

OPERATING DATA



ATEX



TUNNELS

MINING

TRENCHES

VESSELS

CONTAINERS

PROCESS PLANTS

STORAGE AREAS

CONFINED AREAS



contents...

	page
1 PRINCIPAL OPERATING FEATURES	2
2 TECHNICAL DETAILS	3
3 CONFORMITY CHECK	4
4 BATTERY CHARGING	5
5 CONTROLS AND INDICATORS	6
6 OPERATION	7
7 SETTING UP	9
8 CHECKING THE RESPONSE	15
9 MAINTENANCE	16
10 PRECAUTIONS	18
11 ACCESSORIES	20
12 APPROVALS AND CERTIFICATION	21

OPERATING DATA

1 PRINCIPAL OPERATING FEATURES



A compact, handheld instrument for continuous monitoring of dangerous gas concentrations.

Safety protection for personnel working in potentially hazardous atmospheres.



Spot checking for dangerous flammable and toxic gas accumulations.

•Single or dual gas sensing capability.

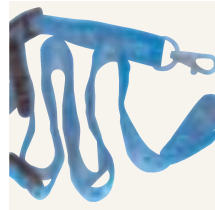
Single: Methane, Carbon Monoxide, Hydrogen Sulphide or Oxygen.

Dual: Methane + Carbon Monoxide
 Methane + Hydrogen Sulphide
 Methane + Oxygen



•High accuracy poison resistant pellistor sensor for flammable gases.
 Fast response electrochemical sensor for toxic gases and oxygen.

•Robust impact resistant moulded housing.
 Proof against dust and water spray.



•Lightweight compact size – easy to carry, with belt clip or neck strap.

•High capacity polymer rechargeable battery.
 Up to 100 hours operate time (with electrochemical sensor).



•LCD readout of gas concentration with battery charge condition and alarm indication. Automatic display illumination.

•Two individually identified alarm warning levels for each gas type with audible and visual indicators. Low battery warning.

•Single push button for ON/OFF, alarm mute, gas display selection and auto zero.

•Vibration alert for use in noisy environments.

•Confidence tone at 15 second intervals to confirm the operation of the instrument.

•Programmable alarm setpoint values and zero/span calibration, all security protected.

•Certified intrinsically safe for use in Group I and Group II hazardous areas.

OPERATING DATA

2 TECHNICAL DETAILS

PERFORMANCE DATA

Temperature	-10°C...50°C										
Storage Temperature	-20°C...60°C										
Humidity	0...95% RH (non condensing)										
Pressure	700mbar...1300mbar										
Housing Material	Glass fibre and stainless steel reinforced nylon 66										
Protection Classification	IP64										
Nett Weight	155gms										
Dimensions	115 x 52 x 26mm										
Battery	Sealed lithium rechargeable										
Battery Operating Life	18 hours with pellistor sensor 18 hours with pellistor + electrochemical sensor 100 hours with electrochemical sensor										
Battery Charge Time	5 hours nominal (can be left on charge indefinitely)										
Display	3 digit LCD readout of gas concentration with gas type, alarm status and battery condition. Display illuminated for 10 seconds when the control button is operated.										
Alarms	<ul style="list-style-type: none"> Flashing LED indicator and high output audible alarm for 1st level and 2nd level alarms. (Deficiency and Enrichment levels for oxygen). Low battery warning (followed by auto shutdown). Confidence tone at 15 second intervals. Vibration alert for use in areas of high ambient noise. 										
Control	Sealed push button: <ul style="list-style-type: none"> ON/OFF (the OFF function can be disabled for Continuous Mode operation). Mute alarm. Gas display selection. Auto zero function. 										
Setup	Setup programming and status display. Security protected – setup only possible when the instrument is installed into the setup charger. <ul style="list-style-type: none"> Calibrate zero. Calibrate span. Alarm set points. Annual safety check due. 										
Gas Sensor Options	<table border="1"> <thead> <tr> <th>SINGLE</th> <th>DUAL</th> </tr> </thead> <tbody> <tr> <td>Methane (%LEL or %v/v)</td> <td>Methane + Carbon Monoxide</td> </tr> <tr> <td>Carbon Monoxide</td> <td>Methane + Hydrogen Sulphide</td> </tr> <tr> <td>Hydrogen Sulphide</td> <td>Methane + Oxygen</td> </tr> <tr> <td>Oxygen</td> <td></td> </tr> </tbody> </table>	SINGLE	DUAL	Methane (%LEL or %v/v)	Methane + Carbon Monoxide	Carbon Monoxide	Methane + Hydrogen Sulphide	Hydrogen Sulphide	Methane + Oxygen	Oxygen	
SINGLE	DUAL										
Methane (%LEL or %v/v)	Methane + Carbon Monoxide										
Carbon Monoxide	Methane + Hydrogen Sulphide										
Hydrogen Sulphide	Methane + Oxygen										
Oxygen											



