

# SEM203TC USER GUIDE

PUSH BUTTON THERMOCOUPLE  
TWO WIRE (4 to 20) mA OUTPUT

## Important - Please read this document before installing.

Every effort has been taken to ensure the accuracy of this document, however we do not accept responsibility for damage, injury, loss or expense resulting from errors and omissions, and we reserve the right of amendment without notice.

## IMPORTANT - CE & SAFETY REQUIREMENTS

Product must be mounted inside a suitable enclosure providing environmental protection to IP65 or greater.

To maintain CE EMC requirements, input wires must be less than 3 metres.

The product contains no serviceable parts, or internal adjustments. No attempt must be made to repair this product. Faulty units must be returned to supplier for repair.

This product must be installed by a qualified person. All electrical wiring must be carried out in accordance with the appropriate regulations for the place of installation.

Before attempting any electrical connection work, please ensure all supplies are switched off.

ABSOLUTE MAXIMUM CONDITIONS (To exceed may cause damage to the unit).	
Supply Voltage	± 30 V dc (Protected for over-voltage and reverse connection)
Current with over-voltage	± 100 mA
Input Voltage	± 3 V between any terminals
Ambient	Temperature (-40 to 85) °C, Humidity (10 to 95) % RH (Non-condensing)



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## 1~DESCRIPTION.

The device is an in-head (4 to 20) mA transmitter that connects to a standard thermocouple sensor and converts the sensor's 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. The other method "Advanced user configuration" offers full configuration, this level is entered by holding down the push button on power up.

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

## 2~RECEIVING AND UNPACKING.

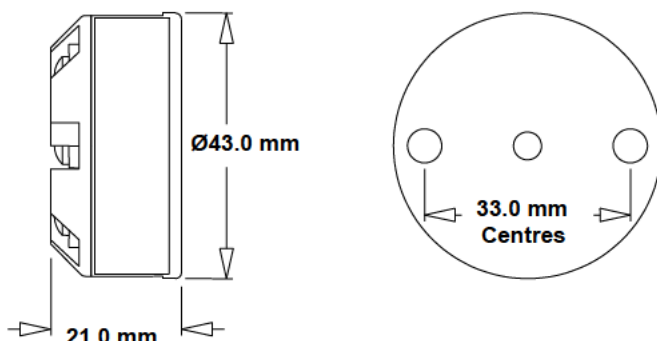
Please inspect the packaging and instrument thoroughly for any signs of transit damage. If the instrument has been damaged, please notify your supplier immediately.

## 3~SPECIFICATION.

Refer to data sheet for full specification.

Configuration	
Factory default	Type K, (0 to 1000) °C, upscale burnout, 0.0 °C user trim

## 4~ INSTALLATION AND WIRING.



Mounting holes: two holes 5.5 mm diameter, 33 mm centres.  
Centre hole sensor wire entry 4 mm.

## 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 atmospheres 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 device body has a centre hole allowing the sensor wire to enter screw terminals from the transmitter centre. This is applicable when the sensor is mounted directly below the transmitter.

## 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

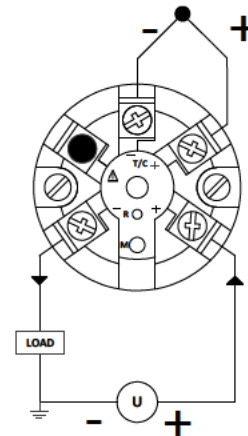


Figure 2 gives connection details; the output is shown connected to a 24 V supply. The load symbol represents any other device connected in the loop, such as monitoring equipment, panel indicators and loop isolators. The load value can range from 0 ohms to the max loop load for given supply. The transmitter conforms with EC directive BS EN 61326: when correctly installed in a termination head providing at least IP65 protection and with sensor wires less than 3 metres. 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 an over-range LED. The menu LED is always off.

## 5~USER CONFIGURATION.

### IMPORTANT

READ COMPLETE SECTION BEFORE ATTEMPTING CONFIGURATION.

### 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 Advanced 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 [R LED flashes for input type (menu 1)] in section 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 may be worth noting at this stage that the Advanced 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 3mm wide

To range the temperature scale, use the following instructions:

<b>User-ranging</b>
Connect thermocouple calibrator to the unit 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 either 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 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 above procedure also applies to mV input, but please ensure only copper wire is used for connection to mV calibrator.

## 5~USER CONFIGURATION (continued).

### Advanced user configuration.

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

Advanced level 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 allows trim of output current at high and low range
Menu 5	Reset factory default.

The Advanced 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:

Three types of button press are used	
Single button press	= Advanced
Double press within 0.5 seconds	= Escape or change direction
Press and hold button > two seconds	= Enter

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

To access the Advanced user menus, press and hold down button during device power up. The Advanced 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:

Navigating the menus	
To access menus, press and hold button > 2 second, then program <b>M LED</b> will start to flash, one flash every burst. This indicates menu 1 is selected.	
To advance to the next menu use single button press. The <b>M LED</b> 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 <b>R LED</b> will start to flash between bursts of the <b>M LED</b> , indicating the state of the opened menu.	

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

#### Menu 1 Input type

R LED flashes for input type (menu 1)	
No. of 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

Menu 1	
1	On Entry <b>M LED</b> single flash every burst (menu 1), followed by a burst of between 1 to 8 <b>R LED</b> flashes, flash count represents the input type as listed. Timeout is 10 seconds.
2	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 <b>R LED</b> flashes.
3	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 <b>R LED</b> ) before returning to normal operation.



## 5~USER CONFIGURATION (continued).

### Menu 2 Fixed ranges

R LED flashes for range (menu 2)				
No. of flashes	C K, J, E, & N	C T	C R & S	Input 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 150	0 to 1600	-10 to 10

Menu 2	
1	On entry the <b>M LED</b> flashes twice every burst (menu2), followed by <b>R LED</b> flashing between 1 to 8 times, flash count represents the range selected as described below. Timeout is 10 seconds.
2	Range 1 is allocated for the user custom push button set range. When a new custom range (see <b>User-ranging</b> ) is entered, the range selected will automatically return to 1.
3	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.
4	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 <b>R LED</b> ) before returning to normal operation.

### Menu 3 Burnout selection

Menu 3	
1	On entry the <b>M LED</b> , three flash every burst (menu 3), followed by a <b>R LED</b> toggle flash, either at a slow rate (every second) or a faster/medium rate. Timeout is 10 seconds
2	Slow rate indicates low scale burnout, faster rate indicates upscale burnout.
3	To advance to the other burnout direction, press button.
4	To store new setting allow 10 seconds with no button action. The burn out selection menu will then timeout, store new setting, (indicated by a flicker of the <b>R LED</b> ), before returning 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 output 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.

Menu 4	
1	On entry the <b>M LED</b> , four flash every burst (menu 4), followed by a <b>R LED</b> toggle flash, either at a slow rate (every second) or a faster medium rate.
2	Slow rate indicates trim direction down, whilst fast rate indicates trim direction up.
3	To change the direction of the trim, up or down, double click the button.
4	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.
5	To store new setting allow 20 seconds with no button action. The user trim menu will then timeout and store any new setting(s), (indicated by a flicker of the <b>R LED</b> ), before returning to normal operation.

### Menu 5 Set factory default

Menu 5	
1	On entry the <b>M LED</b> , five flashes every burst (menu 5), followed by <b>R LED</b> toggle flash at a slow rate (every second).
2	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 <b>R LED</b> . The transmitter will then return to normal operation.
3	To avoid any action, allow 10 seconds with no button action, set factory default menu will then timeout, without storing any default configuration. The transmitter will then return to normal operation.