

# SEM210

## PROGRAMMABLE IN HEAD TEMPERATURE TRANSMITTER

Designed, manufactured and supported by:

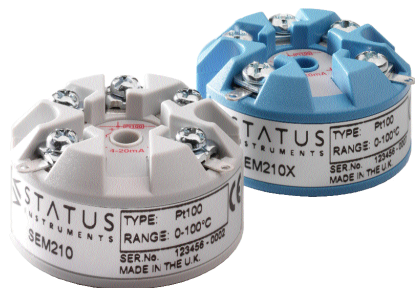


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Stock code 51-214-2186-02

Issue 8



### 1.0 GENERAL

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 M-Config with the USB Configuration module can be used to program the unit.

### 2.0 SPECIFICATION @ 20 °C

#### 2.11 RTD Input (Pt100)

Sensor Range	(-200 to +850) °C (18 to 390) Ω		
Minimum Span <sup>1</sup>	25 °C		
Linearisation	BS EN 60751 (IEC 751) BS 1904 (DIN 43760) JISC 1604		
Basic Measurement Accuracy <sup>2</sup>	± 0.01 % FRI ± 0.05 % Rdg (FRI = Full Range Input), (Rdg = Reading)		
Thermal Drift	Zero (0.008 °C / °C) Span (0.01% / °C)		
Excitation Current	300 µA to 550 µA		
Maximum Lead Resistance	50 Ω / leg		
Lead Resistance Effect	0.002 °C / Ω		

#### 2.12 Thermocouple Input

Sensor Ranges	Thermocouple Type	Measuring Range <sup>3</sup> °C	Minimum Span <sup>1</sup> °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	100
	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

Linearisation	BS 4937 / IEC 584, EN60584		
Basic Measurement Accuracy <sup>2</sup>	± 0.04 % FRI ± 0.04 % Rdg or 0.5 °C (Which ever is greater) (FRI = Full Range Input), (Rdg = Reading)		
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		

#### 2.13 Millivolt Input

Input	Voltage Source		
Range	(-10 to +75) mV		
Characterisation	Linear		
Minimum Span <sup>1</sup>	5 mV		
Basic Measurement Accuracy <sup>2</sup>	± 10 µV ± 0.07 % Rdg		
Input Impedance	10 MΩ		
Thermal Drift	Zero (0.1 µV / °C) Span (0.01% / °C)		

#### 2.14 Slidewire Input

Input	3 Wire potentiometer		
Resistance Range	(10 Ω to 390 Ω) (End to End) Larger values can be accommodated by external resistor		
Characterisation	Linear		
Minimum Span <sup>1</sup>	5 % of FRI		
Basic Measurement Accuracy <sup>2</sup>	0.1 % of FRI		
Thermal Drift	0.01 % / °C		

#### Notes.

- Any span may be selected, full accuracy is only guaranteed for spans greater than the minimum recommended.
- Basic Measurement Accuracy includes the effects of calibration, linearisation and repeatability.
- Consult thermocouple reference standards for thermocouple material limitation.

#### 2.2 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) VDC
Maximum Output Load	[(Vsupply - 10)/20] KΩ (eg 700 Ω @ 24V)

### 2.3 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, 5, 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 EN 61326
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### Mechanical

Enclosure	DIN standard terminal block size
Material	ABS
Weight	35 g
Dimensions	43 mm diameter x 21 mm

### Communications

PC Interface	USB via configurator
Maximum Cable Length	1000 m

### Configurable Parameters

Sensor type: Burnout: °C / °F: Output: Hi / Lo: Filter: Tag: User Offset

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

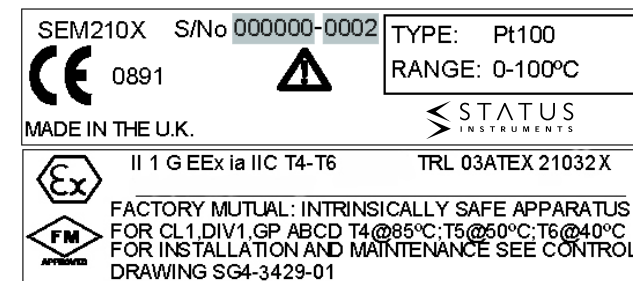
#### 2.4.1 ATEX Certificate

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, eg 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.