GAS SENSORS	FLAMMABLE	TOXIC		
Type of Gas	CH ₄ Methane (.240)	CO Carbon Monoxide (.250)	H ₂ S Hydrogen Sulphide (.251)	O ₂ Oxygen (.257)
Type of Sensor	Micro pellistor	Electrochemical	Electrochemical	Electrochemical
Measuring Range	* 0...100% LEL (0...5% v/v)	0...500 ppm	0...100 ppm	0...25% (20.7% nominal)
Linearity	±2%	±2%	±2%	±5%
Drift	±2% /month	±2% /month	±2% /month	10% /year
Repeatability	±2% LEL	±2%	±2%	±2%
Response Time (T50%)	<10 seconds	<10 seconds	<15 seconds	<5 seconds
Operating Life	2...5 years	2 years	2 years	1 year
Alarm 1 Default Set Point	*25% LEL (1.25% v/v)	30 ppm	10 ppm	OVER 22%
Alarm 2 Default Set Point	* 40% LEL (2% v/v)	200 ppm	15 ppm	UNDER 17%

* Some versions will be supplied calibrated to 0...5% v/v and display data will vary accordingly.



ATEX



OPERATING DATA

3 CONFORMITY CHECK



- Are the correct gas sensor types indicated?
- Check that the units of gas measurement are correct: % LEL or % v/v.



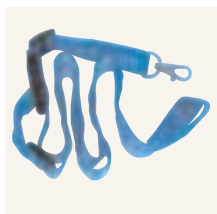
- Is the hazardous area classification of the instrument correct for the application?

PACKING CHECKLIST

CHERUB



TX6531 CHERUB



TX6591 STRAP



QUICK START GUIDE



TX6593 CHERUB KIT



TX6538
 SETUP CHARGER



TX6537
 ac/dc



TX6592
 GAS TEST HOOD



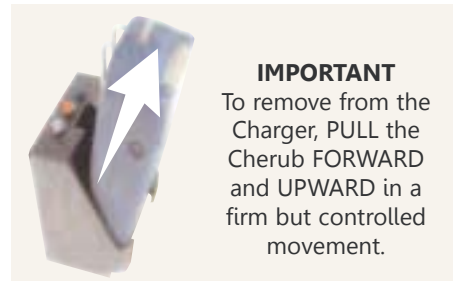
MAIL PACK FOR
 FREE CHERUB
 'HEALTH CHECK'
 RETURN

OPERATING DATA

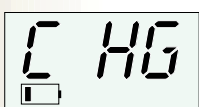
4 BATTERY CHARGING



Battery charging using a TX6538 or TX6539 CHARGER and a TX6537 ac/dc ADAPTOR.



IMPORTANT
To remove from the Charger, PULL the Cherub FORWARD and UPWARD in a firm but controlled movement.



- Cherub will automatically switch to the charging state when it is inserted into the charger. Make sure that it is pushed fully home into the bottom of the charger.



An annual safety check reminder will appear, if appropriate, when the instrument is in the charger (Section 9.2).

