

SEM320/55 HART TRANSMITTER WITH DISPLAY

- **HART 5,6,7 COMPATIBLE**
- **ATEX / UKEX / IEC Ex APPROVALS**
- **(4 to 20) mA OR HART MULTIDROP OUTPUT**
- **PROCESS VALUE, TEXT AND BARGRAPH DISPLAYS**
- **DUAL INPUTS WITH MATHS FUNCTIONS**

➤ **INTRODUCTION**

The SEM320 is a HART 5 upwards (generic device) compatible universal temperature transmitter with display. 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.

Housed in its own bespoke connection head manufactured from cast aluminium finished in a blue epoxy paint or a stainless-steel version is available.

It is programmed using a communication lead (USB Config) together with our free configuration USBSpeedlink software. Standard HART features can also be programmed using HART communication.

The SEM320 has a rotational five-digit display for the process value and a 5-digit display for messaging, in addition to a bar graph for % of mA output.

➤ **FEATURE HIGHLIGHTS**

SENSOR-REFERENCING

The SEM320 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

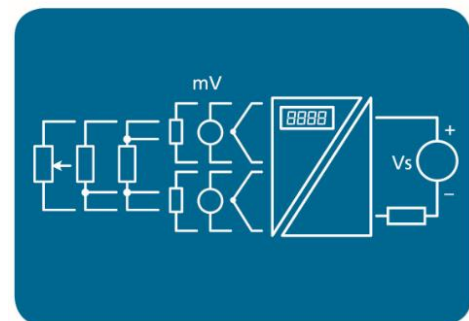
The SEM320 can be programmed with a custom linearisation to suit non-standard sensors, or sensors with unusual or unique characteristics. Consult the sales office for details.

SENSOR BURN-OUT DETECTION

If a sensor wire is broken or becomes disconnected, the SEM320 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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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	±0.2 % of full scale ± 0.5 °C (Plus sensor error)
T	(-150 to 400) °C	
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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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	(3.5 to 23.0) mA	For diagnostics
Current loop off	3.5 mA	
Loop effect	± 0.2 uA/V	
Loop supply	(12 to 30) V DC, > 35 mA	SELV
Max load	[(V supply – 12)/20] KΩ	600 Ω @ 24 V DC
Protection	Reverse and over-voltage	± 30 Vdc, ± 100 mA

Display	
Type	LCD TN positive reflective
Digits	5 numeric digits, height 12.34 mm, display process, 4 decimal point
Numeric	5 off, 14 segment characters, 9.08 mm height, display units and message
Bar and % scales	Act on, mA output, 10 bar graph, plus 0 to 100% display, user-set on or off.
Icons	Warning, °C, °F, mA, communication icon
Temperature limits due to LCD display	Display working range (-25 to 85) °C Below -5 °C the scrolling display is ineffective

USB USER INTERFACE		
Approved USB configuration lead required		
Type/Function	Description	Notes
USB 2.0	Mini B USB Approved configuration lead	USB powers device for configuration only. Power loop for live data.
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

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Type/Function	Description	Notes
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
Damping	User set process variable (PV) damping	(1 to 32) seconds to reach 70% of final value
Display Message	Display message option 32 character per message mA Bar scale and %	Seven user-set process bands with two independent message capabilities. Including ambient temperature, loop mA, signal error and units. User can select Off, Bar, %, Bar + %
Diagnostics	Detect open circuit sensor wire Calibration date, certificate number, calibrated by	
Type/Function	Description	
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 Device ID1, ID2 & ID3	: Read No. pre-ambls : Read maximum No. variables : Read No. of configuration changes : Extended device status : Extended manufacturers ID : Extended distributors ID : Device profile

HART INTERFACE		
Type/Function	Command Number	
HART Protocol 1200 board 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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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
Display	Operating (-25 to 85) °C
Humidity	Operating/Storage (10 to 90) %RH non-condensing
Protection	Enclosure dependent
USB configuration ambient	(10 to 30) °C

MECHANICAL – HOUSED IN SCH55 CONNECTION HEAD	
Enclosure	SCH55 head
Mounting options	The SCH55 housing can be probe or wall/surface mounted
Material body	Aluminium
Material window	Glass
Display orientation	Rotatable through 360°
Mechanical dimensions	See mechanical dimensions layout below
Weight	1200 g approximately
Fixing internal	1 x M5 Earth point
Fixing external	2 x 9 mm diameter holes on 123.5 mm centres, 1 x M5 Earth point
Entries	2 x M20 (in line) with 1 x ½ inch BSP (at 90° to M20 entries)
Colour body	Blue
Approximate weight	1.2 Kg

