Bulletin 931 Signal Conditioners

Technical Data

Allen-Bradley

LISTEN. THINK. SOLVE.®

Analog Signal Conditioner Functionality

Analog Signal Conditioners are designed for use with Rockwell Automation I/O systems to provide reduced installation and maintenance costs in process applications. The products are available with 2 way isolation (between input and output) or 3 way isolation (between input, output and power).

- Isolation of analog measurement and control signals - with 2 way isolation (between input and output) or 3 way isolation (between input, output and power).
- Conversion of analog signals from voltage to current. (i.e. 0...10V to 4...20 mA, etc.)
- Amplification, linearization and transmission of low level sensor signals (i.e., mV signals from thermocouples).
- Transmission of analog signals over long distances
- Provide local display using a splitter or remote status indications and alarms via relay contact closures based on the analog signals.

Typical Applications

Analog Signal Conditioners are used wherever temperature, pressure, level, flow, weight, speed, etc. is measured and controlled as part of a continuous or batch production process. Analog Signal Conditioners help to prevent these measurements from being degraded on their way from the field to the control room by providing protection from external influences or problems that result from the installation methods used. Typical industries include power plants, steel production, water and wastewater plants, oil and gas production, and chemical processing.




Integrated Architecture
Scalable . . . Multi-disciplined . . . Information Enabled

The Rockwell Automation Integrated Architecture™ system improves your productivity and reduces total cost of ownership by providing unparalleled functionality, flexibility and scalability. Using sophisticated control, networking, visualization and information technologies, the Integrated Architecture addresses a full range of control and information needs for discrete, motion, process and batch control, drive control, and safety applications.

Analog Signal Processing

Analog signals involve the measurement of constantly changing physical operating characteristics which come in many different forms, the most common of which are temperature and pressure. These signals are often found in processes that involve harsh industrial environments or are exposed to the elements. Such environmental conditions can significantly affect the quality of the transmitted signal and are also constantly changing themselves. Additionally, such industrial processes often require that these signals are able to be accurately transmitted over long distances.For these and a variety of other reasons, analog signal conditioning is often required between the measuring instrumentation and the control system. Analog signal conditioning is a long established practice in many process industries such as oil and gas processing, pharmaceutical and chemicals industries and standardized electrical signals are normally used. Currents of 0...20 mA or 4...20 mA and voltages of 0...10 V DC are the most often specified by controls engineers.

Bulletin 931 Signal Conditioners Product Range

Rockwell Automation offers a wide range of products to condition analog signals according to industry standards. The Bulletin 931 Analog Signal Conditioners also provide the necessary isolation of the field measurement device from the controller as well as from any external power supplies. Such isolation prevents interference that can occur due to ground loops or common mode noise. The wide range of Allen-Bradley Bulletin 931 Analog Signal Conditioners completely covers the functions involved in analog signal conversion, isolation, and monitoring. The product range addresses nearly all applications in industrial measuring technology and safeguards the elementary functions between field signals and control systems. The products are easily mounted on 35 mm DIN rail and come in standard electronic housings with widths of 6, 12.5, 17.5, 22.5, or 45 mm.

Analog Signal Conditioners

Problem solvers for process automation.

Given the wide variety of analog I/O available with today's modern industrial and process control systems, some may question why Analog Signal Conditioners are used. Here are a few examples of why an Analog Signal Conditioner might be desirable or required in an installation.

- **Local Alarm/Indication**

Many analog signals are passed to local indicators and alarms, which then need to be isolated from each other.

- **Long Distance Transmission**

Instead of running expensive cable to the control system (e.g., thermocouples for temperature), Analog Signal Conditioners can isolate and convert to a high level signal that is easier to transmit (e.g., 4...20 mA).

- **Non-Isolated Analog I/O**

If the existing control system does not provide isolated analog inputs, a separate Analog Signal Conditioner will often be used to provide signal isolation when required e.g., if the control system needs to be protected from electrical noise pulses on its analog inputs.

- **Isolation of the Power Source**

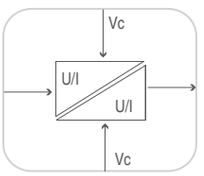
Where the control system cannot provide power for the sesnor / transmitter, it is often convenient to provide isolation of the power source using an Analog Signal Conditioner.

- **Local Display and Linearization**

When a dedicated local display is required, the analog signal can be split using an Analog Signal Conditioner. For example, where a liquid volume indicator is needed for filling a bulk storage tank, but the measurement is level (level to volume conversion depends on the shape of the tank).

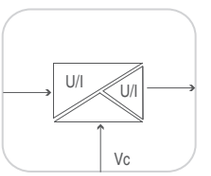
- **The remaining I/O available in an existing system does not provide for the input type of the sensor required.**

Example: The remaining I/O in the control system requires a 4...20mA analog inputs and the sensors provide less common signals – e.g., 0…20mV, 2...10V, 0-10K , 0...1mA, 4-12kHz, 0...5 A (AC), etc.



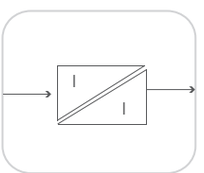
Two-Way Isolation

Analog Signal Conditioners with 2-way isolation separate the input and output signals from each other electrically and decouple the measuring circuits. Potential differences caused by long line lengths and common reference points are eliminated. The electrical separation also protects against irreparable damage caused by over voltages as well as inductive and capacitive interference.



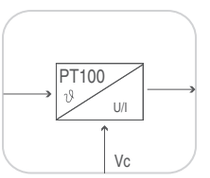
Three-Way Isolation

Analog Signal Conditioners with 3-way isolation separate the supply voltage from the input and output circuits as well and enables the analog circuit to operate with just one operating voltage.



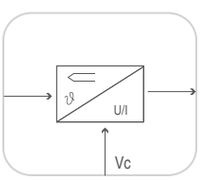
Passive Isolation

Analog Signal Conditioners with passive isolation offer an additional advantage in that they do not require an additional voltage supply. The power supply to the Analog Signal Conditioner can be provided either by the input or output circuit. This current loop feed is characterized by very low power consumption.



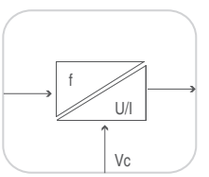
Temperature Measurement
PT100

A number of Analog Signal Conditioners are available for temperature measurements. For example, PT100 signals in 2-, 3- and 4-wire systems are converted into standard 0...20 mA, 4...20 mA and 0...10 V signals.



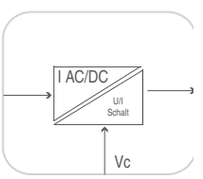
Temperature Measurement
Thermocouples

Analog Signal Conditioners for connecting conventional thermocouples are fitted with cold trap compensation as standard. These devices amplify and linearize the voltage signal provided by the thermocouple. This guarantees accurate analog signal conditioning while eliminating sources of interference or error.



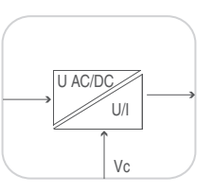
Frequency Conversion

Analog Signal Conditioners are available to convert frequencies into standard analog signals. Downstream controls can therefore directly process pulse strings for measuring rpm or speed.



Current Monitoring

Analog Signal Conditioners are available for current monitoring for currents up to 60A AC or DC. These devices cause a switched output to be triggered by currents above or below the set value and may also provide analog outputs for continuous monitoring of the load current.



Voltage Monitoring

Analog Signal Conditioners are available for voltage monitoring of both AC and DC voltages. Voltage fluctuations due to switching processes or overload conditions can be detected for voltages above or below the user-defined switching threshold.

931 –	S	A1	A1	N	-	IP	N
	a	*b*	*c*	*d*	-	*e*	*f*

a

Code	Description
H	High-density
S	Standard
U	Universal

b

Input Type	
Code	**Description**
Current	
A1	0…20 mA or 4…20 mA
A2	4…20 mA
A3	0…1 A, 0…5 A or 0…10 A AC
A4	0…20 A, 0…25 A or 0…30 A AC/DC
Bridge	
B1	-500 mV…+500 mV
Voltage or Current	
C1	0…5V or 0…1V DC
	0…20 mA or 4…20 mA
C2	0…10V DC
	0…20 mA or 4...20mA
C3	0…10V DC
	0…22 mA
C4	±20mV...±200V
	±0.1 mA…100 mA
C9	Universal Inputs
Frequency	
F1	2-,3-wire PNP/NPN, namar initiator, push/pull step
Potentiometer	
P1	PT 100/2/3/4-Conductor or Ni 100/2/3/4-Conductor
P2	PT 100/2/3-Conductor
P3	PT 100/2/3/4-Conductor
Thermocouple	
T1	Type J
T2	Type K
T9	Types K,J,T,E,N,R,S,B
Voltage	
V1	24…70V, 70…140V, 140…210V or 210…260V AC/DC

c

Output Type	
Code	**Description**
Current	
A1	0…20 mA or 4…20 mA
A2	4…20 mA
A5	(2) 4…20 mA
Voltage or Current	
C1	0…5V or 0…1 VDC
	0…20 mA or 4…20 mA
C2	0…10V DC
	0…20 mA or 4...20mA
C3	0…10V DC
	0…22mA
C5	0...±10V
	0…±20 mA
C6	0…5V, 5…0V DC or 10…0V, 0…10V DC
	0…20 mA, 20…0 mA or 4…20 mA, 20…4 mA
C7	0…±10V
	0...±20 mA
R1	3 A relay contact closure digital output

d

Configuration Setting	
Code	**Description**
N	Non-configurable
D	DIP Switch
J	Jumper
C	Computer

e

Power Type	
Code	**Description**
IP	Input Loop Power
OP	Output Loop Power
BC	Aux AC or DC Power
DC	DC Aux Power
MC	from the Measuring Circuit

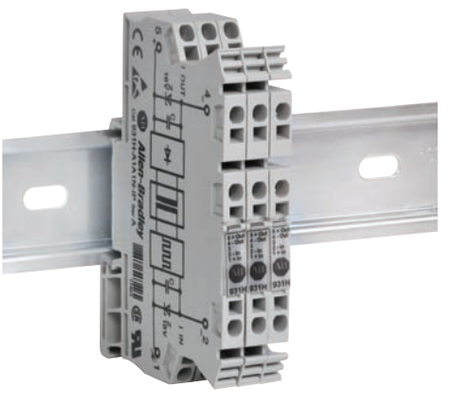
f

Miscellaneous	
Code	**Description**
1	One Channel
2	Two Channels
Hall	Hall Effect Sensor
Hart	Hart Communication Protocol
Cable	Cable
1R	One Relay
2R	Two Relays

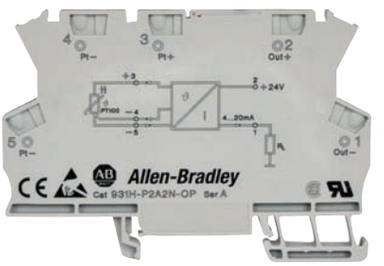
Bulletin 931H - High-Density Series

The modules in the High-Density series provide cost-effective analog signal conditioning in a very small package.

- Extreme high-density mounting (6 mm wide modules)
- Provide isolation and conversion solutions for a variety of signals
  - Current
  - Voltage
  - Temperature (thermocouples and RTDs)
- The DIP switches can be accessed from outside the housing
- Capability to jumper incoming power from unit to unit using standard Bulletin 1492 terminal block jumpers on most Bulletin 931H devices
- Wiring diagrams printed on outside of housing for ease of use in commissioning and maintenance activities



931H-A1A1N-1P

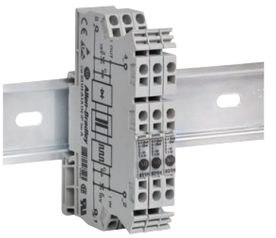


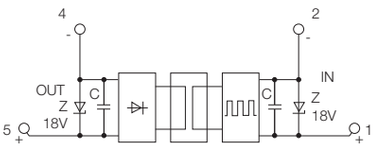
931H-P2A2N-OP

Passive Isolator, 1 Channel

- Passive isolator for electrical isolation of standard 0...20 mA or 4...20 mA signals
- No need for auxiliary power supply
- Low power consumption

931H-A1A1N-IP



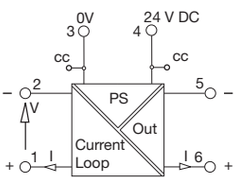
Specifications	***Passive Isolator, 1-Channel***
Wiring Diagram	
Standards Compliance	UL 508, EN 60079-0:2006, EN60079-15:2005, EN50178:1997, CSA C22.2 No. 142, CSA C22.2 No. 14-95, CSA C22.2 No. 0-M91
Certifications	CE, CSA, cURus NRAQ2/8.E113724
Input Ratings	
Current	0...20 mA or 4...20 mA
Max Voltage	15V
Max Current	50 mA
Pick-up Current	< 100 µA
Voltage Drop	2.5….3 V at 20 mA
Output Ratings	
Voltage	max. 10 V
Current	0...20 mA or 4...20 mA
Load Impedance voltage/current	/ ≤ 500 Ω
Accuracy	< 0.1% of final value
Temperature Coefficient	≤ 50 ppm/K of measure. value at 0 M load resistance
Influence of Load Impedance	0.05% of measurement value/100 Ω load resistance
Residual Ripple	< 10 mV_{eff}
Chopper Frequency	approx. 200 kHz
General Specifications	
Operating Temperature	-25 °C…+60 °C
Storage Temperature	-40 °C…+85 °C
Insulation Standards	EN 60529, EN 61010-1
EMC Standards	EN 61000-6-1, EN 610006-2:2005, EN 610006-3:2007, EN 61006-4:2007
Isolation Voltage Input - Output	500V_{eff}

Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931H-A1A1N-IP	1

Active Isolator, 3-Way

- 2-conductor system
- 3-port isolation
- Power supply can be cross connected

931H-A2A2N-DC

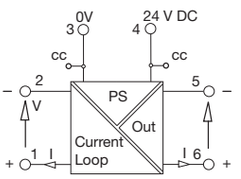
Specifications	***Active Isolator, 3-Way***
Wiring Diagram	
Standards Compliance	CSA C22.2 No 142, CSA C22.2 No 60079-1, CSA E60079, UL 508, UL 60079, EN61010-1:2001
Certifications	cULus, IND. CONT. EQUIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D., CE, ATEX - Class 1, Zone 2
Input Ratings	
Current	4...20mA
Sensor	2-conductor
Supply Voltage	16.5V / constant for 3…22 mA
Output Ratings	
Current	4...20 mA
Output Signal Limit	22...25 mA
Load Impedance voltage/current	≤ 500 Ω voltage
Accuracy	< 0.1 %
Temperature Coefficient	≤ 50 ppm/K
Step Response Time	≤ 2 ms
Offset Current	< 30 µA
Residual Ripple	< 10 mV_{eff}
General Specifications	
Supply Voltage	24V DC ± 15%
Power Consumption	approx. 1 W
Current Carrying Capacity of Cross Connect	≤ 20 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-25 °C…+85 °C
Insulation Standards	EN 50178
EMC Standards	DIN EN 61326 class B, EN61000-6-1:2007, EN61000-6-2:2005, EN6100-6-3:2007, EN61000-6-4:2007
Rated Insulation Voltage	300V
Isolation Voltage Input - Output	1.5kV_{eff}
Surge Category	II
Pollution Severity	2

Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931H-A2A2N-DC	1

Active Isolator, 3-Way, Hart

- 2-conductor system
- 3-port isolation
- With Hart transmission
- Output signal switchable

931H-A2C2D-DCHART

Specifications	*Active Isolator, 3-Way, Hart*
Wiring Diagram	
Standards Compliance	CSA C22.2 No 142, CSA C22.2 No 60079-1, CSA E60079, EN61010-1:2001
Certifications	cULus, IND. CONT. EQUIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D., CE, ATEX - Class 1, Zone 2
Input Ratings	
Current	4...20 mA
Sensor	2-conductor
Supply Voltage	16.5V / constant for 3…22 mA
Output Ratings	
Current	4...20 mA
Voltage	0...10V
Output Signal Limit	22...25 mA resp. 11...12.5V
Load Impedance voltage/current	≥ 10 kΩ / ≤ 500 Ω
Accuracy	I_{OUT}: < 0.1% / U_{OUT}: < 0.2%
Temperature Coefficient	≤ 50 ppm/K
Step Response Time	≤ 2 ms
Offset Current	< 30 µA
Residual Ripple	< 10mV_{eff}
General Specifications	
Supply Voltage	24V DC ± 15%
Power Consumption	approx. 1 W
Communication	to Hart specification
Current Carrying Capacity of Cross Connect	≤ 20 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-25 °C…+85 °C
Insulation Standards	EN 50178
EMC Standards	DIN EN 61326 class B, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Insulation Voltage	600V
Isolation Voltage Input - Output	2.5kV_{eff}
Surge Category	II
Pollution Severity	2

Signal Conditioner	Cat. No.	Pkg. Quantity
	931H-A2C2D-DCHART	1

Setting options/switch position

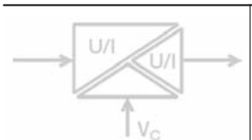
	Switch			
Output	**1**	**2**	**3**	**4**
4 … 20 mA	□	□	■	□
0 … 20 mA	■	□	■	□
0 … 10 V	■	■	□	■

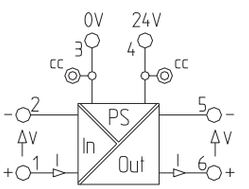
■ = on
□ = off

Active Converter, 3 Way

- 3-way isolation
- Calibrated change over via DIP switch
- Cross-connection of power supply
- Low power loss

931H-C2C2D-DC



Specifications	*Active Converter, 3 Way*
Wiring Diagram	
Standards Compliance	CSA C22.2 No.142, CSA C22.2 No. 60079-1, CSA E60079, UL 508, UL 60079, EN 61010-1:2001
Certifications	cULus, IND. CONT. EQUIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D., CE, ATEX - Class 1, Zone 2
Input Ratings	
Voltage	0...10V
Current	0...20 mA or 4...20 mA
Input Resistance	100 kΩ /≤ 5 Ω
Voltage Drop	< 0.1V at IIN =20 mA (current input)
Output Ratings	
Voltage	0...10V
Current	0...20 mA or 4...20 mA
Load Impedance voltage/current	≥ 10 kΩ / ≤ 500 Ω
Accuracy	< 0.5% of final value
Temperature Coefficient	≤ 150 ppm/K of final value
Cut-off Frequency	approx. 0.6 W
General Specifications	
Supply Voltage	24V DC ± 15%
Power Consumption	approx. 0.6 W
Current Carrying Capacity of Cross Connect	≤ 20 A
Operating Temperature	0 °C...+55 °C
Storage Temperature	-25 °C...+85 °C
Default Settings	0...20 mA / 0...20 mA
Insulation Standards	EN 50178
EMC Standards	DIN EN 61326 class B, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Insulation Voltage	50V
Isolation Voltage Input - Output	$500V_{eff}$ / 1 s
Surge Category	II
Pollution Severity	2

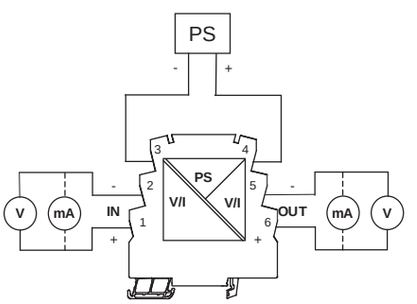
Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931H-C2C2D-DC	1

Setting options/switch position

		Switch							
		S1		S2					
Input	Output	1	2	1	2	3	4	5	6
0 ... 20 mA	0 ... 20 mA	■	□	□	□	□	■	□	□
0 ... 20 mA	4 ... 20 mA	■	□	□	□	■	■	□	□
0 ... 20 mA	0 ... 10 V	■	□	□	□	□	□	■	■
4 ... 20 mA	0 ... 20 mA	■	□	■	■	■	■	□	□
4 ... 20 mA	4 ... 20 mA	■	□	□	□	□	■	□	□
4 ... 20 mA	0 ... 10 V	■	□	■	■	■	□	■	■
0 ... 10 V	0 ... 20 mA	□	■	□	□	□	■	□	□
0 ... 10 V	4 ... 20 mA	□	■	□	□	■	■	□	□
0 ... 10 V	0 ... 10 V	□	■	□	□	□	□	■	■

■ = on
□ = off

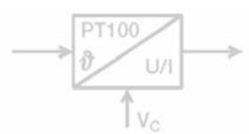
Connection

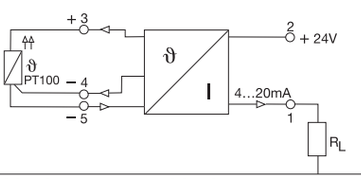


Active Converter, PT100/RTD

- For 2- or 3- conductor PT100 sensors
- Loop-fed output current
- High accuracy and linearity

931H-P2A2N-OP



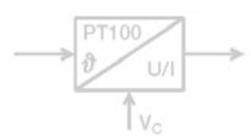
Specifications	*Active Converter, PT100/RTD*
Wiring Diagram	
Standards Compliance	CSA C22.2 No. 142, CSA C22.2 No 0-M91, CSA C22.2 No 14-95, UL 508
Certifications	cURus NRAQ2/8.E113724, CE, CSA
Input Ratings	
Sensor	PT100/2-/3-conductor (to IEC 751)
Supply Voltage	9...30V DC
Supply Current	0.8 mA
Output Ratings	
Current	4...20 mA
Load Impedance voltage/current	≤ 600 Ω
Accuracy	typical 0.2%, max. 0.5% of FSR /max. 0.006 K/Ω
Response Time	10 ms
General Specifications	
Operating Temperature	0 °C…+50 °C
Storage Temperature	-20 °C…+85 °C
Insulation Standards	EN 50178, EN 60751, IEC751
EMC Standards	EN 61000-6-1:2007, EN61000-6-2:2005, EN61000-6-3:2007, EN 61000-6-4:2007

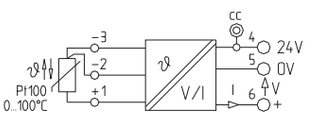
Signal Conditioner	Cat. No.	Pkg. Quantity
	931H-P2A2N-OP	1

Active Converter, PT100/RTD

- 2-way isolation between input/output and power supply
- PT100 2- or 3- conductor converter
- Cross-connection of power supply
- Low power loss

931H-P2C1D-DC



Specifications	*Active Converter, PT100/RTD*
Wiring Diagram	
Standards Compliance	UL 60079.15, UL 508, EN 60079-0:2006, EN 60079-15:2005, CSA C22.2 No. 14-95, CSA C22.2 No. 142-M1987, CSA E60079-15:02
Certifications	Also listed for HAZ. LOC. Areas Class 1, DIV. 2\ Zone 2 Groups A, B, C, and D, CE, ATEX - Class 1, Zone 2, Demko 09ATEX 147279X, cULus NRAG/7.E10314, NWGD/7.E10314 HazLoc
Input Ratings	
Sensor	PT100/2-/3-conductor (to IEC 751)
Supply Current	0.8 mA
Temperature Input Rating	0…100 °C
Output Ratings	
Voltage	0…10V / 0…5V
Current	0...20 mA or 4...20 mA
Load Impedance voltage/current	≥ 10 kΩ / ≤ 300 Ω, ≤ 400 Ω @ 24V
Accuracy	< 0.5% of measuring range
Temperature Coefficient	≤ 250 ppm/K of final value
Step Response Time	< 0.7 s
General Specifications	
Supply Voltage	24V DC ± 10 %
Power Consumption	approx. 0.6 W
Current Carrying Capacity of Cross Connect	≤ 20 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Default Settings	0…20 mA
Insulation Standards	EN 50178, EN 60751
EMC Standards	EN 55011, EN 61326, EN 61000-6-1:2007, EN 61006-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Insulation Voltage	100V
Impulse Withstand Voltage	1.5kV
Isolation Voltage Input - Output	$500V_{eff}$ / 1 s
Surge Category	III
Pollution Severity	2
Clearance and Creepage Distance	≥ 1.5 mm

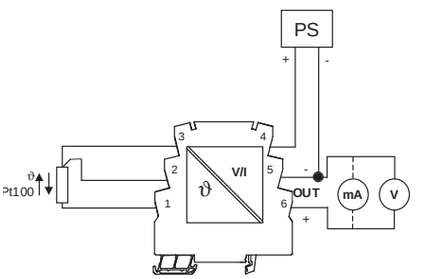
Signal Conditioner	Cat. No.	Pkg. Quantity
	931H-P2C1D-DC	1

Setting options/switch position

	Switch			
Output	1	2	3	4
0 … 10 V	■	■	■	□
0 … 20 mA	□	□	□	□
4 … 20 mA	□	□	□	■
0 … 5 V	■	■	■	■

■ = on
□ = off

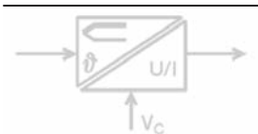
Connection

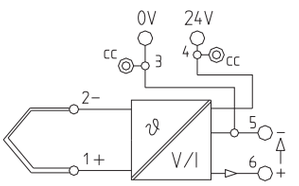


Thermocouple, Type J

- 2-way isolation between input/output and power supply
- Cold-junction compensation
- Linearization
- Output can be switched via DIP switch

931H-T1C1D-DC



Specifications	*Thermocouple, Type J*
Wiring Diagram	
Standards Compliance	UL 60079.15, UL 508, EN 60079-0:2006, EN 60079-15:2005, CSA C22.2 No. 14-95, CSA C22.2 No. 142-M1987, CSA E60079-15:02
Certifications	Also listed for HAZ. LOC. Areas Class 1, DIV. 2\ Zone 2 Groups A, B, C, and D, CE, ATEX - Class 1, Zone 2, Demko 09ATEX 147279X, cULus NRAG/7.E10314 NWGD/7.E10314 HazLoc
Input Ratings	
Sensor	Thermo element to IEC 584, type: J
Temperature Input Rating	0…700 °C
Output Ratings	
Voltage	0…10V / 0…5V
Current	0...20 mA or 4...20 mA
Load Impedance voltage/current	≥ 10 kΩ /≤ 300 Ω, ≤ 400 Ω @ 24V
Accuracy	< 0.7% of measuring range
Temperature Coefficient	≤ 250 ppm/K of final value
Step Response Time	< 0.7 s
Wire Break Detection	output value:.> 20 mA, >10V
Residual Ripple	< 20mV_{eff}
General Specifications	
Supply Voltage	24V DC ± 10 %
Power Consumption	approx. 0.6 W
Current Carrying Capacity of Cross Connect	≤ 20 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Default Settings	0…20 mA
Insulation Standards	EN 50178, EN 60584, IEC 584
EMC Standards	EN 55011, EN 61326, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Insulation Voltage	100V
Impulse Withstand Voltage	1.5 kV
Isolation Voltage Input - Output	500V_{eff} / 1 s
Surge Category	III
Pollution Severity	2
Clearance and Creepage Distance	≥ 1.5 mm