BATTERY CARE

- Once charging is complete the display will indicate *r d4* until it is removed from the charger.
 - The battery will be in an indeterminate state of charge when the instrument is delivered and should be immediately put on charge. Allow at least 12 hours for the initial charge.
 - A new battery will not reach its full potential capacity until several charge/discharge cycles have been completed.
 - Keep the battery charged and store the instrument in a cool environment.
 - The battery must only be recharged using the recommended Trolex charger and ac/dc adaptor combination.
 - The battery will continue to provide its nominal capacity for at least 500 charge/discharge cycles. Discharge completely before disposal.
- DO NOT CHARGE THE BATTERY IN A HAZARDOUS AREA.

- Remember also that a charged battery will gradually lose its stored energy, even when not used, and should be recharged at regular intervals.

LOW BATTERY

- Low battery warning (followed by auto shutdown after 20 minutes).

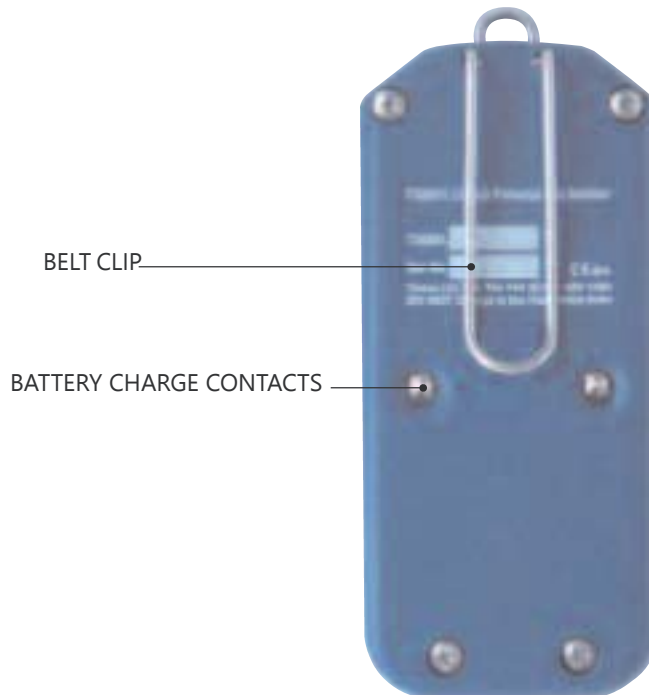
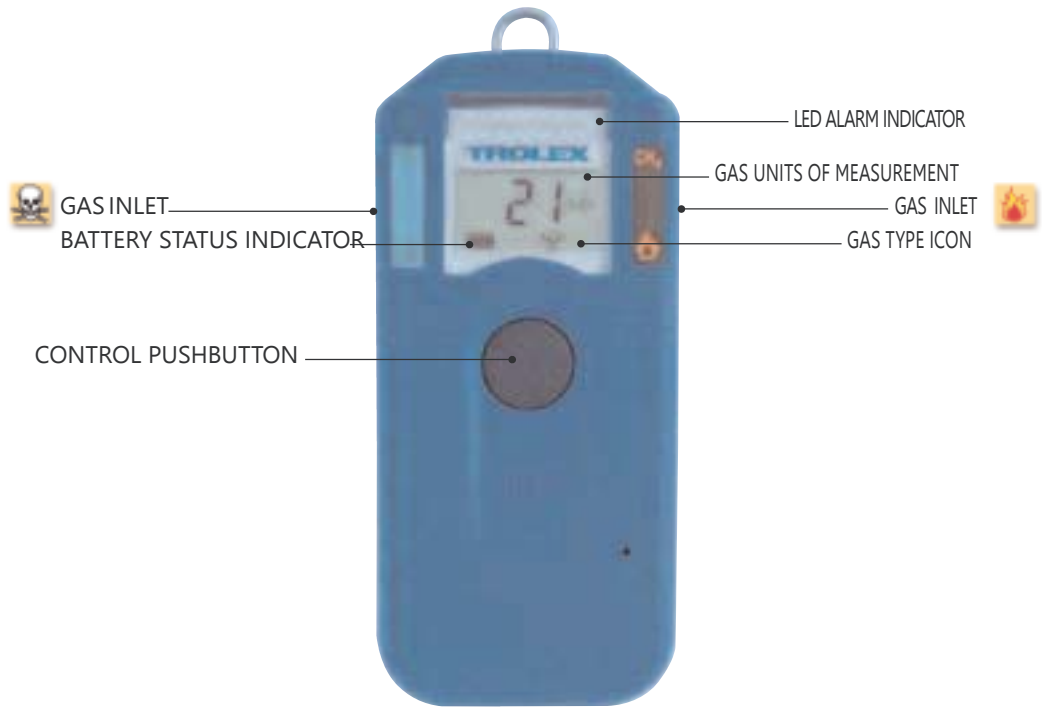


