Two-wire 4-20mA Current Loop Isolation Digital Meter

4-20mA Analog Signal Isolated Control Display Meter
DIN1X1 ISO 4-20MA (LED)

Features	Applications
• Directly display input current loop value, convenient to debug and monitor.	• Industrial site 4-20mA signal isolation monitoring and long distance transmission.
• 3 $^1/_2$ bit LED digital display, high precision, display resolution last bit plus or minus 2 bytes.	• Anti-interference & isolation among signal input channels of PLC, DCS, etc.
• Programmable setting on the 2-channel upper and lower isolated switch alarm signal output.	• Ground loop interference and suppression in controlling panel.
• 4-20mA isolated detection with high precision grade (0.1, 0.2).	• Stable transmission between instrument signal and sensor.
• High linearity in full measuring range, nonlinearity < 0.2%.	• Analog signal data acquisition and long-distance transmission without distortion.
• 3KVDC or 6KVDC high isolation between signal input and output.	• Electric meters and instruments, safety bar used in medical equipments.
• Low impedance (the overall pressure drop <6.5V) without external components and power supply.	• Rail transit DC high voltage sampling & monitoring isolation gate.
• 4-20mA signal extra-wide range voltage (12~36VDC) input	• Industrial equipment operating measurement, monitoring and remote control
• Frequency response (small signal bandwidth): 100HZ (Io=20mA)	• Monitoring system used in oil, chemical, environmental protection.
• Low cost, small size , standard DIN35 rail mounting.	• Temperature, pressure, flow, liquid level signal display and control.
• Industrial operating temperature range: - 25 ℃ ~ + 70 ℃	• Display and control of the sensor, transmitter operating states.

Introduction

Sunyuan DIN 1X1 ISO 4-20mA (LED) Current Loop Signal Intelligent LED Digital Meter adopts low power consumption current loop circuits and electricity stealing technology, which has the following functions: display, alarm, isolated transmission. The product consists of current signal modulation and demodulation circuits, signal coupling isolated conversion circuits, display and alarm controlling circuits. The small input equivalent resistance used achieves the ultra wide voltage input range (12 ~ 36VDC) which meets the users' various requirements in signal isolation, display, alarm, long-distance transmission without distortion in passive mode. Internal integration and new isolation technologies enable the device to reach 3KDC insulation voltage and meet industrial grade temperature, humidity, shake harsh environmental requirements. DIN1X1 ISO 4-20mA (LED) series are easy to use, standard DIN35 rail mounting design, convenient for users to install and use. The products can achieve 4-20mA current loop signal isolation, display and control functions without external power supply and other components.

DIN 1X1 ISO 4-20mA (LED) has a variety of functions which are different from that of the traditional products by adopting intelligent design. It is a kind of passive products which can transmit and isolate the 4-20mA signal in the current loop, and display it correspondingly in decimal figures based on the set range. Two-wire passive operating mode, without external power supply, so it is easy to do wiring and has small size, high precision, low cost. Traditional digital meter adopts potentiometer adjustment technology, it is not flexible in adjustment and easy to be influenced by temperature. That intelligent digital meter has two adjusting buttons, which controlled by the central processor CPU, can be used to set zero, span, a decimal point, alarm, time delay and other parameters, so it has strong flexibility in application. The digital panel meter adopts LED display panel, constant current drive, it has good performance in display and has anti-reverse, over-current protection function. The digital meter is widely used in industry control, petroleum chemical industry, environmental protection, intelligent home furnishing, mining and other controlling devices on temperature, pressure, flow, liquid level, etc.

