Acromag
THE LEADER IN INDUSTRIAL I/O

Monitoring and Control Solutions

TT230 Series Brochure

Loop-Powered

USB Configured

Slim Design

Space-Saving 2-Wire Isolated Transmitters

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60+ Years of I/O Experience

Acromag has more than 60 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.

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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 • Ethernet conformance
• UL, cUL • Modbus conformance
• ATEX • Profibus certification
• CSA • IECex

TT230 Series Thin 2-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)

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
- CE Compliant. UL/cUL Class 1 Div 2 Zone 2 approvals. ATEX / IECEx Zone 2.

TT231
RTD Input

RTD ohms → mA

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

See data sheet

TT233
Thermocouple, Millivolt Input

TC mV → mA

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

See data sheet

TT234
Potentiometer/ Thermistor Input

Pot Therm → mA

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

See data sheet

TT235
Isolated RTD Input

RTD ohms → mA

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

mA mV → mA

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

See data sheet

TT237
Low-Voltage Input

V → mA

Input
- ±1V DC
- ±5V DC
- ±10V DC

See data sheet

TT238
High-Voltage Input

V → mA

Input
- ±15V DC
- ±75V DC
- ±150V DC

See data sheet

TT239
Frequency, Pulse Input

KHz → mA

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

See data sheet

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Key Features

Sink or Source Output

Extra output connections support sourced output 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 (Vista and newer) software via USB.

Space Saving

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

Rugged Design

-40 to 80°C

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

Input Options

Tel: 877-214-6267 ▪ sales@acromag.com ▪ www.acromag.com ▪ 30765 S Wixom Rd, Wixom, MI 48393 USA
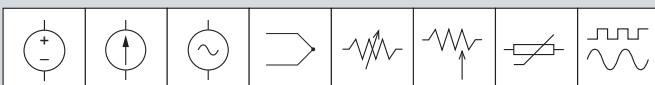
General Operation and Performance Specifications

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 60068-2-6 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. ATEX / IECEx Zone 2.

■ Physical

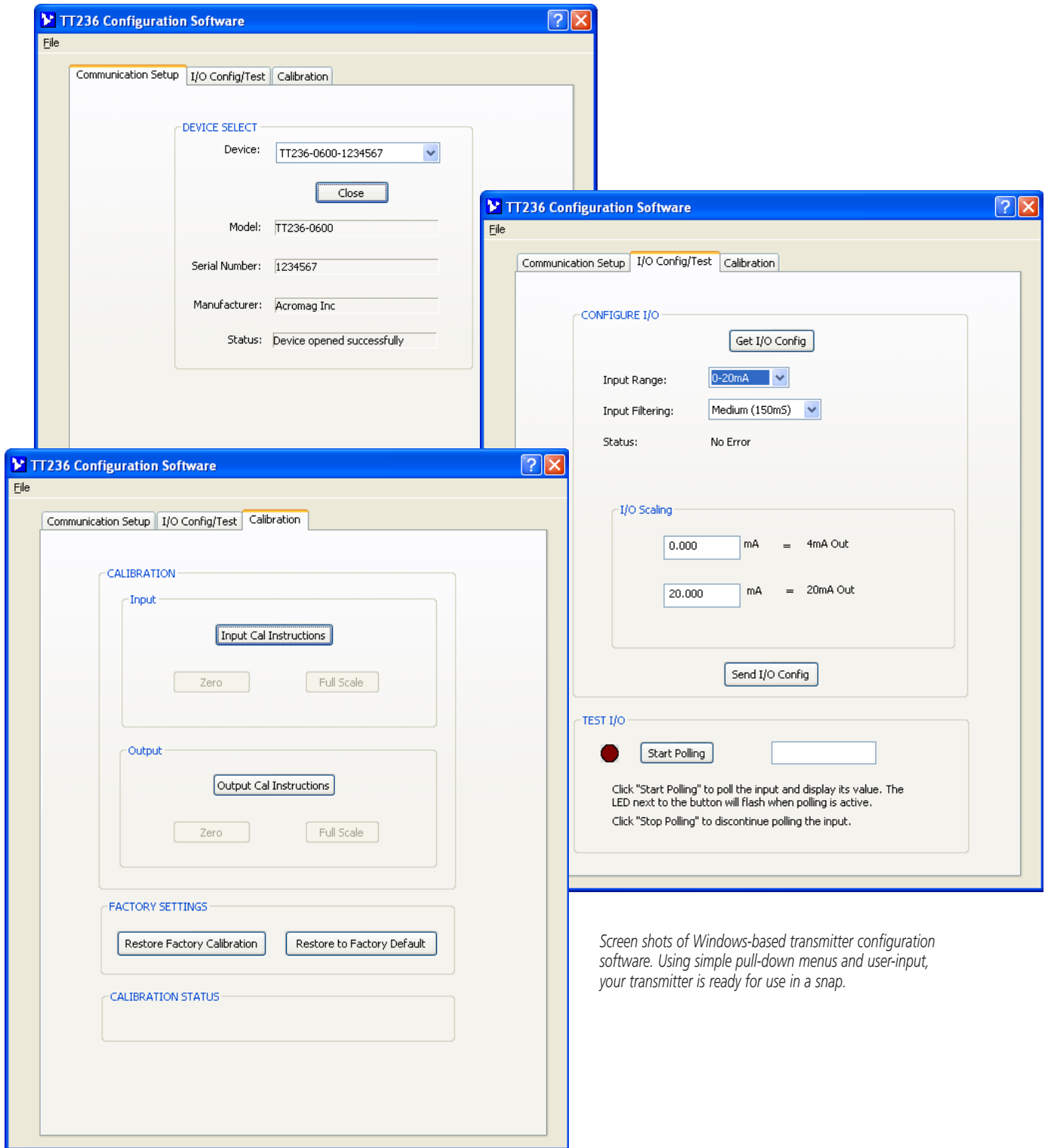|	
General	General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.
Case Material	Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.
I/O Connectors	Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid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

