TX9165
Sentro 8 Sensorstation

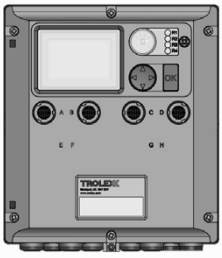
User Manual

TROLEX

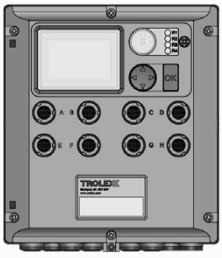
TX9165 Sentro 8 Sensorstation

Contents

1. Product Overview



TX9165 Sentro 8 Sensorstation (four gas ports)



TX9165 Sentro 8 Sensorstation (eight gas ports)

1.1 Operating Features

- Integrated eight channel sensing and control unit for environmental and machine condition monitoring including

  eModule
  - Toxic gases
  - Flammable gases

  rModule
  - Air flow
  - Pressure
  - Temperature
  - Vibration
  - Speed
  - Rotation
  - Most suitable 0.4 to 2 V and 4 to 20 mA inputs
- Pre-calibrated plug-in Sentro eModules and rModules can be user configured to any combination of measuring parameter
- LCD screen
- Programmable built-in Audio/visual alarms
- RS485 Modbus datacomms for distributed monitoring of systems
- Four programmable output relay remote alarm warning and control functions
- Heavy duty, impact resistant housing to IP65
- EMC compliant
- STEL and TWA monitoring of selected gases
- Data logging on all channels

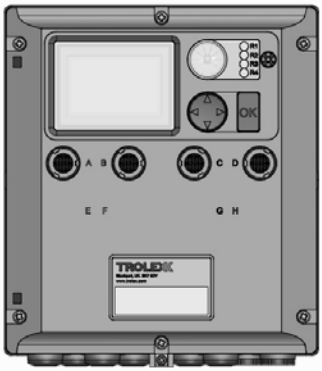
1.2 Application

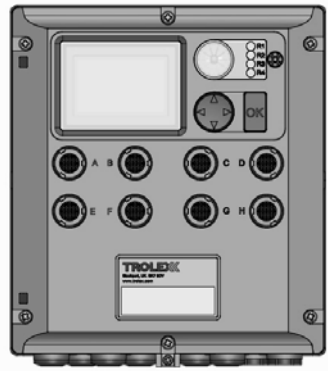
Fixed point multisensor environmental monitoring and machine condition monitoring for use in underground mining and general purpose applications.

General Purpose TX9165.03 	**Application:** **Supply voltage:** **Remote sensors:** **Output relay contacts:**	Non-hazardous areas 24 V dc 85 to 265 V ac supply (universal) 24 V dc supply 2 Amps, 230 V ac
Underground Mining and Tunnelling TX9165.01i 	**Application:** **Supply voltage:** **Remote sensors:** **Output relay contacts:** **Type of protection:** **Category:** **ATEX:**	Can be installed in underground hazardous areas 12 V dc from an approved source Exi approved,12 V dc supply Suitable for, and clearance compatible for, switching other intrinsically safe circuits Intrinsically safe, EX ia M1 94/9/EC

1.3 Product Options

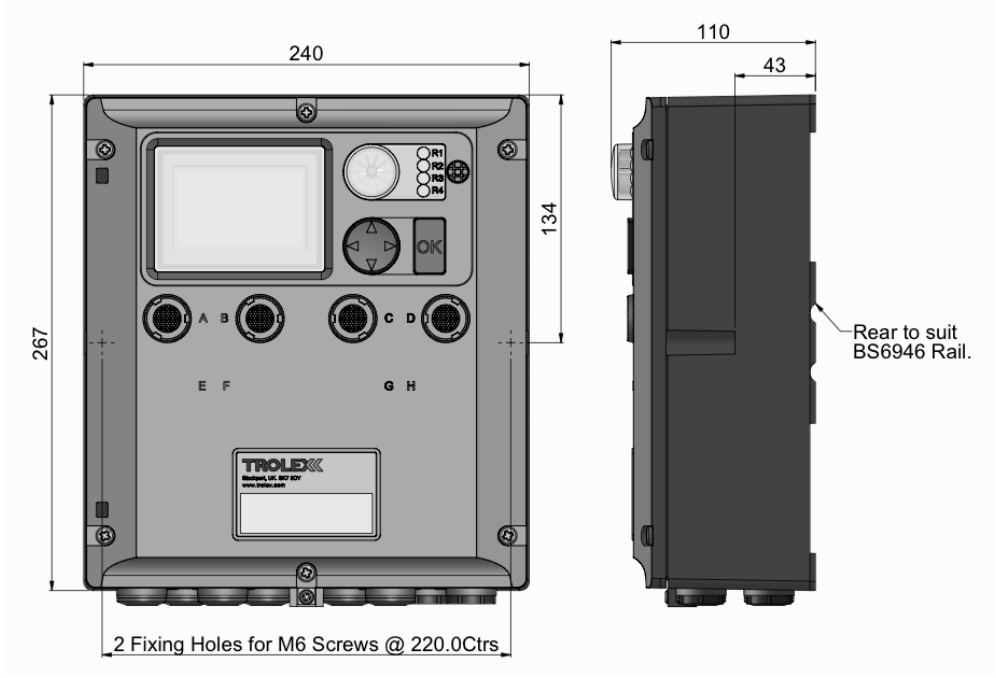
TX9165 Sentro 8 Sensorstation	Mining Ex	General Purpose
12 V dc	TX9165.01	-
24 V dc	-	TX9165.03.102
85 to 265 V ac (universal)	-	TX9165.03.114



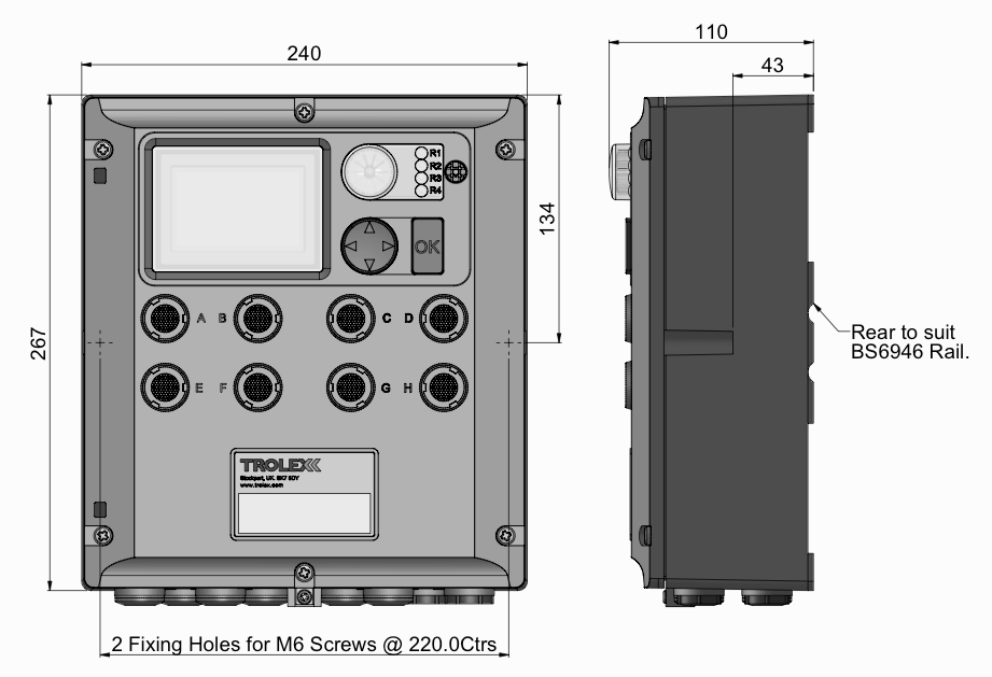


1.4 Dimensions

1.4.1 TX9165 Sentro 8 Sensorstation - Four Gas Ports



1.4.2 TX9165 Sentro 8 Sensorstation - Eight Gas Ports



1.5 Technical Information

Sensing modules:	• Plug-in, pre-calibrated Sentro eModules and rModules with standardised output data and characterised compensation. Accommodation for up to eight eModules and rModules
Protection classification:	• Housing IP65
Operating temperature:	• -10 to +40°C
Storage temperature:	• -20 to +60°C
Humidity:	• 0 to 95% non-condensing
Pressure:	• 700 to 1300 mbar
Housing material:	• Reinforced polymer, anti-static, suitable for use in hazardous areas. EMC compliant
Weight:	• 2.8 kg
Alarm indicators:	• Confidence Alert flash and audible tone at 15 second intervals • High-brightness, area warning, flashing alarm and audible alarm • Function configurable
Audible alarm:	• High intensity audible sounder 95 dB at 300 mm • Function configurable • Mute function
Gas infusion:	• Natural diffusion

Display:	• 128 x 64 pixels, graphic LCD screen with backlight illumination • Alarm indicators for all eight sensor inputs • TWA and STEL alarm displayed for selected toxic gas sensing eModules • Simultaneous readings of all sensor input levels • Individual reading of all sensor input levels with Min and Max data retention • Graphic Trend display of individual sensor values • Scrolling display of Logged data
Function programming:	• Screen contrast adjustment • Keycode security barrier • Two independently programmable setpoint alarm levels, selectable for Over, Under or Window alarm functions for each sensor input • Audio visual alarm functions • Discrete alarms for General/High sensor signal and Fault • 24-hour clock and calendar
Data logging:	• Automatic period logging • 4000 readings per sensor with time, date and alarm event report
Datacomms:	• RS485 datacomms output supporting up to 32 Sentro 8 Sensorstations on a single Modbus network in multidrop mode to a standard PC • System reporting

1.6 Electrical Details

Description	Mining Ex	General Purpose
Supply voltage	12 V dc (+/- 10%)	24 V dc (+/- 10%)/ 85 to 265 V ac
Supply current	200 mA (maximum loading including one pellistor eModule)	
Output relays	Four independent alarms relays each programmable to any alarm setpoint on any monitoring channel for preferred alarm priority grouping	
Relay contacts	One changeover contact on each relay	
Contact rating	Suitable for, and clearance compatible for, intrinsically safe circuits	2 Amps 230 V ac

1.7 Sentro Sensing Modules

Plug-in pre-calibrated eModules and rModules with standardised output data.

- Each eModule and rModule stores all the necessary data about its type, identification, sensing range and specific calibration. This data is automatically recognised by Sentro 8 Sensorstation when the eModule or rModule is plugged into the module bay
- The eModule and rModule are pre-calibrated so they can be replaced at any time with a replacement sensing module - usually of the same type, but an alternative may be inserted if required
- User configurable coding slots at each module bay can be individually configured using coding stops to prevent invalid sensing module combinations
- The eModule and rModule will identify itself when plugged into the module bay, auto configuration will take place and the sensing module type will display on the LCD screen
- All Sentro eModules and rModules have two output alarm signals for **General** alarm and **High** alarm. Default values are entered during manufacture and these can be changed to preferred values
- There are two types of Sentro sensing module:

Sentro eModule
Integral Gas Sensor

Sentro rModule
Terminals for Connecting Remote Sensors

1.7.1 Sentro eModules

For the full range of Sentro eModules refer to the Sentro 8 Product Data Sheet TX9165-DS-EN or contact the Trolex Sales Team: **sales@trolex.com**

1.7.1.1 Flammable Gases • Poison Resistant Catalytic Sensor

The sensor will respond to most flammable gases and vapours to varying degrees; it is normally calibrated to methane in terms of %LEL or %volume.

TX6350	**.240**	**.246**	**.244**
	Methane CH_4	Methane CH_4	Methane CH_4
Sensing element	Poison resistant pellistor with active temperature/humidity compensation		
Sensing range	0 to 100% LEL	0 to 4% v/v	0 to 5% v/v
Linearity	Linear to 3% v/v and 3% to 5% ±0.25% v/v		
Max. Drift @ 25°C	±0.25% CH_4 v/v per month		
Response time (T63)	<15 secs		
Response time (T90)	<20 secs		
Sensing element life	>5 years in clean atmosphere		
Warm up time	<5 mins in air or 1% v/v CH_4 (to 95% of stated accuracy)		
GENERAL alarm	10% LEL (0.44% v/v)		
HIGH alarm	20% LEL (0.88% v/v)		

Checkpoint
The pellistor is automatically protected against exposure to excessively high concentrations of gas.

1.7.1.2 Toxic Gases • Electrochemical Cells

Selected toxic gas eModules are equipped with automatic STEL/TWA calculation in accordance with COSHH.

