# 4 Digit Display Controller
# ATO-CHB2

## User Manual

For your safety, please read the following before use.

## ▣Precautions

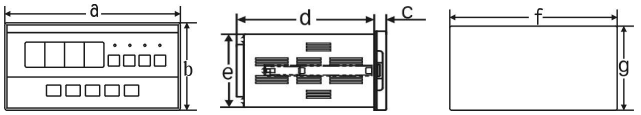
- Please do not use it on life-related equipment such as atomic energy and medical equipment.
- This instrument does not have a power fuse. Please install a fuse or other safety circuit-breaking device in the power supply circuit of the instrument.
- Please do not use this product outside the specifications provided.
- Please do not use it in flammable and explosive places.
- Please avoid installing it directly above instruments that generate large amounts of heat (heaters, transformers, high-power resistors).

## ⚠Warning

- When the ambient temperature is above 50°C, use a forced fan or cooler for cooling. However, do not let cooling air blow directly to the instrument.
- For panel-mounted instruments, in order to prevent users from approaching high-voltage parts such as power terminals, please take necessary measures on the final device.
- The installation, commissioning and maintenance of this product should be carried out by qualified engineering and technical personnel.
- If the fault or abnormality of this product may cause a major accident to the system, please set up an appropriate external protection circuit to prevent accidents.
- We are not responsible for any direct or indirect losses other than the product itself.
- We reserve the right to change product instructions without notice.

## ▣ Overall Dimension Drawing

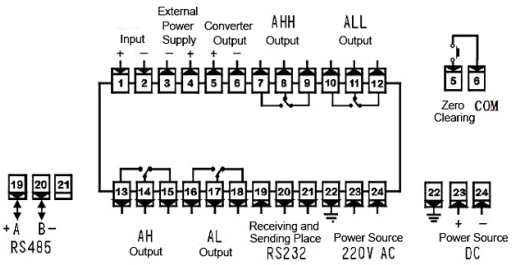
Overall Dimension　　Hole Size



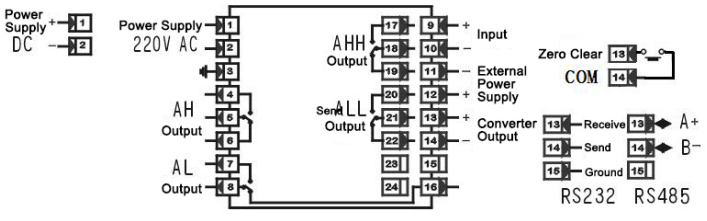

| Specification | a (mm) | b (mm) | c (mm) | d (mm) | e (mm) | f (mm) | g (mm) |
|---|---|---|---|---|---|---|---|
| 160 × 80 | 160 | 80 | 10 | 115 | 75 | 152-1 | 76-1 |
| 96 × 96 | 96 | 96 | 12 | 100 | 91 | 92-0.5 | 92-0.5 |
| 96 × 48 | 96 | 48 | 12 | 100 | 43 | 92-0.5 | 45-0.5 |
| 72 × 72 | 72 | 72 | 12 | 100 | 67 | 68-0.5 | 68-0.5 |

