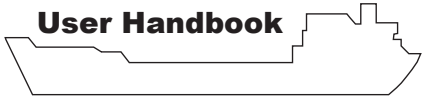
Gas Measurement Instruments Ltd

User Handbook



SHIPSURVEYOR

Issue 8

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LIABILITY

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MODIFICATION NOTICES

GMI aim to notify customers of relevant changes in the product operation and maintain this manual up to date. In view of the policy of continuous product improvement there may be operational differences between the latest product and this manual.

This Handbook is an important part of the **SHIPSURVEYOR** product. Please note the following points:

- It should be kept with the instrument for the life of the product.
- Amendments should be attached.
- This Handbook should be passed on to any subsequent owner / user of the instrument.
- Although every care is taken in the preparation of this Handbook, it does not constitute a specification for the instrument.

SOFTWARE

Software supplied on EPROM or similar device for use in a particular product, may only be used in that product and may not be copied without the written permission of GMI. Reproduction or disassembly of such embodied programmes or algorithms is prohibited. Ownership of such software is not transferable and GMI does not warrant that the operation of the software will be error free or that the software will meet the customer's requirements.

DISPOSAL ADVICE
When no longer in use, dispose of the instrument carefully and with respect for the environment. GMI will dispose of the instrument without charge if returned to the factory.

SAFETY

- The instrument must be regularly serviced and calibrated by fully trained personnel in a safe area.
- **Batteries:** Alkaline or *Rechargeable batteries must be exchanged (*and recharged) in a safe area and fitted correctly before use.

  Never use damaged batteries or expose to extreme heat. See Chapter 5 : OPERATOR MAINTENANCE.
- Only GMI replacement parts should be used.
- If the instrument detects gas, follow your own organisation's procedures and operational guidelines.
- Shipsurveyor instruments are certified as

  ATEX Ex II 2 G Exd ia IIB T3 Gb (-20ºC ≤ Tamb ≤ 50ºC).

  IEC Ex d ia IIB T3 (-20ºC < Ta < +50ºC)
- This equipment conforms to standard EN 50104.
- This equipment is also designed and manufactured to comply with MED Directive CE 0038/YY (Module B&E). Further detail of the Marine Equipment Directive, is located on the MED declaration of conformity, supplied with the instrument.

Any right of claim relating to product liability or consequential damage to any third party against GMI is removed if the warnings are not observed.

WARNING: To prevent ignition of flammable or combustible atmospheres, remove batteries before servicing.

WARNING: To prevent ignition of flammable or combustible atmospheres, read, understand and adhere to the manufacturer's live maintenance procedures.

WARNING: To reduce the risk of ignition of a flammable or explosive atmosphere, batteries must be changed only in a location known to be non-hazardous.

WARNING: To reduce the risk of explosion, do not mix old batteries with used batteries or mix batteries from different manufacturers.

WARNING: Never attempt to recharge non rechargeable cells.

CAUTION: Not for use in oxygen enriched atmospheres.

CAUTION: Replace instrument batteries only with approved batteries, as follows:

ATEX APPROVED INSTRUMENTS:

Alkaline (LR20 'D' size)**:** Duracell Procell; Duracell Industrial; Duracell Plus; Energizer Ultra; Energizer Industrial.

Rechargeable (LR20 'D' size)**:** Uniross 2600mAh NiMH.

AREAS OF USE

Do not use instrument in potentially hazardous atmospheres containing greater than 21% Oxygen. The enclosure material is polypropylene and must not be exposed to environments which are liable to result in mechanical or thermal degradation or to damage caused by contact with aggressive substances. Additional protection may be required in environments where the instrument enclosure is liable to damage.

STORAGE, HANDLING AND TRANSIT

Rechargeable batteries contain considerable energy and care should be taken in their handling and disposal. Batteries should be removed if the instrument is stored for longer than 3 months. The instrument is designed to handle harsh environments and is IP54 rated. If not subjected to misuse or malicious damage, the instrument will provide many years of reliable service. The instrument contains electrochemical sensors with a life of 2 years. Under conditions of prolonged storage the sensors should be removed. The sensor contains potentially corrosive liquid and care should be taken when handling or disposing of the sensor, particularly when a leak is suspected.

WARRANTY

The **SHIPSURVEYOR** instrument has a warranty against faulty goods or workmanship of 2 years. Consumable and Mechanical parts are not included in this. These are covered under GMI standard warranty conditions. For details, please contact GMI Ltd (UK).

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INDEX I

INTRODUCTION

The GMI - SHIPSURVEYOR instrument is a single instrument solution for all your safety monitoring and inerting applications.

This extremely versatile instrument complies with international marine regulations for Confined Space Monitoring, Inerting, Pre-entry Testing, Tank Cleaning and many other marine applications.

Fig. 1-1 Shipsurveyor Instrument

As a minimum, the instrument provides measurement of Lower Explosive Level (LEL) and Volume flammable gas for Shipping Industry surveying and leak detection. Other gas ranges are available, as detailed in Chapter 2 of this handbook.

The SHIPSURVEYOR has a variety of user configurable options. This handbook details the default configuration, with possible options detailed in *italic* text.

The instrument is supplied in a sturdy carrying case that is able to accommodate a selection of accessories.