TX6351	.250.50 Carbon Monoxide CO	.250.250 Carbon Monoxide CO	.250.500 Carbon Monoxide CO	.251 Hydrogen Sulphide H_2S	.252 Sulphur Dioxide SO_2
Sensing element	Electrochemical cell				
Sensing range	0 to 50 ppm	0 to 250 ppm	0 to 500 ppm	0 to 50 ppm	0 to 20 ppm
Linearity	±2% FS				
Drift	2% per month				
Repeatability	±2%				
Response time T63%	<20 secs	<20 secs	<20 secs	<30 secs	<20 secs
Operating life	2 years				
Relative humidity	15 to 90% non-condensing				
Operating temperature	-10 to +40°C				
GENERAL alarm	15 ppm	30 ppm	30 ppm	5 ppm	5 ppm
HIGH alarm	30 ppm	100 ppm	200 ppm	10 ppm	10 ppm
STEL & TWA	200 ppm 30 ppm	200 ppm 30 ppm	200 ppm 30 ppm	10 ppm 5 ppm	5 ppm 2 ppm

Toxic Gases • Electrochemical Cells - continued

TX6351	.254 Nitrogen Dioxide NO_2	.255 Chlorine CL_2	.257 Oxygen O_2	.259 Nitric Oxide NO	.261 Hydrogen H_2
Sensing element	Electrochemical Cell				
Sensing range	0 to 20 ppm	0 to 10 ppm	0 to 25%	0 to 50 ppm	0 to 1000 ppm
Linearity	±2% FS	±5% FS	±5% FS	±5% FS	±2% FS
Drift	2% per month	2% per month	10% per year	2% per month	2% per month
Repeatability	±2%				
Response time T63%	<20 secs	<20 secs	N/A	<20 secs	<70 secs
Operating life	2 years	2 years	1 year	2 years	2 years
Relative humidity	15 to 90% non-condensing				
Operating temperature	-10 to +40°C				
GENERAL alarm	5 ppm	2.5 ppm	19% (under)	5 ppm	250 ppm
HIGH alarm	10 ppm	5 ppm	23% (over)	20 ppm	500 ppm
STEL & TWA	5 ppm 3 ppm	N/A 0.5	N/A N/A	10 ppm 3 ppm	N/A N/A

Checkpoint

All values listed are nominal and slight variations may occur depending upon operating conditions.

- The natural level of oxygen available in the atmosphere is influenced by relative humidity and temperature. The oxygen sensor will react to these changes.
- Sudden changes in atmospheric pressure will also cause temporary instability in electrochemical sensors.
- Long periods of use in conditions of very low humidity will shorten the life of electrochemical sensors.
- Gas sensing eModule type TX6351.259 (nitric oxide) must be constantly powered-up to maintain calibration stability. If the eModule is powered-down for more than 10 minutes, it could take 24-48 hours before stability is restored. Do not calibrate until the output signal is steady.

1.7.1.3 Carbon Dioxide/Methane Gases • Infrared Sensor

This sensor is highly specific to the selected gas and exhibits consistent sensing accuracy with superior long-term stability.

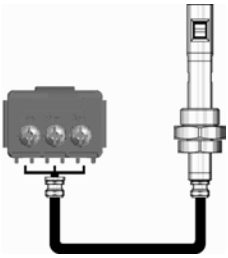
The linear response means that it can be calibrated for low gas concentrations and high concentrations up to 100% by volume.

TX6350	**.243** Methane CH_4	**.245** Methane CH_4	**.242** Methane CH_4	**.278** Carbon Dioxide CO_2	**.279** Carbon Dioxide CO_2
Sensing element	Infrared				
Sensing range	0 to 5% v/v	0 to 100% LEL	0 to 100% v/v	0 to 5% v/v	0 to 100% v/v
Zero drift	±0.05% v/v per month	±1% LEL per month	±0.5% v/v per month	±0.5% v/v per month	±1% v/v per month
Repeatability	±0.1% v/v	±2% LEL	±2% v/v	±0.05% v/v	±2% v/v
Response time T63%	<15 secs				
Response time T90%	<30 secs				
Operating life	<5 years				
Relative humidity	15 to 90% condensing				
Operating temperature	-10 to +40°C				
GENERAL alarm	1.25% v/v	10% LEL	25% v/v	1.25% v/v	25% v/v
HIGH alarm	2.5% v/v	20% LEL	50% v/v	2.5% v/v	50% v/v

Checkpoint

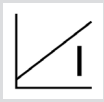
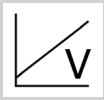
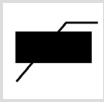
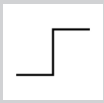
Carbon Dioxide Sensors - Normal atmosphere contains carbon dioxide which will affect the sensor signal so nitrogen gas must be used to accurately calibrate the zero value. The sensor should be powered-up and the nitrogen applied for at least 5 minutes to ensure that the sensor has stabilised.

1.7.2 Sentro rModule Remote Sensing



Sentro rModules function in the same way as eModules and incorporate screw terminals to accept direct input connections of cables from remote analogue or digital sensors. A sensor power supply source is also provided at the rModule terminals where appropriate.

All eight positions (A to H) in the Sentro 8 Sensorstation can be fitted with rModules in positions where no eModules are being used.

TX9160.301	4 to 20 mA	Industrial standard analogue sensor input; 2 and 3 wire options	
TX9160.303	0.4 to 2 V	Voltage input signals, analogue sensor input; 2 and 3 wire connections	
TX9160.306	PT100	Standard PT100 temperature monitoring with line compensation	
TX9160.501	ON/OFF	NAMUR proximity switch with line-fault monitoring or conventional contacts; pressure switches, limit switches, etc	
TX9160.502	ON/OFF & Diode	ON/OFF inputs from contacts with series diode for open circuit and short circuit line fault monitoring	

2. Certification

	**Europe Certification (ATEX)** TX9165.01.i Sentro 8 Sensorstation (Group 1) Ex Certificate Number: SIRA 09ATEX2285X Ex Certification Code: I M1 Ex ia I Ma **General Conditions for Safe Use** – Prior to installation, it is essential that the user refers to the above certificate to ensure that the termination and cable parameters are fully complied with and are compatible with the application. Copies of certificates are available from Trolex Ltd. Cable glands used with this equipment must maintain an ingress protection of at least IP54.
	ATEX directive 94/9/EC EMC directive 2004/108/EC

Special Conditions for Safe Use of Sentro eModules and rModules

The minimum ingress protection stated in the Ex-certificates for the Sentro eModules and rModules are satisfied when mounted in the Sentro 8 Sensorstation, as are the conditions for impact protection and external fuse protection in the case of the infrared eModule.

The Ex-certificates associated with the Sentro eModules and rModules are listed below:

eModule - Flammable (Group I)	SIRA 10ATEX2046U
eModule - Toxic (Group I)	SIRA 08ATEX2097U
eModule - Infrared (Group I)	SIRA 10ATEX2356U
rModule - (Group I)	SIRA 10ATEX2032U

Attention is drawn to the following conditions within the rModule Ex-certificates:

For the purpose of this certificate, a P+F inductive sensor to PTB00 ATEX 2048X to Category II 1G Ex ia IIC T6 connected to terminals 1m and 2m of a TX9160.01i.501 NAMUR input module may be considered equivalent to Category I M1. The sensor shall be installed in such a manner as meets the requirements of Group I e.g. the external; enclosure to meet IP54, impact protection etc.

Where an external sensor is used with Type TX9160.01i.301 (4 to 20 mA), TX9160.01i.303 (0.4 to 2 V), TX9160.01i.321 (4 to 20 mA Differential) or TX9160.01i.323 (0.4 to 2 V Differential) rModules and powered from a separate intrinsically safe power supply, the following conditions shall be met:

- No connection shall be made to rModule terminal 1m (power).
- The 0 V of the external sensor power supply shall be connected to the 0 V input of the equipment that the rModule is plugged into.
- The Ui presented by an externally powered sensor to any rModule, terminals 2m or 3m, shall not exceed 14.4 V.

IECEx	**International Certification (IECEx)** TX9165.01.i Sentro 8 Sensorstation (Group 1) Ex Certificate number: IECEx SIR 09.0120X Ex ia I Ma **General Conditions for Safe Use** – Prior to installation, it is essential that the user refers to the relevant certificate to ensure that the termination and cable parameters are fully complied with and are compatible with the application. Copies of certificates are available from www.trolex.com.

Points to note relating to Sentro eModules and rModules

The minimum ingress protection stated in the Ex-certificates for the Sentro eModules and rModules are satisfied when mounted in the Sentro 8 Sensorstation, as are the conditions for impact protection and external fuse protection in the case of the infrared eModule.

The Ex-certificates associated with the Sentro eModules and rModules are listed below:

eModule - Flammable (Group I)	IECEx SIR 10.0018U
eModule - Toxic (Group I)	IECEx SIR 08.0036U
eModule - Infrared (Group I)	IECEx SIR 10.0185U
rModule - (Group I)	IECEx SIR 10.0013U

Attention is drawn to the following conditions within the rModule Ex-certificates:

For the purpose of this certificate, a P+F inductive sensor to PTB00 ATEX 2048X to Category II 1G Ex ia IIC T6 connected to terminals 1m and 2m of a TX9160.01i.501 NAMUR input module may be considered equivalent to Category I M1. The sensor shall be installed in such a manner as meets the requirements of Group I e.g. the external; enclosure to meet IP54, impact protection etc.

Where an external sensor is used with Type TX9160.01i.301 (4 to 20 mA), TX9160.01i.303 (0.4 to 2 V), TX9160.01i.321 (4 to 20 mA Differential) or TX9160.01i.323 (0.4 to 2 V Differential) rModules and powered from a separate intrinsically safe power supply, the following conditions shall be met:

- No connection shall be made to rModule terminal 1m (power).
- The 0 V of the external sensor power supply shall be connected to the 0 V input of the equipment that the rModule is plugged into.
- The Ui presented by an externally powered sensor to any rModule, terminals 2m or 3m, shall not exceed the 14.4 V.

	Russia Certification (GOST-R) TX9165.01.i Sentro 8 Sensorstation (Group 1) Ex Certificate Number: POCC.GB.ME92.B02587 **General Conditions for Safe Use** – Prior to installation, it is essential that user refers to the above certificate for any special conditions for safe use. The user must ensure that the termination and cable parameters are fully complied with and are compatible with the application. Copies of certificates are available from Trolex.
	South Africa Certification TX9165.01.i Sentro 8 Sensorstation (Group 1) Ex Certificate Number: MASC M/11-420 **General Conditions for Safe Use** – Prior to installation, it is essential that user refers to the above certificate to ensure that the termination and cable parameters are fully complied with and are compatible with the application. Copies of certificates are available from Trolex.

3. Installing

3.1 Safety Precautions

Hazardous Areas

Do not disassemble the Sentro 8 Sensorstation whilst in the hazardous area or use a sensor that has a damaged housing in the hazardous area.

Evacuation

If a dangerous level of gas concentration is detected by a sensor, leave the area immediately.

Operating Life of Gas Sensors

Electrochemical cells contain an electrolyte that is gradually consumed during use. The average life is about two years, dependant upon the duty cycle. The response should be checked at regular intervals. Refer to Chapter 7 - Maintenance for further information.

Sensitivity

Electrochemical cells for toxic gases can be affected by other interfering gases which may displace the subject gas being monitored. Steam laden atmospheres and condensation can also reduce the sensitivity.

Flammable

Be aware that some toxic gases are also 'flammable' at high percentage concentrations.

Operating Limits of Catalytic Combustion Sensors

Catalytic combustion gas sensors positively detect the presence of flammable gas. They rely upon the presence of oxygen in the atmosphere and should only be used for gas concentrations up to the Lower Explosive Limit (LEL).

After this point, the output becomes non-linear and may erroneously indicate that the gas concentration is below the LEL. They should not be used in oxygen enriched or deficient atmospheres.

Discrimination

Catalytic combustion sensors can detect a wide range of flammable gases but they cannot discriminate between individual gases. They will respond to most, or all, of the flammable components present in the atmosphere without distinguishing between them.

Infrared sensors are highly specific to the defined gas type and may NOT respond to other similar gases.

Contamination

The response of catalytic combustion gas sensors can be affected by air borne contaminants which will reduce the sensitivity. Substances such as silicones, tetraethyl lead, sulphur compounds and phosphate esters can cause permanent degradation (poisoning). Hydrocarbons may also cause temporary inhibition.

Interference

If the atmosphere to be monitored contains a gas that dilutes or displaces the air, this may reduce the response of catalytic sensors. Similarly, steam laden atmospheres and condensation can reduce the stability.

High Concentrations of Flammable Gas

Exposure of low concentration catalytic combustion sensors to concentrations of flammable gas greater than the LEL can affect the sensitivity and zero stability of catalytic elements and the calibration should be checked after such an exposure.

Toxicity

Be aware that most flammable gases and vapours are also toxic at low concentrations of LEL.

3.2 Siting Recommendations

Location of Gas Detectors

Each installation needs to be considered in its own right, with reference to safety authorities and in compliance with mandatory local safety regulations. The sensor must be operated in accordance with the User Manual to maintain safety, reliability and to preserve safety integrity where applicable.

It is important that sensors are located in positions determined in consultation with those who have specialised knowledge of the plant or installation and of the principles of gas dispersion. Reference should also be made to those responsible for the engineering layout and topology of the plant as they will be most familiar with the nature of the potential dangers and the most likely sources of gas release.

It is also important to recognise that the characteristics of the gas source can be influenced by many factors; including the relative density or buoyancy of the gas, the pressure at the point of release, the ambient temperature and the ventilation of the site.

Sensor coverage cannot be simply expressed in terms of 'number per unit area'. Sensors need to be sited where they are capable of monitoring those parts of a plant where gas may accumulate or where a source of gas release is expected to occur. This way the earliest possible warning of a gas release can be given to initiate shutdown functions, alarm functions or safe evacuation of the premises.

Sensor Management

A very important part of an efficient gas monitoring system is the training of plant personnel in operation and maintenance of the sensors and the complete monitoring system. Training can be provided by qualified Trolex application engineers.

Once a sensor installation is complete, the sensor locations and types should be formally recorded and a planned test and maintenance procedure instituted.

