Acromag
THE LEADER IN INDUSTRIAL I/O

MONITORING & CONTROL SOLUTIONS

TT230 Series
Thin Transmitters

DIN-Rail Mount

USB-Configured

Slim design

Space-Saving 2/3-Wire Isolated Transmitters

Answers @ Acromag

Process Instruments, Signal Conditioners, and Distributed I/O

Experience counts: *especially when selecting an I/O partner. And with 50 years of I/O experience, Acromag can help you improve reliability, increase productivity and reduce your costs.*

Acromag: The I/O Leader

Acromag is a customer-driven manufacturer focused on developing embedded I/O products that provide the best long term value in the industry. Compare and you'll find that Acromag products offer an unmatched balance of price, performance, and features.

50 Years of I/O Experience

Acromag has more than 50 years of measurement and control experience. Since 1957, we have delivered nearly a million units to thousands of customers around the globe for manufacturing, power, environmental, transportation, and military applications.

Quality with a 2-Year Warranty

We take every measure to guarantee you dependable operation and products that perform at or beyond the specifications. State-of-the-art manufacturing and military-grade components add an extra degree of ruggedness. Acromag is also certified for ISO9000/AS9100 quality control management procedures.

Online Ordering

For your convenience, Acromag provides full product documentation and pricing information on our website. You can obtain quotes or even place your order directly on our website.

Fast Delivery from Stock

Most products can be shipped within 24 hours of receiving your order.

Special Services

We are happy to accommodate your special requirements and offer the following services:

- Custom product development
- Custom calibration
- Source inspections, quality audits
- Special shipping, documentation
- Protective humiseal coating
- Plastic and stainless steel tagging

Certification and Approvals

Many Acromag products carry globally recognized agency approvals and safety certifications.

- CE
- UL, cUL
- Atex
- CSA
- Ethernet/IP conformance
- Modbus conformance
- HART conformance

2 YEAR WARRANTY

24 HOUR STOCK ITEM

ISO9001
AS9100

MADE IN USA

30765 South Wixom Road, Wixom, Michigan 48393 USA ■ Tel: 248-295-0880 ■ www.acromag.com

Transmitters: TT230 Series

TT230 Series Thin 2/3-Wire Transmitters

Introduction

The TT230 series features space-saving thin transmitters and isolators that combine flexibility with rugged housing to withstand harsh industrial environments. Advanced signal processing capabilities, variable range input, and convenient USB programming make these instruments versatile for many applications.

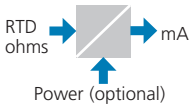
Input
Various sensor signals (by model)

Output
4-20mA current (sink or source)

Power
- Loop-power (2-wire connection)
- Local DC power source (3-wire connection)

Key Features and Benefits
- Space saving 12.5mm housing
- Easy setup via USB with Windows® configuration software
- Supports sink and source output in a single model
- Better than 0.1% accuracy
- 1500V AC isolation
- Wide operation temperature of -40 to 80°C
- Fast response times
- Adjustable filtering levels
- Normal/reverse acting operation (except TT231)
- Shock and vibration resistant
- Designed for use in hazardous locations UL/cUL Class 1 Division 2 Zone 2

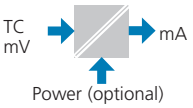
TT231 RTD Input



Input
- 100 ohm Pt RTD; alpha = 379-393
- 0-900 ohms linear resistance

See data sheet

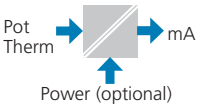
TT233 Thermocouple, Millivolt Input



Input
- Type J,K,T,R,S,E,B,N thermocouple
- ±100mV

See data sheet

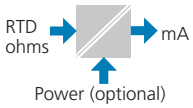
TT234 Potentiometer/ Thermistor Input



Input
- 100-100K ohms from potentiometer/slidewire
- 2K - 30K ohms thermistor
- Custom 100 - 1M ohms

See data sheet

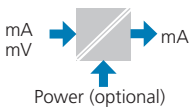
TT235 Isolated RTD Input



Input
- 100, 200, 500, or 1000 ohm Pt RTD; 120 ohm Ni RTD; 10 ohm Cu RTD
- 0-450 ohms linear resistance

See data sheet

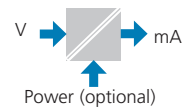
TT236 Current, Millivolt Input



Input
- 0-20mA, 4-20mA DC
- ±1mA, ±20mA DC
- 0-500mV DC
- ±500mV DC
- 0-20A AC

See data sheet

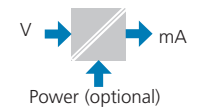
TT237 Low-Voltage Input



Input
- ±1V DC
- ±5V DC
- ±10V DC

See data sheet

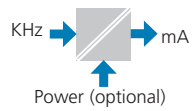
TT238 High-Voltage Input



Input
- ±15V DC
- ±75V DC
- ±150V DC

See data sheet

TT239 Frequency, Pulse Input



Input
- 0 - 100Khz
- Up to 12V rms amplitude
- Unipolar or bipolar signals

See data sheet

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Transmitters: TT230 Series

Key Features

Sink or Source Output

Extra output connections support sourced output (3-wire) with local power supply.

Loop-powered 4-20mA

Power is received from the output loop (2-wire) to provide sinking current output.

Simple Configuration

Digital setup and calibration with straightforward Windows (XP, Vista, 7, 8) software via USB.

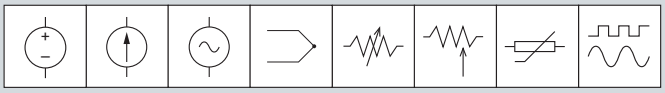
Space Saving

A strikingly thin enclosure, at only 12.5mm wide, to easily achieve high-density DIN-rail mounting.

Rugged Design

Wide ambient temperature operation, shock and vibration-resistant, as well as CE and UL/cUL Class 1, Division 2, Zone 2 approved.

Input Options



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Transmitters: TT230 Series

General Operation and Performance Specifications

The following specifications are common to all TT230 Series transmitter modules.

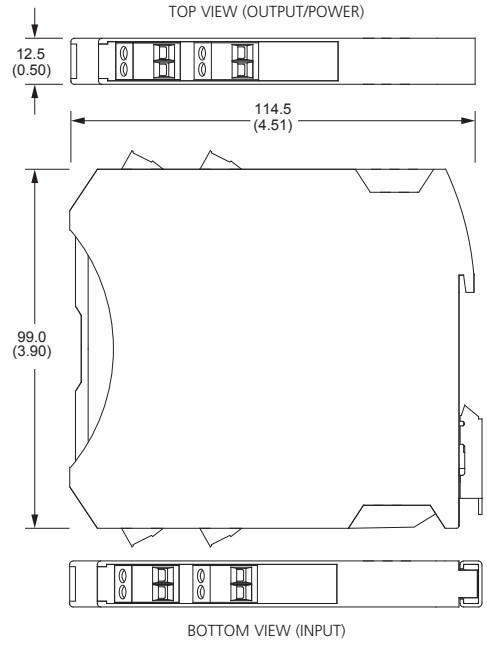
■ USB Interface	
USB Connector	USB Mini-B type socket, 5-pin
USB Data Rate	12Mbps. USB v1.1 and 2.0 compatible

■ Output	
Output Range	4 to 20mA DC
Accuracy	±0.05% of span typical

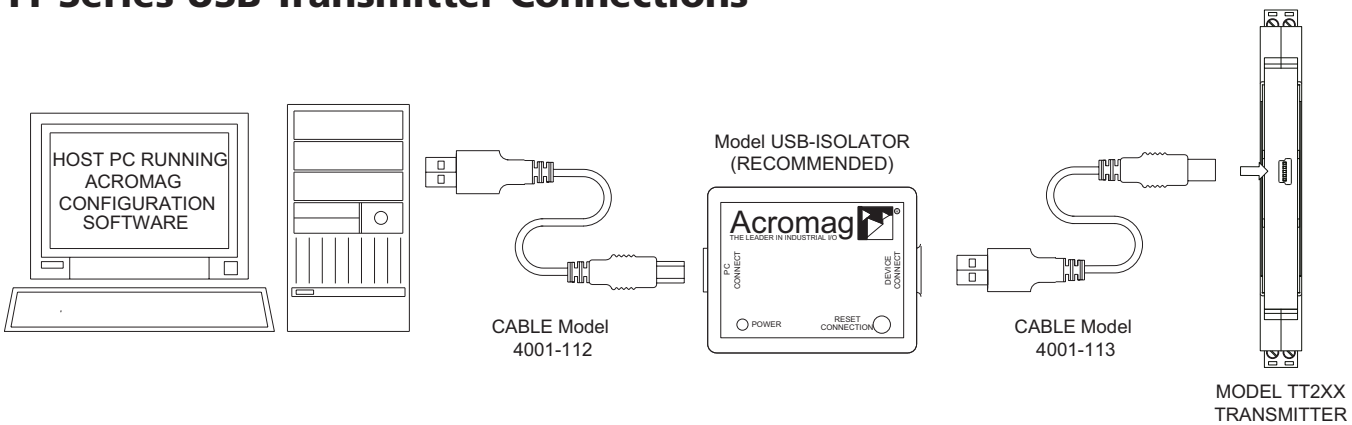
■ Environmental	
Operating Temperature	-40 to 80°C (-40° to 176°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Relative Humidity	5 to 95% non-condensing
Power Requirement	12-32V DC DC SELV (Safety Extra Low Voltage); 24mA max.
Isolation *(except model TT231)*	1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.
Shock and Vibration Immunity	Vibration: 4g, per IEC 60068-2-64. Shock: 25g, per IEC 60068-2-27.
Electromagnetic Compatibility (EMC) Compliance	Radiated Emissions: BS EN 61000-6-4, CISPR 16. RFI: BS EN 61000-6-2, IEC 61000-4-3. Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6. ESD: BS EN 61000-6-2, IEC 61000-4-2. EFT: BS EN 61000-6-2, IEC 61000-4-4. Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.
Approvals	CE compliant. UL/cUL listing. Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical	
General	General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.
Case Material	Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.
I/O Connectors	Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.
Shipping Weight	0.22 kg (0.5 pounds) packed

