X54-SERIES

ISOLATED TWO-WIRE TRANSMITTERS

RONAN

MODEL X54-210 SERIES THERMOCOUPLE TRANSMITTER
MODEL X54-220 SERIES mA, mV, V TRANSMITTER
MODEL X54-230 SERIES RTD TRANSMITTER
MODEL X54-240 SERIES FREQUENCY TRANSMITTER

Ronan's Series X54 Two-Wire Transmitters are ideally suited for field or panel mounting in hazardous or general purpose areas. The X54 design utilizes state of the art micropowered solid-state devices which minimize internal power consumption. The transmitters are RFI-protected, operate over large temperature ranges and feature excellent temperature coefficients, which minimize the effects from plant environments.

The 4-20 mA or 10-50 mA current loop connection provides an output across the loop resistor directly proportional to the transducer input. Power to the transmitter is derived from a serial-connected power supply of 12-80 VDC via the same wire pair providing the output. The input-to-output, transformer-isolated transmitter provides error-free measurements immune to ground loop currents, even if both the transducer and the power supply or output measuring instrument are grounded. Available options, such as linearized output, integral 3½-or 4½-digit LCD local readout and a large variety of housing and mounting styles, establish the X54 Series as the most versatile transmitter line on the market.

The X54 Series is part of Ronan's extensive line of signal-conditioning interface modules. For further information, contact any of our four factories or our worldwide network of representatives.

- Current Output 4-20 mA or 10-50 mA, Jumper Selectable
- Local Display, 3½- or 4½-Digit LCD; Indicates Temperature or Engineering Units with Decimal Point Selection
- Linearized Output
- Field-Exchangeable Submodules to Select Input Type, Display Range on Most Models
- RFI-Protected
- Built-In Cold Junction Compensation
- Power Supply Range 12-80 VDC
- Enclosures: Explosion-Proof Class I, Division 1, Groups B, C, and D, (Zone 1) NEMA Type 4 (IP65); General Purpose, Surface- or DIN Rail-Mount
- Intrinsically Safe Units Also Available

Types of Isolated Two-Wire Transmitter Housings Available

GENERAL PURPOSE
DIN Eurorail Mount

The general purpose transmitter housing is small in scale and is constructed from extruded aluminum, making it ideal for DIN Eurorail mounting. The spring loaded, clip-on arrangement makes installation and maintenance easy.

GENERAL PURPOSE
Panel Mount

For direct surface mounting requirements, choose the panel mount configuration. The extruded aluminum housing is well designed with a small footprint for high density mounting arrangements.

EXPLOSION-PROOF
Class I, Division 1, Groups B, C & D (Zone 1)

The X54 Series transmitters are available in explosion-proof enclosures, NEMA Type 7, suitable for Class I, Division 1, Groups B, C and D locations. With its integral gasket, the unit is also certified for NEMA Type 4 weatherproof applications. Two mounting holes allow installation without depending on input/output conduits.

DIGITAL READOUT

Ronan's X54 transmitters may be optionally equipped with a 3½- or 4½-digit liquid crystal display. The LCD readout features linearization of the input signal to meet accuracy requirements. Temperature, engineering units or frequency are displayed through the glass top of the unit, which is scaled to your specific requirements.

WIRING: All versions of the X54 Series utilize front-mounted, compression-type terminals, which allow convenient sensor, ground and output lead connections with up to 12 AWG (2.5mm²) wires.

