

## SEM210 SERIES

### Programmable In-head Universal Temperature Transmitter



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52-214-2407-01 Issue: Web 210

## INDEX

| SECTION | CONTENTS      | PAGE NO. |
|---------|---------------|----------|
| 1.0     | DESCRIPTION   | 1        |
| 2.0     | SPECIFICATION | 1-5      |
| 3.0     | INSTALLATION  | 6-7      |

## 1.0 DESCRIPTION

The transmitter is a second generation 'Smart' in-head temperature transmitter that accepts any commonly used temperature sensor, slidewire transducer or millivolt signal and converts the output to the industry standard (4 to 20) mA transmission signal. The software package RCPW can be used to program the unit.

## 2.0 SPECIFICATION @ 20 °C

### 2.1 RTD INPUT (Pt100)

|                              |      |  |
|------------------------------|------|--|
| Sensor Range                 |      | (-200 to 850) °C (18 to 390) Ω   |
| Minimum Span*1               |      | 25 °C  |
| Linearisation                |      | BS EN60751 (IEC 751)<br>BS 1904 (DIN 43760)<br>JISC 1604<br>CUSTOM [X]*3 |
| Basic Measurement Accuracy*2 |      | ± 0.01 % FRI ± 0.05 % Rdg (FRI = Full Range Input)                       |
| Thermal Drift                | Zero | 0.008 °C/°C  |
|                              | Span | 0.01 %/°C  |
| Excitation Current           |      | (300 to 550) µA  |
| Maximum Lead Resistance      |      | 50 Ω/leg   |
| Lead Resistance Effect       |      | 0.002 °C/Ω   |

### 2.2 THERMOCOUPLE INPUT

#### SENSOR RANGES

| Thermocouple Type | Measuring Range*4 °C | Minimum Span*1 °C |
|-------------------|----------------------|-------------------|
| TC Type K         | -200 to 1370         | 50                |
| TC Type J         | -200 to 1200         | 50                |
| TC Type T         | -210 to 400          | 25                |
| TC Type R         | -10 to 1760          | 10                |
| TC Type S         | -10 to 1760          | 100               |
| TC Type E         | -200 to 1000         | 50                |
| TC Type L         | -100 to 600          | 25                |
| TC Type N         | -180 to 1300         | 50                |
| TC Type [X]*3     | User defined         |                   |

|                              |      |  |
|------------------------------|------|--|
| Linearisation                |      | BS 4937 / IEC 584, EN60584                                 |
| Basic Measurement Accuracy*2 |      | ± 0.04 % FRI ± 0.04 % RDG or 0.5 °C (whichever is greater) |
| Thermal Drift                | Zero | 0.1 µV/°C  |
|                              | Span | 0.01 %/°C  |
| Cold Junction Error          |      | ± 0.5 °C   |
| Cold Junction Tracking       |      | 0.05 °C/°C   |
| Cold Junction Range          |      | (-40 to 85) °C   |

## 2.3 MILLIVOLT INPUT\*5

|                              |      |  |
|------------------------------|------|--|
| Input                        |      | Voltage source                               |
| Range                        |      | (-10 to 75) mV                               |
| Characterisation             |      | Linear<br>Custom [X]*3, 4th order polynomial |
| Minimum Span*1               |      | 5 mV   |
| Basic Measurement Accuracy*2 |      | ± 10 µV ± 0.07 % Rdg                         |
| Input Impedance              |      | 10 MΩ  |
| Thermal Drift                | Zero | 0.1 µV/°C                                    |
|                              | Span | 0.01 %/°C                                    |

## 2.4 SLIDEWIRE INPUT\*5

|                              |  |  |
|------------------------------|--|--|
| Input                        |  | 3 wire potentiometer   |
| Resistance Range             |  | (10 to 390) Ω (end to end).<br>Larger values can be accommodated by external resistor. |
| Characterisation             |  | Linear<br>Custom [X]*3, 4th order polynomial   |
| Minimum Span*1               |  | 5 %  |
| Basic Measurement Accuracy*2 |  | 0.1 % FRI  |
| Temperature Drift            |  | 0.01 %/°C  |

