SEM320X USER GUIDE

ATEX / UKEX APPROVED HART HEAD MOUNT TEMPERATURE TRANSMITTER AND DISPLAY WITH TWO WIRE (4 to 20) mA OUTPUT

Important - Please read this document before installing in particular the ATEX / UKEX information when applicable to the application.

Every effort has been taken to ensure the accuracy of this document; however, we do not accept responsibility for damage, injury, loss or expense resulting from errors and omissions, and we reserve the right of amendment without notice.

IMPORTANT – CE, UKCA & SAFETY REQUIREMENTS.

Use suitable glands and connections to maintain IP66/68.

To maintain CE EMC requirements, input wires must be less than 3 metres.

The product contains no serviceable parts, or internal adjustments. No attempt must be made to repair this product. Faulty devices must be returned to supplier for repair. This product must be installed by a qualified person. All electrical wiring must be carried out in accordance with the appropriate regulations for the place of installation. Before attempting any electrical connection work, please ensure all supplies are switched off.

ABSOLUTE MAXIMUM CONDITIONS: To exceed may cause damage to the device.	
Supply Voltage	± 30 V dc (Protected for over-voltage and reverse connection)
Current with over-voltage	± 100 mA
Input Voltage	± 3 V between any terminals
Ambient	Temperature (-40 to 85) °C, Humidity (10 to 95) % RH (Non-condensing)

2503 2776

Important – Read this document before installing.

1~DESCRIPTION.

The SEM320X 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, not for ATEX applications.

It is programmed using a communication lead (USBX Config) together with our free configuration USBSpeedlink software. Standard HART features can also be programmed using HART communication. The SEM320X 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.

The apparatus is intended for use mounted in a suitable ATEX or IEC Ex approved enclosure which provides at least IP64 protection.

Sensor types RTD, Thermocouple, Slide wire (resistance). Output two wire (4 to 20) mA loop, with HART interface.

2~RECEIVING AND UNPACKING.

Please inspect the packaging and instrument thoroughly for any signs of transit damage. If the instrument has been damaged, please notify your supplier immediately.

3~SPECIFICATION.

Refer to data sheet for full specification.

Configuration	
Factory default	Pt100, (0 to 100) °C, upscale burnout, 0.0°C offset

4~SPECIAL CONDITIONS.

4~1 For use to comply with CE, UKCA and safety.	
1	The equipment must be installed correctly, providing enviromental protection of IP64 or greater. Steps must be taken to ensure the maximum ambient operating range is not exceeded. In particular the temperature probe surface temperature at the point of entry into the equipment housing.
2	The maximum recommended sensor wire length is 10 metres. To maintain full CE EMC requirements for industrial applications, max length is 3 metres.
3	The device contains no serviceable parts. No attempt must be made to repair this product. Please return faulty devices to the supplier or manufacturer.
4	This equipment must be installed by a qualified person. All electrical wiring must be carried out in accordance with the appropriate regulations for the place of installation.

4~2 ATEX / UKEX SPECIAL CONDITIONS FOR SAFE USE.	
1	a) For gas applications, the SEM320X temperature transmitters must be mounted in an ATEX/IECEx approved enclosure rated for IP64 and located in an area where the enclosure will not be subject to impact or friction b) For dust applications, the SEM320X temperature transmitters must be mounted in a suitably ATEX or IECEx certified enclosure appropriate for the zone of end use.
2	Equipment shall only be configured by means of the USBX configurator (certificate references ATEX EMT16ATEX0024X, IECEx EMT16.0013X & CML21UKEX2526X) Connection outside the hazardous area. However, it can it be config by HART in hazardous area via HART communication.
3	The equipment is mounted in an enclosure with separate IS circuits, appropriate segregation shall be provided in accordance with IEC 60079-11 Clause 6.2.1.
4	Only suitable for connection to Thermocouple(s), RTD temperature sensor(s) or slide wire resistance devices or a simple apparatus. They shall conform to the requirements for simple apparatus as defined in IEC 60079-11 clause 5.7 and shall meet the dielectric withstanding requirements of IEC 60079-11 clause 6.3.13. The insulation must be capable of withstanding an r.m.s a.c. test voltage of 2U + 1000V, with a minimum of 1500V r.m.s., where U is the sum of the voltages of the intrinsically safe and the non-intrinsically safe circuit.
5	The ambient temperature range of the enclosure will limit the permitted ambient range of the overall equipment. Refer to enclosure certification.

