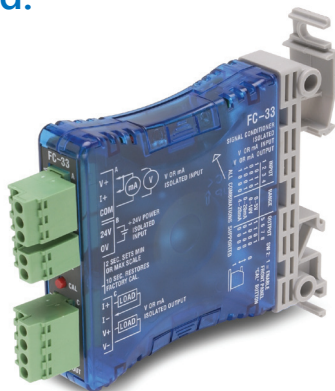


# FC-33 DC Selectable Signal Conditioner

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## Overview

The FC-33 is a DIN-rail or side-mount, selectable input/output signal conditioner with 1500VDC isolation between input and output, and 1500VDC isolation between 24-volt power and input/output. The field configurable input/output types allow a wide ranging capability for 0-5V, 0-10V, 0-20 mA and 4-20 mA signals.

The FC-33 has built-in self-calibration, but also has OFFSET (zero) and SPAN (full scale) adjustments of the output signal. The OFFSET has an adjustment range of 0 to 25% of full scale input and the SPAN has an adjustment of 80% to 102%.

**Level LED:** The LED is a powerful tool when setting up the signal conditioner. During normal operation the LED will blink at a proportional rate to the selected input signal level. When performing field calibration the LED is used for indication of the internal calibration process.

**CAL-Pushbutton:** This pushbutton, along with various switch settings, allows you to calibrate the OFFSET and/or SPAN for your application or to restore factory default calibration.

## Specifications

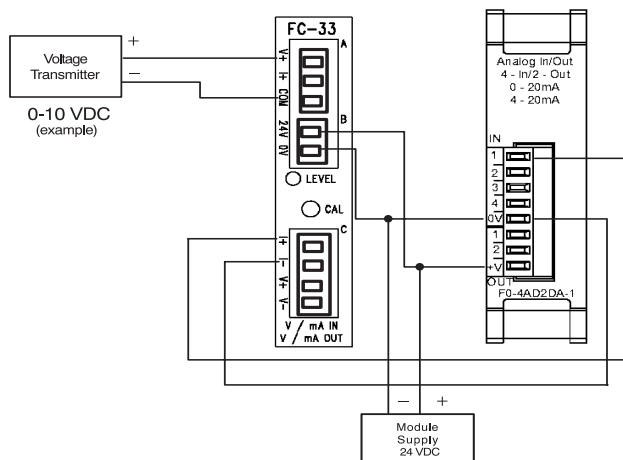
<b>Input Ranges</b>	0-5 V, 0-10 V, 0-20 mA, 4-20 mA
<b>Input Impedance</b>	250Ω, ±0.1% current input 200KΩ / 400KΩ Voltage input
<b>Output Ranges</b>	0-5 V, 0-10 V, 0-20 mA, 4-20 mA
<b>Load Impedance</b>	2KΩ minimum, voltage output 0Ω minimum, current output
<b>Maximum Load / Current</b>	550Ω @ 24VDC (sink/source)
<b>Sample Duration Time</b>	10mS
<b>Filter Characteristic</b>	-3 dB @ 3 Hz, -6 dB/octave
<b>Linearity Error</b>	0.05% FSO maximum
<b>Stability</b>	0.05% FSO maximum
<b>Accuracy vs. Temperature</b>	0.005%/ °C, (50ppm/°C)
<b>Input Power</b>	24VDC, ±10% @ 50mA
<b>Recommended Fuse</b>	0.032 mA, Series 217, current inputs
<b>Isolation</b>	1500VDC input - output* 1500VDC power - input* 1500VDC power - output* *applied for 1 second
<b>Maximum Inaccuracy of Output</b>	0.05% @ 25°C, FSO maximum 0.25% @ 0-60°C, FSO maximum
<b>Output Current</b>	21mA maximum (for mA output)
<b>Approx. Field Cal. Range</b>	0 - 25% (0 - 1.5 V / 5 V mode) 80% - 102% (4 - 5.1 V / 5 V mode)
<b>Operating Temperature</b>	0-60°C (32 to 140°F)
<b>Storage Temperature</b>	-20 to 70°C (-4 to 158°F)
<b>Relative Humidity</b>	5 to 90% (non-condensing)
<b>Vibration</b>	ML STD 810C 514.2
<b>Shock</b>	ML STD 810C 516.2
<b>Noise Immunity</b>	NEMA ICS3-304

## Application

The FC-33, field configurable isolated input/output signal conditioner, is useful in eliminating ground loops and interfacing sensors to PLC analog input modules. The FC-33 has 3-way isolation; this feature solves many types of configuration problems. For example, the signal conditioner can be configured for a sinking input and a sourcing output. It also allows signal translation from current input to voltage output or voltage input to current output.

