Thermocouple Input Modules

Thermocouple Input (TC) modules include three independent input channels. Each input channel receives variable voltage signals from each point, performs thermocouple linearization and cold-junction compensation, and converts the result to degrees Celsius or Fahrenheit. Each channel then transmits 16-bit signed integers representing 0.125 degrees per count to the three Main Processors on demand. In TMR mode, a value is then selected using a mid-value selection algorithm to ensure correct data for every scan.

Each Thermocouple Input Module is programmable to support one thermocouple type, selected from J, K and T for standard Thermocouple Input Modules and from J, K, T, and E for isolated Thermocouple Input Modules. The isolated module allows users to select upscale or downscale burnout detection with the TriStation 1131 software. For non-isolated modules, upscale or downscale burnout detection depends on the field termination selected.

Triplicated temperature transducers residing on the field termination panel support cold-junction compensation. Each channel of a Thermocouple Input Module performs auto-calibration using internal precision voltage references. On the isolated module, a faulting cold-junction transducer is annunciated by a cold-junction indicator on the front panel.

Each module performs complete ongoing diagnostics on each channel. Failure of any diagnostic on any channel activates the Fault indicator, which in turn activates the chassis alarm signal. The module Fault indicator merely reports a channel fault, not a module failure. The module continues to operate properly with as many as two faulty channels.

Thermocouple Input Modules support hot-spare capability, which allows online replacement of a faulty module. Thermocouple Input Modules require a separate external termination panel (ETP) with a cable interface to the Tricon controller backplane.

Each module is mechanically keyed to prevent improper installation in a configured chassis.

Thermocouple Input Module Specifications

Model Number	3706A	3708E
Type	TMR, thermocouple	TMR, thermocouple
Number of input signals	32 differential, DC coupled	16 differential, isolated
Isolated points	No	Yes
Input update rate	50 ms, maximum[a]	50 ms
Thermocouple types supported[b]	J, K, T	J, K, T, E
Accuracy/temp range	See Table A	See Table B
Input resistance (load)	22 MΩ (DC), typical	30 MΩ (DC), minimum
Noise rejection		
Common mode	-85 dB @ 0-60 Hz, minimum -95 dB @ DC, typical	-90 dB @ 0-60 Hz, minimum -100 dB @ DC, minimum
Normal mode	-17 dB @ 60 Hz	-3 dB @ 8 Hz, typical -17 dB @ 60 Hz, typical
Common mode range	±10 VDC max. (channel-to-channel or channel-to-ground)	±200 VDC, max (channel-to-channel or channel-to-ground)
Leg-to-leg isolation	200 KΩ, typical	20 KΩ, typical
Input point protection	110 VAC, continuous	110 VAC, continuous
Reference junction compensation range	32°-140° F (0°-60° C)	32°-140° F (0°-60° C)
Diagnostic indicators	PASS, FAULT, ACTIVE	PASS, FAULT, ACTIVE, CJ FAULT
Color code	Tan	Deep yellow

a. Inputs frozen for one second upon insertion of spare module.
b. Selected using the TriStation 1131 software.

Accuracy of Thermocouple Types for Model 3706A

TC Type	Temperature Range	*Accuracy*[a] (TC Termination Module @ 32-140° F [0-60° C])	
		T_a = 77° F (25° C) *(Typical)*	T_a = 32-140° F (0-60° C) *(Maximum)*
J	-250 to 32° F (-157 to 0° C° C)	± 5.0° F (2.8° C)	± 7.0° F (3.9° C)
	>32 to 2000° F (0 to 1093° C)	± 4.0° F (2.3° C)	± 5.0° F (2.8° C)
K	-250 to 32° F (-157 to 0° C)	± 6.0° F (3.4° C)	± 9.0° F (5.0° C)
	>32 to 2500° F (0 to 1371° C)	± 4.0° F (2.3° C)	± 6.0° F (3.4° C)
T	-250 to 32° F (-157 to 0° C)	± 5.0° F (2.8° C)	± 9.0° F (5.0° C)
	>32 to 752° F (0 to 400° C)	± 3.0° F (1.7° C)	± 5.0° F (2.8° C)

Accuracy of Thermocouple Types for Model 3708E

TC Type	Temperature Range	*Accuracy*[a] (TC Termination Module @ 32-140° F [0-60° C])	
		T_a = 77° F (25° C) *(Typical)*	T_a = 32-140° F (0-60° C) *(Maximum)*
J	-238 to 32° F (-150 to 0° C)	± 3.0° F (1.7° C)	± 9.0° F (5.0° C)
	>32 to 1400° F (0 to 760° C)		± 5.5° F (3.1° C)
K	-238 to 32° F (-150 to 0° C)	± 4.0° F (2.3° C)	± 8.0° F (4.5° C)
	>32 to 2284° F (0 to 1370° C)		± 7.0° F (3.9° C)
T	-250 to 32° F (-161 to 0° C)	± 3.0° F (1.7° C)	± 8.5° F (4.8° C)
	>32 to 752° F (0 to 400° C)		± 4.5° F (2.5° C)
E	-328 to 32° F (-200 to 0° C)	± 3.0° F (1.7° C)	± 8.0° F (4.5° C)
	>32 to 1830° F (0 to 999° C)		± 5.0° F (2.8° C)

a. Accuracy specifications account for errors related to reference-junction compensation, but do not account for errors caused by temperature gradients between the temperature transducers and the TC terminations. The user is responsible for maintaining a uniform temperature across the TC Termination Module.