■ **Dimensions** **in millimeters (inches)*

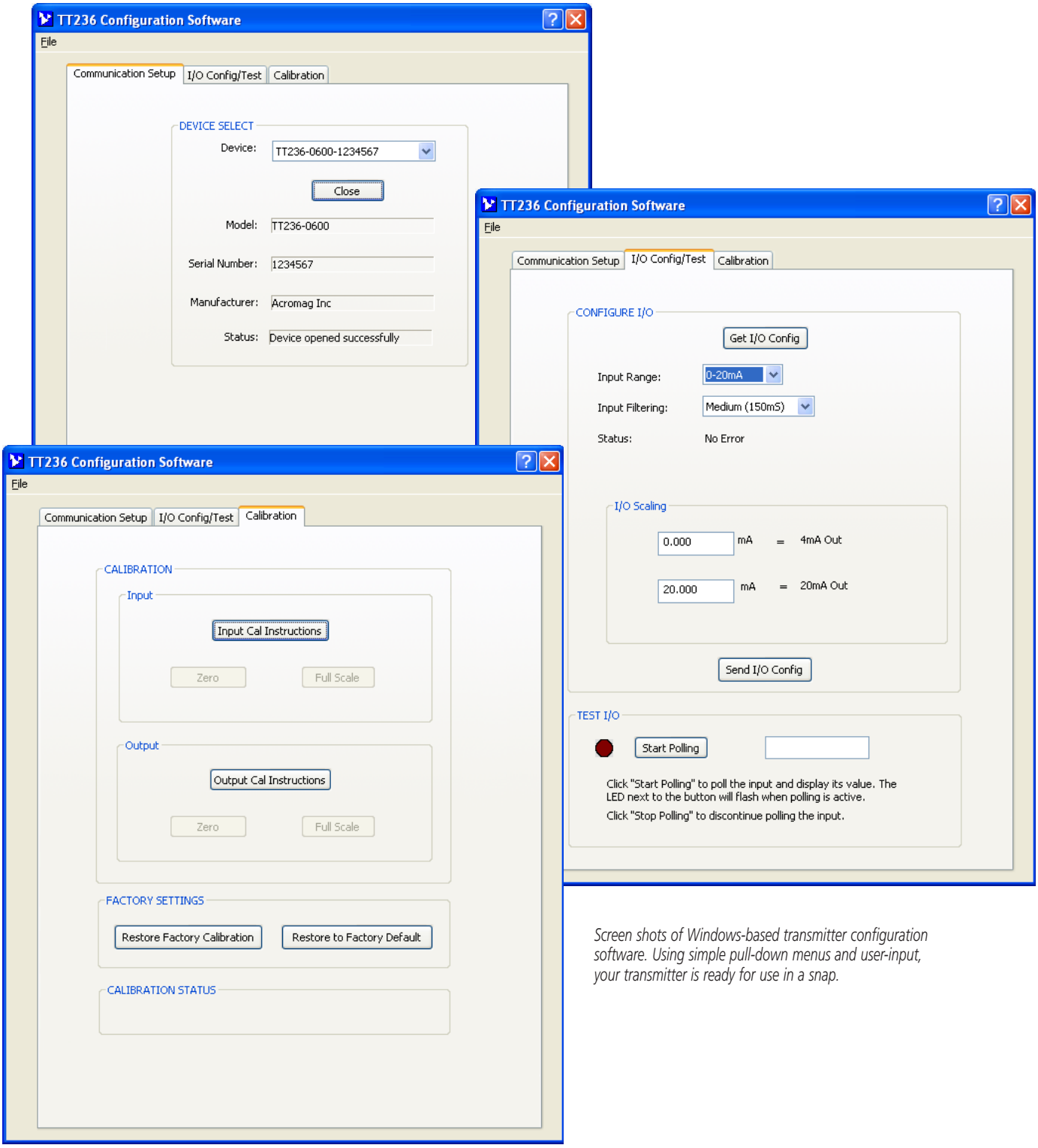


TT Series USB Transmitter Connections



Transmitters: TT230 Series

Module Configuration



Screen shots of Windows-based transmitter configuration software. Using simple pull-down menus and user-input, your transmitter is ready for use in a snap.

Accessories

◆ Configuration Software

TT230 Series Configuration
Simple to use, whether you need the full software interface package (includes USB isolator and cables) or just the configuration software itself. Acromag makes it easy to get started.

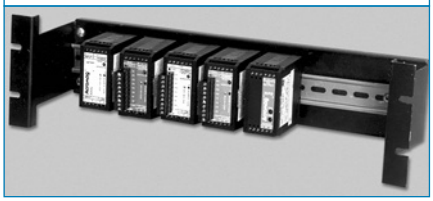
Ordering Information

TTC-SIP
Software Interface Package, includes: configuration software CD-ROM, USB-Isolator, and two USB cables (4001-112, 4001-113).

TT230-Config/Cal
Factory custom configuration/calibration service for all TT230 models.

TT230-CONFIG
Free download of TT230 Transmitter Configuration Software.

◆ Mounting Hardware



Din-Rail Mounting
For your convenience, Acromag offers several mounting accessories to simplify your system installation. Our 19" rack-mount kit provides a clean solution for mounting your I/O modules and a power supply. Or you can buy precut DIN rail strips for mounting on any flat surface.

Ordering Information

20RM-16-DIN
19" rack-mount kit with DIN rail.

DIN RAIL 3.0
DIN RAIL 16.7
DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

◆ Power Supplies

Universal Slimline Power Supplies

Input Power Requirement
85 to 264V AC or 105 to 370V DC

Output
5V DC, 12V DC, or 24V DC
10W to 240W

Ordering Information

PS5R-SB24
Power supply, 15W, 0.65A at 24V DC

PS5R-SD24
Power supply, 60W, 2.5A at 24V DC

Visit www.acromag.com for additional models and more information.

◆ USB Isolator

USB-to-USB Isolator
This compact, industrial-grade isolator provides a high-voltage isolation barrier between a computer and a connected USB device; protecting equipment from electrical surges, transient voltage spikes, and ground loop currents.

Ordering Information

USB-Isolator
USB isolator, includes USB cable (Part # 4001-112) for isolator-to-PC connection

◆ USB Cables

Cables for both PC-to-USB isolator and USB isolator-to-transmitter connections.

