

2-wire Passive V/I Conversion Distribution Isolation Transmitter

Passive 2-wire Voltage to 4-20mA Signal Isolation Transmitter ISO V-4-20mA Series

Features	Applications					
•Unique high efficient signal loop power extraction technique,	•Displacement signal, potentiometer signal data					
external power supply is not required.	acquisition isolation and control.					
•2-wire V/I conversion, 3KVDC isolation between signal input	•PLC/DCS directly gathers voltage signals from sensor.					
and output.	•Converts weighing mV signal into standard 4-20mA					
•DC voltage signal input, loop powered 4-20mA output.	analog signal.					
 Input potentio-meter signal: 0-2KΩ / 0-5KΩ / 0-10KΩ,etc. 	•Interference rejection of industrial field ground.					
Input standard voltage signal: 0-5V/0-10V/1-5V/0-75mV,etc.	Pressure signal acquisition and distribution					
•Input terminal can provide distribution power (5V/3mA) regulated	•Sensor voltage signal acquisition and long-term					
power supply for functions extension.	distortion-less transmission					
•High accuracy and linearity in full measuring range, non-linearity	Bridge (weighing) detecting circuit voltage signal					
error grade < 0.1%.	distribution and transmission					
• Micro size (33X10.5X15.5mm), error grade: 0.1, 0.2.	Voltage signal to passive 2-wire 4-20mA current signal					
• SIP7 Pin PCB-mounted, UL94V-0 flame-retardant package.	isolated conversion: 1-input 1-output, 2-input 2-output,					
• Industrial operating temperature range: -40 ~ +85 $^\circ\!\mathrm{C}.$	3-input 3-output.					

Introduction

Sunyuan ISO V-4-20mA is kind of SIP 12Pin PCB-mounted passive 2-wire voltage to 4-20mA isolation transmitters. The isolation transmitter IC can provide a set of 5V(3mA) power supply for function extension in next step current loop powered mode. And it receives the voltage signal from the input terminal and converts it into standard 4-20mA 2-wire current signal.

The design of product follows the low cost, small size standards, and adopts SIP12PIN fire protection IC package. Inside the product, there are current signal modulation circuit, magneto-electric isolation transform circuit and signal reduction demodulation circuit. It's power supply voltage range is 12-36VDC, low input equivalent resistance, high linearity, the isolation withstand voltage between signal input and output is up to 3000VDC. The power modules are convenient to use, which achieve isolated distribution of voltage signals from the two-wire voltage input distribution sensor and bridge (weighing) detection circuit only by adding some peripheral devices. The isolation transmitter can be used with sensor to directly convert displacement, angle resistance signal into standard 4-20mA signal, zero and gain can be adjusted by adding external potentiometers. When using the module, user should refer to the typical application circuit diagram.

Unique magneto-electric isolation mode and high efficient loop powered technology are used to make the modules convert voltage signal into standard 2-wire 4-20mA signal. The signal transmitter is compatible with the standard analog input terminals, like PLC, DCS, Digital display meter. It can be used in normal in abominable industrial conditions like wide temperature, humidity and vibration. The signal transmitter have two types of package, small size PCB-mounted package, 35mm DIN rail-mounted products can be 1-input 1-output, 2-input 2-output, 3-input 3-output and 16-channel V/I isolated conversion functions.

Max. Rated Value

(If operates in the max. rated value in a long time, may affect the durability, exceeds the max. values, may cause un-repairable damage.)

