Thermocouple / Millivolt Input Module

HE800THM000 / HE800THM100
HE820THM000 / HE820THM100*

*** HE820 denotes plastic case.**

This datasheet also covers products starting with IC300 instead of HE800 or HE820.

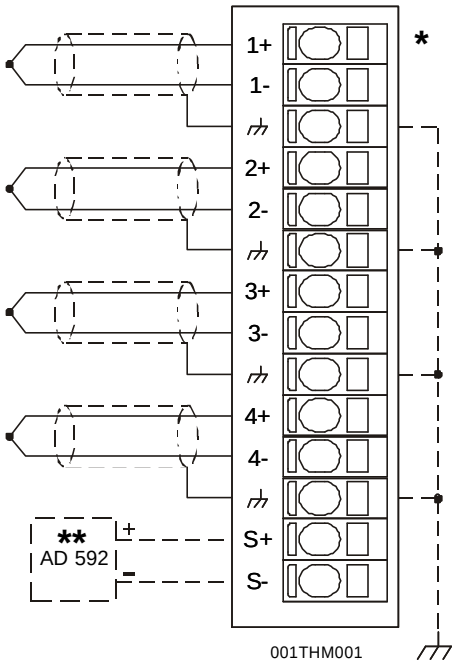
1 SPECIFICATIONS

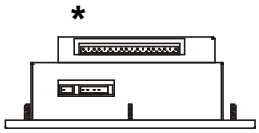
	THM000	THM100		THM000	THM100
Number of Channels	2	4	PLC Update Rate	Set by PLC Scan Rate	
Resolution	0.05°C		Analog Input Points Required	2	4
Input Impedance	10Meg Ohm clamped @ ±24VDC		Cold Junction Compensation	Internal or External; Automatically Selected	
A/D Conversion Type	Integrating		Maximum Sustained Differential O/L	Limited by Common Mode Range	
Required Power (Steady State)	0.34W (14.3mA @ 24VDC)		Common Mode Range	± 12VDC Max.	
Required Power (Inrush)	Negligilble		A/D Conversion Time	16 channels per second	
Types Supported	J,K,T,E,C,R,S		Open Thermocouple Response	High Temperature	
Millivolt Ranges	±25mv, ±50mv, ±100mv		Operating Temperature	0° to 60° Celsius	
Millivolt Accuracy	0.1% Full Scale		Relative Humidity	5 to 95% Non-condensing	
			Weight	9.5 oz. (270 g)	
Common Channel Points	None		**Accuracy** (Accuracy Specifications not guaranteed below -200°C)		
			Types **J,K,T, & E** ±1°C	Type **C** To Be Determined	Types **R & S** ±4°C

Thermocouple Type:	**J**	**K**	**T**	**E**
Input Range Temperature	-210°C to 770°C (-346°F to 1418°F)	-270°C to 1380°C (-454°F to 2516°F)	-270°C to 410 °C (-454°F to 770°F)	-270°C to 1010°C (-454°F to 1850°F)
	C	**R**	**S**	
	0°C to 2320°C (32°F to 4208°F)	0°C to 1760°C (32°F to 3200°F)	0°C to 1760°C (32°F to 3200°F)	

CE UL	See Compliance Table at http://www.heapg.com/Support/compliance.htm

2 WIRING





OCS Bottom View – Shows Corresponding I/O Pin

Pin	Signal	
	THM100	**THM000**
1+	Thermocouple 1 +	Thermocouple 1 +
1-	Thermocouple 1 -	Thermocouple 1 -
⏚	Shield	Shield
2+	Thermocouple 2 +	Thermocouple 2 +
2-	Thermocouple 2 -	Thermocouple 2 -
⏚	Shield	Shield
3+	Thermocouple 3 +	
3-	Thermocouple 3 -	
⏚	Shield	
4+	Thermocouple 4 +	
4-	Thermocouple 4 -	
⏚	Shield	
S+	External AD592 +	
S-	External AD592 -	

****** The AD592 is a 1uA/°K integrated circuit temperature sensor manufactured by Analog Devices. It may be used for external cold junction compensation for the THM100. The THM100 needs to be calibrated with a specific AD592 to meet accuracy specifications in external compensation mode.

3 CONFIGURATION

Note: The status of the I/O can be monitored in Cscape Software.

Preliminary configuration procedures that apply to SmartStack™ Modules are contained in the hardware manual of the controller you are using. Refer to the **Additional References** section in this data sheet for a listing of hardware manuals.

Module Setup Tab

a. Sensor Type for each channel must match what is physically attached.

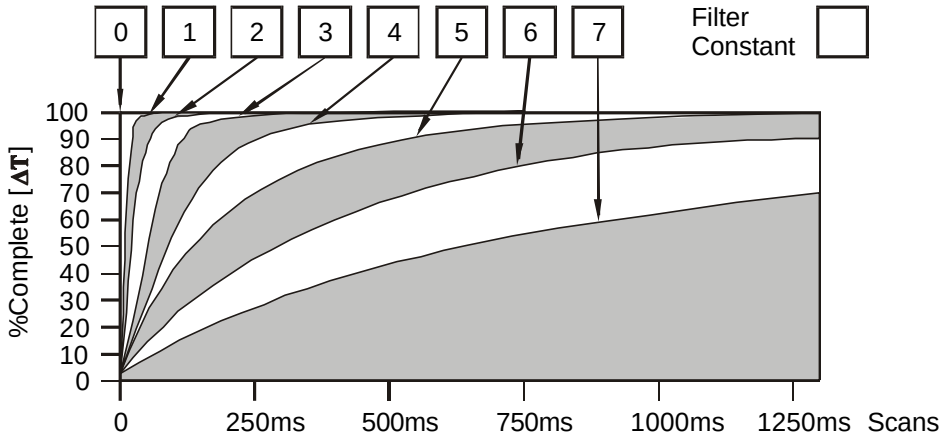
b. Temperature format may be set for various C° or F° ranges. (This does not apply to millivolt ranges.)

c. Filter Constant sets the level of digital filtering according to the chart below.

d. Reject Rates sets the frequency level for noise rejection at 50 or 60HZ.