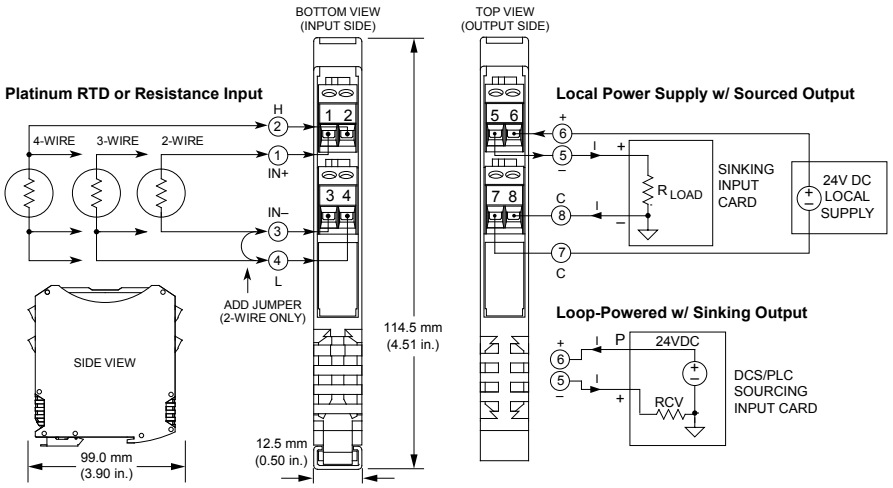
Ordering Information

4001-112
USB Cable, Type A to Type B, 1 meter

4001-113
USB Cable, Type A to Mini-B, 1 meter

Transmitters: TT230 Series

TT231 RTD/resistance input two-wire/three-wire transmitter



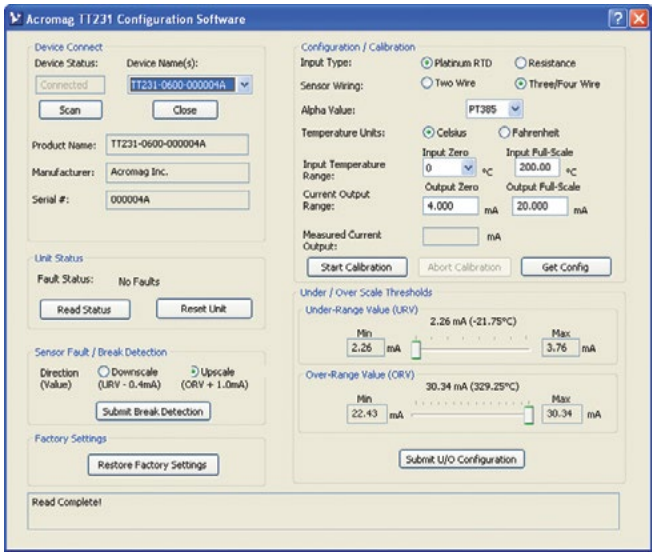
100 ohm Pt RTD or 0-900 ohm input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT231 model is a space-saving two-wire transmitter that converts a 100 ohm Platinum RTD sensor input to a proportional 4-20mA signal. Power is received from the output loop current or a DC supply when using a three-wire connection. The transmitter provides sensor excitation plus performs linearization, lead-wire compensation, and lead-break detection.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.



TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Flexible RTD or linear resistance input ranges (any 100 ohm Pt RTD with 375-393 alpha)
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- Advanced analog signal conditioning ASIC eliminates digitization errors
- Low temperature drift (<80ppm/°C)
- Supports sink or source output wiring
- Programmable over/under-range limits
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- NAMUR-compliant output loop current
- Shock (50g) and vibration (5g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals

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Transmitters: TT230 Series

TT231 RTD/resistance input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

USB Interface

USB Connector
USB Mini-B type socket, 5-pin.

USB Data Rate
12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection
Transient voltage suppression on power and data lines.

USB Cable Length
5.0 meters maximum.

Driver
Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

Input

Default Configuration
100Ω Pt RTD, α=0.00385 Ω/Ω/°C, 0-200°C input, 4-20mA output, upscale break detection.

Input Configuration
Two-, three- or four-wire sensor input connections.

Input Ranges
100 ohm Platinum RTD, alpha = 375-393, 385 (default), -50 to 900°C (-58 to 1652°F).

0 to 900 ohms linear resistance.

Programs in °C, °F, or ohmic integer values only.

Zero Adjust
RTD 3/4 wire: -50, -17.78, or 0°C (-58, 0, 32°F).
RTD 2 wire: 0°C (32°F) fixed.
RES: 0 or 100 ohms.

Full-Scale Adjust
RTD: up to 900°C (1652°F), 50°C (58°F) span minimum.
Resistance: up to 900 ohms, 8 ohm span minimum.

Excitation Current
0.5mA, nominal, each ± lead.

Lead-Wire Compensation
25 ohms per lead.

Lead Break (Sensor Burnout) Detection
Configurable for either upscale or downscale.

Input Filter Bandwidth
-3dB at 700Hz, typical, normal mode filter.

Output

Output Range
4 to 20mA DC.
Under-scale limit adjustable for 2.1 to 3.6mA, nominal.
Over-scale limit adjustable for 21 to 30mA, nominal.

Output Fault Limits (Sensor Fault)
0.4mA below selected under-scale threshold and 1.0mA above over-scale threshold, typical.

Output Compliance
$R_{LOAD} = (V_{SUPPLY} - 8.6V) / 0.020A$.
R_{LOAD} = 0 to 750 ohms @ 24V DC.

Output Accuracy
Better than ±0.1% of span, typical for spans less than 500°C. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Ambient Temperature Effect
Better than ±0.008% per °C of input span or ±80ppm/°C, typical. Includes the combined effects of zero and span drift over temperature.

Output Response Time (for step input change)
500µS, typical with 250 ohm load (to reach 98% of final output value).

Environmental

Operating temperature
-40 to 80°C (-40° to 176°F).

Storage temperature
-40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power Requirement
9-32V DC SELV (Safety Extra Low Voltage), 30mA max.

Shock and Vibration Immunity
Vibration: 5g, per IEC 60068-2-64.
Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance
Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals
CE compliant. UL/cUL listing.
Designed for Class I; Division 2; Groups ABCD; Zone 2

Physical

General
General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material
Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors
Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions
12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight
0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT231-0600
Transmitter, RTD/resistance input.

Services

TT230-Config/Cal
Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)
Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR
USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100
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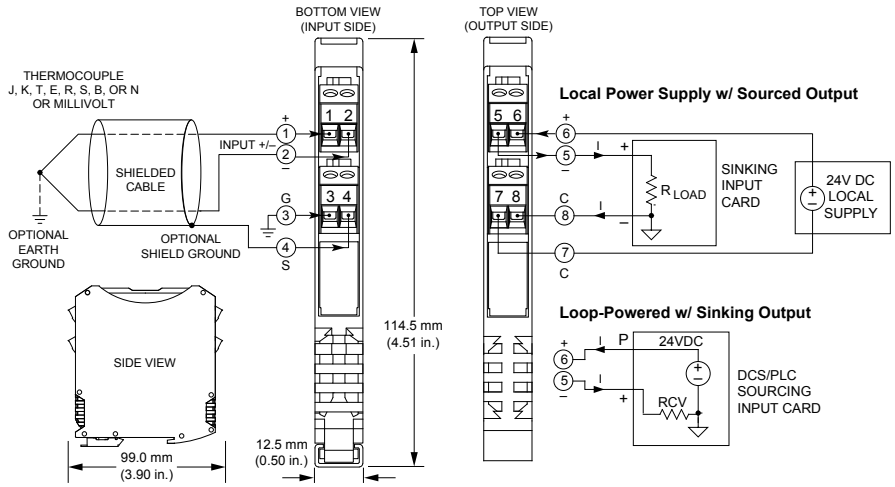
Transmitters: TT230 Series

TT233 Thermocouple/millivolt input two-wire/three-wire transmitter



Universal thermocouple or ±100mV input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

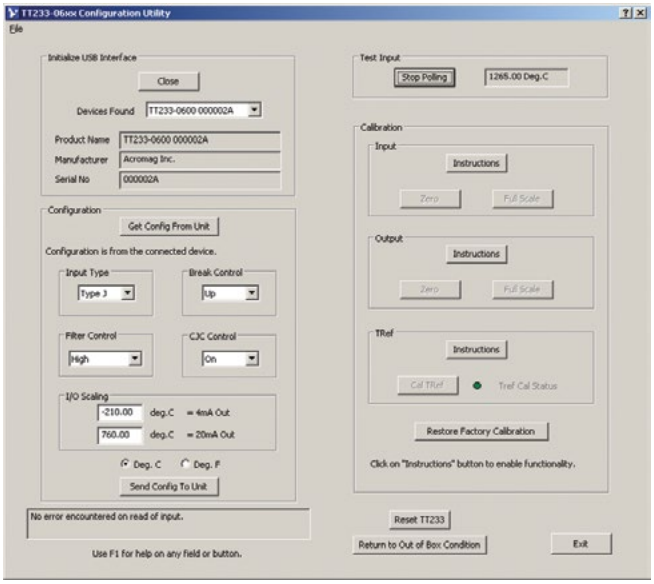
Description

The TT233 model is a space-saving two-wire transmitter that isolates and converts a millivolt or thermocouple sensor input to a proportional 4-20mA control signal. Power is received from the output loop current or a DC supply when using a three-wire connection. The transmitter performs thermocouple linearization, cold-junction compensation, and lead-break detection.

High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.



TT233 Model software allows you to configure transmitters offline, save the file, and download settings into units later, at your convenience.

TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Universal thermocouple or millivolt input (TC Type J, K, T, R, S, E, B, N or ±100mV)
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- Low temperature drift (<80ppm/°C)
- User-selectable filtering (none, low, med., high)
- Supports sink or source output wiring
- Supports reverse-acting (inverse) output
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (50g) and vibration (5g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals

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Transmitters: TT230 Series

TT233 Thermocouple input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

USB Interface

USB Connector
USB Mini-B type socket, 5-pin.

USB Data Rate
12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection
Transient voltage suppression on power and data lines.

USB Cable Length
5.0 meters maximum.

Driver
Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

Input

Default Configuration/Calibration
Input: TC J, -210 to 760°C, high filter, Break: up
Output: 4 to 20mA.

Input Ranges and Accuracy

Input	Range	Accuracy
TC J	-210 to 760°C (-346 to 1400°F)	±0.5°C
TC K	-200 to 1372°C (-328 to 2502°F)	±0.5°C
TC T	-260 to 400°C (-436 to 752°F)	±0.5°C
TC R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
TC B	260 to 1820°C (500 to 3308°F)	±1.0°C
TC N	-230 to 1300°C (-382 to 2372°F)	±1.0°C
mV	-100 to 100mV	±0.1mV

Error includes the effects of repeatability, terminal point conformity, and linearization. Does not include CJC error.

