

## Two-wire Passive I/V Converter

### 2-wire Passive 4-20mA to Voltage Signal Low Cost Converter

#### SY 4-20mA-O Series

Features	Applications
<ul style="list-style-type: none"> <li>• High efficient signal loop stealing technology, external power supply is not required.</li> <li>• 2-wire 4-20mA standard analog signal input, output 0-2.5V/0-3.3V/0-5V/1-5V, etc standard voltage signal.</li> <li>• Extra low input impedance, meet the requirements that when input is 20mA the voltage drop <math>\leq 6V</math>.</li> <li>• Accuracy grade: 0.1, 0.2, 0.5</li> <li>• High linearity in full measuring range, non-linearity error grade <math>&lt; 0.2\%</math></li> <li>• Industrial grade temperature range: <math>-25 \sim +70 \text{ }^{\circ}\text{C}</math></li> <li>• Small size standard SIP 7Pin, UL94V-0 flame-retardant package.</li> </ul>	<ul style="list-style-type: none"> <li>• Sensor 4-20mA signal acquisition and conversion.</li> <li>• Industrial site signal acquisition and long-distance transmission.</li> <li>• Analog signal conversion and data acquisition.</li> <li>• Sensors' or meters' Signal receiving and transmission.</li> <li>• PLC, DCS analog signal acquisition and conversion.</li> <li>• Power control, medical equipments monitoring.</li> <li>• 4-20mA current signal to voltage signal conversion: 1-IN1-OUT, 2-IN 2-OUT, 3-IN 3-OUT.</li> </ul>

#### Introduction

**Sunyuan SY 4-20mA-O** is a kind of low cost small size 2-wire passive 4-20mA to voltage conversion IC, it can convert active 4-20mA signal input into voltage signal output. In designing the converter, 2-wire input loop powered technique is adopted, and the external power supply is not required which simplifies customers' design plan and reduce customers' cost. Inside the conversion IC, current signal conversion circuit, power inverting circuit, subtraction circuit and buffered output circuit are integrated. Very low input equivalent impedance enables the IC to collect current signals from sensor signal output loop circuit and when the input is 30mA signal the voltage drop is  $\leq 6V$ . That 2-wire passive 4-20ma to voltage conversion IC achieves long-distance non-distorted transmission without external power supply.

**SY 4-20mA-O** Series are mainly applied in low cost 4-20mA current to voltage signal design, no external power supply which makes it easy in wire connection, and achieves low power consumption, low heat and high performance. The main features of that conversion IC are: 2-wire loop powered without external power supply, subtraction circuit and amplification buffered output circuit are integrated into the IC, high reliability and easy to use. The converter convert 4-20mA output signal from sensor, PLC, it means that the transmission of electric power, so there is power consumption internally. In that conditions, it requires that 4-20mA source signal should be able to drive  $300\Omega$  load, thus the converter IC can operate normally. In industrial site applications, most of meters and instruments, sensors, PLC, DCS, etc have the capacity to drive  $300\Omega$  load.

In industrial site, in some conditions only one piece of IV conversion sampling resistance is enough to convert current signal into voltage signal. That kind of circuit is easy but not much reliable. First, when the signal is in zero point, there is zero current in sampling resistance, for example, convert 4-0mA into max. 5VDC, in the zero point, it is 1V after conversion, that 1V voltage can be processed by microprocessor software if available. In that case, the available voltage left  $5-1=4VDC$ , it is not 5VDC. The max. input voltage of microprocessor (A/D) is it's power supply, usually 5VDC, so it is much more complicated in deal with such simple input conversion circuits, in order to get the A/D conversion bits, it will increase the IC costs accordingly. The simplest method in dealing with the problems above is that adding a subtraction and buffered processing circuit made by operational amplifier in the input terminal of microprocessor, that circuit is convenient to process zero signal and save the microprocessor resource to ensure that all the resource is used in signal conversion especially in A-D conversion

applications.

Sunyuan low cost small size I/V converter SY 4-20MA-O is designed to solved the problems above in industrial site. That 4-20mA to voltage conversion IC not only realize the conversion between current and voltage signal, it also operates in low heat and passive mode to meet the application requirements in A/D interface data acquisition and signal conversion.

