UNIVERSAL INPUT X
GALVANICALLY ISOLATED X
HIGH ACCURACY AND STABILITY X
SMALL SIZE X
EASILY RE-PROGRAMMED X
IN LOOP INTERROGATION X

TRANSMITTERS

SMART UNIVERSAL TEMPERATURE TRANSMITTER
SEM210

INTRODUCTION

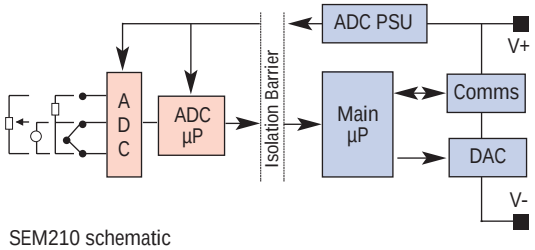
The **SEM210** is a second generation 'Smart' in head temperature transmitter that accepts any commonly used temperature sensor, Slidewire transducer or Millivolt signal and converts the output to the industry standard 4-20 mA transmission signal.

The sensor type and range are easily programmed using a PC and a simple Windows based software program. Connection from the PC serial port is made using the same wires that carry the 4-20mA output signal. This simplifies connection and allows for re-programming or interrogation of the SEM210 while it is installed in the loop. Sensors can be changed without the need for recalibration.

Isolation is a standard feature, removing all ground loop effects as the input is electrically and physically isolated from the loop power supply (see the schematic below). The use of two micro-processors results in error-free data transmission across the isolation barrier.

The very small size coupled with the versatility of this universal transmitter make it the ideal choice for every temperature measurement application, resulting in lower inventory, greater operational flexibility and, in common with our other products, a **low cost of ownership**.

Block diagram



SEM210 schematic

INPUTS

Pt100 Platinum resistance sensors, Thermocouples, millivolts or Slidewire sensors may be connected to the unit. The Type "X" option allows for custom sensor characterization. This option is factory pre-configured to customer's specification.

The Process Variable may be filtered to remove incoming signal noise using one of four settings. If the 'Adaptive' function is selected the filter continuously adjusts to the incoming signal to noise ratio in order to choose an appropriate level of filtering. In this way a slowly changing input can be heavily filtered but if the signal goes through a sudden change the filter quickly reduces allowing a rapid response. Other settings are; off, 2 seconds, 10 seconds.

A user programable offset is available to remove any system errors that may be present and sensor referencing enables the transmitter to be accurately matched to a particular sensor.

CURRENT OUTPUT

In normal operation the current output varies between 4 and 20mA. If the input sensor develops a fault, or the software in either of the two microprocessors detects an error, then the current output is driven either upscale (greater than 20mA) or downscale (less than 4mA) depending upon the sense of the burnout parameter selected.

COMMS OPERATION

The transmitter is accessed via the comms interface adaptor for re-programming or examination of the process variable and status information. The interface adaptor converts the special communications signals on the transmitter power connection cables to the standard RS232 in order to connect directly to a PC serial port. There are two methods of connecting the interface adaptor to the transmitter (1) using the adaptor's own power supply or, (2) using the power from an existing loop.

STATUS INSTRUMENTS INC.
PO Box 548, 456 Park Ave., Scotch Plains, NJ 07076
Phone: (800) 700-3272 Fax: (800) 700-5468 (US & CA only)
Phone: (908) 490-0232
Email: rc@statinst.com Internet Address: www.statinst.com

SPECIFICATION @ 68°F INPUT SENSORS AND RANGES

RTD (Pt100)

Sensor Range		-328 to +1562°F [18-390ohm]
Minimum Span1		77ºF
Linearization		BS-EN60751 / BS1904 / DIN43760 / JISC 1604 / CUSTOM [X]3
Basic measurement accuracy		±0.01%FRI ±0.05% Rdg FRI = Full Range Input
Thermal Drift	**Zero**	0.008°F/°F
	Span	50 ppm/°F
Excitation current		300µA to 550µA
Maximum lead resistance		50 Ohms/leg
Lead Resistance effect		0.004°F/Ohm

THERMOCOUPLE

THERMOCOUPLE TYPE	MEASURING RANGE*4 ºF	MINIMUM SPAN1 ºF
TC Type **K**	-328 to 2450	90
TC Type **J**	-328 to 2192	90
TC Type **T**	-346 to 752	45
TC Type **R**	14 to 3200	180
TC Type **S**	14 to 3200	180
TC Type **E**	-328 to 1832	90
TC Type **F (L)**	-148 to 1112	45
TC Type **N**	-292 to 2372	90
TC Type [**X**]3	±9999	Custom

