

## AI-601

# High Performance Current/Voltage/Power Meter

## Operation Instruction

Version V1.10



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**WARNINGS** Before installing or handling the instrument please carefully read and follow the guidance's in the Instruction Manual. Any other use and modification to the instrument not expressly authorized by Yudian shall be considered improper. Liability for injuries or damage caused by improper use lies exclusively with the user. Yudian reserves the right to modify its products without prior notice.



### **MAIN FEATURES:**

- Equipped with alternative voltage and alternative current signal inputs isolated by transformer. It provides the functions of communication, retransmission and alarm. The main board is isolated with heavy current.
- Measurement accuracy is 0.2%FS.
- Provide dual display instrument.
- Up to four channels of alarm, including two high limit alarms and two low limit alarms, Introduce digital calibration technology, easy to operate and maintenance free, automatically adapted to 50Hz/60Hz power measurement.
- Support RS485 and RS232C communication interface and AIBUS communication protocol, which is 3 to 5 times faster than other field protocols.
- Provide signal retransmission functions with transmission accuracy of 0.2%F.S. able to output standard industrial signal.
- Universal power supply of 100-240VAC or 24VDC and various installation dimensions for users to choose from.
- High quality and latest hardware design using high performance electronic components energy efficient less temperature drifting provides higher stability and reliability.
- ISO9001 and CE certified, achieving world class level of quality, anti-interference ability and safety.

## ORDERING CODE:

The ordering code of AI-601 is made up of 8 parts, for example:

<u>AI-601</u>	<u>A</u>	<u>N</u>	<u>X3</u>	<u>L5</u>	<u>N</u>	<u>S4</u>	—	<u>24VDC</u>
①	②	③	④	⑤	⑥	⑦		⑧

This means an instrument with ① model AI-601, ② dimension A (96x96mm), ③ no module in MIO (multiple input/output) slot, ④ X3 linear current output module installed in OUP (main output) slot, ⑤ L5 dual relay output module in ALM (alarm) slot, ⑥ no module in AUX (auxiliary output), ⑦ RS485 communication interface module S4 in COMM (communication) slot, and ⑧ 24VDC power supply.

The meanings of the 8 parts of ordering code are as below:

① Shows the model of instrument

AI-601	AC current, AC voltage and power Indicating/Alarming Instrument. Input (0~5A, 0~500VAC)
AI-6010	AC voltage indicating/alarming instrument. Input (0~500VAC)
AI-6011	AC current, indicating/alarming instrument. Input (0~5A)

② Shows the front panel dimension:

**A/A2** Front panel 96×96mm (width×height), cut out 92×92mm, depth behind mounting surface 100mm.  
A2 has an additional light bar with 25 segments and 4 levels of luminosity which is able to indicate process value

**B** Front panel 160×80mm (width×height), cut out 152×76mm, depth behind mounting surface 100mm.

**C/C3** Front panel 80×160mm (width×height), cut out 76×152mm, depth behind mounting surface 100mm.  
C3 has an additional light bar with 50 segments and 2 levels of luminosity which is able to indicate process value

**E** Front panel 48×96mm (width × height), cut out 45×92mm, depth behind mounting surface 100mm

**E5** No display DIN rail mounting housing, 48×96mm (width × height), depth 100mm

**F** Front panel 96×48mm (width × height), cut out 92×45mm, depth behind mounting surface 100mm

③ Shows the module types of multiple input/output (MIO). Selectable modules are as follows:

**V10 / V24** Isolated 10 / 24VDC voltage output, can supply power for external transmitter or transducer

④ Shows the module types of main output (OUP):

Installing X3 current output module can retransmit process value (PV).

⑤ Shows the module type of alarm output (ALM):

Can output alarms by installing L1, L2, or L4 relay output module or L5 dual relay output module.

⑥ Shows the module type of auxiliary output (AUX):

Can output alarms by installing L1, L2, L4 or L5 relay output module.

⑦ Shows the module type of communication (COMM):

Installing S or S4 module can communicate with RS485 interface.

⑧ Shows type of power supply:

Null indicates 100~240VAC power supply, and "24VDC" indicates 20~32VDC/AC power.