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.

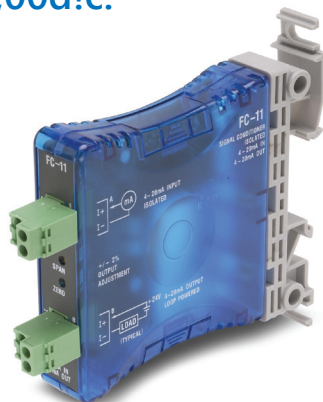
### Typical User Wiring



Voltage Input and Current Output (example)

# FC-11 4-20mA Isolated Signal Conditioner

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UL US UL file E200031

## Overview

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

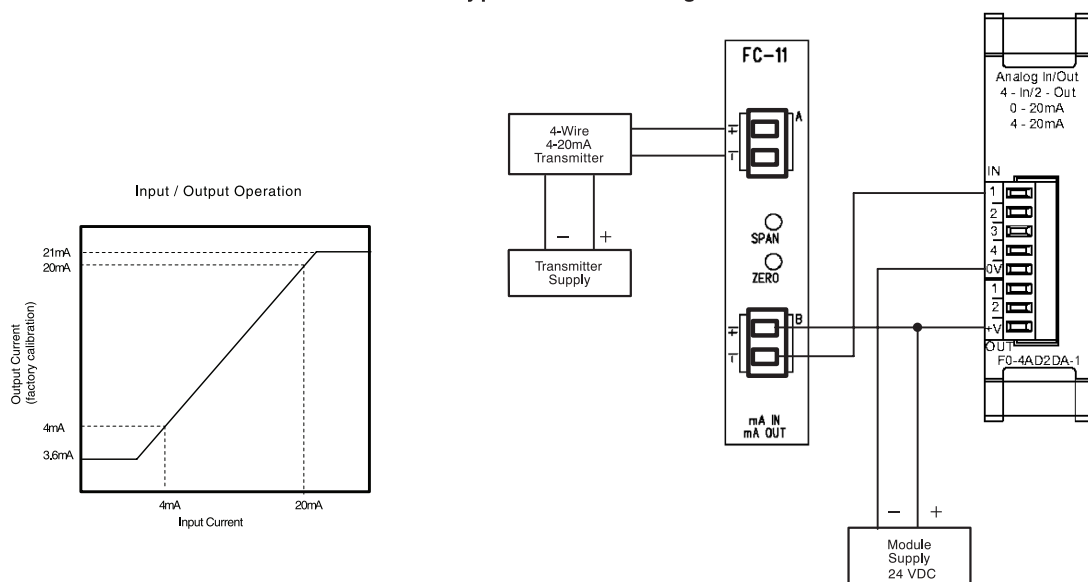
## Specifications

<b>Input Ranges</b>	4-20 ma
<b>Extended Input range<sup>1</sup></b>	3.5 mA to 20.6 mA, ± 1%
<b>Input Burden Voltage<sup>2</sup></b>	6.8 VDC
<b>Maximum Input Current</b>	34mA @ 9.7 VDC
<b>Output Burden Voltage<sup>3</sup></b>	8.5 VDC minimum
<b>Output Range</b>	4-20 mA
<b>Extended Output Range<sup>1</sup></b>	3.5 mA to 20.6 mA, ± 1%
<b>Maximum Load Impedance</b>	650Ω @ 24VDC, 1000Ω @ 29VDC
<b>Maximum Output Current</b>	23mA @ 29VDC
<b>Sample Duration Time</b>	18mS maximum
<b>Linearity Error</b>	0.1% FSO maximum
<b>Max Inaccuracy of Output</b>	0.05% @ 25°C, FSO maximum, 0.3% @ 0-60°C, FSO maximum
<b>Filter Characteristics</b>	-3 dB @ 200 Hz, -6 dB / octave
<b>Stability</b>	0.1% FSO maximum
<b>Accuracy vs. Temperature</b>	± 0.0065% / °C (65ppm / °C)
<b>Isolation</b>	1500VDC Input - Output
<b>Operating Temperature</b>	0 to 60°C (32 to 140°F)
<b>Storage Temperature</b>	-20 to 70°C (-4 to 158°F)
<b>Relative Humidity</b>	5 to 90% (non-condensing)
<b>Vibration</b>	ML STD 810C 514.2
<b>Shock</b>	ML STD 810C 516.2
<b>Noise Immunity</b>	NEMA ICS3-304