3674	Dual DO, 24 VDC, self-protected, 32 pts.	9662-610F	n/a	9653-610F	9671-610F	n/a	9101-010F	n/a	9671-810F[b]
Module Model #	**Module Description**	**Commoned Term Panels**	**Non-Common. Term Panels**	**Basic Term Panels**	**Nonincendive Term Panels**	**RG 1.180 Term Panels**	**Fanned-out Cables**	**Bypass Panels**	**ERT Loop-Back Cables/Panels**
3805E 3805H	AO, 4–20 mA, 8 pts.	n/a	n/a	9853-610F	9861-610F	9860-610F	n/a	n/a	n/a
2870H	AO HART Interface	n/a	n/a	9853-610F	9861-610F	9860-610F	n/a	n/a	n/a
3806E	AO, 6 4–20 mA outputs, 2 20–320 mA outputs	n/a	n/a	9863-710F (special panel)	n/a	n/a	n/a	n/a	n/a
3807	AO, 4 bipolar -60 to 60 mA outputs	9881-810F	n/a	n/a	9871-810F	n/a	n/a	n/a	n/a
Module Model #	**Module Description**	**Upscale**	**Downscale**	**Basic Term Panels**	**Nonincendive Term Panels**	**RG 1.180 Term Panels**	**Fanned-out Cables**	**Bypass Panels**	**ERT Loop-Back Cables/Panels**
3706A	Thermocouple input, type J, K, T, differential, 32 pts.	9766-210F	9766-510F	n/a	9784-610F, upscale 9785-610F, downscale	n/a	n/a	n/a	n/a
3708E	Thermocouple input, type E, J, K, T, isolated, 16 pts.	9765-610F	9765-610F	n/a	9786-110F	9782-110F	n/a	n/a	n/a
Module Model #	**Module Description**	**3-Wire 4-20 mA**	**Voltage**	**2-Wire 4-20 mA**	**Nonincendive Term Panels**	**RG 1.180 Term Panels**	**Basic**		**RTD/TC/AI**
3700 3700A	AI, 0–5 VDC, differential, 32 pts.	n/a	9763-810F	9761-210F, 0–5 V 9771-210F, 0–5 V	9791-610F, current input 9787-110F, voltage input	9790-610F, current input 9792-610F, 4-20 mA, 0-5 V, 16 VDC-56 VDC field 9783-110F, voltage input 9764-310F, RTD/TC/AI input[c]	9753-110F, 0–5 V		9764-310F[c]
2770H	AI HART Interface	n/a	n/a	9761-210F, 0–5 V 9771-210F, 0–5 V	9791-610F, current input	9790-610F, current input	n/a		n/a
3701	AI, 0–10 VDC, differential, 32 pts.	n/a	9763-810F	9761-410F	n/a	n/a	9753-110F, 0–10 V		n/a
3703E[d]	AI, 0–5/0–10 VDC, isolated, 16 pts.	n/a	9763-810F	9762-210F, 0–5 V 9762-410F, 0–10 V 9771-210F, 0-5 V	9791-610F, current input 9787-110F, voltage input	9790-610F, 4–20 mA, 0–5 V 9792-610F, 4-20 mA, 0-5 V, 16 VDC-56 VDC field 9795-610F, 4–20 mA, 0–10 V 9783-110F, voltage input	9753-110F, 0–5/0–10 V		n/a
3704E[d]	AI, 0–5/0–10 VDC, non-isolated, 64 pts.	9765-210F, 0–5V	n/a	9760-210F, 0–5 V 9760-410F, 0–10 V	9789-610F, 4–20 mA	n/a	9750-210F, 4–20 mA 9750-810F, 0–5/0–10 V		n/a
3720	AI, 0–5 VDC, single-ended, 64 pts.	9765-210F, 0–5 V	n/a	9760-210F, 0–5 V	9789-610F, 4–20 mA	n/a	9750-210F, 4–20 mA 9750-810F, 0–5 V		n/a
3721[d]	AI, 0 to 5 VDC or –5 to +5 VDC, differential, 32 pts.	n/a	9763-810F	9761-210F, 0–5 V 9761-410F, 0–10 V 9771-210F, 0–5 V	9791-610F, current input 9787-110F, voltage input	9790-610F, 4–20 mA, 0–5 V 9792-610F, 4-20 mA, 0-5 V, 16 VDC-56 VDC field 9795-610F, 4–20 mA, 0–10 V 9783-110F, voltage input 9764-310F, RTD/TC/AI input[c]	9753-110F, 0–5 V		9764-310F[c]

a. Point blown-fuse indicator will not illuminate when point fuse is removed. Each point is commoned.

b. Point blown-fuse indicator will not illuminate when point fuse is removed. Each point is self-protected and commoned.

c. Signal conditioners must be ordered separately. A total of 16 is required for each termination panel.

d. Must be configured using the TriStation 1131 software.