**Note 1:** The instrument implements the technology of automatic zero and digital calibration, and



maintenance free. If the error exceeds certain range, generally, cleaning and drying the inside of the instrument can fix the problem. If not, please contact the nearest Yudian office or agent for further examination.

**Note 2:** The instrument is designed to measure power sine wave. Sine wave can be correctly measured even the signal is 115% of full scale. However, for non sine wave, if the signal of peak wave is greater than  $115\% \times \text{full scale} / 0.707$ , part of the signal may be ignored because the amplifier is over its range. Therefore, even though the effective value is less than the full scale, some measure error may occur.

**Note 3:** Instrument warranty is 36 months from delivery date. Contact the nearest Yudian office for more information

**Note 4:** Current module X3 and RS485 communication module S share the same power supply in the instrument and are not electric isolated to each other. Therefore, if X3 current module is installed in OOTP slot and RS485 communication is need at the same time, then RS485 communication module should be S4 which itself has isolated power supply.

## TECHNICAL SPECIFICATION:

- **Input type:**
  - AC Current: 0-5A (other specification can be ordered), the displayed scale can be freely defined;
  - AC Voltage: 0-500VAC (0~250VAC other specification can be ordered)
  - Power: Displayed power range can be freely defined according to real AC voltage and current.
- **Measurement accuracy:**  
0.2%FS±1
- **Temperature shift:**  
≤0.01%FS/°C (typical value is 50ppm/°C)
- **Electromagnetic compatibility (EMC) :**  
IEC61000-4-4, ± 4KV/5KHz; IEC61000-4-5, 4KV
- **Retransmission:**  
When X3 current module is installed in OUPF slot, process value (PV) can be retransmitted to standard current with maximum load resistor 500 ohm.
- **Alarm function:**  
High limit, low limit, second high limit and second low limit
- **Isolation withstanding voltage:**  
Between power, relay contact or signal terminals ≥2300VDC; between isolated electroweak signal terminals ≥600VDC
- **Power supply:**  
100~240VAC, -15%, +10% / 50-60Hz; 24VDC / AC, -15%, +10%
- **Power consumption:**  
≤5W
- **Operating Ambient :**  
Temperature -10~+60°C; humidity ≤90%RH














## FRONT PANEL AND OPERATION:

- ① Upper display window, displays PV, or code of a parameter
- ② Lower display window, displays alarming code or parameter value
- ③ Setup key, for accessing parameter tables, and confirming change.
- ④ Data shift key



- ⑤ Data decrease key
- ⑥ Data increase key
- ⑦ Indicator lamps: OP1 and OP2 indicate the status of current retransmission. AL1, AL2, AU1 and AU2 indicate the I/O actions of the corresponding modules.,


**Basal display status:** When power on, the upper display window of the instrument shows the process value (PV). This status is called basal display status. When the input signal is out of the measurable range (for example, the input specification sets wrong), the upper display window will alternately display “orAL”

**Parameter Setting:** In basal display status, press  and hold for about 2 seconds, can access Field Parameter Table. If the parameter lock “Loc” isn't locked (Loc=0), we can modify the value of parameters by   or . Press  key to decrease the value,  key to increase the value, and  key to move to the digit expected to modify. Keep pressing  or , the speed of increasing or decreasing value get quick. Pressing  can go to the next parameter. Press  and hold can return to the preceding parameter. Press  (don't release) and then press  simultaneously can escape from the parameter table. The instrument will escape automatically from the parameter table if no key is pressed within 30 seconds. Setting Loc=808 and then press can access System Parameter Table.

## PARAMETER AND SETTING

● Field parameter table (Press  and hold for 2 seconds to access)

Code	Name	Description	Setting Range
HIAL	High limit alarm	Alarm on when PV (Process Value) >HIAL; Alarm off when PV<HIAL-AHYS	-9990~ 30000
LoAL	Low limit alarm	Alarm on when PV<LoAL; alarm off when PV>LoAL+AHYS	
HdAL	Second high limit alarm	Alarm on when PV>HdAL; alarm off when PV<HdAL-AHYS	
LdAL	Second low limit alarm	Alarm on when PV<LdAL; alarm off when PV>LdAL+AHYS	
Loc	Parameter lock	0~3: allowed to modify field parameters; 4~255: can only modify "Loc"; setting Loc=808 and then pressing can access system parameter table.	0~255