## 2.5 OUTPUT

|                     |   |
|---------------------|---|
| Output Range        | (4 to 20) mA (> 3.8 to < 20.2) mA         |
| Maximum Output      | 23 mA                                     |
| Accuracy            | ± 5 µA                                    |
| Voltage Effect      | 0.2 µA/V                                  |
| Thermal Drift       | 1 µA/°C                                   |
| Supply Voltage      | (10 to 35) V                              |
| Maximum Output Load | [(Vsupply - 10)/20] kΩ (e.g 700 Ω @ 24 V) |

#### \*NOTES:

1. Any span may be selected, full accuracy is only guaranteed for spans greater than the minimum recommended.
2. Basic measurement accuracy includes the effects of calibration, linearisation and repeatability.
3. Customer linearisation requirements are available pre-programmed at the factory, contact your supplier for details.
4. Consult thermocouple reference standards for thermocouple material limitation.
5. If the unit is to be configured for either millivolts or slidewire input, the following procedure should be followed. Configure unit for RTD with BS1904 linearisation (Not EN60751) and up load to unit. The unit can now be configured for millivolts or slidewire input.

## 2.6 GENERAL

|                            |  |
|----------------------------|--|
| Input/Output Isolation     | 500 VAC rms (galvanically isolated)    |
| Update Time                | 250 ms maximum                         |
| Time Constant (Filter Off) | < 1 s (Time to reach 63 % final value) |
| Filter Factor Programmable | Off, 2 s, 10 s or adaptive             |
| Warm up Time               | 120 s to full accuracy                 |

### ENVIRONMENTAL

|                             |                                |
|-----------------------------|--------------------------------|
| Ambient Operating Range     | (-40 to 85) °C                 |
| Ambient Storage Temperature | (-50 to 100) °C                |
| Ambient Humidity Range      | (10 to 90) % RH non condensing |

### APPROVALS

|     |            |
|-----|------------|
| EMC | BS EN61326 |
|-----|------------|

### MECHANICAL

|            |                                  |
|------------|----------------------------------|
| Enclosure  | DIN standard terminal block size |
| Material   | ABS                              |
| Weight     | 35 g                             |
| Dimensions | (43 x 21) mm                     |

### COMMUNICATIONS

|                                |  |
|--------------------------------|--|
| PC Interface                   | RS232 via configurator   |
| Minimum Output Load            | 250 Ω for 'In loop' programming                                |
| Maximum Cable Length           | 1000 m   |
| Configurable Parameters offset | Sensor type: Burnout: °C/°F: Output: Hi/Low: Filter: Tag: User |
| Comms Protocol                 | ANSI X3.28 1976  |
| Data Rate                      | 1200 baud  |

## 2.7 SEM210X VERSION - FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES

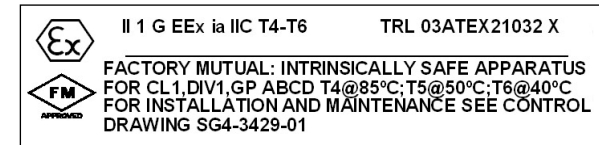
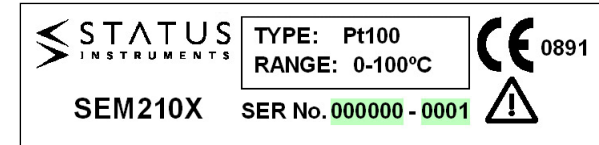
### 2.7.1 ATEX CERTIFICATE

The SEM210X, has been issued with a EC-type examination certificate, confirming compliance with the European ATEX directive 94/9/EC for:

**INTRINSIC SAFETY II 1 G EEx ia IIC T4...T6.**

The equipment bears the Community Mark and subject to local codes of practice, may be installed in any of the European Economic Area (EEA) member countries. The SEM210X housing is coloured light blue to identify the equipment as suitable for Hazardous area use. The equipment must be installed and maintained in accordance with local requirements for electrical equipment for use in potentially explosive atmospheres, e.g EN60079-14 & EN60079-17. This instruction sheet describes installation which conforms with BS EN60079-14 & BS EN60079-17 Electrical Installation in Hazardous Areas. When designing systems outside the UK, the local Code of Practice should be consulted.