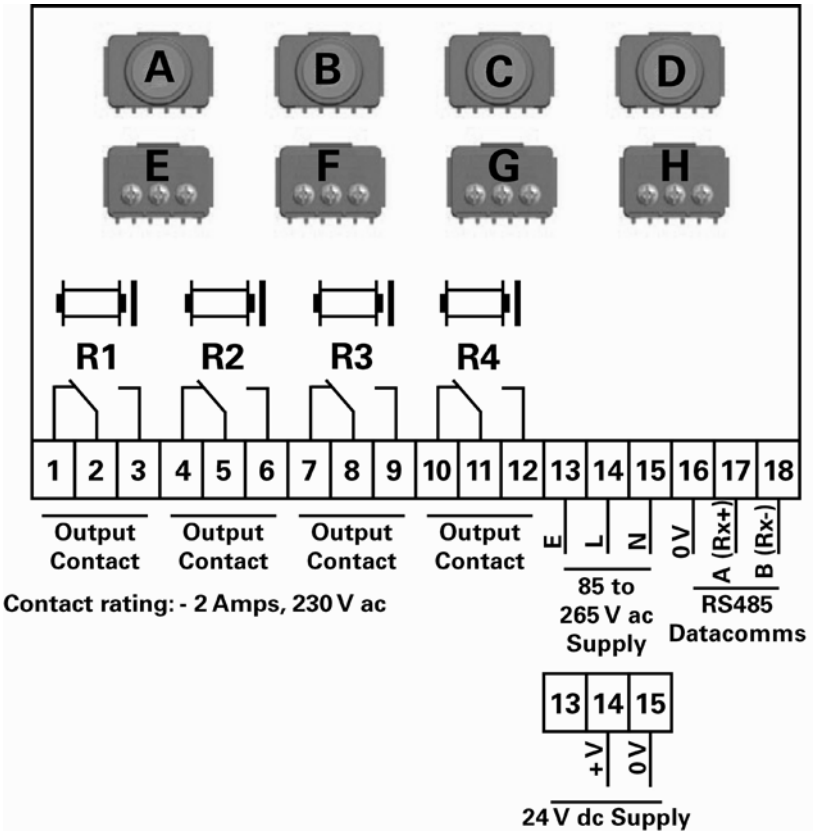
STEL and TWA

Selected gas sensors are equipped to automatically calculate STEL and TWA limits in accordance with COSHH standards. If the facility is selected for use, ensure that all accumulated data is reset to zero before the commencement of a working period.

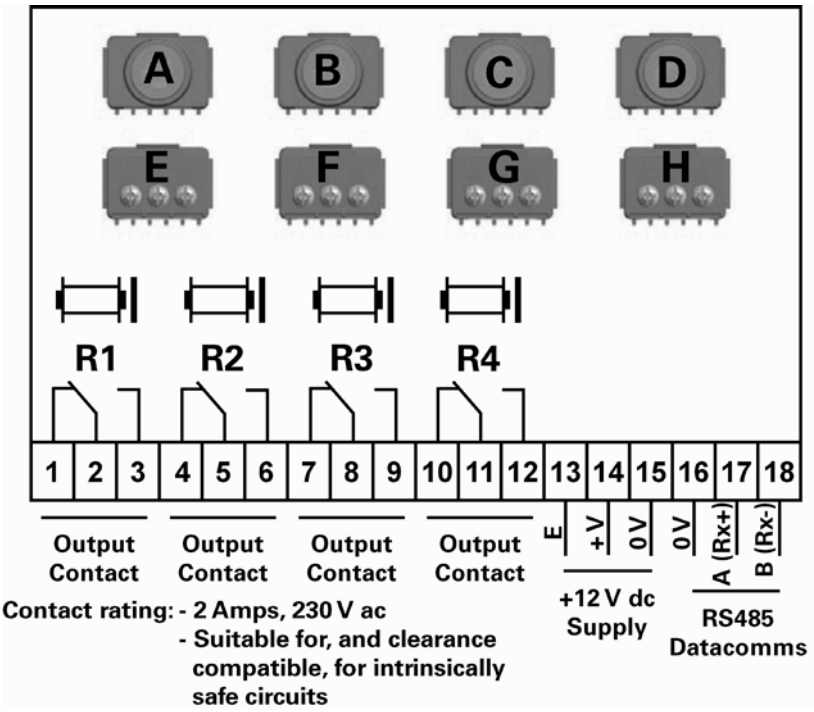
Section 4.2.2.5 »
Section 4.3.6 »
Section 4.4.4 »

3.3 Connections

TX9165.03 (General Purpose)

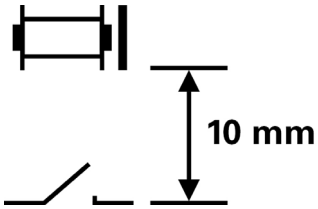


TX9165.01 (Mining Ex)



Relay Output Contacts

Each relay output R1, R2, R3 and R4 has galvanic isolation between coil and contacts to intrinsically safe standards, so different external intrinsically safe control circuits may be connected to the Sentro 8 Sensorstation.



Datacomms Ports

Datacomms signals must be approved intrinsically safe. The power supply for the datacomms signal may come from a different intrinsically safe source.

Relay Operation (R1, R2, R3 and R4)

The output relay contacts are shown in the powered-down state.

	Setpoint Setup in OVER condition	Setpoint Setup in UNDER condition
Power OFF **O**	**LED**	**LED**
Power ON **I**		
Set point / Signal		**Setpoint activated OFF**
Set point / Signal	**Setpoint activated ON**	

Section 4.4.2

Connections to Sentro rModules

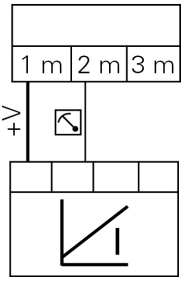
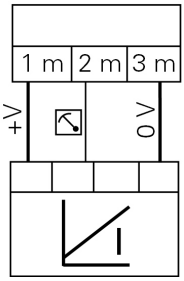
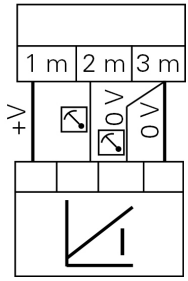
Remote sensor input cables are connected directly into a Sentro rModule that may be loaded into module bays, E to H.

- The rModules are creepage and clearance compliant with intrinsically safe requirements.
- Most remote sensors can normally be powered by the supply source available from the Sentro rModule.

4 to 20 mA Analogue Sensing Module

TX9160.301

rModule

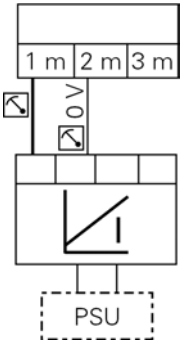
	2 wire	3 wire	4 wire
			
	• 2 wire signal loop • Line powered sensor	• 2 wire signal loop • Additional wire for sensor power 0 V	• 2 wire signal loop • 2 wires for power + V and 0 V
Max. cable length			
1.5 mm²		2000 m	
2.5 mm²		5000 m	
Max. external loop resistance		600 ohms	
Sensor voltage			
TX9165.01	Use 12 V dc sensor	12 V dc via module	12 V dc via module
TX9165.03	Use 24 V dc sensor	24 V dc via module	24 V dc via module
Sensor current available	Line powered	100 mA	100 mA

0.4 to 2 V Analogue Sensing Module

TX9160.303

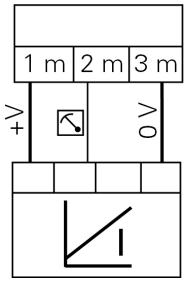
rModule

2 wire



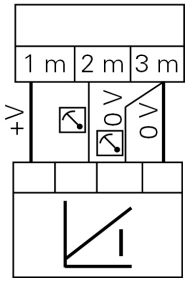
- 2 wire voltage signal
- Sensor powered from independent or integral local power supply

3 wire



- 2 wire voltage signal
- + V power supply to sensor
- 0 V power supply to sensor combined with 0 V signal

4 wire



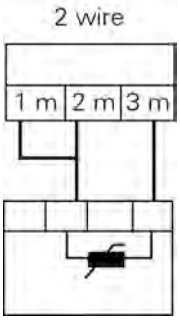
- 2 wire voltage signal
- + V power supply to sensor
- 0 V power supply to sensor combined with a 0 V signal on separate conductors

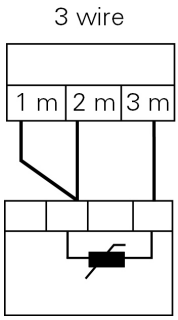
Max. cable length		**10 mA Sensor**	**40 mA Sensor**	**10 mA Sensor**	**40 mA Sensor**
1.5 mm²	4000 m	80 m	20 m	200 m	2000 m
2.5 mm²	10000 m	200 m	50 m		
		Volt drop introduced on to the common 0 V line by the supply feed to the sensor will be superimposed on to the signal. The signal accuracy shift caused by this is the factor that limits the cable length.		The potential cable length is limited by the permissible volt drop in the + V and 0 V power supply feed conductors to the sensor, that will ensure an adequate operating voltage supply at the sensor.	
Input impedance		>10 k ohms			
Sensor voltage					
TX9165.01	Use 12 V dc sensor	12 V dc via module		12 V dc via module	
TX9165.03	Use 24 V dc sensor	24 V dc via module		24 V dc via module	
Sensor current available	Line powered	100 mA		100 mA	

PT100 Temperature Sensing Module

TX9160.306

rModule



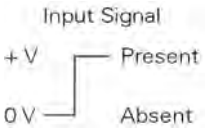


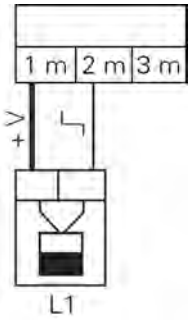
Max cable length		
1.5 mm²	10 m	100 m
2.5 mm²	25 m	100 m

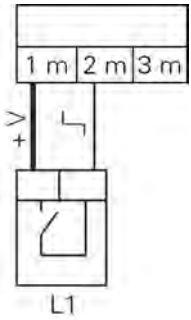
ON/OFF (NAMUR/CONTACT) Sensing Module

TX9160.501

rModule







- NAMUR proximity sensors DN 19234
- Discrete fault alarm generated for OPEN CIRCUIT and SHORT CIRCUIT line condition

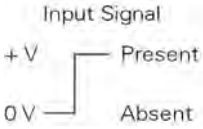
- Can also be used with conventional ON/OFF switches

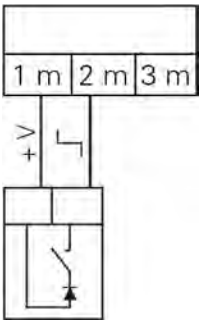
Max. cable length	500 m	500 m
Sensor voltage	8.2 V dc via module	8.2 V dc via module
Frequency range	0 to 10 k Hz	0 to 10 k Hz

Switch Sensing Module

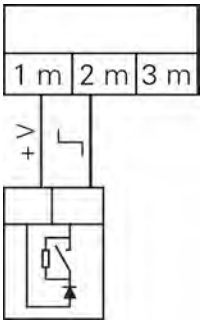
TX9160.306

rModule





- Switches with series diode
- Detection of SHORT CIRCUIT switch line, with series diode
- Detection of OPEN CIRCUIT switch line also, when contact shunt resistor is added



- Switches with series diode
- Detection of SHORT CIRCUIT switch line, with series diode
- Detection of OPEN CIRCUIT switch line also, when contact shunt resistor is added

Max. cable length	500 m	500 m
Sensor voltage	8.2 V dc via module	8.2 V dc via module
Frequency range	10 k Hz	10 k Hz

Checkpoint
Discrete Fault alarms generated for Open Circuit and Short Circuit line condition.

Section 4.5.6 »

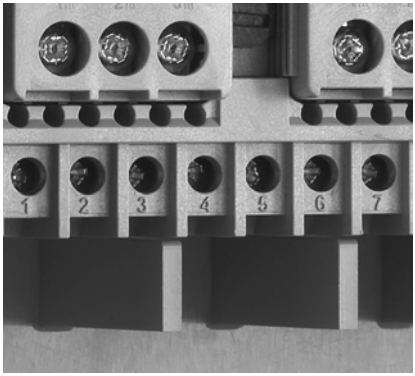
3.4 Connecting in Mining and Tunnelling Areas

The Sentro 8 Sensorstation is approved intrinsically safe for use in underground mining hazardous areas, category M1.

The complete system is powered from a single approved intrinsically safe 12 V dc power source and all elements of the system, including approved sensors, can be mounted in the hazardous area.

Sensor voltage:	12 V dc
Sensor certification:	Ex ia 1 M1

Checkpoint
Creepage and clearance on terminal groupings of the Sentro 8 Sensorstation are sufficient to permit the routing of circuits emanating from different intrinsically safe power supplies through the Sentro 8 Sensorstation.

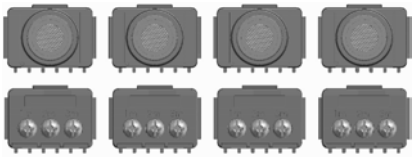


Checkpoint
The outer cover of the Sentro 8 Sensorstation may be safely removed when the Sentro 8 Sensorstation is powered-up in order to replace a gas sensing eModule or to perform calibration.

Section 6.3 »

Section 7.4 »

3.5 Sentro 8 Sensorstation Sensing Module Positions

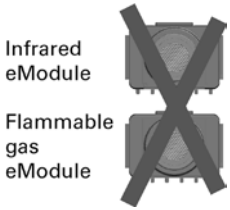


Standard eModule and rModule configuration

Sentro 8 eModule and rModule Configuration

The standard Sentro 8 Sensorstation will accept up to four Sentro eModules in locations A, B, C and D, plus up to four Sentro rModules in locations E, F, G and H. Sentro rModules cannot be fitted in locations A, B, C and D.

Unused gas entry ports will be sealed. The Sentro 8 Sensorstation can be adapted for non-standard configurations according to specification.



Checkpoint

To ensure equal internal power sharing, do not fit Flammable Gas eModules and Infrared eModules above one another. Locate these eModules horizontally or diagonally from one another.

