

DRG-SC-TC

Thermocouple Input, Field Configurable Isolator

Instruction Sheet M2397/0796

DESCRIPTION

The DRG-SC-TC is a DIN rail mount, thermocouple input signal conditioner with 1800VDC isolation between input, output and power. The field configurable input and output offer flexible, wide ranging capability for J, K, T, R, S, E and B type thermocouples.

The input of the DRG-SC-TC can be configured for over 60 different thermocouple temperature ranges (see Table 6). The output is linear to temperature and can be set for either 0-5V, 0-10V, 0-1mA, 0-20mA or 4-20mA.

Wide ranging, precision zero and span pots allow 50% adjustability of offset and span turn-down within each of the ranges. For example, the 0-1000°C range could be offset and turned down to provide a 4-20mA signal representing 500-1000°C. Similarly, adjustment can be referenced to the output range. The example from above could be used to provide a 12-20mA signal from a 750 to 1000°C temperature input.

APPLICATION

The DRG-SC-TC field configurable thermocouple input isolator is useful in eliminating ground loops and interfacing thermocouple sensors to data acquisition and control systems.

Three way isolation completely eliminates ground loops from any source. Isolation protects expensive SCADA systems from ground faults and allows the noise reduction benefits of grounded thermocouples to be realized.

The DRG-SC-TC employs the latest in advanced analog signal processing technology. In addition to its

multiple microprocessors, a special ASIC* chip is used for high accuracy and reliability. The DRG-SC-TC is also equipped with cold junction compensation (CJC) circuitry to provide ice-point reference. Upscale or downscale thermocouple burnout detection is switch selectable.

High density DIN rail mounting offers an extremely compact solution to save valuable panel space.

DIAGNOSTIC LEDs

The DRG-SC-TC is equipped with front panel LEDs for INPUT (green), TROUBLE (yellow) and CAL OK (yellow). At start-up, both the INPUT and the CAL OK LEDs flash alternately for 10 seconds while start-up takes place.

INPUT LED

This green LED is lit continuously when the input is within the specified range. In the full temperature range setting, for the over range condition the LED flashes at 8Hz, whereas for the under range condition it flashes at 4Hz. In a sub-range temperature setting, for the over range condition the LED flashes at 1Hz, whereas for the under range condition it flashes at 0.5Hz.

CAL OK LED

This yellow LED is continuously on when the device is calibrated.

TROUBLE LED

This yellow LED is off during the normal operation of the device. Consult factory if this LED is on, indicating a microprocessor malfunction.

CONFIGURATION

An advantage of the DRG-SC-TC is its wide ranging capabilities and ease of configuration. The DRG-SC-TC enables 50% input zero and span adjustability DRG-SC-TC within each of the full-scale input ranges.

Unless otherwise specified, the factory presets the Model DRG-SC-TC as follows:

Input:	J-type
Range:	0 to 500°C
Output:	4 to 20mA
Burn Out:	Upscale

The DC power input accepts any DC source between 9 and 30V; typically a 12V or 24VDC source is used (see Accessories).

For other I/O ranges refer to Tables 1 through 6 and reconfigure switches SW1 and SW2 for the desired input type range and output.

WARNING: Do not attempt to change any switch settings with power applied. Severe damage will result!

1. Choose the desired temperature range from table 6, then use table 1 and 2 to configure the switches, as described in the following steps, for thermocouple type and range.
2. With DC power off, position input switches 1 and 2 on "SW2" for the desired burnout detection mode.
3. Set positions 4 through 10 on "SW2" for the desired thermocouple range and type.
4. Set positions 1 through 8 of output range switch "SW1" for the desired output signal. (Table 4)

* Application Specific Integrated Circuit

CALIBRATION

1. After configuring the dip switches, connect the input to a calibrated thermocouple source. Connect the output to the actual device load (or a load approximately equivalent to the actual device load value) and apply power.

NOTE: To maximize thermal stability, final calibration should be performed in the operation installation, allowing approximately 1 to 2 hours for warm up and thermal equilibrium of the system.

