

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

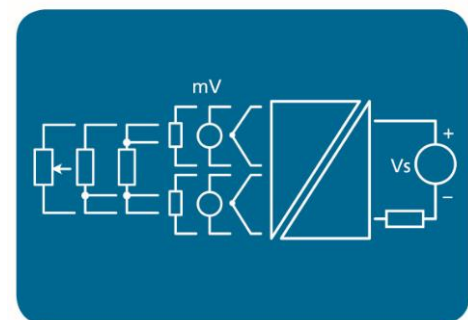
If a sensor wire is broken or becomes disconnected the SEM310 output will automatically go to its user defined level (upscale or downscale) or pre-set value.

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.

Hart® Registered trademark of the HART Communication Foundation.

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



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| ELECTRICAL INPUT | | SPECIFICATIONS @20°C |
|---|--|--|
| Range + Options | Accuracy | Stability |
| Resistance | | |
| (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 |
| Slide wire | | |
| (0 to 100) % Travel Wire resistance (1 to 100) KΩ | ± 0.1 % | ±0.001%/°C |
| mV | | |
| (-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 |
|--|------------------|--|
| RTD (Single/ 2 wire Dual Channel; isolated tip only for Dual operation) | | |
| Type | Range | Accuracy/ Stability |
| 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 | |
|---|-------------------|---|--|
| Thermocouple (Single/Dual Channel; isolated tip only for Dual operation) | | | |
| Type | Range | Accuracy/ Stability | |
| 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 |
|--------------------------------|----------------|---------------------------|
| Type | Range | Accuracy/Stability |
| 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 |
|--------------------------|------------------------------------|---|
| Type/ options | Range | Accuracy/ Stability/ Notes |
| 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 | | |
|--|---|---|
| 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 www.status.co.uk |
| USB programming lead | USB programming lead part number 42-200-0001-01 |
| ATEX / UKEX programming lead | USBX |
| Head enclosure options | Refer to www.status.co.uk |
| Probe options | Refer to www.status.co.uk |