Continuous isolation voltage	3KVrms
Vin (Max. input voltage)	36VDC
Junction Temperature (Max. Range of ambient temperature)	- 40°C ~ + 85°C
Storage temperature	+150 ℃
Lead Temperature (Continuous time <10S)	+300 ℃
Output Short to Common	Continuous



General Parameters

Accuracy, linearity error grade0.1, 0.2	Load regulation ratio <0.05% meas.val./100 Ω				
Auxiliary power supply None	Isolation Signal input and output, dual isolation.				
Operating temperature range40 ~ +85 $^\circ\!\mathrm{C}$	Package SIP 12 Pin				
Operating humidity 10 ~ 90% (non-condensation)	Isolation voltage 3KV(60HZ / S), leakage current <1mA				
Storage temperature45~ +105°C	Impulse withstand voltage 3KV, 1.2/50us (peak value)				
Character humidity 10 05% (non-condensation)	Temperature drift 0.0050%F.S./°C				
Storage numbuly 10 ~ 95% (non-condensation)	(-40 $^\circ\!$				

Technical Parameters

Deremetere	Testing Conditions		11		
Parameters	resting conditions	MIN	TYP	MAX	Unit
Isolated voltage AC, 50Hz	10S		3000		VDC
Insulation resistance	500VDC		100		MΩ
Leakage current	240Vrms,50Hz		0.5		uA
Current output		3.5		24	mA
linearity range					
Gain		0.005	0.3125	0.625	V/mA
Temperature drift	- 40- + 85℃		±50	±100	PPM/℃
Non-linearity	0-5V	±0.1	±0.2	±0.4	%FSR
Input offset voltage			±1	±2	mV
Input voltage signal		0.075		10	V
Input resistance signal		50		10K	Ω
Frequency features			100		Hz
Distribution power voltage	Ireg=3mA	4.75	5	5.25	V
Loop powered voltage		12	24	36	V

Model Selection & Definition





Installation package

Omitted: PCB-mounted type (IC Package)

Model Selection Examples

- E.g.1: Signal input 0-5V; signal output 4-20mA; micro-size SIP 7 Pin. Model NO.: ISO V1-4-20mA
- E.g.2: Signal input 0-5KΩ; signal output 4-20mA; micro-size SIP 7 Pin. Model NO.: ISO R7-4-20mA
- E.g.1: Signal input 0-5V; signal output 4-20mA; 1-ch input, 1-ch output DIN rail-mounted type. Model NO.: **DIN1X1 ISO V1-4-20mA**



E.g.1: Signal input 0-10V; signal output 4-20mA; 2-ch input, 2-ch output DIN rail-mounted type.

Model NO.: DIN2X2 ISO V2-4-20mA

Pin Definition & Functional Block Diagram





Pin functions description (SIP 12Pin)

+5VDistributi on power output +	Signal input GND	Signal input +	Zero adjustment	2.5V Reference volt. output	No connection	Current output +	Voltage input +
VD+	GND	Sin+	ZA	VREF	NC	lout+	Vin+
1	2	3	4	5	6-10	11	12

Dimension & PCB Diagram



Typical Applications

1. Sensor voltage signal acquisition & isolated transmission (2-wire distribution power loop output)



2. Bridge (Weighing) detection circuit mV voltage signal isolated power distribution transmission (2-wire distribution power loop output)



ISO V-4-20mA Typical wiring diagram 2

Two-wire 0-5V/0-10V to 4-20mA Converter IC

Resistance & Potentiometer value calculation formula:

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Note: In measuring mV small signal, integrated amplification circuit are required in input terminal.

3. Displacement potentiometer resistance signal input (2-wire distribution power loop output)



ISO R-4-20mA Typical wiring diagram 3

Resistance & Potentiometer value calculation formula: R2+ZA=2.5V/0.04mA R1+Adj=5V/0.16mA

Adjusting method: First, connect the potentiometer R correctly and set R into the min. value; next adjust ZA terminal to get the output 4mA (between pin11 and pin12). Then set potentiometer R value into the max., next adjust "Adj" to get the output 20mA. The input potentiometer recommended value is between 2--5KΩ. If it requires to measure high resistance value, the integrated transfer circuits should be added in input terminal.

Multi-channel Standard 35mm DIN Rail-mounted DIN 1X1/2X2/3X3/16X16 ISO V-4-20mA Series V/I Conversion Isolation Transmitter

Sunyuan I-Type Standard DIN35 Rail-mounted multi-channel 2-wire V/I Conversion Isolation Transmitter has several sets of ISO V-4-20mA series IC modules inside. The converters can be 1-input 1-output (DIN1X1), 2-input 2-output (DIN 2X2), 3-input 3-output (DIN3X3) to achieve multi-channel voltage signal to 2-wire 4-20ma current isolated conversion. Zero and full adjustment is not required, internal anti-surge protection or suppression circuit is added to make sure that the products is much more reliable.

DIN	1X1 /	/ DIN	2X2	/ DIN	3X3	Series	Dimensio	n &	Pin	Definitio	on:

Pin	Pin Function Description					
1	Signal in1 +	Signal input #1+				
2	Signal in1 -	Signal input #1-				
3	Signal in2 +	Signal input #2+				
4	Signal in2 -	Signal input #2-				
5	Signal in3 +	Signal input #3+				
6	Signal in3 -	Signal input #3-				
7	Vout3 -	Signal output #3-				
8	Vout3+	Signal output #3+				
9	Vout2 -	Signal output #2-				
10	Vout2+	Signal output #2+				
11	Vout1 -	Signal output #1-				
12	Vout1+	Signal output #1+				





DIN1x1/2x2/3x3 Multi-channel Passive Isolation Transmitter



Note: The specification is subject to change without notice.

Two-wire passive analog signal VI conversion 10KV high isolation transmitter

Passive two-wire voltage signal to 4-20mA high isolation transmitter: ISOH V-4-20mA series

Features

- •Unique high-efficiency signal loop power-taking technology, no external working power supply
- •Two-wire VI conversion analog signal input and output 10KVAC high isolation
- •Analog voltage signal input, loop power supply 4-20mA current loop output mode
- •Can Input potential potentiometer signal: $0-2K \Omega / 0-5K \Omega / 0-10K \Omega$, etc. Can input standard analog voltage signal: 0-5V/0-10V/1-5V/0-75mV, etc.
- (5V/3mA) regulated power supply can be provided at the input for circuits such as bridges
- •Extreme accuracy and linearity over the full range, nonlinearity error < 0.1%
- •Small volume (46X22X12 mm), error level: 0.1, 0.2
- •Small size single row SIP 16Pin, UL94V-0 compliant flame retardant package

Typical application

- •Displacement, potentiometer and other sensor voltage signal acquisition isolation
- •PLC / DCS control system matches sensor voltage signal
- •Load cell millivolt signal to 4-20mA analog signal
- •Multi-channel analog acquisition ground loop isolation and interference suppression
- •Sensor and transmitter 4-20mA signal isolation and VI conversion
- Pressure sensor voltage signal acquisition isolation and long-distance transmission
- •Bridge (electronic ruler) detection circuit voltage signal isolation and distribution
- Power instrumentation, medical equipment monitoring isolation barrier
- DC, high voltage monitoring and isolation safety barrier for electric power and rail transit

Summarize

SunYuan ISOH V-4-20mA is the newly developed 10KVAC highest isolation voltage, small size (16 pin single line SIP16 Pin) low-cost passive two-wire sensor voltage signal to 4-20mA isolated transmitter module in the industry. The module can provide a set of 5V (3mA) function expansion power supply to the input circuit and supply power to the pre-stage circuit through the post current current loop feeding mode, and receive the voltage signal from the output of the pre-stage circuit, and output 4~20mA after isolation conversion. Standard two-wire current signal. The new product can realize high precision, high linearity 10KV anti EMC high isolation transmission and VI conversion between industrial field passive two-wire voltage sensor and instrumentation/PLC/DCS.

ISOH V-4-20mA product is designed as a low cost, small size, standard SIP16 Pin flame-retardant IC package that includes a signal modulation and demodulation circuit, a signal coupled isolation converter circuit and a VI conversion circuit. The product has the characteristics of wide output voltage range (12-36VDC), high conversion precision and good linearity. It is very convenient to use. Customers only need to add a small number of peripheral devices at the input end of the product to realize the distribution of voltage signals in the sensor and bridge (weighing) detection circuit of the electronic scale, displacement, potentiometer, etc. The product is small size and easy to install. It can be placed inside the sensor to directly convert the displacement and angular displacement resistance signals into a standard 4-20mA signal output. The full scale and zero point can be adjusted and calibrated by the user through an external potentiometer. The advanced integrated process structure and new technology isolation measures enable the device to achieve high signal isolation of 10,000 VAC.

ISOH V-4-20mA series new products enable analog voltage signals from industrial field sensors and signals between instrumentation, PLC and DCS, high-precision, high linearity 10KV anti EMC high-isolation transmission and



VI conversion. Products include IC package and DIN35 Rail-mounted packaging. It is widely used in track voltage monitoring, generator or motor safe operation monitoring, power transmission and distribution remote monitoring, instrumentation and sensor signal transceiver, medical equipment safety barrier, industrial automation control. nuclear power equipment and other fields etc.

The Maximum product rating (long term operation in the maximum rated environment affects the service life of the product, and irreparable damage may occur beyond the maximum value.)

Continuous Isolation Voltage (The maximum continuous isolation voltage between	Input and output)
10000Vrms	
Vin (The maximum voltage value of Input signal)	36VDC
Junction Temperature (The Maximum working temperature range)	- 40 ~ +85 ℃
Storage Temperature (The Maximum storage temperature)	+150°C
Lead Temperature (the highest soldering temperature of Pin / duration <10S)	+300°C/<10S
Output Short to Common (4-20mAOutput short circuit time)	Sustainable

General parameters:

Accuracy, linearity error level 0.1, 0.2grade	Load regulation rate $ < 0.05\%$ meas.val./100 Ω
Auxiliary power supply No	Isolation signal input/output 10000VAC two isolation
Working temperature $-40 \sim +85 ^{\circ}\text{C}$	Packaging SIP 16 Pin (Single row 16 feet)
Working Humidity10 \sim 60% (No condensation)	Pressure resistance 10KV(50HZ/S), Leakage current <1mA
Storage temperature $-45 \sim +105$ °C	Withstand voltage 10KVAC, 1.2/50us(peak)
Storage Humidity10 ~ 95% (No condensation)	Temperature drift 0.0050%F.S./°C (-40° C \sim +85° C operating temperature range)



Product selection example

- eg 1: signal input: 0-5V; signal output: 4-20mA; 10KVAC isolatoin; small size SIP16 packaging Model No: ISOH V1-4-20mA
- eg 2: Signal input: 0-5KΩ; signal output :4-20mA; 10KVAC isolation ; small size SIP16 packaging Model No: **ISOH R7-4-20mA**

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Parameters	Test	MIN	ТҮР	MAX	Unit
	condition				
Isolation voltage	60S		10000		VAC
AC, 50Hz					
Insulation resistance	500VDC		100		MΩ
Leakage current	240Vrms, 50Hz		0.5		uA
Output current linear range		3.5		24	mA
Gain		0.005	0.3125	0.625	V/mA
Temperature drift	- 40- + 85℃		± 50	± 100	PPM/°C
coefficient					
Nonlinearity	0-5V	±0.1	±0.2	±0.4	%FSR
Input offset voltage			±1	±2	mV
Input voltage signal		0.075		10	V
Input resistance signal		50		10K	Ω
Frequency characteristics			100		Hz
Distribution voltage	Ireg=3mA	4.75	5	5.25	V
Loop supply voltage		12	24	36	V

Technical Parameters

Pin definition and function schematic





Pin function description (single row inline: SIP6 Pin)

+5V Power distribution output positive terminal	signal Input Ground end	signal Input Positive terminal	+2.5V benchmark Voltage Output	Zero point Adjustment foot	Empty foot	Current Output Positive terminal	Voltage Input Positive terminal
VD+	GND	Sin+	Vref	ZA	NC	Iout+	Vin+
1	2	3	4	5	6~14	15	16

Dimensions and PCB layout



Typical application example

Application 1: Sensor voltage signal acquisition isolation transmission typical application (two-wire power distribution loop output mode)



0-Vin input voltage calculation formula: 11=Vin/(R1+Adj)=160uA 12=2.5V/(R2+ZA)=40uA

0-5V input calculation formula:

R2, ZA does not need 1-5V input 11=5V/ (R1+Adj) =200uA

Typical application diagram of passive V/I conversion 10KV high isolation signal transmitter IC

Application 2: Bridge (weighing) detection circuit millivolt voltage signal isolation power distribution typical application (two-wire power distribution loop output mode)



Resistance and potentiometer value calculation formula:

R2+ZA=2.5V/0.04mA R1+Adj=Vin/0.16mA

Remarks:

When measuring a small millivolt signal, add an op amp circuit to the input for adjustment.

Application 3: Displacement potentiometer resistance signal input typical application (two-wire power distribution loop output mode)



Passive displacement resistance signal conversion 10KV high isolation transmitter IC typical application diagram



Application 4: Rail Transit High Voltage Signal Acquisition Isolation Transmitter Typical Application (Two-Wire Power Distribution Loop Output Mode)



0-Vin input voltage calculation formula:

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11=Vin/(R1+Adj)=160uA
12=2.5V/(R2+ZA)=40uA
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When measuring the high voltage signal, it can be input to the operational amplifier through the resistor divider to 0-3V, and the operational amplifier is connected to the voltage follower output as the module's Vin voltage input module (as shown in the figure).

Passive high voltage signal conversion 10KV high isolation transmitter IC typical application diagram

High-voltage isolation safety detection method



High-voltage isolation safety test method and precautions

1. According to the wiring shown in the above figure, set the rated high voltage value of the high voltage tester according to the product isolation voltage parameter specification. Please pay attention to personal safety when testing, beware of electric shock!

Test environment: room temperature TA = 25 ° C, air humidity < 75%

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

3. The instrument case of the high voltage tester must be grounded reliably and should not be detected in a high temperature, humid and dusty environment.

4. When connecting the measured object, the high voltage tester must ensure that the high voltage output value is "0" and the detection function key is "reset" to prevent contact with other objects.

- 5. When the instrument is in the high voltage test state and the high voltage discharge is over, it is strictly forbidden to contact the measured object, test line or high voltage output.
- 6. Product isolation voltage test method As shown in the above figure, short the input terminal and output terminal pin respectively, and load the rated voltage value 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 tester from 0 to the rated value and keep it for a minute.

8. The insulation voltage test itself is a destructive test of the insulator. For the same product, the high voltage test should be minimized. If there are multiple tests between different customers, the general requirements are as follows: the batch product is tested according to the rated voltage value of the specification for the first time, and the test voltage value should be reduced by 0.7 times of the rated value each time. The number of high-voltage tests, otherwise the product will be irreparable damage during multiple high-voltage tests.

DIN3 Series Two-wire Voltage Signal Isolation Transmitter

Standard DIN Rail 35 Package

(Potentiometer, Electric-bridge, etc) Two-wire Sensor Voltage Signal

Isolated Power Distribution and Conversion

Features:

- Isolated power distribution and conversion on voltage signal from two-wire sensors.
- Precision error grade: 0.1(non-isolation type), 0.2(isolation type)
- Linear processing and long-wire compensation circuits inside (Non-linearity <0.05%).
- Isolation between I/O: 3KVDC full isolation.
- Range of the power supply to sensor:12-32VDC
- Small input equivalent resistance, high linearity.
- Small size IC package and DIN rail 35 installation
- \bullet Industrial operating temp. Range: 25 $^\circ\!\mathrm{C}$ \sim + 70 $^\circ\!\mathrm{C}$

Applications:

- •PLC/DCS collects voltage signals directly from sensors.
- •Displacement, potentiometer signals isolated acquisition and control.
- Industrial site ground wire interference inhibition
- Convert weighing signal into standard 4-20mA analog signal
- Pressure sensor signal collection and power distribution.
- Analog signal long-distance transmission without distortion.
- Distribution of voltage signal from electric-bridge (weighing) detecting circuits.

Introduction

Sunyuan Extra-small high precision standard DIN Rail 35 isolated transmitter is a kind of two-wire voltage signal isolated power distribution module, which can realize the distribution and transmission on voltage signal from two-wire voltage signal input type sensors and electric-bridge (weighing) detecting circuits.

This isolated transmitter is designed to small size standard DIN35 package, inside the transmitter there are current signal modulation circuit, magneto-electric isolated conversion circuit and signal demodulation circuit. The power supply range is 12-32VDC, small input equivalent resistance, high linearity, the withstanding voltage and isolated voltage between signal input and output is up to 3000VDC. The transmitter IC is easy to use to achieve solated output of voltage signal from two-wire voltage signal input type sensors and electric-bridge (weighing) detecting circuits. In usage, user should refer to the typical application circuits.

SMD technique and high-tech isolated measures used in the transmitter IC makes it can operate well in industrial temperature conditions, humidity, vibration and other extreme conditions.

Max. Rated Value

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

Continuous Isolation Voltage (continuous max. voltage in the loop)	36VDC
Power supply Volt. Input Range:	±25%Vdd
Operating Temperature	- 45°C ~ + 85°C
Wielding Temperature (<10S)	+300°C

General parameters

Precision, linearity error grade 0.1,0.2	Backlash< 0.5%
Auxiliary power No	Isolation Signal I/O
Operating temp $-20 \sim +70^{\circ}$ C	Insulation resistance $\rightarrow 20M\Omega$
Operating humidity 10 ~ 90%	Withstanding volt 3KVDC(60HZ/S), leakage
(no condensation)	current 1mA.
Storage Temp $-20 \sim +70$ °C	Anti-impulse voltage 3KVDC, 1.2/50us (peak
	value)
Storage humidity $10 \sim 95\%$ (no condensation)	

Model selection:

$\underline{\text{DIN3}} \quad \underline{\text{ISO V-4-20mA}}$

Small size Magneto-electric isolation

din rail 35 two-wire voltage signal isolated acquisition

Product model selection example:

E.g.1: DIN35 terminal wiring type, voltage signal input, isolated acquisition signal output: 4-20mA. Product model No.: DIN3 ISO V-4-20mA

Technical parameters:

Parameters	Testing Conditions	Min.	Typical Value	Max.	Unit
Isolated volt. AC, 50Hz	10S	3000			VDC
Insulation resistance			$10^{12} \parallel 1$		$\Omega \parallel \operatorname{Pf}$
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		0.75	5	10	VDC
Output signal voltage range	RL:250Ω	13	24	36	VDC
Output linearity range			4	24	mA
Output current: Io		0.5		40	mA



Dimension & Typical Applications

Unit:mm



(Dimension)



(Application circuits)

DIN3 ISO V-4-20mA Terminal definition (without zero and gain adjustment)

1	2	3	4	5~6	7	8
Signal input ground GND1	Signal input positive VIN+	Differential input negative -	+5V power distribution output VD+	NC	Two-wire current output terminal Io	Power input positive V+

Typical applications:

1. Two-wire sensor (angel displacement, electric-scale) voltage signal isolated power distribution





2. Electric-bridge (weighing) detecting circuits voltage signal isolated power distribution



External View:

