

Two-wire 4~20mA Current Loop 10KV High Isolation Controller

Passive Two-wire Analog Signal Current Loop 10KV High Isolation Controller: ISOH 4~20mA-E Series

Features:

- Input active signal, output passive signal and control the active load in current loop.
- Small size (46X22X12mm), Error level: 0.1, 0.2
- Unique high-efficiency signal loop coupling powered technology, no need external power supply
- 10000V High Isolation between 4~20mA analog signal input and output
- Active 4~20mA signal acquisition, 5~32V extra-wide voltage range input
- High precision and linearity over the full scale, non-linearity error < 0.2%
- SIP 16 Pin standard PCB mounted, compliant with UL94V-0 flame retardant package.
- Industrial grade temperature range: -40 ~ +85 °C

Typical Application:

- Two-wire active load signal matching, conditioning and controlling.
- Sensor 4-20mA signal isolated acquisition, conditioning and transmission.
- PLC, DCS site analog signal isolation and acquisition.
- Control system ground wire current loop isolation and interference.
- Reliable transmission, reception and monitoring between instrumentation and sensors
- Analog signal data acquisition, isolation and long-distance distortion-free transmission
- Monitoring and isolation safety barrier for power instrumentation and medical equipment
- Realization of 4-20mA loop signal power supplying and isolated controlling

Generalization:

SunYuan ISOH 4-20mA-E is a passive two-wire 4~20mA current loop isolation controller module with 10KV high voltage isolation, small size and low cost. Which is the highest voltage isolation amplifier IC on the market and developed by Sunyuan Technology. This new product can convert active 4-20mA current signal into isolated passive controlling signal to control the two-wire powered (explosion-prevention method) 4-20mA current loop. The module achieves the matching between sensor signals acquisition and the active load from analog input end, which effectively solves the problem of signal collision and interference between the active 4-20mA current signal and power supply of two-wire current loop input end. The new product can realize high precision, high linearity and 10KV anti-EMC interference high isolation transmission, conditioning and controlling between industrial field sensor and instrument, PLC and DCS.

ISOH 4-20mA-E series module employed high-efficiency power stealing technology which makes the IC can operating without independent power supply. And the two-wire loop powered output method used which largely reduces the costs for customers in installation. Inside the IC, there are current signal modulation circuit and signal coupling power stealing and isolated conversion circuit, etc. Input very low equivalent resistance to acquire the extra-wide voltage value (5~32VDC) in the current signal from the loop of instrumentation and sensor or transmitter as working power for signal transmission and conversion, meets the needs of users to transmit distortion-free signal in long distance without power supply.

The output of **ISO 4~20mA-E** was designed for the two-wire powered loop of series connection between 24VDC and sampling resistors (two-wire instrumentation), it is matched with the analog input interface board (host machine), PLC, DCS or other instruments (With active load in analog input port) commonly used in industrial fields. The module achieves the isolation, transmission and acquisition of two-wire 4-20mA signal by add an external 2KΩ multi-turn potentiometer to do adjustment, and meets the requirements of harsh working environments with industrial grade wide temperature, humidity and vibration. SIP 16 Pin PCB mounted and DIN

35 Rail mounted packages are available, which were widely used in rail traffic voltage monitoring, power generator or electric motor safety operation monitoring, electric power transmission and distribution long distance monitoring, signal transmission and reception between instrument and meter, medical equipment isolation safety barrier, industrial intelligent control, nuclear power, etc. field.

Rated Maximum Values:

(Operating the products in the rated maximum value environment for long-term will affects the service life of the product. If the maximum value is exceeded, irreparable damage may be occurred.)

Continuous Isolation Voltage	10000Vrms
Input voltage	36VDC
Operating Temperature	- 40 ~ +85 °C
Storage Temperature	+150°C
Pin Welding Temperature	+300°C/<10S
Output short-circuit time	Sustainable

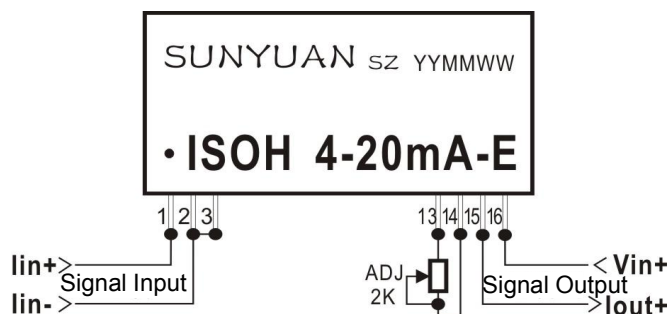
General Parameters:

Accuracy, linearity error grade ----- 0.1, 0.2	Load regulation rate ----- <0.05% meas.val./100Ω
Auxiliary power ----- No	Isolation ----- 10kV isolation between Signal input/output
Operating Temperature ----- -40 ~ +85 °C	Package ----- SIP16 Pin (16Pin PCB Mounted)
Operating Humidity ----- 10 ~ 60% (No condensation)	Withstand voltage ----- 10KV(50HZ / S), leak current <1mA
Storage Temperature ----- -45 ~ +105°C	Impact Resistance Voltage ----- 10KVAC, 1.2/50us (peak)
Storage Humidity ----- 10 ~ 95% (No condensation)	Temperature drift ----- 0.0050%F.S./°C (in -40°C ~ +85°C operating temperature)