5~ATEX / UKEX INSTRUCTIONS.

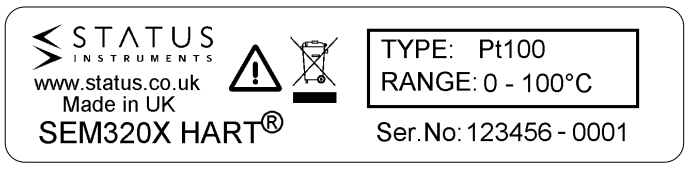
User instruction for SEM320X electrical apparatus when used in a hazardous area. Important: Read and understand this section before any installation.

For safe installation of the SEM320X in hazardous areas the following instructions must be observed. The device must be installed by competent personnel, who are familiar with national and international laws, directives and standards that apply to their region. For installation in European Economic Area (EEA) users in member countries must follow requirements for electrical equipment for use in potentially explosive atmospheres, e.g. EN60079-11 & EN IEC60079-0. This instruction sheet describes installation, which conforms with BS EN60079-14 & BS EN60079-17. Important - Attention must be paid to the section titled, ATEX / UKEX SPECIAL CONDITIONS FOR SAFE USE. Failure to comply to this requirement will result in an unsafe system. The SEM320X has been issued with a certificate, confirming compliance with European ATEX directive 2014/34/EU, and SI2016 No.1107 for the following specification:

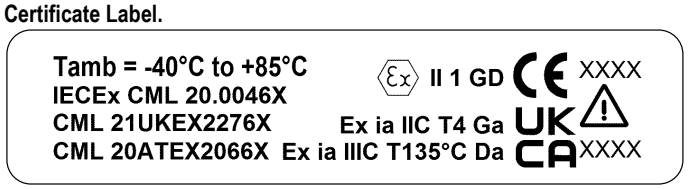
Product Information.

Area Classification		Zone Criteria for Application Atmosphere
Gases	Dusts	
Zone 0	Zone 20	Present continuously or for long periods (> 1000 hours per annum)
Zone 1	Zone 21	Likely to occur in normal operation occasionally (> 10 to < 1000 hours per annum)
Zone 2	Zone 22	Unlikely to occur in normal operation (< 10 hours per annum)

Product label.



Certificate Label.



Working parameters.		
Terminals + / -	Ui = 30 Vdc	Ii = 100 mA
	Pi = 750 mW	Li = 0
	Uo = -	Ci = 0
	Io = -	Po = -

6~INSTALLATION.

6~1 MECHANICAL.

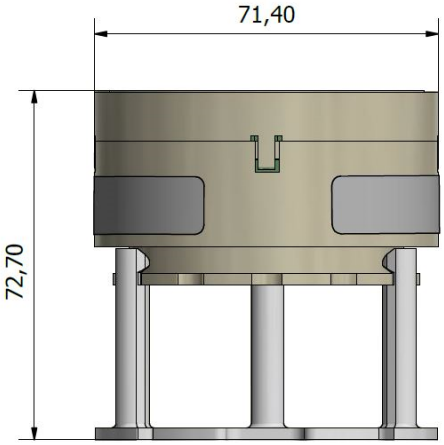
The display device is mounted using a three-pin plastic module support for fitting into a suitable connection head. The module support is secured into the head with screws.
The orientation of the display can be adjusted as required by rotating the display in the module support. Care must be taken to avoid over-stressing any wiring.
The display must be installed with adequate protection from moisture and corrosive atmospheres. The device must be located so the ambient temperature does not exceed the specified operating temperature of the device.

The SEM320X module is mounted using two or three holes, with various fixing centres and will fit a suitable ATEX /IEC Ex approved termination head. The SEM320X must be installed with adequate protection from moisture and corrosive atmospheres. Refer to "special conditions for safe use" section of this user guide for information on enclosure IP rating.
Care must be taken to ensure the SEM320X is located such that the ambient temperature does not exceed the specified operating temperature as specified in the "ABSOLUTE MAXIMUM CONDITIONS" table.