Sensing Module Security Coding

Six coding slots at each module bay can be individually configured using coding stops to give a choice of 20 security codes.

Sensing Module Retainer

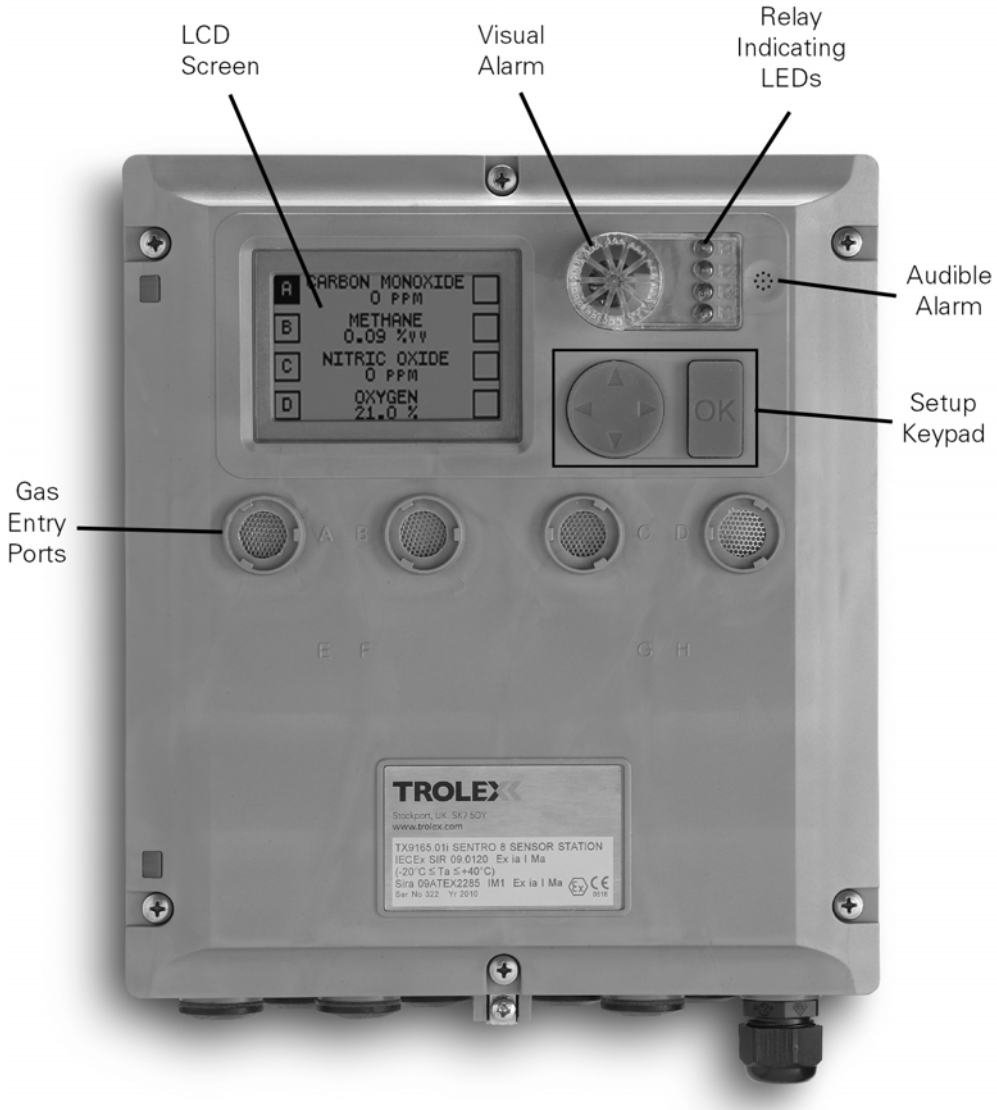
Sensing modules can be mechanically locked in position for added security. Secure the sensing module using a suitable screwdriver and turn the retainer screw one quarter turn clockwise.

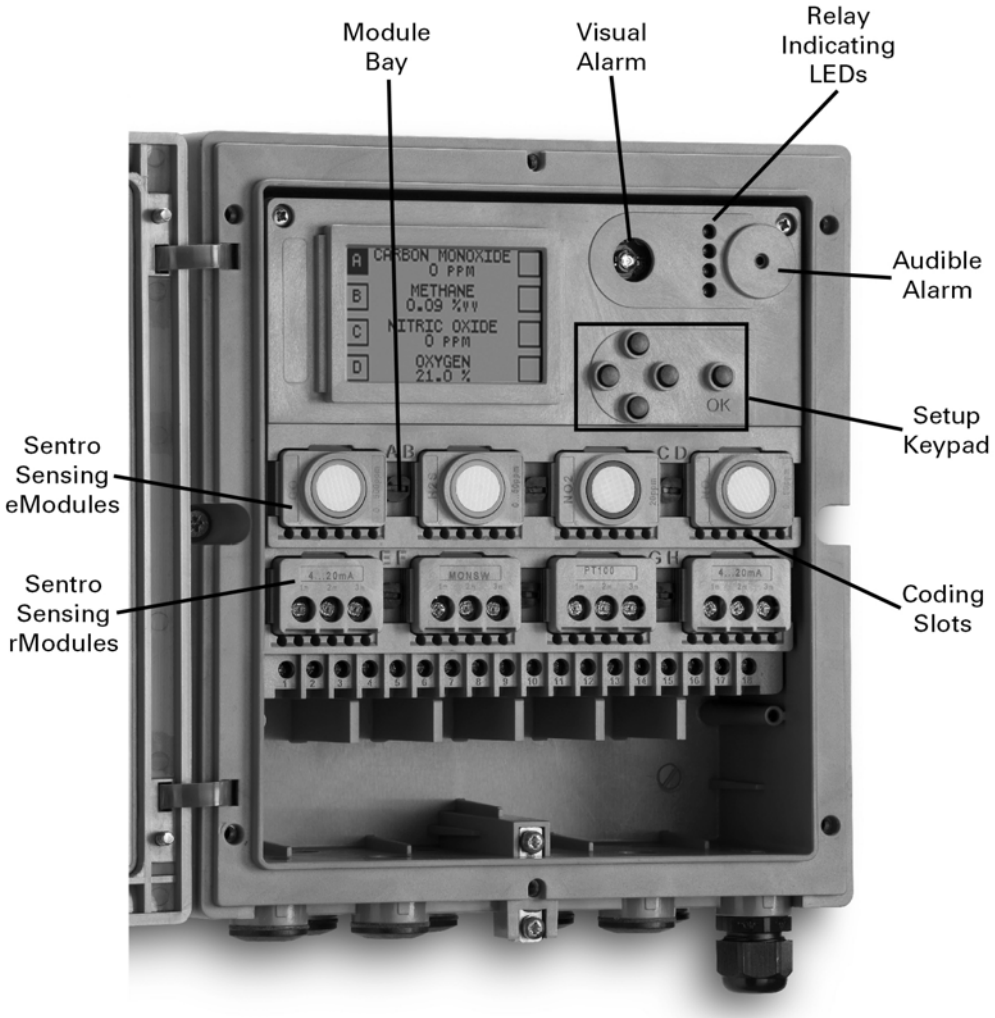
3.6 Datacomms

The datacomms output is RS485 standard supporting Modbus protocol.

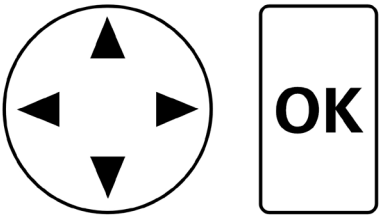
4. Setup and Calibration

4.1 Controls and Indicators




Module Bay
Visual Alarm
Relay Indicating LEDs
Audible Alarm
Setup Keypad
Sentro Sensing eModules
Sentro Sensing rModules
Coding Slots
CARBON MONOXIDE
0 PPM
METHANE
0.09 %vv
NITRIC OXIDE
0 PPM
OXYGEN
21.0 %
OK

4.1.1 Navigation



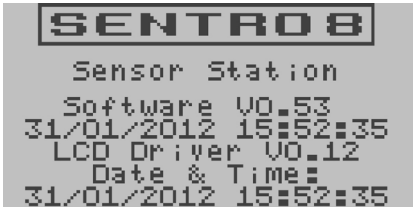
The Sentro 8 Sensorstation software is navigated using the **Setup Keypad**. The **Setup Keypad** consists of a **navigation keypad** and an **OK** key.

The **navigation keypad** is a four-way controller to navigate you through the software. Holding down one of the direction arrows on the navigation keypad scrolls through the menu.

The **OK** key is to confirm menu selections.

4.2 Start Screen

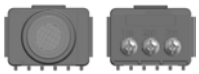
When the Sentro 8 Sensorstation is initially powered-up the **Start** screen will be displayed for a few seconds. The **Start** screen displays basic information about the Sentro system.



4.2.1 Base Screens

After initial power-up is completed the first of the four **Base Screens** will appear. The four **Base Screens** display the following:

- 1 & 2 - **Sensor Inputs Overview** - two screens, one displaying channel group A to D and the other channel group E to H

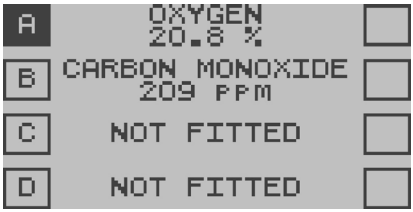


- 3 - **Relay Outputs Overview** - one screen displaying the current state of the four relays

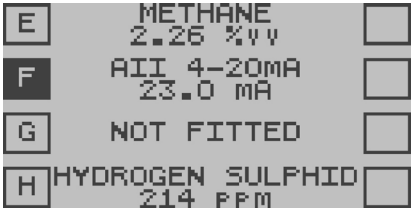
- 4 - **Audio/Visual Alarms Overview** - one screen displaying the current state of the Audio/Visual Alarms

Use the navigation keypad to scroll through the four **Base Screens**.

1.



2.



3.

4.

1 and 2 - Sensor Inputs Overview

The **Sensor Inputs Overview** displays the following information about the sensors fitted to the Sentro 8 Sensorstation:

- Channel address 

- Duty text 

- Signal status with units 

- Any channel exclusions 

- **Setpoint 1** alarm (**SP1**) (**General** alarm) 
- **Setpoint 2** alarm (**SP2**) (**High** alarm) 
- Exposure alarms (TWA/STEL) 
- Over range input signal 

- Under range input signal 

- High fault 

- Low fault 

3 - Relay Outputs Overview

The **Relay Outputs Overview** displays the state of the of the four relay outputs on the Sentro 8 Sensorstation:

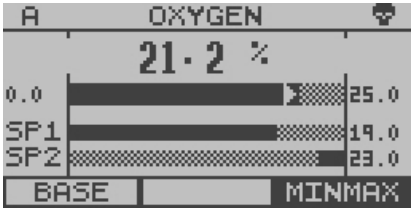
- Output relay state
  - Power-off 
  - Power-on 

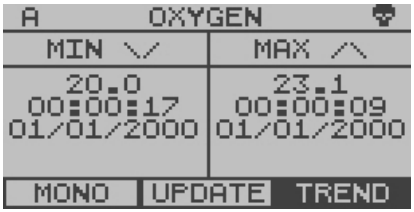
4 - Audio/Visual Alarms Overview

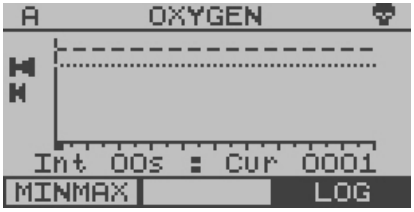
The **Audio Visual Alarms Overview** displays the alarm status.

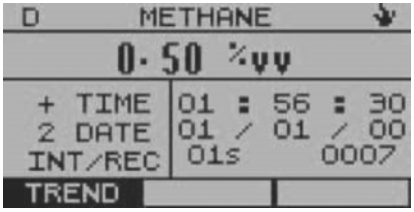
More detailed information about **Sensor Inputs**, **Relay Outputs** and **Audio/Visual Alarms** can be displayed.

Use the navigation keypad, scroll through the four **Base Screens** of **Sensor Inputs Overview (two)**, **Relay Outputs Overview** and **Audio/Visual Alarms Overview** to the channel you wish to view in detail and select **OK**.









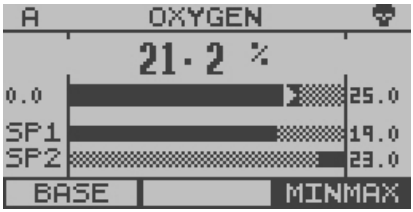
4.2.2 Sensor Inputs Overview

The detail view of each channel is displayed on four/five screens in the following order:

- **Mono View**
- **Exposure View** - toxic gas eModule only
- **Minmax View**
- **Trend View**
- **Log View**

The **Mono View** appears first. Use the **OK** key to step through the detail views and back again to the **Base Screens** displaying the Sensor Inputs Overview 1 & 2.

Checkpoint
The direction of a step can be changed at any time by using the navigation keypad to highlight the next view required in the bottom bar.



4.2.2.1 Mono View

This displays more detailed information about individual channels.

Channel Information

This is a bar graph of the input signal with lower and upper scale values on the left and right. The arrow indicates increasing/stable/decreasing signal tendency.

Setpoint 1 (**SP1**) **General** alarm) and **Setpoint 2** (**SP2**) (**High** alarm) marker with a numerical value on the right side.