■ Dimensions   *in millimeters (inches)*

TOP VIEW (OUTPUT/POWER)

12.5 (0.50)

114.5 (4.51)

99.0 (3.90)

BOTTOM VIEW (INPUT)
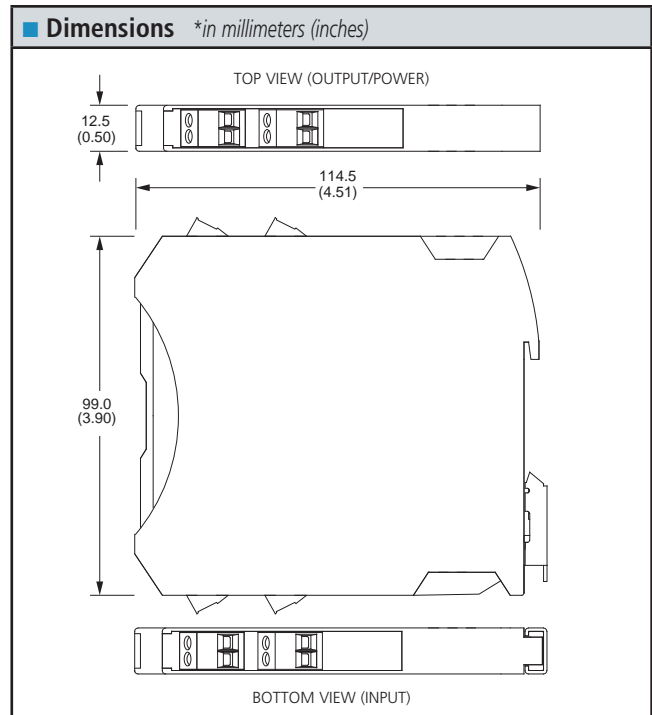
TT Series USB Transmitter Connections

HOST PC RUNNING ACROMAG CONFIGURATION SOFTWARE

CABLE Model 4001-112

Model USB-ISOLATOR (RECOMMENDED)

Acromag
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PC CONNECT

DEVICE CONNECT

POWER   RESET CONNECTION

CABLE Model 4001-113

MODEL TT2XX TRANSMITTER
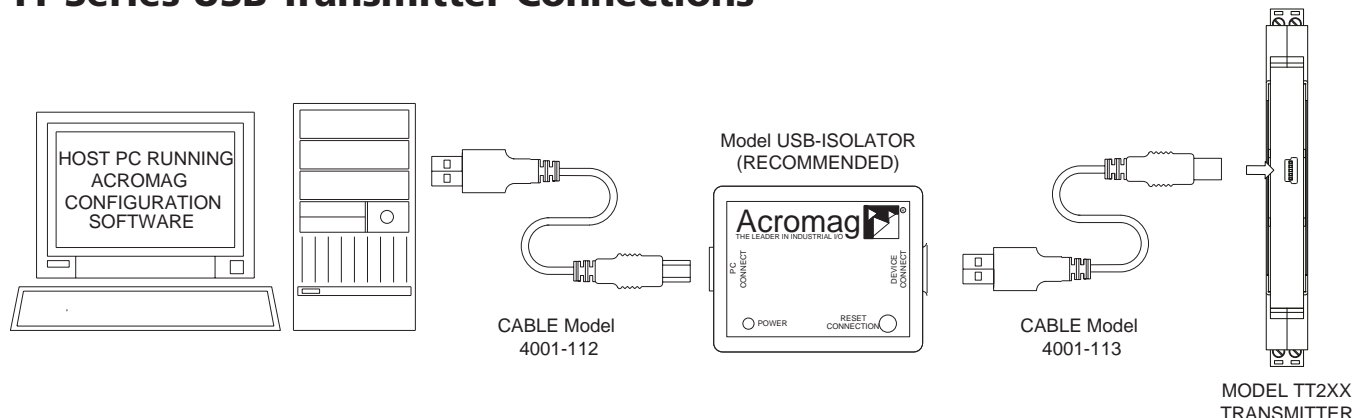
Module Configuration