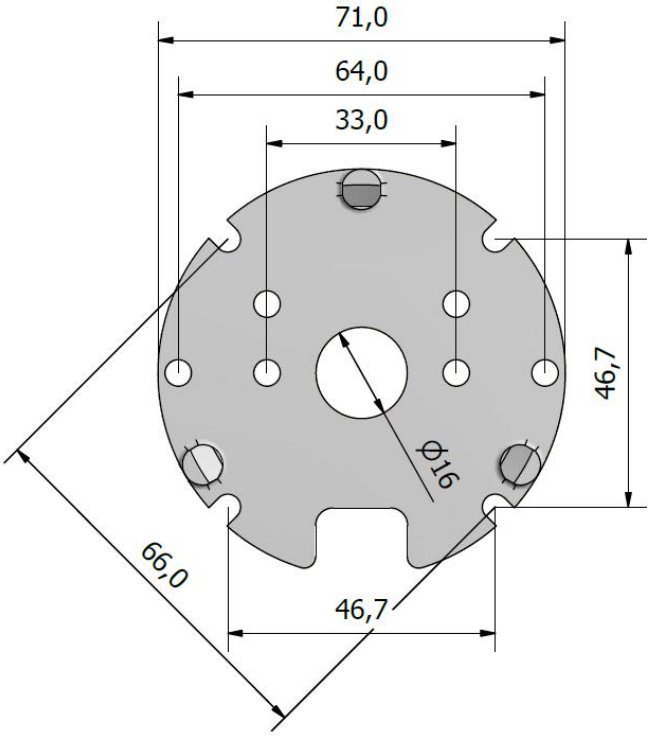
Mount the SEM320X into the approved housing as shown below.



SEM320X Module dimensions.

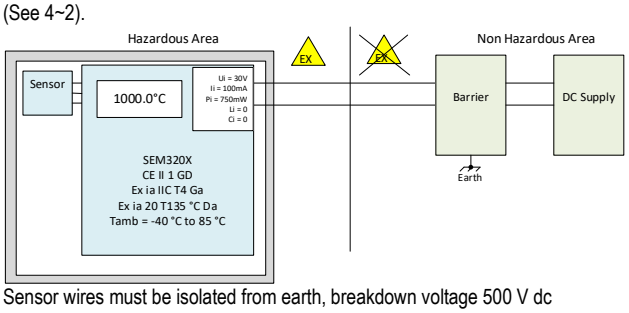


SEM320X Mounting template, showing fixing points to approved housing.



6~2 ELECTRICAL.

REFER TO ATEX/UKEX SPECIAL CONDITIONS FOR SAFE USE
(See 4~2).

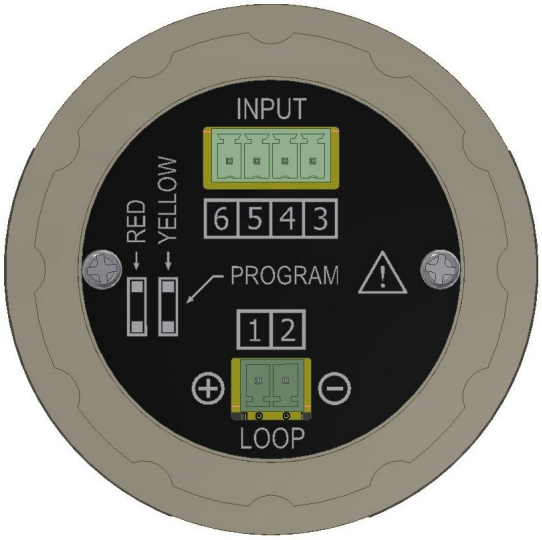


Sensor wires must be isolated from earth, breakdown voltage 500 V dc

Electrical connections are made to the two-part screw terminals provided on the back of the device. The transmitter is protected against reverse connection and over-voltage. If no sensor (input) connection is made, the transmitter will go into either up or down scale output current, depending on configuration setting.
TURN OFF SUPPLY BEFORE WORKING ON ANY ELECTRICAL CONNECTION.

For a wiring diagram, please refer to the rear panel of the device inside the case housing, and this document.
Two-part connectors are used for input and output connections, allowing the device to be easily removed if required.