I/O Map Tab

The I/O Map describes which I/O registers are assigned to a specific SmartStack™ Module and where the module is located in the point map. The I/O Map is determined by the model number and location within the SmartStack™. The I/O Map is not edited by the user.



Digital Filtering. The illustration above demonstrates the effect of digital filtering (set with Filter Constant) on module response to a temperature change.

4 INPUT AND OUTPUT CONVERSIONS

For a given module configuration, use the appropriate formula in the table to obtain the actual temperature (°C or °F) that is represented by the value in the %AI register.

Thermocouple Configuration	Temperature Conversion	
	Celsius	**Fahrenheit**
0.05°	°C = %AI / 20 *	°F = %AI / 20 *
0.1°	°C = %AI / 10 **	°F = %AI / 10 **
0.5°	°C = %AI / 2	°F = %AI / 2

* Maximum reading in 0.05°F or 0.05°C format is limited to 1638.3 because of %AI resolution.

** Maximum reading in 0.1°F or 0.1°C format is limited to 3276.7 because of %AI resolution.

The following table describes how real-world inputs are scaled into the controller. Given a known input voltage, the data value is configured by using the conversion factor from the table. The following formula is used: **Data = Voltage In (Vin) / Conversion Factor**

Example: The user selects a voltage of 25mV.

1. The known input voltage is 25mV.
2. Using the table, the conversion factor for the voltage range of ± 25mV is 0.00078125.
3. To determine the data value, the formula is used: Data = Vin / Conversion Factor
   32000 = 25mV / 0.00078125

Conversion of Real-World Inputs to the Controller			
	%AI Value		
Selected Voltage Range	Voltage In (Vin) VDC	Data Out	Conversion Factor
± 25mv	-25mv	-32000	0.00078125
	0	0	
	+25mv	+32000	
± 50mv	-50mv	-32000	0.0015625
	0	0	
	+50mv	+32000	
± 100mv	-100mv	-32000	0.003125
	0	0	
	+100mv	+32000	

5 INSTALLATION / SAFETY

Warning: Remove power from the OCS controller, CAN port, and any peripheral equipment connected to this local system before adding or replacing this or any module.

a. All applicable codes and standards should be followed in the installation of this product.
b. Shielded, twisted-pair wiring should be used for best performance.
c. Shields may be terminated at the module terminal strip
d. In severe applications, shields should be tied directly to the ground block within the panel.
e. Ungrounded thermocouple sensors are preferred due to their isolated electrical characteristics
f. Interposing terminal strips between the sensor and the module can cause errors due to cold junction effect.
g. If Interposing terminal strips must be used, use specially constructed terminal blocks which match the material characteristics of the thermocouple sensor.
h. Use the following wire type or equivalent: Omega TT-J-20-TWSH for thermocouple input and Belden 8441 for mV input.
i. Horner thermocouple input modules use a high impedance differential circuit to support the use of grounded or ungrounded thermocouples. For grounded thermocouples, the specified **Common Mode Range** allows for ground potential differences between the machine ground and the PLC ground within that range. For ungrounded or floating thermocouples the high impedance inputs are subject to common mode noise pickup. For noisy environments it is recommended that one side of all ungrounded thermocouples be grounded near the PLC. This does not affect open thermocouple detection or measurement accuracy and reduces the effect of common mode noise if present. This PLC side ground connection must not be used with grounded thermocouples or accuracy will be affected. Any thermocouple should be grounded in one place at most.

For detailed installation and a handy checklist that covers panel box layout requirements and minimum clearances, refer to the hardware manual of the controller you are using. (See the **Additional References** section in this document.)

When found on the product, the following symbols specify:

Warning: Consult user documentation.

Warning: Electrical Shock Hazard.

7 ADDITIONAL REFERENCES

For detailed installation, configuration and other information, refer to the hardware manual of the controller you are using. See the **Technical Support** section in this document for the web site address to download references and to obtain revised editions.

Additional References	
Controller	**Manual Number**
Operator Control Station Hardware (OCS, OCX) e.g., OCS1XX / 2XX; Graphic OCS250	MAN0227
Remote Control Station Hardware (RCS [except RCS116], RCX) e.g., RCS210, RCS250	
Color Touch OCS Hardware e.g., OCS300, OCS301,OCS350, OCS351 e.g., OCS451, OCS551, OCS651	MAN0465
OCS LX Series Hardware e.g., LX280 / LX300; RCS116	MAN0755
MiniOCS / MiniRCS / MiniOCX / MiniRCX Hardware e.g., HE500OCSxxx	MAN0305
Other Useful References	
Cscape Programming and Reference	MAN0313
DeviceNet™ Implementation	SUP0326
Wiring Accessories and Spare Parts Manual	MAN0347

8 TECHNICAL SUPPORT

For assistance and manual up-dates, contact Technical Support at the following locations:

North America:
(317) 916-4274
www.heapg.com

Europe:
(+) 353-21-4321-266
www.horner-apg.com

NOTES