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.
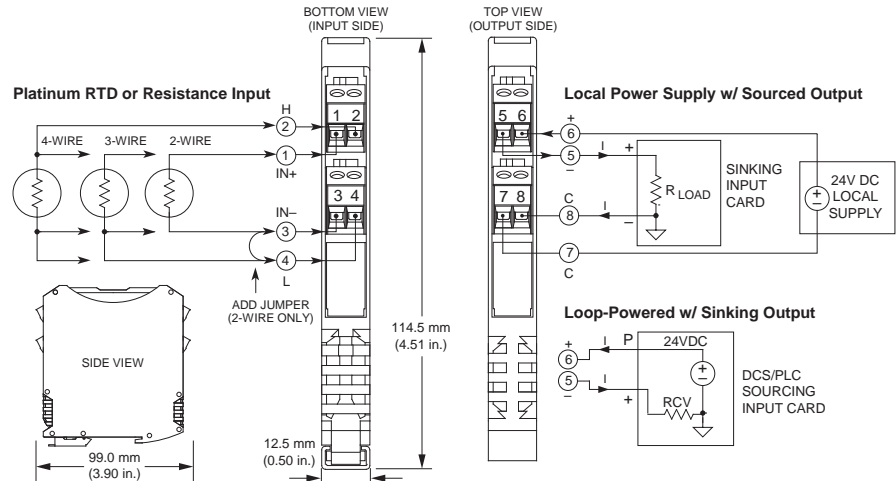
Transmitters: TT230 Series

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

USB Configured

BOTTOM VIEW (INPUT SIDE)

TOP VIEW (OUTPUT SIDE)

Platinum RTD or Resistance Input

Local Power Supply w/ Sourced Output

Loop-Powered w/ Sinking Output

114.5 mm (4.51 in.)

12.5 mm (0.50 in.)

99.0 mm (3.90 in.)

SIDE VIEW

ADD JUMPER (2-WIRE ONLY)

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.

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 (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class I Div 2, ATEX / IECEx Zone 2 approvals

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

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 850°C (-58 to 1562°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 850°C (1562°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: 4g, per IEC 60068-2-6
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. Designed for UL/cUL Class I Division 2 Groups ABCD, ATEX / IECEx 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
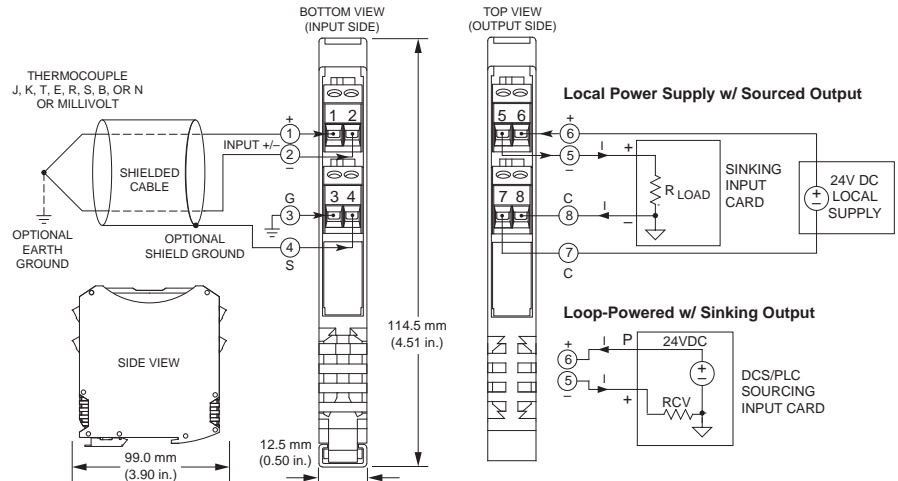USB-to-USB isolator, includes USB cable (4001-112)

Transmitters: TT230 Series

TT233 Thermocouple/millivolt input two/three-wire transmitter

USB Configured

BOTTOM VIEW (INPUT SIDE)

TOP VIEW (OUTPUT SIDE)

THERMOCOUPLE J, K, T, E, R, S, B, OR N OR MILLIVOLT

SHIELDED CABLE

OPTIONAL EARTH GROUND

OPTIONAL SHIELD GROUND

INPUT +/–

Local Power Supply w/ Sourced Output

SINKING INPUT CARD

24V DC LOCAL SUPPLY

Loop-Powered w/ Sinking Output

DCS/PLC SOURCING INPUT CARD

24VDC

RCV

SIDE VIEW

114.5 mm (4.51 in.)

99.0 mm (3.90 in.)

12.5 mm (0.50 in.)

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.