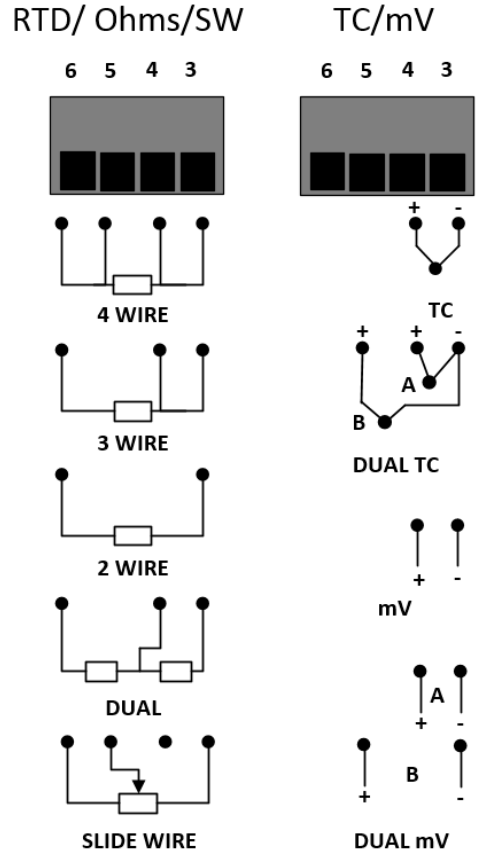
Figure 1: Rear panel layout.



6~2 ELECTRICAL (Continued).

Input sensor connections.

Figure 2: Input connections.



RTD input wires must be equal length and type.

Sensor connections are as figure 2: to maintain BS EN61326 compliance, sensor wires must be less than 3 metres. All sensor connections must be isolated from ground.
For RTD dual input use two wire RTDs. If required, user-offsets can be done on both inputs to known input values.

Thermocouple inputs must use correct compensation cable.

Sensor connections are as figure 2: to maintain BS EN61326 compliance, sensor wires must be less than 3 metres. All sensor connections must be isolated from ground.
For dual thermocouple input, both thermocouples must be of the same type.
If required, user-offsets can be done on both inputs to known input values.

(4 to 20) mA Loop connections.

Ensure all other aspects of the installation comply with the requirements of this document. To maintain CE compliance, the (4 to 20) mA current loop must be tied to a local earth at one point; this is normally at the power supply.

Use twisted pair or screened cables for cable lengths greater than 3 metres. Maximum cable length 1000 metres.

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7~USER CONFIGURATION.

IMPORTANT.

READ COMPLETE SECTION BEFORE ATTEMPTING CONFIGURATION.

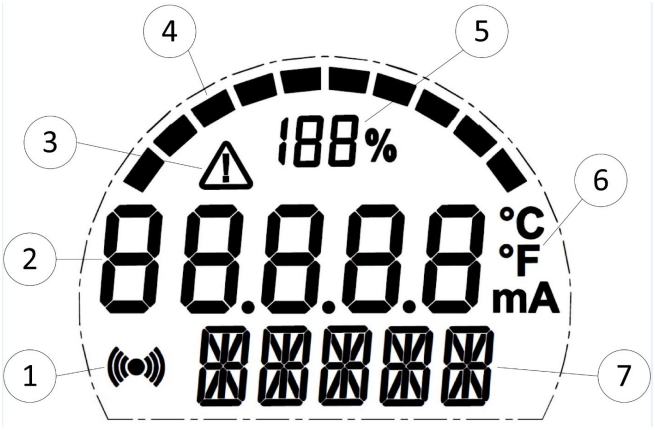
WARNING.

For configuring or reading live data if using a **grounded input** or **output**, it is important not to connect the programming USB lead to a mains powered computer. It is possible to damage the instrument if connected in this way.
To avoid damage, use one of the following methods:

- Disconnect the input and output connectors before configuration, reconnect the connectors after configuration.
- Use a laptop-type computer running from its battery power supply, not connected to a mains supply. This is recommended for reading live device data or offsetting a device if already installed in the field.
- Use an approved USB isolator (USBX Config) between the computer and the device, see supplier for details.

DISPLAY: The display provides five 7-segment characters for display of value and 5 14-segment characters for messages, together with a 10-segment bar graph, % of output signal display and five icons. The display can operate in an ambient temperature range of (-20 to 85) °C, but at temperatures lower than -5 °C (due to the slower LCD speed) scrolled messaging is not practical. The display's high contrast offers clear readouts at low as well as high ambient light and direct sunlight.