DIN 1X1 ISO 4-20mA (LED) is mainly used for signal isolation and display on 4-20mA current loop signal from sensors, PLC, DCS. The embedded digital meter is used to measure 4-20mA signal by taking power directly from 4-20mA current loop without external power supply. The figure displayed is not the current value measured, but the 4mA, 20mA pre-configured value which display in linearity accordingly. For example: 4mA is set to 0, 20mA is set to 8000, when the input is 8mA, the meter displays 2000, input is 12mA, the meter displays 4000; and if 4mA is set to 1000, 20mA is set to -1000, when the input 12mA , it displays 0, input 16mA, the meter displays -500. The maximum display range is 9999, that is 3½ bit; the minimum is -1999. The digital meter also has alarm signal output function and two-channel switch signal output which can display, control signals and alarm simultaneously. The digital meter has two alarm points, and there are positive and negative alarm setting. Alarm point is for the figure displayed in the meter, when there is alarm, the last decimal point in LED panel meter will flash, and alarm information is transferred into alarm signal through digital optical coupling isolation. For the digital meters with alarm function, the alarm upper limit and lower limit, alarming methods can be set through programmer, please refer to *Calibration Instructions* for meters below.
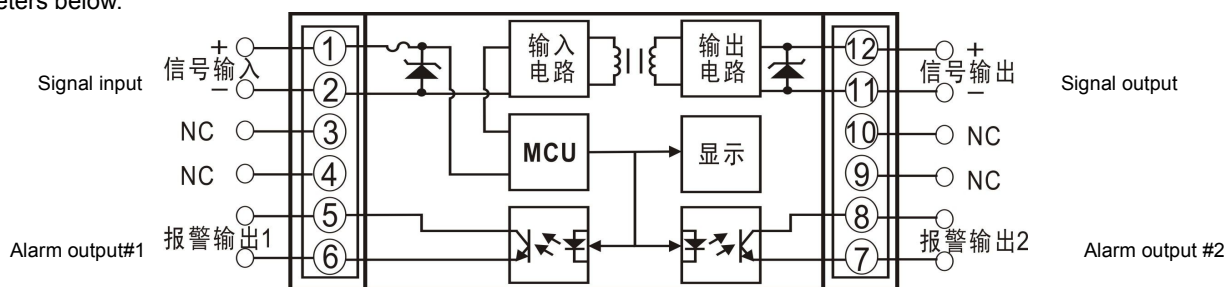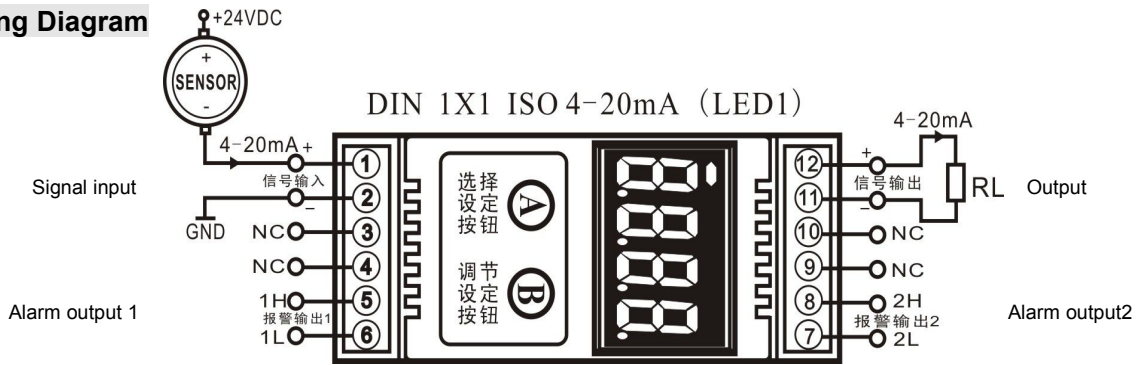

