

Thermocouple Input Module






AI722-S11

User manual

IM23H34-E

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Symbol Definition	
	WARNING: Indicates information that a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	RISK OF ELECTRICAL SHOCK: Indicates information that Potential shock hazard where HAZARDOUS LIVE voltages greater than 30V RMS, 42.4V peak, or 60V DC may be accessible.
	ESD HAZARD: Indicates information that Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices
	ATTENTION: Identifies information that requires special consideration.
	TIP: 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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Thermocouple Input Module AI722-S11

Section 1 Description

AI722-S11 is an 8-channel and channel-channel isolated thermocouple signal input module, which can measure signals including (-20~80) mV and (-100~100) mV voltage signals, and E, J, K, N, T, B, S, and R eight-type thermocouple signals. Meanwhile, it has free range function and can automatically adjust the measure scope according to the setting range to realize high precision measurement. The module can be configured 1:1 for redundancy.

In order to acquire higher precision and quick sampling, AD conversion technology of AI722-S11 adopts sampling and digital filtering technology to have better resistance to signal noise and power supply noise. Under the configuration of anti 50Hz/60Hz frequency and anti-interference, it can realize 1s /8 channels updated rate of sampling; and under the quick sampling configuration (anti 50Hz frequency), it can realize 300ms/8 channels updated rate of sampling.

Besides, AI722-S11 also has the cold junction temperature correction function, and higher precision can be achieved by cold junction temperature correction method.

Section 2 Technical Specifications

Table 2-1 Technical Specifications of AI722-S11

Parameter		Description
Module model		AI722-S11
Type		Thermocouple input module
Channel number		8
Redundancy		Support
Type of isolation		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
Power Supply		24V DC \pm 10%
system power consumption		<1.2W
Signal type	Voltage	(-100~100)mV, (-20~80)mV
	Thermocouple	E, J, K, N, T, B, S, R
Procession	Voltage	(-100~100)mV: \pm 0.1mV
		(-20~80)mV: \pm 0.05 mV
	Thermocouple	E type thermocouple: \pm 2.2°C
		J type thermocouple: \pm 1.9°C
		K type thermocouple: \pm 3.0°C
		N type thermocouple: \pm 2.6°C
		B type thermocouple: \pm 2.6°C(500°C ~ 1800°C)
		T type thermocouple: \pm 1.1°C
		S type thermocouple: \pm 3.2°C
		R type thermocouple: \pm 3.2°C
	Local cold junction temperature	\pm 1°C
Max. signal input scope	(-100~100)mV	(-150~150) mV
	(-20~80)mV	(-45~105) mV
	E type thermocouple	-240°C ~1000°C; Actual range: -200°C ~900°C
	J type thermocouple	-200°C ~1200°C; Actual range: -200°C ~750°C
	K type thermocouple	-220°C ~1350°C; Actual range: -200°C ~1300°C
	N type thermocouple	-220°C ~1300°C; Actual range: 0°C ~1300°C
	B type thermocouple	0°C ~ 1800°C; Actual range: 100°C ~ 1800°C
	T type thermocouple	-250°C ~400°C; Actual range: -200°C ~350°C
	S type thermocouple	-40°C ~1750°C; Actual range: 0°C ~1600°C
	R type thermocouple	-50°C ~ 1750°C; Actual range: 0°C ~1600°C
Sampling cycle (software selection)	Anti 50Hz, 60Hz	1s
	Anti 50Hz	300ms
Input impedance	Power on	2M Ω
	Power off	>10M Ω
Common-Mode Rejection Ratio		\geq 120dB
Series-Mode Rejection Ratio		\geq 60dB
Offline check		Support



Tip:

The “Maximum Signal Input Scope” in the table means the receivable maximum input temperature of the module; “Actual range” means the normal operation scope is according to temperature character of various thermocouples. The precision can only be ensured within the scope.

Section 3 Usage Instruction

3.1 Led Indicators

Table 3-1 LED indicators in AI722-S11

LED indicator	Fault (red)	Status (green)	Duplex (green)	L-Bus (green)	Supply (green)
Description Status	Fault indicator	Running indicator	Work/standby indicator	Communication indicator	Auxiliary power supply status
Off	Normal	--	Standby	Communication link break	Abnormal auxiliary power supply
On	Severe Fault	Normal	Work	Normal	Normal
Blink	--	No configuration	--	Address confliction	--

3.2 Installation of I/O Modules

AI722-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

AI722-S11 directly receives voltage signal or thermocouple signal, and its interface diagram is shown below (take CH1 and CH8 for examples).

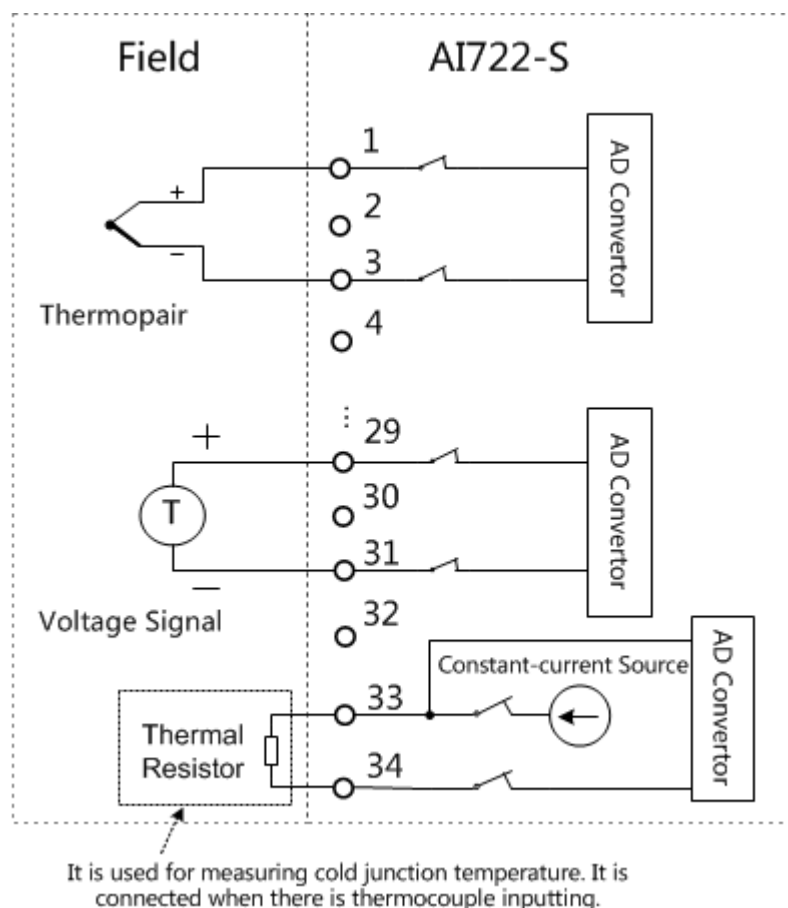


Figure 3-1 Interface Circuit

Each channel of AI722-S11 occupies 2 connection terminals, corresponding to the anode and cathode of the thermocouple. 33 and 34 terminals are used for connecting the thermal resistor which is used for measuring cold junction temperature.

3.4 Terminals Definition & Connection

The terminal wiring of AI722-S11 working with the change-over bases MB745-S11 and MB746-S11 and the change-over terminal unit TUA711-GS00 or with the I/O bases MB735-S11 and MB736-S11 is shown below. TUA711-GS00 corresponds to the 36 terminals of I/O base respectively.

The four terminals of channel are described as CH1, CH2, CH3 and CH4. The channel, terminal and their description refer to Table 3-2.