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 (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class I Div 2, ATEX / IECEx Zone 2 approvals
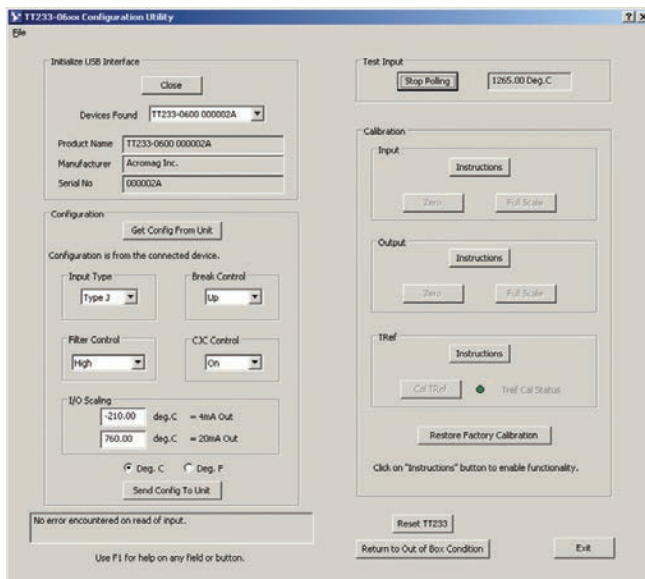
TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

The Agility™ Config Tool is downloadable (FREE) at the Google Play Store For Android Devices only

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

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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: 4g, per IEC 60068-2-6
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. Designed for UL/cUL Class I Division 2 Groups ABCD, ATEX / IECEx 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
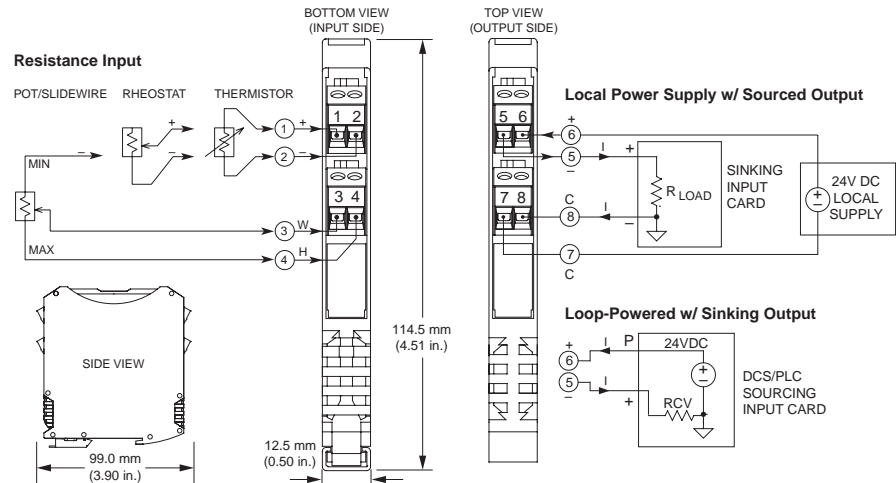**USB-ISOLATOR**
USB-to-USB isolator, includes USB cable (4001-112)

ISO9001
AS9100
MADE IN USA

Acromag
THE LEADER IN INDUSTRIAL I/O ®

TT234 Potentiometer / thermistor input two-wire transmitter

Resistance Input

POT/SLIDEWIRE   RHEOSTAT   THERMISTOR

MIN

MAX

BOTTOM VIEW (INPUT SIDE)

TOP VIEW (OUTPUT SIDE)

Local Power Supply w/ Sourced Output

SINKING INPUT CARD   24V DC LOCAL SUPPLY

Loop-Powered w/ Sinking Output

24VDC   DCS/PLC SOURCING INPUT CARD   RCV

SIDE VIEW

114.5 mm (4.51 in.)

99.0 mm (3.90 in.)

12.5 mm (0.50 in.)

USB Configured

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.

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 compliant. UL/cUL Class I Div 2, ATEX / IECEx Zone 2 approvals
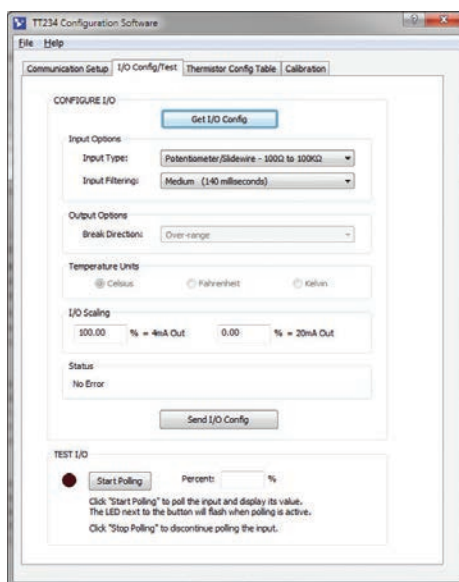
TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

The Agility™ Config Tool is downloadable (FREE) at the Google Play Store For Android Devices only

