

# SEM310 SEM310X HART UNIVERSAL TEMPERATURE TRANSMITTER

- **HART 5,6,7 COMPATIBLE**
- **UNIVERSAL INPUT, DUAL CHANNEL\*1**
- **ATEX, UKEX & IEC Ex VERSION**
- **MATHS FUNCTIONS**
- **SIL HARDWARE SAFETY INTEGRITY**

## ➤ **INTRODUCTION**

The SEM310 is a HART 5 upwards, (generic device) compatible universal transmitter. It accepts RTD, Thermocouple, Potentiometer or millivolt input signals and converts them to the industry standard (4 to 20) mA transmission signal. Alternatively, HART multidrop mode can be selected.

The SEM310 is programmed using a standard USB lead. The ATEX / UKEX / IECEx version (SEM310X) is programmed with a ATEX / UKEX / IECEx approved communication lead (USBX Config).

Both versions use our free configuration USBSpeedlink software downloaded from our web site. Standard features can also be programmed using HART communication.

## ➤ **FEATURE HIGHLIGHTS**

### **SENSOR REFERENCING**

The SEM310 sensor referencing via the Windows based USBSpeedlink software allows for close matching to a known reference sensor eliminating possible sensor errors.

### **USER CALIBRATION**

In addition to sensor referencing, current output trimming is possible via the USB and HART commands.

### **CUSTOM LINEARISATION**

The SEM310 can be programmed with a custom linearization to suit nonstandard sensors or sensors with unusual or unique characteristics. Consult the sales office for details.

### **SENSOR BURN OUT DETECTION**

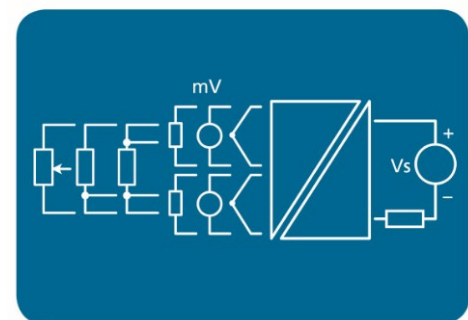
If a sensor wire is broken or becomes disconnected the SEM310 output will automatically go to its user defined level (upscale or downscale) or pre-set value.

### **OUTPUT CURRENT PRESET**

For ease of system calibration and commissioning the output can be set to a pre-defined level anywhere within the (4 to 20) mA range.

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\*1 Dual channel input not available on slide wire or multi wire RTD.



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ELECTRICAL INPUT		SPECIFICATIONS @20°C
<b>Range + Options</b>	<b>Accuracy</b>	<b>Stability</b>
<b>Resistance</b>		
(10 to 10000) Ω Excitation 200 μA Lead resistance (0 to 20) Ω (2,3 or 4 Wire connection)	(10 to 500) Ω ± 0.055 Ω, (500 to 2500) Ω ± 0.5 Ω, (2500 to 10500) Ω ±0.2 % of reading (+ Lead error on 2 wire)	(0 to 500) Ω 0.013 Ω/°C, (500 to 2500) Ω 0.063 Ω/°C, (2500 to 10500) Ω 0.27 Ω/°C
<b>Slide wire</b>		
(0 to 100) % Travel Wire resistance (1 to 100) KΩ	± 0.1 %	±0.001%/°C
<b>mV</b>		
(-205 to 205) mV DC (-1000 to 1000) mV DC	±0.02 mV ±10.0 mV	±0.005 mV/°C ±0.02 mV/°C

SENSOR INPUT		SPECIFICATIONS @20°C
<b>RTD (Single/ 2 wire Dual Channel; isolated tip only for Dual operation)</b>		
<b>Type</b>	<b>Range</b>	<b>Accuracy/ Stability</b>
Pt100 (IEC)	(-200 to 850) °C	0.2°C ± (°0.05% of reading) (Plus sensor error)
Pt500 (IEC)	(-200 to 850) °C	
Pt1000 (IEC)	(-200 to 600) °C	
Ni100	(-60 to 180) °C	
Ni120	(-70 to 180) °C	
Ni1000	(-40 to 150) °C	
Cu53	(-40 to 180) °C	
Cu100	(-80 to 260) °C	
Cu1000	(-80 to 260) °C	
Library contains more (standards/types) Including silicon sensors		
Temperature stability: - Refer to resistance stability values for thermal effect		