Alarm Messages

- **Setpoint 1** (**SP1**) (**General** alarm) or **Setpoint 2** (**SP2**) (**High** alarm) **On**

- **Setpoint 2** (**SP2**) (**High** alarm) **On**

- The input signal is under range

- The input signal is over range

- A location is temporarily excluded

- The input signal is low fault

- The input signal is high fault

- The STEL alarm in the eModule is activated

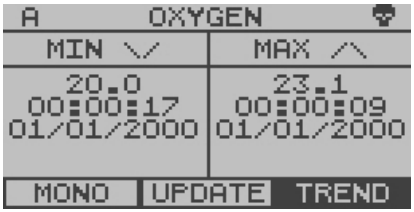
- The TWA alarm in the eModule is activated

Checkpoint

Scroll up or down to view the **Mono View** information on an adjacent input channel.

4.2.2.2 Minmax View

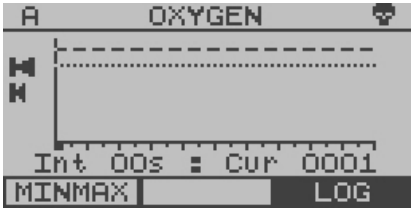
The Minimum and Maximum value that the signal has reached since last updated with time and date stamp.



To update the values displayed, use the navigation keypad to scroll to **Update** and select **OK**.

4.2.2.3 Trend View

The display field displays 100 logged readings and will jump forward in lots of ten.



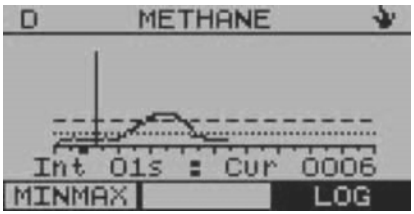
Total maximum logged readings 1 to 4000.

- **Setpoint 1** (**SP1**) (**General** alarm)

- **Setpoint 2** (**SP2**) (**High** alarm)

- Trend cursor

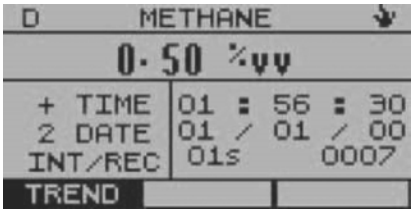
Section 4.2.2.4

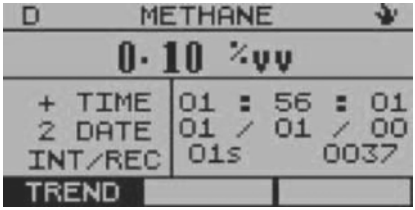


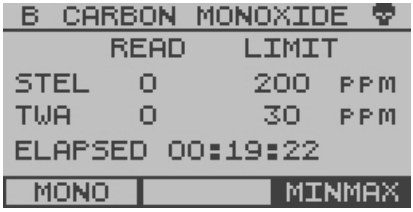
To Review the Trend

Use the navigation keypad, scroll up or down to review the **Trend** and select **OK** to view the **Log** values at the current trend cursor position. Select **OK** to return to **Trend**.

Section 4.2.2.4







4.2.2.4 Log View

Details of the data present at the **Trend** cursor position selected.

Section 4.2.2.3

To Review the Trend

Use the navigation keypad, scroll up or down to review the **Log** and select **OK** to view the general **Trend** around the current **Log** entry. Select **OK** to return to **Log**.

Section 4.2.2.3

4.2.2.5 Exposure View

If a toxic Sentro eModule has been activated to monitor STEL and TWA exposure limits, an additional fifth view called **Exposure View** will appear in the **Sensor Inputs Overview**.

- Short term exposure limit - COSHH

- Time weighted average - COSHH

- Time elapsed into monitoring period

- Current accumulated value

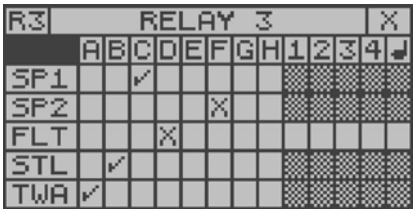
- Preset alarm limits that activate the Exposure alarm signals of the eModule for STEL and TWA

Section 4.3.6 »

Section 4.4.4 »

Checkpoint
STEL: Short term exposure limit of total accumulated units over a rolling 15 minute period.

Checkpoint
TWA: Time weighted average of gas concentration over a working eight hour period.



4.2.3 Relay Outputs Overview

Information is displayed about the signals that are assigned to this relay from the sensing modules and other relay outputs.

Use the navigation keypad, scroll through the **Base Screens** to **Relay Outputs Overview**.

Scroll to the Relay Channel you are interested in and select **OK**.

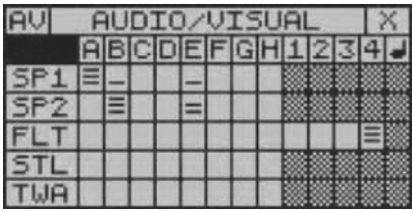
- A to ♩: Origin of incoming signal
- SP1 to TWA: Type of incoming signal

The screen prompts are as follows:

- The incoming signal is a Set function

- The incoming signal is a Reset function

- Non valid function



4.2.4 Audio/Visual Alarms Overview

Information is displayed about the signals that are assigned to this audio/visual alarm from the sensing modules and the other relay outputs.

Use the navigation keypad, scroll through the **Base Screens** to the **Audio/Visual Alarm Overview** and select **OK**.

The screen displays the severity level of the incoming signal, one bar is lowest and three bars is highest.

Section 6 »

4.3 Main Setup Menu

From the **Base Screens** press and hold down the up arrow on the navigation keypad. After a few seconds the **Main Setup Menu** will appear. The available options are as follows:

- **Security**
  - Check code
  - Set code
- **Display**
  - Contrast
  - Auto scroll
  - Backlight
  - Confidence
- **Time and Date**
- **Log**
- **Datacomms**
- **Reset Exposure**

4.3.1 Security

To Access the Security Menu

From the **Main Setup Menu**, use the navigation keypad, scroll to **Security** and select **OK**.

Check Code

From the **Security Menu,** use the navigation keypad, scroll to **Check Code** and select **OK**.

Scroll to **Yes** or **No** and select **OK**. Scroll to **Set** or **Quit** and select **OK**.

To Set the Security Code

Checkpoint
The factory set security code is 0000.

From the **Security Menu** use the navigation keypad to scroll to **Set Code** and select **OK**.

Use the navigation keypad, scroll up or down on the first digit to the required number, scroll right to the next digit, repeat for all four digits and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

Checkpoint
To Open the Security Barrier When Set
Use the navigation keypad, scroll up or down on the first digit to the required number, scroll right to the next digit, repeat for all four digits and select **OK**.

4.3.2 Display

To Access the Display Settings Menu
From the **Main Setup Menu** use the navigation keypad, scroll to **Display** and select **OK**.

To Adjust the Display Contrast
From the **Display Settings Menu** use the navigation keypad, scroll to **Contrast** and select **OK**.

Use the navigation keypad, scroll left or right to adjust the **Display** contrast level and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

To Adjust the Display Scrolltime

Checkpoint
The **Base Screen** can be configured to automatically scroll between the two channel groups - A to D and E to H. The time interval between scrolling is adjustable and this is **Scrolltime**.

From the **Display Settings Menu**, use the navigation keypad, scroll to **Scrolltime** and select **OK**.

Use the navigation keypad, scroll up or down on the first digit, scroll right to the second digit, repeat for the second digit and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

To Set the Display Backlight On/Off
From the **Display Settings Menu**, use the navigation keypad scroll to **Backlight** and select **OK**.

Use the navigation keypad, scroll up or down to set the **Backlight On** or **Off** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

To Set the Confidence Alert On/Off

From the **Display Settings Menu**, use the navigation keypad, scroll to **Confidence** and select **OK**.

Use the navigation keypad, scroll up or down to set the **Confidence Alert On** or **Off** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

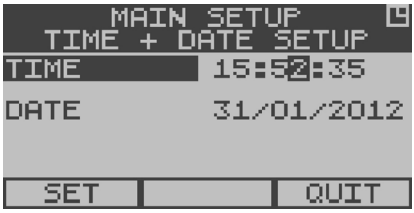
Checkpoint

Trolex strongly recommends that the **Confidence Alert** is set **On** at all times to indicate to users that the Sentro 8 is functioning correctly.

4.3.3 Time and Date

To Access the Time and Date Setup Menu

From the **Main Setup Menu** use the navigation keypad, scroll to **Time and Date** and select **OK**.



To Adjust the Time

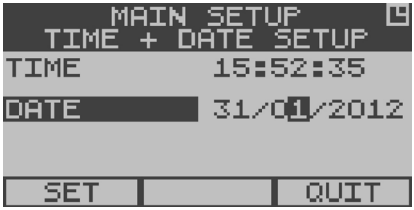
From the **Time and Date Setup Menu**, use the navigation keypad, scroll to **Time** and select **OK**.

Use the navigation keypad, scroll up or down on the first digit to the required time, scroll right to the next digit. Repeat the above for all six digits in **Time** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

To Adjust the Date

From the **Time and Date Setup Menu**, use the navigation keypad, scroll to **Date** and select **OK**.



Use the navigation keypad, scroll up or down on the first digit to the required date, scroll right to the next digit. Repeat the above for all eight digits in **Date** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

Checkpoint

The Sentro 8 internal clock is powered by a miniature lithium battery. The battery has a life expectancy in excess of 10 years.

4.3.4 Log

Readings of data for each channel will be continuously recorded at predetermined intervals.

Checkpoint

By changing **Time Units** and **Log Period** in combination it is possible to configure a Log Period of between 1 second and 99 hours.

To Access the Log Setup Menu

From the **Main Setup Menu**, use the navigation keypad, scroll to **Log** and select **OK**.

To Change the Time Units

From the **Log Setup Menu**, use the navigation keypad, scroll to **Time** and select **OK**.

Use the navigation keypad, scroll up or down to change the time units to **Secs**, **Mins** or **Hours** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

To Change the Log Period

From the **Log Setup Menu**, use the navigation keypad, scroll to **Log Period** and select **OK**.

Use the navigation keypad, scroll up or down to change the **Log Period** digits and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

To Clear the Log

Caution

Always clear the **Log** after any fundamental changes have been made to the Sentro 8 Sensorstation.

- Replacement of eModule or rModule
- Change of Log Period
- Change of Remote Sensor

From the **Log Setup Menu**, use the navigation keypad, scroll to **Clear Log** and select **OK**.

Use the navigation keypad, scroll to **Yes** or **No** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

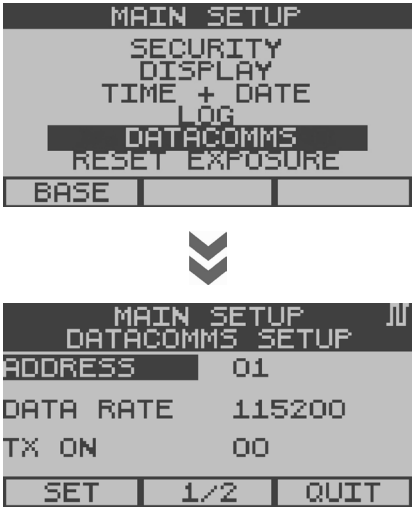
4.3.5 Datacomms Protocol

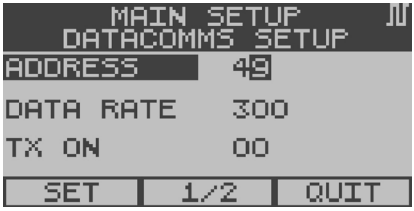
The protocol characteristics required for the Modbus datacomms can be setup where the Sentro 8 Sensorstation is being integrated into a wider communication network or to interface with a PC or SCADA system.

Data Protocol	Modbus
Format	Binary
Databits	8
Stopbits	1
Parity	None
Data rate	300/600/1200/2400/4800/9600/ 14400/19200/28800/38400/ 57600/115200
Address	1 to 99
TX On	0 to 99 ms
TX Off	0 to 99 ms
Duplex	Half

To Access the Datacomms Setup Menu

From the **Main Setup Menu**, use the navigation keypad, scroll to **Datacomms** and select **OK**.



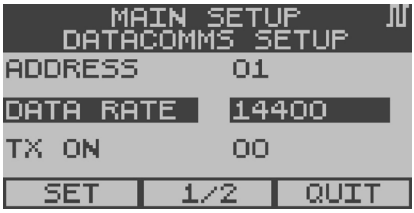


To Change the Address

From the **Datacomms Setup Menu**, use the navigation keypad, scroll to **Address** and select **OK**.

Use the navigation keypad, scroll up or down on the first digit to the required **Address**, scroll right to the second digit. Repeat the above for the second digit in **Address** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

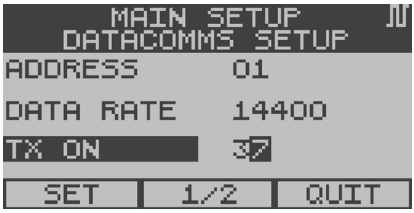


To Change the Data Rate

From the **Datacomms Setup Menu**, use the navigation keypad, scroll to **Data Rate** and select **OK**.

Use the navigation keypad, scroll up or down to the required **Data Rate** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.



To Change the TX On Setting

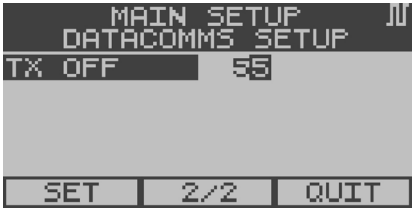
From the **Datacomms Setup Menu**, use the navigation keypad, scroll to **TX On** and select **OK**.