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

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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 60068-2-6
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. Designed for UL/cUL Class I Division 2 Groups ABCD, ATEX / IECEx 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
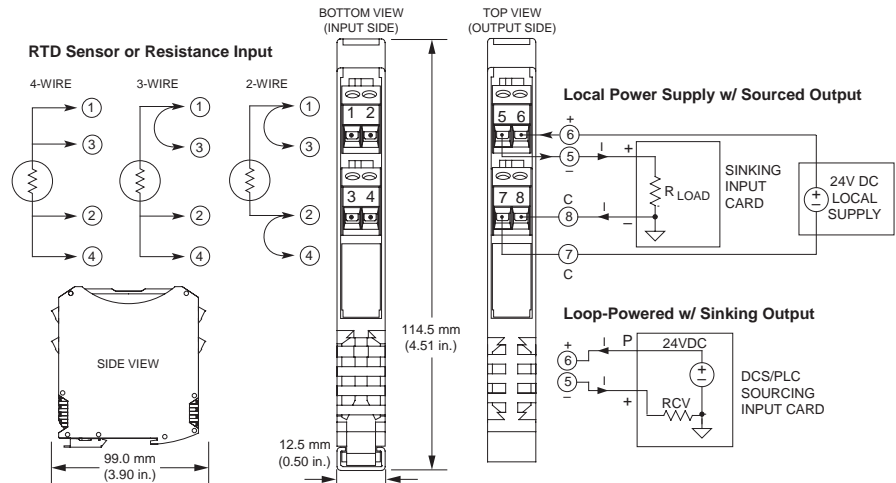USB-to-USB isolator, includes USB cable (4001-112)

ISO9001
AS9100
MADE IN USA

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Transmitters: TT230 Series

TT235 Isolated RTD/resistance input two-wire transmitter

BOTTOM VIEW (INPUT SIDE) TOP VIEW (OUTPUT SIDE)

RTD Sensor or Resistance Input

4-WIRE   3-WIRE   2-WIRE

114.5 mm (4.51 in.)

SIDE VIEW

99.0 mm (3.90 in.)

12.5 mm (0.50 in.)

Local Power Supply w/ Sourced Output

SINKING INPUT CARD   24V DC LOCAL SUPPLY

Loop-Powered w/ Sinking Output

24VDC   DCS/PLC SOURCING INPUT CARD

USB Configured

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

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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.

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

The Agility™ Config Tool is downloadable (FREE) at the Google Play Store For Android Devices only

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

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 compliant. UL/cUL Class I Div 2, ATEX / IECEx Zone 2 approvals

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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	±0.25°C
RTD, Pt 200Ω	-200 to 850°C	±0.30°C
RTD, Pt 500Ω	-200 to 850°C	±0.50°C
RTD, Pt 1000Ω	-200 to 850°C	±1.0°C
Ni 120Ω (Minco 7-120)	-80 to 320°C	±0.08°C
Cu 10Ω (Minco 16-9)	-200 to 270°C	±1.0°C
Resistance (linear)	0 to 25Ω	±0.05Ω
Resistance (linear)	0 to 450Ω	±0.10Ω
Resistance (linear)	0 to 9000Ω	±0.90Ω
Resistance (linear)	0to 2250Ω	±2.25Ω
Resistance (linear)[1]	0 to 4500Ω	±4.50Ω

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 60068-2-6
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. Designed for UL/cUL Class I Division 2 Groups ABCD, ATEX / IECEx 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)

ISO9001
AS9100

MADE IN USA

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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
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class I Div 2, ATEX / IECEx Zone 2 approvals

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

The Agility™ Config Tool is downloadable (FREE) at the Google Play Store For Android Devices only

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

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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

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)
130dB @ 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: 4g, per IEC 60068-2-6
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. Designed for UL/cUL Class I Division 2 Groups ABCD, ATEX / IECEx 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
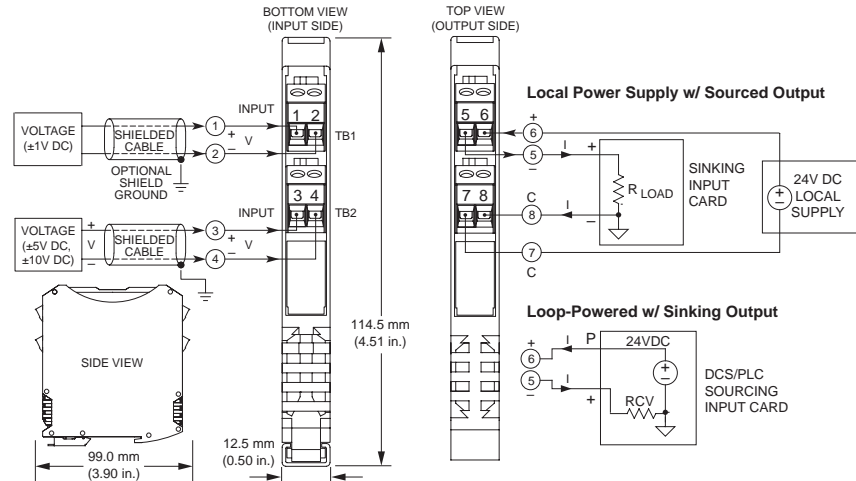
ISO9001
AS9100