Thermocouple Reference (Cold Junction Compensation)
±0.2°C typical, ±0.5°C maximum at 25°C.

Ambient Temperature Effect
Better than ±80ppm/°C (±0.008%/°C).

Zero Scaling Adjust
0 to 95% of range, typical.

Full Scale Adjust
5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection
Configurable for either upscale (24mA) or downscale (3.3mA) operation.

Input Over-Voltage Protection
Bipolar Transient Voltage Suppressers (TVS), 5.6V clamp level typical.

Resolution
Millivolt input: 0.0025% (1 part in 40,000)
Thermocouple input: 0.1°C.

Input Filter
Selectable digital filtering settings (none, low, medium, high).

Input Filter Bandwidth
Normal mode plus digital filtering within the ADC. Bandwidth (-3dB) varies with digital filter setting from 4Hz without filtering to 0.33Hz with high filtering.

Noise Rejection (Common Mode, High Filter)
155dB @ 60Hz, typical with 100 ohm input unbalance.

Output

Output Range
4 to 20mA DC.

Output Compliance
$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.
R_{LOAD} = 0 to 650 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
No filtering	104 milliseconds
Low filter	380 milliseconds
Medium filter	760 milliseconds
High filter	960 milliseconds

Environmental

Operating temperature
-40 to 80°C (-40° to 176°F).

Storage temperature
-40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power Requirement
12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation
1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity
Vibration: 5g, per IEC 60068-2-64.
Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance
Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals
CE compliant. UL/cUL listing.
Designed for Class I; Division 2; Groups ABCD; Zone 2.

Physical

General
General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material
Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors
Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions
12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight
0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT233-0600
Transmitter, thermocouple/millivolt input.

Services

TT230-Config/Cal
Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)
Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR
USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100
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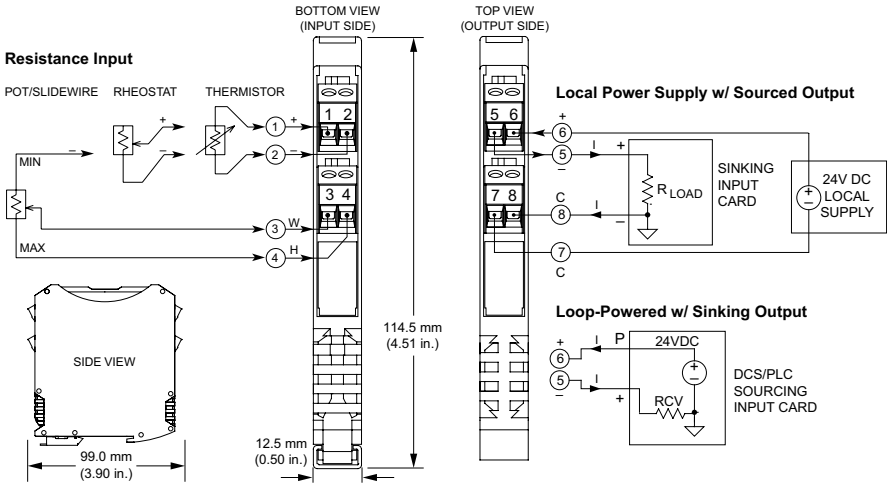
Transmitters: TT230 Series

TT234 Potentiometer / thermistor input two-wire transmitter



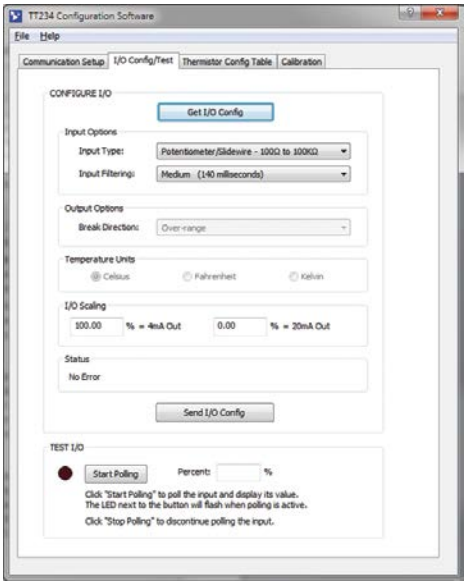
Potentiometer/slidewire, thermistor input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT234 model is a space-saving two-wire transmitter that isolates and converts a resistive sensor input to a proportional 4-20mA signal. Power is received from the output loop current or a DC supply when using a three-wire connection. The transmitter provides sensor excitation plus performs linearization, lead-wire compensation, and lead-break detection.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.



TT234 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Interfaces 100-100kΩ potentiometer/slidewire and 100-1MΩ NTC thermistor/rheostat inputs
- Customizable thermistor linearization table with preset curves for popular resistances
- 1500V isolation between input/output circuits
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- Supports normal or reverse-acting output
- Supports sink or source output wiring
- User-selectable filtering (none, low, med., high)
- Fast response (as low as 11ms)
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Wide ambient operation (-40 to 80°C)
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals

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Transmitters: TT230 Series

TT234 Potentiometer / thermistor input two-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

USB Interface

USB Connector
USB Mini-B type socket, 5-pin.

USB Data Rate
12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection
Transient voltage suppression on power and data lines.

USB Cable Length
5.0 meters maximum.

Driver
Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

Input

Default Configuration
Pot/slidewire, 0% to 100% input, 4-20mA output, downscale break detect, medium filter.

Input Configuration
Two- or three-wire sensor input connections.

User-configurable thermistor linearization table has preset curves for resistances below at 25°C.

Programs in °C, °F, °K, or ohmic integer values only.

Input Ranges

Input Type	Input Range	Accuracy
Potentiometer	0 to 100% (100 to 100KΩ)	< ±0.01% of span
Rheostat	100 to 1MΩ	< ±0.5% of input
Thermistor 2252Ω	-40 to 100°C (-40 to 212°F)	< ±0.05°C (±0.09°F)
Thermistor 2752Ω	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 2795Ω	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 3kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 5kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 10kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 30kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Custom thermistor	100 to 1MΩ	< ±0.5% of input

Input Scaling Adjust
Zero: 0 to 95% of range, typical.
Full scale: 5 to 100% of full scale range, typical.

Excitation Voltage
Thermistor/rheostat: 1.25V DC, typical.
Potentiometer: 0.3V DC, limited to 3.35mA, typical.

Lead Break (Sensor Burnout) Detection
Configurable for either upscale or downscale on thermistor or rheostat inputs. Downscale only on potentiometer/slidewire inputs.

Output

Output Range
4 to 20mA DC.
Under-range capability 3.5mA.
Over-range capability 24mA.

Output Compliance
R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A.
R_{LOAD} = 0 to 650 ohms @ 24V DC.

Output DAC Resolution
16-bit D/A converter

Output Accuracy
Better than ±0.05% of span, typical (±0.1% max.) for for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Ambient Temperature Effect
Better than ±0.008% per °C of input span or ±80ppm/°C, typical. Includes the combined effects of zero and span drift over temperature.

Output Response Time (for step input change)
No filter: 11ms. Medium filter: 150ms.
Low filter: 40ms. High filter: 1200ms.

Environmental

Operating temperature
-40 to 80°C (-40° to 176°F).

Storage temperature
-40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power Requirement
12-32V DC SELV (Safety Extra Low Voltage), 24mA maximum.

Shock and Vibration Immunity
Vibration: 4g, per IEC 60068-2-64.
Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance
Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals
CE compliant. UL/cUL Class I Div. 2 Zone 2.

Physical

General
General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material
Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors
Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions
12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight
0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT234-0600
Transmitter, potentiometer/thermistor input

Services

TT230-Config/Cal
Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)
Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR
USB-to-USB isolator, includes USB cable (4001-112).