## 2.7.2 ATEX MARKING



## COMMON INFORMATION

|              |                        |
|--------------|------------------------|
| Manufacturer | Status Instruments Ltd |
| Type Number  | SEM210X                |

CE Marking  0891

Explosive Protection Marking 

### (TYPE ia) INTRINSIC SAFETY

|                   |                                    |
|-------------------|------------------------------------|
| II 1              | Equipment group and category       |
| G                 | Type of explosive atmosphere (Gas) |
| EEx ia IIC T4..T6 | Intrinsic safety information       |
| TRL03ATEX21032 X  | Certificate reference              |

## 2.7.3 SPECIAL CONDITIONS FOR SAFE USE

As indicated by the Certificate Reference "X" suffix, special conditions apply for safe use for both intrinsic safety and energy limitation applications. They are as follows:

### ZONES, GAS GROUPS, AND T RATING.

When connected to a approved system the SEM210X may be installed in:

|               |  |
|---------------|--|
| <b>Zone 0</b> | Explosive gas air mixture continuously present   |
| <b>Zone 1</b> | Explosive gas air mixture likely to occur in normal use  |
| <b>Zone 2</b> | Explosive gas air mixture not likely to occur and if it does, it will only occur for a short time. |

Be used in gas groups:

|                |          |
|----------------|----------|
| <b>Group A</b> | Propane  |
| <b>Group B</b> | Ethylene |
| <b>Group C</b> | Hydrogen |

Allowable temperature classification/ambient temperature:

### INTRINSIC SAFETY (Type ia)

| CLASS | AMBIENT TEMPERATURE RANGE °C |           |
|-------|------------------------------|-----------|
| T1    | 450°C                        | -25 to 85 |
| T2    | 300°C                        | -25 to 85 |
| T3    | 200°C                        | -25 to 85 |
| T4    | 135°C                        | -25 to 85 |
| T5    | 100°C                        | -25 to 50 |
| T6    | 85°C                         | -25 to 40 |

### 2.7.4 ENVIRONMENTAL PROTECTION

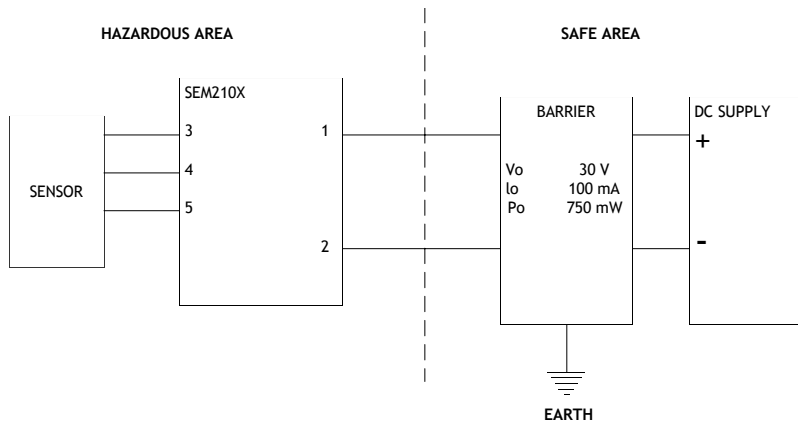
This equipment must be housed in an enclosure which provides a degree of protection of at least IP54. The enclosure must be suitable for the atmosphere and environment in which it is installed. (e.g. If of a plastic material, must be resistant to chemical corrosion, UV light, temperature, humidity, etc).

### 2.7.5 MAINTENANCE

This intrinsically safe equipment contains no user serviceable, adjustable or replaceable parts. No attempt should be made to repair a faulty SEM210X transmitter, all units must be returned to the manufacture for repair or replacement. Attempt service or replacement of parts may invalidate the explosive protection features of the equipment.

### 2.8 CONNECTION DIAGRAM

They equipment must be electrically connected as shown below:



#### SEM210X WORKING PARAMETERS

|                |        |
|----------------|--------|
| U <sub>i</sub> | 30 V   |
| I <sub>i</sub> | 100 mA |
| P <sub>i</sub> | 750 mW |
| C <sub>i</sub> | 10 nF  |
| L <sub>i</sub> | 0 µH   |

## 3.0 INSTALLATION

### 3.1 MECHANICAL

The transmitter is mounted using two 5.5 mm diameter holes, on standard 33 mm fixing centres and will fit a DIN standard termination head. The transmitter should be installed with adequate protection from moisture and corrosive atmospheres.

Care must be taken when locating the transmitter to ensure the ambient temperature remains within the specified operating range. Figure 1 shows the mechanical layout and a typical application of the transmitter mounted inside a termination head enclosure, with sensor wires entering through the centre of the transmitter body.