For a comprehensive list of accessories that are supplied in the carrying case and additional accessories available, refer to Chapter 7 ' ACCESSORIES'.

The main features of the **SHIPSURVEYOR** are:

- A gas detection instrument that is simple to operate with easy maintenance procedures.
- Two button operation allowing the user access to all features.
- Two operating modes: Confined Space Monitor (CSM) mode and Combustible Gas Indicator (CGI) mode.
- LCD with backlighting which displays the current gas readings together with operational and status information.
- Clear battery life indication.
- Audible and Visual alarms enabled in CSM mode only. Alarm levels are pre-set and an optional periodic confidence signal is emitted. The audible and visual confidence signals will provide assurance that the instrument is sensing for gas without the need for the operator to constantly view the display. The signals, which consist of an audible 'beep' and a visual pulse of the LED approximately every eight seconds, are active in CSM mode.
- Manual and automatic datalogging is available in CSM mode.
  Manual datalogging is available in CGI mode.

- Rugged polypropylene case, sealed to IP54 rating and suitable for outdoor use.
- Directly interfaces with GMI Auto Calibration Unit.

During normal operation, the top and / or bottom line of the instrument display indicates button press options.

If the option is not highlighted, **a single press** of the adjacent button selects that option.

If the option is highlighted, **a press and hold** of the adjacent button selects that option.

An audible 'beep' will be heard for a single button press, and two 'beeps' will be heard for a press and hold, of either buttons.

Fig. 1-2 illustrates a typical CSM mode LEL display for a Shipsurveyor 1.
Note: A configurable option allows the instrument to display this range type as LFL (Lower Flammable Limit).

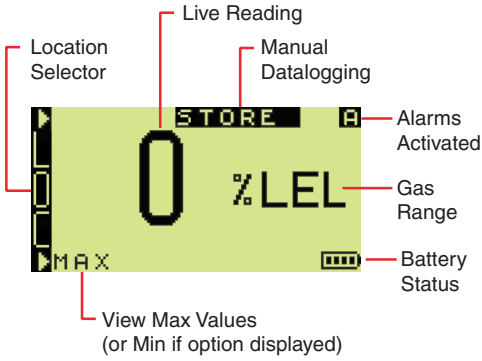


Fig. 1-2 CSM Button Press Options

Fig. 1-3 illustrates a typical CGI mode LEL display for a Shipsurveyor 1.

Note: A configurable option allows the instrument to display this range type as LFL (Lower Flammable Limit).

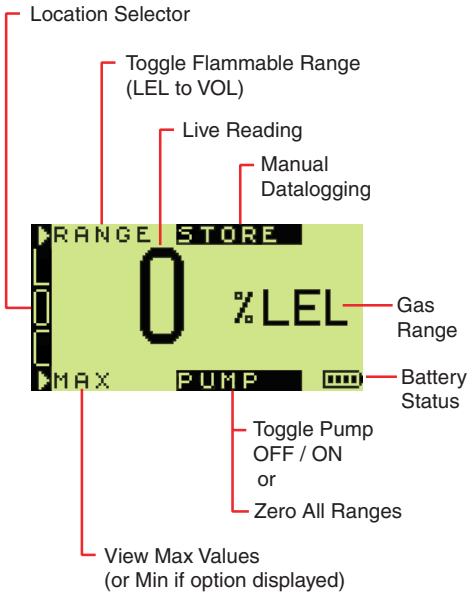


Fig. 1-3 CGI Button Press Options

Note: Figs. 1-2 and 1-3 illustrate instrument displays with datalogging enabled (including LOC panel and STORE option). If instrument LOC selector is disabled, the display does not show the LOC panel.

2

GENERAL INFORMATION

2.1 Instrument Models / Ranges

There are eight (8) models in the **SHIPSURVEYOR** range of instruments. Not all detection ranges may be included in the version of instrument selected by your company.

The table below illustrates each model and corresponding gas sensor ranges included:

SENSORS FITTED (* IR = infrared)	SHIPSURVEYOR MODELS							
	1	2	3	4	5	6	7	8
0-100% LEL (IR)	X	X	X	X	X	X		X
0-100% VOL GAS (IR)	X	X	X	X	X	X		X
0-25% Oxygen		X	X	X	X	X	X	X
0-100ppm Hydrogen Sulphide			X			X		X
0-20% Carbon Dioxide (IR)				X	X		X	X
0-1000ppm Carbon Monoxide					X	X		

Fig. 2-1 Gas Ranges / Instrument Model

2.2 Details of Operating Ranges

The basic instrument can measure 0-100% LEL and 0-100% VOL GAS.

Other models can measure the following gas types:

- Oxygen (O_2)
- Hydrogen Sulphide (H_2S)
- Carbon Dioxide (CO_2)
- Carbon Monoxide (CO)

2.2.1 LEL, 0 - 100 %

The LEL range indicates the explosivity of the flammable gas in the sample. This is displayed as a percentage of the lower explosive limit (LEL) of the gas.

% LEL is displayed clearly in the LCD. From 0 - 100% LEL, the digital display resolves to 1% LEL.

A configurable option allows the displayed LEL value to have a resolution of 0.1% LEL from 0 - 9.9%, and 1% LEL from 10 - 100%.