### NOTES:

1. When adjusting SPAN and OFFSET potentiometer
2. Voltage required to power internal circuitry
3. Formula, [(output load) x 20 mA] + 8.5 V, i.e.: 13.5 VDC @ 250Ω
4. Internal analog converter resolution is 12-bit

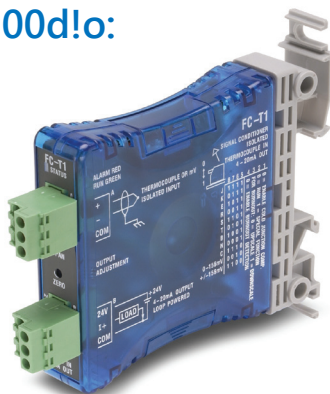
## Typical User Wiring



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

# FC-T1 Thermocouple/mV Input Isolated Signal Conditioner

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## Overview

The FC-T1 is a DIN-rail or side-mount thermocouple/mV input signal conditioner with 1500VAC 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  $\pm 156.25$  mV signals.

The FC-T1 has built-in self-calibration, but also offers OFFSET (zero) and SPAN (full scale) potentiometer 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.



Click on the thumbnail or go to <https://www.automationdirect.com/VID-TE-0006> for a short video on Remote Temperature Sensing

## Specifications

	T/C	°C	°F	Resolution <sup>1</sup>
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			0.038 mV
	-156.25 mV to +156.25 mV			0.076 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 $\pm 50$ V			
Maximum Inaccuracy	$\pm 3^\circ\text{C}$ , Temperature Input $\pm 0.1\%$ , Voltage Input			
Linearity Error	0.1%			
Over Temperature Error	$0.1 \times 10^{-5}\%$ (10 ppm)/°C			
Insulation Resistance	$\geq 100$ Mr 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	$\leq 3$ 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:

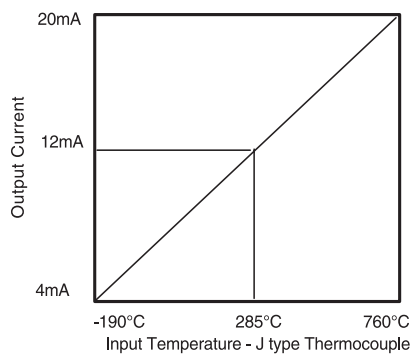
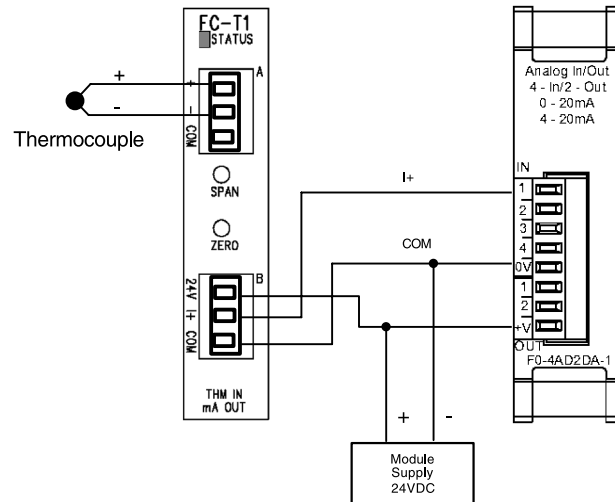
<sup>1</sup> Internal analog converter resolution is 12-bit.