MADE IN USA

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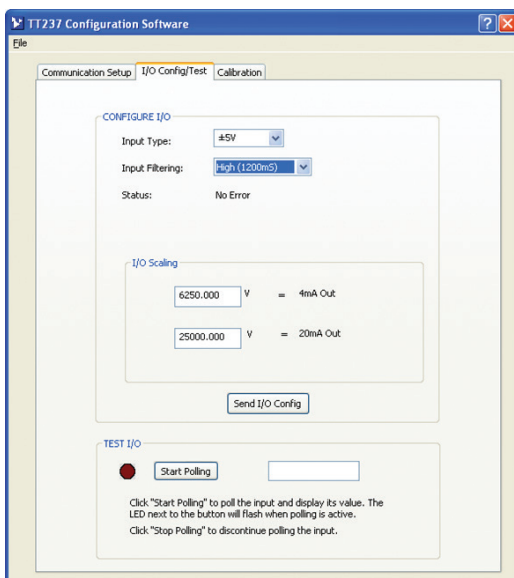
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

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
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class I Div 2, ATEX / IECEx Zone 2 approvals

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

The Agility™ Config Tool is downloadable (FREE) at the Google Play Store For Android Devices only

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

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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

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

Input Over-Voltage Protection
Bipolar Transient Voltage Suppressers (TVS), 14V working and 18V 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)
130dB @ 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: 4g, per IEC 60068-2-6
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. Designed for UL/cUL Class I Division 2 Groups ABCD, ATEX / IECEx 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
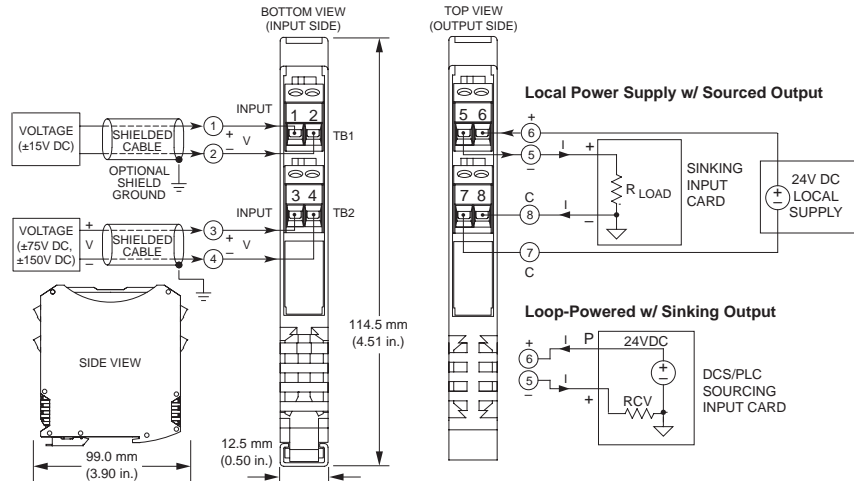USB-to-USB isolator, includes USB cable (4001-112)

ISO9001
AS9100
MADE IN USA

Acromag
THE LEADER IN INDUSTRIAL I/O

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

BOTTOM VIEW (INPUT SIDE)
TOP VIEW (OUTPUT SIDE)

VOLTAGE (±15V DC) — SHIELDED CABLE — INPUT — 1 2 TB1
OPTIONAL SHIELD GROUND

VOLTAGE (±75V DC, ±150V DC) — SHIELDED CABLE — INPUT — 3 4 TB2

SIDE VIEW

99.0 mm (3.90 in.)

12.5 mm (0.50 in.)

114.5 mm (4.51 in.)

Local Power Supply w/ Sourced Output

SINKING INPUT CARD
24V DC LOCAL SUPPLY
R LOAD

Loop-Powered w/ Sinking Output

24VDC
DCS/PLC SOURCING INPUT CARD
RCV

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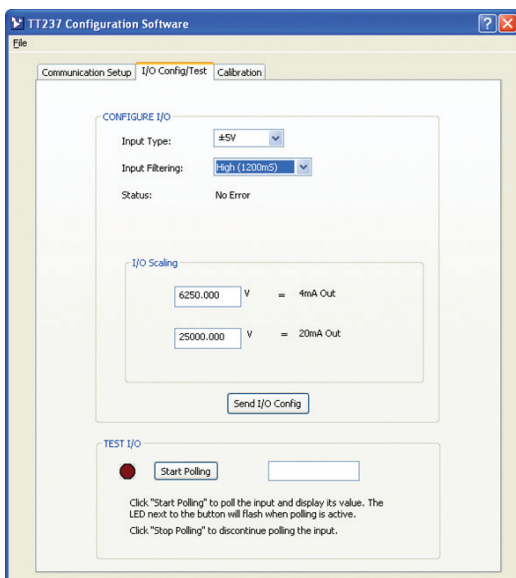
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

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
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class I Div 2, ATEX / IECEx Zone 2 approvals

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

The Agility™ Config Tool is downloadable (FREE) at the Google Play Store For Android Devices only

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

THE LEADER IN INDUSTRIAL I/O

Acromag

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	±0.05% of span
±75V DC	±0.05% of span
±150V 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.

Input Impedance
Greater than 1M ohms.

