

## STX3241 TOXIC GAS SENSOR

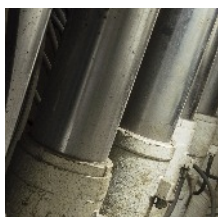
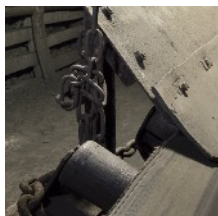
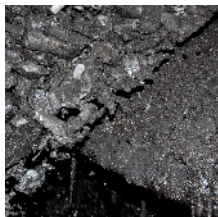


## INSTALLATION & OPERATING DATA



A TEX  
M1  
GROUP I  
INTRINSICALLY  
SAFE

**MINING**  
**TUNNELLING**  
**MINERAL  
EXTRACTION**



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## INSTALLATION & OPERATING DATA

### 1 PRINCIPAL OPERATING FEATURES



Fixed gas sensors for the detection of toxic gases present in the atmosphere.

High accuracy electrochemical sensing elements for a wide range of toxic gases.

LCD readout of gas concentration with OVER RANGE indication.

Convenient calibration of ZERO and SPAN via front mounted potentiometers.

Output signal versions:- 4 to 20 mA or 0.4 to 2 V.

Reinforced Polymer - EMC protected and proof against electrostatic charge.

Intrinsically safe for use in Group I hazardous areas.



Optional format with remote mounted gas sensing module in robust metal housing.



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### 2 APPLICATION

Fixed gas monitoring for point-source hazards and perimeter protection in arduous duty and exposed locations. Safety protection for toxic gas risk occurring in hazardous areas and general industrial applications.

A range of primary instrumentation and monitoring modules is available from Trolex to which the sensors can be directly connected to provide a flexible choice of display and control functions.



#### TRIP AMPLIFIER

for use with analogue output sensors.



#### CONFIGURABLE SENSOR CONTROLLER

for monitoring up to 8 analogue output sensors.



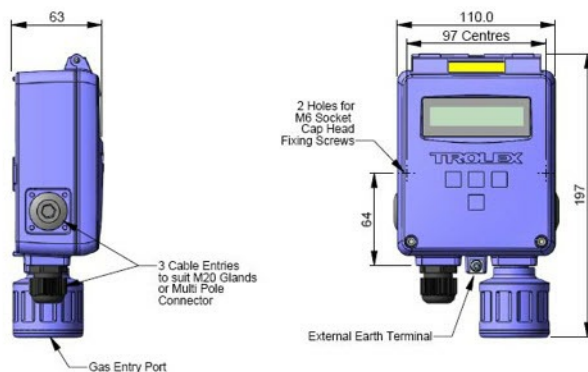
#### COMMANDER DISTRIBUTED I/O SYSTEM

for large scale general plant monitoring systems and the mining and tunnelling industries.

## INSTALLATION & OPERATING DATA

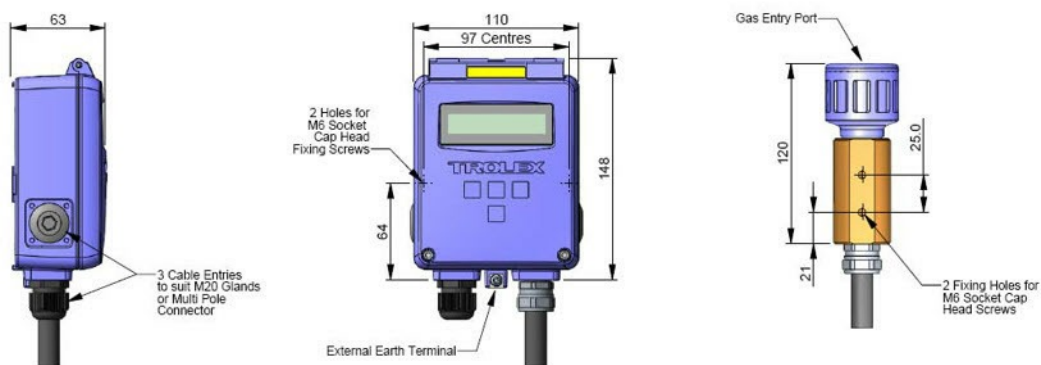
### 3 DIMENSIONS

#### 3.1 STX3241.01 TOXIC GAS SENSOR/TRANSMITTER



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#### 3.2 STX3241.01.84 TOXIC GAS SENSOR/TRANSMITTER with Remote Gas Sensing Module.