It greatly reduce user's cost and the internal resource consumption in choosing microprocessor and provide simplest solutions to the developers.

### Max. Rated Value

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

Junction Temperature (Max. Range of ambient temperature)	- 45°C ~ + 85°C
Lead Temperature (Continuous time <10S)	+300°C
Output Voltage Load Min (Min. Load of voltage signal output)	5KΩ

### General Parameters

Linearity Accuracy error grade ----- 0.1, 0.2	hysteresis error of instrument ----- < 0.5%
Auxiliary power supply -----No	Isolation ----- No
Operating temperature----- -20 ~ +70°C	Insulation resistance -----NO
Operating humidity-----10~90% (non-condensation)	Withstand voltage ----- No
Storage temperature ----- -45~ +85°C	Withstand impulse voltage ----- No
Storage humidity ----- 10 ~ 95% (non-condensation)	

### Technical Parameters

Parameters	Conditions	Min.	Typ.	Max.	Unit
Temperature drift			±35	±50	PPm/°C
Non-linearity			±0.2	±0.5	%FSK
Load capacity	Vout=5VDC	5	10		KΩ
Input signal voltage range		9	24	36	VDC
Input impedance	Iin=20mA		300		Ω
Output signal voltage range	RL:5KΩ	0		5.2	VDC
Output linearity range		0		5.2	V
Output current I <sub>o</sub>		0.5		1.2	mA
Output signal ripple	No filtering		10	20	mVRMS
Frequency response time (Small signal bandwidth)	V <sub>o</sub> =5V		1	10	KHz
Response time			1	20	mS
Ambient temperature		-25	25	70	°C
Storage temperature		-55		105	°C

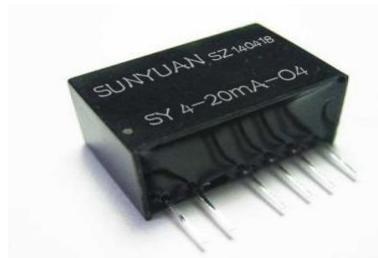
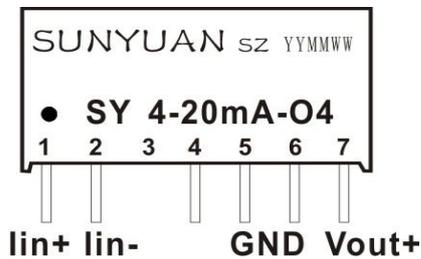
### Model Selection

**SY**      **4-20mA** - **O**  
 IN/OUT    Input signal    Output voltage signal  
 Non-isolation      O2.5: 0-2.5V    O4:0-5V  
                          O3.3: 0-3.3V    O6: 1-5V  
                          O8:Customized

### Model Selection Examples

- E.g.1: Input signal 4-20 mA, output signal 0-5V; Model No.: SY 4-20mA-O4
- E.g.2: Input signal 4-20 mA, output signal 1-5V; Model No.: SY 4-20mA-O6
- E.g.3: Input signal 4-20 mA, output signal 0-2.5V; Model No.: SY 4-20mA-O2.5
- E.g.4: Input signal 4-20 mA, output signal 0-3.3V; Model No.: SY 4-20mA-O3.3

### SY 4-20mA-O Pin Definition



### PIN functions description (SIP 7Pin)

Signal input +	Signal input -	No connection	Signal output GND	Signal output GND	Signal output GND	Signal output +
lin+	lin-	NC	GND	GND	GND	Vout+
1	2	3	4	5	6	7

Note: Please do not connect input pin #2 lin- to output pin #4/#5/#6 GND.