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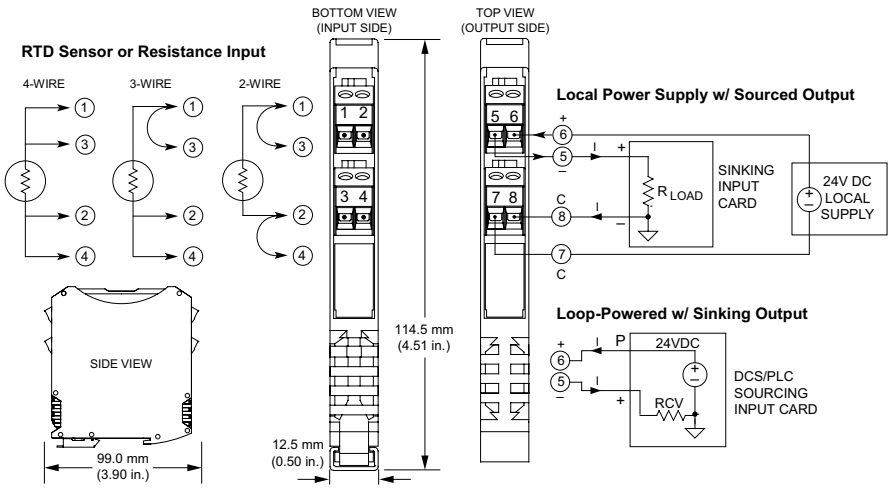
Transmitters: TT230 Series

TT235 Isolated RTD/resistance input two-wire transmitter



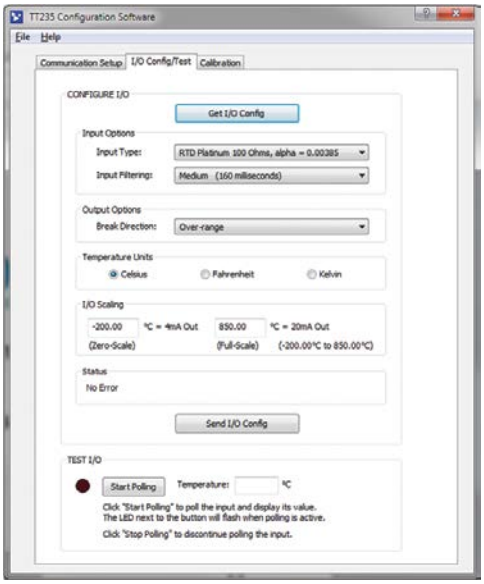
RTD (Pt, Ni, Cu) or 0-450 ohm input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT235 model is a space-saving two-wire transmitter that isolates and converts an RTD sensor input to a proportional 4-20mA signal. Power is received from the output loop current or a DC supply when using a three-wire connection. The transmitter provides sensor excitation plus performs linearization, lead-wire compensation, and lead-break detection.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.



TT235 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.
Windows XP, Vista, 7, & 8

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Selectable RTD or linear resistance input type: Pt RTD (100Ω, 200Ω, 500Ω, or 1000Ω), Ni RTD (120Ω), Cu RTD (10Ω), or Resistance (0-450Ω)
- 1500V isolation between input/output circuits
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- Supports normal or reverse-acting output
- Supports sink or source output wiring
- User-selectable filtering (none, low, med., high)
- Fast response (as low as 22ms)
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Wide ambient operation (-40 to 80°C)
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals

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Bulletin #8400-755b

Transmitters: TT230 Series

TT235 Isolated RTD/resistance input two-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

USB Interface

USB Connector
USB Mini-B type socket, 5-pin.

USB Data Rate
12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection
Transient voltage suppression on power and data lines.

USB Cable Length
5.0 meters maximum.

Driver
Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

Input

Default Configuration
100Ω Pt RTD, α=0.00385, -200 to 850°C input, 4-20mA output, upscale break detect, medium filter.

Input Configuration
Two-, three- or four-wire sensor input connections.

Programs in °C, °K, °F, or ohmic integer values only.

Input Ranges

Input Type	Input Range	Accuracy[2]
RTD, Pt 100Ω	-200 to 850°C (-328 to 1562°F)	±0.2°C, ±0.019%
RTD, Pt 200Ω	-200 to 850°C	±0.3°C, ±0.029%
RTD, Pt 500Ω	-200 to 850°C	±0.5°C, ±0.048%
RTD, Pt 1000Ω	-200 to 850°C	±1.0°C, ±0.095%
RTD, Ni 120Ω (Minco 7-120)	-80 to 320°C (-112 to 608°F)	±0.08°C, ±0.020%
RTD, Cu 10Ω (Minco 16-9)	-200 to 270°C (-328 to 518°F)	±0.5°C, ±0.106%
Resistance (linear)[1]	0 to 450Ω	±0.05Ω, ±0.010%

Note 1: Linear resistance input range approaches but does not include 0Ω and 500Ω. If exactly 0Ω or 500Ω is measured, break detection is triggered.

Note 2: Rated accuracy (in °C and % of span) applies for input spans greater than 5% of input full-scale.

Input Scaling Adjust
Zero: 0 to 95% of range, typical.
Full scale: 5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection
Configurable for either upscale or downscale.

Output

Output Range
4 to 20mA DC.
Under-range capability 3.5mA.
Over-range capability 24mA.

Output Compliance
R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A.
R_{LOAD} = 0 to 650 ohms @ 24V DC.

Output DAC Resolution
16-bit D/A converter

Output Accuracy
Better than ±0.05% of span, typical (±0.1% max.) for for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Ambient Temperature Effect
Better than ±0.008% per °C of input span or ±80ppm/°C, typical. Includes the combined effects of zero and span drift over temperature.

Output Response Time (for step input change)
No filter: 22ms.
Low filter: 50ms.
Medium filter: 160ms.
High filter: 1210ms.

Environmental

Operating temperature
-40 to 80°C (-40° to 176°F).

Storage temperature
-40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power Requirement
12-32V DC SELV (Safety Extra Low Voltage), 24mA maximum.

Shock and Vibration Immunity
Vibration: 4g, per IEC 60068-2-64.
Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance
Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals
CE compliant. UL/cUL Class I Div. 2 Zone 2.

Physical

General
General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material
Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors
Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions
12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight
0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT235-0600
Transmitter, isolated RTD/resistance input.

Services

TT230-Config/Cal
Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)
Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR
USB-to-USB isolator, includes USB cable (4001-112).

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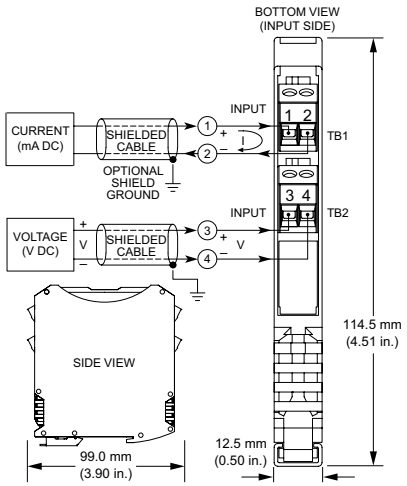
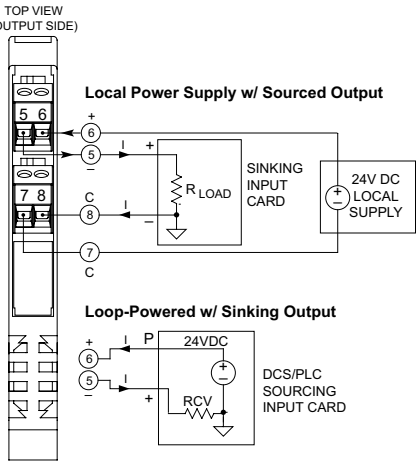
Transmitters: TT230 Series

TT236 Current/millivolt input two-wire/three-wire transmitter





Multi-range ±20mA or ±500mV input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT236 model is a space-saving two-wire transmitter that isolates and converts a DC current or low voltage input to a proportional 4-20mA control signal. A single unit supports both voltage and current input for extra flexibility. Power is received from the output loop current or a DC supply when using a three-wire connection.

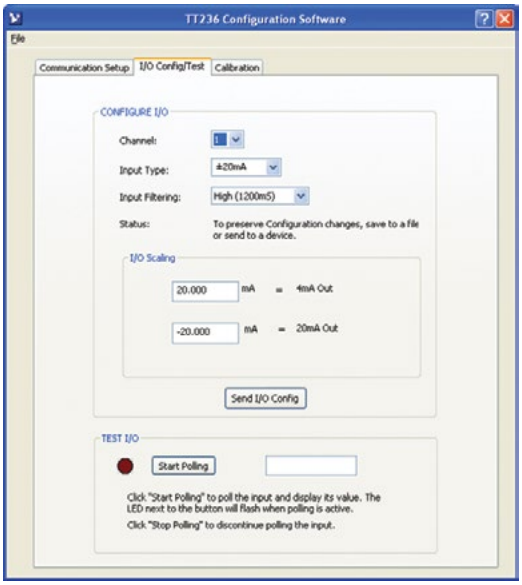
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports unipolar and bipolar input ranges up to ±20mA or ±500mV DC
- Accepts 0-20A AC input (with external sensor)
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (low, medium, high)
- Supports sink or source output wiring
- Supports reverse-acting (inverse) output
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (50g) and vibration (5g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT236 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

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Transmitters: TT230 Series

TT236 Current/millivolt input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

USB Interface

USB Connector
USB Mini-B type socket, 5-pin.

USB Data Rate
12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection
Transient voltage suppression on power and data lines.

USB Cable Length
5.0 meters maximum.

Driver
Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

Input

Default Configuration/Calibration
Input: 4 to 20mA, medium filter.
Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
±500mV	±0.05% of span
0 to 500mV	±0.05% of span
±20mA	±0.05% of span
0 to 20mA	±0.05% of span
4 to 20mA	±0.05% of span
0 to 11.17mA (for AC sensor)	±0.05% of span
±1mA	±0.05% of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect
Better than ±80ppm/°C (±0.008%/°C).

Zero Scaling Adjust
0 to 95% of range, typical.

Full Scale Adjust
5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection
Configurable for either upscale (24mA) or downscale (3.3mA) operation.