Specifications

THERMOCOUPLE TRANSMITTER

Input:
Thermocouple Type E, J, K, T, R or S

Input Impedance:
>10 Mohms

Output:
Standard: 4-20 mA or 10-50 mA, jumper selectable
Optional: digital display, scaled in engineering units as requested

Span Adjustment:
Front-accessible, multi-turn, infinite resolution potentiometer permits minimum ±10% adjustment. Wider ranges available at no extra charge

Zero Adjustment:
Front-accessible, multi-turn, infinite resolution potentiometer permits minimum ±10% adjustment. Wider ranges available at no extra charge

Input Open Circuit Response:
Upscale drive standard; downscale drive optional

Calibrated Accuracy:
±0.1% of span + linearization*

Isolation:
Input and output circuits isolated by transformers

Common Mode Rejection:
>120 dB, at 60 Hz

Common Mode Voltage:
600 VDC or peak AC maximum without damage

Ambient Temperature Coefficient:
Ambient temperature range: 32° to 158°F (0° to 70°C)
Gain: <±0.01%/°F
Zero: <±2 μV/°F referred to the input
Reference junction: <2 μV/°F from 40° to 120°F

Ambient Temperature Range:
(with or without Liquid Crystal Display)
Operating: −20° to 175°F (−25° to 80°C)
Storage: −40° to 175°F (−40° to 80°C)

Load Effect:
<.05% change in output current for load variation from short circuit to maximum loop resistance

Power Supply Range:
12 to 80 VDC (60 VDC maximum with 10-50 mA output)

Power Supply Effects:
<±0.01% of range for a ±10 V change

Maximum Loop Resistance (R) vs. Power Supply Voltage (PSV):

4-20 mA range: $R\ max = \frac{PSV - 12\ V}{20\ mA}$

10-50 mA range: $R\ max = \frac{PSV - 12\ V}{50\ mA}$

Display Module:
3½- or 4½- digit, LCD 0.35" (9 mm) character size
Optimal view angle 60° (explosion-proof housing only)

Radio Frequency Effects:
<0.4 mV (referred to input), +0.2% of span (referred to output) when exposed to 5 W transmitter with frequency range 20-460 MHz at a distance of 1 m

Calibration:
Output and display are factory calibrated to customer-specified ranges

Terminals:
Compression type, wire size 14 AWG max., 10 A max., 300 V max.

Weight:
General purpose housing: 0.5 lbs. (0.23 kg)
Explosion-proof housing: 4.2 lbs. (1.88 kg)

*Linearization accuracy is dependent on input type and range.

ENGINEERING UNIT TRANSMITTER AND AC CURRENT AND VOLTAGE

Input mV, V, mA, Vac, Iac:
mV ranges: 10, 25, 50, 75 and 100 mV
V ranges: 1, 5 and 10 V
mA ranges: 4-20 and 10-50 mA
Vac: 10-150 or 100-280 Vac
Iac: 0-5 Aac

Input Impedance:
mV ranges: >10 Mohms; *V ranges:* >500 Kohms; *mA ranges:* <25 ohms

Output:
Standard: 4-20 mA or 10-50 mA, jumper selectable
Optional: digital display, scaled in engineering units as requested

Span Adjustment:
Front-accessible, multi-turn, infinite resolution potentiometer permits minimum ±10% adjustment. Wider ranges available at no extra charge

Zero Adjustment:
Front-accessible, multi-turn, infinite resolution potentiometer permits minimum ±10% adjustment. Wider ranges available at no extra charge

Input Open Circuit Response:
Upscale drive standard; downscale drive optional

Calibrated Accuracy:
±0.1% of span

Isolation:
Input and output circuits isolated by transformers

Common Mode Rejection:
>120 dB, at 60 Hz

Common Mode Voltage:
600 VDC or peak AC maximum without damage

Ambient Temperature Coefficient:
Ambient temperature range: 32° to 158°F (0° to 70°C)
Gain: <±0.01%/°F
Zero: <±2 μV/°F referred to the input

Ambient Temperature Range:
(with or without Liquid Crystal Display)
Operating: −20° to 175°F (−25° to 80°C)
Storage: −40° to 175°F (−40° to 80°C)

Load Effect:
<.05% change in output current for load variation from short circuit to maximum loop resistance

Power Supply Range:
12 to 80 VDC (60 VDC maximum with 10-50 mA output)