### IC Package Dimension & Typical Applications

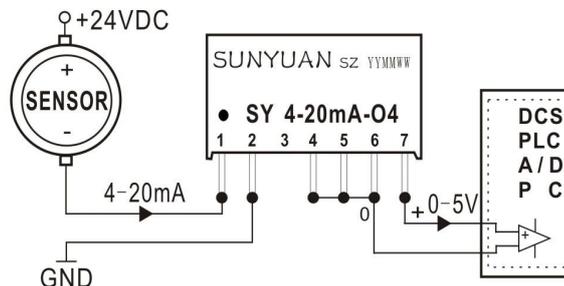
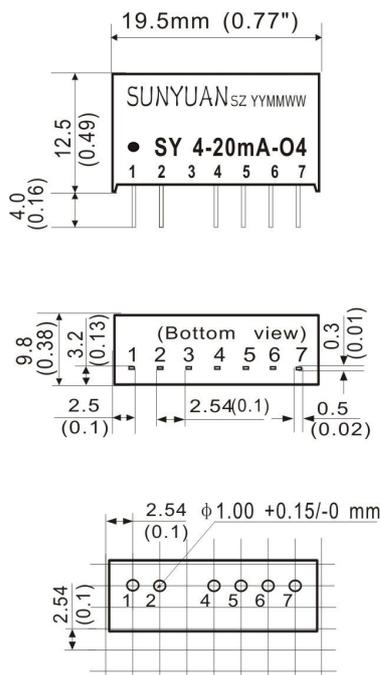


图1 电流输入/电压输出 (I/V转换)

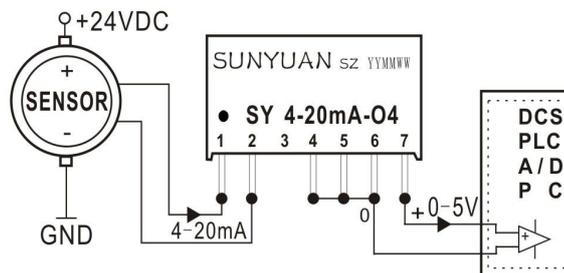
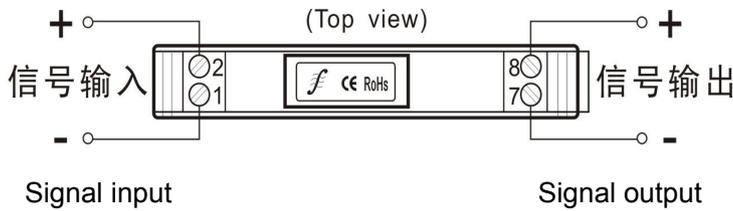


图2 电流输入/电压输出 (I/V转换)

IC封装SIP7PinPCB布板参考

### DIN3 SY 4-20mA-O Series Single Channel Low Cost Small Size Standard DIN35 Rail-mounted Product Terminal Description

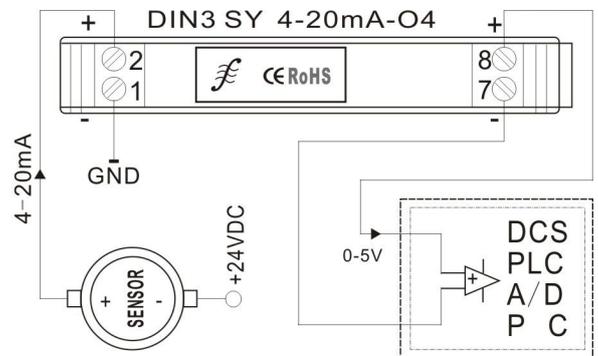
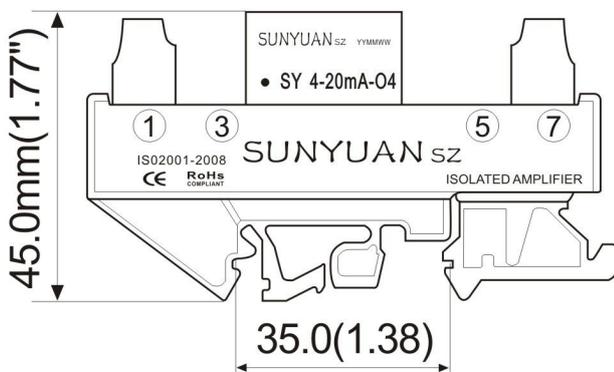
DIN3 SY 4-20mA-O is a kind of 4-20ma current loop to voltage converters with super slim (12.5mm in thickness) 35mm rail-mounted base. SY 4-20mA-O series IC is integrated into the PCB, and wiring terminals are used as auxiliary power supply and signal input/output connections. The converter is easy to use and zero gain adjustments are not required. Due to size limitations, DIN3 series small size rail-mounted products only have 1-in-1-out conversion function.



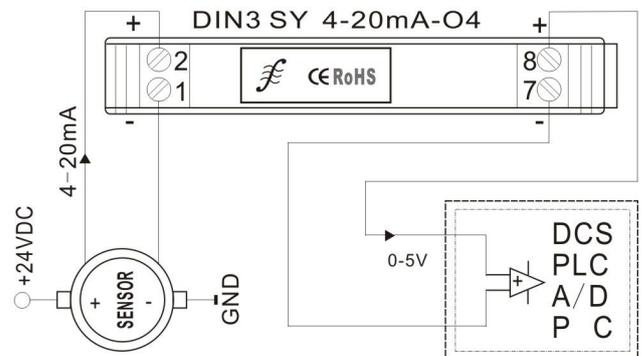
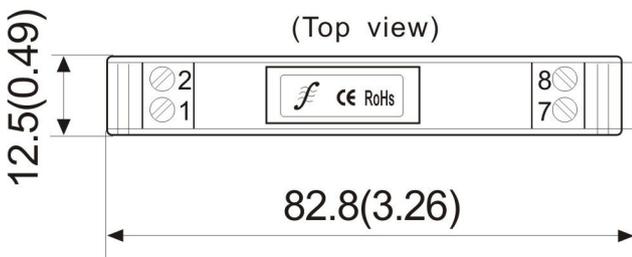
### DIN3 SY 4-20mA-O Series standard 35mm rail-mounted I/V converter pin definition

Signal input	Signal input	No connection	No connection	No connection	No connection	Signal output -	Signal output +
lin-	lin+	NC	NC	NC	NC	Vout-	Vout+
1	2	3	4	5	6	7	8

### DIN3 SY 4-20mA-O Series External Dimension & Typical applications



4-20mA 转 0-5V 典型应用接线图1

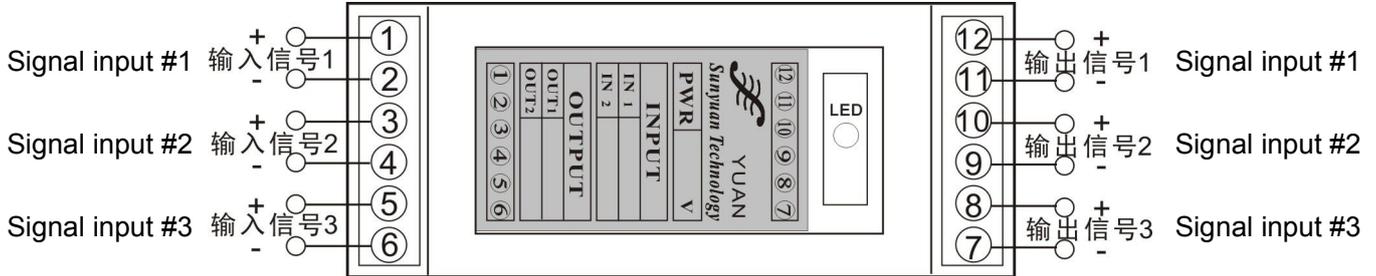


4-20mA 转 0-5V 典型应用接线图2

DIN3 系列小体积单路无源 I/V 转换器外形尺寸

## Multi-channel Standard 35mm DIN Rail-mounted DIN 1X1/1X2/2X2 SY 4-20mA-O Series Dimension & Wring Diagram

Sunyuan I Type standard DIN35 Rail-mounted multi-channel dual-isolation IV converter has several sets of SY 4-20mA-O 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 2-wire 4-20ma current to voltage 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 / 2X2 / 3X3 (无源型) 多路I/V转换器

### DIN 1X1/2X2/3X3 Passive Type Multi-channel IV Converter

### DIN 1X1 / DIN 2X2 / DIN 3X3 SY 4-20mA-O Series Dimension & Terminal Definition

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