REMOVAL

- When Cherub is removed from a TX6539 or TX6538 Battery Charger, after a NORMAL charge cycle, it will first execute a ZERO IN CLEAN AIR function on both gas sensors (Section 6.4). When the ZERO IN CLEAN AIR function is complete, it will immediately switch to the normal gas monitoring mode (Section 6.2).

OPERATING DATA

5 CONTROLS AND INDICATORS

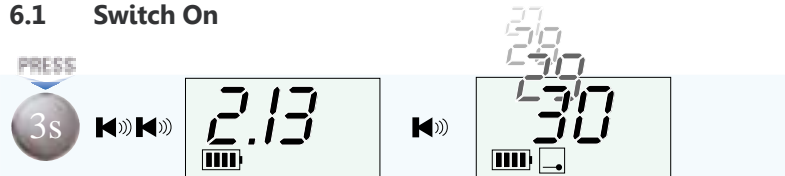


OPERATING DATA

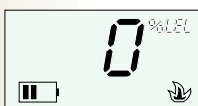
6 OPERATION



6.1 Switch On



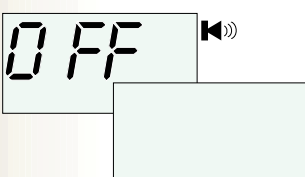
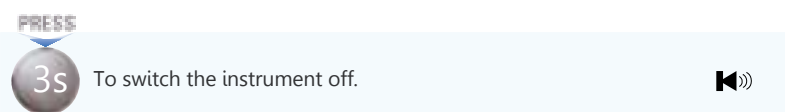
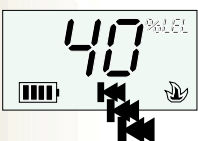
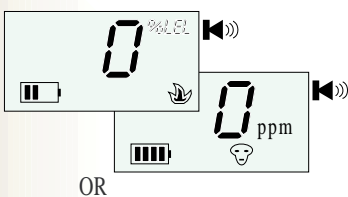
CHECK POINT A COUNTDOWN period of 30 seconds duration will occur where a gas sensing element (CH₄) is fitted. This will permit the sensing element to reach thermal stability before normal measurement commences.



6.2 Measuring the Gas Concentration

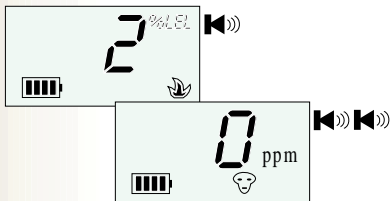
PRESS
 Select which gas is to be displayed. (On a Dual Gas Cherub).
 Flammable OR Toxic

CHECK POINT A gas concentration that has exceeded an alarm setpoint will automatically take display priority (Section 7.3 and 7.4).



OPERATING DATA

6 OPERATION continued



6.3 Setpoint Function



When *any* alarm setpoint is actuated it will *latch on*lt can be reset by the pushbutton when the gas has receded below the ALARM 1 setpoint level.

6.4 Zero in Clean Air



Each time the instrument is removed from a TX6538 or TX6539 charger after a NORMAL charging cycle, the instrument will prompt **GO** to Zero in Clean Air (or 20.7% v/v if an oxygen sensor is fitted).



