931 Signal Conditioners
Precise Process Measurement and Control

Features and Benefits
- Helps protect your expensive control system from transients and noise
- Eliminates ground loop/noise-induced errors in process measurements through high levels of galvanic isolation
- Cost effective signal conversion to solve a signal mismatch between field device and I/O
- Eliminates signal degradation of critical process measurement during transmission
- Converts thermocouple/RTD measurements economically
- Accurately reproduces the signal using latest transformer and optical technologies
- Reduces the need to run expensive cables to transfer signals to control system
- Enables dedicated local display through signal splitting
- Rated for hazardous areas
- Extensive certifications for global use including: cULus, CE, ATEX, IECEx, FM, DNV-GL, KC, RCM, Class 1 Div 2

Signal Conditioners Help Protect Equipment, Maintain Process Integrity and Integrate Sensors

The Allen-Bradley® 931 Signal Conditioners provide optimal signal isolation, conversion and amplification. We offer many isolation and conversion options and a powered DIN-rail feature that eliminates the need to separately wire devices to the power supply. And the space-saving 931 Nano versions are only 6 mm wide.

Critical process measurements such as temperature, pressure, flow, level, weight, speed, frequency, current or voltage in your continuous or batch production process are exposed to noise and harsh environmental conditions that result in erroneous signal. These signal conditioners help protect your measurements and provide a more reliable signal so your processes can run efficiently.

These DIN rail-mounted analog signal conditioners are compatible with all types of integrated PLC and DCS I/O systems. They can also be integrated with PlantPAx® DCS to leverage a single control platform for batch, drives, motion control, process and safety.

Signal conditioners are commonly used in food and beverage production, water treatment, chemical processing, energy and power plants, steel production, oil and gas, and pharmaceutical industries.
# 931 Nano Series

**Thoughtful design**
- Space-saving 6 mm housing
- Easy onboard configuration
- Angled terminals for ease of wiring

**Isolate and convert numerous signals**
- Analog: 0/4…20 mA, 0/1/2…10V
- Bipolar: ±10 mA, ±20 mA and -11.5…+11.5V
- RTD: Pt10/20/50/100/200/250/300/400/500/1000, Ni50/100/120/1000
- Linear resistance: 0 Ω…10000 Ω
- Potentiometer: 10 Ω…100 kΩ

**High performance**
- High galvanic isolation: 2.5 kV AC
- High accuracy: 0.05%
- Fast response time for all analog signals: <5/7 ms
- Low power consumption
- Sensor and signal error detection

**Reduced wiring time**
- Power rail option reduces supply wiring
- One feed module powers up to 75 devices

**Extensive global certifications**
- UL/CSA, CE, ATEX, IECEx, FM, DNV-GL, KC, RCM, Hazardous Area (Class 1 Div 2/Zone 2)

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## Product Selection

<table>
<thead>
<tr>
<th>Output</th>
<th>Input</th>
<th>0...23 mA</th>
<th>0/4…20 mA; 0/1/2…5/10V (Configurable)</th>
<th>4…20 mA; 20…4 mA</th>
<th>±10 mA; ±20 mA</th>
<th>Channel</th>
<th>Power</th>
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<tbody>
<tr>
<td>0...23 mA</td>
<td>931N-C121</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>24V DC</td>
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<tr>
<td></td>
<td>931N-C122</td>
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<tr>
<td></td>
<td>931N-C141</td>
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<td>931N-C164</td>
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<td>Output Loop</td>
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<tr>
<td>0/4…20 mA; 0/1/2…5/10V (Configurable)</td>
<td>931N-A221</td>
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<td>1</td>
<td>24V DC</td>
</tr>
<tr>
<td></td>
<td>931N-A222</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24V DC</td>
</tr>
<tr>
<td>±10/±20 mA, ±10 V (Configurable)</td>
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<td>931N-X222</td>
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<tr>
<td>Thermocouple J, K</td>
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<tr>
<td>PT100</td>
<td>931N-R161</td>
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<td>24V DC</td>
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<tr>
<td>Thermocouple J, K; PT100</td>
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<td>Output Loop</td>
</tr>
<tr>
<td>Universal (All Thermocouples, PT/RTDs, Potentiometer, Resistance, Current, Voltage)</td>
<td>931N-U221</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>24V DC</td>
</tr>
</tbody>
</table>
### Standard Signal Isolators
- Cost-effective way to isolate 0...23 mA signal
- Galvanic isolation of input, output and power supply
- Replicates the exact input signal value to output, no configuration needed
- Eliminates ground loop/noise related errors to provide a reliable signal
- Sensor error and wire breakage detection, NAMUR NE43 compliance

