (for 4-20mA input, add external 100Ω/0.1% shunt resistor). RSP function not available if Analog Output is used.

Note 2: Digital Input function not available if Analog Output is used.

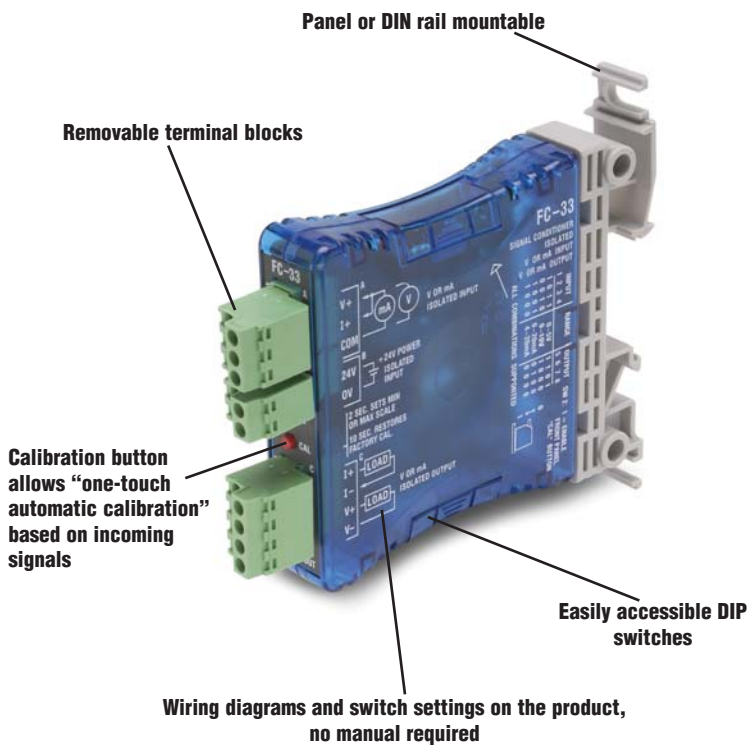
Note 3: Analog Output: 0 to 20mA or 4 to 20mA; 500Ω maximum load (for 0/1-5V output, add external 250Ω/0.1% shunt resistor). Analog Output function not available if Digital Input is used.

Table 3 - Selectable Input types	
Input Type	Range
Thermocouple J (1°C resolution)	-166 to 1400 °F (-110 to 760 °C)
Thermocouple K (1°C resolution)	-238 to 2498°F (-150 to 1370°C)
Thermocouple S (1°C resolution)	32 to 3200°F (0 to 1760°C)
Thermocouple T (1°C resolution)	-256 to 752°F (-160 to 400 °C)
RTD Pt100 (0.1°C resolution)	-199.9to 986°F (-199.9 to 530°C)
RTD Pt100 (1°C resolution)	-328 to 986°F (-200 to 530°C)
4 to 20 mA	Tc. J linearization. programmable range: -166 to 1400°F (-110 to 760°C)
4 to 20 mA	Tc. K linearization. programmable range: -238 to 2498°F (-150 to 1370°C)
4 to 20 mA	Tc. T linearization. programmable range: -256 to 752°F (-160 to 400°C)
4 to 20 mA	Tc. S linearization. programmable range: 32 to 3200°F (0 to 1760°C)
4 to 20 mA	RTD Pt100 Linearization programmable range: -328 to 986°F (-199.9 to 530°C)
4 to 20 mA	RTD Pt100 Linearization programmable range: -328 to 986°F (-199.9 to 530°C)
0 to 50mV	Linearization programmable indication - 1999 to 9999
4 to 20 mA	Linearization programmable indication - 1999 to 9999
0 to 5 Volts	Linearization programmable indication - 1999 to 9999
4 to 20 mA	Square root extraction

Main dimensions and panel cutout



FC SERIES SIGNAL CONDITIONERS



Convert, isolate and transmit your process signals

Not all electrical signals are created equal. That's why the FC series signal conditioners are the perfect solution for converting process, temperature and other electrical signals into voltage or current signals for transmission or input to a PLC.

The FC series signal conditioners offer 1500V isolation between the input and output to help eliminate electrical noise. Features include easily accessible potentiometer adjustment of the output span and offset, (with the exception of FC-33), slim DIN rail or side mount cases and removable terminal blocks.

The FC series signal conditioners are ideal for use with PLCs, loop controllers, digital displays and any other applications requiring an isolated/analog signal.