Input Impedance
Current input: 24.9 ohms.
Voltage input: 15M ohms

Input Over-Voltage Protection
Bipolar Transient Voltage Suppressers (TVS), 5.6V clamp level typical.

Input Resolution
Bipolar input: 1 part in 50000 (±25000)
Unipolar input: 1 part in 25000

Input Filter
Selectable digital filtering settings (low, medium, high).

Input Filter Bandwidth
Normal mode plus digital filtering within the ADC. Bandwidth (-3dB) varies with digital filter setting from 4Hz without filtering to 0.33Hz with high filtering.

Noise Rejection (Common Mode, High Filter)
138dB @ 60Hz, typical with 100 ohm input unbalance.

Output

Output Range
4 to 20mA DC.

Output Compliance
$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.
R_{LOAD} = 0 to 650 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
Low filter	50 milliseconds
Medium filter	150 milliseconds
High filter	1200 milliseconds

Environmental

Operating temperature
-40 to 80°C (-40° to 176°F).

Storage temperature
-40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power Requirement
12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation
1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity
Vibration: 5g, per IEC 60068-2-64.
Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance
Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals
CE compliant. UL/cUL listing.
Designed for Class I; Division 2; Groups ABCD; Zone 2.

Physical

General
General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material
Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors
Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions
12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight
0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT236-0600
Two-wire transmitter, current/millivolt input.

Services

TT230-Config/Cal
Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)
Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR
USB-to-USB isolator, includes USB cable (4001-112).

5020-350
AC current sensor (toroidal transformer); converts 0-20A AC to 0-11.17mA DC.

ISO9001
AS9100
MADE IN USA

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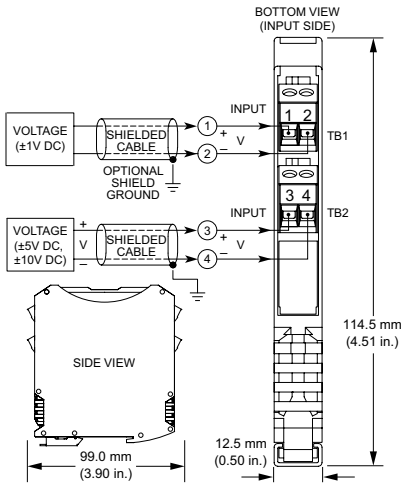
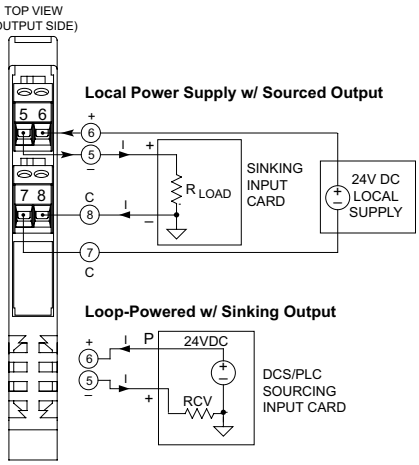
Transmitters: TT230 Series

TT237 Process voltage input two-wire/three-wire transmitter





Multi-range ±1V, ±5V, or ±10V input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT237 model is a space-saving two-wire transmitter that isolates and converts a process level DC voltage input to a proportional 4-20mA control signal. A single unit supports multiple voltage input ranges for extra flexibility. Power is received from the output loop current or a local DC supply when using a three-wire connection.

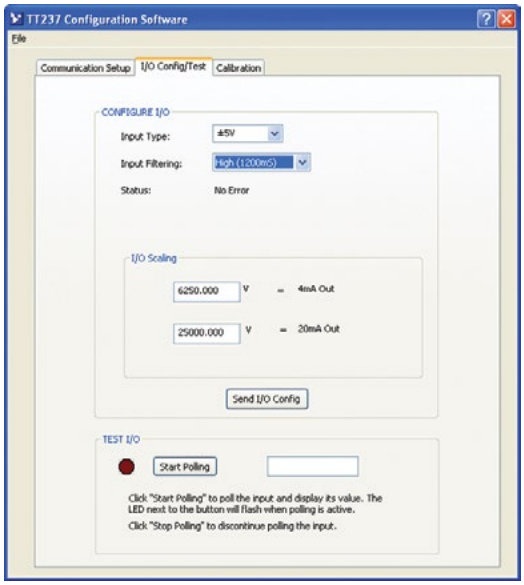
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports ±1V, ±5V, and ±10V DC input ranges
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (low, medium, high)
- Supports sink or source output wiring
- Supports reverse-acting (inverse) output
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (50g) and vibration (5g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT237 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com Windows XP, Vista, 7, & 8.

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Transmitters: TT230 Series

TT237 Process voltage input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

USB Interface

USB Connector
USB Mini-B type socket, 5-pin.

USB Data Rate
12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection
Transient voltage suppression on power and data lines.

USB Cable Length
5.0 meters maximum.

Driver
Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

Input

Default Configuration/Calibration
Input: ±10V DC, medium filtering.
Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
±1V DC	±0.05% of span
±5V DC	±0.05% of span
±10V DC	±0.05% of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect
Better than ±80ppm/°C (±0.008%/°C).

Zero Scaling Adjust
0 to 95% of range, typical.

Full Scale Adjust
5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection
Configurable for either upscale (24mA) or downscale (3.3mA) operation.

Input Impedance
±1V input: 15M ohms.
±5V input: >1M ohms.
±10V input: >1M ohms.

Input Over-Voltage Protection
Bipolar Transient Voltage Suppressers (TVS), 5.6V clamp level typical.

Input Resolution
Bipolar input: 1 part in 50000 (±25000)
Unipolar input: 1 part in 25000

Input Filter
Selectable digital filtering settings (low, medium, high).

Input Filter Bandwidth
Normal mode plus digital filtering within the ADC. Bandwidth (-3dB) varies with digital filter setting from 4Hz without filtering to 0.33Hz with high filtering.

Noise Rejection (Common Mode, High Filter)
138dB @ 60Hz, typical with 100 ohm input unbalance.

Output

Output Range
4 to 20mA DC.

Output Compliance
$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.
R_{LOAD} = 0 to 650 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
Low filter	50 milliseconds
Medium filter	150 milliseconds
High filter	1200 milliseconds

Environmental

Operating temperature
-40 to 80°C (-40° to 176°F).

Storage temperature
-40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power Requirement
12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation
1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity
Vibration: 5g, per IEC 60068-2-64.
Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance
Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals
CE compliant. UL/cUL listing.
Designed for Class I; Division 2; Groups ABCD; Zone 2.

Physical

General
General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material
Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors
Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions
12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight
0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT237-0600
Two-wire transmitter, process voltage input.

Services

TT230-Config/Cal
Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)
Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR
USB-to-USB isolator, includes USB cable (4001-112).

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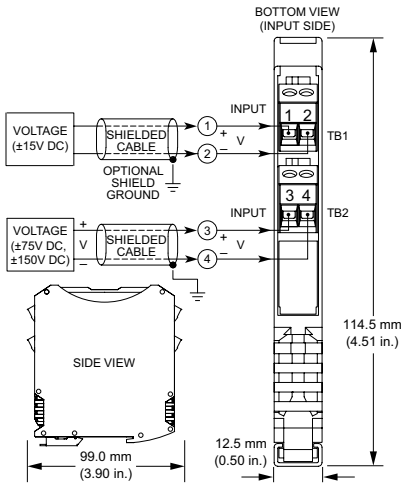
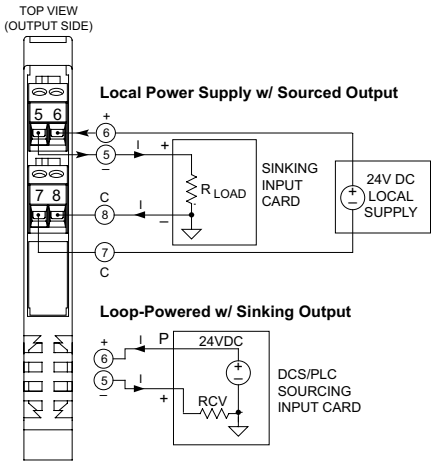
Transmitters: TT230 Series

TT238 High voltage input two-wire/three-wire transmitter





Multi-range ±15V, ±75V, or ±150V input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT238 model is a space-saving two-wire transmitter that isolates and converts a high level DC voltage input to a proportional 4-20mA control signal. A single unit supports multiple voltage input ranges for extra flexibility. Power is received from the output loop current or a local DC supply when using a three-wire connection.

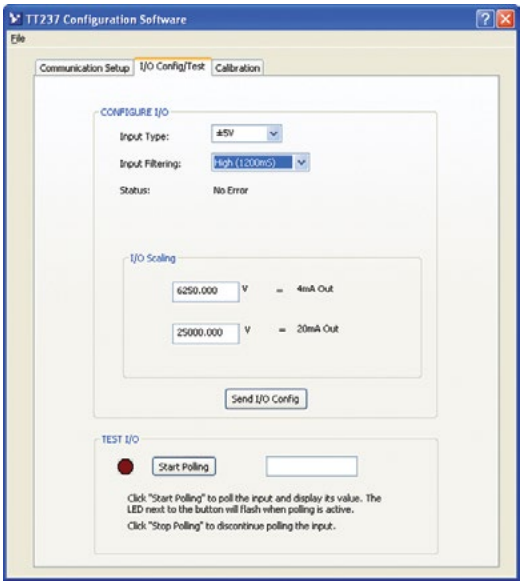
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports ±15V, ±75V, and ±150V DC input ranges
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (low, medium, high)
- Supports sink or source output wiring
- Supports reverse-acting (inverse) output
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (50g) and vibration (5g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT238 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

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Transmitters: TT230 Series

TT238 High voltage input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

USB Interface

USB Connector
USB Mini-B type socket, 5-pin.

USB Data Rate
12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection
Transient voltage suppression on power and data lines.

USB Cable Length
5.0 meters maximum.

Driver
Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

Input

Default Configuration/Calibration
Input: ±150V, medium filtering.
Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
±15V DC ±75V DC ±150V DC	±0.05% of span ±0.05% of span ±0.05% of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect
Better than ±80ppm/°C (±0.008%/°C).

Zero Scaling Adjust
0 to 95% of range, typical.

Full Scale Adjust
5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection
Configurable for either upscale (24mA) or downscale (3.3mA) operation.

Input Impedance
Greater than 1M ohms.

Input Over-Voltage Protection
Bipolar Transient Voltage Suppressers (TVS), 5.6V clamp level typical.

Input Resolution
Bipolar input: 1 part in 50000 (±25000)
Unipolar input: 1 part in 25000

Input Filter
Selectable digital filtering settings (low, medium, high).

Input Filter Bandwidth
Normal mode plus digital filtering within the ADC. Bandwidth (-3dB) varies with digital filter setting from 4Hz without filtering to 0.33Hz with high filtering.

Noise Rejection (Common Mode, High Filter)
138dB @ 60Hz, typical with 100 ohm input unbalance.

Output

Output Range
4 to 20mA DC.

Output Compliance
$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.
R_{LOAD} = 0 to 650 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
Low filter	50 milliseconds
Medium filter	150 milliseconds
High filter	1200 milliseconds

Environmental

Operating temperature
-40 to 80°C (-40° to 176°F).

Storage temperature
-40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power Requirement
12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation
1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity
Vibration: 5g, per IEC 60068-2-64.
Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance
Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals
CE compliant. UL/cUL listing.
Designed for Class I; Division 2; Groups ABCD; Zone 2.

Physical

General
General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material
Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors
Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions
12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight
0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT238-0600
Two-wire transmitter, high voltage input.

Services

TT230-Config/Cal
Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)
Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR
USB-to-USB isolator, includes USB cable (4001-112).

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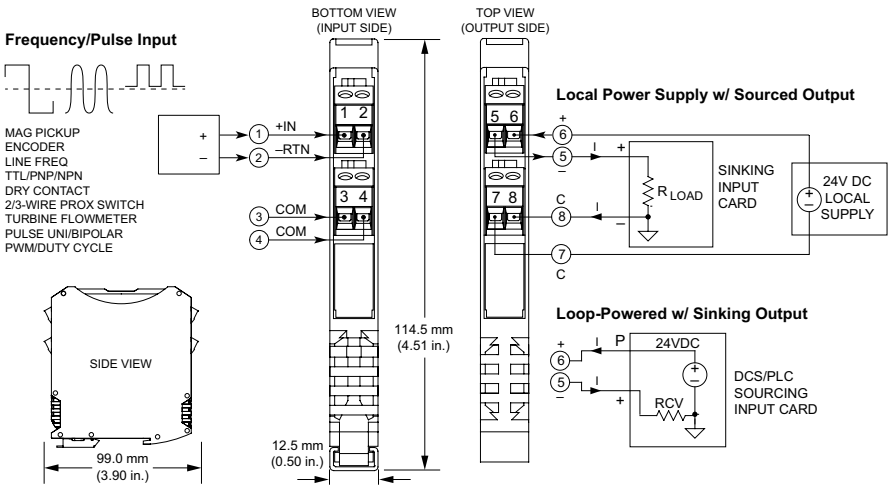
Transmitters: TT230 Series

TT239 Frequency/pulse/PWM input two-wire transmitter

CE 24 HOUR STOCK ITEM 2 YEAR WARRANTY

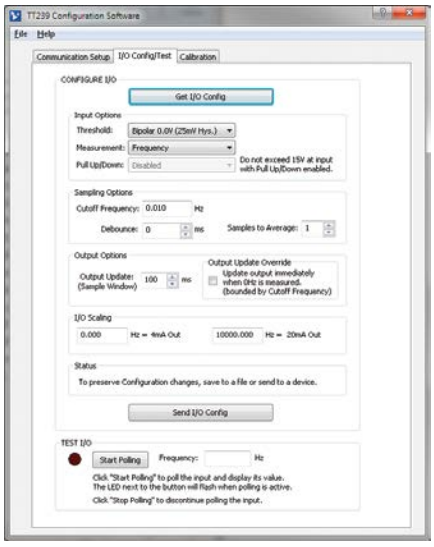


Multi-range frequency/pulse input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT239 model is a space-saving two-wire transmitter that isolates and converts frequency, pulse, or pulse-width modulation (PWM) input to a proportional 4-20mA signal. You can select to measure either the input frequency or the duty cycle. Power is received from the output loop current or a DC supply when using a three-wire connection.

High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.



TT239 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile frequency measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Amplifier applications include:

- Speed pickup
- Line frequency monitoring
- Turbine flowmeter interface
- PWM sensing/feedback circuits
- Shaft encoder interface

TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Measures frequency or duty cycle and interfaces many input types up to 100KHz
- Accepts input amplitudes up to 120VRMS (±170V DC, unipolar or bipolar)
- Adjustable 0Hz cut-off, sample averaging, debounce, and output update time
- Software configurable pull-up/down resistors (+4V DC input pull-up for sensors/transducers)
- 1500V isolation between input/output circuits
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- Fast response time and high accuracy
- Supports normal or reverse-acting output
- Supports sink or source output wiring
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals (pending)

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Transmitters: TT230 Series

TT239 Frequency/pulse/PWM input two-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

USB Interface

USB Connector
USB Mini-B type socket, 5-pin.

USB Data Rate
12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection
Transient voltage suppression on power and data lines.

USB Cable Length
5.0 meters maximum.

Driver
Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

Input

Default Configuration/Calibration
±5.0V Square Wave; Input Threshold = Bipolar 0.0V; Hysteresis ±25mV; Measurement = Frequency; Pull Up/Down = Disabled; Excitation = Enabled; 0Hz Cutoff = 0.5Hz; Sample Average = 1; Output Range = 4-20mA; I/O Scaling = 0Hz to 10KHz, Normal Acting; Output Update = 100ms.

Frequency Input
Configurable for any range from 0Hz to 100KHz. Accepts unipolar (non-zero crossing) or bipolar (zero crossing) input signals. 0.5Hz minimum span. 10µs minimum pulse width.

Input Ranges

Frequency Input	Output Update	Input Resolution	Typical Accuracy
0 to 100Hz	Any rate	1 part in 60000	±0.05Hz
0 to 1KHz	Any rate	1 part in 6000	±0.5Hz
0 to 5KHz	Any rate	1 part in 1200	±1Hz
0 to 10KHz	10ms	1 part in 60000	±200Hz
0 to 10KHz	100ms	1 part in 600000	±20Hz
0 to 10KHz	1000ms	1 part in 6000000	±2Hz
0 to 100KHz	10ms	1 part in 60000	±400Hz
0 to 100KHz	100ms	1 part in 600000	±40Hz
0 to 100KHz	1000ms	1 part in 6000000	±4Hz

PWM Input Carrier Freq	Duty Cycle	Input Resolution	Typical Accuracy
0 to 100Hz	1 to 99%	1 part in 60000	±0.02%
0 to 1KHz	10 to 90%	1 part in 6000	±0.2%
0 to 3KHz	20 to 80%	1 part in 1200	±2.0%

ISO9001
AS9100

Input Scaling Adjust
Zero: Adjustable over 0 to 99% of full-scale input.
Full scale: Adjustable over 0.5Hz to 100KHz.
Cut-off frequency: Adjustable over 0.01Hz to 100KHz.

Input Pull-up/Pull-down (internal, software-select)
Configurable 12.4KΩ pull-up to +4V and 1KΩ pull-down to –FRTN, or disabled. 15V DC maximum input. 4V pull-up with ±28mV hysteresis or 3V when ±84mV.

Unipolar Signal Configuration:
Amplitude: 0 to 3V DC min., 0 to 170V DC max.

Thresholds: Configurable for 1.6V DC (±25mV hysteresis) or 5V DC (±83mV hysteresis), typical.

Bipolar Signal Configuration:
Amplitude: ±50 to ±200mV min. (depending on range and hysteresis), 120VRMS max. (±170V DC).

Thresholds: 0mV nominal (±25 or ±83mV hysteresis).

Output

Output Range
4 to 20mA DC, wired as sink or source.
Under-range capability 3.6mA. Over-range 24mA.