## ▣ Wiring Diagram

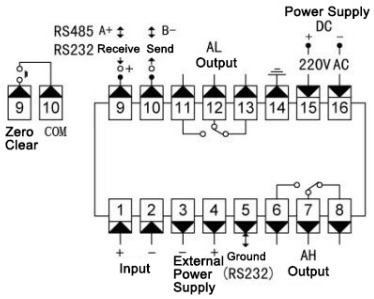
▸ 160×80 Display Controller



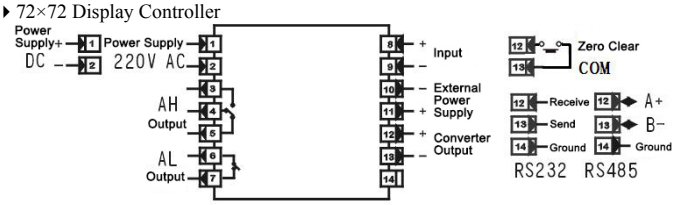

▸ 96×96 Display Controller




▸ 96×48 Display Controller

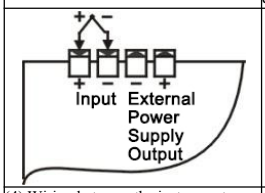



▸ 72×72 Display Controller

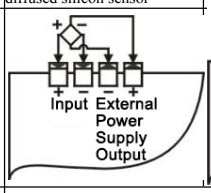



## ▣ Input Wiring Diagram

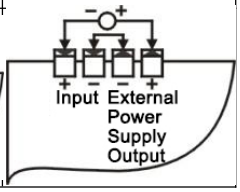
(1) Wiring between the instrument and current and voltage inputs



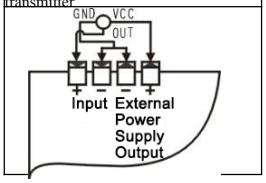

(2) Wiring between the instrument and the mV signal of the strain bridge or diffused silicon sensor




(3) Wiring between the instrument and the 2-wire current transmitter

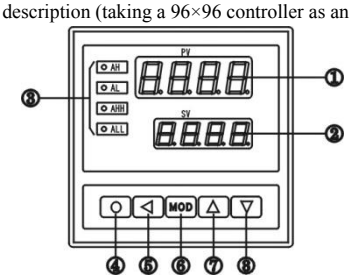



(4) Wiring between the instrument and the 3-wire voltage and current transmitter




## ▣ Setting

**1** Panel and button description (taking a 96×96 controller as an example)




| Name | | Instruction |
|---|---|---|
| **Display** | ① Measurement value display | • Display measured value, peak value, valley value.<br>• In the parameter setting state, the parameter symbols and parameter values are displayed. |
| | ② Alarm settings | • Display alarm set value, peak value and valley value. |
| ③ **Indicator Light** | | • Alarm status display of each alarm point. |
| **Operation keys** | ④ Setting key ● | • In the measurement state, press and hold for more than 2 second swithout releasing to enter the setting state.<br>• In the setting state, when the parameter symbol is displayed, press and hold for more than 2 seconds without releasing to enter the next set of parameters or return to the measurement state. |
| | ⑤ Left key ◀ | • In the measurement state, clear the peak and valley values. fbc=on<br>In the setting state: ① Call out the original parameter values.<br>②Move modified bits. |
| | ⑥ Enter MOD | • In the measurement state, switch to display the measured value, peak value, and valley value. fbc=on<br>In the setting state, save the modified parameter value. |
| | ⑦ Add key ▲ | Invalid in measurement state.<br>Add parameter value or change setting type in setting state. |
| | ⑧ Decrease key ▼ | In the measuring state, the measured value is cleared to zero.<br>Reduce the parameter value or change the setting type in the setting state. |

## 2 Specification

▸ First group of parameters: Alarm setting value

| Symbol | Name | Content | Address | Range |
|---|---|---|---|---|
| Av | Av | Comparison value of deviation alarm mode | 00H | -1999~9999 |
| AH | AH | 1st alarm point setting value | 01H | -1999~9999 |
| AL | AL | 2nd alarm point setting value | 02H | -1999~9999 |
| AHH | AHH | 3rd alarm point setting value | 03H | -1999~9999 |
| ALL | ALL | 4th alarm point setting value | 04H | -1999~9999 |

▸ Second group of parameters: alarm configuration

| Symbol | Name | Content | Address | Range |
|---|---|---|---|---|
| oA | oA | Passcode | 10H | 0~9999 |
| ALo1 | ALo1 | 1st alarm point alarm mode | 11H | Note1 |
| ALo2 | ALo2 | 2nd alarm point alarm mode | 12H | Note1 |
| ALo3 | ALo3 | 3rd alarm point alarm mode | 13H | Note1 |
| ALo4 | ALo4 | 4th alarm point alarm mode | 14H | Note1 |
| HYA1 | HYA1 | 1st alarm point sensitivity | 19H | 0~8000 |
| HYA2 | HYA2 | 2nd alarm point sensitivity | 1AH | 0~8000 |
| HYA3 | HYA3 | 3rd alarm point sensitivity | 1BH | 0~8000 |
| HYA4 | HYA4 | 4th alarm point sensitivity | 1CH | 0~8000 |
| cYt | cYt | Alarm delay | 1FH | 0 ~ 20 |