Technical Parameters:

Parameters	Condition	Min.	Typical Value	Max.	Unit
Isolation voltage AC, 50Hz	60S		10000		VAC
Insulation resistance	500VDC		100		MΩ
Leak current	240Vrms, 50Hz		0.5		uA
Temperature drift			±50	±100	PPm/°C
Non-linearity			±0.2	±0.5	%FSK
Load capacity	24VDC		750		Ω
Input signal voltage range		5	24	32	VDC
Output signal voltage range	RL:250Ω	13	24	36	VDC
Output linear range			4	24	mA
Output current		0.5		40	mA
Output signal ripple			10	20	mV
Frequency response (Small signal bandwidth)	Io=20mA		100		Hz

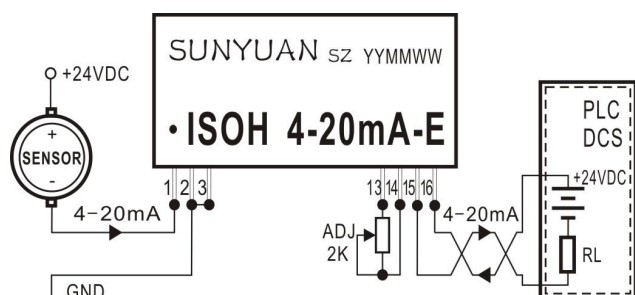
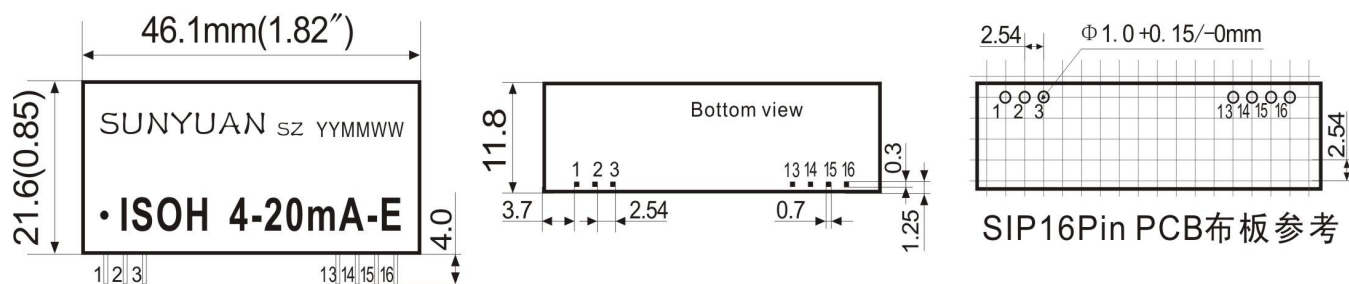
Pin definition and block diagram:



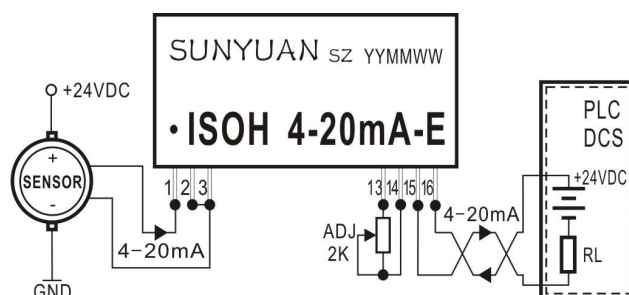
Pin function description (SIP16 Pin)

Signal input Positive	Signal input Negative	No connection	Gain Adjustment	Gain Adjustment	Current output Positive	Voltage input Positive
lin+	lin-	NC	ADJ	ADJ	lout+	Vin+
1	2~3	3~12	13	14	15	16

Dimension and Typical application:

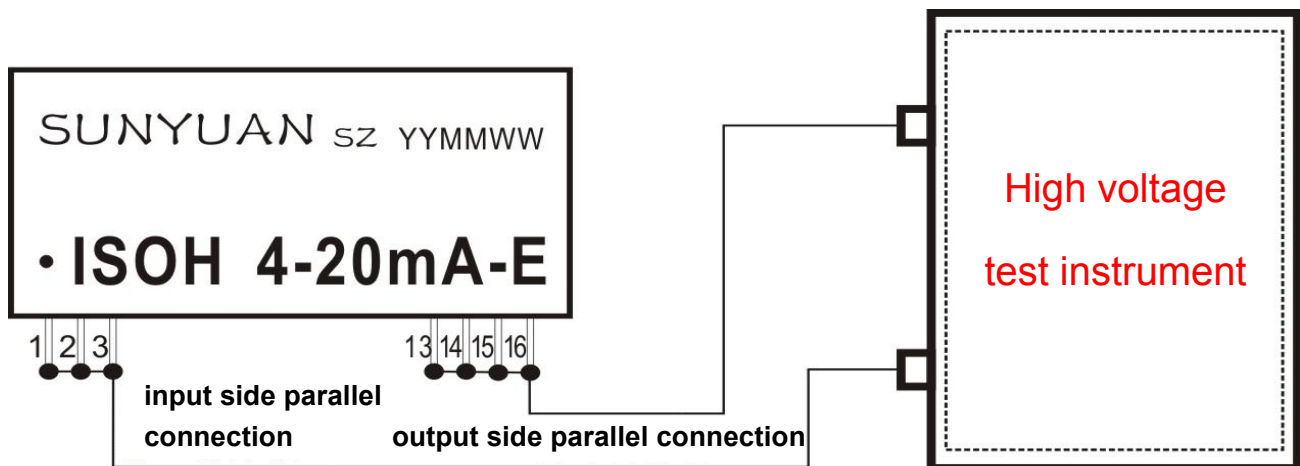


4~20mA current 10KV isolation controller
IC connection diagram 1



4~20mA current 10KV isolation controller
IC connection diagram 2

High voltage isolation safety test methods:



High voltage isolation safety test methods and precautions

1. Please connect the wire as the above picture, set the rated high voltage value on the high voltage test instrument according to the technical parameter. Please pay attention to personal safety during the test, beware of electric shock!

Test environment: room temperature $T_A = 25^\circ \text{C}$, air humidity $< 75\%$

2. High-voltage test operator must wear rubber-insulated gloves, with rubber insulation pads on the ground to prevent high-voltage electric shock.

3. The house of the high voltage test instrument must be reliable and reachable for the ground, please do not make the test in the high temperature, humid and dusty environments.

4. When the high voltage test instrument is connected to the measured object, please make sure that the high voltage output value is "0" and the test function key is in the "reset", and prohibit the high voltage test instrument connected to other object.

5. Do not touch the measured object, the test line and the high voltage output side when the instrument is in the high voltage test state or before the end of the high voltage discharge.

6. Product isolation withstand voltage test method as shown above picture, short-circuit the input and output pins respectively and load the rated voltage for 1 minute.

7. According to the rated isolation voltage value of the product, use the manual gear to adjust the output voltage of the instrument from 0 to the rated value and keep it for a few minutes.

8. The insulation voltage test itself is a destructive test for an insulate product, and the high voltage test should be performed as little as possible for the same product. If there are different customers require multiple inspections, the general requirements are as follows: the batch product is tested according to the rated voltage value of the parameter for the first time, and the test voltage value and the high-voltage detection frequency should be reduced by 0.7 times of the rated value each time. Otherwise, the unrecoverable damage will be occurred to the product in the process of multiple high-voltage tests.

Active Load Two-wire Isolation Controller IC

ISO 4-20mA-E Series

Regulating and Controlling Active Load in Current Loop from PLC/DCS through Active Signal

Features:

- No external power supply required, two-wire signal loop powered output mode.
- Active 4-20mA signal acquisition, volt. (5-32V) extra-wide range input.
- High precision within 4-20mA measuring range (0.1, 0.2). 4-20mA signal transmission with high linearity(non-linearity error <0.1%).
- Active 4-20mA signal acquisition input, 3KV isolation between input and output.
- Active signal input, the output can control the active load in current loop.
- SIP 12Pin small size, UL94V-0 standard fire-retardant package.
- Industrial operating temp. : - 45°C ~ + 85°C.

Applications:

- Two-wire active load signal matching and controlling.
- PLC, DCS site analog signal isolation and acquisition.
- Ground wire current loop isolation and interference.
- The matching between sensor signals and analog data input and output terminals.
- Sensor 4-20mA signal isolated acquisition, conditioning and transmission.
- Analog signal data isolated acquisition and long-distance transmission.
- Electric meters and instruments, medical equipments.

Generalization:

SUNYUAN SIP12 Package Two-wire 4-20mA Signal Isolated Conditioning and Controlling IC: ISO4-20mA-E is a kind of two-wire active sensor (4-20mA) signal isolated conditioner, it belongs to ISO4-20mA series products. It can convert active 4-20mA current signal into isolated passive controlling signal to control the two-wire powered (explosion-prevention method) 4-20mA current loop. The module achieves the matching between sensor signals acquisition and active load from analog input end, which effectively solves problems on the conflict between the active 4-20mA current signal and power supply of two-wire current loop input end.

ISO 4-20mA-E series module employed high-efficiency stealing electricity technology which makes the ic can operate without independent power supply. And the two-wire loop powered output method used which largely reduces the costs for customers in installation. Inside the IC, there are current signal modulation circuit, magnetoelectric isolation transform circuit and signal reduction demodulation circuit, etc. The low input equivalent resistance makes the voltage value of the current signal from the sensor output loop arrive at 5~32VDC to realize the long-distance, non-distortion transmission of signals without external power supply.

The output of ISO4-20mA-E Module is designed on the basis of the two-wire powered loop circuit of the 24VDC and sampling resistance (two-wire meter) which are parallelly connected, the output also matches well with the analog input terminals of the industrial equipments like analog input interface board (host machine), PLC, DCS, and other instruments and meters, etc. The module is convenient to use to achieve the isolation, transmission and acquisition of two-wire 4-20mA signal by add an external 10KΩ multi-turn potentiometer to do adjustment and meets the requirements that operating in industrial field wide temperature, humidity, vibration, etc adverse operation conditions.

Maximum Rated Values:

(If exceed the value below, may cause irremediable defect.)

Continuous Isolation Volt.	3KVDC/rms
Vin./ Input Signal Volt.(Max.)	32VDC
Operating Ambient Temp.:	- 45°C ~ + 85°C
Soldering Temp.(≤ 10 S):	+300°C
Output Short-circuit Time:	Main-tenability

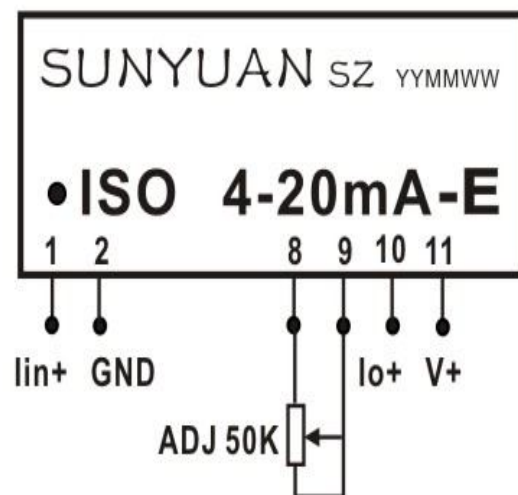
General Parameters:

Accuracy, linearity error grade ----- 0.1, 0.2	Hysteresis error ----- < 0.5%
Auxiliary power----- No	Isolation ----- signal input and output
Operating Temp.----- -20 ~ +70℃	Insulation Resistance ----- ≥20MΩ
Operating Humidity-----10~90% (no condensation)	Withstand Volt. ----- 3KV(60HZ / S), leak current 1mA
Storage Temp.----- -20 ~ +70℃	Impact Resistance Volt. ----- 3KV, 1.2/50us(peak value)
Storage Humidity-----10 ~ 95% (no condensation)	

Technical Specifications:

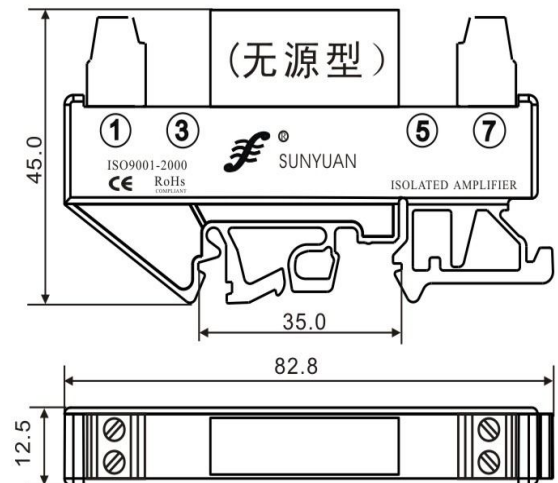
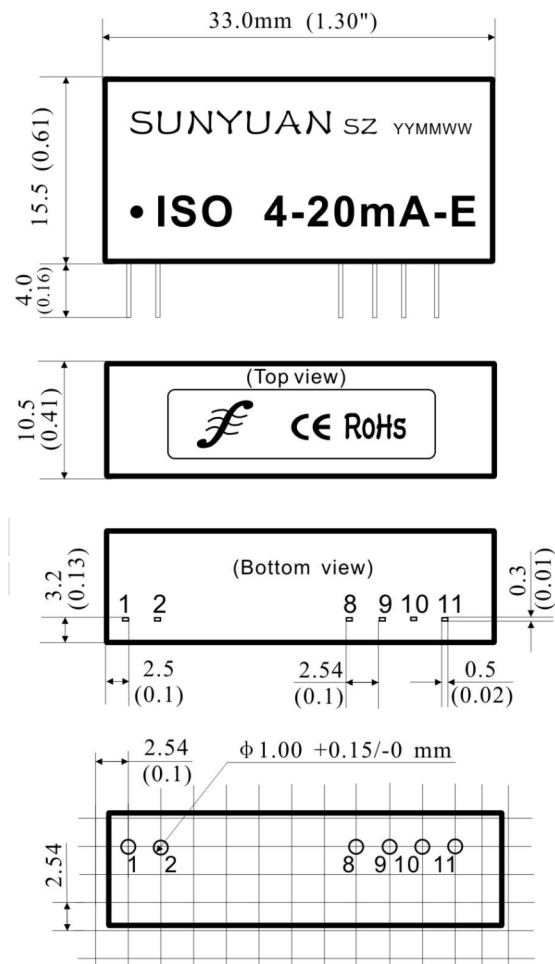
Parameter	Conditions	Min.	Typical Value	Max.	Unit
Isolation Volt. AC, 50Hz	10S	3000			VDC
Insulation Impedance			10 ¹² ±1		Ω/Pf
Leak current	240Vrms, 50Hz		0.5		uA
Temp. Drift			±50	±100	PPm/℃
Non-linearity			±0.2	±0.5	%FSK
Load competence	24VDC		750		Ω
Input Signal Volt. Range		5	24	36	VDC
Output Signal Volt. Range	RL:250Ω	13	24	36	VDC
Output Linearity Range			4	24	mA
Output Current I _o		0.5		40	mA
Output Signal Ripple			10	20	mV
Frequency Response (small signal bandwidth)	I _o =20mA		100		Hz

PIN Definition:



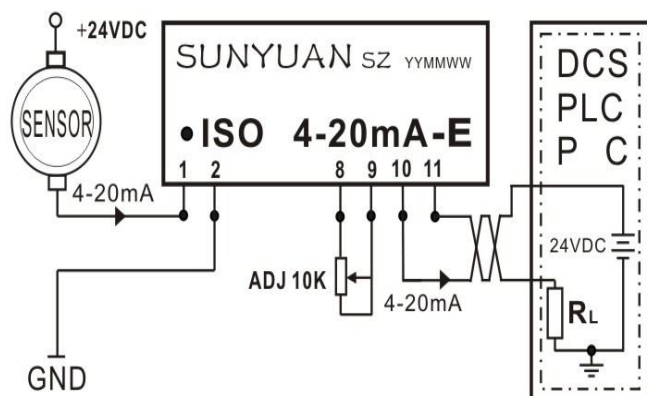
Signal Input +	Signal Input -	Null	Gain Adjustment #1	Gain Adjustment #2	Current Output +	Loop Power +	Null
Iin	GND	NC	Adj 1	Adj 2	Io+	V+	NC
1	2	3~7	8	9	10	11	12

IC Dimension and PCB Board Installation Dimension:

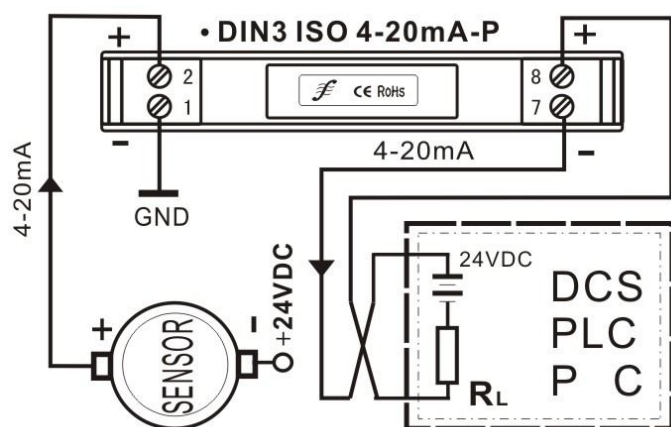


Compact DIN Rail 3 Dimension

Typical Applications:



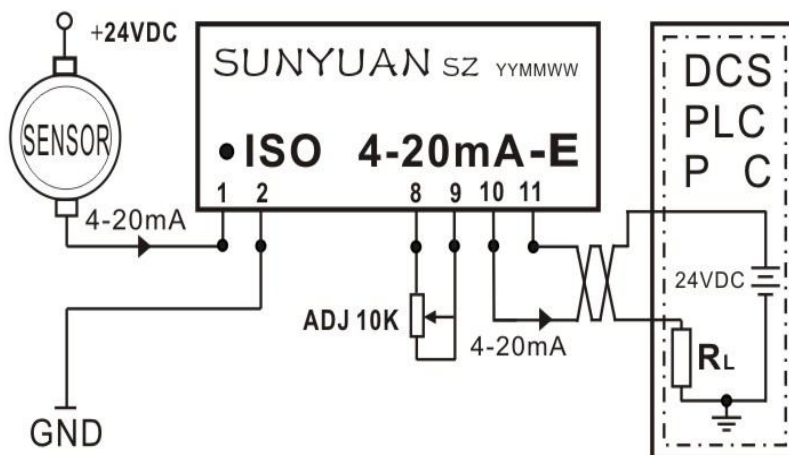
Active Load Two-wire 4-20mA Isolated Controlling Connection Diagram



DIN3 4-20mA-E Signal Isolated Controller Connection Diagram

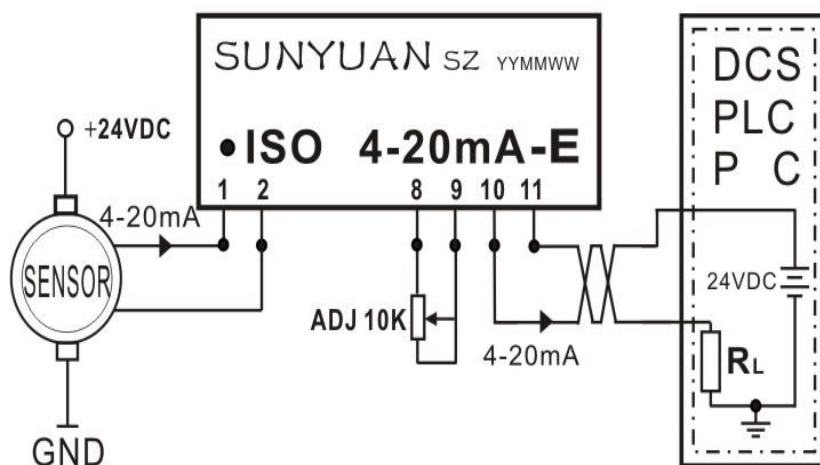
Typical Application I

ISO 4-20mA-E Isolated two-wire sensor 4-20mA Active Signal Input, Passive signal output(Two-wire active load loop powered output).



Typical Application II

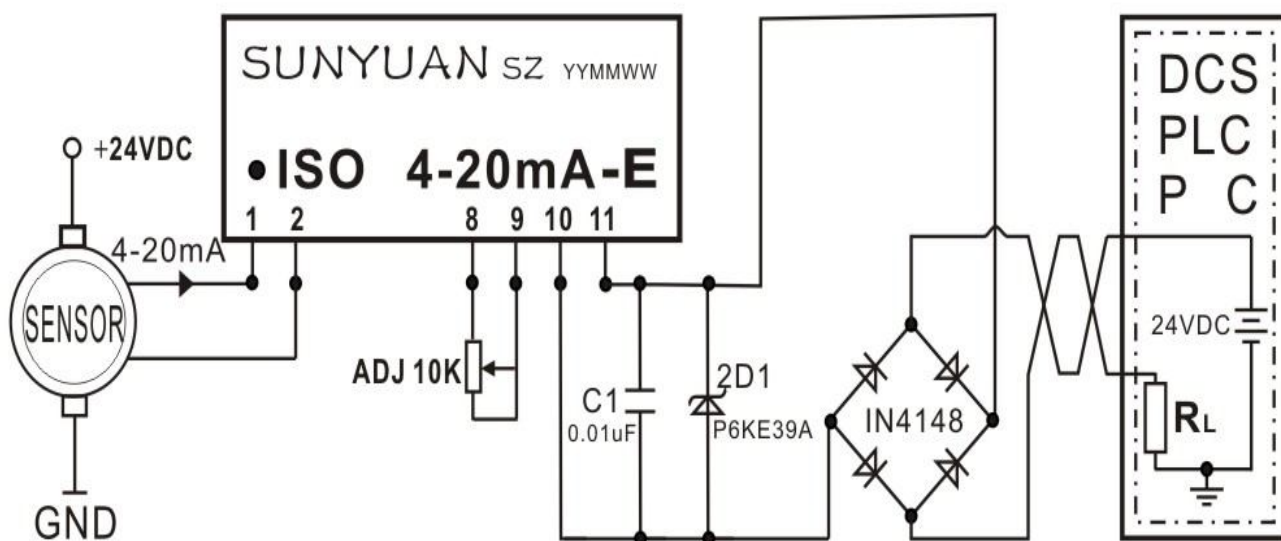
ISO 4-20mA-E Isolated four-wire sensor 4-20mA active signal input, passive signal output (Two-wire active load loop powered output).



Typical Application III

ISO 4-20mA-E Isolated four-wire sensor 4-20mA active signal input, passive signal output (Two-wire active load loop powered output).

Application Solution on External Protection Circuit of Output



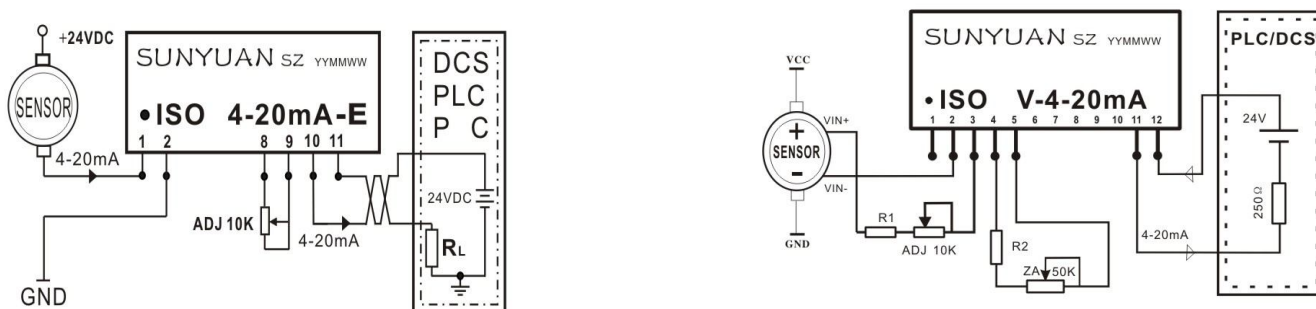
Outside View and Installation Methods:



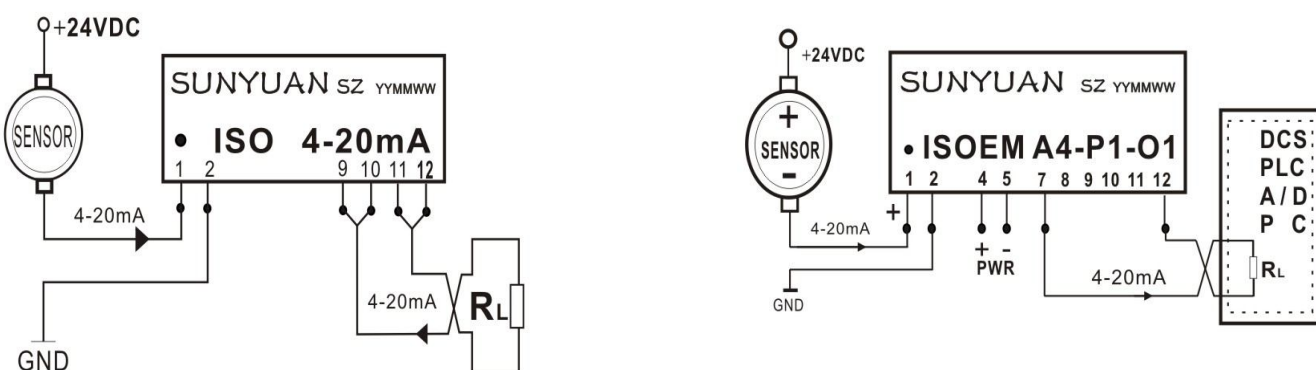
The Universal Connection Solutions for Industrial Sensors and Instruments

(ISO 4-20mA) Series

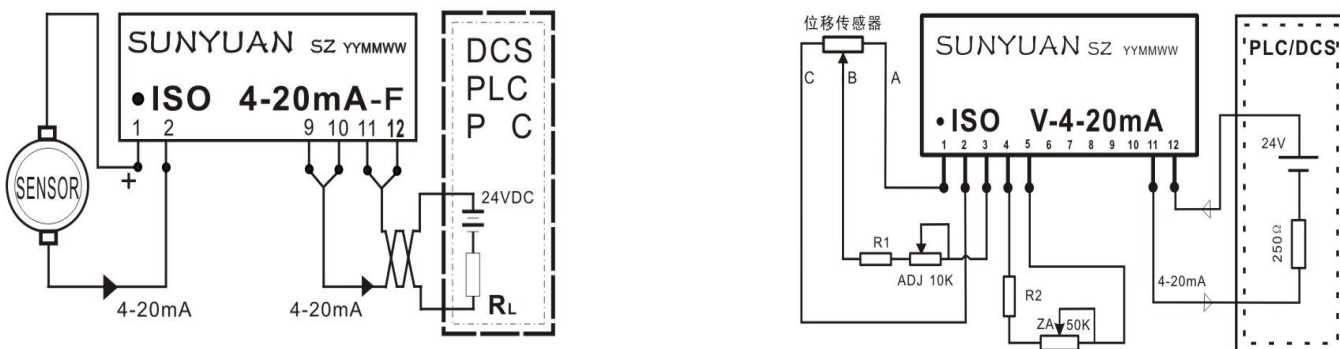
1. Two wire sensor 4-20mA active signal and active load connection



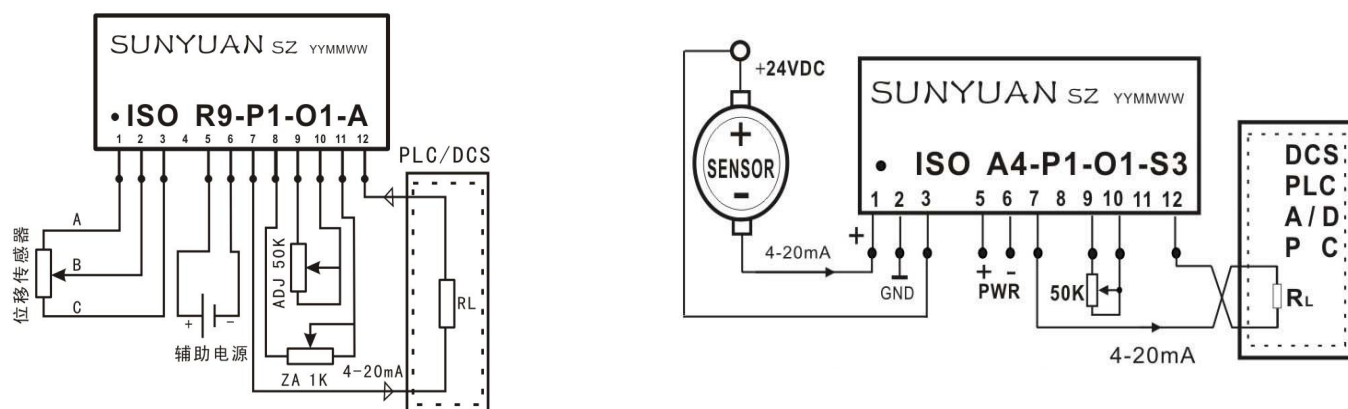
2. Two wire sensor 4-20mA active signal and passive load connection



3. Two wire sensor 4-20mA passive signal and active load connection



4. Two wire sensor 4-20mA passive signal and passive load connection



DIN3 Series Two-wire 4-20mA Analog Isolated Controller

**Extra-small low cost standard DIN rail 35 package
Controlling PLC current loop active load through active signal**

Features

- Without external power, two-wire signal loop powered output.
- Active 4-20mA, signal collection voltage (5 ~ 32V) extra-wide range input.
- High precision grade (0.1, 0.2) in 4-20mA measuring range.
- 4-20mA signal transmission with high linearity (non-linearity <0.1%).
- 3KV isolation between active 4-20mA input and output.
- Active signal input, output can control the active load in current loop.
- Industrial operating temperature range: - 25℃ ~ +70℃.

Applications

- Two-wire active load signal control.
- PLC, DCS site analog signal isolation and collection.
- Ground wire current loop isolation and interference inhibition.
- Matching sensor signal with analog input and output interfaces.
- Sensor 4-20mA signal isolated collection, adaptation and transmission.
- Analog signal data acquisition and long-distance transmission without distortion.
- Electric meters and instruments, safety bar for medical equipments.

Introduction

SUNYUAN Extra-small low cost standard DIN rail35 Package Two-wire 4-20mA Signal Isolated controller can convert active 4-20mA current signal into isolated passive controlling signal to control the two-wire powered (explosion-prevention method) 4-20mA current loop. The module achieves the matching between sensor signals acquisition and active load from analog input end, which effectively solves problems on the conflict between the active 4-20mA current signal and power supply of two-wire current loop input end.

DIN3 ISO 4-20mA-E series controller adopts high-efficiency stealing electricity technology which makes the IC can operate without independent power supply. And the two-wire loop powered output method used which largely reduces the costs for customers in installation. Inside the IC, there are current signal modulation circuit, magnetoelectric isolation transform circuit and signal reduction demodulation circuit, etc. The low input equivalent resistance makes the voltage value of the current signal from the sensor output loop arrive at 5~32VDC to realize the long-distance, non-distortion transmission of signals without external power supply.

The output of DIN3 ISO4-20mA-E Module is designed on the basis of the two-wire powered loop circuit of the 24VDC and sampling resistance (two-wire meter) which are parallelly connected, the output also matches well with the analog input terminals of the industrial equipments like analog input interface board (host machine), PLC, DCS, and other instruments and meters, etc. The module is convenient to use to achieve the isolation, transmission and acquisition of two-wire 4-20mA signal by add an external 10KΩ multi-turn potentiometer to do adjustment and meets the requirements that operating in industrial field wide temperature, humidity, vibration, etc adverse operation conditions.

Model selection

DIN3 ISO 4-20mA-E

Small size Magneto-electric

DIN rail 35 Two-wire 4-20mA isolated controller

Model selection examples:

E.g.1: DIN Rail 35 package with external wiring terminal type, signal input: 4-20mA; isolated controlling signal output: 4-20mA. Product model No.: **DIN3 ISO 4-20mA-E**

Max. Rated Value

(If the product operates in the max. rated value in the long-term, may affect the durability, if exceed the max. values, may cause unrepairable damage.)

Continuous Isolation Voltage	3KVDC/rms
Power supply Volt. Input Range:	-Non
Operating Temperature	- 45℃ ~ + 85℃
Output short-circuit to normal	Continuous
Welding Temperature (<10S)	+300℃

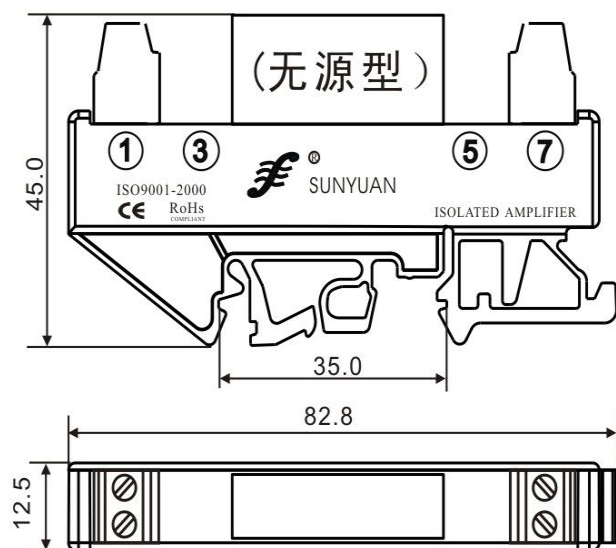
General parameters

Precision, linearity error grade ----- 0.1,0.2	Backlash----- < 0.5%
Auxiliary power ----- No	Isolation ----- Signal I/O
Operating temp. ----- -20 ~ +70℃	Insulation resistance ----- ≥20MΩ
Operating humidity-----10 ~ 90% (no condensation)	Withstanding volt. ----- 3KVDC(60HZ/S), leakage current 1mA.
Storage Temp. ----- -20 ~ +70℃	Anti-impulse voltage -----3KVDC, 1.2/50us (peak value)
Storage humidity ----- 10 ~ 95% (no condensation)	

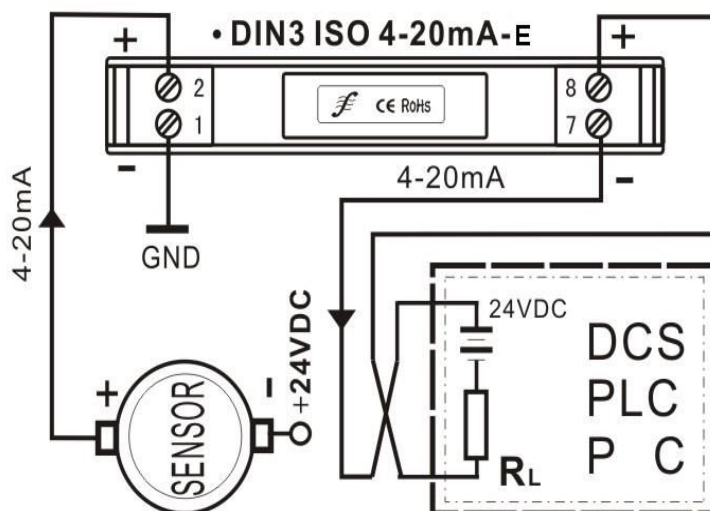
Technical parameters

Parameters	Testing Conditions	Min.	Typical Value	Max.	Unit
Isolated volt. AC, 50Hz	10S	3000			VDC
Insulation resistance			10 ¹² 1		Ω Pf
Leakage current	240Vrms, 50Hz		0.5		uA
Temp. drift			±50	±100	PPm/℃
Non-linearity			±0.2	±0.5	%FSK
Load capacity	24VDC		750		Ω
Input signal voltage range		5	24	36	VDC
Output signal voltage range	RL:250Ω	13	24	36	VDC
Output linearity range			4	24	mA
Output current I _o		0.5		40	mA

Dimension & Typical applications



External size



Typical application

DIN3 ISO 4-20mA Terminal definition (without Zero and Gain adjustment)

1	2	3 4 5 6	7	8
Signal input negative Iin	Signal input negative GND	NC	Current output positive Io+	Loop power positive V+