## INSTALLATION & OPERATING DATA



### 4 TECHNICAL DETAILS

#### 4.1 Specification

Ambient Temperature Limits:	-10 to +40°C.
Humidity:	15 to 90% non condensing.
Storage Temperature Limits:	-20 to +60°C.
Ambient Pressure Limits:	1 bar ± 100 mbar absolute.
Protection Classification:	Dust & waterproof to IP66. Gas inlet port to IP54.
Housing Material:	Reinforced Polymer - EMC protected and proof against electrostatic charge.
Sensing Principle:	Electrochemical cell.
Cell Operating Life:	>2 years (in clean atmosphere).
Electrical Connections:	4 mm barrier/clamp terminals.
Information Display:	Graphic LCD.
Vibration Limits (BS2011):	10 to 100 Hz, 0.25 mm pk. 100 to 600 Hz, 2 g pk.
Impact Limits:	20 joules (housing).
Nett Weight:	450 g.
Certification:	EEx ia I M1.



#### TOXIC GASES ELECTROCHEMICAL CELLS

			SENSING RANGE	LINEARITY	DRIFT	REPEATABILITY	RESPONSE TIME T63%	OPERATING LIFE*
CO	STX3241.01.250.50	CARBON MONOXIDE	0 to 50 ppm	±2% FS	2% month	±2%	9 secs	>2 years
CO	STX3241.01.250.250	CARBON MONOXIDE	0 to 250 ppm	±2% FS	2% month	±2%	9 secs	>2 years
CO	STX3241.01.250.500	CARBON MONOXIDE	0 to 500 ppm	±2% FS	2% month	±2%	9 secs	>2 years
NO2	STX3241.01.254.20	NITROGEN OXIDE	0 to 20 ppm	±2%	2% month	±2%	15 secs	>2 years
NO	STX3241.01.259.100	NITRIC OXIDE	0 to 100 ppm	±5%	2% month	±2%	9 secs	>2 years
H2S	STX3241.01.251.50	HYDROGEN SULPHIDE	0 to 50 ppm	±2%	2% month	±2%	14 secs	>2 years
H	STX3241.01.261.1000	HYDROGEN	0 to 1000 ppm	±2%	2% month	±2%	14 secs	>2 years
SO2	STX3241.01.252.20	SULPHUR DIOXIDE	0 to 20 ppm	±2%	2% month	±2%	7 secs	>2 years
Cl2	STX3241.01.255.10	CHLORINE	0 to 10 ppm	±2%	2% month	±2%	7 secs	>2 years
O2	STX3241.01.257.25	OXYGEN	0 to 25%	±2%	2% month	±2%	7 secs	>2 years

\*IN CLEAN AIR

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#### 4.2 Electrical Details

##### STX3241.01 GROUP I APPLICATIONS (12 V dc) **Ex**

Output:	0.4 to 2 V dc	
Min Load	10 k ohms	
Supply	6.5 to 14.4 V dc	
Max Supply Current	10 mA (@12 V)	

Output:	4 to 20 mA	
Max Load @12 V	250 ohms @ 12 V	
Supply	6.5 to 14.4 V dc	
Max Supply Current	30 mA (@12 V)	

## INSTALLATION & OPERATING DATA

### 5 INSTALLATION

#### 5.1 Conformity Check

(Refer to Test Certificate provided with the sensor).



Does the output signal of the sensor concur with the input requirement of the monitoring equipment being used?

**12 V dc**

Is the correct supply voltage available for the sensor?

Is the type of gas and its anticipated maximum level of concentration, within the operating parameters of the sensor?