Power Supply Effects:
<±0.01% of range for a ±10 V change

Maximum Loop Resistance (R) vs. Power Supply Voltage (PSV):

4-20 mA range: $R\ max = \frac{PSV - 12\ V}{20\ mA}$

10-50 mA range: $R\ max = \frac{PSV - 12\ V}{50\ mA}$

Display Module:
3½- or 4½-digit, LCD 0.35" (9 mm) character size
Optimal view angle 60° (explosion-proof housing only)

Radio Frequency Effects:
<0.4 mV (referred to input), +0.2% of span (referred to output) when exposed to 5 W transmitter with frequency range 20-460 MHz at a distance of 1 m

Calibration:
Output and display are factory calibrated to customer-specified ranges

Terminals:
Compression type, wire size 14 AWG max., 10 A max., 300 V max.

Weight:
General purpose housing: 0.5 lbs. (0.23 kg)
Explosion-proof housing: 4.2 lbs. (1.88 kg)

POTENTIOMETER AND RTD TRANSMITTER

Input:
RTD sensor type: platinum, nickel, copper
Potentiometer: 0-5 ohms to 0-20 Kohms

Input Impedance:
>100 Kohms

Output:
Standard: 4-20 mA or 10-50 mA, jumper selectable
Optional: digital display, scaled in engineering units as requested

Span Adjustment:
Front-accessible, multi-turn, infinite resolution potentiometer permits minimum ±10% adjustment. Wider ranges available at no extra charge

Zero Adjustment:
Front-accessible, multi-turn, infinite resolution potentiometer permits minimum ±10% adjustment. Wider ranges available at no extra charge

Input Open Circuit Response:
Upscale drive standard; downscale drive optional

Calibrated Accuracy:
±0.1% of span + linearization*

Isolation:
Input and output circuits isolated by transformers

Common Mode Rejection:
>120 dB, DC at 60 Hz

Common Mode Voltage:
600 VDC or peak AC maximum without damage

Ambient Temperature Coefficient:
Ambient temperature range: 32° to 158°F (0° to 70°C)
Gain: <±0.01%/°F
Zero: <±2 μV/°F referred to the input

Ambient Temperature Range:
(with or without Liquid Crystal Display)
Operating: −20° to 175°F (−25° to 80°C)
Storage: −40° to 175°F (−40° to 80°C)

Load Effect:
<0.05% change in output current for load variation from short circuit to maximum loop resistance

Power Supply Range:
12 to 80 VDC (60 VDC maximum with 10-50 mA output)

Power Supply Effects:
<±0.01% of range for a ±10 V change

Maximum Loop Resistance (R) vs. Power Supply Voltage (PSV):

4-20 mA range: $R\ max = \frac{PSV - 12\ V}{20\ mA}$

10-50 mA range: $R\ max = \frac{PSV - 12\ V}{50\ mA}$

Display Module:
3½- or 4½-digit, LCD 0.35" (9 mm) character size
Optimal view angle 60° (explosion-proof housing only)

Radio Frequency Effects:
<0.4 mV (referred to input), +0.2% of span (referred to output) when exposed to 5 W transmitter with frequency range 20-460 MHz at a distance of 1 m

Calibration:
Output and display are factory calibrated to customer-specified ranges

Terminals:
Compression type, wire size 14 AWG max., 10 A max., 300 V max.

Weight:
General purpose housing: 0.5 lbs. (0.23 kg)
Explosion-proof housing: 4.2 lbs. (1.88 kg)

*Linearization accuracy is dependent on input type and ranges.

