User's Guide

1 YEAR WARRANTY

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ISO 9001 CERTIFIED CORPORATE QUALITY — STAMFORD, CT

ISO 9002 CERTIFIED CORPORATE QUALITY — MANCHESTER, UK

TX13
Push Button Thermocouple

1.0 DESCRIPTION

The transmitter is an in-head (4 to 20) mA transmitter that connects to a standard thermocouple sensor and converts the sensors temperature to a linear temperature (4 to 20) mA signal. The transmitter sensor type and range can be requested at the time of order, but if desired the user can re-configure the transmitter parameters by use of a single push button and the range "R" menu "M" LEDS. Two methods of configuration are available, the first "USER RANGING" acts only on the transmitter range, similar to the previous design. The other method "ADVANCED USER CONFIGURATION" offers full configuration, this level is entered by holding down the push button on power up. The advanced level has the following menus:

- Menu 1 - Selection of input type, seven popular thermocouples or mV input
- Menu 2 - Select either user push button set range or one of seven fixed ranges
- Menu 3 - Select either up or down scale output on sensor burnout
- Menu 4 - User trim allow trim of output current at high and low range
- Menu 5 - Reset factory default

The addition of fixed ranges to this product allows the user to re-range the product without the need for specialist equipment. The transmitter input is isolated.

2.0 RECEIVING AND UNPACKING

Please inspect the packaging and instrument thoroughly for any signs of transit damage. If the instrument has been damaged, please notify your supplier immediately.

3.0 SPECIFICATION @ 20 °C

INPUT

Sensor	Range	Accuracy
K	-200 to 1370	± 0.1% of F.S. ± 0.5°C (plus any sensor error)
J	-100 to 1200	± 0.1% of F.S. ± 0.5°C (plus any sensor error)
E	-100 to 1000	± 0.1% of F.S. ± 0.5°C (plus any sensor error)
N	-180 to 1300	± 0.1% of F.S. ± 0.5°C (plus any sensor error)
T	-100 to 400	± 0.2% of F.S. ± 0.5°C (plus any sensor error)
R	-10 to 1760	± 0.1% of F.S. ± 0.5°C (plus any sensor error) over range 800 to 1600
S	-10 to 1760	± 0.1% of F.S. ± 0.5°C (plus any sensor error) over range 800 to 1600
mV	-10 to 70	± 0.02% of full scale

Isolation: Tested to 250 Vdc
Sensor Burnout: Either up or down scale output
Cold Junction: Range (-40 to 85)°C; accuracy ± 0.5; tracking ± 0.05°C / °C
Stability: Offset 0. 1°C / °C; span 0.05°C / °C

OUTPUT
Type: Two wire (4 to 20) mA sink
Limits: Low 3.8 mA; high 21.5 mA
Accuracy: (mA out / 2000) or 5 uA which ever greater
Loop Effect: ± 0.2 uA / V measured @ 50 Hz 1V (peak to peak)
Thermal Drift: ± 1 uA / °C typical ; ± 1. 5 uA max
Max Load: [(Vsupply - 10) / 20] KΩ

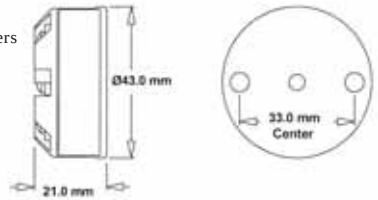
GENERAL
Update Time: 0.5 seconds
Response Time: 1 second to reach 90% of final value
Start Up Time: From power up typically 5 seconds
Filter Factor: Adaptive
Ambient Temperature: (-40 to 85)°C
Connection: Screw terminal
Approvals: BS EN 61326; 1998 -electrical equipment for measurent and control ANNEX A; ANNEX F
Factory Default: (0 to 1000)°C type K upscale burnout (0.0°C user trim)

4.0 INSTALLATION AND WRING

4.1 Mechanical

The transmitter has been specifically designed to fit inside a DIN standard probe head enclosure, which provides adequate protection from moisture, dust, corrosive atmosphere etc. All cable entries must be sealed using the correct size gland. Likewise any probe assembly fitted must be sealed. Care must be taken when locating the transmitter to ensure the working ambient temperature range of (-40 to 85)°C is not exceeded. The transmitter enclosure has a center hole allowing the sensor wired to enter screw terminals from the transmitter center, this is applicable when the sensor is mounted directly below the transmitter.

Figure 1
Mounting Holes: Two holes
5.5 mm diameter, 33 mm centers
Center hole sensor wire entry:
4 mm



4.2 Electrical

Electrical connections to the transmitter are made to the screw terminal provided on the top face. The correct type of thermocouple wire must be used to connect sensor, this will normally be provided as part of the probe assembly. The screw terminals allow for wires to enter either inner or outer direction. Never attempt to unscrew the spare terminal which secures the factory fitted cold junction sensor. The terminal is fitted with a tamperproof screw to avoid accidental adjustment.

