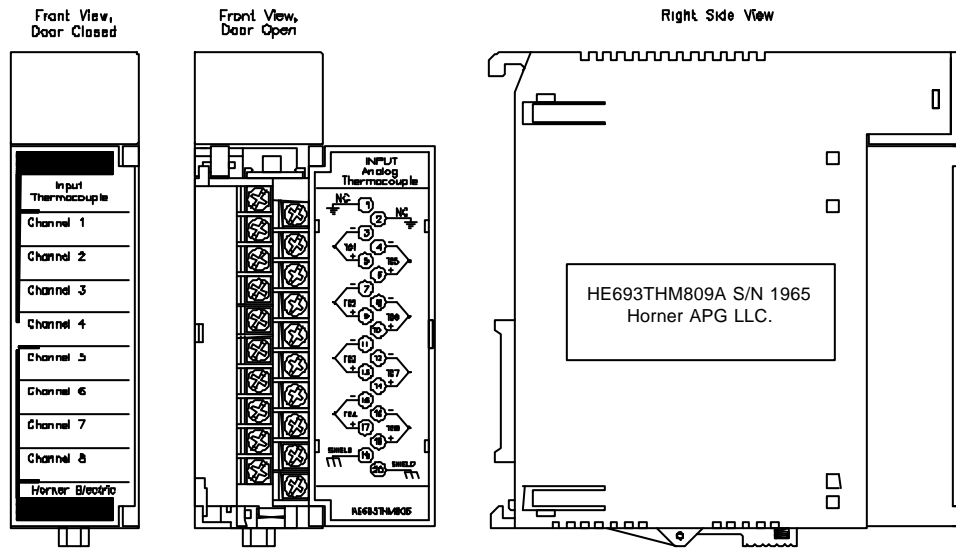




# Thermocouple Input Module Product Specifications and Installation Data

## 1 DESCRIPTION

The Horner APG Thermocouple Input Modules allow thermocouple temperature sensors to be directly connected to the PLC without external signal processing (transducers, transmitters, etc.). All analog and digital processing of the thermocouple signal is performed on the module. These modules have a resolution of 0.5°C, and temperature values may be reported to the PLC %AI I/O table in 0.5°C or 0.5°F increments. There are four standard resolution models available, with four input channels (HE693THM409/HE693THM449), and with eight input channels (HE693THM809/HE693THM889). All models feature open circuit detection, where the temperature value written to the %AI register goes to its maximum value upon an open circuit condition. Two models (HE693THM449 and HE693THM889) also feature %I alarm bits which energize on an open circuit condition. The first four %I bits are used for the HE693THM449 and the first eight %I bits are used for the HE693THM889.



## 2 SPECIFICATIONS

Table 1 – Specifications					
Specification	THM409[449]	THM809[889]	Specification	THM409 [449]	THM809 [889]
Power Consumption	70mA @ 5VDC and 60mA @ 24V Relay		I/O Points Required	4%AI, [& 16%I]	8%AI [& 16%I]
Number of Channels	4	8	Input Impedance	>20Mohms	
Types Supported	J, K, N, T, E, R, S,		Maximum Safe Overload	+/- 35V	
Input Range (Temp) (J, K, N, T, E, R,S)	J: -210 TO +760°C	E: -270 to +1000°C	Common Mode Range	+/- 12V	
	K: -270 to +1372°C	R: 0 to +1768°C	Common Mode Rejection	>100dB	
	N: -270 to +1300°C	S: 0 to +1768°C	A/D Conversion Type	Integrating	
	T: -270 TO +400°C		A/D Conversion Time	5 ms	
Resolution	0.5°C		Operating Temperature	0 to 60°C (32 to 140°F)	
Accuracy	+/- 0.5°C typical (Type J)		Relative Humidity	5% to 95% non-condensing	

## 3 CONFIGURATION

SLOT 2	SOFTWARE CONFIGURATION	
	Catalog #: FOREIGN	FOREIGN MODULE
FRGN	<pre> Module ID      : 3 %I Ref Adr    : %I0001  Byte 1   : 00000001  Byte 9   : 00 %I Size       : 0       Byte 2   : 00000010  Byte 10  : 00 %Q Ref Adr    : %Q0001  Byte 3   : 00         Byte 11  : 00 %Q Size       : 0       Byte 4   : 00         Byte 12  : 00 %AI Ref Adr   : %AI001  Byte 5   : 00         Byte 13  : 00 %AI Size      : 8       Byte 6   : 00         Byte 14  : 00 %AQ Ref Adr   : %AQ001  Byte 7   : 00         Byte 15  : 00 %AQ Size      : 0       Byte 8   : 00         Byte 16  : 00                     </pre>	

Figure 2 - Foreign Module Configuration

To reach this screen, select I/O Configuration (F1), cursor over to the slot containing the module and select Other (F8), and Foreign (F3). This configuration is for the HE693THM809.

Table 2 – Configuration Parameters							
Model	%AI Size	%I Size	Byte				
			1	2	3	4	5
THM409	4	0	1	(see chart)	0: 0.5°C	0	00: J 01: K 02: N 03: T 04: E 05: R 06: S
THM449		16					
THM809	8	0					
THM889		16					

Byte 2 sets digital filtering, Byte 3 sets temperature units, and Byte 5 sets the thermocouple type.

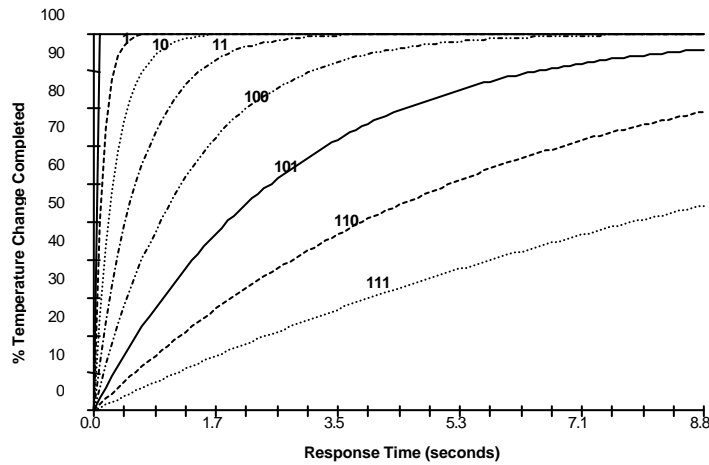


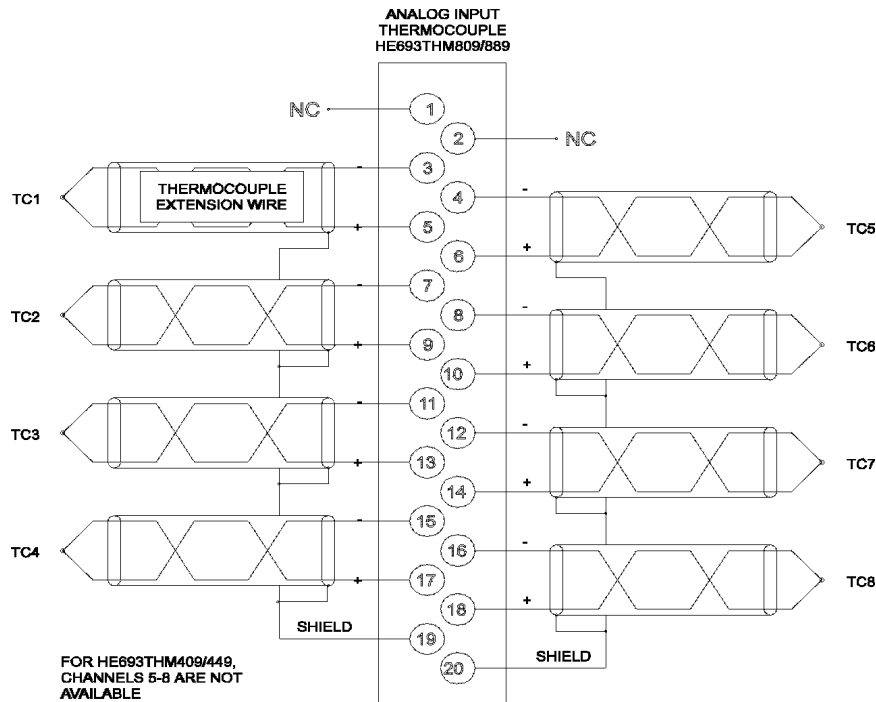
Figure 3 - Digital Filtering

The effect of digital filtering (set with Byte 2) on module response to a temperature change. (% temp change completed vs. time).

Table 3 – Temperature Scaling	
Byte 3	Formula
0	°C = %AI / 2
1	°F = %AI / 2

Temperature values are written to the %AI registers in 0.5°C or 0.5°F increments, depending upon the value of Byte 3.

## 4 WIRING



## 5 INSTALLATION

### 5.1 Installation Hints

1. Special care must be taken with grounded junction sensors to avoid applying a voltage potential to the thermocouple junction.
2. Extension wire of the proper Thermocouple type must be used. Keep total wire resistance less than 100Ω to maintain rated accuracy.
3. Extension wiring should be routed in its own conduit. Shielded, twisted pair extension wiring offers best noise immunity.
4. If shielded wiring is used, a good earth ground connection is critical. Terminals 19 and/or 20 may be used as the shield ground point.

## 6 CONFORMANCE TO STANDARDS

The Thermocouple input modules are CE-marked to indicate compliance with the EMC Directive. The EMC Directive is concerned with the immunity of electrical equipment to a variety of interference sources and the emissions from electrical equipment which could interfere with the operation of other equipment. The EMC Directive applies to complete installations, and since Horner APG products are included in the installation, Horner APG is supporting the EMC Directive by testing and CE-marking a subset of our equipment.

### 6.1 General

In order to meet CISPR (EN 55011) Group 1, Class A Radiated Emissions levels, all components in the PLC system require the following:

- ♦ All components must be mounted in a metal enclosure or the equivalent. The wiring must be routed in metal conduit or the equivalent. All surfaces of the enclosure must be adequately grounded to adjacent surfaces to provide electrical conductivity.
- ♦ The metal conduit (flexible conduit is acceptable) for all wiring external to the cabinet must be mounted to the enclosure using standard procedures and hardware to ensure electrical conductivity between the enclosure and the conduit.
- ♦ An external EMI filter must be wired to the AC Main for the PLC. Sprague Electric Part Number 259A9098P3 (available from GE Fanuc), or any other EMI filter which provides equivalent performance, may be used.
- ♦ An external ground wire (16 AWG (1.32 mm<sup>2</sup>), 6" (15.24 cm) maximum length) must be wired from the Series 90-30 power supply safety ground wire terminal to the metal enclosure.
- ♦ On AC Main Ports connected to PLCs, MOVs shall be connected Line to Line and Line to Ground.
- ♦ All cables and Analog signals must use shielded cable with a minimum of overall foil.



**EMC Directive  
89/336/EEC  
92/31/EEC  
93/68/EEC**

## 6.2 Specifics

Use fully shielded high-grade thermocouple sensor wire. Shielded, twisted pair extension wire offers the best noise immunity.

Extension wiring must be routed in its own conduit.

A good earth ground is critical for the shielded wire.

Do not expose the module(s) to excessive EMI or RF interference.

Do not expose the module(s) to extreme temperature variations

Module(s) must be allowed to stabilize for at least 15 minutes after complete connection and power-on.

Module(s) must be in the upright position (panel-mounted position).

Special care must be taken with grounded junction sensors to avoid applying a voltage potential to the thermocouple junction.

Extension wire of the proper sensor type must be used.

Keep wire lengths to a minimum.

## 6 TECHNICAL ASSISTANCE

For user manual updates, contact Horner APG, Technical Support Division, at (317) 916-4274 or visit our web site at [www.heapg.com](http://www.heapg.com).