▸ Third group of parameters: Polyline operation

| Symbol | Name | Content | Address | Range |
|---|---|---|---|---|
| c1 | c1 | 1st polyline point measurement | 20H | -1999~9999 |
| b1 | b1 | 1st polyline point standard value | 21H | -1999~9999 |
| c2 | c2 | 2nd polyline point measurement | 22H | -1999~9999 |
| b2 | b2 | 2nd polyline point standard value | 23H | -1999~9999 |
| c3 | c3 | 3rd polyline point measurement | 24H | -1999~9999 |
| b3 | b3 | 3rd polyline point standard value | 25H | -1999~9999 |
| c4 | c4 | 4th polyline point measurement | 26H | -1999~9999 |
| b4 | b4 | 4th polyline point standard value | 27H | -1999~9999 |
| c5 | c5 | 5th polyline point measurement | 28H | -1999~9999 |
| b5 | b5 | 5th polyline point standard value | 29H | -1999~9999 |
| c6 | c6 | 6th polyline point measurement | 2AH | -1999~9999 |
| b6 | b6 | 6th polyline point standard value | 2BH | -1999~9999 |
| c7 | c7 | 7th polyline point measurement | 2CH | -1999~9999 |
| b7 | b7 | 7th polyline point standard value | 2DH | -1999~9999 |
| c8 | c8 | 8th polyline point measurement | 2EH | -1999~9999 |
| b8 | b8 | 8th polyline point standard value | 2FH | -1999~9999 |

▸ Fourth group of parameters: Measurement and display

| Symbol | Name | Content | Address | Range |
|---|---|---|---|---|
| incH | incH | Input signal selection | 30H | 0 ~ 7 |
| in-d | in-d | Show decimal point position selection | 31H | Note2 |
| u-r | u-r | Lower limit of measuring range | 32H | -1999~9999 |
| F-r | F-r | Upper limit of measuring range | 33H | -1999~9999 |
| in-A | in-A | Zero point correction value | 34H | -1999~9999 |
| Fi | Fi | Full scale correction value | 35H | 0.500~1.500 |
| FLtr | FLtr | Digital filter time constant | 36H | 1 ~ 20 |
| c-b | c-b | Polyline function selection | 37H | Note3 |
| Zror | Zror | Clear range | 38H | 0 ~ 9999 |
| Zrot | Zrot | Key clear effective time | 39H | 0 ~ 6 |
| At | At | Display update rate | 3AH | 1~60 |
| bout | bout | Failure proxy value | 3CH | -1999~9999 |
| HL | HL | Setting value display selection | 3DH | 0 ~6 |
| Fbc | Fbc | Operating mode | 3EH | Note3 |
| Fbao | Fbao | Window 1 shows selection | 3FH | 0 ~ 3 |

▸ Fifth group of parameters: Communication interface, transmission output, etc.

| Symbol | Name | Content | Address | Range |
|---|---|---|---|---|
| Add | Add | Communication address | 40H | 0 ~ 99 |
| bAud | bAud | Communication speed selection | 41H | Note4 |
| ctd | ctd | Alarm output control right selection | 44H | Note 3 |
| ctA | ctA | Transmission output controight selection | 45H | Note 3 |
| oA1 | oA1 | Alarm setting password selection | 46H | Note3 |
| oP | oP | Output signal selection | 4DH | 0 ~ 2 |
| bA-L | bA-L | Transmission output lower limit | 4EH | -1999~9999 |
| bA-H | bA-H | Transmission output upper limit | 4FH | -1999~9999 |

Note1: 0 ~ 4 ---H to --PA5 alarm methods

Note2: 0 ~ 3 0.000, 00.00, 000.0, 0000.