Is the temperature variation range, at the installation, within the stated temperature range of the sensor?



Is the hazardous area classification correct?



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#### STANDARD OPTIONS AVAILABLE



##### STX3241.01 TOXIC GAS SENSOR/ TRANSMITTER

TYPE OF GAS

[Refer to Section 4.1](#)

OUTPUT SIGNAL	0.4 to 2 V	(11)
	4 to 20 mA	(12)



##### STX3241.01.84 TOXIC GAS SENSOR/ TRANSMITTER with Remote Gas Sensing Module.

TYPE OF GAS

[Refer to Section 4.1](#)

OUTPUT SIGNAL	0.4 to 2 V	(11)
	4 to 20 mA	(12)





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## 5 INSTALLATION *continued*

### 5.2 Location

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 Installation and Operating Data to maintain safety, reliability and to preserve Intrinsic 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 when 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.

### 5.3 System Integrity

If a gas monitoring system should fail for any reason, it is important that the system is capable of immediately alerting operational staff to this fact. The sensor will indicate a system failure or mechanical defect and this information can be utilised to initiate a warning alarm. It is good practice to provide emergency facilities to protect against the loss of the mains power supply. Standby batteries can be incorporated with automatic changeover facilities, so guaranteeing continued operation of the sensing system even in the event of a plant breakdown as a result of a power supply failure. Certainly, in critical plants, duplication or triplication of sensors is recommended.

The Trolex TX9042 Programmable Sensor Controller can be programmed to operate with sensors in the multiple voting mode.



### 5.4 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 facilities 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.

## INSTALLATION & OPERATING DATA

### 5 INSTALLATION *continued*

#### 5.5 Relative Density



The relative density or buoyancy of the gas or vapour with respect to air is a very important consideration. This determines its propensity to rise or fall when released into the atmosphere.

Gases or vapours with a buoyancy less than air will tend to rise from the source of release.

Conversely, gases or vapours heavier than air will tend to fall and accumulate in concentrations for long periods of time.

This is a particular problem in pits, trenches, machine rooms, etc. Normal air movements in and around such gas concentrations will have the inevitable effect of producing zones of highly toxic mixtures.

This knowledge of the characteristics of the gas assists when positioning the gas sensor.

The behaviour of the gas accumulation will also be affected by the velocity and location of the gas release and by ambient air movement caused by ventilation systems or draughts.

Pockets of gas can be trapped in trenches or ceiling cavities, all of which adds to the unpredictability of critical gas concentrations.

Hydrogen	LIGHTER THAN AIR
Carbon Monoxide	
Nitric Oxide	HEAVIER THAN AIR
Oxygen	
Sulphur Dioxide	
Chlorine	
Nitrogen Dioxide	

#### 5.6 Hazardous Areas

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

#### 5.7 Evacuation

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

#### 5.8 Operating Life

Electrochemical cells contain an electrolyte that is gradually consumed during use. The average life is about two years, dependent upon the duty cycle. The response should be checked at regular intervals.



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## INSTALLATION & OPERATING DATA

### 5 INSTALLATION *continued*

#### 5.9 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.

#### 5.10 Flammable

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

#### 5.11 Biased Sensors

Some gas sensors must be continuously powered to maintain the calibration. If the gas head is removed from any supply voltage for greater than 10 minutes, it could take 24–48 hours to restore its calibration.



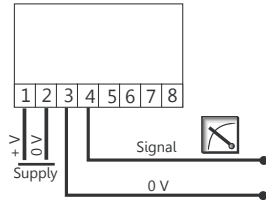
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## INSTALLATION & OPERATING DATA

### 6 CONNECTIONS

#### OUTPUT SIGNAL OPTIONS

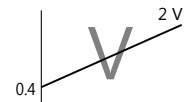


STX3241.01 TOXIC GAS SENSOR/ TRANSMITTER

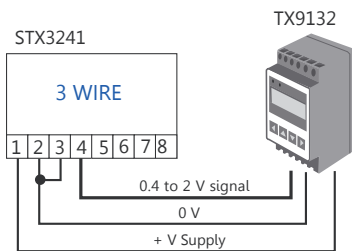


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#### 6.1 0.4 to 2 V Output Signal