When the reading reaches 100% LEL, EEE (over-range) is displayed. The user can, by using the top button, change range to % Volume Gas in CGI mode only.

An example of a 10% LEL gas detection reading is illustrated in Fig. 2-2 (example from Shipsurveyor 1 model).

Fig. 2-2 LEL Example (CGI mode)

2.2.2 Volume Gas, 0 - 100 % (CGI mode only)

This range displays the total volume of a flammable gas.

% VOL is displayed clearly in the LCD. The displayed VOL gas value has a resolution of 0.1% VOL from 0 - 9.9%, and 1% VOL from 10 - 100%.

A configurable option allows the displayed VOL gas value to have a resolution of 1% VOL from 0 - 100%.

Fig. 2-3 illustrates a typical VOL Gas display (example from Shipsurveyor 1 model).

Fig. 2-3 Volume Gas Example

2.2.3 Oxygen (O_2), 0 - 25 %

This range displays the % of oxygen in the sample.

% O2 is clearly displayed in the LCD. The displayed oxygen value has a resolution of 0.1% O2 from 0 - 20.9%, and 1% from 21 - 25%. Fig. 2-4 illustrates a typical display including Oxygen (example from Shipsurveyor 2 model).

Fig. 2-4 Oxygen Example

2.2.4 Hydrogen Sulphide (H_2S), 0 - 100 ppm

This range displays the parts per million (ppm) of Hydrogen Sulphide in the sample.

H2S is clearly displayed in the LCD. The displayed hydrogen sulphide value has a resolution of 1 ppm. Fig. 2-5 illustrates a typical display including Hydrogen Sulphide (example from Shipsurveyor 3 model).

Fig. 2-5 Hydrogen Sulphide Example

2.2.5 Carbon Dioxide (CO_2), 0 - 20 %

This range displays the percentage of Carbon Dioxide in the sample.

CO2 is clearly displayed in the LCD. The displayed carbon dioxide value has a resolution of 0.1% CO2 from 0 - 5%, and 0.5% from 5 - 20%. Fig. 2-6 illustrates a typical display including Carbon Dioxide (example from Shipsurveyor 4 model).

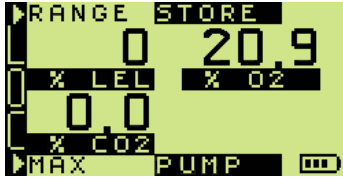


Fig. 2-6 Carbon Dioxide Example

2.2.6 Carbon Monoxide (CO), 0 - 1000 ppm

This range displays the parts per million (ppm) of Carbon Monoxide in the sample.

CO is clearly displayed in the LCD. The displayed carbon monoxide value has a resolution of 1 ppm. Fig. 2-7 illustrates a typical display including Carbon Monoxide (example from Shipsurveyor 5 model).

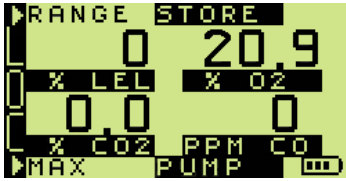


Fig. 2-7 Carbon Monoxide Example

2.3 Operating Modes

Confined Space Monitor (CSM) Operation

In this mode the instrument operates as a safety monitor for use when entering confined spaces which may contain hazardous gas mixtures (flammable, toxic and/or asphyxiant). The instrument continually samples the ambient atmosphere to which the operator is exposed and generates alarms for low oxygen, high oxygen, high flammable gas, high toxic gas, Short Term TWA (STEL) and Long Term TWA (LTEL).

During normal operation in CSM mode, the instrument emits a confidence beep and illuminates a pair of red LED's briefly every 8 seconds. This function is programmable in the instrument setup software.

The confidence signal function makes the user aware that the instrument is sensing for gas without the need for the operator to constantly view the display:

The confidence beep and / or LED indication can be disabled.

Combustible Gas Indicator (CGI) Operation

In this mode the instrument operates as a gas indicator drawing a sample via a probe from points where gas is suspected to be present. Alarms are disabled in CGI mode as the instrument is generally used for measuring gas levels rather than monitoring for the presence of gas.

2.4 Alarms

The **SHIPSURVEYOR** alarms are disabled in Combustible Gas Indicator (CGI) mode. When operating in Confined Space Monitor (CSM) mode, both audible and visual alarms are active, (refer to Confined Space Monitor Operation in Chapter 3). The audible alarm is rated at 85 dB(A). The visual alarm consists of two (2) pairs of red LED's flashing alternately in the display panel.

The instrument, by default, will have alarm levels pre-set, (refer to 'Default Alarms' table in Chapter 4).

It is the responsibility of the user to ensure that the alarm levels, where set in the instrument, are appropriate for the safe operation and legal requirements for the country / industry in which the unit is being used.

Latching alarms can only be cleared manually after the detected gas level has fallen below the alarm limit.

An option allows the alarms to be non-latching. These clear automatically when the gas levels fall below the alarm limit. Another option allows the audible alarm to be muted.

TWA alarms, by default, are non-latching.

2.5 Datalogging

The **SHIPSURVEYOR** memory can store over 1000 logged entries in date order. The memory will overwrite entries in the event of an overflow.