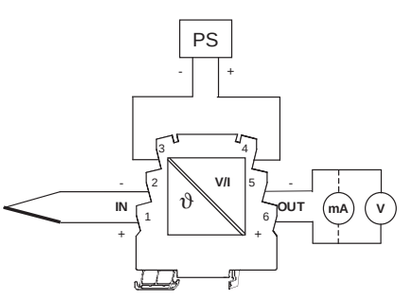
Signal Conditioner	Cat. No.	Pkg. Quantity
	931H-T1C1D-DC	1

Setting options/switch position

	Switch			
Output	1	2	3	4
0 … 10 V	■	■	■	□
0 … 20 mA	□	□	□	□
4 … 20 mA	□	□	□	■
0 … 5 V	■	■	■	■

■ = on
□ = off

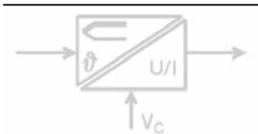
Connection

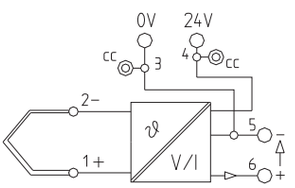


Thermocouple, Type K

- 2-way isolation between input/output and power supply
- Cold-junction compensation
- Linearization
- Output can be switched via DIP switch

931H-T2C1D-DC



Specifications	***Thermocouple, Type K***
Wiring Diagram	
Standards Compliance	UL 60079.15, UL 508, EN 60079-0:2006, EN 60079-15:2005, CSA C22.2 No. 14-95, CSA C22.2 No. 142-M1987, CSA E60079-15:02
Certifications	Also listed for HAZ. LOC. Areas Class 1, DIV. 2\ Zone 2 Groups A, B, C, and DCE, ATEX - Class 1, Zone 2 Demko 09ATEX 147279X, cULus NRAG/7.E10314, NWGD/7.E10314 HazLoc
Input Ratings	
Sensor	Thermo element to IEC 584, type: K
Temperature Input Rating	0…1000 °C
Output Ratings	
Voltage	0…10V / 0…5V
Current	0...20 mA or 4...20 mA
Load Impedance voltage/current	≥ 10 kΩ /≤ 300 Ω, ≤ 400 Ω @ 24V
Accuracy	< 0.6% of measuring range
Temperature Coefficient	≤ 250 ppm/K of final value
Step Response Time	< 0.7 s
Wire Break Detection	output value: .> 20 mA, >10V
Residual Ripple	< 20mV_{eff}
General Specifications	
Supply Voltage	24V DC ± 10 %
Power Consumption	approx. 0.6 W
Current Carrying Capacity of Cross Connect	≤ 20 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Default Settings	0…20 mA
Insulation Standards	EN 50178, EN 60584, IEC 584
EMC Standards	EN 55011, EN 61326, EN61000-6-1:2007, EN61000-6-2:2005, EN61000-6-3:2007, EN61000-6-4:2007
Rated Insulation Voltage	100V
Impulse Withstand Voltage	1.5 kV
Isolation Voltage Input - Output	500V_{eff} / 1 s
Surge Category	III
Pollution Severity	2
Clearance and Creepage Distance	≥ 1.5 mm

Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931H-T2C1D-DC	1

Bulletin 931S - Standard Series

The 931S Standard Series of analog signal conditioners provide solutions for a wide variety of analog signals. They are available in compact sizes ranging from 12.5... 22.5 mm in width.

- Provide isolation and conversion solutions for a wide variety of signals:
  - Current
  - Voltage
  - Temperature (thermocouples and RTDs)
  - Frequency
  - Load Cells (bridge transducers)
  - Potentiometers
- Removable, plug-in terminal blocks are coded to eliminate wiring errors.
- The printed circuit board can be removed and re-installed without tools providing ease of use when accessing the internal DIP switches.
- Capability to jumper incoming power from unit to unit using standard Bulletin 1492 terminal block jumpers on some 931S devices.
- Jumper settings printed on outside of housing for ease of use in commissioning and maintenance activities.

Circuit Board Removal

The printed circuit board can be removed without any tools. Once the terminal blocks are removed, simply press in the locking hook at the top and pull out the printed circuit board. This makes accessing the internal DIP switches fast and easy.

Power Connection

Standard Bulletin 1492 jumpers can be used to connect units to the same Bulletin 1606 power supply. These jumpers provide a fast and easy way to provide power to a series of Bulletin 931 analog signal conditioners mounted together on a DIN Rail.

Safe Isolation

"Protective separation" has to be guaranteed as per EN 50178. The Bulletin 931S series omplies with full separation between the analog signal and the incoming power.

Removable Terminal Blocks

Removable terminal blocks are coded for easy removal and replacement without error. They accommodate wire sizes up to 14 AWG (2.5 mm^2).

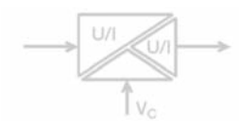
Standardized Housings

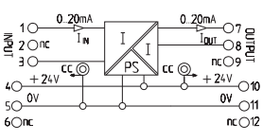
The housings come in 3 standard sizes, 12.5, 17.5, and 22.5 mm. Ventilation slots provide for heat dissipation. Jumper and DIP switch settings are printed on the side of the housing for ease of use in commissioning and maintenance.

Active Converter, 3 Way

- Signal conversion
- Electrical isolation between input/output signal and power supply
- Power supply can be cross-connected using plug-in bridges

931S-A1A1N-DC

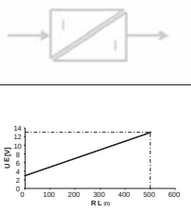
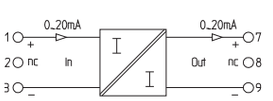
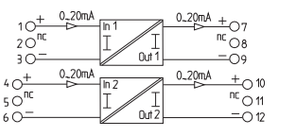


Specifications	*Active Converter, 3-Way*
Wiring Diagram	
Standards Compliance	cULus, IND. CONT. EQUIP., UL 508, CSA 22.2 No. 142-M198, EN 61000-6-1: 2007, EN 61000-6-2: 2005, EN61000-6-4:2007
Certifications	CE, cULus NRAQ.E113724
Input Ratings	
Current	0...20 mA or 4...20 mA
Max Current	25 mA
Output Ratings	
Current	0...20 mA or 4...20 mA
Load Impedance voltage/current	*≤ 600 Ω voltage*
Accuracy	0.2%
Temperature Coefficient	≤ 250 ppm/K
Step Response Time	< 45 ms
Cut-off Frequency (-3 dB)	10 Hz
General Specifications	
Supply Voltage	24V DC ± 25%
Power Consumption	< 1.5 W at I_{OUT} =20 mA
Current-Carrying Capacity of Cross-Connect	≤ 2A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Insulation Standards	EN 50178: 1997
Rated Insulation Voltage	300V
Impulse Withstand Voltage	4kV
Isolation Voltage Input/Output	$2kV_{eff}$ /5 s
Surge Category	III
Pollution Severity	2
Clearance and Creepage Distance	≥ 3 mm

Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931S-A1A1N-DC	1

Passive Isolator

- Reliable isolation
- Very low power consumption

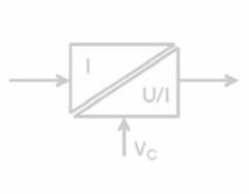
	931S-A1A1N-IP1	931S-A1A1N-IP2
		
Specifications	***Passive Isolator, 1-channel***	***Passive Isolator, 2-channel***
Wiring Diagram		
Standards Compliance	EN 61000-6-1:2007, EN61000-6-2:2005, EN61000-6-3:2007, UL 508, CSA C22.2 No. 142-M198, CSA C22.2 No. 142-213-M1	EN 61000-6-1:2007, EN61000-6-2:2005, EN61000-6-3:2007, UL 508, CSA C22.2 No. 142-M198, CSA C22.2 No. 142-213-M1
Certifications	cULus, IND. CONT. EQUIP., NRAG.E10314 Also listed for use HAZ. LOC. areas Class 1, DIV 2, Groups A, B, C, and D., CE	cULus, IND. CONT. EQUIP. NRAG/7.E10314 Also listed for use HAZ. LOC. areas Class 1, DIV 2, Groups A, B, C, and D., CE
Input Ratings		
Voltage	—	—
Current	0...20 mA or 4...20 mA	0...20 mA or 4...20 mA
Pick-up Current	<100 µA	<100 µA
Voltage Drop	approx. 3V at R_L =0 Ω, approx. 13V at R_L =500 Ω (I_{IN} =20mA)	approx. 3V at R_L =0 Ω, approx. 13V at R_L =500 Ω (I_{IN} =20mA)
Max Voltage	18V	18V
Max Current	50 mA	50 mA
Output Ratings		
Voltage	—	—
Current	0...20 mA or 4...20 mA	0...20 mA or 4...20 mA
Load Impedance	≤ 500 Ω	≤ 500 Ω
Influence of Load Impedance	< 0.1% of measurement value/100 Ω load resistance	< 0.1% of measurement value/100 Ω load resistance
Temperature Coefficient	≤ 50 ppm/K of final value	≤ 50 ppm/K of final value
Residual Ripple	20 mV	20 mV
Chopper Frequency	approx. 170 kHz	approx. 170 kHz
General Specifications		
Operating Temperature	-40 °C...+70 °C	-40 °C...+70 °C
Storage Temperature	-40 °C...+80 °C	-40 °C...+80 °C
Insulation Standards	EN 50178 (protective separation): 1997	EN 50178 (protective separation): 1997
Rated Insulation Voltage	300V	300V
Impulse Withstand Voltage	6kV	6kV
Isolation Voltage Input - Output	4kV/1 s	4kV/1 s
Surge Category	III	III
Pollution Severity	2	2
Clearance and Creepage Distance	≥ 5.5 mm	≥ 5.5 mm

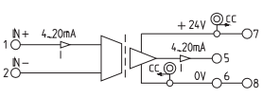
Signal Conditioner	Cat. No.	Pkg. Quantity	Cat. No.	Pkg. Quantity
	931S-A1A1N-IP1	1	931S-A1A1N-IP2	1

Active Isolator

- Signal conversion
- Electrical isolation between input and output signals
- Power supply can be cross-connected using ZQV cross connection system

931S-A2A2N-DC



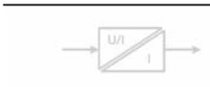
Specifications	***Active Isolator***
Wiring Diagram	
Standards Compliance	EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN61000-6-4:2007, UL 508, CSA C22.2 No, 142-M198, CSA C22.2 No. 142-213-M1
Certifications	cULus, IND. CONT. EQUIP. NRAG.E10314 Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D., CE
Input Ratings	
Current	4...20 mA
Max Current	25 mA
Max Voltage	7V
Output Ratings	
Current	4...20 mA
Output Signal Limit	approx. 31 mA
Load Impedance voltage/current	*≤ 500 Ω voltage*
Accuracy	0.2% of measuring range final value
Temperature Coefficient	≤ 250 ppm/K
Step Response Time	< 30 ms
Cut-off Frequency (-3 dB)	15 Hz
General Specifications	
Supply Voltage	24V DC ± 20%
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Insulation Standards	EN 50178: 1997
Rated Insulation Voltage	300V
Impulse Withstand Voltage	4kV
Isolation Voltage Input - Output	$1.2kV_{eff}$/1 s
Surge Category	III
Pollution Severity	2
Clearance and Creepage Distance	≥ 3 mm

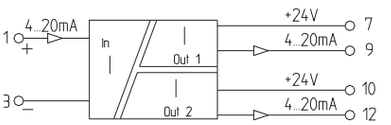
Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931S-A2A2N-DC	1

Passive Isolator, Splitter

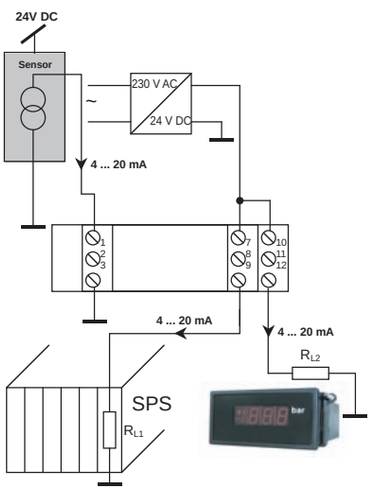
- Electrical isolation
- Input and output current loop feed
- Very low power consumption
- No callibration necessary

931S-A2A5N-OP

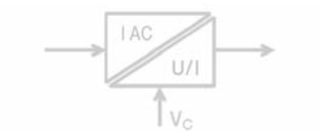
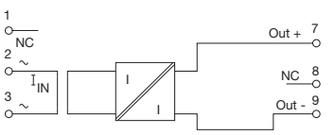
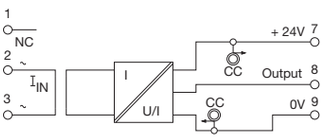