SENSOR INPUT		SPECIFICATIONS @20°C
<b>Thermocouple (Single/Dual Channel; isolated tip only for Dual operation)</b>		
<b>Type</b>	<b>Range</b>	<b>Accuracy/ Stability</b>
K	(-150 to 1370) °C	±0.1 % of full scale ± 0.5 °C (Plus sensor error)
J	(-200 to 1200) °C	
N	(-270 to 1300) °C	
E	(-260 to 1000) °C	
T	(-150 to 400) °C	
R	(0 to 1760) °C	±0.2 % of full scale ± 0.5 °C (Plus sensor error)
S	(0 to 1760) °C	
L	(-200 to 900) °C	±0.1 % of full scale ± 0.5 °C over range (800 to 1760) °C (Plus sensor error)
U	(-200 to 600) °C	
B	(0 to 1820) °C	
C	(0 to 2300) °C	
D	(0 to 2300) °C	
G	0 to 2300) °C	
Library contains more (standards/types)		
Temperature stability: - Refer to mV stability values for thermal effect		

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COLD JUNCTION (Ambient sensor)		SPECIFICATIONS @20°C
<b>Type</b>	<b>Range</b>	<b>Accuracy/Stability</b>
Thermistor 10K Beta 3380	(-40 to 85) °C	±0.2 °C
Thermal drift	Zero at 20 °C	±0.05 °C/°C

DUAL CHANNEL OPERATION	
Thermocouples A & B	Functions; Average, Redundancy, A + B, A – B, Highest, Lowest
mV A & B	Functions; Average, A + B, A – B, Highest, Lowest
RTD A & B	Two wire connection. Functions; Average, A + B, A – B, Highest, Lowest

OUTPUT		SPECIFICATIONS @20°C
<b>Type/ options</b>	<b>Range</b>	<b>Accuracy/ Stability/ Notes</b>
Two wire current	(4 to 20) mA	(mA Out/ 2000) or 5 uA whichever is the greater
Thermal drift	Zero at 20 °C	1 uA/°C
User set minimum current	(3.5 to 4.0) mA 3.8 mA default	
User set maximum current	(20 to 23.0) mA 20.5 mA default	
User set error current	(3.5 to 23.0) mA	
User pre-set current	(20 to 23.0) mA	For diagnostics
Current loop off	3.5 mA	
Loop effect	± 0.2 uA/V	
Loop supply	(10 to 30) V DC, > 35 mA	SELV
Max load	[(V supply – 10)/20] KΩ	700 Ω @ 24 V DC
Protection	Reverse and over voltage	

USB USER INTERFACE, required to access advanced functionality options		
Approved USB configuration lead required for SEM310X		
Type/ Options/ Function	Description	Notes
USB 2.0	Mini B USB Approved configuration lead SEM310X	USB powers device for config Only. Power loop for live data.
Baud Rate	38,400	
Sensor configuration	Sensor type  Sensor offset Sensor fail high or low Pre-set sensor value Set damping Set No. wires resistance Input Set fixed or auto cold junction	TC/mV/RTD/Ohms/Slide wire Dual TC/mV/RTD Dual use separate offsets Dual Share sensor fail For diagnostics  2, 3 or 4 wire
Profiler configuration	Set profiler input range Set profiler segments Enter profile X~Y values Set profiler output units Set the output process range TC & RTD input only set units	In sensor units (4 to 22) segments    Profiler set up
Output signal	Select the process range for re-transmission Set minimum current Set maximum current Set the error current Trim 4.0 mA signal Trim 20 mA signal Pre-set Loop current	Set in profiler out units (3.5 to 4.0) mA (20 to 23.0) mA (3.5 to 23.0) mA (3.8 to 4.5) mA (19.5 to 20.5) mA (3.5 to 23.0) mA