FC-33

DC Selectable Signal Conditioner with 3-way isolation

Field configurable input and output ranges of 0-5 V, 0-10 V, 0-20 mA and 4-20 mA with 1500 VDC isolation between input and output, and 1500 VDC isolation from 24 volt power and input/output. LED indicates normal operation and is used in conjunction with the calibration pushbutton for the internal calibration process.

- 3-way 1500V isolation
- Push button calibration



FC-T1

Thermocouple/mV Isolated Signal Conditioner

Field configurable input for several different types of thermocouple or mV inputs with 1500 VDC isolation between input and output. Cold junction compensation and burnout detection. Alarm/run LED.

- 1500V isolation
- Cold junction compensation (CJC)
- Internal diagnostics (burnout detection or calibration errors)



FC-11

4-20 mA Isolated Signal Conditioner

Loop powered 4-20 mA input/output signal with 1500 VDC isolation between input and output.

- 1500V isolation
- Loop powered



FC-R1

RTD Input Signal Conditioner

Loop powered, non-isolated, 3-wire unit converts an RTD input to a linear 4-20 mA signal. User selectable CU10, PT100 or PT1000 input.

FC-11, 4-20mA ISOLATED SIGNAL CONDITIONER



Overview

The FC-11 is a DIN rail or side mount, 4-20 mA Input/Output loop powered signal conditioner with 1500 VDC isolation between input and output.

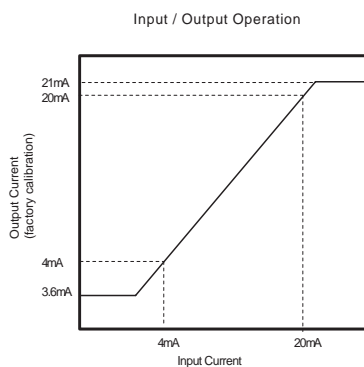
The FC-11 has a user-selectable factory calibration. The output can also be calibrated with OFFSET (zero) and SPAN (full scale) adjustments. The OFFSET has an adjustment range of 0 to 25% of full scale input and the SPAN has an adjustment of 80% to 102%.

Application

The FC-11 isolated input/output signal conditioner is useful in eliminating ground loops and sinking/sourcing issues when interfacing to PLC analog input modules. The FC-11 design feature solves many types of configuration problems. For example, the signal conditioner can solve the problem of connecting a sinking input transmitter to a sinking analog input module.

This feature would be useful in a system design with a limited type and number of channels – for example: eight channels of 0-10 VDC, seven of which are used, and one 4-20 mA input transmitter.

See page 21–13 for the signal conditioner dimensions.



Specifications	
Input Ranges	4-20 mA
Extended Input range¹	3.5 mA to 20.6 mA, ±1%
Input Burden Voltage²	6.8 VDC
Maximum Input Current	34 mA @ 9.7 VDC
Output Burden Voltage³	8.5 VDC minimum
Output Range	4-20 mA
Extended Output Range¹	3.5 mA to 20.6 mA, ±1%
Maximum Load Impedance	650 Ω @ 24 VDC, 1000 Ω @ 29 VDC
Maximum Output Current	23 mA @ 29 VDC
Sample Duration Time	18 mS maximum
Filter Characteristic	-3 dB @ 200 Hz -6 dB / octave
Linearity Error	0.1% FSO maximum
Stability	0.1% FSO maximum
Accuracy vs. Temperature	±0.0065% / °C (65ppm / °C)
Maximum Inaccuracy of Output	0.05% @ 25°C, FSO maximum 0.3% @ 0-60°C, FSO maximum
Isolation	1500 VDC Input - Output
Operating Temperature	0-60°C (32 to 140°F)
Storage Temperature	-20 to 70°C (-4 to 158°F)
Relative Humidity	5 to 90% (non-condensing)
Vibration	ML STD 810C 514.2
Shock	ML STD 810C 516.2
Noise Immunity	NEMA ICS3-304