Specifications	*Passive Isolator, Splitter*
Wiring Diagram	
Standards Compliance	EN 60079-0:2006, EN 60079-15: 2005, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN61000-6-4:2007, UL 508, CSA C22.2 No, 142-M198, CSA C22.2 No. 142-213-M1
Certifications	cULus, IND. CONT. EQUIP. NRAG/7.E10314, NWGD/7.E10314 Also listed for HAZ. LOC. Areas Class 1, DIV. 2\ Zone 2 Groups A, B, C, and D, CE ATEX, Class 1 Zone 1 Demko 09ATEX 0929065X
Input Ratings	
Current	4...20 mA
Max Current	40 mA
Voltage Drop	3.8V
Output Ratings	
Current	2 x 4...20 mA
Output Signal Limit	approx. 31 mA
Load Impedance voltage/current	/RL = (UB-12 V) / 20 mA e.g. 600 M at 24 V
Accuracy	0.2% of measuring range final value
Temperature Coefficient	≤ 150 ppm/K
Step Response Time	< 20 ms
Cut-off Frequency (-3 dB)	30 Hz
General Specifications	
Supply Voltage	min. 12V DC, max. 30V DC
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Insulation Standards	EN 50178 (protective separation):1997
Rated Insulation Voltage	300V
Impulse Withstand Voltage	4kV
Isolation Voltage Input - Output	$4kV_{eff}$/1 s
Surge Category	III
Pollution Severity	2
Clearance and Creepage Distance	≥ 5.5 mm

Signal Conditioner	Cat. No.	Pkg. Quantity
	931S-A2A5N-OP	1



Active Converter, Monitoring
Passive Converter, Monitoring - Loop Powered

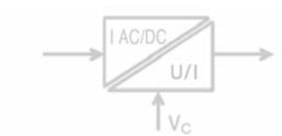
	931S-A3A2D-OP	931S-A3C2D-DC
		
Specifications	***Passive Converter, Monitoring - Loop Powered***	***Active Converter, Monitoring***
Wiring Diagram		
Standards Compliance	UL 508, UL 60079-15, CSA C22.2 No. 14-M95, CSA C22.2 No. 213-M 1987, CSA C22.2 No. 142-M1987, EN 60079-0:2006, EN60079-15:2005	UL 508, CSA C22.2 No. 14-M95
Certifications	cULus, IND. CONT. EQUIP. NRAG/7. E10314, NWGD/7.E10314, Also listed for HAZ. LOC. Areas Class 1, DIV. 2\ Zone 2 Groups A, B, C, and D, CE, ATEX Class 1, Zone 2, Demko 09 ATEX 0929065X	CE, cULus, IND. CONT. EQUIP. NRAQ2/8. E113724
Input Ratings		
Current	0…1 A AC/ 0…5 A AC/ 0…10 A AC	0…1 A AC/ 0…5 A AC/ 0…10 A AC
Frequency	50…60 Hz	50…60 Hz
Max Current	100 A for 1 s	100 A for 1 s
Voltage of Measuring Circuit	250 V AC	250 V AC
Sensor	Transforming (internally)	Transforming (internally)
Output Ratings		
Voltage	0…10V	0…10V
Current	4 mA…20 mA	0 mA…20 mA or 4 mA…20 mA
Load Impedance voltage/current	≤ 600 Ω	≥ 1 kΩ / ≤ 600 Ω
Step Response Time	typically 700 ms	typically 700 ms
Temperature Coefficient	≤ 200 ppm/K	≤ 200 ppm/K
Accuracy	0.5% FSR	0.5% FSR
Offset Current	max. 100 µA	max. 100 µA
Output Signal Limit	approx. 24 mA	approx. 13V resp. 24 mA
Status Indicator	LED ON: OK; FLASHING: signal out of range; LED OFF: Error	LED ON: OK; FLASHING: signal out of range; LED OFF: Error
General Specifications		
Supply Voltage	13...30V DC	24V DC ± 10 %
Power Consumption	—	40 mA at I_{OUT} =20 mA
Current-carrying Capacity of Cross-Connect	—	≤ 2 A
Operating Temperature	0 °C…+50 °C	0 °C…+50 °C
Storage Temperature	-20 °C…+70 °C	-20 °C…+70 °C
Default Settings	0…5 A AC, 4…20 mA	0…5 A AC, 4…20 mA
Insulation Standards	EN 50178 (protective separation): 1997	EN 50178 (protective separation)
EMC Standards	EN 55011, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007	EN 55011, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Insulation Voltage	300V	300V
Impulse Withstand Voltage	6kV	6kV
Isolation Voltage Input - Output	$4kV_{eff}$ / 5 s	$4kV_{eff}$ / 5 s
Surge Category	III	III
Pollution Severity	2	2
Clearance & Creepage Distance	≥ 5.5 mm	≥ 5.5 mm

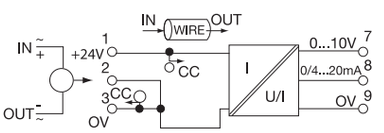
Signal Conditioners	Cat. No.	Pkg. Quantity	Cat. No.	Pkg. Quantity
	931S-A3A2D-OP	1	931S-A3C2D-DC	1

Active Isolator, Half-Effect Monitoring

- Input/output electrically isolated
- Input and output ranges adjustable using DIP switch
- No calibration necessary

931S-A4C2D-DCHALL



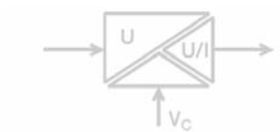
Specifications	*Active Isolator, Half-Effect Monitoring*
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 14-M95
Certifications	CE, cULus, IND. CONT. EQUIP., NRAQ2/8.E113724
Input Ratings	
Current	0…20 A AC/DC or 0…25 A AC/DC or 0…30 A AC/DC
Frequency	0…2 kHz (true RMS to DC converter)
Max Current	dependant on conductor cross-section
Voltage of Measuring Circuit	400V AC, >400V AC depends on conductor insulation
Sensor	Hall sensor (internal)
Diameter of Entry	8 mm
Output Ratings	
Voltage	0…10V
Current	0 mA…20 mA or 4 mA…20 mA
Load Impedance voltage/current	≥ 1 kΩ / ≤ 600 Ω
Step Response Time	typically 700 ms
Temperature Coefficient	≤ 200 ppm/K
Accuracy	0.5% FSR
Offset Current	max. 150 µA
Output Signal Limit	approx. 13V resp. 24 mA
Status Indicator	LED ON: OK; FLASHING: signal out of range; LED OFF: Error
General Specifications	
Supply Voltage	24V DC ± 10 %
Power Consumption	50 mA at I_{OUT} =20 mA
Current-carrying Capacity of Cross-Connect	≤ 2 A
Operating Temperature	0 °C…+50 °C
Storage Temperature	-20 °C…+70 °C
Default Settings	0…25 A, 4…20 mA
Insulation Standards	EN 50178 (protective separation):1997
EMC Standards	EN 55011, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Insulation Voltage	300V
Impulse Withstand Voltage	6kV
Isolation Voltage Input - Output	$4kV_{eff}$ / 5 s
Surge Category	III
Pollution Severity	2
Clearance & Creepage Distance	≥ 5.5 mm

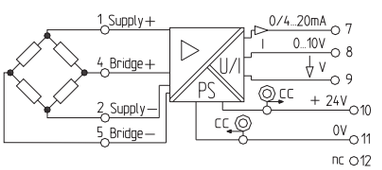
Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931S-A4C2D-DCHALL	1

Bridge Converter, 3-Way

- 3-way isolation
- Input and output ranges adjustable using DIP switch
- No calibration necessary
- Inverse output signals possible

931S-B1C6D-DC



Specifications	***Bridge Converter, 3 Way***
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 142-M198
Certifications	CE, cULus, IND. CONT. EQUIP., NRAQ2/8.E113724
Input Ratings	
Input Voltage	2-, 3-wire PNP/NPN, namur initiator, push-pull step /
Input Resistance, Voltage	Threshold / Hysteresis: Namur: approx. 1.7 mA/approx. 0.2 mA; NPN: approx. 6.5 V/approx. 0.2V; PNP: approx. 6.7V/approx. 0.5V
Output Ratings	
Voltage	0…5V, 5…0V, 10…0V, 0…10V
Current	0 mA…20 mA or 20 mA…0 mA, 4 mA…20 mA or 20 mA…4 mA
Load Impedance voltage/current	≥ 1 kΩ / ≤ 600 Ω ent
Step Response Time	typically < 200 ms
Temperature Coefficient	± 250 ppm/K of output range
Accuracy	0.3% of output range
Offset Current	max. 100 µA /max. 0.05V
Status Indicator	green LED
Wire Break Detection	output: 0V resp. 0/4 mA
Bridge Supply Voltage	+10V, +5V, 4.8…10.2V; offset adjustable; max. 40 mA
General Specifications	
Supply Voltage	24V DC ± 25 %
Power Consumption	max. 1.9 W at I_{OUT} = 20 mA
Current-carrying Capacity of Cross-Connect	≤ 2 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Default Settings	-500 mV…+500 mV / 0…10V / + 10V / standard
Insulation Standards	EN 50178:1997
EMC Standards	EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Insulation Voltage	300V
Impulse Withstand Voltage	4kV
Isolation Voltage Input - Output	2 kV_{eff} / 5 s
Surge Category	III
Pollution Severity	2
Clearance & Creepage Distance	≥ 3 mm

Signal Conditioner	Cat. No.	Pkg. Quantity
	931S-B1C6D-DC	1

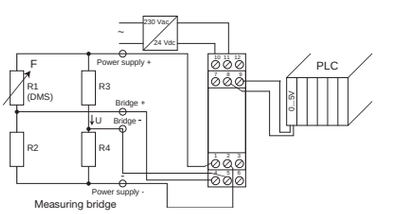
Switch position/setting options

	SW 1									
Input voltage	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0…10 mV						□	□	□	□	
0…20 mV						□	□	□	■	
0...50 mV						□	□	■	□	
0...100 mV						□	□	■	■	
0...200 mV						□	■	□	□	
0...500 mV						□	■	□	■	
-10 mV...10 mV						■	□	□	□	
- 20 mV...20 mV						■	□	□	■	
- 50 mV...50 mV						■	□	■	□	
- 100 mV...100 mV						■	□	■	■	
- 200 mV...200 mV						■	■	□	□	
- 500 mV...500 mV						■	■	□	■	
Output										
0...+10 V					□	□				
0...+5 V					□	■				
0...20 mA					■	□				
4...20 mA					■	■				
Bridge supply voltage										
+10V	■	□	□							
+5V	■	□	■							
+4.8...+10.2V adjustable	□	■	□							
+4.8...+10.2V adjustable man. adjustment and offset possible	□	■	■							
Transmission method										
standard output signal										□
inverse output signal										■

■ = on
□ = off

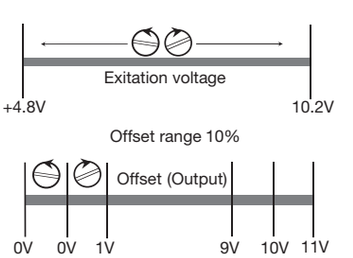
Status LED	
LED on	normal operating
LED off	Error
LED blinks slow	measurement range undershoot Uin < Umax – 10 %
LED blinks fast	measurement range overshoot Uin < Umax + 10 %

Application



Example for bridge supply voltage

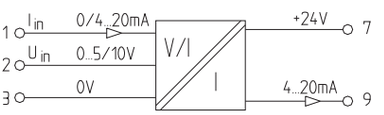
Temperature adjustment:	
Input voltage	0…10 mA
Output	0…10 V
Bridge supply voltage	+4.8…10.2 V
Bridge excitation	1 mV/V (Declaration from manufacturer)



Passive Converter

- Electrical isolation
- Very low power consumption
- Input range selected via DIP switch
- No callibration necessary

931S-C1A2D-OP

Specifications	***Passive Converter***
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 142-M198, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Certifications	CE, cULus, IND. CONT. EQUIP. NRAQ2/8.E113724
Input Ratings	
Voltage	0...5V or 0...1V
Current	0...20 mA or 4...20 mA
Max Voltage	30V DC
Max Current	40 mA
Input Resistance, Voltage/Current	0…5V: 210 kΩ; 0…10V: 430 kΩ /51 Ω
Output Ratings	
Current	4...20 mA
Output Signal Limit	approx. 24 mA
Load Impedance voltage/current	R_L = (UB-12 V) / 20 mA e.g. 600 M at 24 V
Accuracy	0.2%
Temperature Coefficient	≤ 150 ppm/K
Residual Ripple	50 mV_{eff} at 500 Ω
Step Response Time	< 10 Hz: 80 ms; 100 Hz: 50 ms
Cut-off Frequency (-3 dB)	10 Hz/ 100 Hz switchable
General Specifications	
Supply Voltage	min. 12V DC, max. 30 V DC
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Default Settings	0...20 mA, 10Hz
Insulation Standards	EN 50178:1997
Rated Insulation Voltage	300 V
Impulse Withstand Voltage	4 kV
Isolation Voltage Input - Output	4 kV_{eff} /5 s
Surge Category	III
Pollution Severity	2
Clearance and Creepage Distance	≥ 5.5 mm

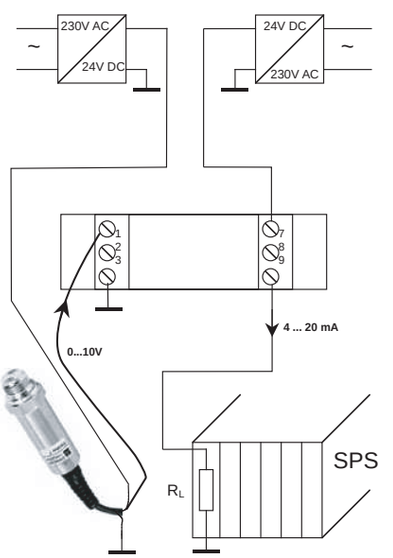
	Cat. No.	Pkg. Quantity
Signal Conditioners	931S-C1A2D-OP	1