Output Compliance
RLOAD = (VSUPPLY - 12V) / 0.020A.
RLOAD = 0 to 600 ohms @ 24V DC.

Output DAC Resolution
16-bit D/A converter

Output Update
Software configurable from 10ms to 5000ms. Determines the rate at which the output signal is updated, unless optionally overridden.

Output Settling Time
1ms, 0% to 98% for a step-change in input, typical.

Output Accuracy
Better than ±0.05% of span, typical (±0.1% max.) for for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Ambient Temperature Effect
Better than ±0.0020% per °C of input span or ±20ppm/°C, typical. Includes the combined effects of zero and span drift over temperature.

Environmental

Temperature Range
Operation: -40 to 80°C (-40° to 176°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power Requirement
12-32V DC SELV (Safety Extra Low Voltage), 24mA maximum.

Isolation
1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity
Vibration: 4g, per IEC 60068-2-64.
Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance
Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals
CE compliant. UL/cUL listing pending.
Designed for Class I; Division 2; Groups ABCD; Zone 2

Physical

General
General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material
Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors
Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions
12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight
0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT239-0600
Transmitter, isolated frequency/pulse/PWM input

Services

TT230-Config/Cal
Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)
Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR
USB-to-USB isolator, includes USB cable (4001-112).

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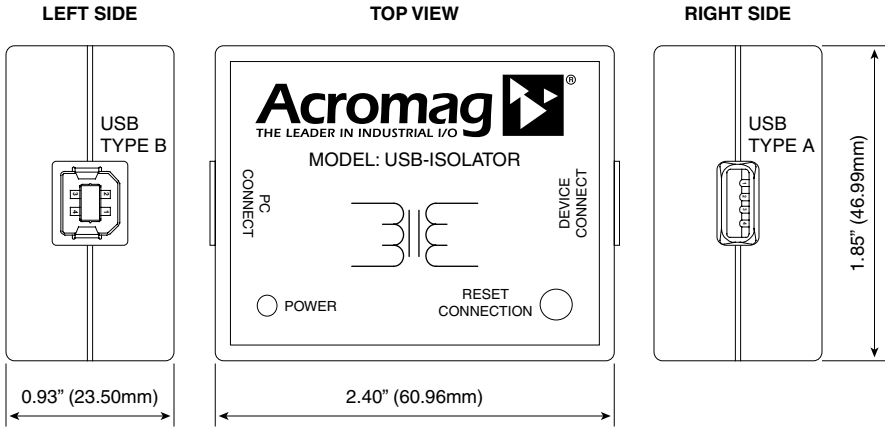
Accessories

USB-ISOLATOR USB-to-USB Isolator



USB-powered, USB 2.0 and 1.1 compatible ◆ 1500V AC / 2100V DC isolation ◆ No drivers required

Description

This compact, industrial-grade isolator provides a high-voltage isolation barrier between a computer and a connected USB device. The isolation protects equipment from electrical surges and transient voltage spikes. It also eliminates ground loop currents flowing between the PC and peripherals which can cause damage and inaccurate measurements. Additionally, isolation minimizes conducted noise from static discharge, magnetic fields, and radio frequency interference.

Acromag's USB isolator is very easy to use. The isolator inserts in-line with the USB connection and operates transparently. No special software drivers are required. The unit receives power from the PC's USB port and isolates that power to the connected device. High noise immunity and low radiated emissions ensure reliable data transfer in sensitive applications.

A number of high-performance features help provide convenient and dependable operation. The green LED indicates that power is being received and blinks if the connected device draws too much current. An internal jumper lets you switch from Full Speed (12 Mbps) to Low Speed (1.5 Mbps) communication. The reset button offers a simple way to reinitialize a connected device without breaking the cable connection. High-retention USB sockets keep cables securely attached under shock and vibration.

Key Features & Benefits

- Isolates and protects a USB peripheral from a USB host
- Electrical isolation up to 1500V AC / 2100V DC
- Common mode filtering on all data lines
- Built-in surge/transient suppression up to 8kV on all ports
- Self-powered through the USB port
- Supports USB 2.0 full speed (12 Mbps) and USB 1.1 low speed (1.5 Mbps) data rates with jumper-selection
- LED for power indication and diagnostics
- Reset button to reinitialize and re-enumerate peripheral devices
- Output short circuit protection with auto-retry
- No software or configuration required (transparent operation)
- Uses standard high-retention USB Type A/B cable connections (includes 1m cable)
- Compact size and rugged design for harsh environments
- Wide ambient temperature operation -40 to 70°C (-40 to 158°F)
- CE, FCC, UL/cUL approvals

Ordering Information

Models

USB-ISOLATOR
USB isolator, includes USB cable (Part # 4001-112) for isolator-to-PC connection

TTC-SIP
CD-ROM (Part #5040-944), USB isolator and two USB cables (Part # 4001-112, 4001-113) for configuration of Acromag TT2XX Series transmitters

Accessories

4001-112
USB cable, 1 meter, with Type A to Type B plugs

4001-113
USB cable, 1 meter, with Type A to Mini-B plugs

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Performance Specifications

■ USB Port Interface

Standards
USB 1.1 and 2.0 compatible, full speed (12Mbps, default) and low speed (1.5Mbps) data rates supported. For low speed data rates, an internal jumper is provided for user setting. Connection is transparent, no software or configuration is required. Isolator will not be enumerated in the device manager.

■ Physical

Dimensions
2.40" Length x 1.85" Wide x 0.925" High (60.96mm x 46.99mm x 23.495mm).

Connectors
Standard high retention USB A/B connectors with minimum withdrawal force of 15 Newtons. 1 meter A/B cable included.

PC Connector
USB Type B receptacle

Device Connector
USB Type A receptacle

LED Indicator
Green LED indicates isolator receiving 5V power from the USB computer bus. Flashing indicates short circuit/ retries on peripheral side.

Reset Button
Resets the connection to the USB peripheral device for reinitialization and re-enumeration.

Enclosure Material
ABS Resin, UL94 rated, IP30 plastic case.

■ Environmental

Operating temperature
-40 to 70°C (-40° to 158°F).

Storage temperature
-40 to 85°C (-40 to 185°F).

Relative humidity
5 to 95% non-condensing.

Power
PC Connect Side: Standard USB bus power (5V DC).

Device Connect Side: 5V DC / 120mA with full power connection from PC. Includes over-current protection with auto-retry.

Isolation
1500V AC / 2100V DC peak isolation.
250V AC continuous safety isolation.

Agency Approvals:
CE and FCC compliant. UL/cUL Class 1 Div. 2 Zone 2.

Radiated Field Immunity (RFI)
Designed to comply with IEC1000-4-3 Level 3 and EN50082-1.

Electromagnetic Compatibility (EMC)
Minimum immunity per EN61000-6-2:2001

Electrostatic Discharge (ESD) Immunity
Per IEC61000-4-2.

Radiated Field Immunity (RFI)
Per IEC61000-4-3.

Electrical Fast Transient Immunity (EFT)
Per IEC61000-4-4. Complies with IEC1000-4-4 Level 3 and EN50082-1.

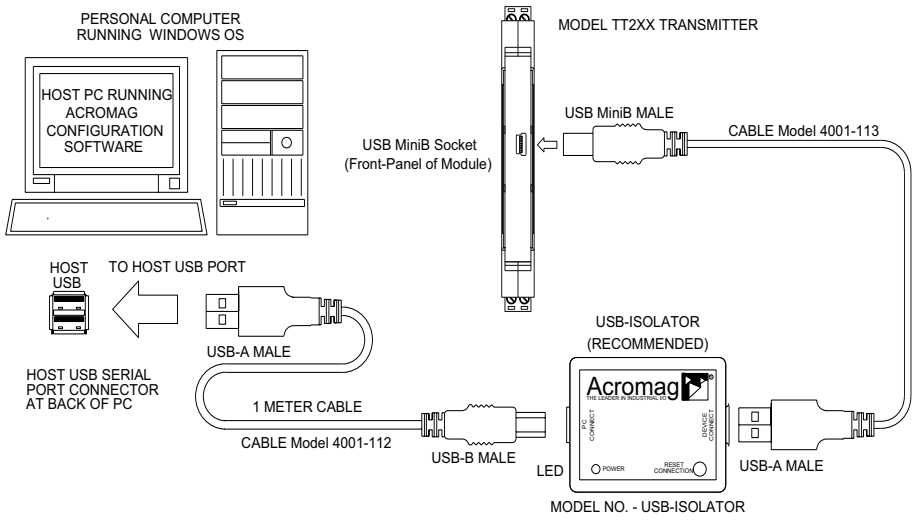
Surge Immunity
Complies with IEC1000-4-5 Level 3 and EN50082-1. Per IEC61000-4-5.

Conducted RF Immunity (CRFI)
Per IEC61000-4-6.

Emissions
Per EN61000-6-4:2001.

Radiated Frequency Emissions
Per CISPR11 Class A. Meets or exceeds EN50081-1 for Class B equipment.

TT SERIES USB TRANSMITTER CONNECTIONS



ISO9001
AS9100
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