FREQUENCY TRANSMITTER

Input:
Periodic wave form: Pulse, triangle, or sine
Ranges: 0-30 Hz to 0-10 KHz
Amplitude: 50 mV to 200 V, peak

Input Impedance:
>300 K ohms

Output:
Standard: 4-20 mA or 10-50 mA, jumper selectable
Optional: digital display, scaled in engineering units as requested

Span Adjustment:
Front-accessible, multi-turn, infinite resolution potentiometer permits minimum ±10% adjustment. Wider ranges available at no extra charge

Zero Adjustment:
Front-accessible, multi-turn, infinite resolution potentiometer permits minimum ±10% adjustment. Wider ranges available at no extra charge

Input Open Circuit Response:
Downscale drive standard

Calibrated Accuracy, Including Linearity:
±0.1% of span

Isolation:
Input and output circuits isolated by transformers

Ambient Temperature Coefficient:
Ambient temperature range: 32° to 158°F (0° to 70°C)
Gain: <±0.01%/°F
Zero: <±2 μV/°F referred to the input

Ambient Temperature Range:
(with or without Liquid Crystal Display)
Operating: −20° to 175°F (−25° to 80°C)
Storage: −40° to 175°F (−40° to 80°C)

Load Effect:
<.05% change in output current for load variation from short circuit to maximum loop resistance

Power Supply Range:
12 to 80 VDC (60 VDC maximum with 10-50 mA output)

Power Supply Effects:
<±0.01% of range for a ±10 V change

Maximum Loop Resistance (R) vs. Power Supply Voltage (PSV):

4-20 mA range: $R\ max = \frac{PSV - 12\ V}{20\ mA}$

10-50 mA range: $R\ max = \frac{PSV - 12\ V}{50\ mA}$

Display Module:
3½- or 4½-digit, LCD 0.35" (9 mm) character size
Optimal view angle 60° (explosion-proof housing only)

Radio Frequency Effects:
<0.4 mV (referred to input), +0.2% of span (referred to output) when exposed to 5 W transmitter with frequency range 20-460 MHz at a distance of 1 m

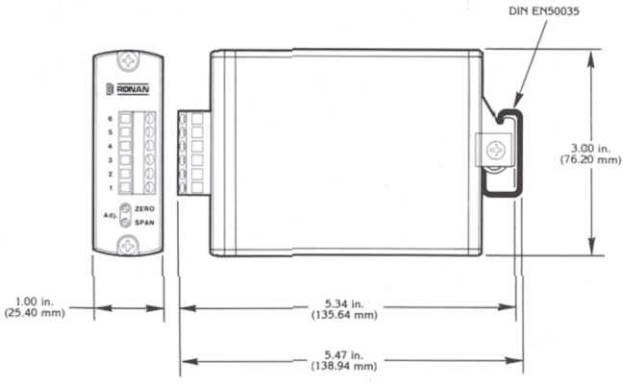
Calibration:
Output and display are factory calibrated to customer-specified ranges

Terminals:
Compression type, wire size 14 AWG max., 10 A max., 300 V max.

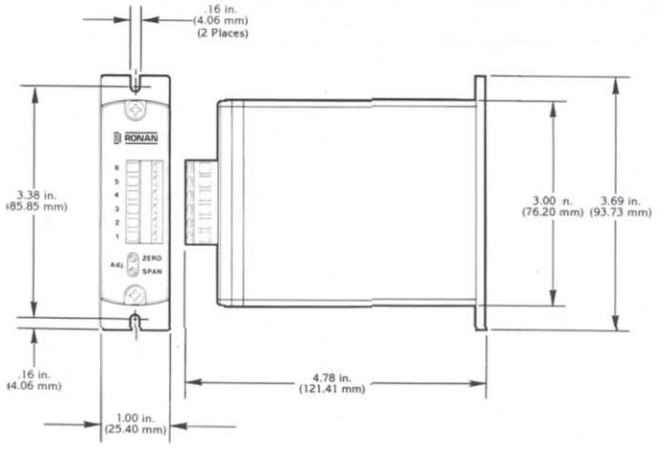
Weight:
General purpose housing: 0.5 lbs. (0.23 kg)
Explosion-proof housing: 4.2 lbs. (1.88 kg)

NOTE: Specifications apply at an ambient temperature of 25±2°C unless otherwise stated. Specifications are subject to change without notice.