Setting options/switch position

	SW 1			
Input	**1**	**2**	**3**	**4**
0…20 mA	□	□	□	□
4…20 mA	■	□	□	□
0…5 V	■	■	■	□
0…10 V	□	■	□	□
Transmission frequency				
10 Hz	□	□	□	■
100 Hz	□	□	□	□

■ = on
□ = off

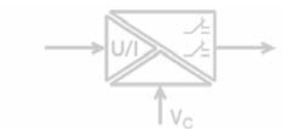
Example of application

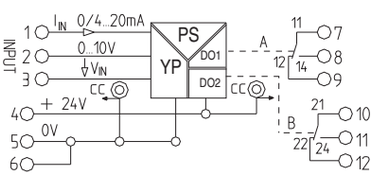


Isolator, 3-Way, Limit Value Monitoring

- 3-way Isolation
- Low Trip/ High Trip
- FAILSAFE/NON-FAILSAFE
- 2 relay outputs

931S-C2R1D-DC2R



Specifications	*Isolator, 3-Way, Limit Value Monitoring*
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 142-M198
Certifications	CE, cULus, IND. CONT. EQUIP. NRAQ2/8. E113724
Input Ratings	
Voltage	0...10VC
Current	0...20 mA or 4...20 mA
Input Resistance Voltage/Current	≥ 100 kΩ /≤ 110 Ω
Output Ratings	
Contact Complement	2 change-over contacts
Contact Material	AgNi 90/10
Switching Thresholds	1...90% (independently for channel 1 and channel 2)
Hysteresis	1...90% (independently for channel 1 and channel 2)
Switching Voltage, Max	253V AC
Continuous Current	3 A
Function	Open-circuit/closed-circuit principle
Temperature Coefficient	≤ 500 ppm/K
Status Indicator	LED green ON: OK, LED red ON: alarm (per channel)
General Specifications	
Supply Voltage	24V DC ± 25 %
Power Consumption	typically 1 W both relays picked up
Current-carrying capacity of cross-connect.	≤ 2 A
Operating Temperature	-10 °C...+55 °C
Storage Temperature	-20 °C...+85 °C
Default Settings	channel A/B: low trip and FAILSAFE
Insulation Standards	EN 50178:1997
EMC Standards	EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated voltage	300V
Impulse Withstand Voltage	4kV
Isolation Voltage Input - Output	$2kV_{eff}$ /5 s
Surge Category	III
Pollution Severity	2
Clearance & Creepage Distance	≥ 3 mm

Signal Conditioner	Cat. No.	Pkg. Quantity
	931S-C2R1D-DC2R	1

Switch position/setting options

	SW 1			
function	**1**	**2**	**3**	**4**
Channel A High Trip	■			
Channel A Low Trip	□			
Channel B High Trip		■		
Channel B Low Trip		□		
FAILSAFE, Channel 1 & 2			□	□
NON FAILSAFE, Chan. 1 & 2			■	■

■ = on
□ = off

NON FAILSAFE: The relay picks up when the alarm is trigered

FAILSAFE: The relay drops out when the arlarm is triggered. An alarm is also triggered in the FAILSAFE mode, if for example, the operating voltage to the moduls fail

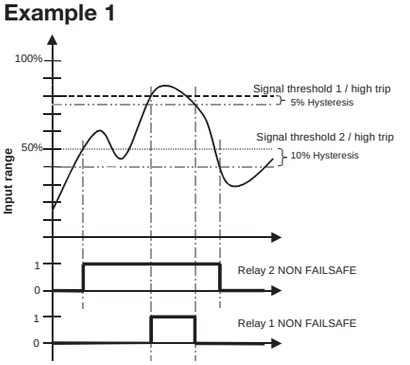
Low Trip: Alarm is triggered if the signal is undershoot the threshold.

High Trip: Alarm is triggered if the signal is overshoot the threshold.

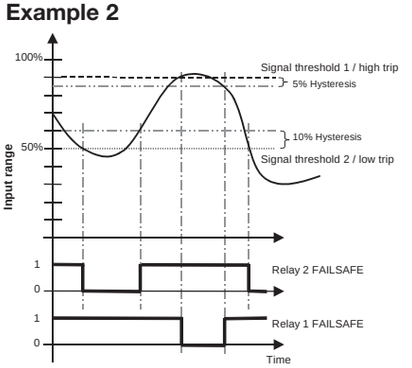
Signal threshold: Adjustments of the signal threshold (1...90)% are made for channel 1 with the potentiometer P1, and separately for channel 2 via potentiometer P2.

Hysterese: Adjustments of the hysteresis (1...10)% are made for channel 1 with the potentiometer P3, and separately for channel 2 via potentiometer P3.

Example 1



Example 2



Active Converter, 3-Way

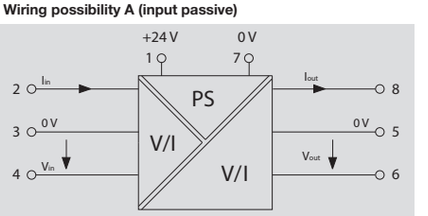
- Auxiliary power supply
- Supply of 12...60V DC
- LED status indicator
- Pluggable connection terminals

931S-C3C3J-DC

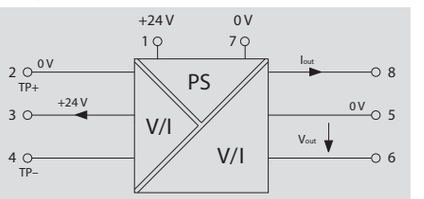
Specifications	*Active Converter, 3-Way*
Standards Compliance	UL 61010-1, CSA C22.2 No. 1010.1-92
Certifications	cULus, IND. CONT. EQUIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D. CE, ATEX Class 1, Zone 2
Input Ratings	
Type	0...10V Current or voltage input, configurable with jumpers
Input Signal Limits	0...22 mA / 0...10V
Sensor Supply	20 mA @ 24V DC output
Smallest Received Measuring Span	4 mA or 2V
Input Resistance	100 Ω (current input) or > 1 MΩ (voltage input)
Step Response Time	< 220 ms (10…90 %)
Resolution	3.5 µA / 1.76 mV per bit
Output Ratings	
Type	Current input or voltage input, configurable with jumpers
Output Signal Limits	0...22 mA / 0...10V
Smallest Received Measuring Span	4 mA or 2V
Load Resistance, Current	≤ 1 kΩ
Load Resistance, Voltage	≥ 500 Ω
Residual Ripple	3 A
Resolution	Open-circuit/closed-circuit principle
General Specifications	
Supply Voltage	24V DC ± 25 %
Power Consumption	typically 1 W both relays picked up
Linearity	< ± 0.1 % (Typically ± 0.05 %)
Humidity	10...90 % (no condensation)
Temperature Coefficient	≤ 0.05 % / °C
Long-term drift	0.1 % / 10,000 h
Step Response Time	< 220 ms (10…90 %)
Impulse Withstand Voltage	4kV (1.2/50 µs)
Data Backup	100 years
Operating Temperature	0 °C…+60 °C
Storage Temperature	-25°C…+70°C
Insulation Standards	EN 50178: 1997
EMC Standards	EN 61326, EN61000-6-1:2007, EN61000-6-2:2005, EN61000-6-4:2007
Isolated Voltage	2kV between ports
Rated voltage	$300V_{eff}$

Signal Conditioner	Cat. No.	Pkg. Quantity
	931S-C3C3J-DC	1

Wiring possibility A (input passive)



Wiring possibility B (input active)



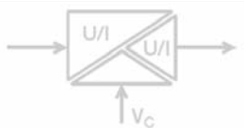
Connections

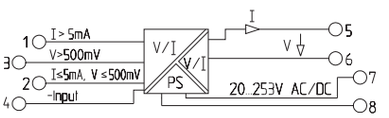
Terminal	Signal	
1	Signal +	Supply voltage
7	Signal –	
4	Signal +	Voltage input
3	Signal –	
2	Signal +	Current input
3	Signal –	
3	Signal +	Loop Powered Input
2	Signal –	
6	Signal +	Voltage output
5	Signal –	
8	Signal +	Current output
5	Signal –	

Active Converter, 3 Way

- Universally adjustable using DIP switch
- Online service tool to assist with DIP switch selection
- Voltage supply 20...230V AC/DC
- Low power loss
- Adjustable transmission frequency

931S-C4C5D-BC



Specifications	*Active Converter, 3 Way*
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 142-M95, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Certifications	cULus, IND. CONT. EQUIP., CE, ATEX Class 1, Zone 2
Input Ratings	
Voltage	± 20mV…± 200V
Current	± 0.1 mA…± 100 mA
Max Voltage	30V DC
Max Current	IIN < 5 mA: < 100 mA, IIN > 5 mA < 300 mA
Input Resistance, Voltage/Current	ca. 1 MΩ /< 5 mA: approx. 100 Ω; >5 mA: approx. 5 Ω
Output Ratings	
Voltage	0…±10V
Current	0…±20 mA
Load Impedance voltage/current	≥ 1 kΩ / ≤ 600 Ω
Accuracy	< 0.1% of final value
Temperature Coefficient	≤ 60 ppm/K of end value
Offset Current	20 µA or 10 mV
Adjustment Range, Zero Point	± 25% of measuring range of chosen output range
Adjustment Range, Amplification	0.33…3.30 x final value of selected output range
Displacement	100%, -50%, 0%, 50%, 100% of measuring range
Cut-off Frequency (-3 dB)	> 10 kHz/ < 10 Hz
General Specifications	
Supply Voltage	22…230V AC/DC +10 %/ 48…62 Hz
Power Consumption	approx. 1 W
Operating Temperature	-10 °C…+70 °C
Storage Temperature	-40 °C…+85 °C
Default Settings	0…10V / 0…10V / 10Hz
Insulation Standards	EN 50178: 1997
Rated Insulation Voltage	600V
Impulse Withstand Voltage	5kV, 1.2/50 µs (IEC 255-4)
Isolation Voltage Input - Output	$4kV_{eff}$
Surge Category	III
Pollution Severity	2

Signal Conditioner	Cat. No.	Pkg. Quantity
	931S-C4C5D-BC	1

Switch position/setting options

	Switch							
Input	S1				S2			
Input range	1	2	3	4	1	2	3	4
0 … ±60 mV	□	□	□	□	□	□	□	■
0 … ±100 mV	■	□	□	□	□	□	□	■
0 … ±150 mV	□	■	□	□	□	□	□	■
0 … ±300 mV	■	■	□	□	□	□	□	■
0 … ±500 mV	□	□	■	□	□	□	□	■
0 … ±1 V	■	□	■	□	□	■	□	■
0 … ±5 V	□	■	■	□	□	■	□	■
0 … ±10 V	■	■	■	□	□	■	□	■
0 … ±100 V	□	□	□	■	□	□	■	■
0 … ± ~0.3 mA	■	□	□	■	■	□	□	■
0 … ±1 mA	□	■	□	■	■	□	□	■
0 … ±5 mA	■	■	□	■	■	□	□	■
0 … ±10 mA	□	□	■	■	■	□	□	■
0 … ±20 mA	■	□	■	■	■	□	□	■
0 … ±50 mA	□	■	■	■	■	□	□	■
4 … ±20 mA*	■	■	■	■	■	□	□	■

*Offset conversion not calibrated

	Switch S2	4
calibratet ranges		■
Span-pot. activated: input x 0.33	.. x 3.30	

	Switch				
Output	S1			S3	
Output range	5	6	7	1	2
0 … ±10 V	□	□	□	■	■
2 … 10 V	■	□	□	■	■
0 … ±5 V	□	■	□	■	■
1 … 5 V	■	■	□	■	■
0 … ±20 mA	□	□	■	□	□
4 … 20 mA	■	□	■	□	□

Offset	S1			S2
(in % of output voltage)	8	9	10	5
0 %	□	□	□	■
-100 %	■	□	□	■
-50 %	□	■	□	■
+50 %	■	■	□	■
+100 %	□	□	■	■
Zero pot. activated: additional ±25 %				

	Switch S3	3
Bandwidth 10 kHz		□
Bandwidth 10 Hz		■

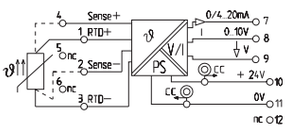
Set range can be documented on side of housing.