A COUNTDOWN period of 30 seconds duration will occur where a flammable gas sensing element is fitted. This will permit the sensing element to reach thermal stability before proceeding to Zero in Clean Air.

The instrument is now ready to **GO** to Zero in Clean Air (or 20.7% v/v if an oxygen sensor is fitted).



To ZERO IN CLEAN AIR (both gas sensors).



The instrument can now be SWITCHED OFF ready for normal use (Section 6.1).



The SWITCH OFF will NOT function if the instrument is set into CONTINUOUS mode (Section 7.6).



For safety reasons the amount of ZERO IN CLEAR AIR offset correction that may be automatically applied is limited to about 10% of the measuring scale. After this point the measuring function of the instrument will be inhibited; a recommendation for fundamental calibration and return for service, will be displayed.

6.5 Flammable Gas Overrange

If the flammable gas detected exceeds a prescribed OVERRANGE value: (CH₄ Methane: 100% LEL) the alarm will *latch on*and cannot be reset until the instrument is returned to the Charger.

6.6 Underrange

An UNDERRANGE signal (usually the result of a sensor fault) will be triggered at a display value of -0.1% of the scale reading. The measuring function of the instrument will be inhibited until the fault is cleared.

OPERATING DATA

7 SETTING UP



The basic SETUP functions can be individually programmed for each gas sensor fitted, when the instrument is in the Setup Charger TX6538 and the power to the charger is ON.

- 7.1 Zero
- 7.2 Span
- 7.3 Alarm 1
- 7.4 Alarm 2



These functions can ONLY be adjusted when the instrument is inserted into the Setup Charger TX6538 and the power to the charger is on.



Plug the instrument into the Setup Charger. The battery will be charged in the normal way (Section 4).

PRESS



To enter the SETUP sequence.



A TWIN Gas instrument will first present a choice of two menu PATHWAYS; one for each type of gas sensor fitted.

PRESS



OR to TRANSFER the choice of gas sensor.



PRESS



To CONFIRM the choice of gas sensor.



A COUNTDOWN period of 30 seconds duration will occur where a flammable gas sensor is about to be calibrated. This will permit the sensor to reach thermal stability before proceeding to SETUP.

The instrument is now ready to GO to a fixed sequential SETUP routine.



The first step in the SETUP sequence will be SET ZERO. **Do not proceed unless the surrounding atmosphere is CLEAR of the subject gas.**



PRESS



ADVANCE RIGHT through the menu sequence



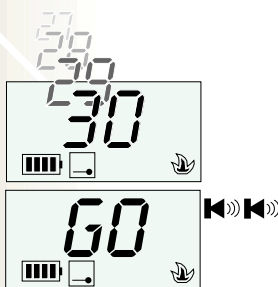
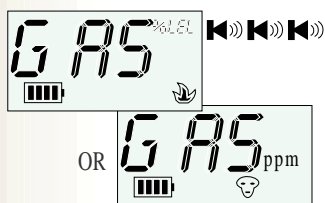
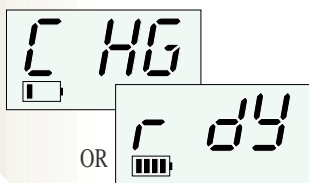
SCROLL UP at each step in the menu sequence.



SCROLL DOWN at each step in the menu sequence.



STEP BACK (Press & hold to clear).



OPERATING DATA

7 SETTING UP continued



7.1 Zero

- Connect the application tube of a Trolex TX6520.32 Gas Test Kit to the appropriate inlet port of the Test Gas Hood and fit the hood onto the instrument.
- Apply purge air at a flow rate of about 1 l/min for a few seconds to clear any remnants of gas.

Wait until the display reading settles to its LOWEST value near to, or at, ZERO. Keep the purge air ON.



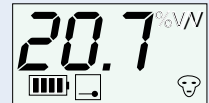
To SET ZERO.

The display will automatically advance to SPAN (Section 7.2).



