

**RTD Input Module**






**AI731-S11**

**User manual**

**IM23H35-E**














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| Symbol Definition   |   |
|---|---|
|  | <b>WARNING:</b> Indicates information that a potentially hazardous situation which, if not avoided, could result in serious injury or death.  |
|  | <b>RISK OF ELECTRICAL SHOCK:</b> Indicates information that Potential shock hazard where HAZARDOUS LIVE voltages greater than 30V RMS, 42.4V peak, or 60V DC may be accessible.           |
|  | <b>ESD HAZARD:</b> Indicates information that Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices |
|  | <b>ATTENTION:</b> Identifies information that requires special consideration.   |
|  | <b>TIP:</b> Identifies advice or hints for the user.  |

## Security& Caution Symbols

The following table lists Security& Caution symbols used on equipments.

| No. | Symbol  | Description                           |
|-----|---|---------------------------------------|
| 1   |    | Direct current (DC)                   |
| 2   |    | Alternating current (AC)              |
| 3   |    | Ground (Earth) terminal               |
| 4   |    | Protective earth (ground) terminal    |
| 5   |    | Reference ground (Earth) terminal     |
| 6   |   | Frame or chassis                      |
| 7   |  | Equipotentiality                      |
| 8   |  | On (power)                            |
| 9   |  | Off (power)                           |
| 10  |  | Caution, risk of electric shock       |
| 11  |  | Caution, hot surface                  |
| 12  |  | Caution, risk of danger               |
| 13  |  | Electrostatic sensitive devices (ESD) |

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# RTD Input Module AI731-S11

## Section 1 Description

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Analog input module AI731-S11 is an 8-channel and channel-channel isolated RTD input module. Its adjustable signals include resistance thermometer sensor Pt100 and Cu50, regular resistance signals  $(1\sim400)\Omega$  and  $(2\sim1000)\Omega$ . It has free range function, by which it can automatically adjust measurement scope according to the set range to realize higher measure precision. The module can be configured 1:1 for redundancy.

## Section 2 Technical Specifications

**Table 2-1 technical specifications of AI731-S11**

| Parameter                    |                                     | Description                        |
|------------------------------|-------------------------------------|------------------------------------|
| Module model                 |                                     | AI731-S11                          |
| Type                         |                                     | RTD Input Module                   |
| Channel No.                  |                                     | 8                                  |
| Redundancy                   |                                     | Support                            |
| Isolation type               |                                     | Channel-channel isolated           |
| Isolated power               |                                     | 500V AC                            |
| Temperature                  | Operating temperature               | (-20~70)°C                         |
|                              | Storage temperature                 | (-40~85)°C                         |
| Humidity                     | Operating humidity                  | 10%RH~90%RH. No vapor condensation |
|                              | Storage humidity                    | 5%RH~95%RH. No vapor condensation  |
| System power supply          |                                     | 24V DC±10%                         |
| 24V system power consumption |                                     | <1.2W                              |
| Signal type                  | Resistance                          | (1~400) Ω, (2~1000) Ω              |
|                              | Resistance thermometer sensor       | Pt100, Cu50                        |
| Precision                    | Resistance                          | ±0.25Ω                             |
|                              | Resistance thermometer sensor       | ±1°C                               |
| Max. signal input scope      | (1~400)Ω                            | (1~500)Ω                           |
|                              | (2~1000)Ω                           | (2~1250)Ω                          |
|                              | Pt100 resistance thermometer sensor | (-200~850)°C                       |
|                              | Cu50 resistance thermometer sensor  | (-50~150)°C                        |
| Sampling cycle               |                                     | 1s                                 |
| Sampling current             | (1~400) Ω                           | (0.6±0.1) mA                       |
|                              | Pt100                               |                                    |
|                              | Cu50                                |                                    |
|                              | (2~1000) Ω                          | (0.46±0.1) mA                      |
| Common-Mode Rejection Ratio  |                                     | ≥120dB                             |
| Series-Mode Rejection Ratio  |                                     | ≥60dB                              |
| Offline check                |                                     | Support                            |



**Tip:**

When using two-wire system connection method, the resistance of lead wire should be taken into consideration. In the case, precision indexes above can't be ensured.

## Section 3 Usage Instruction

### 3.1 Led Indicators

**Table 3-1 LED indicators in AI731-S11**

| LED indicator         | Fault (red)     | Status (green)    | Duplex (green)         | L-Bus (green)            | Supply (green)                          |
|-----------------------|-----------------|-------------------|------------------------|--------------------------|---|
| Description<br>Status | Fault indicator | Running indicator | Work/standby indicator | Communication indicator  | Auxiliary power supply status indicator |
| OFF                   | Normal          | --                | Standby                | Communication link break | Abnormal auxiliary power supply         |
| ON                    | Fault           | Normal            | Work                   | Normal                   | Normal                                  |
| Flashing              | --              | No configuration  | Try to switch          | IP confliction           | --                                      |

### 3.2 Installation of I/O Modules

AI731-S11 is installed on I/O Module base, which equips with power terminal and field signal terminal.

Please refer to *Control Station Hardware User Manual*.

### 3.3 Interface Features

AI731-S11 module provides precise current source for excite the site instruments. According to different site application requirements, AI731-S11 can be connected to two-wire system, three-wire system and four-wire system instruments. AI731-S11 has different connection methods for different instruments.

The connection method is shown in Figure 3-1 (take channel 1, channel 2 and channel 8 for example). When two-wire system signal is used in the site equipment, terminal 3 and 4 in Figure 3-1 should be in short connection via lead wires.

I+ remarks the positive pole of constant-current source, I- remarks the negative pole of constant-current source; V+ remarks the positive pole of measurement circuit, V- remarks the negative pole of measurement circuit

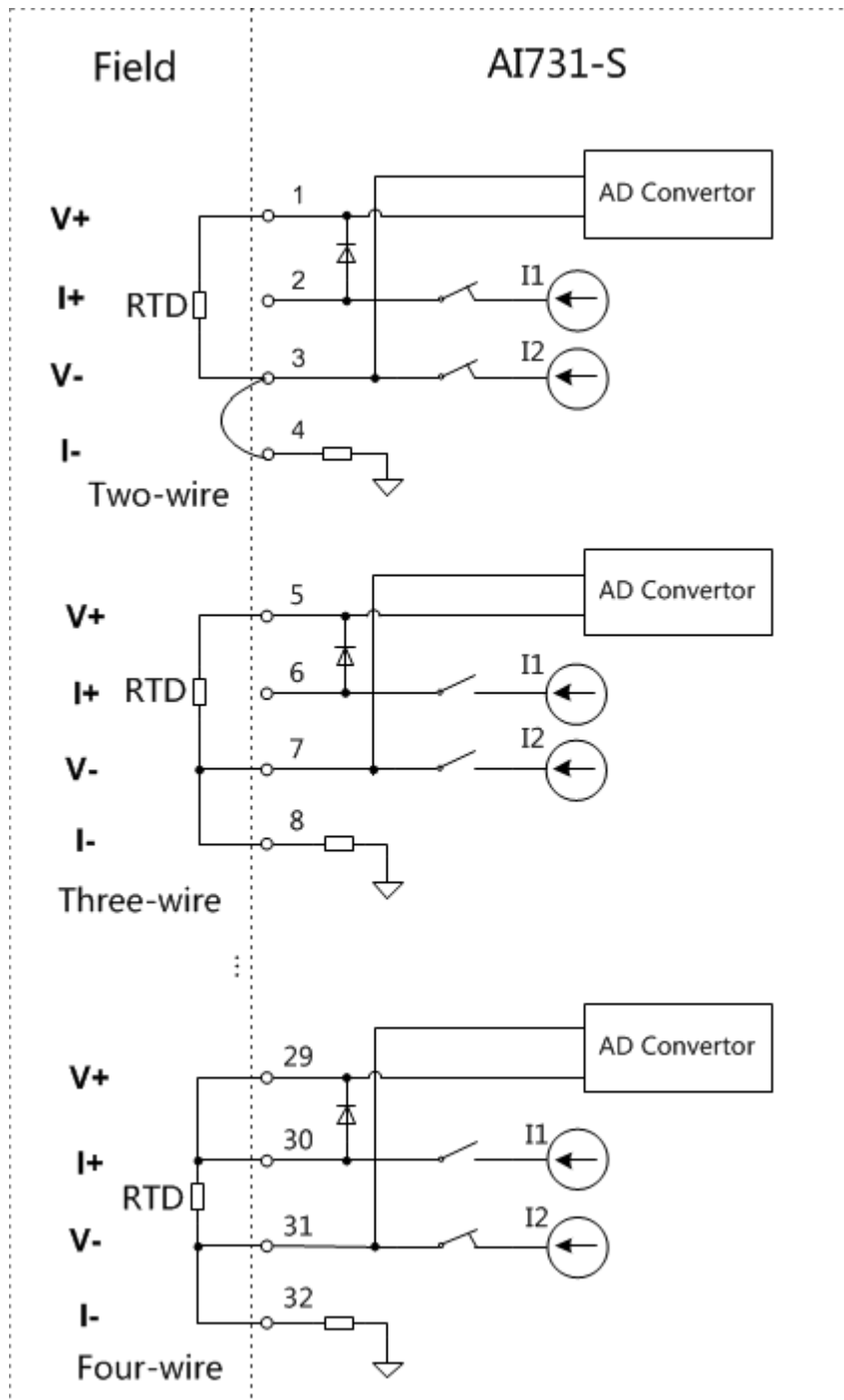


Figure 3-1 interface circuit of the two-wire signal

### 3.4 Terminals Definition & Connection

Each channel of AI731-S11 is provided with 4 wiring terminals to realize three connection methods. See interface circuit instruction for the connection. The terminal connection instruction is shown in Table 3-2:

CH\* is channel No., means 1 is CH1. The 4 terminals of each channel are described as CH-1, CH-2, CH-3, CH-4 respectively.



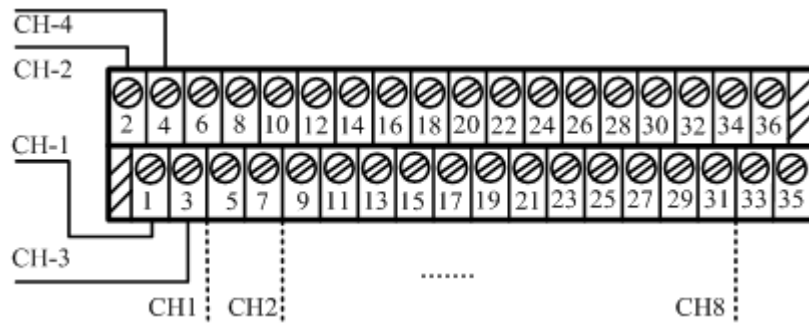


Figure 3-4 Diagram of terminal wiring

Table 3-2 Connections of terminals of AI731-S11

|  | Terminal | Wiring mark | Description | Channel |
|--|----------|-------------|-------------|---------|
|  | 1        | CH-1        | V+          | CH1     |
|  | 2        | CH-2        | I+          |         |
|  | 3        | CH-3        | V-          |         |
|  | 4        | CH-4        | I-          |         |
|  | 5        | CH-1        | V+          | CH2     |
|  | 6        | CH-2        | I+          |         |
|  | 7        | CH-3        | V-          |         |
|  | 8        | CH-4        | I-          |         |
|  | 9        | CH-1        | V+          | CH3     |
|  | 10       | CH-2        | I+          |         |
|  | 11       | CH-3        | V-          |         |
|  | 12       | CH-4        | I-          |         |
|  | 13       | CH-1        | V+          | CH4     |
|  | 14       | CH-2        | I+          |         |
|  | 15       | CH-3        | V-          |         |
|  | 16       | CH-4        | I-          |         |
|  | 17       | CH-1        | V+          | CH5     |
|  | 18       | CH-2        | I+          |         |
|  | 19       | CH-3        | V-          |         |
|  | 20       | CH-4        | I-          |         |
|  | 21       | CH-1        | V+          | CH6     |
|  | 22       | CH-2        | I+          |         |
|  | 23       | CH-3        | V-          |         |
|  | 24       | CH-4        | I-          |         |
|  | 25       | CH-1        | V+          | CH7     |
|  | 26       | CH-2        | I+          |         |
|  | 27       | CH-3        | V-          |         |
|  | 28       | CH-4        | I-          |         |

|  | Terminal    | Wiring mark | Description   | Channel |
|--|-------------|-------------|---------------|---------|
|  | 29          | CH-1        | V+            | CH8     |
|  | 30          | CH-2        | I+            |         |
|  | 31          | CH-3        | V-            |         |
|  | 32          | CH-4        | I-            |         |
|  | 33,34,35,36 |             | No connection |         |

### 3.5 Base/Terminal Unit Selection

Selection of bases/terminal unit matching AI731-S11 is shown in Table 3-3.

**Table 3-3 Selection of bases/terminal unit matching AI731-S11**

| Signal connection requirement | Module working method | Base model | Terminal unit model |
|-------------------------------|-----------------------|------------|---------------------|
| Direct connection             | Single module         | MB735-S11  | -                   |
|                               | Redundancy            | MB736-S11  | -                   |
| Terminal change-over          | Single module         | MB745-S11  | TUA711-GS00         |
|                               | Redundancy            | MB746-S11  |                     |

AI731-S11 of this version is totally compatible with last version.

### 3.6 Configuration Instruction

Please refer to *Hardware Module Builder User Manual* for details.

The module address is determined according to the module's position in rack. When configuring, select the corresponding control domain address (0~15), controller address (2~126), IO link module address (1~7), IO rack address (0~3), module address (0~15) and channel No. (0~7) according to the position of the module in the rack.

### 3.7 Maintenance

Clean and fasten all power and ground points for every 6 months or during the time when system stops running.

Vacuum the modules, bases, racks, fan unit, power supply terminal unit, etc via static-resistant vacuum every 6 months or during the time when system stops running.

Please refer to *Control Station Hardware User Manual* for the installation and disassembly.

## Section 4 Application

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### 4.1 Notices

- It is prohibited to connect 24V power directly to current input channel; otherwise it may cause damage to the corresponding channel.
- AI731-S11 module allows input signal to exceed certain configuration range, but within over-range limit. When the input signal exceeds the configuration range but within the over-range limit, the module can continue measuring and sending sampling data. When the input signal exceeds the over-range limit, the module will record the phenomenon and limit the sampling data.
- The default over-range limit of AI731-S11 module is -25%~125% of the configuration, and the over-range limit will be limited by the max. signal input scope.

### 4.2 Fault Diagnosis and Troubleshooting

1. If the Fault indicator is ON all the time, there is a severe module fault. Module replacement is required.
2. If L-Bus indicator is OFF, there is a communication fault or L-Bus indicator circuit damage or there is another node in the I/O bus. Please check the communication connection.
3. If the L-Bus indicator flashes, there is IP confliction. Please check if there is module confliction in the bus.
4. If Supply is OFF, there is bad connection of periphery 24V power source or unreliable module connection. Please check the auxiliary power connection and the connection between module and base.
5. If all indicators are OFF when the module is energized, maybe the power of module system has problem. Check the system power connection. If the connection is reliable, please replace the module.
6. When two-wire system signal is used in the site equipment, user can select three-wire for sampling mode in hardware configuration.

## Section 5 Revision

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*Table 5-1 Retrofit list of the version*

| Document Version | Applicable Module Model                | Remarks   |
|------------------|--|---|
| V1.1             | AI731-S-11.11.00                       |   |
| V1.2             | AI731-S-12.12.00                       |   |
| V1.3             | AI731-S-12.12.00                       | Bases selection has been changed.   |
| V1.4             | AI731-S-12.12.00                       | Add notice of Configuration   |
| V2.0(20131223)   | AI731-S11 V15.15.00 and later versions | Bases selection and power distribution have been changed<br>Add model information |
| V2.1(20141218)   | AI731-S11 V15.15.00 and later versions | Modify figure 3-1   |
| V2.2(20150917)   | AI731-S11 V15.15.00 and later versions | Modify IO link module address   |
| V2.3(20161116)   | AI731-S11 V15.15.00 and later versions | Add code  |
| V2.4(20210206)   | AI731-S11 V15.15.00 and later versions | Add common-mode and series-mode rejection ratio                                   |