Figure 3: Display layout.



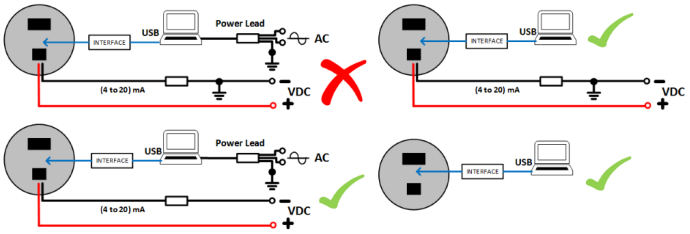
1. Indicated HART communications
2. Main numeric value display
3. Signal out-of-range warning icon
4. Bar graph of output
5. % of output
6. Bespoke °C and °F temperature indication devices (mA not used) display.
7. % Message/additional units display

7~1 USBSpeedLink USER CONFIGURATION.

A USBX configuration module is required for connecting the device to the PC. Refer to your supplier for details.

The device can be configured whilst connected and powered but a portable battery powered computer must be used to avoid the effects of ground loops if the (4 to20) mA loop is grounded. This may cause damage to the display device.

Figure 4: Configuration connection.



Configuration must take place in the non- hazadous area with the approved USBX Config module.

Configuration steps.

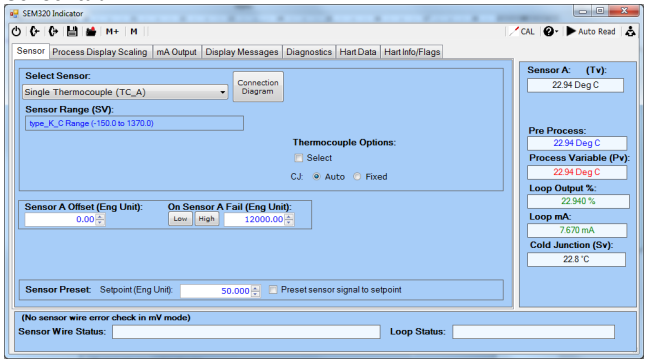
Configuration steps must be taken in the non-hazardous areas.	
1	Install the software and connect the approved USB configuration module to the PC.
2	Remove the SEM320X module from the approved housing
3	Remove the rear panel cover held by two screws (see figure 1)
4	Connect the approved configuration module to the device (observe orientation).
5	Select the correct programming page in the software.
6	Read the device configuration into the software.
7	Re-configure or adjust configuration options as required.
8	Send the new configuration to the device.

Configuration options in USBSpeedLink software.

Sensor tab.	
Input type	RTD (type, No. of wires), T/C (type), Ohms, Slide-wire, mV Single input, dual input (with maths).
Sensor offset	In engineering devices, can be entered for probe/system correction
Burn out	Any value in input devices to control device behaviour on input fail
Sensor pre-set	An internal "simulated" value can be applied to the input of the device for diagnostics

7~1 USBSpeedLink USER CONFIGURATION (continued).

Sensor tab.



Process display scaling tab.	
Mode Off	Normal use for °C temperature inputs
Mode Scale	Select for °F, process and dual inputs
Mode Profile	Gives 22-segment user-linearisation tool for custom input to output relationship. Can be used to apply probe corrections at up to 22 points.
Display decimal place	Used to set the required number for the display

mA output tab.	
Damping	Seconds to reach 76% of final value
Low mA	Engineering value to give 4 mA output
High mA	Engineering value to give 20 mA output
Fixed loop	The device can be set to give a pre-set mA output. The device will return to normal operation after a power reset, for diagnostics.
Current limits	Can be used to set the minimum and maximum current values the device can output. Useful for defining burnout condition.
Namur 43 standard	Burnout control, on or off

Display messages tab.	
Range	Use to set up to 6 defined temperature/process bands that can have fixed or custom messages assigned to them. The display will show the messages in turn, with the input value, when within the selected band.
Message	Define up to 6 custom messages that can be displayed when the input value is within pre-set bands
MsgA, MsgB	Sets which messages are displayed for each band
Bar and %	Selects whether to show the % of input range bar and the % of input range value on the screen