# FC-T1 Thermocouple/mV Input Isolated Signal Conditioner

## Application

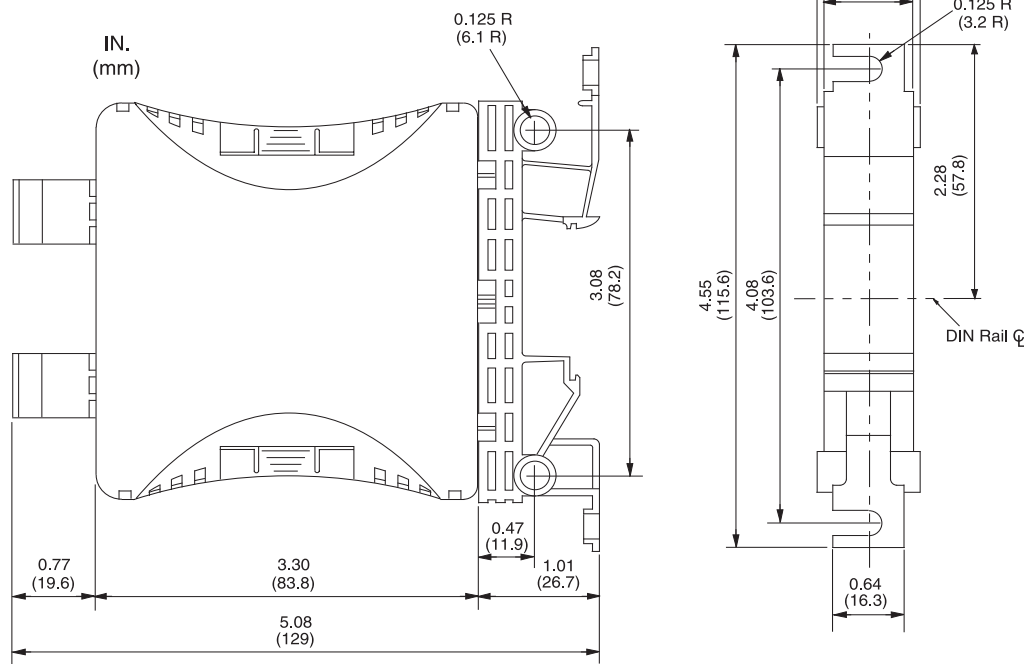
The FC-T1, field configurable thermocouple/mV signal conditioner, is useful in eliminating ground loops and for interfacing to PLC analog input modules. If your requirements are only for one channel of temperature, you can add the signal conditioner to your 4-20 mA input module. Or, if your requirements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

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cULus UL file E200031

## 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 signal.

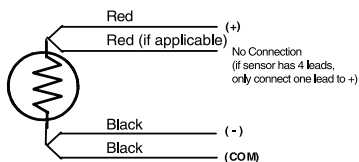
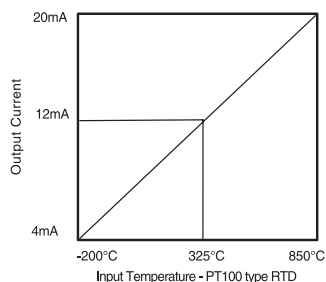
The FC-R1 has a user selectable CU10 (10 Ohm copper), PT100 (100 Ohm platinum) or PT1000 (1000 Ohm platinum) RTD input, and also offers OFFSET (zero) and SPAN (full scale) adjustments of the output signal. The OFFSET has an adjustment range of 0 to 25% of full scale output and the SPAN has an adjustment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



Click on the thumbnail or go to <https://www.automationdirect.com/VID-TE-0006> for a short video on Remote Temperature Sensing