■ = on
□= off

Active Converter, 3-Way, RTD

- Universally adjustable using DIP switch
- 3-way isolation
- Linearisation
- Power supply can be cross-connected using ZQV cross connection system

931S-P1C2D-DC

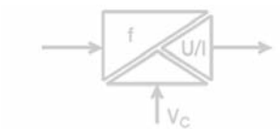
Specifications	*Active Converter, 3 Way, RTD*
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 142-M198, CSA C22.2 No. 142+213-M1
Certifications	CE, cULus, IND. CONT. EQUIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D. NRAQ2/8.E113724, NRAG./7E10314
Input Ratings	
Sensor	PT100/2-/3-/4-cond., Ni100/2-/3-/4-cond., potentiometer: min. 0-/100 M, max. 0...100 kM, resistor: 0...450 M
Temperature Range	Configurable
Output Ratings	
Voltage	0...10V
Current	0 mA…20 mA or 4 mA…20 mA
Load Impedance voltage/current	≥ 1 kΩ / ≤ 600 Ω ent
Step Response Time	fast/slow: 2-/3-/4-conductor: 1.2 s/2.2 s; potentiometer: 0.5 s/1.1 s
Line resistance in measuring circuit	50 Ω for 3- and 4-conductor
Offset Current	max. 100 µA /max. 0.05 V
Influence of Cable Resistance Conductor	max. + 0.25 °C at 50 Ω conductor resistance
Wire Break Detection	LED flashed (output value > 20 mA, >10V)
Fine Adjustment	≥ +/- 5%, Version 1:>=12.5% / Poti:12.5%…25%
Status Indicator	active: LED on/cond. broken: LED flashing/Error: LED off
General Specifications	
Supply Voltage	24V DC ± 25 %
Power Consumption	830…880…980 mW at I_{OUT} = 20 mA
Current-carrying Capacity of Cross-Connect	≤ 2 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Default Settings	PT100/3-cond./ 0…100°C / 4…20 mA / man. fine calib.: off / slow step response
Insulation Standards	EN 50178:1997, EN 60751, DIN 43760
Rated Insulation Voltage	300V
Impulse Withstand Voltage	4 kV
Isolation Voltage Input - Output	2 kV_{eff} / 5 s
Surge Category	III
Pollution Severity	2
Clearance & Creepage Distance	≥ 3 mm

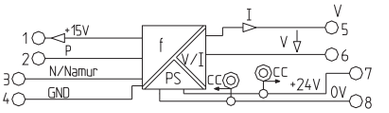
Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931S-P1C2D-DC	1

Frequency Converter, 3-Way

- 3-way isolation
- Max. input frequency 100 kHz
- Input and output ranges adjustable using DIP switch
- No calibration necessary
- Special ranges can be programmed

931S-F1C2D-DC



Specifications	*Frequency Converter, 3-Way*
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 142-M198, CSA 22.2 No. 142+213-M1
Certifications	CE, cULus, IND. CONT. EQUIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D. NRAQ2/8.E113724, NRAG/7.E10314
Input Ratings	
Sensor	2-, 3-wire PNP/NPN, namur initiator, push-pull step /
Rated Input Level	Threshold / Hysteresis: Namur: approx. 1.7 mA/approx. 0.2 mA; NPN: approx. 6.5 V/approx. 0.2V; PNP: approx. 6.7V/approx. 0.5V
Resolution	0.1 mHz resp. 5 ppm of measurement value
Output Ratings	
Voltage	0...10V
Current	0 mA…20 mA or 4 mA…20 mA
Load Impedance voltage/current	≥ 1 kΩ / ≤ 600 Ω ent
Step Response Time	360 ms + 2-fold period time of input frequency
Temperature Coefficient	max. 200 ppm/K of output range
Accuracy	0.2% of output range
Offset Current	max. 100 µA /max. 0.05V
Status Indicator	green LED
General Specifications	
Supply Voltage	24V DC ± 25 %
Power Consumption	max. 1.6 W at I_{OUT} = 20 mA
Current-carrying Capacity of Cross-Connect	≤ 2 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Default Settings	0…10 kHz / 4…20 mA
Insulation Standards	EN 50178 (protective separation):1997
EMC Standards	EN 55011, EN 61326, EN 61000-6-1:2007, EN 61000-6-2: 2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Insulation Voltage	300V
Impulse Withstand Voltage	6 kV
Isolation Voltage Input - Output	4 kV_{eff} / 5 s
Surge Category	III
Pollution Severity	2
Clearance & Creepage Distance	≥ 5.5 mm

Signal Conditioner	Cat. No.	Pkg. Quantity
	931S-F1C2D-DC	1

Selecting the operating mode

Operating mode	Switch 2 3	4
0…fmax	□	□
fmin…fmax	□	■
saving fmin	■	□

f= (A+B) x C

Selecting the frequency

A	Switch 1 1	2	3	4
0	□	□	□	□
1	□	□	□	■
2	□	□	■	□
3	□	□	■	■
4	□	■	□	□
5	□	■	□	■
6	□	■	■	□
7	□	■	■	■
8	■	□	□	□
9	■	□	□	■
10	■	□	■	□
11	■	□	■	■
12	■	■	□	□
13	■	■	□	■
14	■	■	■	□
15	■	■	■	■

Selecting the frequency

B	Switch 1 5	6	7	8
0	□	□	□	□
0.1	□	□	□	■
0.2	□	□	■	□
0.3	□	□	■	■
0.4	□	■	□	□
0.5	□	■	□	■
0.6	□	■	■	□
0.7	□	■	■	■
0.8	■	□	□	□
0.9	■	□	□	■

Selecting the frequency

C	Switch 2 1	2
x1	□	□
x10	□	■
x100	■	□
x1000	■	■

Selecting the output

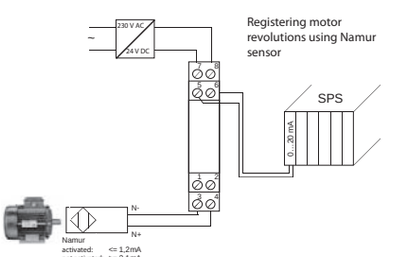
Output	Switch 2 5	6	7	8
0...10 V	■	□	■	■
0...20 mA	□	□	□	□
4...20 mA	□	■	□	□
0…5 V	■	■	■	■

Special range (frequency generator is required)

Function	Switch 2 1	2	3	4
save min. frequency	□	■	■	■
save max. frequency	■	□	■	■
select special range	■	■	■	■

■ = on
□ = off

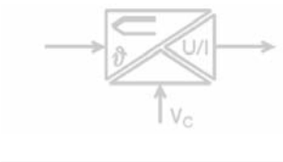
Application

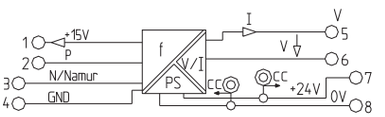


Universal Thermocouple, 3-Way

- Universally adjustable using DIP switch
- 3-way isolation
- Linearisation
- Power supply can be cross-connected using ZQV cross connection system

931S-T9C2D-DC



Specifications	*Universal Thermocouple, 3 Way*
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 142-M95, CSA C22.2 No. 142+213-M1, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Certifications	CE, cULus, IND. CONT. EQUIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D. NRAQ2/8.E113724, NRAG/7.E10314
Input Ratings	
Sensor	Thermo element (IEC 584) type: K,J,T,E,N,R,S,B
Temperature Range	-200…+1820 °C
Output Ratings	
Voltage	0...10V
Current	0 mA…20 mA or 4 mA…20 mA
Load Impedance voltage/current	≥ 1 kΩ / ≤ 600 Ω ent
Step Response Time	max. 1.4 s; with filter: max. 7.5 ms
Line resistance in measuring circuit	50 Ω for 3- and 4-conductor
Offset Current	max. 100 µA /max. 0.05 V
Influence of Cable Resistance Conductor	max. + 0.25 °C at 50 Ω conductor resistance
Wire Break Detection	LED flashed (output value > 20 mA, >10V)
Fine Adjustment	≥ +/- 5%, Version 1:>=12.5% / Poti:12.5%…25%
Status Indicator	active: LED on/cond. broken: LED flashing/Error: LED off
General Specifications	
Supply Voltage	24V DC ± 25 %
Power Consumption	830…880…980mW at I_{OUT} = 20 mA
Current-carrying Capacity of Cross-Connect	≤ 2 A
Operating Temperature	0 °C…+55 °C
Storage Temperature	-20 °C…+85 °C
Default Settings	PT100/3-cond./ 0…100°C / 4…20 mA / man. fine calib.: off / slow step response
Insulation Standards	EN 50178: 1997, EN 60751, DIN 43760
Rated Insulation Voltage	300V
Impulse Withstand Voltage	4 kV
Isolation Voltage Input - Output	2 kV_{eff} / 5 s
Surge Category	III
Pollution Severity	2
Clearance & Creepage Distance	≥ 3 mm

Signal Conditioner	Cat. No.	Pkg. Quantity
	931S-T9C2D-DC	1

Select of thermocoupler

Typ	SW1 1	2	3
K	■	■	■
J	□	■	■
T	■	□	■
E	□	□	■
N	■	■	□
R	□	■	□
S	■	□	□
B	□	□	□

Selection of minimum temperature

min	SW1 4	5	6	7
0°C	■	■	■	■
-10°C	■	■	■	□
-20°C	■	■	□	■
-30°C	■	■	□	□
-40°C	■	□	■	■
-50°C	■	□	■	□
-100°C	■	□	□	■
-150°C	■	□	□	□
-200°C	□	■	■	■
+50°C	□	■	■	□
+100°C	□	■	□	■
+150°C	□	■	□	□
+200°C	□	□	■	■
+250°C	□	□	■	□
500°C	□	□	□	■
Special range	□	□	□	□

Selection of temperature span

Span	SW2 1	2	3	4	5
100°C	■	■	■	■	■
150°C	■	■	■	■	□
200°C	■	■	■	□	■
250°C	■	■	■	□	□
300°C	■	■	□	■	■
350°C	■	■	□	■	□
400°C	■	■	□	□	■
450°C	■	■	□	□	□
500°C	■	□	■	■	■
550°C	■	□	■	■	□
600°C	■	□	■	□	■
650°C	■	□	■	□	□
700°C	■	□	□	■	■
750°C	■	□	□	■	□
800°C	■	□	□	□	■
850°C	■	□	□	□	□
900°C	□	■	■	■	■
950°C	□	■	■	■	□
1000°C	□	■	■	□	■
1050°C	□	■	■	□	□
1100°C	□	■	□	■	■
1150°C	□	■	□	■	□
1200°C	□	■	□	□	■
1250°C	□	■	□	□	□
1300°C	□	□	■	■	■
1350°C	□	□	■	■	□
1400°C	□	□	■	□	■
1450°C	□	□	■	□	□
1500°C	□	□	□	■	■
1600°C	□	□	□	■	□
1700°C	□	□	□	□	■
1800°C	□	□	□	□	□

■ = on
□ = off

Selection of output

Output	SW2 6	7
0...10V	■	□
0...20mA	□	□
4...20mA	□	■

Switching on the manual fine adjustment

man. adjust.	SW1 8
off	□
on	■

Switching on the filter function

Filter	SW2 8
off	□
on	■

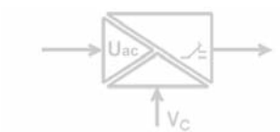
Temperature coefficient

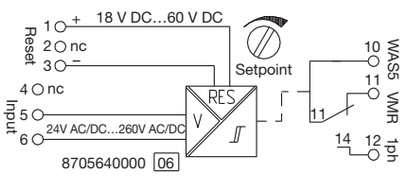
K	-200°C...-150°C	± (5K + 0,1% of set range)
	-150°C...1200°C	± (3K + 0,1% of set range)
	1200°C...1372°C	± (4K + 0,1% of set range)
J	-200°C...-150°C	± (4K + 0,1% of set range)
	-150°C...1200°C	± (3K + 0,1% of set range)
T	-200°C...-150°C	± (5K + 0,1% of set range)
	-150°C ...400°C	± (3K + 0,1% of set range)
E	-200°C...-150°C	± (4K + 0,1% of set range)
	-150°C...1000°C	± (3K + 0,1% of set range)
N	-200°C...-150°C	± (6K + 0,1% of set range)
	-150°C...1300°C	± (3K + 0,1% of set range)
R	-50°C ...200°C	± (10K + 0,1% of set range)
	200°C...1760°C	± (6K + 0,1% of set range)
S	-50°C ...200°C	± (10K + 0,1% of set range)
	200°C...1760°C	± (6K + 0,1% of set range)
B	50°C ...250°C	± (25K + 0,1% of set range)
	250°C ...500°C	± (10K + 0,1% of set range)
	500°C...1820°C	± (6K + 0,1% of set range)

Isolator, 3-Way, Monitoring

- 3-way Isolation
- Monitoring of single-phase systems up to 260V AC/DC
- 4 input ranges selected by DIP switches
- 1 relay with change-over contact
- Switchable hysteresis
- Switch adjusted via potentiometer
- Reset input

931S-V1R1D-MC1R



Specifications	*Isolator, 3-Way, Monitoring*
Wiring Diagram	
Standards Compliance	UL 508, CSA C22.2 No. 14-M95
Certifications	CE, cULus, IND. CONT. EQUIP. NRAQ2/8.E113724
Input Ratings	
Voltage	24…70 / 70…140 / 140…210 / 210…260V AC / DC
Frequency	50…60 Hz
Max Voltage	260V AC / DC
Output Ratings	
Switching Voltage, Max	250V AC
Switching Current, Max	8 A
Continuous Current/ AC Switching Capacity	3 A /1000VA
Step Response Time	< 300 ms
Temperature Coefficient	≤ 250 ppm/K
Accuracy	< 0.3% of set range
Hysteresis	24…70V AC, small = 5V / large = 10V
Status Indicator	LED green = OK / LED red/yellow = alarm status
General Specifications	
Supply Voltage	from the measuring circuit
Reset Input Voltage	18V DC...30V DC
Pulse Length	50 mA at I_{OUT} =20 mA
Operating Temperature	-10 °C…+55 °C
Storage Temperature	-20 °C…+70 °C
Default Settings	DIP switches: ON = 1,2,5,8 / OFF = 3,4,6,7
Insulation Standards	EN 50178:1997
EMC Standards	EN 55011, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007, EN 61326
Rated Insulation Voltage	input/output, input/reset input, reset input/output: 300V
Impulse Withstand Voltage	input/output, input/reset input, reset input/output: 4 kV
Isolation Voltage Input - Output	2 kV_{eff}
Surge Category	III
Pollution Severity	2
Clearance & Creepage Distance	input/output, input/reset input, reset input/output: 3 mm

Signal Conditioner	**Cat. No.**	Pkg. Quantity
	931S-V1R1D-MC1R	1

Table of setting options

Input	1	2	3	4	5	6	7	8
24 V AC/DC...70 V AC/DC				■	□	□	□	
70 V AC/DC...140 V AC/DC				□	□	□	■	
140 V AC/DC...210 V AC/DC				□	□	■	□	
210 V AC/DC...260 V AC/DC				□	■	□	□	
Trip								
High Trip	■							
Low Trip	□							
Memory								
Memory on		□						
Memory out		■						
Hysteresis								
Hysteresis small			□					
Hysteresis large			■					
Input voltage								
AC voltage								■
DC voltage								□

■ = on
□ = out

Status indicator

- ● Set value not exceeded.
- ● Alarm status.
- ○ Alarm status can be reset because set value has been exceeded.