O₂

If it is an OXYGEN sensor that is being calibrated, the display will SET to 20.7% v/v.

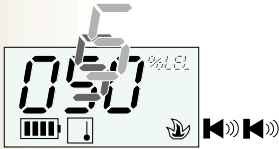


- Remove the purge air supply.

OPERATING DATA

7 SETTING UP continued

7.2 Span 



PRESS



To TRAVERSE the flashing digit.



PRESS



OR



To SCROLL the digits until the display value concurs with the value of gas concentration marked on the test gas canister. This sets the TARGET for SPAN calibration.

Typical START default values:

- >50% LEL (2.5% v/v) for CH₄
- 250ppm for CO
- 25ppm for H₂S
- 0.0% v/v for O₂



O₂

If it is an OXYGEN sensor that is being calibrated, the display will automatically set the TARGET value to 00.0.

PRESS



To CONFIRM test gas value (TARGET).



The display reading now reverts to ZERO waiting for test gas to be applied.



O₂

If it is an OXYGEN sensor that is fitted, the display will now revert to 20.7 waiting for the test gas to be applied



Apply test gas at a flow rate of about 1 l/min. The display reading will start to increase as the gas enters the sensor.

This is not yet a true value of gas concentration, just an indication the rising response of the sensor to the gas being applied.



O₂

If it is an OXYGEN sensor that is fitted, then NITROGEN test gas must be used to expel all the OXYGEN from the sensing element.

This will drive the display towards 00.0 if it is not already there.

OPERATING DATA

7 SETTING UP *continued*



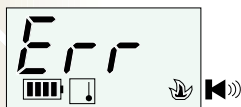
To ALIGN the rising display reading to the TARGET value.
 Keep repeating this alignment function until the display reading stabilises at the TARGET value, denoting that the sensor has reached response equilibrium.



To CONFIRM SPAN
 The display will automatically advance to ALARM 1 (Section 7.3).



Remove the gas supply.



If insufficient gas has been applied for correct SPAN calibration, the display will briefly show **Err**, then automatically revert to SPAN calibration (Section 7.2). No data will be changed.

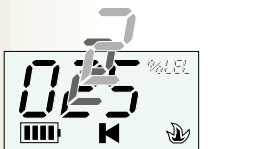
7.3 Alarm

1.7.4 Alarm



- The alarm setpoints have been preset to comply with COSHH recommendations and should not be changed without consultation with the relevant safety authority or Safety Officer.
- Where an OXYGEN sensor is fitted, the alarm setpoints will be preset to occur:

OVER 22% v/v:	Oxygen ENRICHMENT
UNDER 17% v/v:	Oxygen DEFICIENCY



To TRAVERSE the flashing digit.



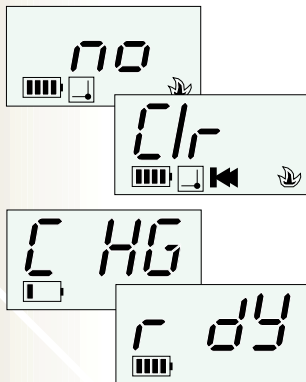
To SCROLL the digits to the required setpoint value.



To CONFIRM ALARM 1.
 The display will automatically advance to ALARM 2 (Section 7.4).

OPERATING DATA

7 SETTING UP *continued*



7.5 Confirm the Setup



To CONFIRM the values of ZERO, SPAN, ALARM 1 and ALARM 2 just programmed.



To VERIFY.
 The display will briefly show *YES* then return to the Charge display (Section 7).



REMOVAL

Cherub will NOT set to ZERO when it is removed from the charger, having just completed a SETUP sequence. It will immediately switch to the normal gas monitoring mode.

To QUIT the Setup.



PRESS



The display will briefly show *no* then *Clr*

All data entered will be CLEARED and the display will return to the CHARGE display (Section 7).