2. Set the calibrator to the desired minimum input and adjust the zero potentiometer for the desired minimum output.

3. Set the calibrator to the desired maximum input and adjust the span potentiometer for the desired maximum output.

4. Repeat steps 2 and 3, if necessary for best accuracy.

TABLE 1: Thermocouple type switch settings (SW2, positions 8, 9, 10)

TYPE	8	9	10
B	■	■	■
E	■	■	
J	■		■
K	■		
R		■	■
S		■	
T			■

KEY

■ = ON

TABLE 2
Range switch settings used in conjunction with Table 6 (SW2, positions 4, 5, 6, and 7)

RANGE	4	5	6	7
1	■		■	
2	■	■	■	
3		■		■
4	■	■		
5	■		■	■
6	■	■	■	■
7	■			■
8	■			
9		■		■
10		■	■	
11			■	
12		■		
13			■	■
14	■	■		■
15				■
16				■

TABLE 3: Thermocouple burnout detection switch settings (SW2, position 1, 2)

Note: SW2 position 3 is not used.

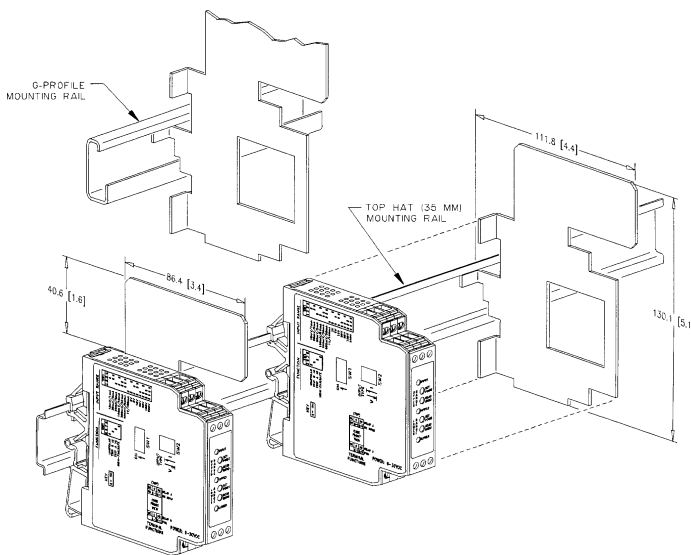
BURN OUT	1	2
NOT ALLOWED	■	■
UPSCALE	■	
DOWNSCALE		■
NONE		

TABLE 4
Output switch settings (SW1, position 1-8)

	1	2	3	4	5	6	7	8
0-5V	■	■	■	■				
0-10V	■		■	■				
0-1mA		■	■	■				
4-20mA						■	■	■
0-20mA	■	■				■	■	■

TABLE 5: Accuracy

TC Type	Temp. Range °C (°F)	Accuracy
J	-200 to 750°C (-328 to 1382°F)	±2.0 °C (±3.6°F)
K	-200 to -140°C (-328 to -220°F)	±5.0 °C (±9.0°F)
K	-140 to 1250°C (-220 to 2282°F)	±2.0 °C (±3.6°F)
K	1250 to 1370°C (2282 to 2498°F)	±4.0 °C (±7.2°F)
E	-150 to 1000°C (-238 to 1832°F)	±2.5 °C (±4.5°F)
T	-150 to 400°C (-238 to 752°F)	±3.0 °C (±5.4°F)
R	50 to 1760°C (122 to 3200°F)	±6.0 °C (±10.8°F)
S	50 to 1760°C (122 to 3200°F)	±6.0 °C (±10.8°F)
B	500 to 1820°C (932 to 3308°F)	±5.0 °C (±9.0°F)



Note1: All modules are designed and tested to operate in ambient temperatures from 0 to 55°C, when mounted on a horizontal DIN rail. When five or more modules are mounted on a vertical rail, circulating air or model DRG-HS01 Heat Sink is recommended.