Abb.1: Overvoltage monitoring
Alarm set to "high trip"
(Set permanently to closed-circuit principle.)

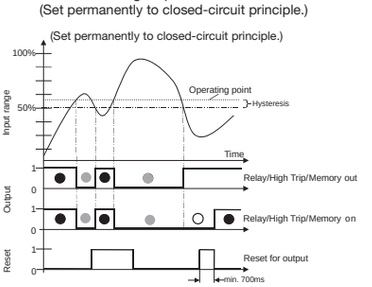
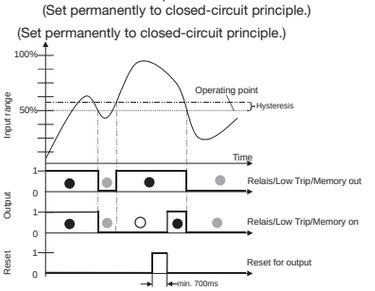


Abb.2: Undervoltage monitoring
Alarm set to "low trip"
(Set permanently to closed-circuit principle.)



Bulletin 931U - Universal Series

The 931U Universal Series of analog signal conditioners are programmable, allowing the devices to be used on a wide variety of analog signals. Two models are available, one in a 12.5mm wide housing and one in a 45mm wide housing. Both are programmable using the same software.

- Provide isolation and conversion solutions for a wide variety of signals
  - Current
  - Voltage
  - Temperature (thermocouples and RTDs)
  - Potentiometers
  - AC and DC current monitoring
- Removable, plug-in terminal blocks are coded to eliminate wiring errors.
- Programmable using the same software, which is bundled with the programming cable - Cat. No. 931U-CABLE.

Bulletin 931U Programming Software

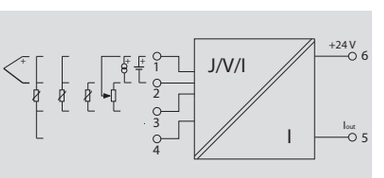
Active Converter, Universal

- Output Loop Powered
- Programmable with PC
- Pluggable connection terminals
- Compact housing

931U-C9A2C-OP

Specifications	*Active Converter, Universal*
Standards Compliance	UL 61010-1, CSA 22.2 No. 1010.1-92, EN 50178:1997
Certifications	cULus, IND. CONT. EQIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D., CE, ATEX - Class 1, Zone 2
Input Ratings	
Type	Universal signal isolator/amplifier, thermocoupler, RTD
Type, Thermocouple	B / C / E / J / K / L / N / R / S / T / W3 / W5 -200…+ 2300 °C depending on thermocoupler
Current	-10…+20 mA (min. span 1 mA)
Voltage	-5...+10 V / -100...+200 mV (min. span 0.5 V / 4 mV)
Input Resistance	2 MΩ (Voltage input) or 40 Ω (current input)
Output Ratings	
Type	Current output
Current	4…20 mA
Limits of Range	+ 22 mA
Residual Ripple	< 20 mV_{ss}
Load Resistance	[(Vs - 10) / 0.02] Ω (Typically 700 Ω @ 24V DC)
Calibration/Set-up	PC and CBX100 Interface required 7940010208
General Specifications	
Supply Voltage	10…40 V DC, powered by loop current
Influence of the Power Supply	0.005 % / V
Humidity	10...90 % (no condensation)
Temperature Coefficient	typ. 0.02 % / °C
Long-term drift	0.1 % / 10,000 h
Cycle Time	20…200 ms
Digital Filter Factor	1…100
Interference Radiation	< ± 0.5 %
Step Response Time	Typically 200 ms (10 to 90 %)
Impulse Withstand Voltage	4 kV (1.2/50 µs)
Isolation Voltage	2 kV between ports
Rated Voltage	$300V_{eff}$
Transmit Function	direct or reverse
Operating Temperature	-10 °C…+70 °C
Storage Temperature	-20°C…+70°C
EMC Standards	EN 61326, EN 61000-6-1:2007, EN 61000-6-2:2005, E N 61000-6-4:2007

Signal Conditioner	Cat. No.	Pkg. Quantity
	931U-C9A2C-OP	1



Connections

Terminal	Signal	
5	Loop –ve	Supply voltage
6	Loop +ve	
1	Signal + Power supply Sensor	Thermocouple
2	Signal + Power supply Storage (only for programming)	
1	A-Sense	4-wire PT100/RTD (or resistance)
3	A	
2	B	
4	B-Sense	
1	A-Sense	3-wire PT100/RTD (or resistance)
3	A	
2	B	
3	A	2-wire PT100/RTD (or resistance)
2	B	
1	Signal +	Voltage (mV or V)
2	Signal –	
1	Signal +	Current (mA)
2	Signal –	
3	A	Potentiometer
1	Wiper	
2	B	

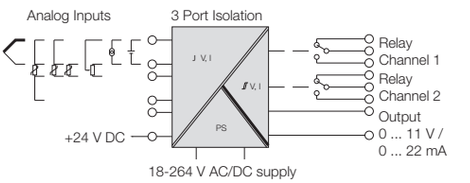
Active Converter, 3-Way, Universal

- Universal inputs
- Programmable with PC
- Loop-powered or passive mA input
- AC or DC supply

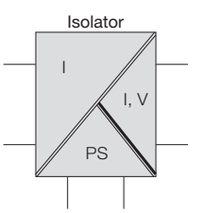
931U-C9C7C-BC

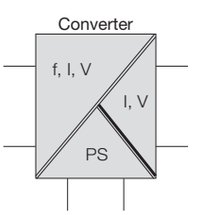
Specifications	***Active Converter, 3-way, Universal***
Standards Compliance	UL 508, CSA C22.2 No. 142-M198
Certifications	cULus, IND. CONT. EQIP. Also listed for HAZ. LOC. Areas Class 1, DIV. 2, Groups A, B, C, and D., CE, ATEX - Class 1, Zone 2
Input Ratings	
Type, Thermocouple	B, E, J, K, L, N, R, S, T (IEC 60584)
Type, RTD	PT100, PT1000, (EN 60571) Ni100, Ni1000, (JIS1604), Cu10, Cu25, Cu50, Cu100 (DIN 43760) 2-/3-/4-conductor
Potentiometer/ Current	100 Ω…100 kΩ
Resistance	10 Ω…5 kΩ
Frequency	2 Hz…100 kHz
Voltage	-200…500 mV (min. span 4 mV), -20…50V DC (min. span 0.5V)
Current	-20…50 mA (min. span 1 mA)
Current Loop Supply	24V DC / 22 mA
Output Signal During Wire Break	configurable
Accuracy	< 0.1 % span (DC, RTD); 0.2 % span (or 1 °C) + CJ error
Temperature Coefficient	< 0.1 % / K (DC, RTD); < 0.1 % FSR / K + CJ error 0.07 °C/K
Output Ratings - Analog	
Voltage	Can be set from -10…+10V (min. span 2.5V)
Current	Can be set from 0…20 mA (min. span 5 mA)
Load Resistance Voltage	> 10 kΩ @ 0…10V / > 20 kΩ @ -10…+10V
Load Resistance Current	< 700 Ω
Signal Output	Direct or inverted
Transmit Function	Linear, x1/2, x3/2, x5/2 or user-defined curve (101 points)
Output Ratings - Digital	
Type	2 x 1 CO contact (hard gold plated)
Contact Base Material	AgSnO 5 µm Au
Max Switching Voltage	250V
Continuous Current	3 A
General Specifications	
Supply Voltage	18…264V AC/DC
Power Consumption	< 3.5 W
Operating Temperature	-40 °C…+70 °C
Storage Temperature	-40°C…+85°C
Step Response Time	50 ms…1 sec (RTD, mV inputs), 110 ms…1 sec (V, mA inputs)
Insulation Standards	EN 50178 (protective separation):1997
EMC Standards	EN 55011, EN 61000-6-1:2007, EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61000-6-4:2007
Rated Voltage	300V
Impulse Withstand Voltage	6 kV between supply & input/output, 4 kV between input & output
Pollution Severity	2
Overvoltage Category	III
Clearance and Creepage Distance	≥ 5.5 mm (1 mm input/output)

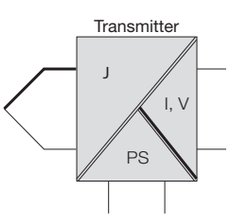
Signal Conditioner	Cat. No.	Pkg. Quantity
	931U-C9C7C-BC	1

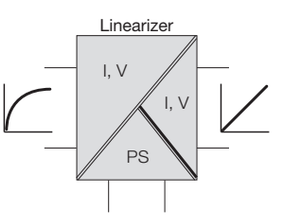


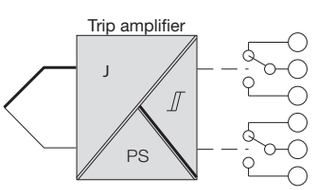
Typical functions











Accessories

The table below indicates the accessories available for each signal conditioner.

Markers		Jumpers		End Barrier	Cable	
1492-M5X10	1492-M6X10	1492CJL5-2-*	1492-CJL6-*	931H-EB1	931U-CABLE	Cat. No.
Standard Signal Conditioners						
•						931S-A1A1N-IP1
•						931S-A1A1N-IP2
•						931S-A2A5N-OP
•		•				931S-A2A2N-DC
•		•				931S-A1A1N-DC
•						931S-C1A2D-OP
•						931S-C4C5D-BC
•		•				931S-P1C2D-DC
•		•				931S-T9C2D-DC
•		•				931S-F1C2D-DC
	•	•				931S-B1C6D-DC
	•	•				931S-A3C2D-DC
	•	•				931S-A3A2D-OP
						931S-A4C2D-DCHALL
	•	•				931S-V1R1D-MC1R
•		•				931S-C2R1D-DC2R
						931S-C3C3J-DC
High-Density Signal Conditioners						
	•		•			931H-A2A2N-DC
•						931H-A2C2D-DCHART
•						931H-C2C2D-DC
	•		•			931H-P2C1D-DC
	•		•			931H-T2C1D-DC
	•		•			931H-T1C1D-DC
	•		•	•		931H-A1A1N-IP
	•		•	•		931H-P2A2N-OP
Universal Signal Conditioners						
•					•	931U-C9A2C-OP
•					•	931U-C9C7C-BC

* For size and color, please see product selection tables below.

Snap-in Markers

Description	Pkg. Quantity	Markers Per Card	Marker Size	Cat. No.
Snap-in Markers	5	144	5 X 10 mm	1492-M5X10
Snap-in Markers	5	120	6 X 10 mm	1492-M6X10

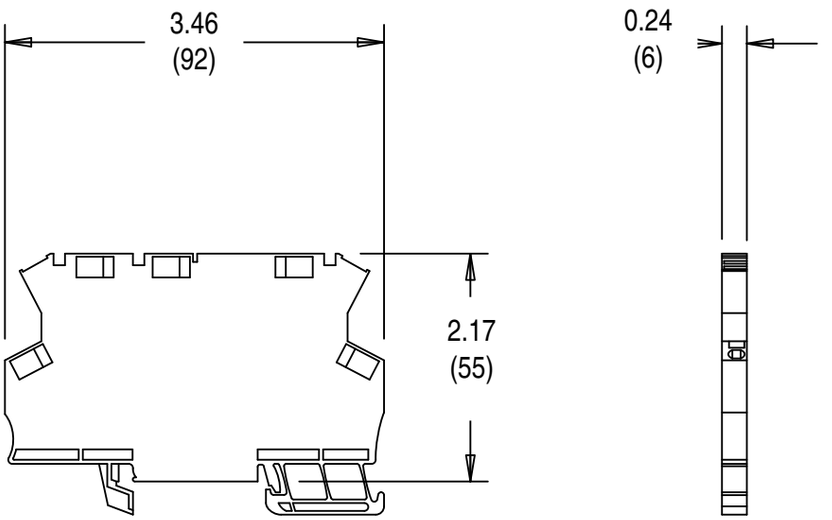
Plug-in Jumpers

Description	Pkg. Quantity	Color	Cat. No.
Plug-In Jumper, 2-pole, Yellow	60	Yellow	**1492-CJLJ5-2**
Plug-In Jumper, 2-pole, Red	60	Red	**1492-CJLJ5-2-R**
Plug-In Jumper, 2-pole, Blue	60	Blue	1492-CJLJ5-2-B
Plug-In Jumper, 2-pole, Black	60	Black	1492-CJLJ5-2-BL
Plug-In Jumper, 2-pole, Red	60	Red	1492-CJLJ6-2-R
Plug-In Jumper, 2-pole, Blue	60	Blue	1492-CJLJ6-2-B
Plug-In Jumper, 3-pole, Red	60	Red	1492-CJLJ6-3-R
Plug-In Jumper, 3-pole, Blue	60	Blue	1492-CJLJ6-3-B
Plug-In Jumper, 10-pole, Red	20	Red	1492-CJLJ6-10-R
Plug-In Jumper, 10-pole, Blue	20	Blue	1492-CJLJ6-10-B
Plug-In Jumper, 41-pole, Red	10	Red	1492-CJLJ6-41-R
Plug-In Jumper, 41-pole, Blue	10	Blue	1492-CJLJ6-41-B