The transmitter is protected against reverse connection and over voltage. If no sensor (input) connection is made the transmitter will go into either up or down scale output current, depending on configuration setting.

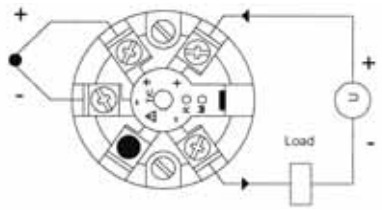
Figure 2 gives connection details, the output is shown connected to a 24V supply. The load symbol represent any other device connected in the loop, such as monitoring equipment, panel indicators and loop isolators. The load value can range from 0 Ω to the max loop load for given supply, refer to section 3 "max load" for more information.

The transmitter conforms with EC directive BS EN 61326: 1998 when correctly installed in a termination head providing at least IP20 protection and with sensor wires less than 3 meters.

Screened or twisted pair wires are recommended for output wires. Always ensure the (4 to 20) mA loop is grounded at one point this would normally be at the monitoring equipment or loop power supply.

In normal operation the range "R" LED acts as over-range LED. The menu LED is always off.

Figure 2



5.0 USER RANGING

The transmitter may be purchased pre-configured, if specified at the time of order. User ranging is provided to allow the temperature range of the transmitter to be set to a custom range. This configuration level cannot change the input type. If the input type or other parameters require change, then please refer to the advances configuration section. To confirm the present input type set on the transmitter is correct for your application, count the number of flashes of the range "R" LED at power up then refer to the chart in section 6 "Menu 1" to establish the type set.

The push button is located under the slot in the key hole label, the slot located next to the menu "M" LED. To press the button use a 3 mm screw driver (flat blade), inserted into the slot and locate resistance of button key. The button has a slight click action.

It my be worth noting at this stage the advance user configuration provides the user with the option of selecting fixed ranges, this may be a more attractive option if a suitable range is available, as no calibration equipment will be required.

Configuration will require the following tools and equipment:

- DC Supply (12 to 30) V @ 30 mA
- Thermocouple calibrator
- Thermocouple compensating wire
- Screw driver flat blade 3 mm wide

To re-range the temperature scale follow the instructions below:

- Connect thermocouple calibrator to transmitter input terminals using correct thermocouple compensation wire. Observe polarity.
- Connect the output terminals to the DC supply, observe polarity.
- Turn DC supply on.
- Set calibrator to the required low scale temperature. Note Range "R" LED if on indicates input connection error or input out of range, please check input.
- Allow 1 minute warm up period.
- To "enter" ranging, press and keep pressed the push button until Range "R" LED flashes at a slow rate, then release button.
- The "R" LED will flash at a slow rate for a approximately one second during which period the low scale range is stored. Once the store is complete the "R" LED will flash at a medium rate indicating the transmitter is ready to store the high range setting.
- Set the calibrator to the required high range temperature and allow ten seconds.
- Press button to store high range setting, the "R" LED will flicker for one second before the transmitter returns to normal operation. The transmitter is now re-ranged.

The temperature scale procedure also applies to mV input, but please ensure only copper wire is used for connection to mV calibrator.

6.0 ADVANCED USER CONFIGURATION

The advanced user configuration option is based on five menus, each menu Sets a different parameter:

Menu 1: Selects one of eight input types
Menu 2: Selects either custom user range or one of seven fixed range
Menu 3: Selects the output direct on sensor burnout
Menu 4: Provide user trim at 4 mA and 20 mA
Menu 5: Reset to factory default setting

The advance configuration menus are navigated using the push button, menu "M" LED and range "R" LED, The push button is located underneath the slot in the key hole label, located just below the "M" LED.
To press the button use a 3 mm screw driver (flat blade) inserted into the slot. The button has a slight click action.

Three commands are used to navigate menus, performed by clicking the button as follows:

- **Advance:** Single button press or click
- **Escape or Change Direction:** Double press or click within 0.5 seconds
- **Enter:** Press and hold button > two seconds

When a menu is selected the "M" LED will flash a burst of 1 to 5 flashes, the number of flashes represents the menu number.

Note the range "R" LED will only operate when a selected menu has been entered, then the "R" LED uses a series of flashes or toggle flash rates to indicate the state or stage of the open menu.

Navigating the menus (Read all of this section before attempting configuration)

To access the advanced user menus press and hold down button during transmitter power up. The advance user menus will now be enabled and remain enabled until transmitter power is removed. Note the "USER RANGING" level will not be active at this stage, the push button will now serve to navigate "advance user menus" as follows:

- To "enter" menus press and hold button for > 2 seconds. The "M" LED will then start to flash, rate one flash per burst (indicating menu 1).
- To "advance" to the next menu use single button press, the "M" LED will advance to two flashes per burst, indicating menu 2 is selected. Repeated single presses will advance menu, once menu 5 is reached, the next press will return to menu 1, for a repeat cycle around the menus.
- To "escape" from menus back to normal operation use a double click of the button or remove transmitter power. Note menus have no timeout escape and therefore will remain selected indefinitely.
- To "enter" a selected menu press and hold button for two seconds, at which stage the "R" LED will start to flash between bursts of the "M" LED, indicating the state of the opened menu.