#### 931N-C121: Analog Signal Converter
- Three-way galvanic isolation between input, output and power supply
- Powered by 24V DC, compatible for power bus DIN system

#### 931N-C122: Analog Signal Splitter
- Provides two isolated output signals from one input signal, which can be used for local HMI or other use
- Four-way galvanic isolation between power supply, input, 2 outputs
- Powered by 24V DC, compatible for power bus DIN system

#### 931N-C141: Analog Signal Converter
- Two-way galvanic isolation between the input and output
- Powered by input measuring circuit

#### 931N-C144: Dual Channel Converter
- Two isolated channels
- Four-way galvanic isolation between the inputs and outputs
- Powered by input measuring circuit

#### 931N-C161: Analog Signal Converter
- Two-way galvanic isolation between the input and output
- Powered by output loop circuit

#### 931N-C164: Dual Channel Converter
- Two isolated channels
- Four-way galvanic isolation between the inputs and outputs
- Powered by output loop circuit

### Standard Signal Converters with Isolation
- Cost-effective way to convert 0/4...20 mA and 0...10V signals
- Galvanic isolation of input, output and power supply
- Configurable input and output signals
- Easy configuration with DIP switch

#### 931N-A221: Analog Signal Converter
- Converts analog current and voltage signals
- Three-way galvanic isolation between input, output, and power supply
- Powered by 24V DC, compatible for power bus DIN system

#### 931N-A222: Analog Signal Splitter
- Provides two isolated output signals from one input signal, which can be used for local HMI or other use
- Four-way galvanic isolation between power supply, input, 2 outputs
- Powered by 24V DC, compatible for power bus DIN system

### Thermocouple Signal Converters
- Converts thermocouple J and K measurements to configurable analog current/voltage output signals

#### 931N-T221: Thermocouple Signal Converter
- Three-way galvanic isolation between input, output and power supply
- Powered by 24V DC, compatible for power bus DIN system
- Pre-calibrated temperature ranges
- Sensor error and wire breakage detection, NAMUR NE43 Compliance
- Eliminates signal degradation to provide a reliable temperature measurement

### RTD Signal Converters
- Converts temperature measurement from PT100 (2/3/4 wire) to configurable analog current output signal
- Sensor error and wire breakage detection, NAMUR NE43 compliance
- Easy configuration with DIP switch

#### 931N-R161: RTD Signal Converter
- Converts PT100 signal to analog current signal for better reliability
- Powered by the output loop circuit

#### 931N-R221: RTD Signal Converter
- Three-way galvanic isolation between input, output and power supply
- Powered by 24V DC, compatible for power bus DIN system

### Temperature Signal Converters
- Converts PT100 (2/3/4 wire) and thermocouple J and K signals to configurable analog current output

#### 931N-N161: Temperature Signal Converter
- Sensor error and wire breakage detection, NAMUR NE43 compliance
- Pre-calibrated temperature ranges
- Easy configuration with DIP switch
- Eliminates signal degradation to provide a reliable temperature measurement
- Powered by the output loop circuit

### Universal Signal Converters
- Convert a broad range of signals including RTDs, thermocouples, current, voltage, potentiometer and resistance inputs to analog current/voltage outputs

#### 931N-U221: Universal Signal Converter
- Sensor error and wire breakage detection, NAMUR NE43 compliance
- Three-way galvanic isolation between input, output and power supply
- Powered by 24V DC, compatible for power bus DIN system
931S Smart Series

These signal conditioners provide a wide range of highly configurable and flexible functionality – to help solve and prevent many problems in control and process applications.