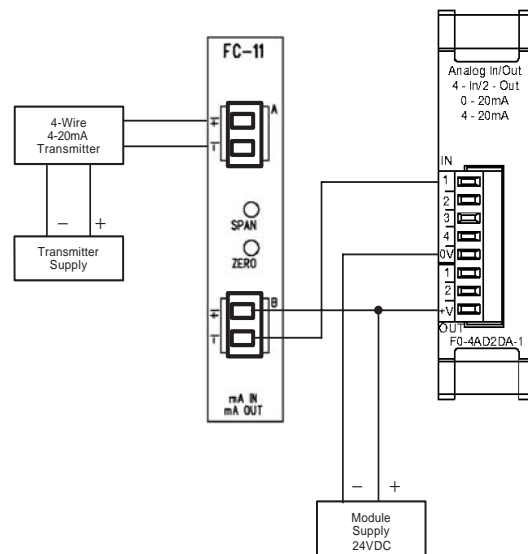
NOTE:

1 When adjusting SPAN and OFFSET potentiometers

2 Voltage required to power internal circuitry

3 Formula, [(output load) x 20 mA] + 8.5 V,
i.e. 13.5 VDC @ 250 Ω

Typical User Wiring



4 -20mA Input Isolated to 4 -20mA Output (example)

FC-T1, THERMOCOUPLE/mV INPUT ISOLATED SIGNAL CONDITIONER



Overview

The FC-T1 is a DIN rail or side mount thermocouple/mV input signal conditioner with 1500 VAC isolation between input and output.

The field configurable input allows a wide ranging capability for a type J, K, E, R, S, T, B, N and C thermocouple, or 0-156.25 mV and ± 156.25 mV signals.

The FC-T1 has built-in self-calibration, but also offers OFFSET (zero) and SPAN (full scale) potentiometers for adjustment of the output signal.

The FC-T1 is also equipped with cold junction compensation (CJC) circuitry to provide an internal ice-point reference.

The temperature calculation and linearization are based on data provided by the National Institute of Standards and Technology (NIST).

ALARM and RUN LED: This LED is bicolor (red and green). A red LED indicates either power up, a fault with internal calibration, or a thermocouple burnout condition, while a green LED indicates normal operation.

Burnout Function: The output current can be selected to provide either upscale (20mA) or downscale (4mA) detection whenever thermocouple burnout occurs.

Specifications				
	T/C	°C	°F	Resolution ¹
Input Ranges	J	-190 to 760	-310 to 1400	0.23°C
	K	-150 to 1372	-238 to 2502	0.37°C
	E	-210 to 1000	-345 to 1832	0.295°C
	R	65 to 1768	149 to 3214	0.42°C
	S	65 to 1768	149 to 3214	0.42°C
	T	-230 to 400	-382 to 752	0.15°C
	B	529 to 1820	984 to 3308	0.315°C
	N	-70 to 1300	-94 to 2372	0.33°C
	C	65 to 2320	149 to 4208	0.55°C
		0 to 156.25 mV		
	-156.25 mV to +156.25 mV			0.078 mV
Output Range	4 to 20 mA			
External Power Supply	15 mA, 22 to 26 VDC			
Input Impedance	>5 MΩ			
Absolute Maximum Rating	Fault protected input ± 50 V			
Maximum Inaccuracy	$\pm 3^\circ\text{C}$, Temperature Input $\pm 0.06\%$, Voltage Input			
Linearity Error	0.1%			
Over Temperature Error	0.1 X 10 ⁻⁵ % (10 ppm)			
Insulation Resistance	≥ 100 MΩ with 500 VDC (Input to output power)			
Isolation	1500 VAC @ 1 Sec. (Input to output commons)			
Sample Duration Time	120 mS Voltage Input 250 mS Thermocouple Input			
Common Mode Rejection	-100 dB @ DC, -90 dB @ 50/60 Hz			
Input Filter (FIR)	-3 dB @ 15 Hz, -100 dB@50 Hz, -100 dB@60 Hz			
Broken Thermocouple	Up/Down Scale Red/Green LED			
Over Range	Up Scale			
Under Range	Down Scale			
Burnout Time	≤ 3 Seconds			
Cold Junction Compensation	Automatic			
Warm-up Time	30 min. typical $\pm 1^\circ\text{C}$ repeatability			
Operating Temperature	0 to 60°C (32 to 140°F)			
Storage Temperature	-20 to 70°C (-4 to 158°F)			
Relative Humidity	5 to 90% (non-condensing)			
Environmental Air	No corrosive gases permitted			
Vibration	ML STD 810C 514.2			
Shock	ML STD 810C 516.2			
Noise Immunity	NEMA ICS3-304			

Note:

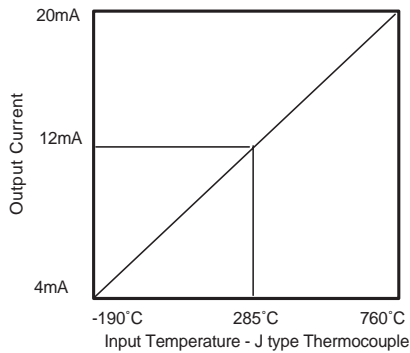
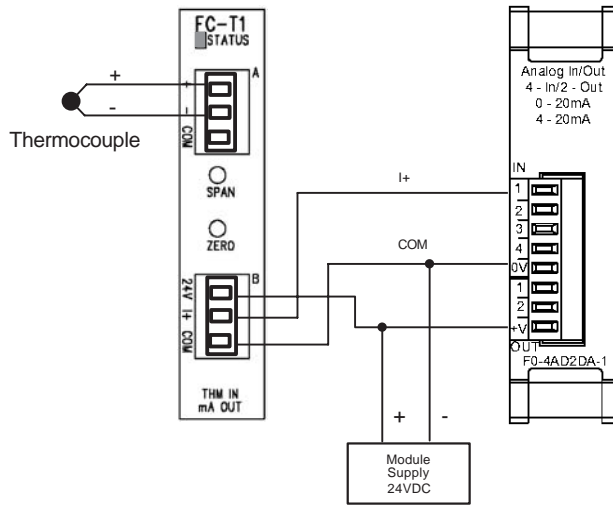
¹ Based on 12-bit (4095) analog input module

FC-T1, THERMOCOUPLE/mV INPUT ISOLATED SIGNAL CONDITIONER

Application

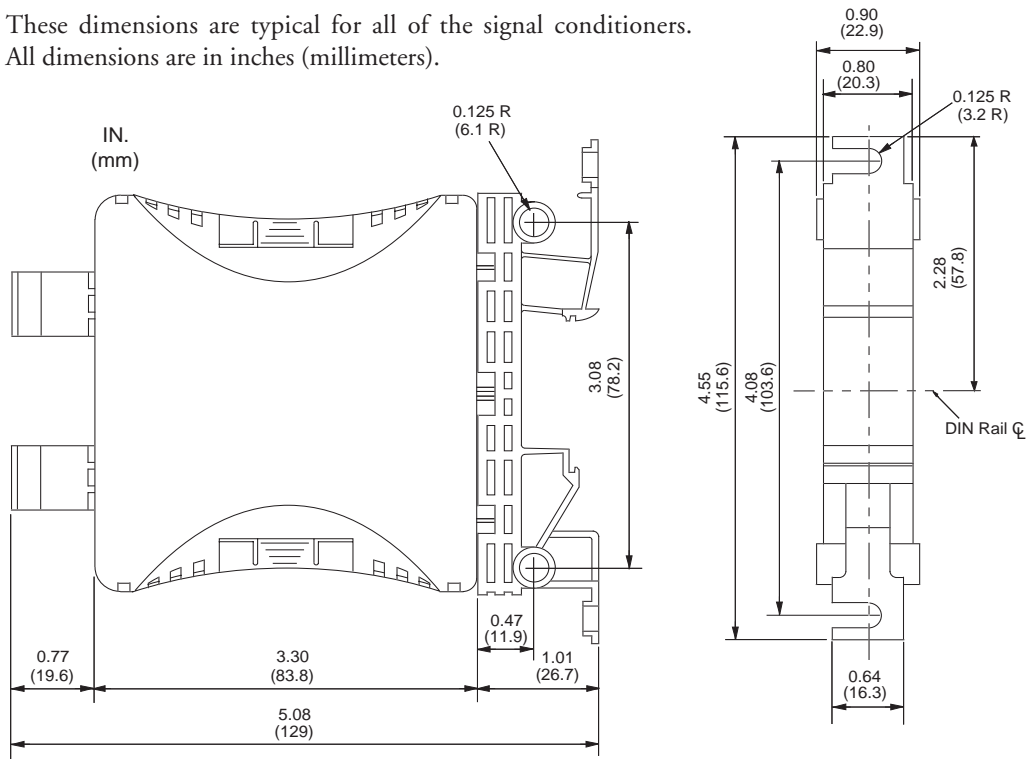
The FC-T1, field configurable thermocouple/mV signal conditioner is useful in eliminating ground loops and for interfacing to PLC analog input modules. If your requirements are only for one channel of temperature, you can add the signal conditioner to your 4-20 mA input module. Or, if your requirements are for a single millivolt signal source, you have the option of adding this input to your analog module.