The instrument, by default, has automatic and manual datalogging enabled when operating in CSM mode. Manual datalogging allows the user to store a snapshot of the gas readings at any time.

When the instrument is operating in CGI mode, only manual datalogging is enabled. There is no automatic datalogging available in this mode.

2.5.1 Location (LOC) Selector

The **SHIPSURVEYOR** instrument features a 'LOC' location selector, allowing the user to allocate datalogged readings to a location (LOC) of a vessel. Refer to Chapter 3.18 for more details.

2.6 Max / Min Values

The **SHIPSURVEYOR** instrument records the maximum / minimum gas values for each sensor, since switch-on.

2.7 Construction

The instrument is housed in a tough, impact resistant, moulded case made of polypropylene.

The top panel features a carbon loaded polycarbonate LCD cover.

The battery cover is attached to the main instrument body by means of two stainless steel hexagonal screws.

The instrument is sealed against dust and water to IP54 standard. The instrument sensors are protected from dust and water by an integral hydrophobic filter.

2.8 Batteries

The **SHIPSURVEYOR** instrument can operate on either two (2) alkaline or rechargeable cells. Typical operating times are as follows:

	Alkaline	Rechargeable
Two (2) Cells	> 20 hrs	> 8 hrs

Fig. 2-8 Typical Battery Operating Times

A battery symbol, as illustrated in Fig. 2-9, provides an indication of remaining battery life. The symbol is displayed in

the bottom RH corner of the display during normal operation.

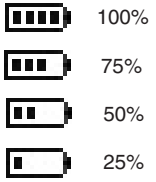


Fig. 2-9 Remaining Battery Life

Refer to Chapters 4.5.7 and 4.5.8 for detailed battery warnings.

To replace batteries, refer to Chapter 5, 'OPERATOR MAINTENANCE'.

2.9 Filters

Note: The **SHIPSURVEYOR** instrument has an integral hydrophobic filter fitted.

To remove / install integral hydrophobic filter, refer to 'MAINTENANCE MANUAL' (GMI Part No. 48166).

Where possible an external filter (accessory) should always be used to prevent ingress of dust / water.

2.10 Liquid Crystal Display (LCD)

The dot matrix LCD (128 x 64) shows the current gas readings in a clear, digital form. Operational and status information is also displayed. Backlighting is controlled by an optical sensor that illuminates automatically during warm-up, when an alarm is active, and also in low lighting conditions.

2.11 Before Use Checks

The following checks should be carried out before every operation:

- The instrument is clean and in good condition.
- The sample line and any accessories are in good condition and leak free. Make sure that the instrument displays a flow fault when the instrument inlet / sample line is blocked. If a flow fault is not displayed, check tightness of all fittings.
- Any accessory filters used are clean and in good condition.
- The batteries have sufficient power left for the intended use of the instrument.
- The instrument is still within the calibration period and is calibrated for the gas that you are intending to sample.
- All gas ranges are operational and zeroed correctly.

OPERATION

3.1 Instrument Features

The **SHIPSURVEYOR** front panel features two operating buttons, a Liquid Crystal Display (LCD) illuminated in low lighting conditions, and a series of status LED's as illustrated in Fig. 3-1,

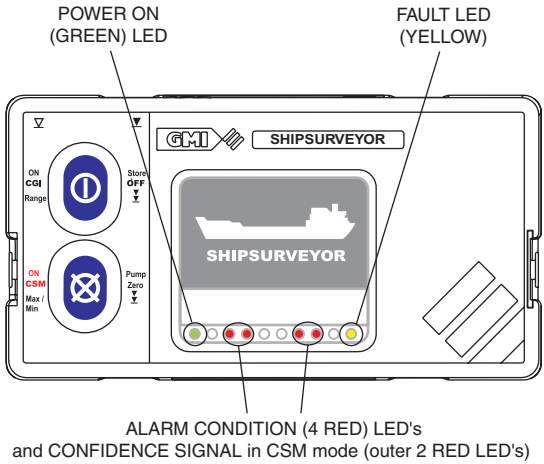


Fig. 3-1 Instrument Front Panel

The POWER ON LED is green in colour and indicates that the instrument is powered ON.

The ALARM LED's are red in colour and, when flashing, indicate that the instrument is in an alarm condition. Refer to Chapter 4 'ALARMS' for details.

The CONFIDENCE SIGNAL LED's (CSM mode only) are also red in colour and provide assurance that the instrument is sensing for gas without the need for the operator to constantly view the display.

The FAULT LED is yellow in colour and when illuminated, indicates that a fault has been detected. Refer to Chapter 4.2 'Fault Alarms', for details.

3.2 Operating Buttons

The **SHIPSURVEYOR** features two operating buttons, as illustrated in Figure 3-2.

All functions are easily accessible by a single press or a press and hold of the relevant button.

Each button press is acknowledged with a 'beep' sound.

Each press and hold is acknowledged by two 'beeps'.

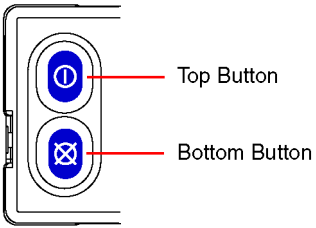


Fig. 3-2 Switch Panel

Refer also to paragraph 3.21 'Button Operation Summary' later in this chapter.