Isolate and Convert Numerous Signals

- HART transparent and bidirectional
- Current up to 60 A AC/DC, through-hole and inline wiring voltage up to 480V AC and 660V DC frequency
- Load cell, strain gauge and bridge circuits
- Universal (including most thermocouples and potentiometers analog and relay outputs)

Product Selection

<table>
<thead>
<tr>
<th>Output</th>
<th>Input</th>
<th>Channels</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>0…22 mA, 0…11 V (Config small measurement ranges, 4mA/2V)</td>
<td>931S-A481</td>
<td>1</td>
<td>12…60V DC</td>
</tr>
<tr>
<td>Load Cell/Bridge ±10 mV; ±20 mV, ±30 mV; ±50 mV</td>
<td>931S-C121</td>
<td>1</td>
<td>24V DC</td>
</tr>
<tr>
<td>0/4…20 mA with HART</td>
<td>931S-C121, 931S-C122, 931S-C124</td>
<td>2</td>
<td>24V DC</td>
</tr>
<tr>
<td>0/4…20 mA</td>
<td>931S-C212</td>
<td>1</td>
<td>24V DC</td>
</tr>
<tr>
<td>0…5/10 A AC or DC</td>
<td>931S-L521</td>
<td>1</td>
<td>24V DC</td>
</tr>
<tr>
<td>0…4/50/60 A AC or DC</td>
<td>931S-M321</td>
<td>1</td>
<td>24V DC</td>
</tr>
<tr>
<td>0…20/25/30 A AC or DC</td>
<td>931S-M5213</td>
<td>1</td>
<td>24V DC</td>
</tr>
<tr>
<td>0…40/50/60 A AC or DC</td>
<td>931S-M5216</td>
<td>1</td>
<td>24V DC</td>
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<tr>
<td>PT100, PTC</td>
<td>931S-N392</td>
<td>1</td>
<td>24…240V AC/DC</td>
</tr>
<tr>
<td>±0.1mA, ±100 mA, ±20 mV, ±300 V</td>
<td>931S-P491</td>
<td>1</td>
<td>24…240V AC/DC</td>
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<tr>
<td>0…600V DC, 0…440V AC</td>
<td>931S-V291</td>
<td>1</td>
<td>24…240V AC/DC</td>
</tr>
<tr>
<td>200…480V AC (3Ph)</td>
<td>931S-V342</td>
<td>1</td>
<td>24…240V AC/DC</td>
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<tr>
<td>110/240/400V AC/DC</td>
<td>931S-V392</td>
<td>1</td>
<td>24…240V AC/DC</td>
</tr>
<tr>
<td>Universal (All Thermocouples, PT/RTDs, Potentiometer, Resistance, Current, Voltage)</td>
<td>931S-U392</td>
<td>1</td>
<td>9…264V AC</td>
</tr>
</tbody>
</table>

High Performance

- High galvanic isolation, up to 4 kV AC
- High accuracy: up to 0.05%
- Fast response time up to 0.5 ms
- Low power consumption
- Extensive global certifications: UL, CE, ATEX, IECEx, KC, RCM, Hazardous Area (Class 1 Div 2/Zone 2)

Thoughtful Designs

- Configuration without any tools
- Interactive display
- Three phase voltage and current monitoring in a compact housing
- Removable terminals with error-proof keys
### Configurable Signal Converter – Low Span
- Highly configurable input and output analog current/voltage signals conversion

**931S-A481: Configurable Signal Converter**
- Easy set-up via built-in buttons and dip switches
- Minimum range/span: 4 mA or 2V
- Measure and convert from 0 mA or 0V
- Wide power supply option

### Strain Gauge Converter
- Signal data conversion from resistance measuring bridges to standard analog signals
  - Weigh scale
  - Strain gauge
  - Wheatstone bridge
  - Load cell

**931S-B481: Strain Gauge Converter**
- 5 or 10V excitation
- Simple tare weight compensation with external button or an external PLC signal
- Supply up to 4 parallel connected measuring bridges, 350 Ω
- 4- and 6-wire measurement
- Three-way galvanic isolation between input, output and power supply

### Analog Signal Converter – HART
- Galvanic Isolation of input, output and power supply
- Replicates the exact input signal value to output, no configuration needed
- HART compatible, 0.5 - 2.5 kHz
- Bidirectional HART signal transmission between input and output
- Eliminates ground loop/noise related errors to provide a reliable signal

**931S-C121: Analog Signal Converter**
- Three-way galvanic isolation between input, output and power supply
- Powered by 24V DC

**931S-C122: Analog Signal Splitter**
- Provides two isolated output signals from one input signal, which can be used for local HMI or other use
- Four-way galvanic isolation between power supply, input, 2 outputs
- Powered by 24V DC, compatible for power bus DIN system

**931S-C124: Analog Signal Converter**
- Two isolated channels
- Five-way galvanic isolation between power supply, inputs and outputs
- Powered by 24V DC

**931S-C221: Dual Channel Converter (non-Hart)**
- Converts analog current input signal to voltage output signal
- Hazardous Area rated
- Three-way galvanic isolation between input, output and power supply