Use the navigation keypad, scroll up or down on the first digit to the required **TX On** number, scroll right to the second digit. Repeat the above for the second digit in **TX On** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

To Change the TX Off Setting

From the Datacomms Setup Menu, use the navigation keypad, scroll to **TX Off** and select **OK**.



Use the navigation keypad, scroll up or down on the first digit to the required **TX Off** number, scroll right to the second digit. Repeat the above for the second digit in **TX Off** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

4.3.6 Reset Exposure

Checkpoint

STEL and TWA that has accumulated in any toxic gas Sentro eModules will be simultaneously reset to zero.

Checkpoint

The accumulated STEL and TWA levels should only be reset by authorised personnel.

To Access the Reset Exposure Menu

From the **Main Setup Menu**, use the navigation keypad, scroll to **Reset Exposure** and select **OK**.

To Reset Exposure

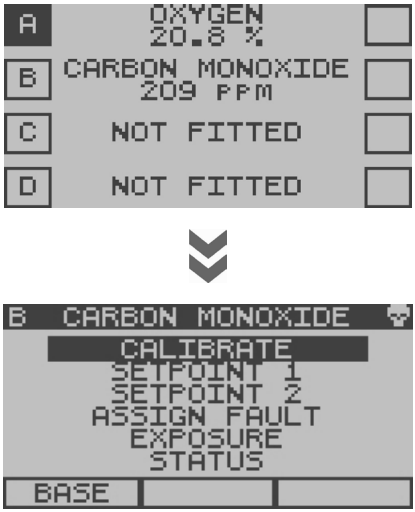
From the **Reset Exposure Menu**, select **OK**, use the navigation keypad, scroll to **Yes** or **No** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

4.4 Sentro eModule Setup

This displays more detailed information about the configuration of individual eModule channels.

From the **Base Screens**, use the navigation keypad, scroll to the required channel A, B, C or D, press and hold down the left arrow on the navigation keypad. After a few seconds the **Sentro eModule Setup Menu** will appear. The options are as follows:



- **Calibrate**
  - Zero
  - Set Calibration Gas
  - Span
- **Setpoint 1**
  - Activate
  - Level
  - Assign
- **Setpoint 2**
  - Activate
  - Level
  - Assign
- **Assign Fault**
- **Exposure**
- **Status**
  - Exclude

4.4.1 Sentro eModules Calibrate

Checkpoint
The standard configuration for a Sentro 8 has eModules fitted in locations A, B, C and D. It is possible that eModules are fitted in locations E, F, G and H but this is a factory fitted configuration. If you are unsure which modules you have fitted to your Sentro 8, look at the **Sensor Inputs Overview** for channels group E to H and see if gas types are displayed. If gas types are displayed you have eModules fitted in channel group E to H. If you are still unsure contact: **service@trolex.com** for assistance.

Checkpoint
Ensure the area where the equipment is being calibrated is well ventilated. Observe appropriate Health and Safety legislation and applicable local procedures when handling test gases.

Checkpoint
When calibrate is selected the eModule will output a fixed value of 0.00. This prevents the possibility of false alarm signals being activated in the monitoring equipment during the calibration process (20% will be output for an oxygen sensor).

Fit a gas hood to the corresponding port of the eModule being calibrated. Connect the gas application tube from the clean air test gas cylinder to the gas hood fitted to the eModule being calibrated.

Zero

From the **Sentro eModule Setup Menu**, use the navigation keypad, scroll to **Calibrate** and select **OK**.

If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

The screen will display an arbitrary reading.

Open the valve and apply clean air from the test gas cylinder at a rate of 1 litre/min to clear any gas from the sensor.

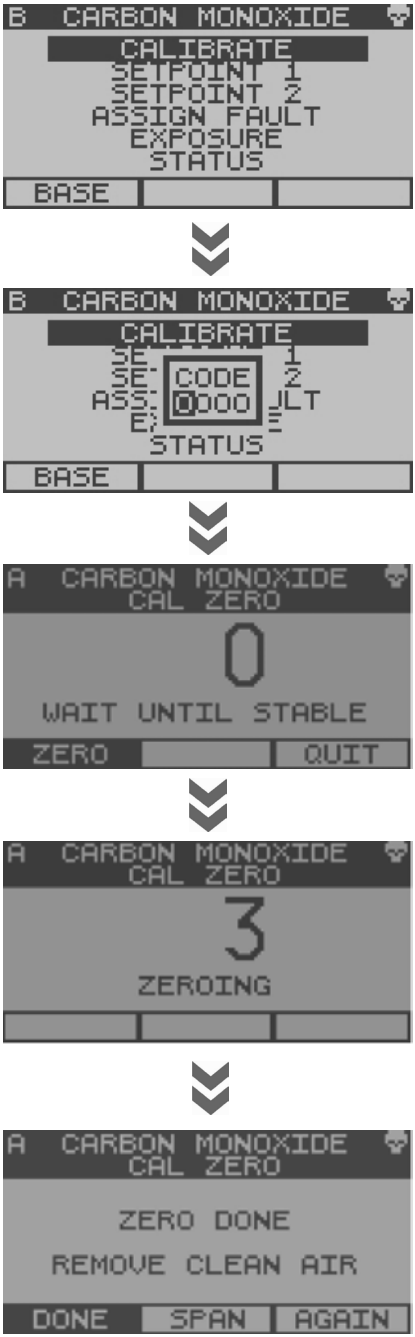
Wait for the reading to settle at a stable value, not necessarily 0.

When stable select **OK** to **Zero** the reading. If the **Zero** point continues to shift then select **OK** again.

Close the valve and stop the supply of clean air.

Disconnect the application tube from the gas port.

Use the navigation keypad, scroll to **Span** and select **OK**.



Check

The screen displays the **Span** value of calibration gas that the Sentro 8 Sensorstation expects to be used during calibration.

Check the **Span** value of gas displayed against the value on your calibration gas cylinder.

If the two values match then proceed to the **Calibrate Span** procedure.

If they do not match then **Change** the value as follows:

Use the navigation keypad, scroll to **Change** and select **OK**.

With **Expected** highlighted select **OK**.

Use the navigation keypad, scroll up or down on the first digit to the required **Span** value on your calibration gas cylinder. Scroll right to the second digit. Repeat the above for the second and third digit in **Span** and select **OK**.

Scroll to **Accept** and select **OK**.

Continue with **Calibrate Span** as described in the following section.

Calibrate Span - Using a Calibration Gas of an Expected Value

Connect the gas application tube from the calibration gas cylinder to the gas hood fitted to the corresponding gas port of the eModule being calibrated.

Scroll to **Accept** and select **OK**.

Open the valve and apply calibration gas at a rate of 1 litre/min to clear any clean air from the sensor.

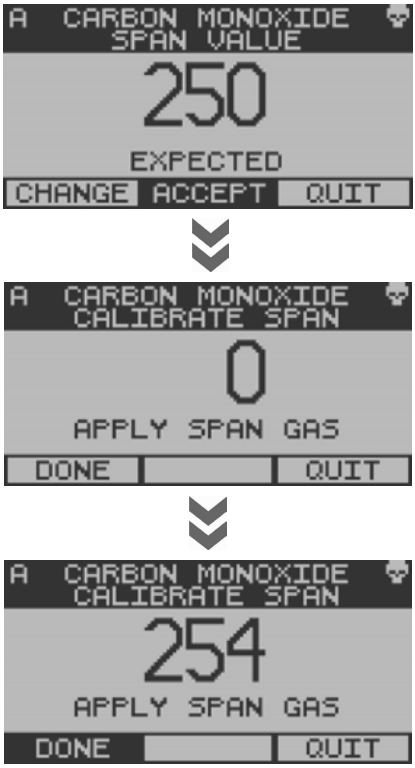
Wait for the reading to settle at a stable value, this is not necessarily the calibration gas value and select **OK** when stable.

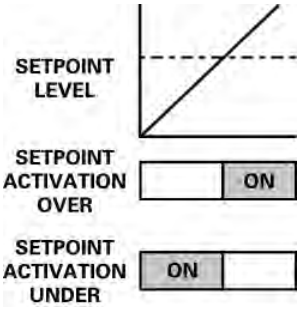
Select **OK** again if the displayed value continues to shift.

Select **OK** again if the displayed value continues to shift.

Use the navigation keypad, scroll to **Done** or **Quit** in the toolbar and select **OK**.

Shut the valve and stop the supply of calibration gas to the sensor. Disconnect the application tube from the gas hood and remove the gas hood.





4.4.2 Setpoint 1 and Setpoint 2

Each input channel A to H has two **Setpoint On** alarm states - **Setpoint 1** (**SP1**) (**General** alarm) and **Setpoint 2** (**SP2**) (**High** alarm).

The available options are as follows:

- Activate
- Level
- Assign

To Access the Setpoint 1 or Setpoint 2 Setup Menu

From the Sentro **eModule Setup Menu**, use the navigation keypad, scroll to **Setpoint 1** or **Setpoint 2** and select **OK**.

If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

Activate

The **Activate** mode of **Setpoint 1** and **Setpoint 2** can be setup to preference.

From the **Setpoint 1** or **Setpoint 2 Setup Menu**, use the navigation keypad, scroll to **Activate** and select **OK**.

Use the navigation keypad, scroll to **Over** or **Under** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

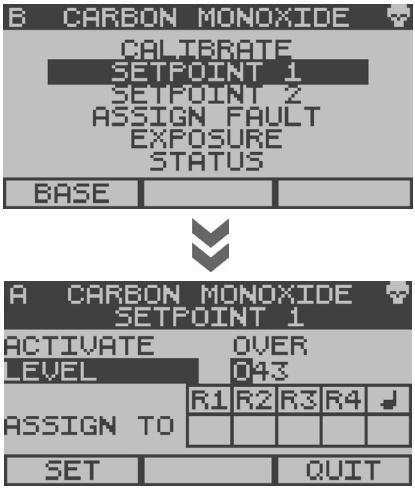
Level

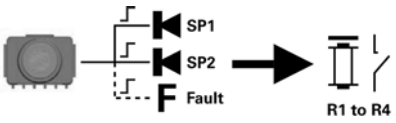
The operating **Level** of **Setpoint 1** and **Setpoint 2** can be setup to preference.

From the **Setpoint 1** or **Setpoint 2 Setup Menu**, use the navigation keypad, scroll to **Level** and select **OK**.

Use the navigation keypad, scroll up or down on the first digit to the required **Level** value. Scroll right to the second digit. Repeat the above for the second and third digit in **Level** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.





Assign Setpoint

The **Setpoint 1 or Setpoint 2 On** alarm state can be assigned to the following:

- Relay 1 output
- Relay 2 output
- Relay 3 output
- Relay 4 output
- The on-board audio/visual alarm

The **Assign To** of **Setpoint 1** and **Setpoint 2** can be setup to preference.

From the **Setpoint 1** or **Setpoint 2 Setup Menu**, use the navigation keypad, scroll to **Assign To** and select **OK**.

The screen prompts are as follows:

- Cursor
- Power-up the selected relay
- Reset a latched relay
- Audio alarm severity

4.4.3 Assign Fault

Each input channel A to H has a fault alarm output state:

- Analogue input signal over range
- Analogue input signal under range
- Module fault

To Access Assign Fault

From the **Sentro eModule Setup Menu**, use the navigation keypad, scroll to **Assign Fault** and select **OK**.

If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

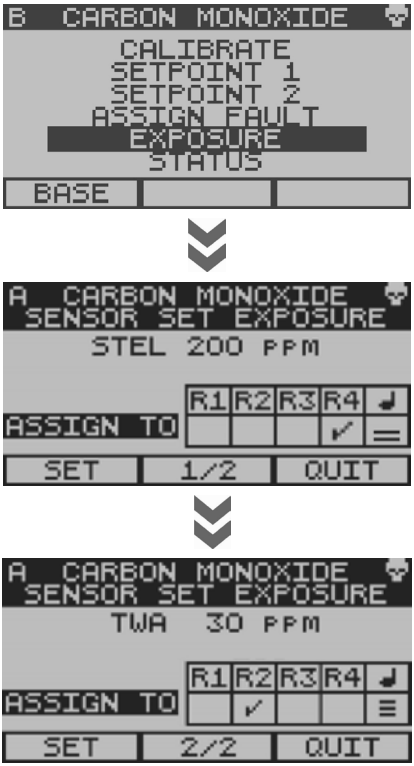
The screen prompts are as follows:

- Cursor

- Power-up the selected relay

- Reset a latched relay

- Audio alarm severity



4.4.4 Assign Exposure Alarm

When a toxic gas Sentro eModule equipped with STEL and TWA processing is enabled at a location, an additional menu item **Exposure** will appear.

To Access Exposure

From the **Sentro eModule Setup Menu**, use the navigation keypad, scroll to **Exposure** and select **OK**.

If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

The preset limits of STEL and TWA can be viewed. STEL and TWA alarm states can be assigned to the following:

- Relay 1 output
- Relay 2 output
- Relay 3 output
- Relay 4 output
- The on-board audio/visual alarm

The screen prompts are as follows:

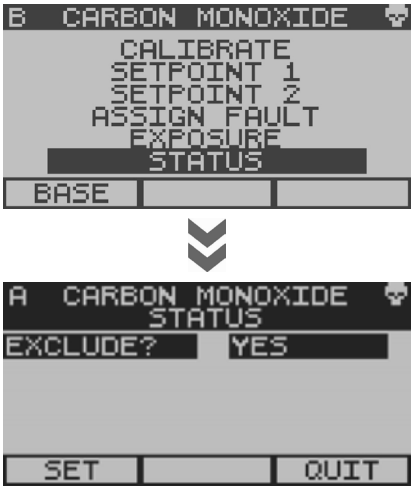
- Cursor
- Power-up the selected relay
- Reset a latched relay
- Audio alarm severity

Section 4.3.6 »

Checkpoint

Reset the accumulated STEL and TWA data in accordance with section 4.3.6.