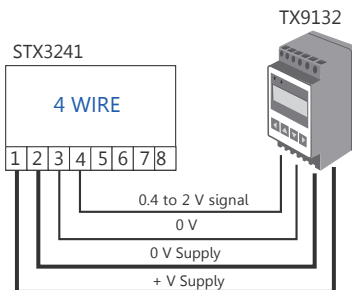
##### 3 WIRE CONNECTION



A low impedance two-wire voltage output signal requiring a separate power supply to the sensor. This can be derived from a Trip Amplifier or Programmable Sensor Controller, when one of those is used as the monitoring instrument.

This connection configuration works well up to about 10 m distance between the sensor and the monitoring equipment.

##### 4 WIRE CONNECTION



Both the signal and the power supply to the sensor are being carried in the common 0 V conductor so at some point – influenced by the length of the cable and the resistance of the cable cores – the current flowing in the 0 V conductor will impose an unacceptable voltage error onto the signal.

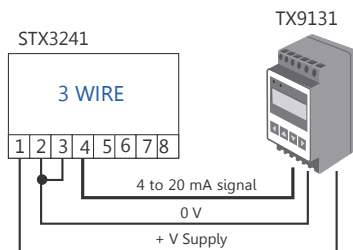
This effect can be reduced on long distance connections by increasing the size of the cable cores, or even better, running a separate 0 V conductor to power the sensor enabling operating distances up to 1000 m.

## INSTALLATION & OPERATING DATA

### 6 CONNECTIONS continued

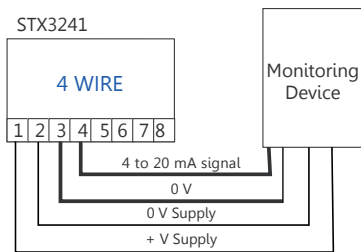
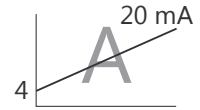


#### 6.2 4 to 20 mA Output Signal



The sensor may be connected the 3 or 4 wire connection mode.

The power supply for the sensor may be sourced from the monitoring equipment (eg. TX9131 Trip Amplifier or a TX9042 Programmable Sensor Controller) or from a separate power supply.



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#### 6.3 Using Gas Sensors in Hazardous Areas

**GROUP I HAZARDOUS AREAS (MINING)**

**STX3241.01 TOXIC GAS SENSOR/ TRANSMITTER**



Both options of the STX3241.01 sensor (0.4 to 2 V, 4 to 20 mA) are certified Intrinsically Safe for use in Group I hazardous areas (Mining) when used with approved equipment – eg. TX9131 Trip Amplifier or a TX9042 Programmable Sensor Controller.

THE COMPLETE SYSTEM, BOTH SENSOR AND MONITORING DEVICE, CAN BE MOUNTED IN THE HAZARDOUS AREA.

The interconnecting cable between the sensor and the monitoring device must have steel wire armoured protection or a braided earth screen.

The cross sectional area of the conductors must be a minimum of 1 mm<sup>2</sup>.

## INSTALLATION & OPERATING DATA

### 7 CONTROLS AND INDICATORS

#### 7.1 STX3241.01 TOXIC GAS SENSOR/ TRANSMITTER



Removeable control module for ease of servicing.

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#### 7.2 STX3241.01.84 TOXIC GAS SENSOR/ TRANSMITTER with REMOTE GAS SENSING MODULE



This version uses the same gas sensing module as the STX3241.01. The module is fitted into a robust metal housing which can be mounted at a remote location where space is constricted or the operating conditions are extremely harsh.



Connections:	2 m, flexible cable in a flexible armoured conduit. (other lengths available to specification. Max 10 m).
Protection Classification:	Dust & waterproof to IP66. Gas inlet port to IP54.
Housing Material:	Brass.