3.3 Probe Handle / Quick Connect

The **SHIPSURVEYOR** instrument is equipped to accept probe types listed in Chapter 7 'Accessories'.

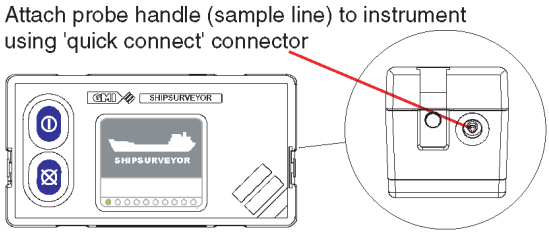


Fig. 3-3 Probe Connection

3.4 Operating Modes - Switch ON

The **SHIPSURVEYOR** is a dual configuration instrument. It operates as a Confined Space Monitor (CSM) or as a Combustible Gas Indicator (CGI) depending on the button used to switch it on.

For **Confined Space Monitor** (CSM) operation, the instrument must be switched on by pressing and holding the Bottom Button ⊠ for approximately one second in fresh air.

For **Combustible Gas Indicator** (CGI) operation, the instrument must be switched on by pressing and holding the Top Button ⏻ for approximately one second in fresh air.

The title screen is displayed, as illustrated in Fig. 3-4, the pump is activated and the instrument begins its warm-up routine that lasts approximately 60 seconds. During the warm-up cycle, a countdown timer appears in the top right hand corner of the display.

The display backlight illuminates and remains ON during warm-up.

Fig. 3-4 Title Screen

3.5 Language Option

The language setup has three configurable options:

- English (Default)
- *Other (single) language*
- *Choice of language*

During the warm-up cycle, the language screen, as illustrated in Fig. 3-5, is only displayed if 'choice of language' is configured. This allows the user to select a pre-programmed language from the menu. The previously selected language is highlighted in the display.

Fig. 3-5 Language Selection

Note: *If choice of language is not configured, the warm-up cycle will automatically continue with the configured language.*

To select the required language option

- *Single press the Top Button* ⓘ *, or single press Bottom Button* ⊠ *, to highlight required language.*
- *Press and hold OK (the Bottom Button)* ⊠ *to confirm selection.*

3.6 Instrument Identification

During the warm-up cycle, the instrument display identifies the model, serial number, software version, datalogging, battery status and calibration gas information as illustrated in Fig. 3-6:

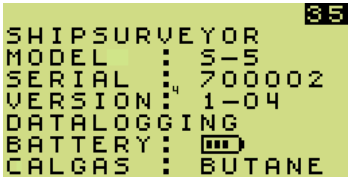


Fig. 3-6 Instrument Identification

Note: The battery symbol is indicated during the warm-up cycle, then on the bottom RH corner of the display during normal operation.

3.7 Time / Date

The current time and date is displayed during the warm-up cycle, as illustrated in Fig. 3-7.

Fig. 3-7 Time and Date

3.8 Calibration Due Date

The CAL DUE period can be set from 1 to 400 days and is set to 365 days by default.

The CAL DUE date is automatically reset when the instrument is successfully calibrated.

The CAL DUE feature has five (5) configurable options:

1. CAL DUE DATE MESSAGE IS NOT DISPLAYED (OPTION)

2. CAL DUE DATE MESSAGE IS DISPLAYED (OPTION)

Cal Due date message is displayed, as illustrated in Fig. 3-8.

Fig. 3-8 Calibration Due Date

If the Cal Due date has expired, i.e. overdue, the screen illustrated in Fig. 3-9 is displayed.

Fig. 3-9 Calibration Expired

After approximately five (5) seconds, the instrument warm-up continues.

3. CAL DUE DATE MESSAGE IS DISPLAYED WITH USER ACKNOWLEDGE IF EXPIRED (DEFAULT)

Cal Due date message is displayed, as illustrated in Fig. 3-10.

Fig. 3-10 Calibration Due Date

If the Cal Due date has expired, i.e. overdue, the screen illustrated in Fig. 3-11 is displayed.

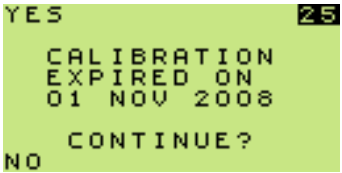


Fig. 3-11 Calibration Overdue

The user must acknowledge that Cal Due date has expired.

To accept expiry (continue):

- Press YES (Top Button) ⓘ to continue the warm-up cycle.

To acknowledge expiry:

- Press NO (Bottom Button) ⊠ to abort.

  The screen, illustrated in Fig. 3-12 is displayed.

Fig. 3-12 Switch OFF

- Press and hold the Top Button ⏻ to switch the instrument OFF.

4. CAL DUE DATE MESSAGE IS DISPLAYED - USER ACKNOWLEDGE FOR EXTENDED PERIOD IF EXPIRED (OPTION)

Cal Due date message is displayed, as illustrated in Fig. 3-13.

Fig. 3-13 Calibration Due Date

If the Cal Due date has expired, i.e. overdue, but within the 'extended period', the screen illustrated in Fig. 3-14 is displayed.