Basic Measurement Accuracy2		±0.04% FRI ±0.04% Rdg or 0.025ºF (whichever is greater)
Linearization		BS 4937 / IEC 584-3
Cold Junction Error		±0.25°F
Cold Junction Tracking		0.05°F/°F
Cold Junction Range		-40 to +185ºF
Thermal drift	**Zero**	0.05µV/°F
	Span	50 ppm/°F

MILLIVOLTS

Input		Voltage Source
Range		-10 to +75mV
Characterization		Linear Custom [X]3 (5th Order Polynomial)
Minimum Span1		5 mV
Basic Measurement Accuracy2		±10µV ±0.07% rdg
Input Impedance		10 M Ohm
Thermal Drift	**Zero**	0.05µV/°F
	Span	50 ppm/°F

SLIDEWIRE

Input	3 wire potentiometer
Resistance range	10 Ohm to 390 Ohm [End to End] (Larger values can be accommodated by fitting an external resistor)
Characterization	Linear Custom [X]3 (5th Order Polynomial)
Minimum Span1	5%
Basic Measurement Accuracy2	0.1%
Temperature Drift	50 ppm/ºF

OUTPUT

Output Range	4-20 mA
Max Output	23mA
Accuracy	±5µA
Voltage effect	0.2µA/V
Thermal drift	0.05µA/°F
Supply voltage	10 to 35V
Max. output load	[(V supply -10)/20] Kohms (700 ohms @ 24V)

GENERAL SPECIFICATION

Input/Output Isolation	500 V AC rms
Update time	250 mS Maximum
Response time (Filter OFF)	< 1 second
Filter Factor Programmable:	Off, 2 seconds, 10 seconds or Adaptive
Warm up	2 minutes to full accuracy
Stability	0.1% FRI or 0.1°C / year

APPROVALS

EMC	**Emissions**	BS EN50081
	Immunity	BS EN50082
	Hazardous Area	Approvals pending

ENVIRONMENTAL

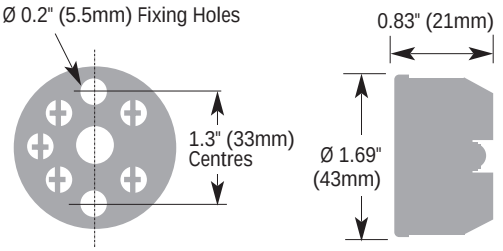
Ambient operating range	-40 to 185ºF
Ambient storage temperature	-58 to 212ºF
Ambient humidity range	10 to 90% RH non-condensing I.S. version 0-100% RH

ENCLOSURE

Material	NORYL™
Flammability	SEI UL94-V1

Mechanical Details

Weight 0.9 oz (25g) Standard version
1.4 oz (40g) I.S. version



Notes

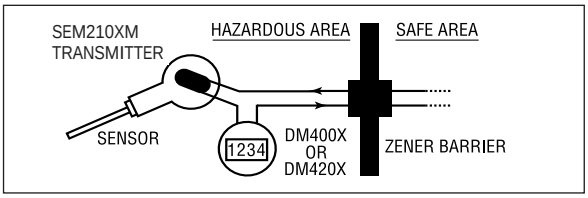
1. Any span may be selected but full accuracy is only guaranteed for spans greater than the minimum recommended.
2. Basic Measurement Accuracy includes the effects of calibration, linearization and repeatability.
3. Customer linearization is available pre-programmed at the factory, contact sales office for details.
4. Consult Thermocouple reference standards for practical temperature spans.

COMMUNICATIONS

PC Interface	RS 232 via interface adapter
Comms protocol	ANSI X3.28 1976
Data Rate	1200 baud
Minimum output load	100 ohms for 'In loop' programming
Maximum cable length	3280 feet (1000m)
Configurable Parameters	Sensor type: Burnout: °F /°C Output Hi/Lo: Filter: Tag: User offset

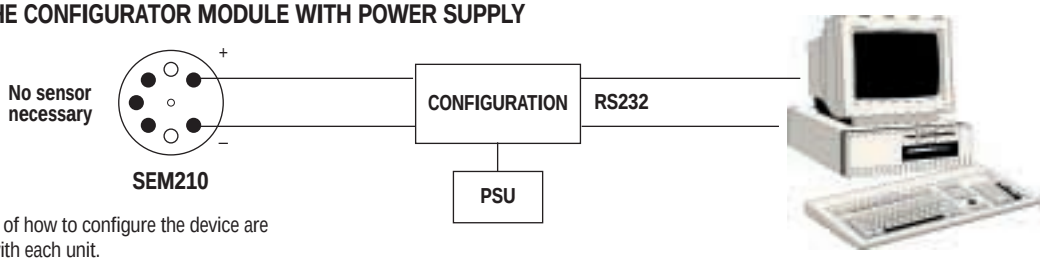
HAZARDOUS AREA

Available for mounting in flammable atmospheres approved to FM3610, EEx ia IIc T5 or Ex NII.