Note3: 0 OFF, 1ON.

Note4: 0 ~ 3 2400, 4800, 9600, 19.2k

## 3 Parameter setting method

The parameters of the instrument are divided into several groups, and the group of each parameter is listed in the "Parameter List".

★ Parameters in Group 2 and later are controlled by password and cannot be entered without setting a password.

★ Whether the first group of parameters is controlled by password can be selected by setting parameter oA1. oA1 When set to OFF, it is not controlled by password; when set to ON, if no password is set, although you can enter and modify, you cannot save.

★ After entering the setting state, if no key operation is performed for more than 1 minute, the instrument will automatically exit the setting state.

**3.1 How to set the alarm set value**

The alarm setting value is in the first group of parameters. Instruments without alarm function do not have this group of parameters.

① Press and hold the setting key ● for more than 2 seconds without releasing it to enter the setting state, and the instrument displays the symbol of the first parameter.

② Press MOD key to select other parameters of this group in sequence.

③ Press the ◀ key to call up the original setting value of the current parameter, and the flashing bit is the correction bit.

④ Use the ◀ key to move the modification bit, the ▲ key to increase the value, and the ▼ key to decrease the value, and modify the parameters to the required values.

⑤ Press the MOD key to save the modified parameters and go to the next parameter. If it is the last parameter of this group, pressing the MOD key will exit the setting state.

Repeat steps ② ~ ⑤ to set other parameters of this group.

**3.2 Password setting method**

When the instrument is in the measuring state or the first group of parameter symbols are displayed, the password can be set.

① Press and hold the setting key ● until oA is displayed.

② Press the ◀ key to enter the modification state, and modify it to 1111 with the cooperation of the ◀ , ▲ , and ▼ keys.

③ Press the MOD key to complete the password setting.

★ The password will be automatically cleared when the instrument is powered on or if there is no key operation for more than 1 minute.

**3.3 How to set other parameters**

① First set the password according to the password setting method.

② Because the second group of parameters is the group where the password parameters are located, after the password setting is completed, press the key MOD to select each parameter of this group.

③ The parameters of other groups, by holding down the set key ● , enter each parameter group in sequence, and the meter displays the symbol of the first valid parameter of the group.

④ After entering the group where the parameters that need to be set are located, press the MOD key to cycle through the parameters that need to be set in this group.

⑤ Press the ◀ key to call up the original setting value of the current parameter, and the flashing bit is the modification bit.

⑥ Use the ◀ key to move the modification bits, the ▲ key to increase the value, and the ▼ key to decrease the value, and modify the parameters to the required values.

⑦ Press the MOD key to save the modified parameters and go to the next parameter.

Repeat steps ④ ~ ⑦ to set other parameters of this group. Exit setting: When the parameter symbol is displayed, press and hold the setting key ● until you exit the parameter setting state.

★ For parameters that represent parameter values in symbolic form, when modified, the flashing bit should be in the last position.

# ▣ Function corresponding parameter description

## 1 Measurement and display

The process of the instrument from sampling to display:

Sampling → Digital filtering → Dimension conversion → Adjustment → Line operation → Reset → Peak and valley value detection → Display

Dimension conversion: voltage, current, mV signal according to the set range of the upper and lower limits of conversion.

In special cases, the signal provided by the user can also be compared with the displayed table or formula.

Adjustment: See the Adjustment instructions.

Polyline operation: See the description of 8-section polyline operation function.

The parameters for measurement and display are listed below. Incorrect Settings may cause the meter to display abnormally.

❗ The display is also affected by tuning and polyline operations.

▸ incH (incH) —— Input signal selection

The settings should be consistent with the instrument model and the actual input signal. The value of this parameter is represented in symbolic form, and the corresponding relationships are listed in the following table:

| | | |
|---|---|---|
| 0 | 4-20 | 4mA~20mA |
| 1 | 0-10 | 0mA~10mA |
| 2 | 0-20 | 0mA~20mA |
| 3 | 1-5u | 1V~5V |
| 4 | 0-5u | 0V~5V |
| 5 | 20mu | ±20mV |
| 6 | 50mu | ±50mV |
| 7 | 90mu | ±90mV |

▸ in-d (in-d) —— Location selection of the decimal point displayed

▸ u-r (u-r) —— Lower range limit

▸ F-r (F-r) —— Upper range limit

These two parameters specify the start and end of the display value corresponding to the start and end of the input signal.