4.4.5 Status



Exclude

A Sentro eModule can be excluded to disable alarm activity

To Access Exclude

From the **Sentro eModule Setup Menu**, use the navigation keypad, scroll to **Status** and select **OK**.

If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

From the **Status Menu**, select **OK**, use the navigation keypad, scroll to **Yes** or **No** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

4.5 Sentro rModule Setup

This displays more detailed information about the configuration of individual rModule channels.

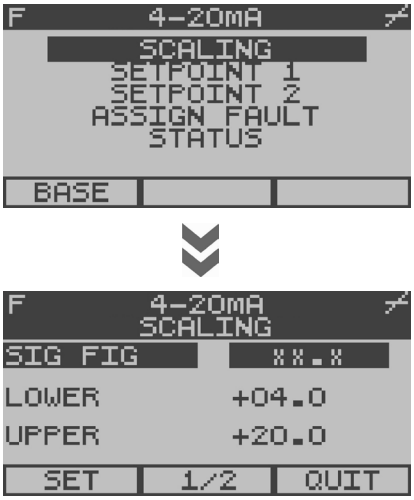
From the **Base Screens**, use the navigation keypad and scroll to the required channel E, F, G or H. Press and hold down the left arrow on the navigation keypad. After a few seconds the **Sentro rModule Setup Menu** will appear. The options are as follows:

- **Calibrate** - if PT100 fitted
- **Scaling**
  - Sig Fig
  - Lower
  - Upper
  - Units
  - Update
  - Text
- **Setpoint 1**
  - Activate
  - Level
  - Assign To
  - Hysteresis
  - On Delay
  - Off Delay
- **Setpoint 2**
  - Activate
  - Level
  - Assign To
  - Hysteresis
  - On Delay
  - Off Delay
- **Assign Fault**
  - Assign To
- **Status**
  - Exclude

Checkpoint
The standard configuration for a Sentro 8 has rModules fitted in locations E to H. It is possible that eModules are fitted in locations E to H but this is a factory fitted configuration. If you are unsure which modules you have fitted to your Sentro 8, look at the **Sensor Inputs Overview** for channels group E to H and see if gas types are displayed. If gas types are displayed you have eModules fitted in channel group E to H. If you are still unsure contact: **service@trolex.com** for assistance.

4.5.1 Scaling

The various characteristics of the analogue input signal scale values can be configured.

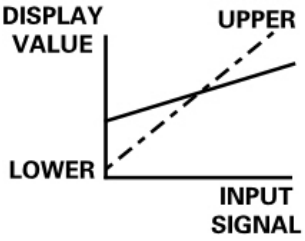


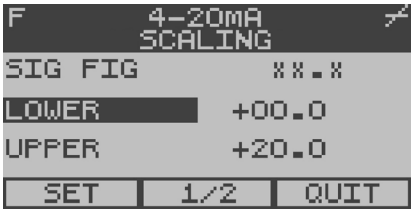
To Access Scaling
From the **Sentro rModule Setup Menu**, use the navigation keypad, scroll to **Scaling** and select **OK**.

If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

Sig Fig
The position of the decimal point can be shifted along the displayed number to the best **Significant Figure** to suit the particular sensor signal being monitored and its optimum measuring range.

This can be used to eliminate digit flicker and redundant decimal places.



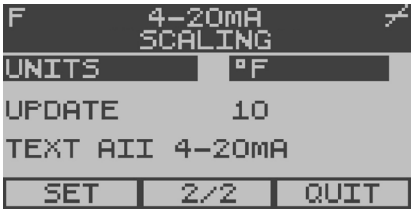


Lower - Upper

Set the desired **Lower** and **Upper** limits of the displayed reading for a given magnitude of input signal scan. This can be any numeric value and the polarity can be any negative value through to any positive value.

Checkpoint

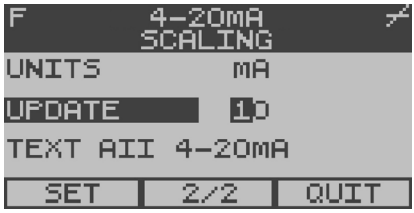
Enter the preferred **Sig Fig** before setting the **Lower** and **Upper** values.



Units

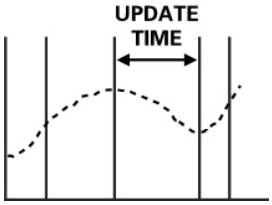
A menu of most standard engineering units is available for adding on to the signal value displayed.

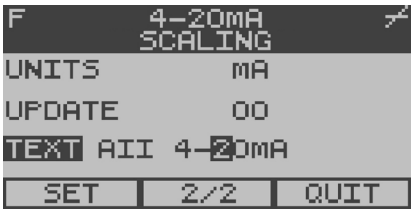
An option called **Create User Defined Units** will appear in the units menu choice. Specific user defined units can be configured. Up to four characters of text can be entered into the Sentro 8.



Update

The Input Signal is sampled at pre-determined intervals and the **Update** time period is adjustable. Signal values are averaged between samples.



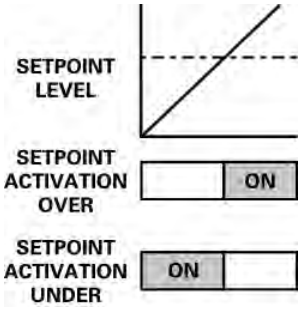


Text

Duty **Text** can be entered to denote the input duty or a tag reference of the input device.

4.5.2 Setpoint 1 and Setpoint 2

Each input channel E to H has two **Setpoint On** alarm states - **Setpoint 1** (**SP1**) (**General** alarm) and **Setpoint 2** (**SP2**) (**High** alarm).



To Access Setpoint 1 and Setpoint 2

From the **Sentro rModule Setup Menu**, use the navigation keypad, scroll to **Setpoint 1** or **Setpoint 2** and select **OK**.

If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

Activate

The **Activate** mode of **Setpoints** can be setup to preference.

From the **Setpoint 1** or **Setpoint 2 Setup Menu**, use the navigation keypad, scroll to **Activate** and select **OK**.

Use the navigation keypad, scroll to **Over** or **Under** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

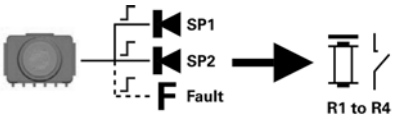
Level

The operating **Level** of **Setpoints** can be setup to preference.

From the **Setpoint 1** or **Setpoint 2 Setup Menu**, use the navigation keypad, scroll to **Level** and select **OK**.

Use the navigation keypad, scroll up or down on the first digit to the required **Level** value. Scroll right to the second digit. Repeat the above for the second and third digit in **Level** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.



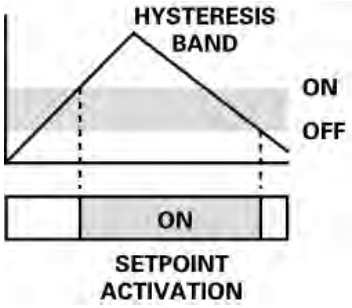
Assign To

The **Setpoint On** alarm state can be assigned to the following:

- Relay 1 output
- Relay 2 output
- Relay 3 output
- Relay 4 output
- The on-board audio/visual alarm

The **Assign To** of **Setpoint 1** (**SP1)** (**General** alarm) and **Setpoint 2** (**SP2)** (**High** alarm) can be setup to preference. The screen prompts are as follows:

- Cursor
- Power-up the selected relay
- Reset a latched relay
- Audio alarm severity



Hysteresis

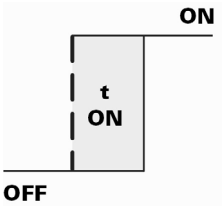
Hysteresis is the deadband between the setpoint **Activating On** and **Activating Off** as the input signal increases and decreases.

Checkpoint

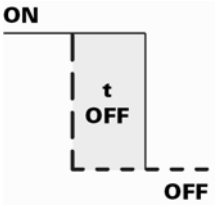
The **Activating Off** level is defined with respect to the programmed **Activating On** setpoint level.

On Delay - Off Delay

The **Activation On** of the setpoint can be delayed by an adjustable time period (**t On**).



The **Activation Off** of the setpoint can also be delayed by an adjustable time period (**t Off**).



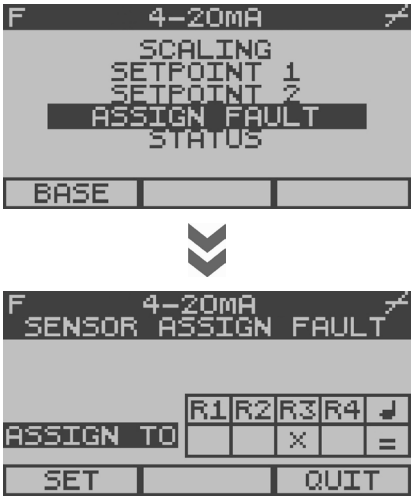
4.5.3 Assign Fault

Each input channel **E** to **H** has a **Fault** alarm output state.

- Analogue input signal over range
- Analogue input signal under range
- Module fault

To Access Assign Fault

From the **Sentro rModule Setup Menu**, use the navigation keypad, scroll to **Assign Fault** and select **OK**.



If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

Assign to

The **Fault** state can be assigned to the following:

- Relay 1 output
- Relay 2 output
- Relay 3 output
- Relay 4 output
- The on-board audio/visual alarm

The screen prompts are as follows:

- Cursor
- Power-up the selected relay
- Reset a latched relay
- Audio alarm severity

4.5.4 Status

Exclude

A selected **Sentro rModule** can be excluded to disable alarm activity

To Access Status

From the **Sentro rModule Setup Menu**, use the navigation keypad, scroll to **Status** and select **OK**.

If a **Security Code** has been enabled you will be prompted to enter it, enter the **Security Code** and select **OK**.

Exclude

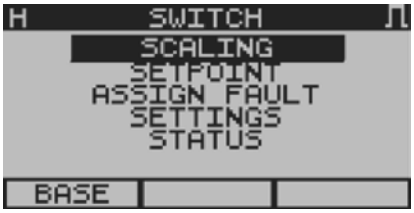
From the **Exclude Menu**, select **OK**, use the navigation keypad, scroll to **Yes** or **No** and select **OK**.

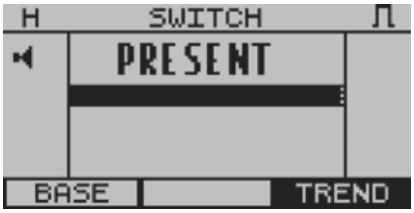
4.5.5 Calibrate PT100

If a **PT100 Temperature** rModule is fitted **Calibrate** will appear in the menu. Trim the signal to suit site measured conditions.

4.5.6 Setup of an On/Off Input rModule

The **On/Off Sentro rModules** will respond to signals from simple switching sensors such as thermostats, pressure switches and interlock limit switches. The switches may be conventional contacts or NAMUR proximity sensors.





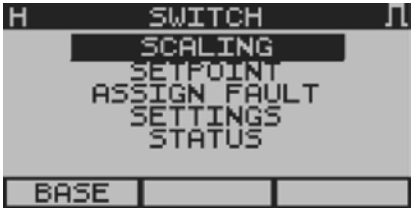
Setup functions are the same as for Analogue input rModules.

Mono View

The **Mono View** will display the Present/ Absolute status of the input switch signal.

4.5.7 Setup of an On/Off Diode Input rModule

The input is also configured to accept an input from switching devices such as pressure switches, limit switches, thermostats, etc with a diode connected in series at the remote point.



This rModule has the same basic functions as the **On/Off Input rModule**.

Section 4.5.6 »

In addition it will respond to Open Circuit and Short Circuit conditions by generating a discrete High Fault alarm.

Mode - No Resistor

The input is configured to accept an input from switching devices such as pressure switches, limit switches, thermostats, etc with a diode connected in series at the remote point. The rModule will respond to a short circuit condition occurring by generating a **Low Fault** condition.

Mode - Resistor

In addition to the operation of the **No Resistor** mode, when a resistor is connected in parallel with the switching device at the remote point, the rModule will respond to the open circuit condition occurring by generating a **Low Fault** condition.

4.6 Output Relays Setup

The Sentro 8 Sensorstation is equipped with four integral output relays for external alarm and control purposes.

Initiating control commands can be assigned to any of the four relays:

- From **Setpoint 1** (**SP1**) (**General** alarm) on modules **A** to **H**
- From **Setpoint 2** (**SP2**) (**High** alarm) on modules **A** to **H**
- From a **Fault** on modules **A** to **H**
- From other relays fault monitoring
- From the **A/V Alarm** fault monitoring

The response characteristics of each of the relays can be setup according to functional requirements.

Checkpoint
The LED relay indicator is on when the relay is powered-down (Alarm State).

4.6.1 Mode

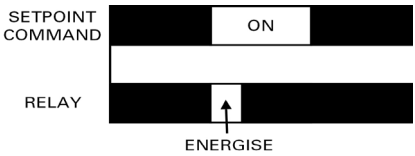
Each relay can be independently setup to respond in three different ways.

Auto Reset
The output relay will power-down when the **Setpoint** command is activated **On** and power-up when the **Go** command is activated **Off**.

Latch

The output relay will power-down when the **Go** command is activated **On** and Latch until reset.

To reset a latched relay: **Section 6.5**



Pulse

The output relay will power-up when the **Go** command is activated **On** and power-down after an adjustable time.