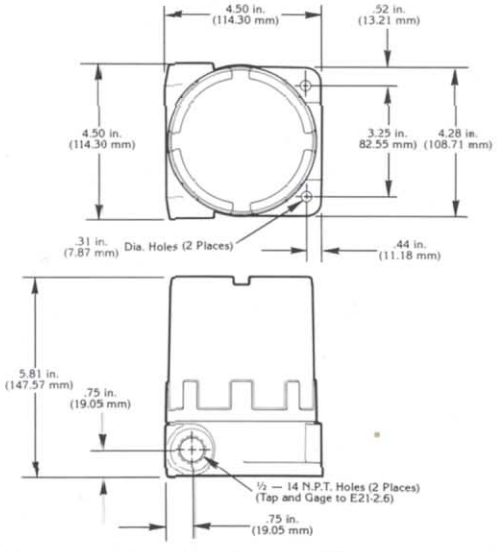
Mechanical Dimensions



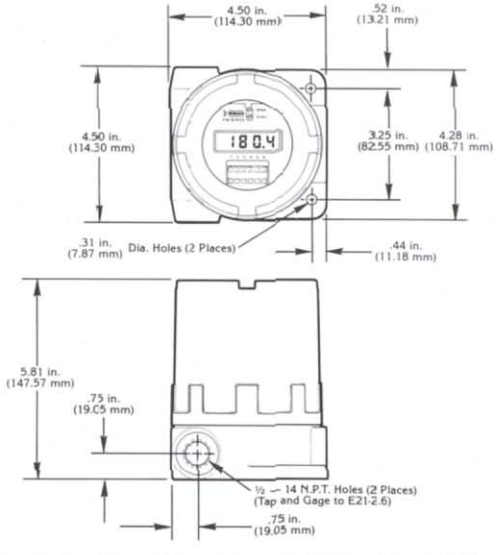
Isolated Two-Wire Transmitter
DIN Rail-Mount — Dimensional Drawing



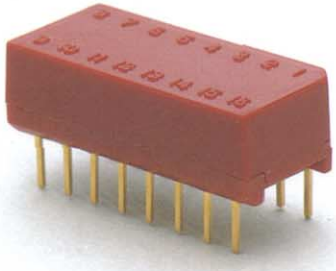
Isolated Two-Wire Transmitter
Surface-Mount — Dimensional Drawing



Isolated Two-Wire Transmitter with
Explosion-Proof Housing — Dimensional Drawing



Isolated Two-Wire Transmitter with LCD,
Explosion-Proof Housing — Dimensional Drawing



INPUT TYPE AND RANGE SELECTION

X54 transmitters provide total flexibility when you need to select input and output parameters in the field. By exchanging one to three plug-in submodules, input type, output range and linearization (if applicable) can be easily selected. The local LCD readout range may be selected by a separate submodule, allowing different scaling from the output range. Consult Ronan or your local representative for submodule selection information.

Ordering Information

THERMOCOUPLE**	Model	Description
	X54-210 -( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D (Note 1)
	X54-210L-( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, Linearized (Note 1)
	*X54-211 -( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 3½-Digit Display (Note 1)
	*X54-211L-( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 3½-Digit Display, Linearized (Note 1)
	*X54-212 -( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 4½-Digit Display (Note 1)
	*X54-212L-( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 4½-Digit Display (Note 1)
	X54-215 -( )-( )-( )	General Purpose Housing, Surface-Mount
	X54-215L-( )-( )-( )	General Purpose Housing, Surface-Mount, Linearized
	X54-216 -( )-( )-( )	General Purpose Housing, DIN Rail-Mount
	X54-216L-( )-( )-( )	General Purpose Housing, DIN Rail-Mount, Linearized
		Output Type: B = 4-20 mA; C = 10-50 mA
		Input Range: °C or °F
		Type E, J, K, T, R or S