- FLtr (FLtr) —— Digital filtering time constant

Used to overcome the display fluctuation caused by signal instability, the larger the set value, the stronger the effect, but the slower the change of the input number. This parameter is factory set to 1.

- At (At) -- Shows the update rate

The sampling rate of the meter is 10 times per second. The value set in the At parameter indicates the number of samples required to perform an average calculation for displaying one update. For example, if At is set to 5, the system displays the update once after the average of the five samples.

The cycle of alarm and transmission output is 10 times/second, which has nothing to do with this parameter.

- HL (HL) -- The second window shows the selection

The instrument with a setpoint display displays a setpoint through the selection of this parameter. The value ranges from 0 to 6, corresponding to xxx, xxx, xxx, xxx, peak value, and valley value.

## 2 Reset

- Zror (Zror) -- Clear zero range, factory set to 0
- Zrot (Zrot) - Key clear valid time

The setting range is 0-6 seconds. When it is set to 0, the measured value is within the zero clearing range, and you can clear it by pressing the button. In the measuring state, when the measured value is within the zero clearing range, there are three ways to achieve the zero clearing of the measured value:

① Press the ▼ key for a certain amount of time (set by Zrot ) to clear the measured value to zero.
② The external opening "Clear zero" is closed for a certain time (set by Zrot ), and the measured value is cleared to zero.
③ Clearing by the host computer through the communication interface.

## 3 Peak and valley value detection

- Fbc (Fbc) -- Work mode selection

When set to oFF , work in normal mode, only the measured value;

When the value is set to on , the meter performs peak and valley value detection while working in peak and valley mode.

- FbAo (Fbc) -- Display selection

When set to 0: The first window displays the measured value;
1: Press the MOD key to display the measured value and peak value in the first window;
2: Press the MOD key to display the measured value and valley value in the first window;
3: Press the MOD key to display the measured value, peak value and valley value in the first window;

When the instrument works in peak-valley mode, the peak-valley value is judged for each measurement and control period. Press the MOD key to switch the first window to display the measured value,peak value, and valley value. When the peak and valley value are displayed, the last decimal point of the first window is lit.

In the measurement state,Fbc = on , there are two ways to clear the peak and valley values:

① Press ◄ to clear the peak and valley values;
② The upper computer clears the peak and valley values through the communication interface;

Note: If Fbc = oFF , the FbAo parameter is invalid, and HL should be set to 0 to 4.

## 4 8 section line operation function

This function is an optional function.
When the input signal and display data show monotonically increasing nonlinearity, and the data cannot be determined when ordering, and need to be corrected during calibration, the instrument's polyline calculation function can be used.

Monotonically rising means that within the full range of the input signal, as the input signal increases, the displayed data also increases.

① Relevant parameters of polyline operation:

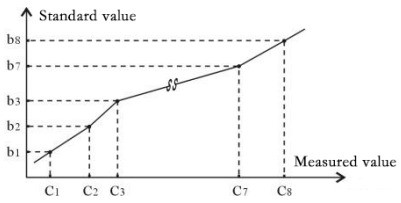
- c-b (c-b)——Polyline function selection
- c1 ~ c8 : Indicates the measurement value of each polyline point
- b1 ~ b8 : Indicates the standard value of each polyline point

Measured value: refers to the displayed value before the polyline operation. Standard value: refers to the expected display value after the polygonal operation.

② Instructions

- The polyline operation is performed after dimension conversion and adjustment, and relevant parameters should be set according to "Adjustment".
- Select the c-b parameter as OFF to turn off the polyline operation function.
- After the instrument is connected to the input signal, increase the input signal from small to large. During this process, record the measured values and standard values of each breakline point, that is, c1~c8, b1 ~ b8 are obtained.
- Select the c-b parameter to ON, turn on the polyline operation function, and set the c1 ~ c8, b1 ~ b8 parameters.