#### 2.4.2 ATEX Marking



#### Common Information

Manufacturer Status Instruments Ltd  
Type Number SEM210X

CE marking



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

**2.4.3 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:-

**2.4.3.1 Zones, Gas Groups, and T rating.**

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

Zone 0	explosive gas air mixture continuously present
Zone 1	explosive gas air mixture likely to occur in normal use
Zone 2	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:-

Group A	propane
Group B	ethylene
Group C	hydrogen

Allowable Temperature classification / ambient temperature:-

Intrinsic safety (Type ia)

Class Range	Ambient Temperature
T1 450°C	-25 to 85 °C
T2 300°C	-25 to 85 °C
T3 200°C	-25 to 85 °C
T4 135°C	-25 to 85 °C
T5 100°C	-25 to 50 °C
T6 85°C	-25 to 40 °C

**2.4.3.2 Environmental protection**

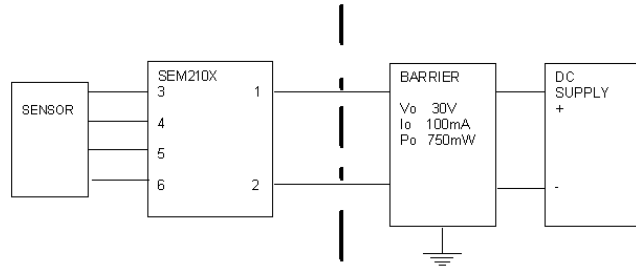
This equipment must be housed in an enclosure which provides a degree of protection of at least IP54. The enclosure must be suitable for the atmosphere and environment in which it is installed. (eg If of a plastic material, must be resistant to chemical corrosion, UV light, temperature, humidity, etc).

**2.4.3.3 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.

**2.4.3.4 Connection Diagram**

They equipment must be electrically connected as shown below:-



**SEM210X Working Parameters**

Ui	30 V
Ii	100 mA
Pi	750 mW
Ci	10 nF
Li	0

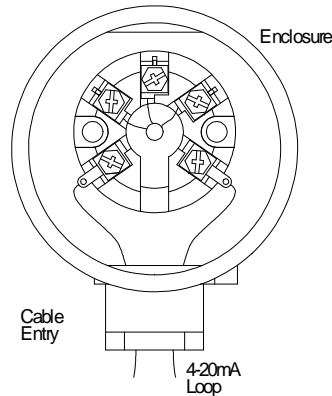
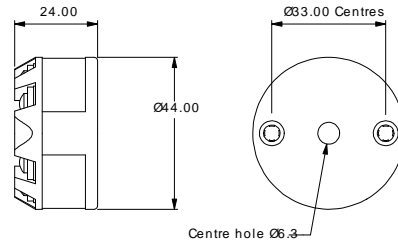
**3.0 INSTALLATION**

**3.1 Mechanical**

The transmitter is mounted using two 5.5mm 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**



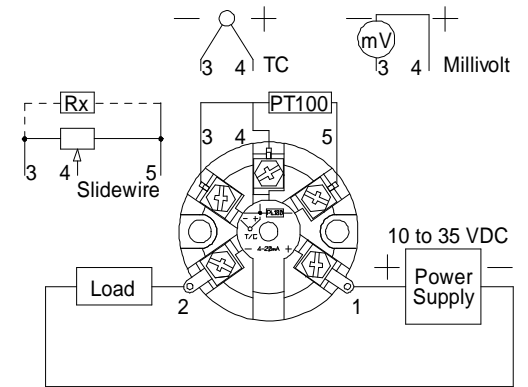
**3.2 Electrical**

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 Ø4.5 mm 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 2 shows the method of connection to provide a (4-20) 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 (4-20) 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 metres long and the transmitter housing should prevent access to the transmitter during normal operation.

**Figure 2**



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