Fig. 3-14 Calibration Overdue

The user must acknowledge that Cal Due date has expired.

Note: The extended period can be set from 1 to 31 days.

To accept extended expiry (continue):

- *Press YES (Top Button) to continue the warm-up cycle.*

Note: When the extended period option expires, the user will be forced to switch the instrument OFF.

To reject the extended expiry:

- *Press NO (Bottom Button).*

The screen, illustrated in Fig. 3-15, is displayed.

Fig. 3.15 Calibration Expired

To proceed with the shut-down sequence:

- Press and hold the Top Button ⏻ to switch the instrument OFF.

5. CAL DUE DATE MESSAGE IS DISPLAYED - USER SHUT-DOWN IF EXPIRED (OPTION)

Cal Due date message is displayed as illustrated in Fig. 3-16.

Fig. 3-16 Calibration Due Date

If Cal Due date has expired, the screen illustrated in Fig. 3-17 is displayed.

Fig. 3.17 Calibration Expired

To proceed with the shut-down sequence:

- Press and hold the Top Button ⏻ to switch the instrument OFF.

3.9 Service Due Date

The Service due date can be set by the workshop and is set to two (2) years by default from last service date. The date can be set over a period of 1 to 36 months in 1 month steps.

Note : The service due date, if enabled, will only be displayed if less than 90 days from the current date.

The SERVICE DUE feature has five (5) configurable options:

1. NOT USED (DEFAULT)

Service Due date message is not displayed during warm-up (Default).

2. SERVICE DUE DATE MESSAGE IS DISPLAYED (OPTION)

Service Due date message is displayed, as illustrated in Fig. 3-18.

Fig. 3-18 Service Due Date

If the Service Due date has expired, i.e. overdue, the screen illustrated in Fig. 3-19 is displayed.

Fig. 3-19 Service Expired

After approximately five (5) seconds, the instrument warm-up continues.

3. SERVICE DUE DATE MESSAGE IS DISPLAYED - USER ACKNOWLEDGE IF EXPIRED (OPTION)

Service Due date message is displayed, as illustrated in Fig. 3-20.

Fig. 3-20 Service Due Date

If the Service Due date has expired, i.e. overdue, the screen illustrated in Fig. 3-21 is displayed.

Fig. 3-21 Service Overdue

The user must acknowledge that Service Due date has expired.

To accept expiry (continue):

- *Press YES (Top Button) to continue the warm-up cycle.*

To acknowledge expiry:

- *Press NO (Bottom Button) to abort.*

  The screen illustrated in Fig. 3-22 is displayed.

Fig. 3-22 Switch OFF

- Press an hold the Top Button to switch the instrument OFF.

4. SERVICE DUE DATE MESSAGE IS DISPLAYED - USER ACKNOWLEDGE FOR EXTENDED PERIOD IF EXPIRED (OPTION)

Service Due date message is displayed, as illustrated in Fig. 3-23.

Fig. 3-23 Service Due Date

If the Service Due date has expired, i.e. overdue, but within the 'extended period', the screen illustrated in Fig. 3-24 is displayed.

Fig. 3-24 Service Overdue

The user must acknowledge that Service Due date has expired.

Note: The extended period can be set from 1 to 31 days.

To accept extended expiry (continue):

- *Press YES (Top Button) to continue the warm-up cycle.*

Note: When the extended period option expires, the user will be forced to switch the instrument OFF.

To reject the extended expiry:

- *Press NO (Bottom Button).*

The screen, illustrated in Fig. 3-25, is displayed.

Fig. 3.25 Service Expired

To proceed with the shut-down sequence:

- Press and hold the Top Button to switch the instrument OFF.

5. SERVICE DUE DATE MESSAGE IS DISPLAYED - USER SHUT-DOWN IF EXPIRED (OPTION)

Service Due date message is displayed as illustrated in Fig. 3-26.

Fig. 3-26 Service Due Date

If Service Due date has expired, the screen illustrated in Fig. 3-27 is displayed.

Fig. 3.27 Calibration Expired

To proceed with the shut-down sequence:

- Press and hold the Top Button ⏻ to switch the instrument OFF.

3.10 Sensor Zeroing

The final feature in the instrument warm-up cycle is sensor zeroing.

During this check, the screen illustrated in Fig. 3-28 is displayed.

Fig. 3-28 Sensor Check Display

When all sensors have been correctly zeroed, the instrument is ready for use.

3.10.1 Instrument Will Not Zero - Zero Fault

If a sensor fails to zero because of a fault, the screen illustrated in Fig. 3-29 is displayed, providing the user with the option to continue working and use the remaining operational sensor(s). (Details of the failed sensor will be datalogged).

Fig. 3-29 Failed Sensor Display

To accept sensor fault and continue operation:

- Press and hold YES (Top Button) ⓘ to continue using operational sensor(s).

Note: A spanner symbol flashes in the faulty range (LEL in example), as illustrated in Fig. 3-30.

alternates with

Fig. 3-30 Faulty Range Display

To reject sensor fault and proceed with the shut-down sequence:

- Press and hold NO (Bottom Button) ⊠ to switch the instrument OFF.