③ Schematic diagram




★ If the measured value is less than C1, the instrument will push downward according to the data in the next section;
★ If the measured value is greater than C8, the instrument will push upward according to the data of the previous section;

## 5 Alarm output

This function is an optional function.

The instrument can be configured with up to 4 alarm points. Each alarm point has 3 parameters, which are used to set the alarm value, select the alarm mode and set the alarm sensitivity.

- AH、AL、AHH、ALL The sequence is the alarm setting values of the 1st to 4th alarm points.
- ALo1 ~ ALo4 The sequence is the alarm mode selection of 4 alarm points.
- HyA1 ~ HyA4 The sequence is the alarm sensitivity setting of 4 alarm points.

There are also 2 common parameters for alarm output:

- Au (Av)——Comparison value of deviation alarm mode

An alarm occurs when the deviation between the measured value and this value exceeds the set value. The non-deviation alarm mode has nothing to do with this parameter.

- cYt (cYt)——Alarm delay

The setting range is 0~20 seconds. When it is 0, there is no alarm delay function.

When the measured value exceeds the alarm set value, the alarm delay is started. If the measured value is always in the alarm state during the alarm delay period, the alarm signal will be output at the end of the alarm delay. Otherwise, no alarm signal will be output.

Alarm recovery is also controlled by a delay.

- Alarm mode: There are 5 alarm modes. Select the alarm mode of each alarm point through ALo1 ~ ALo4 parameters.

Select as
- ---H : Upper limit alarm, alarm when measured value > set value.
- ---L : Lower limit alarm, alarm when measured value < set value.
- -PAH : Deviation upper limit alarm, (measured value -Au) > set value alarm.
- -PAL : Lower limit of deviation alarm, (Au - measured value) > set value alarm.
- --PA : Deviation absolute value alarm, ( Au -measured value) > set value alarm.

! In the deviation alarm mode, the alarm setting value cannot be a negative number.

- Alarm sensitivity: In order to prevent the alarm relay from frequently operating when the measured value fluctuates near the alarm set value, an extended area for alarm release can be set as needed.

! For instruments with communication functions, when the ctd parameter is selected as ON, the instrument will not perform alarm processing.

## 6 Transmission output

This function is an optional function. The transmission output has 3 parameters:

- oP (op)——Output signal selection

Select as
- 4-20 : Output is 4mA -20mA (or 1 V -5V)
- 0-10 : Output is 0mA -10mA
- 0-20 : Output is 0mA -20mA (or 0 V -5V, or 0 V -10V)

- bA-L (bA-L)——Transmission output lower limit setting
- bA-H (bA-H)——Transmission output upper limit setting

! For instruments with communication functions, when the ctA parameter is selected as ON, the instrument does not perform transmission output processing.

## 7 Communication interface

This function is an optional function. There are 4 parameters related to the communication function:

- Add (Add)——Instrument communication address. Setting range 0-99. Factory setting is 1.
- bAud (bAud)——communication rate selection.

There are 4 types available: 2400, 4800, 9600, and 19.20k. The factory setting is 9600.

- ctd (ctd)——Alarm output right selection. Factory setting is OFF.

When OFF is selected, the instrument is controlled by the alarm function. When ON is selected, control is transferred to the computer, and the alarm output is directly controlled by the switch output command issued by the computer.

- ctA (ctA)——Transmission output control right selection. Factory setting is OFF.

When OFF is selected, the instrument outputs according to the transmission output function. When ON is selected, control is transferred to the computer, and the transmission output is directly controlled by the analog output command issued by the computer.