Table 6: Thermocouple Range Settings

TC TYPE	RANGE	TEMPERATURE RANGE	
B	6	500°C to 1820°C (932 to 3308°F)	
	7	1000°C to 1820°C (1832 to 3308°F)	
	8	500°C to 1000°C (932 to 1832°F)	
	11	1500°C to 1820°C (2732 to 3308°F)	
	12	750°C to 1000°C (1382 to 1832°F)	
E	2	-18°C to 1000°C (0 to 1832°F)	
	3	-18°C to 500°C (0 to 932°F)	
	4	-18°C to 250°C (0 to 482°F)	
	5	-18°C to 125°C (0 to 257°F)	
	8	500°C to 1000°C (932 to 1832°F)	
	9	250°C to 500°C (482 to 932°F)	
	10	125°C to 250°C (257 to 482°F)	
	12	750°C to 1000°C (1382 to 1832°F)	
	13	375°C to 500°C (707 to 932°F)	
	14	-150°C to 750°C (-238 to 1382°F)	
	15	-150°C to 250°C (-238 to 482°F)	
16	-150°C to 0°C (-238 to 32°F)		
J	2	-18°C to 750°C (0 to 1382°F)	
	3	-18°C to 500°C (0 to 932°F)	
	4	-18°C to 250°C (0 to 482°F)	
	5	-18°C to 125°C (0 to 257°F)	
	8	500°C to 750°C (932 to 1382°F)	
	9	250°C to 500°C (482 to 932°F)	
	10	125°C to 250°C (257 to 482°F)	
	13	375°C to 500°C (707 to 932°F)	
	14	-200°C to 750°C (-328 to 1382°F)	
	15	-200°C to 250°C (-328 to 482°F)	
	16	-200°C to 0°C (-328 to 32°F)	
K	1	-18°C to 1370°C (0 to 2498°F)	
	2	-18°C to 1000°C (0 to 1832°F)	
	3	-18°C to 500°C (0 to 932°F)	
	4	-18°C to 250°C (0 to 482°F)	
	5	-18°C to 125°C (0 to 257°F)	
	7	1000°C to 1370°C (1832 to 2498°F)	
	8	500°C to 1000°C (932 to 1832°F)	
	9	250°C to 500°C (482 to 932°F)	
	10	125°C to 250°C (257 to 482°F)	
	12	750°C to 1000°C (1382 to 1832°F)	
	13	375°C to 500°C (707 to 932°F)	
	14	-200°C to 750°C (-328 to 1382°F)	
	15	-200°C to 250°C (-328 to 482°F)	
	16	-200°C to 0°C (-328 to 32°F)	
	R,S	1	50°C to 1760°C (122 to 3200°F)
		2	50°C to 1000°C (122 to 1832°F)
3		50°C to 500°C (122 to 932°F)	
4		50°C to 250°C (122 to 482°F)	
7		1000°C to 1760°C (1832 to 3200°F)	
8		500°C to 1000°C (932 to 1832°F)	
9		250°C to 500°C (482 to 932°F)	
10		125°C to 250°C (257 to 482°F)	
11		1500°C to 1760°C (2732 to 3200°F)	
12		750°C to 1000°C (1382 to 1832°F)	
13		375°C to 500°C (707 to 932°F)	
T		3	-18°C to 400°C (0 to 752°F)
		4	-18°C to 250°C (0 to 482°F)
	5	-18°C to 125°C (0 to 257°F)	
	9	250°C to 400°C (482 to 752°F)	
	10	125°C to 250°C (257 to 482°F)	
	13	375°C to 400°C (707 to 752°F)	
	14	-150°C to 400°C (-238 to 752°F)	
	15	-150°C to 250°C (-238 to 482°F)	
16	-150°C to 0°C (-238 to 32°F)		