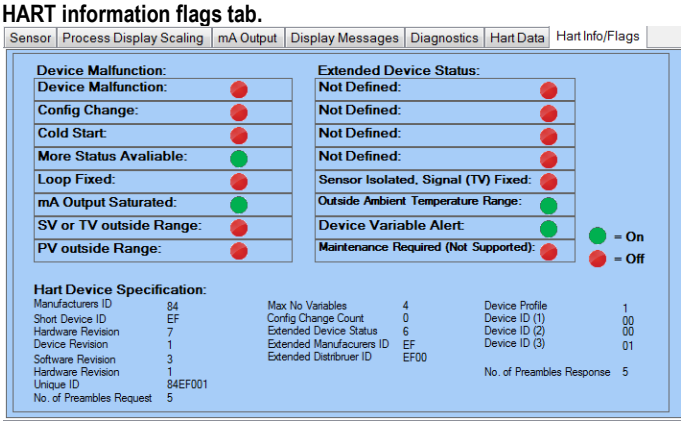
Diagnostic tab.	
Operation data	Will display: Maximum and minimum values since last reset Operational time from manufacture Operational time from calibration Calibration date
Cal cert number	Free type field saved to the device
Calibrated by	Free type field saved to the device
Save transducer	Will save the configuration manifest to a text file on the PC

HART data tab.	
Tag number	HART specified; free type field saved to the device
Date	HART specified; saved to the device
Description	HART specified; free type field saved to the device
Message	HART specified; free type field saved to the device
Final Assembly	HART specified; number saved to the device
Long tag	HART specified; free type field saved to the device
Transducer number	HART specified; number saved to the device
Write protect	HART write protect: On, Off

Read HART.	
Transducer	ID
Configuration counter	Number of changes made via HART communications

HART information tab.	
HART info flags	On, Off, see info tab screen image

HART information flags tab.



Live data display

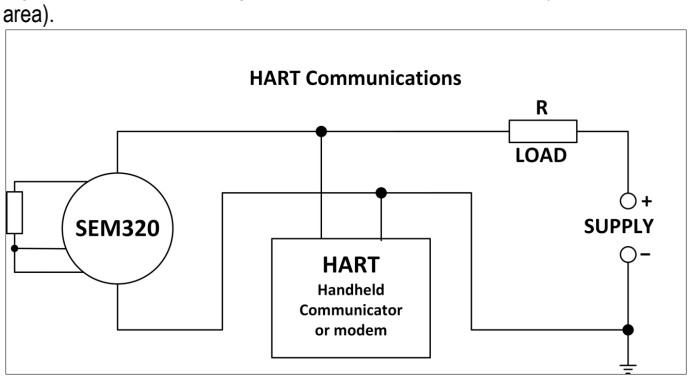
With a device connected to the configuration module, the software can display some live data readings. The sections to the right-hand side and the bottom of the screen are used.

Live data reading.	
Sensor A	Input value
Sensor B	Input value
Pre-process	Pre-maths input value
Process variable	Post-maths input value
Loop output %	Loop output as a % of range
Loop mA	Loop output in mA
Cold junction	Temperature of the cold junction
Sensor wire	Error detection for input wiring
Loop	Error detection for loop wiring

7~2 HART USER CONFIGURATION.

The SEM320X has HART communications. The SEM320X is a generic HART device. For a list of implemented HART commands please refer to the data sheet. Connection is as shown below. A suitable load resister (250 Ohm) must be used in the loop.

Figure 5: Connection arrangement for HART communications (non-hazardous area).



Note: The configuration setup shown above is performed in the non-hazardous area. Configuration with the SEM320X in the hazardous area can be performed:

If

~The HART handheld communicator is approved for use in the hazardous area.

Or

~The HART handheld communicator is in the safe area connected to the SEM320X via an approved power supply or barrier.

For more information on the HART protocol, refer to the Fieldcomm group website https://fieldcommgroup.org

For more information on the SEM320 range refer to www.status.co.uk

Status Instruments Ltd, Status Business Park, Gannaway Lane, Tewkesbury, Gloucestershire, UK, GL20 8FD

Web Page: www.status.co.uk,

Email: sales@status.co.uk

Technical Support: support@status.co.uk

Tel: +44 (0) 1684 296818, Fax: +44 (0) 1684 293746