OPERATING DATA

7 SETTING UP continued



7.6 To change the Operating Mode

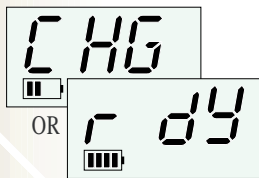
There is a choice of two selectable operating modes:

SPOT MODE:

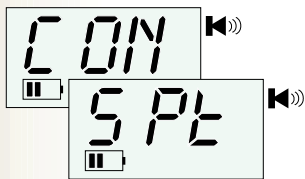
The instrument can be switched ON or OFF as needed using the main pushbutton (Section 6).



CONTINUOUS MODE:

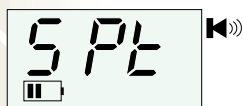
It will not be possible to switch the instrument OFF and it will operate continuously until the battery is exhausted.




Insert the instrument into the Setup Charger.
 (Do NOT enter the setup sequence (Section 7).



PRESS

 OR To TRANSFER the Mode.




PRESS
 To CONFIRM the choice of Mode.



Auto Return to CHARGE Mode.

OPERATING DATA

8 CHECKING THE RESPONSE



Gas sensing cells react positively to the presence of the subject gas.

Consequently, failure of the cell to function correctly is not always made self-evident when gas is present.

Check the response of the instrument immediately prior to use, using a calibrated test gas to ensure correct response and accuracy.



ATEX



CHECK SPAN

- Fit the Test Gas Hood and check the SPAN value using the appropriate test gas at a flow rate of 1 l/min. Compare the reading on the display with the value marked on the test gas canister.
- Ensure that Health and Safety guidelines are followed when handling toxic gases.
- The ambient temperature should be between 20°C and 30°C during the checking procedure.
- Ensure the correct operation of the Alarm 1 and Alarm 2.
- Institute a formal checking and maintenance plan (Section 9).
- Operate a Maintenance and Calibration Log (Section 9).

OPERATING DATA

9 MAINTENANCE



9.1 Service and Calibration

The instrument should be calibrated in compliance with appropriate statutory requirements, or at least every 6 months, to ensure accurate response.

Re-calibrate the instrument if necessary (Section 7).

Contact our Product Support Department (or your local Distributor) for service and calibration.

Carry out additional gas response tests if the instrument has been exposed to detrimental substances and contaminants or excessively high gas concentrations. (Section 10).

9.2 Annual Safety Check

The instrument is crucial to personal safety and it is recommended that it be returned to our Product Support Department (or to your local Distributor) for an annual safety check. (Section 4).

Itemised details of this safety check can be supplied on request.

9.3 Battery

Periodically examine the charge condition icon of the battery and recharge if necessary. (Section 4).



Do NOT clean the battery charge contacts with abrasive or corrosive materials.

9.4 Damaged Instrument

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

9.5 Record Keeping

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

Please contact our Product Support Department (or your local Distributor) for help in installing proper maintenance procedures.

The Maintenance and Calibration Log on page 17 gives an example of a typical recording system.



Incorrect use or inadequate maintenance may not necessarily be self-evident in the instrument and consequently, it must be regularly checked and serviced.

OPERATING DATA



10 PRECAUTIONS

10.1 Operating Safety

The instrument must be operated in accordance with the Operating Data to maintain safety, reliability and to preserve the intrinsic safety integrity.

Gas monitoring procedures should always be carried out in accordance with the regulations of Safety Authorities and in compliance with any mandatory local safety regulations.

10.2 Hazardous Areas

Do NOT dismantle the instrument whilst in a hazardous area.

Do NOT use an instrument that has a damaged housing in a hazardous area.

10.3 Evacuation

If the instrument alarm initiates due to dangerous levels of gas concentration, leave the area immediately.

10.4 Battery Charging

Recharging of the battery must only be carried out using the Trolex Charger supplied with the instrument.