## INSTALLATION & OPERATING DATA

### 8 CALIBRATION

The gas sensing module will gradually change its response characteristics, by a small amount, during normal use. The output signal is standardised so the module can be quickly changed when necessary.

The gas sensing module may be re-calibrated when required, using a Trolex TX6520 Gas Test Kit equipped with both Air and Test Gas canisters.



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#### 8.1 Prepare to Calibrate

The sensor should be powered for a minimum of 30 minute prior to commencing calibration.

Connect the application tube of the gas test kit to the inlet aperture of the gas sensing module using the bayonet fixing gas test hood provided.



#### 8.2 Calibrate Zero

Apply purge air, at a flow rate of 0.3 to 1.0 l/min.

Allow the display reading to stabilise.

If necessary, adjust the ZERO potentiometer until display reads 0.00.

Remove the purge air.



#### 8.3 Calibrate Span

Apply calibration gas, at a flow rate of 0.3 to 1.0 l/min.

Allow the reading to stabilise.

Adjust the SPAN potentiometer until display reads the same value as calibration gas being used.

Remove the SPAN gas.



The test gas used must be a minimum concentration of 25% of the full scale measuring value of the sensor.

## INSTALLATION & OPERATING DATA

### 9 MAINTENANCE

It is good safety practice to carry out regular preventative maintenance to confirm correct operation.

#### 9.1 Output Signal

Check the response of the sensor at pre-determined intervals by injecting a test gas using a Trolex TX6520.32 Gas Test Kit.

Compare the value of the display with the value marked on the test gas canister.



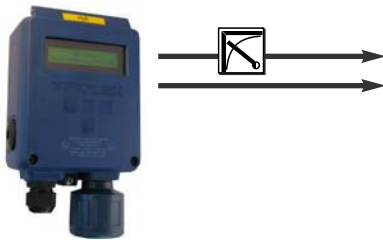
**STX3241.01.12**  
Measure Current: 4 to 20 mA

Insert an approved test meter into the signal line and compare the value of the display with the measured value.

Change the gas sensing module if necessary.

Recalibrate if necessary.

**Refer to Section 8**



**STX3241.01.11**  
Measure Voltage: 0.4 to 2 V

#### 9.2 Annual Safety Check

The main transmitter itself will not normally require maintenance or calibration but it is advisable to return it to the Trolex Product Support Department for an annual safety check.

#### 9.3 Damaged Sensors

A Sensor that has been dropped or damaged in any way should be taken out of service immediately for inspection, repair and re-calibration.

#### 9.4 Record Keeping

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

Incorrect use of the Sensor or inadequate maintenance may not necessarily be self evident in the Sensor and consequently it must be regularly checked and maintained.



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## INSTALLATION & OPERATING DATA



### 10 APPROVALS AND CERTIFICATION

#### 10.1 Intrinsically Safe

##### 10.1.1 ATEX



The instrument is certified Intrinsically Safe Group I apparatus for use in potentially explosive atmospheres when used with an approved power supply or safety barriers.

The sensor is designed to comply with the ATEX directive (94/9/EC).

**STX3241.01**  
**TOXIC GAS SENSOR/TRANSMITTER**

**GROUP I:** I M1  
Ex ia I Ma  
Sira 07ATEX2170  
(Ta = -20 to +55°C)

##### 10.1.2 ANZEx

The instrument is certified Intrinsically Safe Group I apparatus for use in potentially explosive atmospheres when used with an approved power supply or safety barriers.

ANZEx

**STX3241.01.11 and STX3241.01.12**  
**TOXIC GAS SENSOR/TRANSMITTER**

**GROUP I:** Ex ia I Ma  
ANZEx 08.3038X  
(Ta = +55°C)

##### 10.1.3 MASC

The instrument is certified Intrinsically Safe Group I apparatus for use in potentially explosive atmospheres when used with an approved power supply or safety barriers.



**STX3241.01**  
**TOXIC GAS SENSOR/TRANSMITTER**

**GROUP I:** Ex ia I Ma  
MASC M/11-360X  
(Ta = -20 to +55°C)

#### 10.2 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](http://www.trolex.com).

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