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Damping	User set process variable (PV) damping	(1 to 32) seconds to reach 70% of final value
Diagnostics	Read (PV, mA, ambient °C, error & power off) logs points back from device Set the log period Clear log and start new log Export log data Detect open circuit sensor wire Calibration date, certificate number, calibrated by	Up to 150 points Log Rate (1 to 60) readings per hour
Live Data	Read process variable (PV) Read profiler input signal Read profiler output signal Read ambient temperature Read % output Read mA output	
HART information	Read/write tag number Read/write tag date Set polling address Read/write description Read/write message Read/write final assembly number Read/write long tag	
HART specification	Read manufacturers ID Read short ID Read HART revision Read device revision Read software revision Read hardware revision Read unique ID Read No. pre-amble Read maximum No. variables Read No. of configuration changes Extended device status Extended manufacturers ID Extended distributes ID Device profile Device ID1, ID2 & ID3	

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HART INTERFACE		
Type/ options/ function	Description	Notes
<p>HART Protocol 1200 baud FSK</p> <p>Version HART 5 to 7 compatible</p> <p>Universal commands</p>	<p>1.Read primary variable (PV)</p> <p>2.Read loop current and percentage of range</p> <p>3.Read dynamic variables and Loop current</p> <p>7.Read loop configuration</p> <p>8.Read dynamic variable classifications</p> <p>9.Read device variables with status</p> <p>12.Read message</p> <p>13.Read tag, descriptor and date</p> <p>14.Read primary variable transducer Information</p> <p>15.Read device information</p> <p>16.Read final assembly number</p> <p>17.Write message</p> <p>18.Write tag, descriptor and date</p> <p>19.Write final assembly number</p> <p>20.Read long tag</p> <p>22.Write long tag</p> <p>38.Reset configuration changed flag</p> <p>48.Read additional device status</p>	
<p>Additional universal commands</p>	<p>0. Read unique ID</p> <p>6. Write polling address</p> <p>11. Read unique ID associated with tag</p> <p>21. Read unique ID associated with long tag</p>	
<p>Common practice commands</p>	<p>34. Write PV damping value</p> <p>35. Write PV range</p> <p>40. Enter/exit fixed current mode</p> <p>41. Perform self-test</p> <p>42. Perform device reset</p> <p>45. Trim loop current zero</p> <p>46. Trim loop current gain</p> <p>49. Write primary variable transducer serial number</p> <p>71. Lock device</p> <p>76. Read lock device state</p>	

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GENERAL	
Function	Description
Isolation	Flash tested 5 Seconds 4 KV DC, working voltage 50 V AC
Reading update	200 ms
Response time	500 ms to reach 70% final value
Warm up	2 minutes
Start-up time	5 seconds

AMBIENT	
Function	Description
Temperature	Operating/Storage (-40 to 85) °C
Humidity	Operating/Storage (10 to 90) %RH non-condensing
Protection	>= IP65
USB configuration ambient	(10 to 30) °C

MECHANICAL	
Enclosure	DIN standard size terminal block
Material	ABS flammability UL94-VO
Dimensions	44 mm diameter 24 mm height
Weight	Approximately 43 g
Fixing centres	33 mm
Centre hole	6.35 mm
Colour	Black SEM310, Blue SEM310X

CONNECTIONS	
Function	Description
Output	Screw terminals (1 to 2)
Input	Screw terminals (3 to 6)
USB	Mini USB for SEM310, approved configuration lead for SEM310X

APPROVALS	
EMC	BS EN 61326 Industrial
Ingress protection	BS EN 60529
RoHS	Directive 2011/65/EU Incorporating Amendment Directive EU2015/863 and UK designated standard.
SIL Accreditation	IEC 61508-2: 2010 clauses 7.4.4 and 7.4.5
ATEX / UKEX SEM310X	Ex ia IIC T4 Ga
	Ex ia IIIC T135 Da
IECEX SEM310X	Ex ia T4 Ga
	Ex ia IIIC T135 Da

ORDER CODE	
STANDARD	SEM310
ATEX / UKEX	SEM310X

ACCESSORIES	
USB configuration software	USBSpeedLink free of charge from <a href="http://www.status.co.uk">www.status.co.uk</a>
USB programming lead	USB programming lead part number 42-200-0001-01
ATEX / UKEX programming lead	USBX
Head enclosure options	Refer to <a href="http://www.status.co.uk">www.status.co.uk</a>
Probe options	Refer to <a href="http://www.status.co.uk">www.status.co.uk</a>

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