

## 2.2.2. Thermocouple, Voltage & Current Input Module

### ■ Thermocouple Introduction

A thermocouple is a temperature sensor which consists of two wires of different conductors.

Based on the Seebeck effect in thermoelectricity, the temperature difference results voltage difference on the two wires.

Thermocouples are widely used in scientific and industrial applications because they're generally accurate and can operate over wide range of temperature.



### ■ Applications



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RS-485 I/O Products

Thermocouple, Voltage & Current Input Module		
Model Name	I-7011(D) M-7011(D)	I-7018 M-7018
Pictures		
Channels	1	8 (I-7018 is 6-channel differential and 2-channel single-ended, or 8-channel differential. M-7018 is 8-channel differential.)
Wiring	Differential	
★ Sensor Type	Thermocouple	J, K, T, E, R, S, B, N, C
	Voltage	±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V
	Current	±20 mA (requires optional external 125 Ω resistor)    ±20 mA, 0 ~ 20 mA, 4 ~ 20 mA (requires optional external 125 Ω resistor)
Resolution	16-bit	
★ Accuracy	0.1%	
★ Sampling Rate	10 Hz	10 Hz (Total)
Input Impedance	> 400 kΩ	
★ Common Voltage Protection	±5 Vdc	±15 Vdc
★ Individual Channel Configuration	-	
★ Overvoltage Protection	±5 Vdc	±80 Vdc
Overcurrent Protection	-	
Virtual Channel to Channel Isolation	-	±30 Vdc
Open Wire Detection (for thermocouple only)	Yes	-
Temperature Outputs Consistency	-	
Stable Temperature Output in the Field	-	
<b>System</b>		
★ Dual Watchdog	Yes	
ESD (IEC 61000-4-2)	-	
EFT (IEC 61000-4-4)	-	
Intra-Module Isolation, Field-to-Logic	3000 Vdc	
Power Input	10 ~ 30 Vdc	
Power Consumption	0.9 W; 1.5 W for (D) version	1.0 W

Note1: I-7011(D) and M-7011(D) both include 1 DI and 2 DO channels. The specification is as following

Digital Input		Digital Output		■ Thermocouple Type			
Channels	1	Channels	2	Type	Range (°C)	Type	Range (°C)
Contact	Dry	Type	Open Collector	J	-210 ~ +760	B	0 ~ +1820
Sink/Source (NPN/PNP)	Source	Sink/Source (NPN/PNP)	Sink	K	-270 ~ +1372	N	-270 ~ 1300
On Voltage Level	Close to GND	Load Voltage	3.5 ~ 30 Vdc	T	-270 ~ +400	C	0 ~ 2320
Off Voltage Level	Open	Max. Load Current	30 mA/Channel	E	-270 ~ +1000	L	-200 ~ +800
Counter (50 Hz, 16-bit)	Yes	Power-on Value	Yes	R	0 ~ +1768	M	-200 ~ +100
Input Impedance	3 kΩ	Safe Value	Yes	S	0 ~ +1768	L (DIN43710)	-200 ~ +900
Overvoltage Protection	±30 Vdc						

### Heavy Industrial Grade

To work well in heavy industrial environment, the hardware of module need special design to against noise, surge, EFT. For this purpose, we provide several heavy industrial grade analog modules.

1. Common Voltage Protection
2. Overvoltage Protection
3. ESD (IEC 61000-4-2)
4. EFT (IEC 61000-4-4)

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RS-485 I/O Products

Thermocouple, Voltage & Current Input Module (Heavy Industrial Grade)				
Model Name	I-7018R	I-7018Z	I-7019R	M-7019Z
	M-7018R	M-7018Z	M-7019R	
Pictures				
<b>Thermocouple, Voltage &amp; Current Input</b>				
Channels	8	10	8	10
Wiring	Differential			
Sensor Type	Thermocouple	J, K, T, E, R, S, B, N, C, L, M, LDIN43710		
	Voltage	±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V		±15 mV, ±50 mV, ±100 mV, ±150 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V, ±10 V
	Current	±20 mA (requires optional external 125 Ω resistor)		±20 mA, 0 ~ 20 mA, 4 ~ 20 mA (Jumper selectable)
Resolution	16-bit			
★ Accuracy	0.1%			
★ Sampling Rate	10 Hz (Total)		8 Hz (Total)	10 Hz (Total)
Input Impedance	> 400 kΩ			
★ Common Voltage Protection	±200 Vdc		±200 Vdc	
★ Individual Channel Configuration	-	Yes	Yes	
★ Overvoltage Protection	240 V <sub>rms</sub>		240 V <sub>rms</sub>	
Overcurrent Protection	-			
Virtual Channel to Channel Isolation	±400 Vdc			
Open Wire Detection (for thermocouple only)	Yes		Yes	
Temperature Outputs Consistency	-	Yes	-	Yes
Stable Temperature Output in the Field	-	Yes	-	Yes
<b>System</b>				
Dual Watchdog	Yes			
ESD (IEC 61000-4-2)	±4 kV			
EFT (IEC 61000-4-4)	±4 kV			
Intra-Module Isolation, Field-to-Logic	3000 Vdc			
Power Input	10 ~ 30 Vdc			
Power Consumption	1.0 W	1.1 W	1.2 W	1.8 W

Note1: We recommend to choose I-7018Z/M-7018Z and M-7019Z for extremely accurate thermocouple measurement.

#### Thermocouple Type

Type	Range (°C)	Type	Range (°C)
J	-210 ~ +760	B	0 ~ +1820
K	-270 ~ +1372	N	-270 ~ 1300
T	-270 ~ +400	C	0 ~ 2320
E	-270 ~ +1000	L	-200 ~ +800
R	0 ~ +1768	M	-200 ~ +100
S	0 ~ +1768	L (DIN43710)	-200 ~ +900

#### Accessories for I-7018Z, M-7018Z and M-7019Z

 <b>I-7018Z-G/S</b> = I-7018Z-G Connects DB-1820 Directly	 <b>I-7018Z-G/2S</b> = I-7018Z-G Connect DN-1822 Directly +1.8 m Cable	 <b>I-7018Z-G/S + CD-2518D</b>	 <b>CD-2518D</b> = 1.8 m Cable + DB-1820	 <b>I-7018Z-G/S + CD-25015 + 4PAPP-006-G</b>
			 <b>CD-25015</b> = 15 cm Cable + DB-1820	 <b>4PAPP-006-G</b>