Functional Block

General Parameters

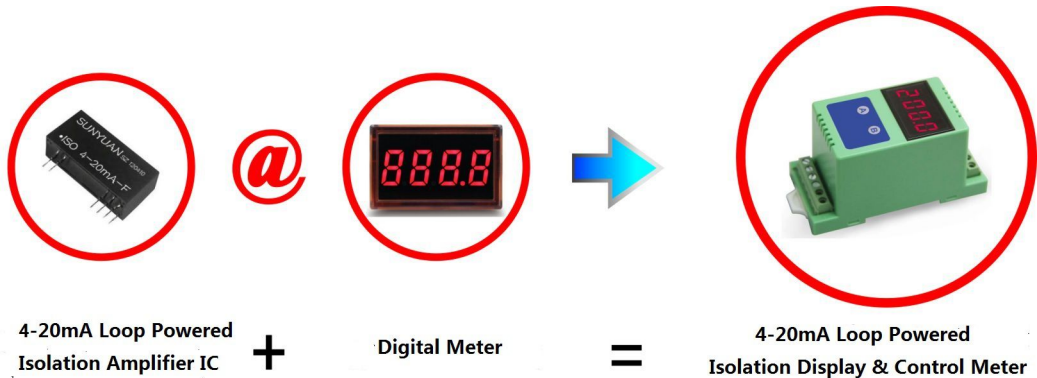|	
Precision, linearity error grade---------- 0.1, 0.2	Backlash ---------- < 0.5%
Auxiliary power---------- No	Isolation ---------- Signal input and output
Operating temp.---------- -25 ~ +70℃	Insulation resistance ---------- ≥20MΩ
Operating humidity--------10 ~ 90% (no condensation)	Withstanding volt ---------- 3KV (60HZ / S), Leakage current 1mA
Storage Temp.---------- -20 ~ +70℃	Anti-impulse voltage---------- 3KV,1.2/50us (peak value)
Storage humidity---------- 10 ~ 95% (no condensation)	

Technical Parameters

Parameters	Testing Conditions	Min.	Typical Value	Max.	Unit
Isolation Volt. DC, 50Hz	10S	3000			VDC
Insulation Resistance			10^{12}‖1		Ω‖Pf
Leakage Current	240Vrms，60Hz		0.5		uA
Temp.drift			±50	±100	PPm/℃
Non-linearity			±0.2	±0.5	%FSK
Input Signal Voltage Range		12		36	V
Input Impedance	20mA		330R+RL		Ω
Input Overload Capacity			22	24	mA
Output Overload Capacity			300	500	Ω
Output Linearity Range		0.05	4	20	mA
Output Current Io			20	40	mA
Output Voltage Drop Voh	Io=20mA			6.5	V
Output Ripple				5	mV
Response Time			20	50	mS
Frequency Response (small signal bandwidth)	Io=20mA		100		Hz

Typical Wiring Diagram

DIN 1X1 ISO 4-20mA（LED1）

+24VDC

SENSOR

4-20mA +

Signal input

信号输入

GND NC

Alarm output 1 报警输出1 1H 1L

选择设定按钮 A

调节设定按钮 B

1 信号输入 +
2 −
3 NC
4 NC
5 1H
6 1L

12 信号输出 +
11 −
10 NC
9 NC
8 2H
7 2L 报警输出2

4-20mA

RL Output

Alarm output2

Product Show

4-20mA Loop Powered Isolation Amplifier IC + **Digital Meter** = **4-20mA Loop Powered Isolation Display & Control Meter**

Dimension & Terminal Definition
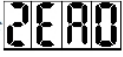
Pin	Terminal Functions	
1	Signal IN	Signal input +
2	Signal GND	Signal input -
3	NC	NO Connection
4	NC	NO Connection
5	Alarm1	Alarm output #1(high level)
6	Alarm1	Alarm output #1(low level)
7	Alarm2	Alarm output #2(low level)
8	Alarm2	Alarm output #2(high level)
9	NC	NO Connection
10	NC	NO Connection
11	IOut-	Signal output -
12	IOut+	Signal output +

61.0mm(2.40")

63.0(2.48)

DIN * ___-P__-O___

1 IN 1(+)   NC 12
2 IN 1(-)   NC 11
3 IN 2(+)   OUT1(+) 10
4 IN 2(-)   OUT1(-) 9
5 PWR(+) V   OUT2(+) 8
6 GND   OUT2(-) 7

IN:_____ OUT:_____

35.0(1.38)

83.8(3.3)

(Bottom view)