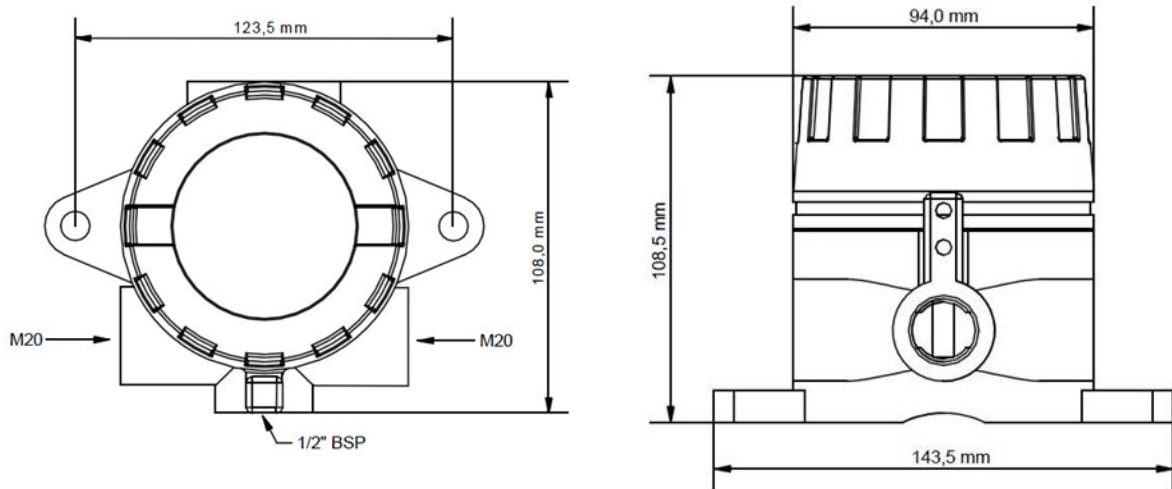
CONNECTIONS	
Function	Description
Output	Two-part screw terminals
Input	Two-part screw terminals
USB	Configuration lead for SEM320

APPROVALS	
EMC	BS EN 61326 Industrial
Ingress protection	BS EN 60529
Ex d	Refer to label information below
Ex ia	Ex ia IIC T4 Ga Ex ia IIIC T135°C Da Tamb -40°C to + 85°C
RoHS	Directive 2011/65/EU incorporating RoHS 3 Amendment directive EU2015/863 and UK designated standard.

APPROVALS SCH55 Head MARKING OPTIONS	
Ex ia Option	Ex d Option
Ex ia IIC T4 Ga Tamb -40°C to + 85°C Ex ia IIIC T135°C Da Tamb -40°C to + 85°C	Ex db IIC T6 Gb Tamb -40°C to + 65°C Ex tb IIIC T85°C Db Tamb -40°C to + 65°C Ex db IIC T5 Gb Tamb -40°C to + 80°C Ex tb IIIC T100°C Db Tamb -40°C to + 80°C Ex db IIC T4 Gb Tamb -40°C to + 85°C Ex tb IIIC T135°C Db Tamb -40°C to + 85°C
The SCH55 series head markings required must be specified at the time of ordering	

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Mechanical Dimensions



ORDER CODES			
		Material A = Aluminium S = Stainless	Approval option for SEM320X variants Ex d * ¹ Ex ia
SEM320	/55	/	
SEM320X	/55	/	/
Example: Aluminium, Ex ia = SEM320X/55/A/Ex ia			
* ¹ Ex d variants must be supplied with a probe fitted.			

ACCESSORIES	
USB configuration software	USBSpeedLink free of charge from
Programming lead	Configuration lead for SEM320
31-620-0013-01	M20 blanking plug (one supplied)
31-620-0012-01	M20 blanking plug Ex d Version
31-630-5368-01	M20 Brass blanking plug (Dome head) ATEX / UKEX
31-620-5369-01	1/2" BSPP SS stopping plug
31-630-5370-01	1/2" BSPP Brass stopping plug (Dome head)
31-620-5371-01	1/2" BSPP SS stopping plug (Dome head)
31-610-5394-01	U Bolt, supplied with nuts and washers
31-620-5395-01	SS M20 (M) x 1/2" NPT (F) Adaptor
31-620-5396-01	SS M20 (M) x 1/2" NPT (F) Adaptor ATEX / UKEX
Temperature probe options	