4.6.2 Pulse Time

Set the length of relay pulse when operating in Pulse Mode, 0 to 25 seconds.

4.6.3 Assign Fault

The function of each relay is monitored for correct operation and the **Setpoint On** alarm state can be assigned to:

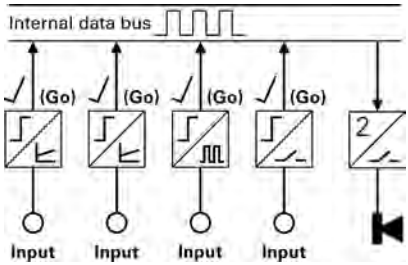
- Relay 1 output
- Relay 2 output
- Relay 3 output
- Relay 4 output
- The on-board audio/visual alarm

The screen prompts are as follows:

- Cursor
- Power-up the selected relay
- Reset a latched relay
- Audio alarm severity

4.6.4 And Function

A relay can be set to power-up only when several **Go** commands are present at the same time, so creating an **And** decision.



Voting Inputs

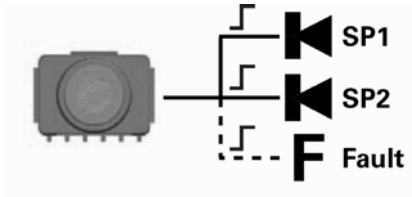
If **Go** commands are assigned to the relay from for example, 4 assignors, set the **And** function at 2. The relay will activate on a vote of any 2 out of 4.

4.6.5 Text

Duty text can be entered to denote the input duty or a tag reference of the input device.

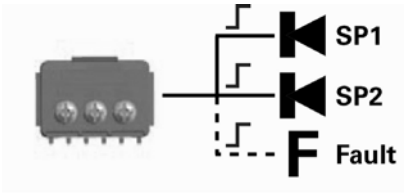
5. Audio/Visual Alarm References

All alarm signals and fault signals can be assigned to operate the inbuilt audio visual alarm in any combination.



Alarms are generated from:

- From **Setpoint 1** (**SP1**) (**General** alarm) on sensing modules **A** to **H**
- From **Setpoint 2** (**SP2**) (**High** alarm) on sensing modules **A** to **H**
- From a **Fault** on sensing modules A to H
- Relays 1 to 4 fault monitoring

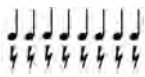


5.1 Alarm Severity Selection

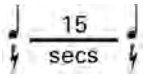
General Alarm
Slow repeating pulse

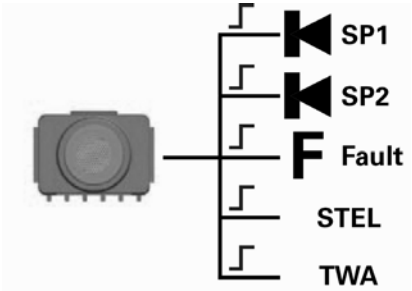
Warning Alarm
Faster, double repeating pulse

Critical Alarm
Faster, insistent pulse



Confidence Alert
To indicate that the Sentro 8 Sensorstation is **On** and functioning





Checkpoint
To view an Alarm Event and mute the Audible Alarm, enter the **Mono View** to view detailed information about the Alarm Event. This action will also mute the audible alarm.

5.2 Assign Fault

The **Audio/Visual** indicators are equipped with self function monitoring and will generate a **Fault** signal if a device failure is detected.

The **Fault** signal will be generated at the moment when the **Audio/Visual** alarm is activated **On**.

The **Fault** state can be assigned to:

- Relay 1 output
- Relay 2 output
- Relay 3 output
- Relay 4 output

The screen prompts are as follows:

- Cursor

- Power-up the selected relay

6. Diagnostics

6.1 Over Range Indication on a Pellistor Gas Sensing eModule

Incorrect readings will be given by a pellistor gas sensing eModule if it is exposed to gas concentrations that exceed its normal working range.

When over range is detected on a pellistor gas sensing eModule the Sentro 8 Sensorstation will switch into **Overrange Lock**.

The screen will display the message **Pell Over**.

The transmitted output data will be clamped at full scale.

The pellistor in the gas sensing eModule will be switched into a protect state to prevent oxidisation damage.

To Reset

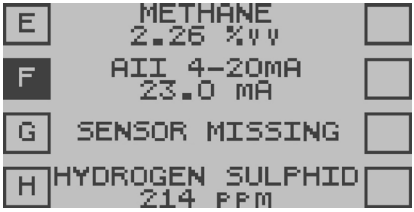
Check that the gas has cleared.

Remove the eModule, wait five seconds and refit the eModule.

6.2 Absent Sensing Module Message

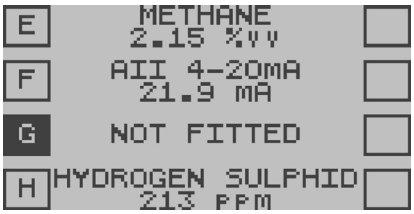
When the Sentro 8 Sensorstation is first switched on, or a sensing module is removed during normal operation, the screen will display the message:

- Sensor Missing



If a sensing module has not been fitted within a period of 10 seconds, the screen will display the message:

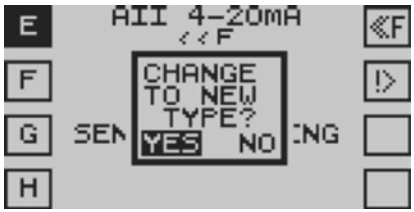
- Not Fitted



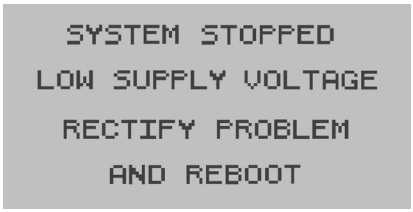
6.3 Replacing a Sentro Sensing Module

If a Sentro sensing module is removed and replaced with a sensing module of the same type, then the Sentro 8 Sensorstation will first request permission to accept the new sensing module configuration or write the configuration data of the previous sensing module into the new sensing module.

If a Sentro sensing module is removed and replaced with a sensing module of a different type, then the Sentro 8 Sensorstation will first request permission to proceed.



Section 7.4 »



6.4 Low Supply Voltage

A warning message will appear when the supply voltage falls below a safe working level.

6.5 Latched Relay Message and Relay Reset

Use the navigation keypad and scroll through the **Base Screens** to the **Relay Outputs Overview**.

Select the **Relay Channel** you are interested in and select **OK**.

The relay may be **Reset** if the initiating signal is absent.

Scroll to **Reset** and select **OK**.

7. Maintenance

7.1 Sentro eModule and rModules

Sentro eModules and rModules are conveniently replaced, as they have a pre-calibrated standardised output signal. They can be replaced in seconds - eliminating the need for precision calibration facilities.

7.2 Checking the Response of Gas Sensing eModules

The response of the Sentro 8 Sensorstation should be checked at regular intervals to ensure continued accuracy.

Check the **Zero** and **Span** response of the Sentro eModules by injecting a test gas into the Sentro 8 Sensorstation. This should be done once a month.

Checkpoint

If there is a discrepancy of greater than 5% of reading then recalibrate the appropriate eModule of the Sentro 8 Sensorstation.

Section 4.4.1 »

Or consider replacing the eModule.

Section 7.4 »

Calibrate the Sentro 8 eModules every six months.

Section 4.4.1 »

Checkpoint

If there is a discrepancy of greater than 5% of reading then consider changing the gas sensing eModule.

Section 7.4 »

Checkpoint

- Ensure that the appropriate Health and Safety guidelines and applicable local procedures are followed when handling test gases.
- The ambient temperature should be between +20 and +30°C during the checking procedure.
- Ensure the correct operation of the **Setpoint 1** and **Setpoint 2** alarms.
- Institute a formal checking and maintenance plan.
- Operate a Maintenance and Calibration Log and ensure it is updated every time any Maintenance or Calibration work is carried out.

7.3 Service Replacement Sensing Modules

Service replacement Sentro eModules and rModules can be supplied by our Product Support Department on a regular basis. Contact: **service@trolex.com** for assistance. Simply insert the replacement eModule or rModule into the Sentro 8 and return the original for calibration using the envelope provided.

7.4 Replacing a Sentro Sensing Module

Identify the sensing module to be replaced.

To prevent a **Fault** condition being generated when the sensing module is removed it is necessary to **Exclude** the sensing module.

From the **Base Screens**, use the navigation keypad, scroll to the required sensing module, press and hold down the left arrow on the navigation keypad.

Use the navigation keypad, scroll to **Status** and select **OK**.

Select **OK** to access the **Exclude Menu**.

Use the navigation keypad, scroll to **Yes** and select **OK**.

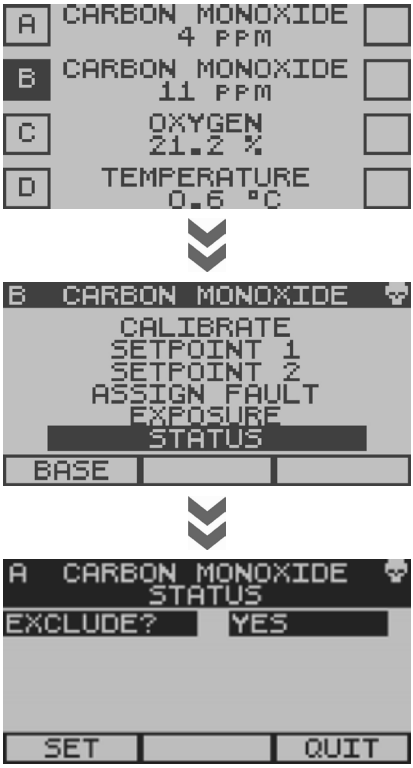
Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.

Using a suitable size screwdriver turn the sensing module retainer screw anti-clockwise to release the sensing module.

Remove the sensing module from the module bay.

Insert the replacement sensing module into the module bay ensuring that the connector is fully engaged.

Using a suitable size screwdriver turn the sensing module retainer screw clockwise to secure the sensing module.



Return the removed sensing module to your local Trolex service agent for service or disposal using the envelope provided or suitable packaging if the envelope is not available.

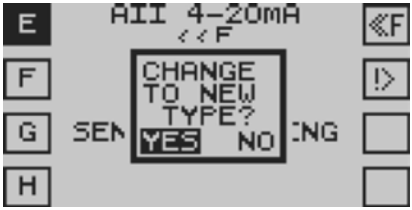
From the **Base Screens**, use the navigation keypad, scroll to the required sensing module, press and hold down the left arrow on the navigation keypad.

Use the navigation keypad scroll to **Status** and select **OK**.

Select **OK** to access the **Exclude Menu**.

Use the navigation keypad, scroll to **No** and select **OK**.

Use the navigation keypad, scroll to **Set** or **Quit** and select **OK**.



Checkpoint

- Confirmation of eModule or rModule setup data will be requested whenever a eModule or rModule is replaced.
- If an eModule or rModule is replaced by the **same** type of sensing module, then the existing data would normally be used. Overwrite the data if required or if a **different** type of eModule or rModule is loaded.
- Ensure that new coding stops are fitted into a replacement eModule or rModule where a user specific code has been previously defined.

7.5 Maintenance and Calibration Log

Order Reference: TX	
Serial Number:	Date Purchased:
Gas Type:	Location:

Date	Scheduled Check	Fault	Recalibrate	Replace Modules	Return to Trolex	Comments

7.6 Record Keeping

Institute a regular calibration and maintenance procedure and keep a record.

Please contact our Product Support Department at **service@trolex.com** or your local Trolex service agent, for help in installing proper maintenance procedures. The 'Maintenance and Calibration Log' gives an example of a typical record system.

There are also sensing module user accessible locations, via Modbus, which can be used to store recent calibration information.

7.7 Protection Grid

Periodically check the condition of the stainless steel protection grid and sealing ring on the front cover of the instrument. Clean excessive dust accumulations with a small brush or light air steam.

7.8 Servicing and Repair

Some versions are certified to Ex standards and must be serviced and repaired by Trolex Ltd or your local Trolex service agent approved by Trolex Ltd in order to preserve the Ex integrity.

Substitution of components and any additions or changes to the product will invalidate the product warranty and may contravene the terms of the intrinsically safe certificate.

7.9 Disposal

Part of the ethos of Trolex is sustainable design. **Sentro 8** contains materials that can be recovered, recycled and reused. At the end of its useful life ensure that the **Sentro 8** is recycled in accordance with local laws and bylaws for the geographic area where it is located. The end of its useful life is to be determined by the owner/operator of the equipment and not Trolex. Ensure that the **Sentro 8** is recycled by licenced waste contractors with the appropriate licences for handling electronic waste in the geographic area where the **Sentro 8** is located.

Checkpoint
Consult your local Trolex service agent or the Trolex Product Support Department if you require assistance with disposal:
service@trolex.com

Disclaimers

The information provided in this document contains general descriptions and technical characteristics of the performance of the product. It is not intended as a substitute for and is not to be used for determining suitability or reliability of this product for specific user applications. It is the duty of any user or installer to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use. Trolex shall not be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments, or find errors in this publication, please notify us at: **marketing@trolex.com**.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only Trolex or its affiliates should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Trademarks

Document History

Issue 5	1 September 2014	Fifth issue of this document
Issue 6	1 December 2014	Sixth issue of this document

Contact Details

Trolex Ltd, Newby Road, Hazel Grove, Stockport, Cheshire, SK7 5DY, UK
+44 (0) 161 483 1435 sales@trolex.com

Trolex Ltd. Newby Road, Hazel Grove, Stockport, Cheshire SK7 5DY, UK
t: +44 (0)161 483 1435 **e:** sales@trolex.com www.trolex.com