Typical User Wiring



SIGNAL CONDITIONER DIMENSIONS

These dimensions are typical for all of the signal conditioners. All dimensions are in inches (millimeters).



FC-R1, RTD INPUT LOOP POWERED SIGNAL CONDITIONER



Overview

The FC-R1 is a DIN rail or side mount Resistive Temperature Detector signal conditioner.

It is a non-isolated signal conditioner which converts a 3-wire RTD to a linearized 4-20 mA current loop.

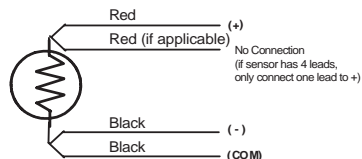
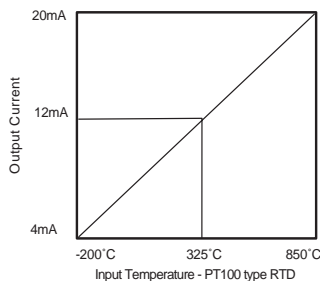
The FC-R1 has a user selectable CU10 (10 Ohm copper), PT100 (100 Ohm platinum) or PT1000 (1000 Ohm platinum) RTD input, and also offers OFFSET (zero) and SPAN (full scale) adjustments of the output signal. The OFFSET has an adjustment range of 0 to 25% of full scale output and the SPAN has an adjustment of 80% to 102%.

Specifications			
Input Ranges	CU10	-200°C to 260°C	-328°F to 500°F
	PT100	-200°C to 850°C	-328°F to 1562°F
	PT1000	-200°C to 595°C	-328°F to 1103°F
RTD Excitation Current	CU10, PT100 500 µA ±50 µA PT1000 80 µA ±20 µA		
Common Mode Range	0 - 3.5 VDC		
Maximum Inaccuracy	0.35% FSO / CU10 0.2% FSO @ 25°C / PT100 & PT1000 0.26% FSO @ 60°C / PT100 & PT1000		
Maximum Loop Supply	30 VDC		
Load Impedance	0 Ω minimum		
Maximum Load/Power Supply	203 Ω / 12 V, 745 Ω / 24 V		
Linearity Error	0.35% FSO / CU10 0.2% FSO @ 25°C / PT10 & PT1000		
Output Slew Rate	1% @ 20 mS		
Filter Characteristics	105 dB @ DC, 60 dB @ 10 Hz, 40 dB @ 60 Hz		
Stability	0.05% FSO maximum		
Operating Temperature	0 to 60°C (32 to 140°F)		
Storage Temperature	-20 to 70°C (-4 to 158°F)		
Relative Humidity	5 to 90% (non-condensing)		
Environmental Air	No corrosive gases permitted		
Vibration	ML STD 810C 514.2		
Shock	ML STD 810C 516.2		
Noise Immunity	NEMA ICS3-304		

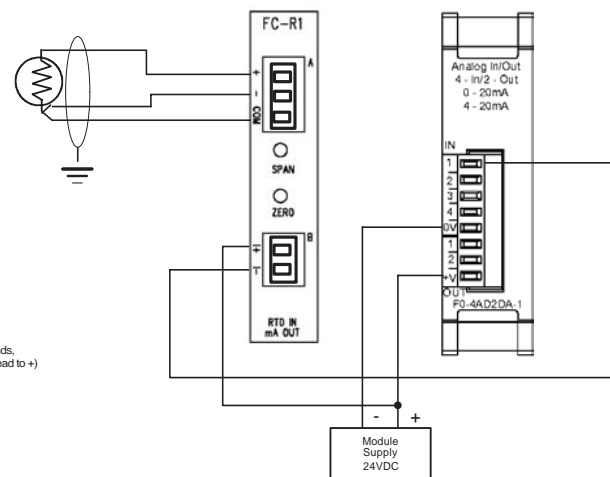
See page 21-13 for the signal conditioner dimensions.

Application

The FC-R1 field configurable input signal conditioner is useful for interfacing RTD sensors to PLC analog current input modules. It is recommended that shielded RTD's be used whenever possible to minimize noise on the input signal.



Typical User Wiring



RTD Signal Conditioner to 4-20mA DL05/06 analog module
Only use three wire and four wire RTDs.