Figure 1

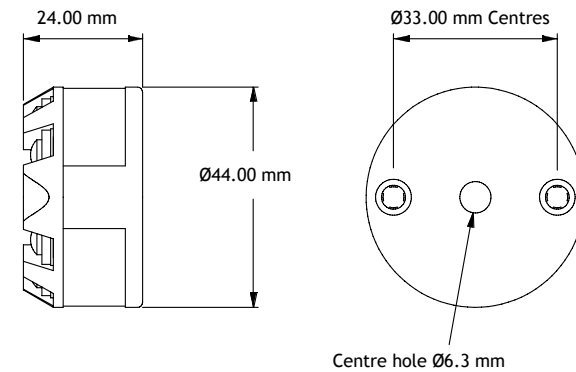
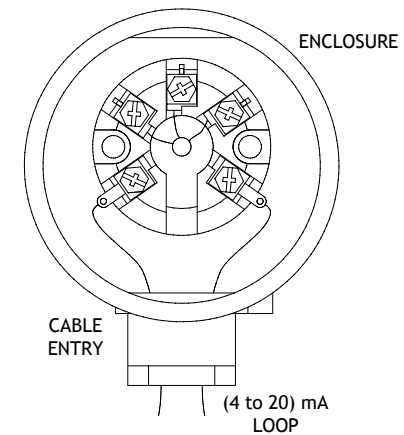


Figure 2



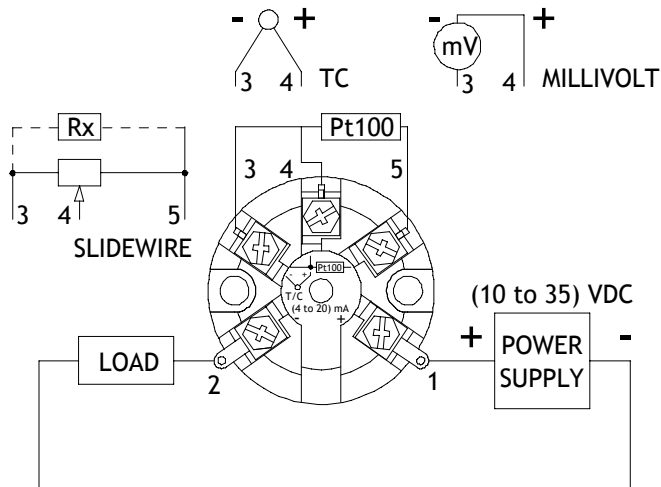
### 3.2 ELECTRICAL

Connections to the transmitter are made to the screw terminals provided on the top face. No special wires are required for the output connections, but screened twisted pair cable are the most suitable for long runs. It is recommended that screened cable is used for the three input signal wires for cable runs greater than one metre. All three input wires must have the same core diameter to maintain equal lead resistance in each wire. A Ø4.5mm hole is provided through the centre of the transmitter to allow sensor wires to be threaded through the transmitter body direct to the input screw terminals. The screw terminals have been designed to allow all connection wires to enter from an inner or an outer direction.

Figure 3 shows the method of connection to provide a (4 to 20) mA current loop output. The Pt100 sensor shown would normally take the form of a probe assembly with a three wire connection. The output loop has a voltage power supply used to provide loop excitation. The load symbol represents other equipment in the loop, normally indicators, controllers or loggers. Care must be taken when designing the (4 to 20) mA circuit to ensure that the total voltage requirements of all the equipment in the loop added together, does not exceed the power supply voltage. If a number of instruments are connected in the loop, ensure that only one instrument is tied to ground. Grounding the loop at two points will cause a short circuit of part of the loop leading to measurement errors.

To guarantee CE compliance, sensor leads must be less than 3 m long and the transmitter housing should prevent access to the transmitter during normal operation.

Figure 3



\* Fit Rx for all potentiometers with end to end resistance > 390 Ω. Such that total end to end resistance is > 200 Ω < 390 Ω.

### ALSO AVAILABLE:

- Smart In Head Temperature Transmitters
- DIN Rail Mounted Temperature Transmitters
- Panel & Field Temperature Indicators
- Temperature Probes
- Trip Amplifiers
- Signal Conditioners
- And many other products

For further information on all products:



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