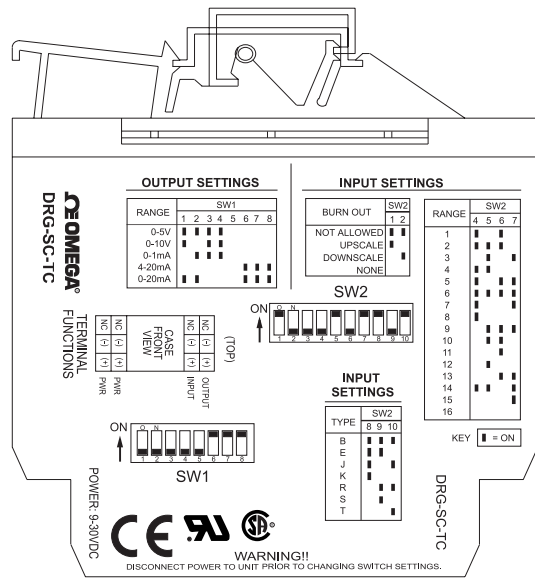


Figure 1: DRG-SC-TC Factory Calibration: J-Type, 0-500°C, 4-20mA, Upscale

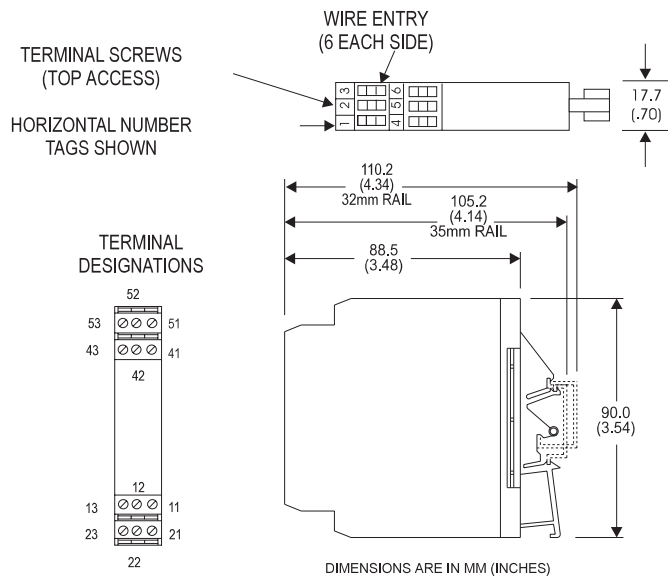


Figure 2: Mechanical dimensions for DRG-SC-TC

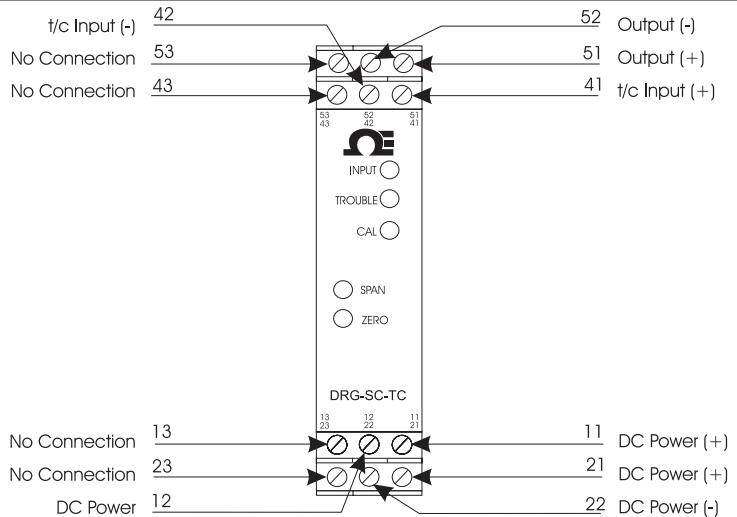


Figure 3: Wiring Diagram for DRG-SC-TC

SPECIFICATIONS

Inputs

Sensor Types: J, K, T, R, S, E, B
Input Ranges: see table 6.

Impedance: >1M Ω

Bias Current (burnout detection):
<1.5microamp

Overvoltage: \pm 10V differential

Common Mode (Input to Ground):
180VDC, max.

Zero and Span Adjustability

50% of any selected range

Output

Voltage Output

Output: 0-5V, 0-10V

Source Impedance: <10 Ω

Drive: 10mA, max.