For details of the relevant communication commands and protocols, see "Communication Protocol". The commands related to the instrument are as follows:

| | |
|---|---|
| ● #AA↙ | Read measured values |
| ● #AA01↙ | Read peak value |
| ● #AA02↙ | Read valley |
| ● #AA2222↙ | Clear measured value |
| ● #AA3333↙ | Clear peak and valley value |
| ● #AA0001↙ | Read the output analog value (transmission output) |
| ● #AA0002↙ | Read switch input status |
| ● #AA0003↙ | Read switch output status (alarm output) |

- ' AABB↙ Expression symbol (name) for reading instrument parameters
- $AABB↙ Read instrument parameter values
- %AABB(data) ↙ Set instrument parameters
- &AA(data) ↙ Output switching value
- &AABBDD↙ Output analog value

## ▣ Adjustment

During adjustment, zero point correction should be performed first, and then full scale correction should be performed.

- in-A (in-A)——Zero point correction value. The factory setting is generally 0.
- Fi (Fi)——full scale correction value. The factory setting is generally 1.000.

Display value = （Display value before zero point correction + in-A) × Fi

## ▣ Input fault signal processing

Using the input signal fault processing function of the instrument can more effectively ensure the safe operation of the equipment and abnormal equipment operation caused by input signal faults, such as interlocking, shutdown, etc. The meter displays ol indicating input signal failure. Parameter settings can still be made when the instrument displays ol .
Input signal failure is caused by overflow of the A/D conversion in the instrument due to excessive input signal.

- bout (bout)——surrogate measurement value when input signal fails

When the instrument determines that the input signal is faulty, the set bout value is used as the input value of the alarm output and transmission output.The input signal fault alarm output function can be added according to user requirements.

❗ If the instrument does not have alarm output function, transmission output function and communication function, this parameter will have no effect.

## ▣ Specification

### 1 Basic specifications

| | | |
|---|---|---|
| Supply voltage | AC power | 100-240 V AC 50/60 Hz |
| | AC/DC power | 10-24V AC 50/60 Hz； 10-24V DC |
| Power consumption | AC power | Below 7 VA |
| | AC/DC power | AC: Below 6 VA ; DC: Below 5W |
| Allowable voltage variation range | | 90 ~ 110% of power supply voltage |
| Insulation resistance | | 100MΩ or more (500 V DC MEGA reference) |
| Withstand voltage | | 1 minute at 2000 V AC 50/60Hz |
| Anti-interference | | IEC61000-4-2 (electrostatic discharge), level III;<br>IEC61000-4-4 (electrical fast transient burst), level III;<br>IEC61000-4-5 (surge), level III |
| Protection level | | IP65(Product front part) |
| Environment | Temperature | -10 ~ 55℃; storage -25 ~ 65℃ |
| | Humidity | 35 ~ 85 %RH; storage 35 ~ 85 %RH |

### 2 Input specifications

| | | | |
|---|---|---|---|
| Measure control speed | | | 10 times/second or more |
| Basic error | | | ±0.2 %F.S |
| Display range | | | -1999~ 9999 |
| Input signal | Voltage | V | 0-5V DC； 1-5V DC |
| | Current | I | 4-20/0-10/0-20 mA |
| | mV | M | ±20、±50、±90 mV |
| Digital filtering | Inertia; average; moving average, etc. | | |

### 3 Optional accessories specifications

| | | | |
|---|---|---|---|
| Contact output | A1-A4 | 1-4 points, 250VAC/3A resistive load | |
| Contact input | K | 1 external binary input for clearing | |
| Analog output (resolution 1/3000) | M1 | Current output (4-20)mA, (0-10) mA, (0-20) mA | |
| | M2 | Voltage output (1-5) V, (0-5) V | |
| Communication interface | C1 | TC ASCII protocol RS232 | Rate: 2400; 4800; 9600; 19200 TC<br>Adress: 0~99<br>Response time: 500μS (measured value) |
| | C2 | ASCII protocol RS485 | |
| | R1 | Modbus-RTU protocol RS232 | |
| | R2 | Modbus-RTU protocol RS485 | |
| External power supply | P1 | 24V±5%, below 50mA | |
| | P1G | 24V±5%, below 100mA | |
| | P2 | 12V±5%, below 50mA | |
| | P2G | 12V±5%, below 100mA | |
| | P3 | Precision power supply, generally 10V±2%, 30ppm, below 100mA | |

## ▣ Contact Us

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