SEM310 SEM310X HART UNIVERSAL TEMPERATURE TRANSMITTER

> **HART 5,6,7 COMPATABLE**

> **UNIVERSAL INPUT, DUAL CHANNEL**

> **S.I.L APPROVAL, ATEX & IEC Ex Version**

> **MATHS FUNCTIONS**

> **FLASH TESTED TO 4 KV DC**

> ## 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 / IECEx version (SEM310X) is programmed with a ATEX / 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.
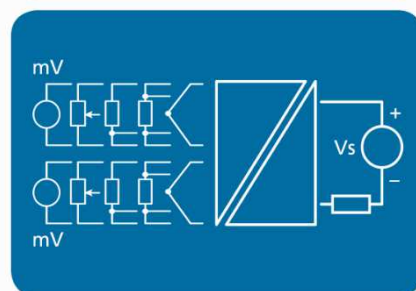
SENSOR BURN OUT DETECTION
If a sensor wire is broken or becomes disconnected the SEM310 output will automatically go to its user defined level (upscale or downscale) or pre-set value.

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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STATUS INSTRUMENTS

SEM310 SEM310X HART UNIVERSAL TEMPERATURE TRANSMITTER

ELECTRICAL INPUT		SPECIFICATIONS @20°C
Range + Options	**Accuracy**	**Stability**
Resistance		
(10 to 10000) Ω Excitation 200 uA 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) K**Ω**	± 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 RTD (Single/ 2 wire Dual Channel; isolated tip only for Dual operation)		SPECIFICATIONS @20°C
Type	**Range**	**Accuracy/ Stability**
Pt100 (IEC)	(-200 to 850) °C	
Pt500 (IEC)	(-200 to 850) °C	
Pt1000 (IEC)	(-200 to 600) °C	
Ni100	(-60 to 180) °C	0.2°C ± (°0.05% of reading) (Plus sensor error)
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 Thermocouple (Single/Dual Channel; isolated tip only for Dual operation)		SPECIFICATIONS @20°C
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	±0.2 % of full scale ± 0.5 °C (Plus sensor error)
R	(0 to 1760) °C	±0.1 % of full scale ± 0.5 °C over range (800 to 1760) °C (Plus sensor error)
S	(0 to 1760) °C	
L	(-200 to 900) °C	±0.1 % of full scale ± 0.5 °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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SEM310 SEM310X HART UNIVERSAL TEMPERATURE TRANSMITTER

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

◄ STATUS I N S T R U M E N T S

SEM310 SEM310X HART UNIVERSAL TEMPERATURE TRANSMITTER

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-ambles Read maximum No. variables Read No. of configuration changes Extended device status Extended manufacturers ID Extended distributes ID Device profile Device ID1, ID2 & ID3	

◁ STATUS
I N S T R U M E N T S

SEM310 SEM310X HART UNIVERSAL TEMPERATURE TRANSMITTER

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

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SEM310 SEM310X HART UNIVERSAL TEMPERATURE TRANSMITTER

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
SIL Accreditation	IEC 61508-2: 2010 clauses 7.4.4 and 7.4.5
ATEX 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	SEM310X

ACCESSORIES	
USB configuration software	USBSpeedLink free of charge
USB programming lead	USB programming lead part number 42-200-0001-01
ATEX programming lead	
Head enclosure options	
Probe options	

To maintain full accuracy annual calibration is required
The data in this document is subject to change. Status Instruments assumes no responsibility for errors

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