40.0(1.57)
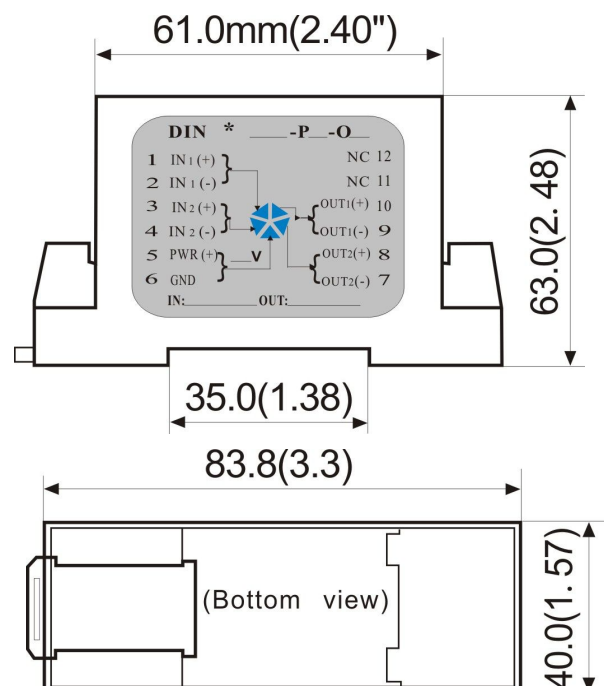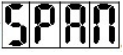
LED Display Meter Calibration Instructions

Input signal to the meter, the meter is in power-on self-test state and displays the mark **ANO.**, then turn into the measuring display state.
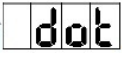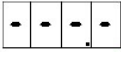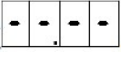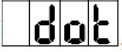
① **Zero setting** (when it is 4-20mA current loop input)

Press button **A+B**, it shows the zero setting interface **ZERO**, then press **A+B** again, turn into zero setting, the interface shows the current setting value **0.000**, at this time the last digit is flickering, press button **A,** four digital tube are flickering alternately, flickering digit is the bit to be adjusted, press button **B,** the digit of flashing bit changes from 0 to 9 in turn. The first digit of left side changes from the "**–**; **-1**; **0** to **9** in turn)," users set them according to the values displayed (Note: 4mA display value range of 4mA is: -1999 ~ 9999, the default value is "0.0"). Complete the setup, press button **A+B** to confirm and return the interface **ZERO**.
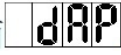
② **Full scale/Span setting** (when it is 4-20mA current loop input)

Continue to press button **A** to go to span setting interface **SPAN**, then press button **A + B**, turn into span settings, the interface shows the current setting value **2.000**. (Note: For 20mA, the display range is from -1999 to 9999, the default value "200.0"). The rest of the operation is the same as that in ①. Complete the setup, press button **A+B** to confirm and return the interface **SPAN**.
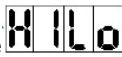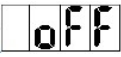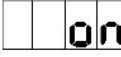
③ **Decimal point setting**

Continue to press button **A** to go to the decimal point setting interface **dot**, then press button **A + B**, turn into current value setting interface **- - - -**, press button **B**, the decimal point is shifted one bit to the left **- - - -**. Press button **B** in continuous, the decimal point shifts to the left in turn. Complete the setup, press button **A+B** to confirm and return the interface **dot**.

④ **Damping time setting**

Continue to press button **A** to go to damping time setting interface **dAP**, then press button **A + B**, go to the current value setting interface **00.0**, the damping time range can be set from 0 seconds to 20 seconds, press button **A**, the time value is down ↓, press button **B**, the time value is up ↑, the setting value changes based on 0.5s multiplied. Complete the setup, press button **A+B** to confirm and return the interface **dAP**.

⑤ **Alarm switch setting**

Continue to press button **A** to go to the alarm switch settings interface **HILo**, then press button **A + B**, go to the alarm switch setting, the meter displays the current setting value **oFF**, indicating the following alarm settings do not come into effect. Press button **A** or **B** to switched it into **on**, indicating the following alarm parameters come into effect. All the alarming indicates through the last flashing point. Complete the setting, press button **A + B** to confirm and

return to the menu. The factory default setting is [oFF].