## Application

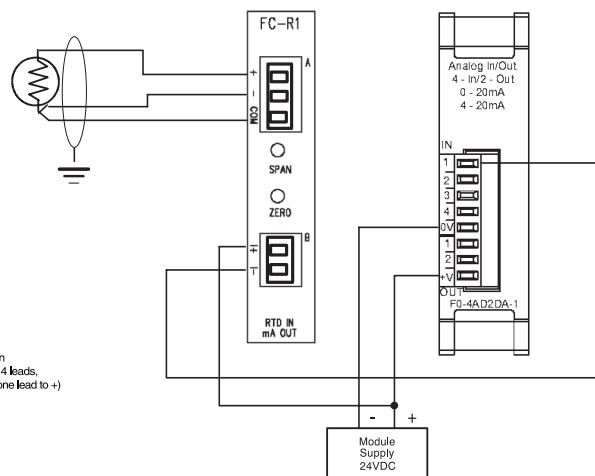
The FC-R1 field configurable input signal conditioner is useful for interfacing RTD sensors to PLC analog current input modules. It is recommended that shielded RTDs be used whenever possible to minimize noise on the input signal.



## Specifications

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

## Typical User Wiring



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



# FC-P3 Potentiometer Input, Analog Output Signal Conditioner

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CE cULus UL file E157382

## Overview

The FC-P3 is a resistive input to isolated analog output signal conditioner. The input resistive range (high end resistivity, low end resistivity) is set through the use of a pushbutton programming routine.

The FC-P3 is field configurable for 3-wire potentiometer/slide-wire inputs with end-to-end resistance ranges from 0-100 ohms to 0-100 kilohms. The input adjustment range can be scaled down to a minimum of 10% of the potentiometer being used. Switch selectable, analog output options include 0-20 mA, 4-20 mA, 0-5V, and 0-10 V. The PGM LED provides an indication of operating status and is used during the field programming process.

The MAX and MIN LED's indicate OVER and UNDER range status. The module can be 35mm DIN rail or side mounted and is UL listed. Power for the unit is provided by a customer supplied 24VAC or 24VDC Class 2 power supply.

Specifications	
Input Specifications	
<b>Input Ranges</b>	0 - 100Ω up to 0-100kΩ, 3-wire potentiometer/slide-wire
<b>Programmable Range Minimum</b>	Pushbutton Adjustable to 10% of full range of applied potentiometer
<b>Excitation</b>	>100 uA @ 2.5VDC
<b>External Power Required</b>	24VDC ±10% @ 120 mA or 24VAC ±10% @ 120mA, Class 2
Output Specifications	
<b>Output Ranges</b>	0-5 V, 0-10 V, 0-20 mA, 4-20 mA (DIP Switch Selectable/Invertable)
<b>Maximum Output Current</b>	21mA (for mA OUT ONLY)
<b>Response Time</b>	35ms for mA Out, 100ms for V Out
<b>Load Impedance</b>	2kΩ minimum, voltage output 550Ω maximum current output
<b>Output Drive</b>	Voltage: 10mA maximum Current: 21mA maximum
<b>Maximum Inaccuracy</b>	±0.75% @ 0-60°C, FSO maximum
<b>Output Stability and Repeatability</b>	0.05% FSO maximum

Specifications (continued)	
Output Specifications (continued)	
<b>Output Ripple</b>	0.05% of full scale
<b>Output Protection</b>	Outputs short circuit protected
<b>Inverted Outputs</b>	Invert Outputs using DIP Switch 6
Terminal Block Specifications	
<b>Field Wiring</b>	Removable Screw Terminal Blocks (included)
<b>Number of Positions</b>	2 (Dinkle EC350V-02P), 4 (Dinkle EC350V-04P), 4 (Dinkle EC350V-04P)
<b>Wire Range</b>	28-14 AWG solid or stranded conductor; wire strip length 1/4" (6-7mm)
<b>Screw Torque</b>	1.7 inch-pounds (0.19 NM)
General Specifications	
<b>Accuracy vs. Temperature</b>	±50 PPM of full scale/°C Maximum
<b>Response Time</b>	35ms, 100ms for 0-10V range
<b>Power Dissipation within Module</b>	3W Maximum
<b>Thermal Dissipation</b>	9.42 BTU/hr
<b>Surrounding Air Temperature</b>	0 to 60°C (32 to 140°F) IEC 60068-2-14 (Test Nb, Thermal Shock)
<b>Storage Temperature</b>	-20 to 70°C (-4 to 158°F) IEC 60068-2-1 (Test Ab, Cold) IEC 60068-2-2 (Test Bb, Dry Heat) IEC 60068-2-14 (Test Na, Thermal Shock)
<b>Enclosure Rating</b>	IP20
<b>Humidity</b>	5 to 95% (non-condensing) IEC 60068-2-30 (Test Db, Damp Heat)
<b>Environmental Air</b>	No corrosive gases permitted (EN61131-2 pollution degree 1)
<b>Vibration</b>	MIL STD 810C 514.2
<b>Shock</b>	MIL STD 810C 516.2
<b>Isolation</b>	1500VDC Input to Output 1000VDC Power to Input 1000VDC Power to Output applied for 1 second (100% tested)
<b>Insulation Resistance</b>	>10 MΩ @ 500 VDC
<b>Noise Immunity</b>	NEMA ICS3-304 IEC 61000-4-2 (ESD) Impulse 1000 V @ 1μS pulse IEC 6100-4-4 (FTB) RFI, (145 MHz, 440 MHz 5W @ 15 cm) IEC 61000-4-3 (RFI)
<b>Weight</b>	0.25 lbs
<b>Agency Approvals</b>	UL508*, File Number: E157382, CE