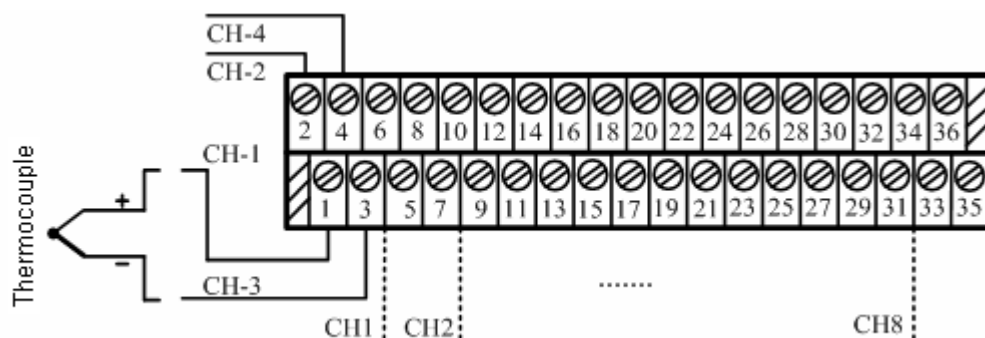


Figure 3-2 Terminal Wiring Diagram

Each channel of AI722-S11 actually occupies 2 connecting terminals to introduce local signals. The connection is shown in interface connection diagram and the terminal connection is shown in the following table. 33 and 34 are cold junction compensation resistance connection terminals.



Tip:

The cold junction compensation resistance (standard: 103AT-S) must come from the DCS manufacturer to ensure the measuring precision.

Table 3-2 Connection Diagram of AI722-S11 Terminals

Wiring diagram	Terminal	Channel	Description	Remarks
<p>Thermopair</p> <p>Voltage Signal</p>	1	CH-1	+	CH1
	2	CH-2	No Connection	
	3	CH-3	-	
	4	CH-4	No Connection	
	5	CH-1	+	CH2
	6	CH-2	No Connection	
	7	CH-3	-	
	8	CH-4	No Connection	
	9	CH-1	+	CH3
	10	CH-2	No Connection	
	11	CH-3	-	
	12	CH-4	No Connection	
	13	CH-1	+	CH4
	14	CH-2	No Connection	
	15	CH-3	-	
	16	CH-4	No Connection	
	17	CH-1	+	CH5
	18	CH-2	No Connection	
	19	CH-3	-	
	20	CH-4	No Connection	
	21	CH-1	+	CH6
	22	CH-2	No Connection	

Wiring diagram	Terminal	Channel	Description	Remarks
	23	CH-3	-	
	24	CH-4	No Connection	
	25	CH-1	+	CH7
	26	CH-2	No Connection	
	27	CH-3	-	
	28	CH-4	No Connection	
	29	CH-1	+	CH8
	30	CH-2	No Connection	
	31	CH-3	-	
	32	CH-4	No Connection	
	33, 34	Connect with Reference Junction Temperature Compensation		
	35, 36	No Connection		

3.5 Base/Terminal Unit Selection

Selection of bases/terminal unit matching AI722-S11 is shown in Table 3-3.

Table 3-3 Selection of bases/terminal unit matching AI722-S11

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

AI722-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 address of AI722-S11 is determined according to its position in the rack (Please refer to *Control Station Hardware User Manual*). 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 AI722-S11 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

4.1 Notices

1. It is prohibited to connect 24V power directly to current input channel; otherwise it may cause damage to the corresponding channel.
2. AI722-S11 allows input signal to exceed certain configuration range, but just 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, but the precision of sampling data can not be completely ensured in this case. When the input signal exceeds the over-range limit, the module will record the phenomenon and limit the sampling data.
3. The default over-range limit of AI722-S11 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.

Section 5 Revision

Table 5-1 Retrofit list of the version

Document Version	Applicable Module Version	Remarks
V1.0(20110129)	AI722-S V10.10.00 VisualFieldV3.1+SP03	The First Version
V1.1(20120831)	AI722-S V12.12.00 and later version VisualFieldV3.1+SP03	Add the information of B type thermocouple
V1.2(20130929)	AI722-S V12.12.00 and later version VisualFieldV3.1+SP03	Delete Atmospheric Pressure
V1.3(20131223)	AI722-S11 V12.12.00 and later versions	Bases selection and power distribution have been changed Add model information
V1.4(20150917)	AI722-S11 V12.12.00 and later versions	Modify IO link module address
V1.5(20160503)	AI722-S11 V12.12.00 and later versions	Modify the cold junction compensation resistance
V1.6(20161116)	AI722-S11 V12.12.00 and later versions	Add code
V1.7(20210206)	AI722-S11 V12.12.00 and later versions	Add common-mode and series-mode rejection ratio