MENUS (First select the required menu and open as described above).

Menu 1 Input Type

- On Entry "M" LED single flash every burst (menu 1), followed by a burst of between 1 to 8 "R" LED flashes, flash count represents the input type as listed below. Timeout is 10 seconds so be sure to act quickly if the type needs changing.

"R " LED flashes	Input Type
1	Type K
2	Type J
3	Type E
4	Type N
5	Type T
6	Type R
7	Type S
8	mV

- Single button press to "advance" to the next input type, when type 8 is reached the next "advance" will cycle back to type 1. To ensure valid indication of input menu, allow one to two burst cycle after "advance", before counting the "R" LED flashes.
- Once the desired type is selected, allow 10 seconds with no button action, the transmitter will then store the selected input type, (indicated by flicker of "R" LED) before return back to normal operation.

Menu 2 Fixed Ranges

- On "Entry" the "M" LED flashes twice every burst (menu 2) followed by a "R" LED flashes between 1 to 8, flash count represents the range selected as described below. Timeout is 10 seconds so be quick to act.
- Range 1 is allocated for the user custom push button set range. When a new custom range (see USER RANGING) is entered, the range selected will automatically return to 1 .

Range "R" LED flashes	Inputs K, J, E, & N (°C)	Input T (°C)	Inputs R, & S (°C)	Input mV mv
1	User Ranged			
2	0 to 1000	0 to 400	800 to 1760	0 to 70
3	0 to 1200	0 to 250	800 to 1600	0 to 5
4	0 to 600	0 to 200	800 to 1400	0 to 10
5	0 to 500	0 to 150	1000 to 1760	0 to 20
6	0 to 250	0 to 100	1000 to 1600	0 to 25
7	0 to 100	0 to 50	1000 to 1400	0 to 50
8	-100 to 100	-100 to 100	0 to 1600	-10 to 10

- Single button press to "advance" to the next range, once range 8 is reached, the next "advance" will cycle range back to 1. To ensure valid indication of range menu, allow one to two burst cycle after "advance". before counting flashes.
- Once the desired range is selected allow for 10 seconds with no button action, the transmitter will then store new range (indicated by flicker of "R" LED) before returning to normal operation.

Menu 3 Burnout Selection

- On "Entry" - "M" LED, three flesh every burst (menu 3), followed by a "R" LED toggle flash, either at a slow rate (every second) or a faster medium rate. Be quick to act as timeout is 10 seconds.
- Slow rate indicated low scale burnout, fast rate indicates upscale burnout. To "advance " to the the other burnout direction press button.
- To store new setting allow 10 seconds with no button action, the bum out selection menu will then timeout, store new setting, (indicated by a flicker of the "R" LED), before returning back to normal operation.

Menu 4 User Trim

This menu allows the user to trim the output current at zero and span, (similar function to trim potentiometers) and is very useful for trimming out sensor errors. The input of the transmitter must be connected to either a calibrator or a temperature sensor held at a known temperature. The (4 to 20) mA loop current will also need to be monitored with a current meter. This menu has extended timeout of 20 seconds.

- The trim action will only operate within certain output current bands, the zero will be trimmed when the out current is between (3.8 to 6.0) mA, and the span will be trimmed when the output current is between (18.0 to 21.5) mA.
- On "Entry" - "M" LED, four flash every burst (menu 4), followed by a "R" LED toggle flash, either at a slow rate (every second) or a faster medium rate.
- Slow rate indicates trim direct down, whilst fast rate indicate trim direction up. To "change direction" the trim direction double click button.
- To trim, single press button to "advance" current by 2 uA, or press and hold button to auto advance, after two seconds the trim will adjust automatically at a rate of 3 uA per second until the button is released. Note after approximately 20 seconds of continuous button press, the auto trim rate will speed up to a rate of 10 uA per second.
- To store new setting allow 20 seconds with no button action, the User Trim menu will then timeout and store any new setting, (indicated by a flicker of the "R" LED), before returning back to normal operation.

Menu 5 Set Factory Default

- On "Entry" - "M" LED, five flashes every burst (menu 5). Followed by "R" LED toggle flash at a slow rate (every second).
- To set factory default and zero any user trim, press button, default setting will then be loaded and stored into the transmitter, indicated by a flicker of the "R" LED. The transmitter will then return to normal operation.
- To avoid any action, allow 10 seconds with no button action, set factory default menu, and then timeout, without storing any default configuration. The transmitter will then return to normal operation.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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