⑥ **The first alarm point setting**

Continue to press button **A** to go to the first alarm setting interface [StPL], then press button **A + B**, go to the first

alarm current value setting [00], the first digit in the left is flickering, press button **A,** two digital tubes are flickering alternately, flickering bit is the bit to be adjusted. Press button **B**, the flickering digits change from 0 to 9 in turn, set the limit or boundary point based on the value displayed. (Note: The alarm setting value represents the percentage of the current

signal input, such as the setting is [50], means that alarm limit point is (20mA-4mA) * 50% +4 mA = **12mA,** when the input current is greater or less than 12mA (it's up to alarm direction setting), the micro-controller outputs alarm signal to drive the optical-coupler, then it gives an alarm through external alarm equipments connected to the meters (the alarm function is designed according to users' requirements). Complete the setting, press button **A + B** to confirm and return to the main menu.
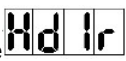
⑦ **The second alarm point setting**

Continue to press button **A** to go to the second alarm point setting interface [StPH], the setting method is the same as that in ⑥. Complete the setup, press **A+B** button to confirm and return to main menu.

⑧ **The first alarm point direction setting**

Continue to press button **A** to go to the first alarm point direction setting interface [Ld Ir], then press button **A + B**,

go to the current value setting interface [UP], indicating it gives an alarm when the value varies from low to high, e.g., set the limit point to 12mA, it give an alarm when the input current is increased from 4mA to the value which is higher than 12mA, no alarm when the current is decreased from 20mA to the value which is lower than 12mA. Press button **B**, shift

to [dn], indicating it gives an alarm when the value varies from high to low, e.g., set the limit point to 12mA, no alarm when the current is increased from 4mA to the value which is higher than 12mA, it gives an alarm when the input current is decreased from 20mA to the value which is lower than 12mA. When the input current is restored to the previous current value (before the state of alarm), the state of alarm is canceled. Complete the setup, press **A + B** button to confirm and return to the main menu. (Note: In the state of alarm, the last decimal point in the LED display panel is flashing which indicates the current state is in alarm conditions.)

⑨ **The second alarm point direction setting**

Continue to press button **A** to go to the second alarm point direction setting interface [Hd Ir], the setting method is the same as that in ⑧. Complete the setup, press **A+B** button to confirm and return to menu.

⑩ **Alarm delay time setting**

Continue to press button **A** to go to alarm delay time setting interface [dELA], press button **A+B** to go to current value

setting interface [00]; the alarm delay time can be set to the value from 0 seconds to 30 seconds, press button **A**, the time value is up ↑, press button **B**, the time value is down ↓, the setting value changes based on 1.0s multiplied.

Complete the setup, press button **A+B** to confirm and return the interface. (Note: 0 means no delay, it will not give the alarm immediately when it meets the alarm condition, but go to the alarm state after the value displayed meets the alarm condition for several seconds, when the value restored to that in normal sate(no alarm), state of alarm is released without delay.)

Continue to press button **A** to return to the measuring display interface, the end of all settings.

5 . 4mA and 20mA Calibration (that settings should be done cautiously)

Input 4mA signal to the meter, press and hold the **A** button until the digital meter displays 【4.00】. Stop to press button for 3Seconds, then press button **A** again, the meter shows 【0⊢4】, now the 4mA current input signal sampling has been saved as the standard. Change the nput signal into 20mA, press button **A**, the meter displays 【20.00】, press button **A** after 3Seconds, the meter displays 【0⊢20】. 20mA current input signal sampling has been saved as the standard. Press button **A** again, return to the state of measurement.

Model selection examples

When the signals measured is beyond the limits of AD bit of the IC measuring range, or the display value is greater than 9999 or less than -1999 without decimal points, do the over-range display.

Beyond the measuring limit AD bit of the IC (4-20mA calibration)

4mA : display **0**, 20mA: display **2000**, input 3.01mA, display **oLL**, input 26.01mA, display **oHH**.

4mA : display **2000**, 20mA: display **0**, input 3.01mA, display **oLL**, input 26.01mA, display **oHH**.

The digit displayed is greater than 9999, less than -1999 without decimal point:

4mA: display **0**, 20mA: display **9999**, 20.01mA : display **oHH**, because the input has no decimal point, it can be shifted.

4mA: display **-1999**, 20mA: display **5000**, 3.99mA: display **oLL**, because the input has no decimal point, it can be shifted.