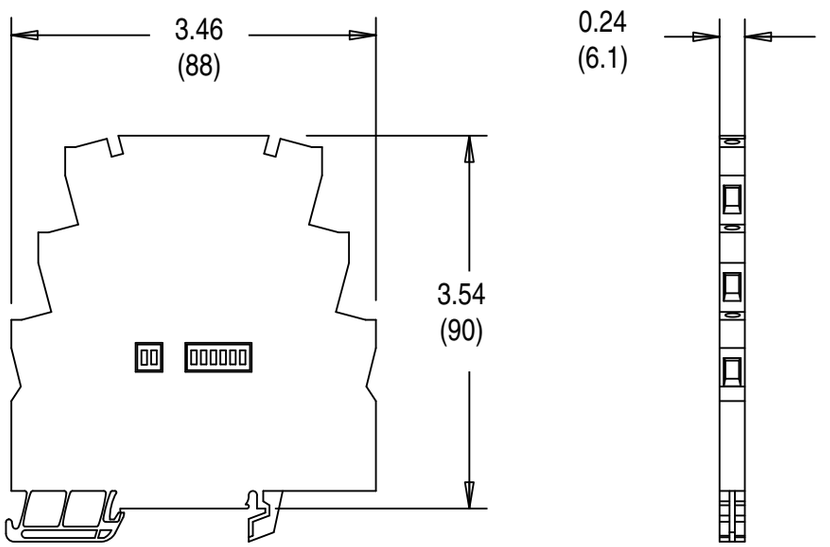
High-Density Signal Conditioners

Approximate dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

- 931H-A1A1N-IP



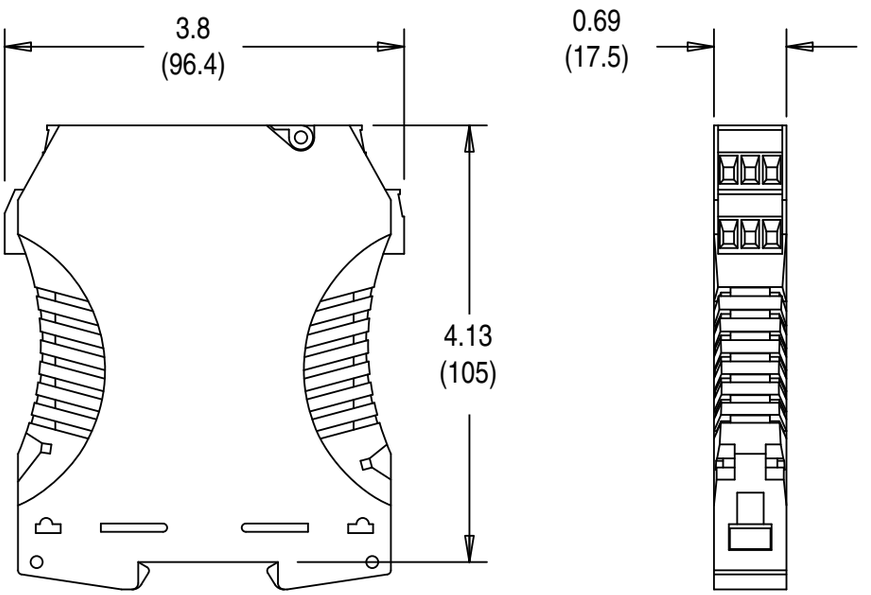
- 931H-P2C1D-DC
- 931H-T1C1D-DC
- 931H-A2C2D-DCHART
- 931H-A2A2N-DC
- 931H-T1C1D-DC
- 931H-T2C1D-DC



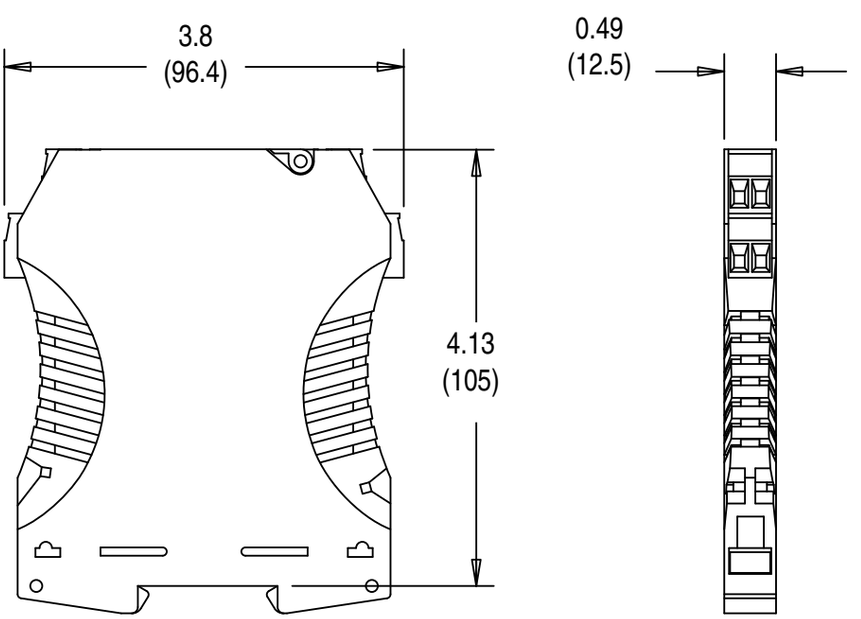
Standard Signal Conditioners

Approximate dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

- 931S-A4C2D-DCHALL
- 931S-B1C6D-DC
- 931S-C1A2D-OP
- 931S-C2R1D-DC2
- 931S-P1C2D-DC
- 931S-A1A1N-DC
- 931S-A1A1N-IP1
- 931S-A1A1N-IP2
- 931S-A2A5N-OP
- 931S-T9C2D-DC
- 931S-V1R1D-MC1



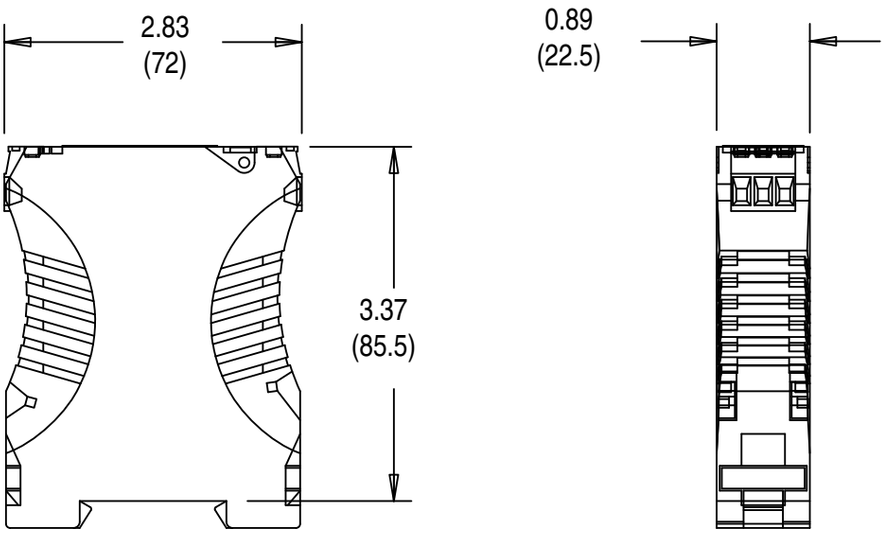
- 931S-C4C5-DC
- 931S-C4C5-BC



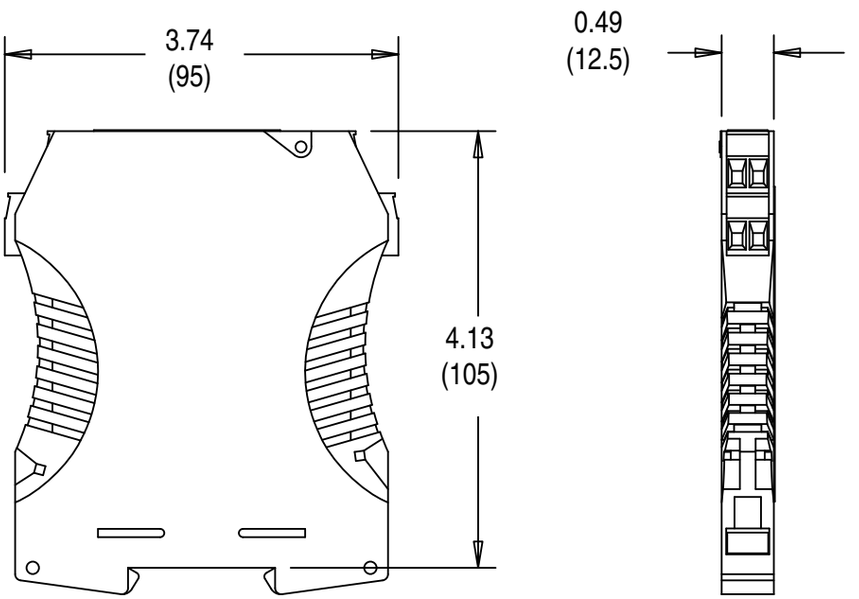
Standard Signal Conditioners, Continued

Approximate dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

- 931S-A3A2D-OP
- 931S-A3C2D-DC



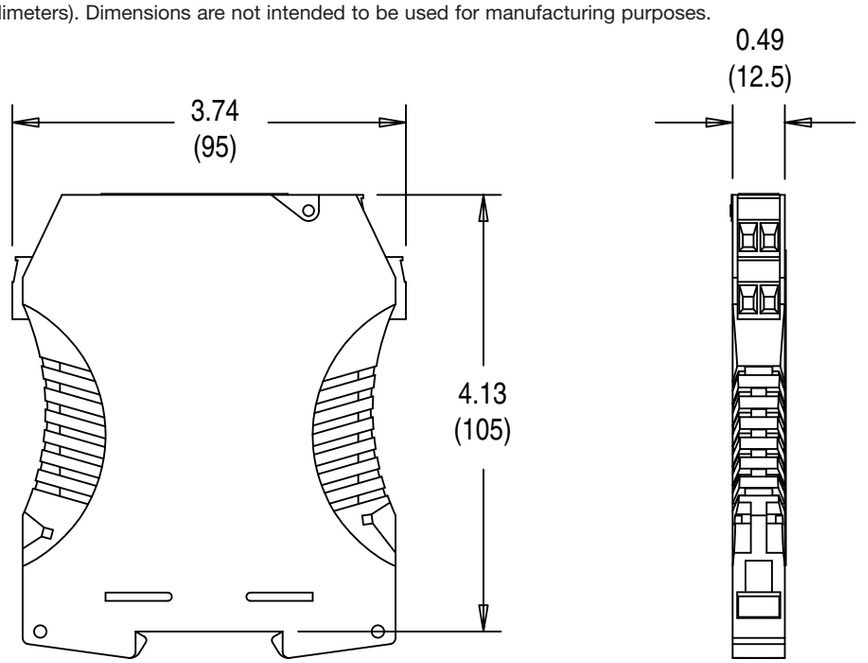
- 931S-C3C3J-DC



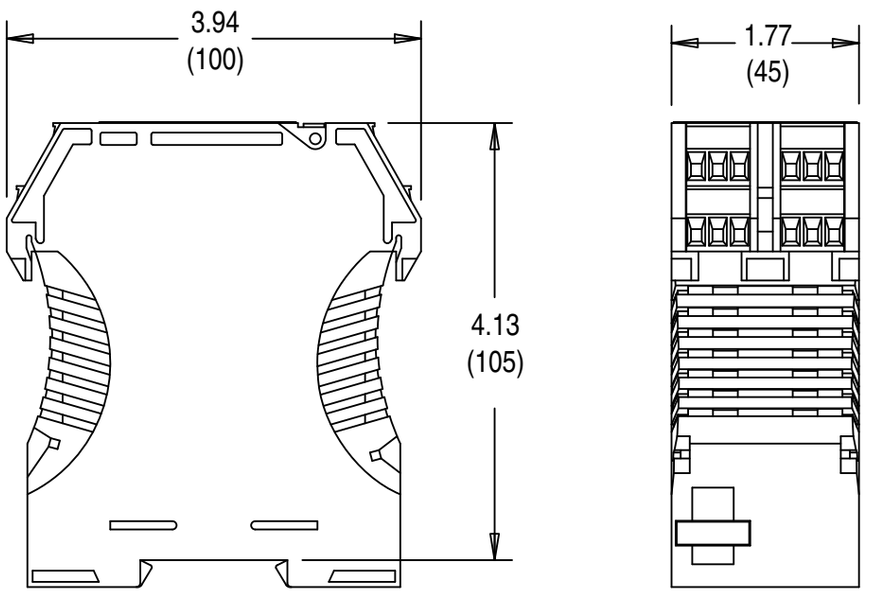
Universal Signal Conditioners

Approximate dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

• 931U-C9A2C-OP



• 931U-C9C7C-BC



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