10.5 Flammable Gas Sensors

- It is good safety practice to perform a sensitivity test of the instrument before each day's use with a known concentration of methane of between 25% and 50% LEL (1.25 and 2.5% v/v). Accuracy must be within 10% of actual reading (Section 8).
If not, the instrument should be re-calibrated.
- 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 concentration up to the Lower Explosive Limit (LEL).
After this point, the output of the sensor becomes non linear and may erroneously indicate that the gas concentration is below the explosive limit.
They should not be used in oxygen enriched atmospheres and conversely, severe oxygen deficiency will affect the sensitivity of the sensor.
- Catalytic combustion gas 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.
If the atmosphere to be monitored contains gas that dilutes or displaces the air, this may reduce the response of the catalytic sensor. Similarly, steam laden atmospheres and condensation can reduce the sensitivity.
- The response of the catalytic combustion sensors can be affected by airborne contaminants which will reduce the sensitivity. Substances such as silicones, tetraethyl lead, sulphur compounds and phosphate can cause permanent degradation and halogenated carbons may cause temporary inhibition.
- Exposure to high concentrations of flammable gas greater than the LEL can affect the sensitivity of catalytic combustion sensors and the calibration should be checked after such exposure.
- Be aware that most flammable gases and vapours are also toxic at low percentages of LEL.

OPERATING DATA

10 PRECAUTIONS *continued*

10.6 Toxic Gas Sensors

- It is good safety practice to perform a sensitivity test of the instrument before each day's use with a known test concentration of the subject gas.
 Re-calibrate if necessary.
- Electrochemical gas sensors 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.
- Electrochemical gas sensors 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 sensitivity.
- Be aware that some toxic gases are also 'flammable' at high percentage concentrations.

10.7 Servicing and Repair

The instrument is certified Intrinsically Safe and must be serviced and repaired by Trolex or a service agent approved by Trolex in order to preserve the Intrinsically Safe 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.

10.8 Disposal

Exhausted batteries and some gas sensor cells contain mildly corrosive substances and must be disposed of in the correct manner. Make sure that the battery is completely discharged before disposal.

10.9 Contamination

The instrument is sealed against the ingress of dust and water splashes.

It will even tolerate temporary immersion in water but should be removed as quickly as possible to avoid contamination of the gas sensing ports.

Ensure that the ports are completely dry and free of contamination before further use.



OPERATING DATA

11 ACCESSORIES



TX6537 ac/dc ADAPTOR

For use with a TX6538 SETUP CHARGER and a TX6539 STANDARD CHARGER

- UK. 100...240V ac 50/60 Hz (.11)
- EU. 100...240V ac 50/60 Hz (.12)
- NA.100...240V ac 50/60 Hz (.14)



TX6538 SETUP CHARGER

Fitted with pushbuttons for SETUP function.

Use with a TX6537 ac/dc ADAPTOR.



TX6539 STANDARD CHARGER

CHARGER.

Use with a TX6537 ac/dc ADAPTOR.



TX6520.32 PORTABLE GAS TEST KIT



TX6592 GAS TEST HOOD

OPERATING DATA

12 APPROVALS AND CERTIFICATION

12.1 Certification



ATEX

EURONORM

The instrument is certified Intrinsically Safe Group I and Group II, for use in potentially explosive atmosphere to EURONORM standards.

The instrument is designed to comply with the ATEX directive (94/9/EEC).

GROUP II **II 2 G Ex ia d IIB T3** (Tamb = -20°C...+44°C)
SIRA 06ATEX2065

GROUP I **I M1 Ex ia d I** (Tamb = -20°C...+44°C)
SIRA 06ATEX2065



ATEX



12.2 Electro Magnetic Compatibility and Performance Approval

The instrument has been designed and tested to comply with the following performance standards:

BS EN61779 Parts 1 and 2: (2000)

EN50270: 2006

EN50271: 2001

FTZU 08ATEX0335X



IA CERTIFICATE: SAEx M/03-005 X
Ex ia I +H2



PENDING

TROLEX LIMITED

NEWBY ROAD, HAZEL GROVE, STOCKPORT,
 CHESHIRE SK7 5DY, UK

T: +44 (0)161 483 1435

E: sales@trolex.com

W: trolex.com