Input current	Output display	Linearity relations
4-20mA	**0.0～800.0**	input 4mA, the correspondingly display:0.0
		input 8mA, the correspondingly display:200.0
		input 12mA, the correspondingly display:400.0
		input 16mA, the correspondingly display:600.0
		input 20mA, the correspondingly display:800.0
4-20mA	**800.0～0.0**	input 4mA, the correspondingly display: 800.0
		input 8mA, the correspondingly display: 600.0
		input 12mA, the correspondingly display: 400.0
		input 16mA, the correspondingly display:200.0
		input 20mA, the correspondingly display:0.0
4-20mA	**-100.0～100.0**	input 4mA, the correspondingly display: -100.0
		input 8mA, the correspondingly display: -50.0
		input 12mA, the correspondingly display: 0.0
		input 16mA, the correspondingly display: 50.0
		input 20mA, the correspondingly display:100.0

4-20mA	**100.0～-100.0**	input 4mA, the correspondingly display: 100.0
		input 8mA, the correspondingly display: 50.0
		input 12mA, the correspondingly display: 0.0
		input 16mA, the correspondingly display: -50.0
		input 20mA, the correspondingly display:-100.0

Alarm Output and Applications

1. In main CPU chip, there is DC current level signal output which generates from two-channel alarm signal, the low level output indicates the alarm state, high level output indicates non-alarm state.

2. The display digital meter operates in 2-wire passive mode, the min. operating current is 3mA, so the alarm signal is also very weak, the min. current is 0.5mA. The meter isolates the signal through photosenstive triode type optical-coupler, and adopts open-collectoer (OC) output. The output is connected to pull-in voltage, the current can be amplified to 120mA. The functional block of photosensitive triode type optical-coupler below: in the diagram, the signal from meter is isolated by optical-coupler.⑤,⑥ "1H /1L", ⑦、⑧"2L/2H" wiring terminals are the output terminals of open-collector of optical-coupler, the terminals are to be connected to external power supply circuits of the meter to do further amplification and strengthen on alarm signal, and to drive the required components like sound, light, power, cool, heat, motor, etc. ⑤,⑥"1H /1L": the first alarm output,⑦,⑧"2L /2H": the second alarm output, "1H", "2H": connect to photsensitive triode collector, "1L", "2L": connect to emitter.
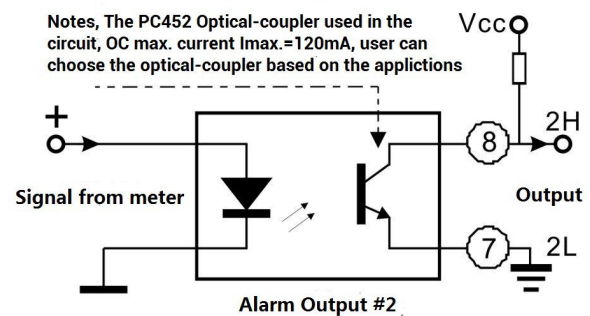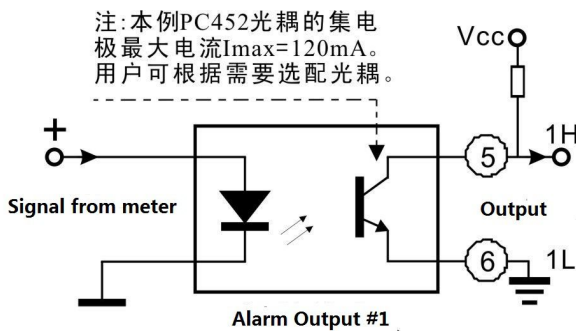
3. Due to the max. current limit of photosensitive triode IC, the capability of the meter in current amplification and drive load is limited. If the greater drive current is required to propel inverters, magnetic valves, stepper motor or other devices, user can add power expansion circuit (power amplifier tube or servo circuit) to amplify current or order it from us specially.

Ordering Notes

Please read the data sheet carefully before placing orders to ensure that products to be ordered can meet the requirements in real applications and there is no mistakes in model selection.

1. The default values: 4mA :display"0.0",   20 mA: display "200.0"

2. Any special requirements on display specifications, please notify us. The meter will be calibrated according to user's requirements before ex-factory.

3. User should notify us the signal input type and the value of parameters below: AC, DC, reisitance (displacement or potentiometer), electric-bridge (pressure or weighing).

Note: The specification is subject to change without notice.