ENGINEERING UNITS**	Model	Description
	X54-220 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D (Note 1)
	*X54-221 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 3½-Digit Display (Note 1)
	*X54-222 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 4½-Digit Display (Note 1)
	X54-225 -( )-( )	General Purpose Housing, Surface-Mount
	X54-226 -( )-( )	General Purpose Housing, DIN Rail-Mount
		Output Type: B = 4-20 mA; C = 10-50 mA
		Input Range: 010 = 0-10 mV; 025 = 0-25 mV; 050 = 0-50 mV; 15 = 1-5 mA; 420 = 4-20 mA; 1050 = 10-50 mA; 050000 = 0-5 VDC; 010000 = 0-10 VDC; 110000 = 1-10 VDC

RTD**	Model	Description
	X54-230 -( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D (Note 1)
	X54-230L-( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, Linearized (Note 1)
	*X54-231 -( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 3½-Digit Display (Note 1)
	*X54-231L-( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 3½-Digit Display, Linearized (Note 1)
	*X54-232 -( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 4½-Digit Display (Note 1)
	*X54-232L-( )-( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 4½-Digit Display, Linearized (Note 1)
	X54-235 -( )-( )-( )	General Purpose Housing, Surface-Mount
	X54-235L-( )-( )-( )	General Purpose Housing, Surface-Mount, Linearized
	X54-236 -( )-( )-( )	General Purpose Housing, DIN Rail-Mount
	X54-236L-( )-( )-( )	General Purpose Housing, DIN Rail-Mount, Linearized
		Output Type: B = 4-20 mA; C = 10-50 mA
		Input Range: °C or °F
		9 = 10 ohm at 25°C Copper RTD; 10 = 10 ohm at 0° Copper RTD; 100 = 100 ohm Platinum; 120 = 120 ohm Nickel

FREQUENCY	Model	Description
	X54-240 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D (Note 1)
	*X54-241 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, Digital Display (Note 1)
	*X54-242 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 4½-Digit Display (Note 1)
	X54-245 -( )-( )	General Purpose Housing, Surface-Mount
	X54-246 -( )-( )	General Purpose Housing, DIN Rail-Mount
		Output Type: B = 4-20 mA; C = 10-50 mA
		Input Range: 0 to Full Scale (Full Scale = 30 Hz to 10 KHz)

POTENTIOMETER**	Model	Description
	X54-250 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D (Note 1)
	*X54-251 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 3½-Digit Display (Note 1)
	*X54-252 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 4½-Digit Display (Note 1)
	X54-255 -( )-( )	General Purpose Housing, Surface-Mount
	X54-256 -( )-( )	General Purpose Housing, DIN Rail-Mount
		Output Type: B = 4-20 mA; C = 10-50 mA
		Input Range: ohms

AC CURRENT/VOLTAGE	Model	Description
	X54-260 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D (Note 1)
	*X54-261 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 3½-Digit Display (Note 1)
	*X54-262 -( )-( )	Explosion-Proof Housing, Cl. I, Div. 1, Grps. B, C & D, 4½-Digit Display (Note 1)
	X54-265 -( )-( )	General Purpose Housing, Surface-Mount
	X54-266 -( )-( )	General Purpose Housing, DIN Rail-Mount
		Output Type: B = 4-20 mA; C = 10-50 mA
		Input Range: Current or Voltage

*For all units with digital displays, include the display range and units of measure, e.g.:
X54-221-420-B-(0 to 100.0 ft./sec.)
Units of Measure
Display Range

Note 1: Also certified as NEMA type 4 and IP65 classification. **Consult factory for I.S. applications.**

**These units are field scaleable using plug-in sub modules shown of page 6. All other units cans be rescaled at the factory.

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