3.10.2 Instrument Will Not Zero - Gas Present

If a sensor fails to zero because of gas in the atmosphere, the gas reading flashes as illustrated in Fig. 3-31.

alternates with

Fig. 3-31 Gas Present During Warm-up

To correct this fault, switch the instrument OFF then ON again in fresh air.

3.11 Alarm Warning (CGI mode only)

When the instrument has been switched ON in CGI mode and if configured, a 'WARNING' flashes in the display as illustrated in Fig. 3-32, to alert the user that alarms are disabled in this mode.

alternates with

Fig. 3-32 Alarm Disabled Warning

To continue operation:

- Press and hold 'YES' (Top Button) ⏻ for one second.

To abort instrument warm-up:

- Press and hold 'NO' (Bottom Button) ⊗ for one second. The instrument automatically switches OFF.

3.12 Warm-up Complete

The instrument will now display the current gas readings for the selected mode. Fig. 3-33 illustrates the display for a Shipsurveyor 1 in CGI mode.

Fig. 3-33 LEL Display

3.13 Alarms (CSM mode only)

If alarms are enabled, an 'A' character is displayed in the top RH corner of the screen as illustrated in Fig. 3-34.

Fig. 3-34 Alarm Enabled Identifier

Alarm levels are set as per the configuration of the instrument.

3.14 LEL / Vol Gas Range Selection (CGI mode only)

When the warm-up cycle is complete, the instrument automatically selects the LEL range as default.

To select Vol Gas range:

- Single press 'RANGE' (Top Button) ⓘ.

3.15 Switch Pump OFF / ON (CGI mode only)

When the warm-up cycle is complete, the instrument pump is automatically set to ON.

To switch the pump OFF / ON:

- Press and hold 'PUMP' (Bottom Button) ⊠ for one second.

3.16 Zero All Ranges (CGI mode only)

To zero all ranges, e.g. If the instrument displays a gas reading when operating in fresh air:

To zero all ranges in fresh air:

- Press and hold the Bottom Button ⊠ for approximately five (5) seconds The following screen is displayed:

Fig. 3-35 Zero All Ranges

- Press and hold ‘YES’ (Bottom Button)  for one second to zero all ranges and return to live readings.

Alternatively,

- Press and hold ‘NO’ (Top Button)  for one second to return to live readings without zeroing.

3.17 Datalogging

The **SHIPSURVEYOR** can store over 1000 logged entries in date order. In addition, it can store up to 300 location entries. Location (LOC) entries allows logged data to be associated with particular areas of the vessel.

3.17.1 CSM Mode

The instrument, by default, has automatic and manual datalogging enabled when operating in CSM mode.

During automatic datalogging the instrument stores the values of all gas ranges together with the current time and date at 60 second intervals. *This interval can be set between 1 second and 10 minutes.*

Manual datalogging allows the user to store a snapshot reading at any time.

To manually store a reading:

- Press and hold ‘STORE’ (Top Button)  for one second.

3.17.2 CGI Mode

When the instrument is operating in CGI mode, only manual datalogging is available:

To manually store a reading:

- Press and hold 'STORE' (Top Button) ⏻ for one second.

3.18 Max / Min Values

The **SHIPSURVEYOR** instrument records the maximum and minimum gas values for each sensor, since switch-on.

Note: Only the Oxygen (O_2) sensor will display a minimum value. All other sensors will indicate zero.

To view max values:

- Start from the normal operating display, illustrated in Fig. 3.36.

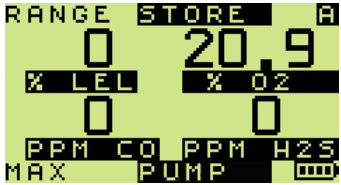


Fig. 3-36 Normal Operating Display

- Press ‘MAX’ (Bottom Button) to display each recorded maximum gas reading since switch-on. ‘MAX’ alternates with the range name as illustrated in Fig. 3-37.

alternates with

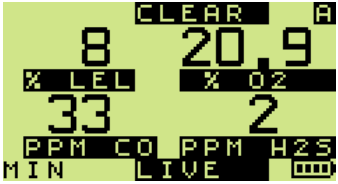


Fig. 3-37 Max Displayed Values

Note: The display will automatically return to live readings if no buttons are pressed within ten (10) seconds. The stored values are retained in the instrument memory unless they have been reset by a press and hold of ‘CLEAR’ (Top Button) .

To view min values:

Note: ‘MIN’ button press option is only displayed in instruments with an Oxygen (O_2) sensor fitted.

- Press ‘MIN’ (Bottom Button) to display the recorded minimum oxygen reading. ‘MIN’ alternates with the range name as illustrated in Fig. 3-38.

alternates with

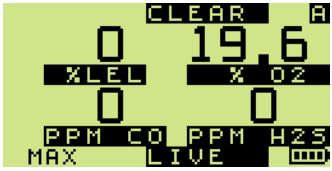


Fig. 3-38 Min Displayed Values

Note: The display will automatically return to live readings if no buttons are pressed within ten (10) seconds. The stored value is retained in the instrument memory unless it has been reset by a press and hold of ‘CLEAR’ (Top Button).

To return to live readings:

- Press and hold ‘LIVE’ (Bottom Button) for one second to return to live readings.