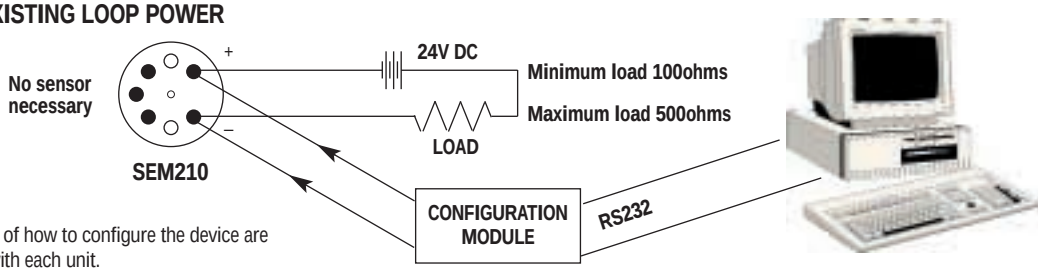
CONFIGURATION DIAGRAM

USING THE CONFIGURATOR MODULE WITH POWER SUPPLY



Full details of how to configure the device are supplied with each unit.

USING EXISTING LOOP POWER

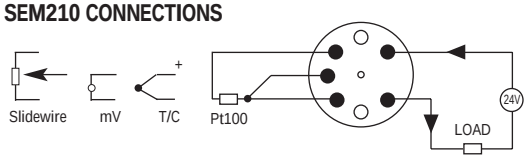


Full details of how to configure the device are supplied with each unit.

ELECTRICAL CONNECTIONS

Connections to the transmitter are made via the screw terminals provided on the top face. The transmitter is protected against reverse connection so that incorrect connection of the output wires results in near zero current flow in the loop.

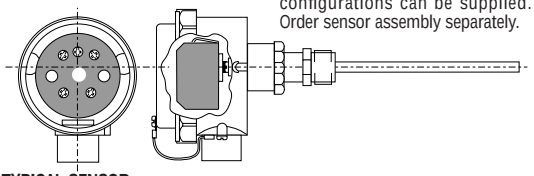
SEM210 CONNECTIONS



SEM210 Showing the RCPW-210 configuration kit and computer

TYPICAL SENSOR ASSEMBLY

Other Termination head styles and configurations can be supplied. Order sensor assembly separately.



TYPICAL SENSOR
A typical assembly of a Sensor fitted with an SCH4 Connecting Head and containing an SEM210 Series Transmitter.

ORDER CODE

SEM210	Standard Unit
SEM210X	Approved for Hazardous Area Use to EEx ia IIC T5 and FM3610
SEM210N	Approved to ExN II
CONFIG 210	Pre Configured to Specified Range (State Range)
RCPW-210-USA	Programming kit for SEM210 comprising I/F adapter box, RCPW software, North American PSU and carry case.

ASSOCIATED PRODUCTS

SEM104 series **LOW COST Temperature Transmitter**.
A low cost transmitter for RTD (Pt-100) and T/C sensors providing a two wire 4-20 mA output. The standard factory calibrated settings can be user re-ranged via links and on board Span and Zero potentiometers. A wide selection of probe assemblies can be supplied.

SEM220 and **SEM230** series **Smart** DIN Rail **Transmitters/Conditioners**.
These **Smart** Isolated transmitters and conditioners are universal and fully configurable via a simple to use PC serial communications link. **SEM230XM** is a transmitter for Intrinsically Safe operation allowing the sensors to be directly connected into a hazardous area eliminating the need for additional barriers. Alarm options are also available.

DIN rail mount, high accuracy (0.05%) and stability is offered with a high packing density.

SEM1000	Analog Process Signal Isolators loop powered.
SEM1020	Loop Booster.
SEM1100	Line Powered process isolator
SEM1200	Signal splitter
SEM1300	Power supply providing 24V DC @ 250mA from an AC power source
SEM1401/1402	Loop powered trip amplifiers
SEM1503/1504	RTD (Pt 100) 2 or 3, or, 3 or 4 wire transmitters
SEM1500 T/C	Isolating Thermocouple Transmitter

DM4000 series **SMART** Digital Panel **Indicators**.
These SMART digital indicators are configurable from the front panel or by an optional serial communication link. There are 3 versions: **DM4000U**, a universal instrument accepting all common process signals, the **DM4000C**, accepting pulse inputs and displaying RATE or TOTAL and the **DM4000A** which accepts rate proportional analog inputs to display RATE and TOTAL.

LOCAL REPRESENTATION

RICHTEC
A RICHTEC PLC GROUP COMPANY
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