\* In order to comply with UL508, the supplied power must be less than 26 VDC and fused at a maximum of 3 amps.

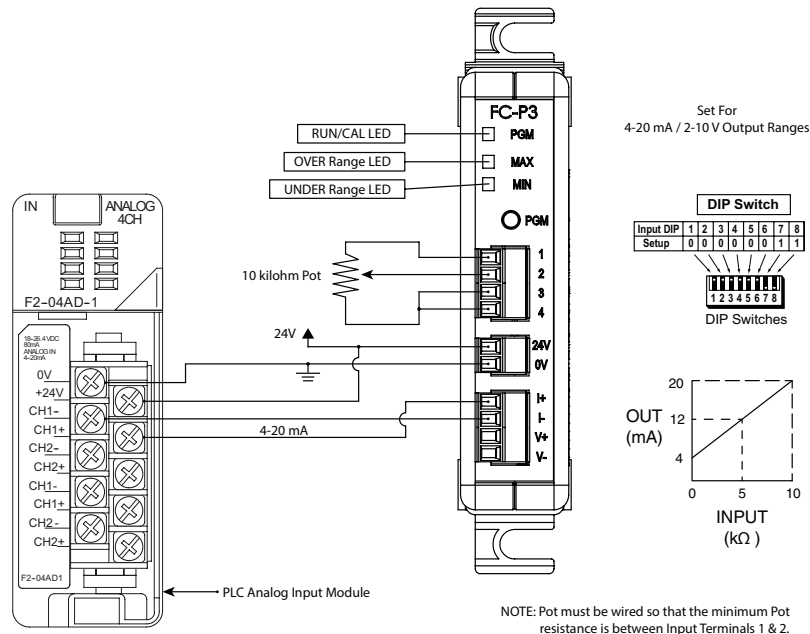


Click on the above thumbnail or go to <https://www.automationdirect.com/VID-PS-0003> for a short introductory video for the FC Series Signal Conditioners.

# FC-P3 Application and Dimensions

## Application

Use the FC-P3 to eliminate the challenge of getting a variable set by a machine operator into the PLC. Using the FC-P3 to convert the resistive signal from a 10 kilohm potentiometer to a 4-20 mA signal that can be used by a PLC is simple.



## Wiring Connections

Input Terminal Block	
Faceplate Label	Description
1	Pot End Terminal
2	Pot Wiper
3	Pot End Terminal
4	Shield Connection

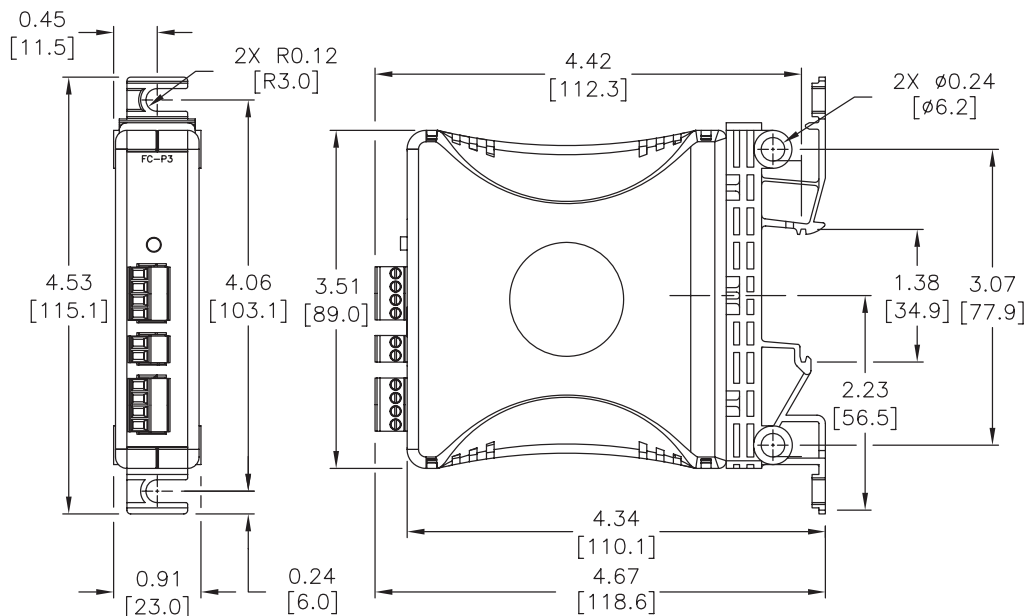
**NOTE:** Pot must be wired so that the minimum Pot resistance is between Input Terminals 1 & 2.

External Power Terminal Block	
Faceplate Label	Description
24 V	24 VDC or 24 VAC $\pm 10\%$ , Class 2
0V	0V

Output Terminal Block	
Faceplate Label	Description
I+	Current
I-	Current
V+	Voltage
V-	Voltage

## Dimensions

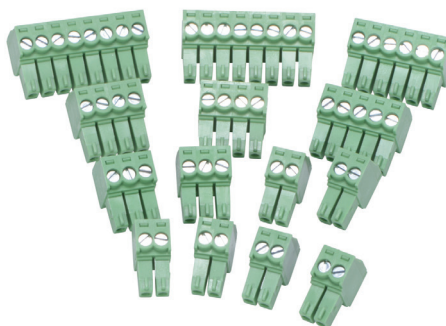
inches [mm]



# FC Series Accessories



FC-5MM



FC-35MM

## Description

Universal terminal block replacements for the FC Series signal conditioners. Each package includes enough terminal blocks to replace all the terminal blocks on any FC Series signal conditioner according to the following table:

FC Series Terminal Blocks		
FC Series Model	Terminal Block Replacement Part Number	Package Includes
<a href="#"><u>FC-11</u></a>	FC-5MM	(2) 2-pole blocks (2) 3-pole blocks (1) 4-pole blocks
<a href="#"><u>FC-33</u></a>		
<a href="#"><u>FC-R1</u></a>		
<a href="#"><u>FC-T1</u></a>		
<a href="#"><u>FC-ISO-C</u></a>	FC-35MM	(6) 2-pole blocks (2) 3-pole blocks (2) 4-pole blocks (1) 5-pole blocks (1) 6-pole blocks (2) 8-pole blocks
<a href="#"><u>FC-ISO-D</u></a>		
<a href="#"><u>FC-B34</u></a>		
<a href="#"><u>FC-35B</u></a>		
<a href="#"><u>FC-P3</u></a>		
<a href="#"><u>FC-3RLY2</u></a>		
<a href="#"><u>FC-3RLY4</u></a>		

*Note: Depending on the model, some terminal blocks in the package may be unused.*

Universal Signal Conditioners				
Part No.	Description	Rated Torque (N·m)	Weight (Lbs)	Price
<a href="#"><u>FC-5MM</u></a>	Terminal block, replacement, 5mm. Package of 5. For use with FC Series signal conditioners.	0.5	0.1	\$10hd:
<a href="#"><u>FC-35MM</u></a>	Terminal block, replacement, 3.5mm. Package of 14. For use with FC Series signal conditioners.	0.2	0.1	\$10hc: