

DIN Thermocouple Conditioner

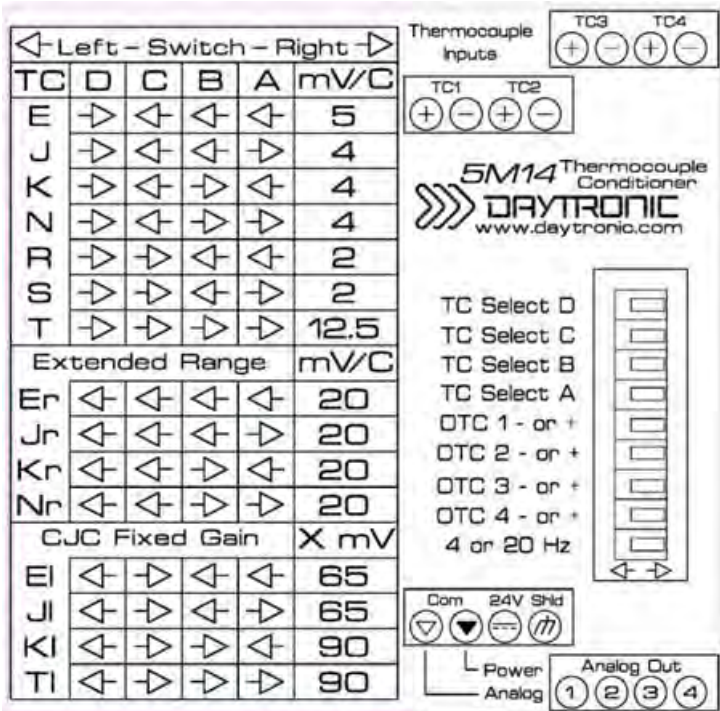
MODEL 5M14(V)

QUAD ISOLATED THERMOCOUPLE CONDITIONER Module

1 GENERAL DESCRIPTION AND SPECIFICATIONS

The Model 5M14(V) is a precision conditioner designed for TC-based temperature measurements requiring *high input isolation*. With built-in reference-junction compensation, it accepts up to four independent temperature signals from **Types E, J, K, N, R, S, and T Thermocouples**. *All four thermocouple inputs must be of the same type*. Sensors may be grounded or ungrounded, in any desired mix. An amplifier-per-channel design with chopper stabilization and active low-pass filtering allows highly responsive, amplified analog signals with or without linearization correction.

For the Model **5M14**, the analog output signal is 5 Vdc and the **5M14V** is 10 Vdc. These are *nominal* full scale voltages since the Module is based on a millivolt per degree C value. All setup of the module is accomplished via the front panel configuration switch settings - polarity over-range, TC type, filter setting, extended gain, and linearized or non-linearized output.



Model 5M14 Thermocouple Module

Access switch settings via the front panel of the 5M14 by gently pulling the clear plastic cover (from the bottom side) so the cover rotates open from the top. Use a small tool or finger to place the switches to the left or right position as you face the front of the module. This process can be done with or without power to the unit. Once completed, return the cover to the original position.

Open Thermocouple Detection (OTC)

Can be set per individual TC input to saturate the analog output signal full-scale positive or negative. Note: when this condition exists the analog output can be as much as 12 Vdc. When an OTC condition occurs, the yellow LED indicator on the front of the module will illuminate.

View of Side Label of the Model 5M14 Thermocouple Module

5M14(V) QUAD ISOLATED THERMOCOUPLE Module

5M14(V) SPECIFICATIONS

Measurement Range and Resolution: See Table 1, below; switch selected—

Linearization: Internal analog compensated; maximum error: $\pm 0.05^\circ\text{C}$

Reference-Junction Compensation: Internal, using a built-in precision thermistor

Thermocouple Break Detection (per channel): Selectable, Off-scale negative or positive with front panel indication

Amplifier (per channel)

Normal - Mode Range: $\pm 80\text{ mV}$ operating; $\pm 240\text{ V}$ without instrument damage

Common-Mode Range: $\pm 1000\text{ V}$ (rms) operating and without instrument damage

Common-Mode Rejection Ratio: DC and at 60Hz -154 dB

Input Impedance: Differential: $10\text{ M}\Omega$; Common-Mode: $> 500\text{ M ohms}$

Offset: Initial: $\pm 5\text{ }\mu\text{V}$; vs. Temperature: $\pm 0.1\text{ }\mu\text{V}/^\circ\text{C}$; vs. Time: $\pm 25\text{ ppm/month}$

Gain Accuracy: $\pm 0.02\%$ of absolute mV input range of -10 to +80 mV

Gain Stability: vs. Temperature: $\pm 25\text{ ppm}/^\circ\text{C}$; vs. Time: $\pm 25\text{ ppm/month}$

Filter (per module): 3-pole modified Butterworth; 3 dB down at 4 Hz or 20 Hz; selectable

Step-Response Settling Time (Full-Scale Output @ 4 Hz)

To 1% of final value: 0.450 sec; (0.060 sec @ 20 Hz)

To 0.1% of final value: 0.600 sec; (0.080 sec @ 20 Hz)

To 0.02% of final value: 0.750 sec; (0.125 sec @ 20 Hz)

Total Accuracy: 0.05% full scale, including linearization, compensation and amplification

Analog Output: Reference Table 1 below, millivolt or fixed gain per Degree C, selectable

Power Supply: 24 Vdc +/- 10% regulated; 110 mA nominal, 150 mA max.

Operating Temperature: -10 to +70 Degrees C, 5 to 95% relative humidity, non-condensing

Table 1 Thermocouple Ranges for the Model 5M14 (V)

TC Type	Standard Range	mv/ Degree C	5 Vdc Unit/FS	10 Vdc Unit/FS
E	-200° C to +1000° C	5.00 mv/° C	5.000 Vdc	10.000 Vdc
J	-200° C to +1200° C	4.00	4.800	9.600
K	-200° C to +1372° C	4.00	5.488	10.976
N	-180° C to +1300° C	4.00	5.200	10.400
R	-50° C to +1768° C	2.00	3.536	7.072
S	-50° C to +1768° C	2.00	3.536	7.072
T	-200° C to +400° C	12.50	5.000	10.000
TC Type	Reduced TC Range	mv/ Degree C	5 Vdc Unit/FS	10 Vdc Unit/FS
Jr	-200° C to +250° C	20.00 mv/° C	5.000 Vdc	10.000 Vdc
Er	-200° C to +250° C	20.00	5.000	10.000
Kr	-200° C to +250° C	20.00	5.000	10.000
Nr	-180° C to +250° C	20.00	5.000	10.000
TC Type	Non-Linearized CJC Range	mv Gain/ TC output	5 Vdc Unit/FS	10 Vdc Unit/FS
Jl	-200° C to +1000° C	65.0	4.964 Vdc	9.928 Vdc
El	-200° C to +1200° C	65.0	4.521	9.042
Kl	-200° C to +1372° C	90.0	4.940	9.880
Nl	-180° C to +400° C	90.0	1.878	3.757

ref @ 0 degree C

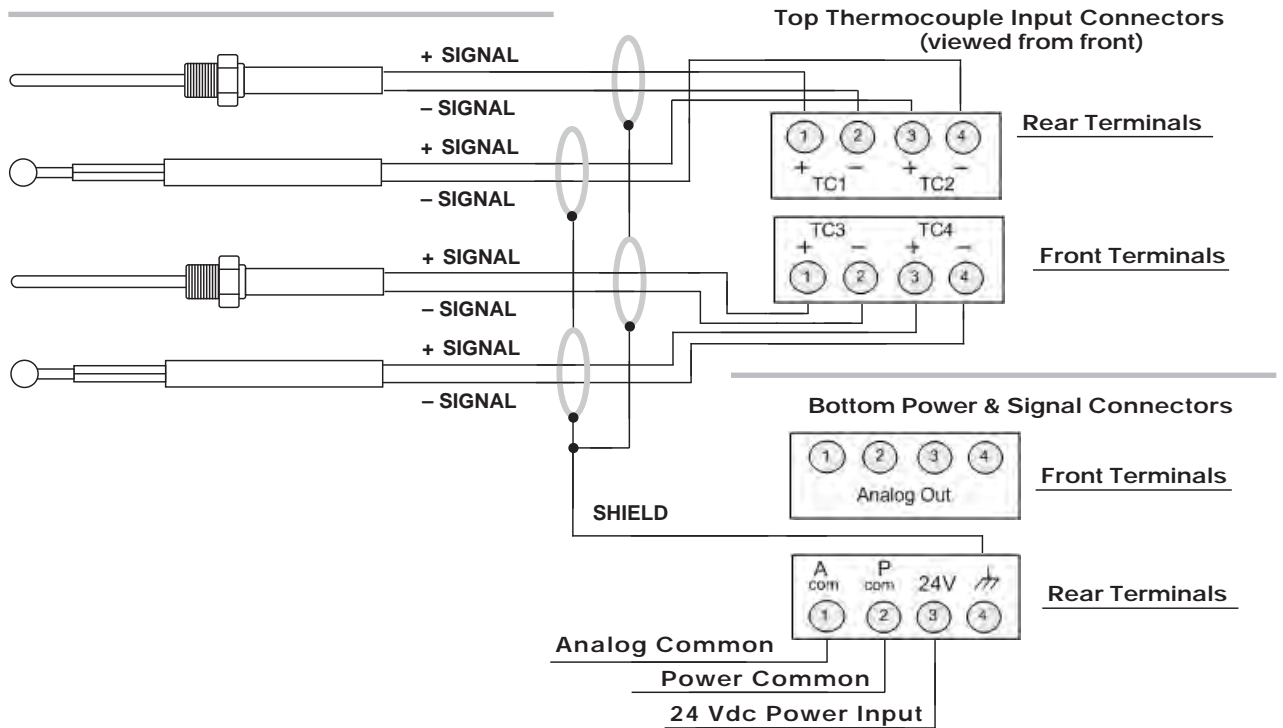
2 TRANSDUCER CONNECTIONS

The Model 5M14(V) I/O CONNECTIONS are via non-removable screw terminals which will accept wire sizes from AWG 12 to 26. **NOTE:** unused thermocouple inputs should have their individual channels + and - terminals shorted together to prevent over-range LED light indication. Thermocouple wire should be directly attached to its corresponding screw terminals - never solder or use copper wire extensions which will cause cold junction compensation errors. Table 2 denotes screw terminal assignments.

Table 2 Model 5M14 Pin Assignments

I/O Connector Pin Number	Screw Terminal	Conditioner Channel Number	Conditioner Line Function
Top Rear 1	1(+)	1	+SIGNAL TC Input
Top Rear 2	2(-)	1	-SIGNAL TC Input
Top Rear 3	3(+)	2	+SIGNAL TC Input
Top Rear 4	4(-)	2	-SIGNAL TC Input
Top Front 1	1(+)	3	+SIGNAL TC Input
Top Front 2	2(-)	3	-SIGNAL TC Input
Top Front 3	3(+)	4	+SIGNAL TC Input
Top Front 4	4(-)	4	-SIGNAL TC Input
Bottom Front 1	1	all	+SIGNAL Output
Bottom Front 2	2	n/a	+SIGNAL Output
Bottom Front 3	3	n/a	+SIGNAL Output
Bottom Front 4	4	all	+SIGNAL Output
Bottom Rear 1	1	1	Analog Common
Bottom Rear 2	2	2	Power Common
Bottom Rear 3	3	3	24 Vdc Power
Bottom Rear 4	4	4	Shield

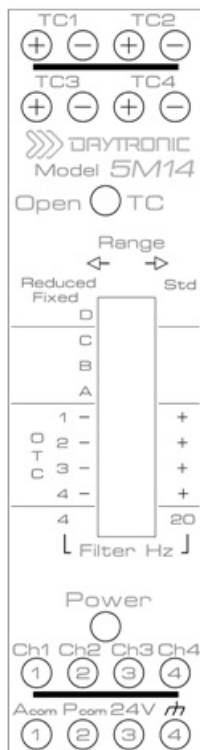
Fig. 1 Model 5M14 Transducer Cabling



5M14 QUAD ISOLATED THERMOCOUPLE Module

3 CALIBRATION

The Model 5M14(V) does not require field calibration. Front panel selector switches, as shown below, will enable the correct linearization and cold junction temperature compensation to the thermocouple connected to the unit. All four thermocouples will be conditioned and linearized for the thermocouple type selected. **Note:** Depending on the switch selection, the conditioned output of the thermocouple signal(s) will be - 1) Normal gain through-out the thermocouple's temperature specifaion to NIST tables. 2) Extended gain if the user desires amplification in a restricted temperature range. 3) Non-linearized which enables the Cold Junction Compensation and gain amplification only. In this mode it is expected that the external readout device connected to the 5M14(V) will perform the correct linearization operation for the application and connected thermcouple sensor(s).