Current Output

Output: 0-1mA, 0-20mA,
4-20mA

Source Impedance: >100K Ω

Compliance:

0-1mA; 7.5V, max.(7.5K Ω)

0-20mA; 12V, max.(600 Ω)

4-20mA; 12V, max.(600 Ω)

Accuracy (Including Linearity,
Hysteresis) see Table 5

Stability

\pm 0.04% of the maximum full scale
range per $^{\circ}$ C change in ambient
temperature, maximum.

Response Time (10 to 90%)

500mSec., typical.

Common Mode Rejection

DC to 60Hz: 120dB

Isolation

180VDC between input, output
and power.

EMC Compliance

Emissions: EN50081-1

Immunity: EN50082-2

Safety: EN50178

LED Indication

TROUBLE LED: Yellow, off during
normal device operation.

INPUT LED: Green, continuously on
if input is within selected range,
flashes otherwise

CAL OK LED: Yellow, continuously
on in normal device operation

Thermocouple Burnout Detect

Field configurable upscale,
downscale, or disabled

Humidity (Non-Condensing)

Operating: 15 to 95% (@ 45 $^{\circ}$ C)

Soak: 90% for 24 hours (@ 65 $^{\circ}$ C)

Temperature Range

Operating: 0 to 55 $^{\circ}$ C (32 to 131 $^{\circ}$ F)

Storage: -25 to 70 $^{\circ}$ C (-13 to 158 $^{\circ}$ F)

Power

Consumption: 1.5W typical,
2.5W max.

Range: 9 to 30VDC

Terminations and Wire

Screw terminals for 12-22 AWG.

Use twisted pair for output and
power connections.

Agency Approvals

CSA certified per standard C22.2,
No. 0-M91 and 142-M1987 (File No.
LR42272). **UL** recognized per stan-
dard UL508 (File No.E99775). **CE**
Conformance per EMC directive
89/336/EEC and low voltage 73/
23/EEC.

Mounting

32mm or 35mm DIN rail

PIN CONNECTIONS

11	DC Power(+)
12	DC Power (-)
13	No Connection
41	T/C Input(+)
42	T/C Input (-)
43	No Connection
21	DC Power (+)
22	DC Power(-)
23	No Connection
51	Output (+)
52	Output (-)
53	No Connection



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Servicing North America:

USA: One Omega Drive, Box 4047
www.omega.com
Stamford, CT 06907-0047
Telephone: (203) 359-1660 Fax: (203) 359-7700
e-mail: info@omega.com

Canada: 976 Bergar
Laval (Quebec) H7L 5A1
Telephone: (514) 856-6928 Fax: (514) 856-6886
e-mail: canada@omega.com

For immediate technical service or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGASM
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En Espanol: (203) 359-1660 ext. 2203 e-mail: espanol@omega.com

Servicing Europe:

Benelux: Postbus 8034, 1180 LA Amstelveen, The Netherlands
Tel: (31) 20 6418405 Fax: (31) 20 6434643
Toll Free in Benelux: 06 0993344
e-mail: nl@omega.com

Czech Republic: Ostravska 767, 733 01 Karvina
Tel: 42 (69) 6311899 Fax: 42 (69) 6311114
e-mail: czech@omega.com

France: 9, rue Denis Papin, 78190 Trappes
Tel: 33 0130-621-400 Fax: 33 0130-699-120
Toll Free in France: 05-4-06342
e-mail: france@omega.com

Germany/Austria: Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
Tel: 49 (07056) 3017 Fax: 49 (07056) 8540
Toll Free in Germany: 0130 11 21 66
e-mail: germany@omega.com

United Kingdom: 25 Swannington Road, P.O. Box 7, Omega Drive
www.omega.com
Broughton Astley, Leicestershire, Irlam, Manchester,
LE9 6TU, England M44 5EX, England
Tel: 44 (1455) 285520 Tel: 44 (161) 777-6611
Fax: 44 (1455) 283912 Fax: 44 (161) 777-6622

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3. Repair instructions and/or specific problems relative to the product.

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