Input Over-Voltage Protection
Bipolar Transient Voltage Suppressers (TVS), 220V working 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)
130dB @ 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: 4g, per IEC 60068-2-6
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. Designed for UL/cUL Class I Division 2 Groups ABCD, ATEX / IECEx 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)

ISO9001
AS9100
MADE IN USA

Acromag
THE LEADER IN INDUSTRIAL I/O

TT239   Frequency/pulse/PWM input two-wire transmitter

(Certification marks: Ex, c(UL)us LISTED, CE, 24 HOUR STOCK ITEM, 2 YEAR WARRANTY, RoHS Compliant)

USB Configured
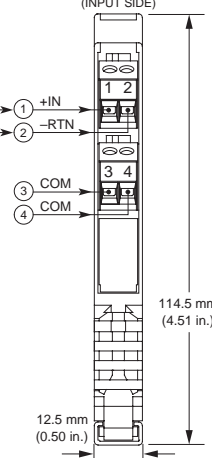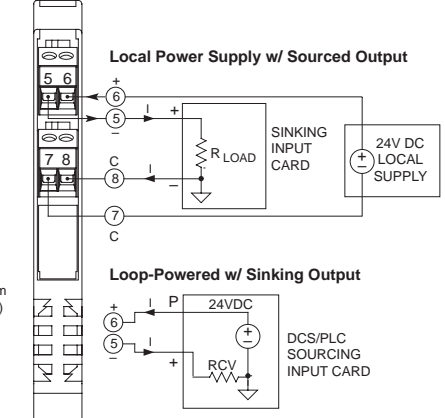
Frequency/Pulse Input

MAG PICKUP
ENCODER
LINE FREQ
TTL/PNP/NPN
DRY CONTACT
2/3-WIRE PROX SWITCH
TURBINE FLOWMETER
PULSE UNI/BIPOLAR
PWM/DUTY CYCLE

BOTTOM VIEW (INPUT SIDE)
TOP VIEW (OUTPUT SIDE)

1 2   ① +IN   ② −RTN
3 4   ③ COM   ④ COM

SIDE VIEW

114.5 mm (4.51 in.)
99.0 mm (3.90 in.)
12.5 mm (0.50 in.)

Local Power Supply w/ Sourced Output

5 6
7 8
⑥ + − I +   R LOAD   SINKING INPUT CARD   24V DC LOCAL SUPPLY
⑤
⑧ C I −
⑦ C

Loop-Powered w/ Sinking Output

⑥ + I P   24VDC
⑤ − I +   RCV   DCS/PLC SOURCING INPUT CARD
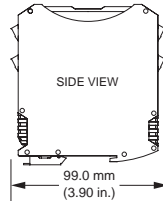
Multi-range frequency/pulse input ◆ 4-20mA output (sink/source) ◆ 12-32V DC local/local power

Description

The TT239 model is a space-saving two-wire transmitter that isolates and converts a 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 conneciton.
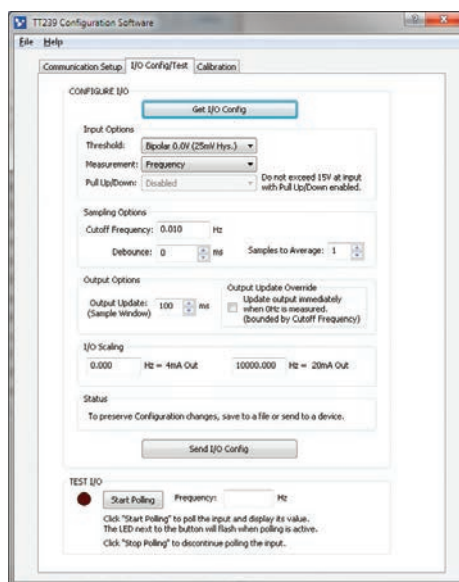
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

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.

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

The Agility™ Config Tool is downloadable (FREE) at the Google Play Store
For Android Devices only

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 120V$_{RMS}$ (±170V DC, unipolar or bipolar)
- Adjustable 0Hz cut-off, sample averaging, 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 I Div 2, ATEX / IECEx Zone 2 approvals

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Tel 877-214-6267 ■ sales@acromag.com ■ www.acromag.com ■ 30765 Wixom Rd, Wixom, MI 48393 USA

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	Cycle Range	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%

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), 120V$_{RMS}$ 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
$R_{LOAD} = (V_{SUPPLY} - 12V) / 0.020A$.
R_{LOAD} = 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 60068-2-6
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. Designed for UL/cUL Class I Division 2 Groups ABCD, ATEX / IECEx 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)