Switch 1 - TC Select D - selects thermocouple type, see chart 1

Switch 2 - TC Select C - selects thermocouple type, see chart 1

Switch 3 - TC Select B - selects thermocouple type, see chart 1

Switch 4 - TC Select A - selects thermocouple type, see chart 1

Switch 5 - OTC 1 - selects positive or negative open thermocouple on channel 1

Switch 6 - OTC 2 - selects positive or negative open thermocouple on channel 2

Switch 7 - OTC 3 - selects positive or negative open thermocouple on channel 3

Switch 8 - OTC 4 - selects positive or negative open thermocouple on channel 4

Switch 9 - Filter - selects 4 Hz or 20 Hz for all four thermocouple analog signals

OTC - indicates an open thermocouple condition, analog signal saturates positive or negative pending switch condition of associated channel

Power - indicates the power input voltage is ON

Front Panel Switch information

TC Switch Select Chart

← Left - Switch - Right →					
TC	D	C	B	A	mV/C
E	→	←	←	←	5
J	→	←	←	→	4
K	→	←	→	←	4
Z	→	←	→	→	4
R	→	→	←	←	2
S	→	→	←	→	2
T	→	→	→	→	12.5
Extended Range					mV/C
E _r	←	←	←	←	20
J _r	←	←	←	→	20
K _r	←	←	→	←	20
Z _r	←	←	→	→	20
CJC Fixed Gain					X mV
E _i	←	→	←	←	65
J _i	←	→	←	→	65
K _i	←	→	→	←	90
T _i	←	→	→	→	90

TC Select D

TC Select C

TC Select B

TC Select A


OTC 1 - or +

OTC 2 - or +

OTC 3 - or +

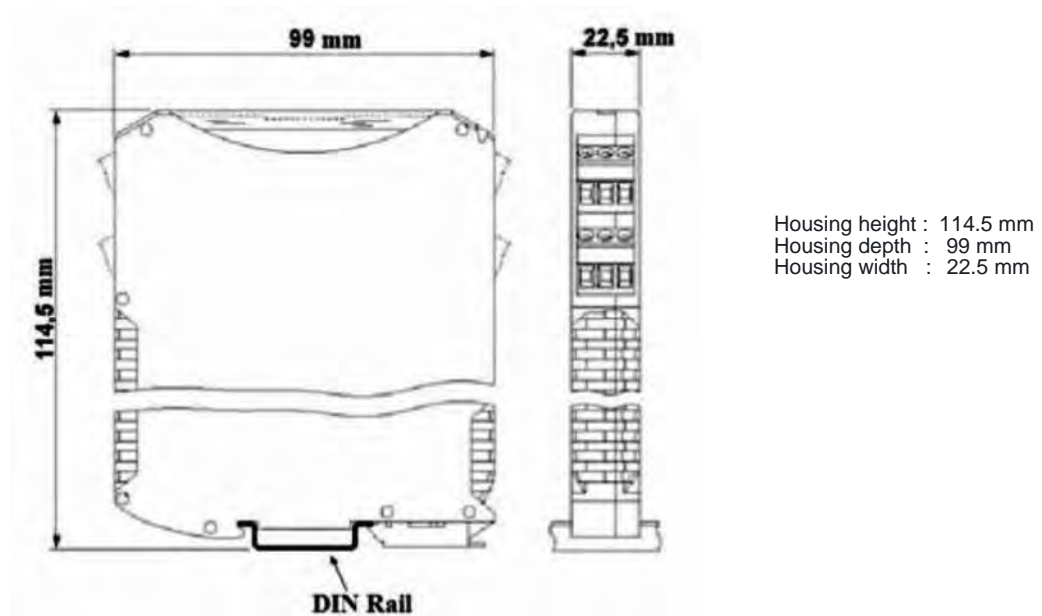
OTC 4 - or +

4 or 20 Hz



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Dimensions



Product Warranty and Repair

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ANY PRODUCT FOUND TO BE DAMAGED THROUGH CUSTOMER NEGLIGENCE OR MIS-USE MAY BE EXCLUDED FROM ANY AND ALL POLICIES CONTAINED IN THIS DOCUMENT.

ALL EQUIPMENT TO BE REPAIRED OR REPLACED UNDER WARRANTY MUST BE RETURNED TO THE FACTORY. Before returning a product or products for any reason, the customer must call **Daytronic Customer Support Services** at **(937) 866-3300** to request a **RETURN MATERIAL AUTHORIZATION (RMA)**. Once the customer has provided the necessary information and has been assigned a specific RMA, the product(s) in question may be returned to Daytronic by shipping it

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