● System parameter table (set Loc=808 and then press  to access)

AHYS	Alarm hysteresis	Avoid frequent alarm on-off action because of the fluctuation of PV.	0~200																														
AOP	Alarm output assignment	<table border="1" style="margin-bottom: 10px;"> <thead> <tr> <th>Alarm Output to</th> <th>LdAL (x 1000)</th> <th>HdAL (x100)</th> <th>LoAL (x10)</th> <th>HIAL (x1)</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>AL1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>AL2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>AU1</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> </tr> <tr> <td>AU2</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> </tr> </tbody> </table> <p><b>Example:</b>  <b>AOP = <u>  3  </u> <u>  3  </u> <u>  0  </u> <u>  1  </u></b>  <b>          LdAL    HdAL    LoAL    HIAL</b></p> <p>It shows that HdAL and LdAL are sent to AU1, LoAL has no output, HIAL is sent to AL1.</p> <p>Note : Installing L5 dual relay output module in ALM or AUX can implement AL2 or AU2 alarm.</p>	Alarm Output to	LdAL (x 1000)	HdAL (x100)	LoAL (x10)	HIAL (x1)	None	0	0	0	0	AL1	1	1	1	1	AL2	2	2	2	2	AU1	3	3	3	3	AU2	4	4	4	4	0~4444
Alarm Output to	LdAL (x 1000)	HdAL (x100)	LoAL (x10)	HIAL (x1)																													
None	0	0	0	0																													
AL1	1	1	1	1																													
AL2	2	2	2	2																													
AU1	3	3	3	3																													
AU2	4	4	4	4																													

<b>Ctl</b>	Measurement period	Suggest set to Ctl=1, set value to small, the measurement respond will faster, but measurement fluctuation also larger	0.2~2 Sec
<b>INP</b>	Measurement unit	INP=0, for VAC voltage measurement. INP=1, for VAC current measurement INP=2, for VAC power measurement (active power). INP=3, upper display will display measured VAC power, lower display will display measured VAC current. INP=4, upper display will display measured VAC power, lower display will display measured VAC voltage INP=5, upper display will display measured VAC power, lower display will display measured VAC voltage and VAC current alternately	
<b>dPt</b>	Resolution	Four formats (0, 0.0, 0.00, 0.000) are selectable, used for define the unit of measurement. When voltage measurement (INP=0), dPt should = 0.0, When measure object was related current or power (INP= 1,2,3,4 and 5), decimal point should set to consistent with other. When the value of PV or any parameter is probably greater than 9999, format 0.000 is recommended.	0 / 0.0, / 0.00, / 0.000
<b>SCHA</b>	Current input measuring range	Use as define current input measuring range, For example, from 0~5A input display to 0~500.0A. Current transformer is 500:5) Then can set dPt=0.0, SCHA=500.0. AI-6010 do not have this parameter	0~3000 0 unit
<b>SCHU</b>	Voltage input measuring range	Use as define voltage input measuring range, For example, from 0~5A/0~500VAC input display to 0~100.0KW. (Current transformer is 200:5. Voltage upper scale is 500VAC, so, power upper scale should be = 100KW) Then can set dPt=0.0, SCHA=200.0, SCHU=500.0. AI-6011 do not have this parameter	0~1050 V
<b>OPt</b>	Output type	0-20: 0~20mA linear current retransmission output; 4-20: 4~20mA linear current retransmission output.	
<b>SPSH</b>	Retransmission output upper value	Define the retransmission output upper value, retransmission source was according to selected INP For example: retransmission 0~50A to 0~20mA. Set SPSH=50; when need retransmission 0~1000V to 0~20mA, set SPSH=1000	0~3000 0 unit
<b>Addr</b>	Communication address	In the same communication line, different instrument should be set to different address.	0~80





<b>bAud</b>	Baud rate	The range of baud rate is 1200 ~ 19200 bit/s. Can be set to 4800, 9600 or 19200.	0~ 19200
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## TERMINAL LAYOUT AND WIRING

Wiring graph for instruments with dimension A, A2, B, C, C3, E or F

(Note: AC signal input do not have “+” and “-” limit)