ISO9001
AS9100
MADE IN USA

Acromag
THE LEADER IN INDUSTRIAL I/O ®

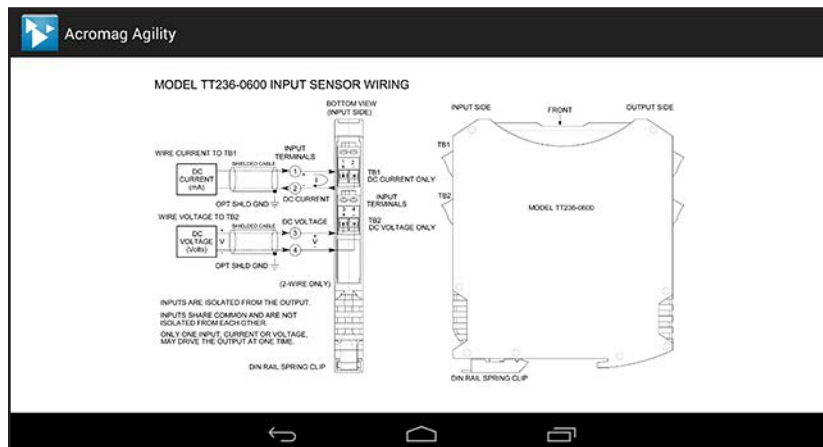## Acromag Agility™ Config Tool   Mobile Application

The Agility™ Config Tool is a mobile application that allows easy setup and configuration of Acromag TT Series transmitters via a tethered mobile device.

This free app is available for Android devices at the Google Play store at Acromag Agility™ Config Tool.

Demo the software, no need for a module. To enter demo mode simply tap the ▶ icon in the upper left corner 8 times.
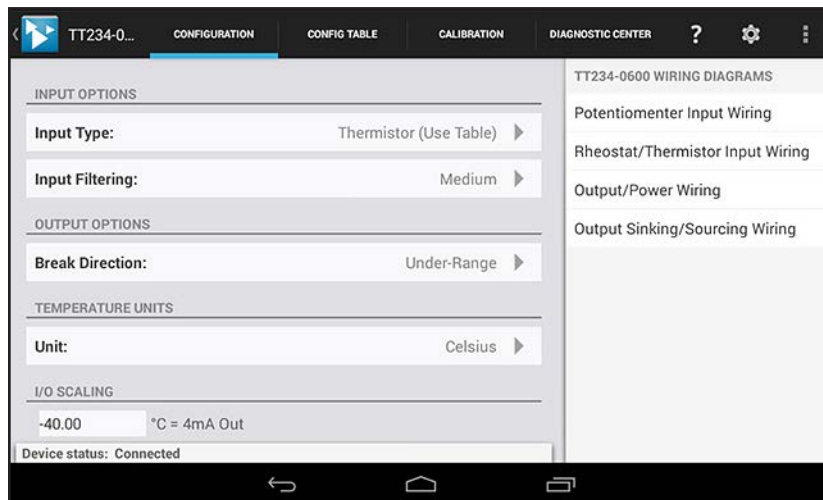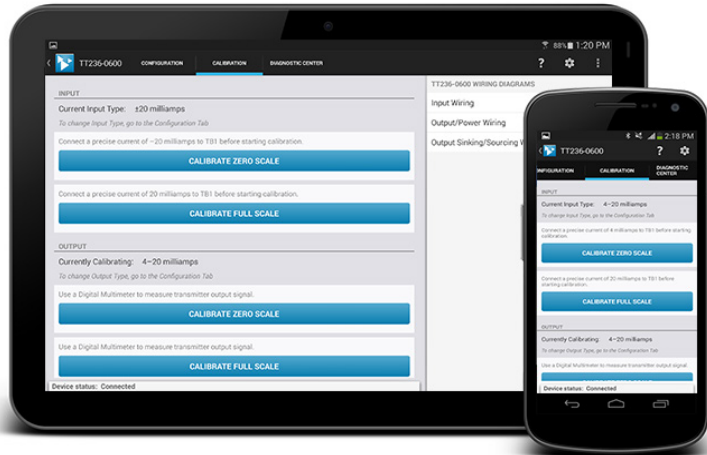
With a couple of taps, quickly configure input, output, unit and scaling options.

Key Features & Benefits

■ Connects to Acromag TT Series transmitters (except models TT231)

■ Requires the use of USB OTG Cable (Acromag part #: 5028-565) and USB A to Mini B Cable (Acromag part #: 4001-113)

■ Configures and calibrates TT Series products via phone or tablet running Android 4.3 ICS (Ice Cream Sandwich) or later.

■ View wiring diagrams, even without an internet connection

■ Perform quick and easy field diagnostics and troubleshooting

■ Ideal for field technicians

Quick and easy access to the wiring diagram, even offline without internet access.

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Tel 877-214-6267   ■   sales@acromag.com   ■   www.acromag.com   ■   30765 Wixom Rd, Wixom, MI 48393 USA

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.

Acromag Agility™ Config Tool
Easy to download, configuation too mobile app for free download at the Google Play Store.

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
Universal Input (85-264V AC / 100-370V DC)
Output
10W, 15W, 30W, 60W, 90W, 120W, 240W

Ordering Information

PS5R-VB24
Power supply, 15W, 0.65A at 24V DC

PS5R-VD24
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 PC-to-USB isolator, USB isolator-to-transmitter connections, and mobile device-to-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
5028-565
USB Cable, USB OTG Cable, 6 inches