### Temperature Signal Converter
- Convert temperature measurements from PT100 and PTC to relay outputs

**931S-N392: Temperature Signal Converter**
- Dual relay output, 5 A rated
- Four-way galvanic isolation between the input, outputs and power
- Wide power supply option

### Signal Converter with Configuration Using Display
- Configure without any tools or programs

**931S-P491 Signal Converter**
- Interactive on-board display for easy configuration
- User-friendly, three-button front face plate configuration with display
- Wide range of input signals
- Universal power supply
- Three-way galvanic isolation and conversion of a broad range of input signals to standard analog signals
- Hazardous Area rated

### Current Monitoring Converters
- Measure, monitor and convert AC or DC current up to 60 A
- Contactless through-hole for the current carrying conductor
- One relay and one analog (configurable voltage/current) output
- Relay output can be configured for desired conditions such as over-current, under-current, etc.
- True RMS or Arithmetic Average for precise monitoring
- Adjustable trigger delay for filtering current peaks
- Four-way galvanic isolation between the input, outputs and power supply

**931S-M5211: Current Monitoring Converter**
- 0…10 A

**931S-M5213: Current Monitoring Converter**
- 0…30 A

**931S-M5216: Current Monitoring Converter**
- 0…60 A

**931S-M321: Current Monitoring Converter**
- 0…60 A

**931S-M521: Current Monitoring Converter**
- In-line (wired) AC or DC up to 10 A
- One relay and one analog (configurable voltage/current) output
- Relay output can be configured for desired conditions such as over-current, under-current, etc.
- Four-way galvanic isolation between the input, outputs and power
### Voltage Monitoring Converters

- Monitor and convert voltage up to 660V DC or 480V AC
- Analog or digital outputs, configurable for:
  - Preset voltage measurement levels
  - Phase asymmetry
  - Phase loss
  - Phase sequence and phase angle errors

**931S-V291: Voltage Monitor**

- Monitor and convert single-phase AC (440 max) and DC (660V)
- Configurable analog output
- Three-way galvanic isolation between input, output and power supply
- Wide power supply option

**931S-V342: Voltage Monitor**

- Monitor and convert three-phase AC up to 480V
- Two isolated relay outputs
- Three-way galvanic isolation between input and 2 outputs
- Powered by the input loop circuit

**931S-V392: Voltage Monitor**

- Monitor and convert single-phase AC and DC voltages up to 400V
- Two isolated relay outputs
- Four-way galvanic isolation between power, input and 2 outputs
- Wide power supply option

### Universal Signal Converter

- Versatile devices that can isolate, convert and amplify several types of input signals
- Input signals include RTDs, Thermocouples, current, voltage, potentiometer and resistance input signals
- Configurable analog and digital output options
- Configuration via on-board buttons/encoders or FDT/DTM program
- Transfer functions for input to output characterization
- Hazardous Area rated

**931S-U382**

- Two isolated output relays that can be configured for any user desired alarm/trip settings including auto/manual resets/delay function for the output alarm
- Four way galvanic isolated between the input, output(s) and power supply

**931S-U392**

- Two isolated output relays that can be configured for any user desired alarm/trip settings including auto/manual resets/delay function for the output alarm.
- Four way galvanic isolated between the input, output(s) and power supply
- Wide power supply

**931S-U561**

- One analog and one transistor output
- Three-way galvanic isolation between input and 2 outputs
- Powered by output loop circuit
931 Accessories

Power Bus DIN System

- Eliminates the need to wire devices to power supply
- Provides up to 2.5 A
- One feed module powers up to 75 signal conditioners
- Redundant power can be achieved with two feeds at opposite ends

<table>
<thead>
<tr>
<th>Description</th>
<th>DIN Size</th>
<th>Length</th>
<th>Catalog Number</th>
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<tbody>
<tr>
<td>Kit Contains: 1 bus circuit layer insert, 1 support section, 1 cover, 1 end left plate, 1 end right plate</td>
<td>35 x 7.5 mm</td>
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<td>931A-CS</td>
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<td>500 mm</td>
<td>931A-FS</td>
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<td>35 x 15 mm</td>
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<td>500 mm</td>
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Configuration Cable

<table>
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<tr>
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<th>Part</th>
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<tbody>
<tr>
<td>USB Cable</td>
<td>931A-CB*</td>
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*Assists in the configuration of devices with DTM files.