3.19 Location (LOC) Selector

The **SHIPSURVEYOR** instrument features a 'LOC' location selector allowing the user to allocate datalogged readings to a location (LOC) of a vessel.

For example, if 'HOLD1' is selected, all subsequent datalogging (manual and automatic) will be referenced to 'HOLD1'.

300 Location (LOC) names are available and can be customised to meet individual user requirements.

Location (LOC) names can only be customised and stored in the instrument using the Shipsurveyor Data Downloading Software (GMI Part No. 48150).

3.19.1 To select a location (LOC):

The location list can be accessed by simultaneously pressing the Top Button ⓘ and Bottom Button ⊠ for two (2) seconds.

1. <u>Location data already stored in the instrument:</u>

If location data has previously been stored in the instrument, it will now be displayed as illustrated in Fig. 3-39.

Fig. 3-39 'LOC' Display

To select **next** entry in 'LOC' list :

- Press Bottom Button ⊠.

To quickly scroll down:

- Press and hold Bottom Button ⊠.

To select **previous** entry in 'LOC' list:

- Press Top Button ⓘ.

To quickly scroll up:

- Press and hold Top Button ⓘ.

If a location is highlighted and the user exits the location (LOC) list, then that location will be associated with all subsequent datalogging.

To exit 'LOC' list:

- Press and hold Top Button ⓘ and Bottom Button ⊠ simultaneously for three seconds.

  The instrument will return to displaying the gas readings.

2. No Location data stored in the instrument:

If no location data has been stored in the instrument, the display will be as illustrated in Fig. 3-40.

The instrument will still datalog, but no location data will be associated with the stored readings.

Fig. 3-40 'LOC' Display

3.20 Acknowledge Alarms (CSM mode only)

The **SHIPSURVEYOR** default alarm function means that instantaneous alarms will be latching and both the audible and visual functions will operate. (Where an alarm level is exceeded, the instrument LED's flash and the sounder pulses rapidly). Latching alarms must be cleared manually.

To clear a latching alarm:

- Press and hold the Bottom Button, for one second, after the detected gas level has fallen below the alarm limit. Refer to Chapter 4.4.1.

The option for the alarms is non-latching. These clear automatically when the gas levels fall below the alarm limit. The audible alarm can be muted.

To mute a non-latching alarm:

- *Press and hold the Bottom Button for one second. Refer to Chapter 4.4.3.*

Note: An alarm remains muted until a new alarm event occurs.

3.21 Switch the instrument OFF

Before switching OFF from the normal operating mode, make sure that the instrument is in fresh air in order to purge any remaining gas from the instrument.

To initiate the shutdown sequence:

- Press and hold the Top Button ⏻.

  The OFF sequence countdown begins and the user must keep the buttons depressed for a further three (3) seconds to switch the instrument OFF.

  The countdown sequence is illustrated in Fig. 3-41.

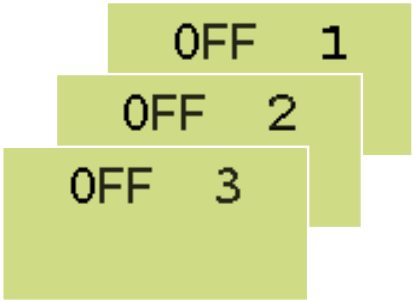


Fig. 3-41 Countdown Sequence to OFF

Note 1: The OFF sequence can be aborted by releasing the Top Button, providing access to the previous operating display.

Note 2: The countdown sequence will commence at '9' if an alarm is active when the shutdown sequence is initiated.

3.22 Button Operation Summary

BUTTON PRESS	CURRENT STATUS OF INSTRUMENT — OFF	NORMAL OPERATION	VIEWING MAX / MIN	GAS ALARM ACTIVE	FLOW FAULT ALARM	ZERO FAULT ALARM	IN 'LOC' LIST
▽ PRESS (①)		Change Range LEL to VOL (CGI only)					UP One Item
▼ PRESS &. HOLD (①)	Switch ON (CGI only)	Store Values ▼ Switch OFF	Clear MIN / MAX	Store Values			Ramp UP
▽ PRESS (⊗)		View MAX	View MIN (if available)				DOWN One Item
▼ PRESS &. HOLD (⊗)	Switch ON (CSM only)	Pump ON / OFF (CGI only) ▼ ZERO (CGI only)	Return to LIVE Readings	Acknowledge Latching Alarm (CSM only) Mute Non-Latching Alarm (CSM only)	Acknowledge Flow Fault Alarm - Switch Pump Back ON (CGI only)	Acknowledge Zero Fault Alarm	Ramp DOWN
PRESS &. HOLD BOTH		Enter LOC List					Select &. Exit

48161_01

Note: ▼ = Press & Extended Hold

ALARMS

4.1 Gas Alarms

The **SHIPSURVEYOR** alarms, by default, are enabled when operating in Confined Space Monitor (CSM) mode as indicated by an 'A' symbol in the top right corner of the display. Both audible and visual alarms are active. The audible alarm is rated up to 85 dB(A). The visual alarm consists of two (2) pairs of red LED's in the display panel as illustrated in Fig. 4-1. When flashing, the red LED's indicate that the instrument is in alarm condition.

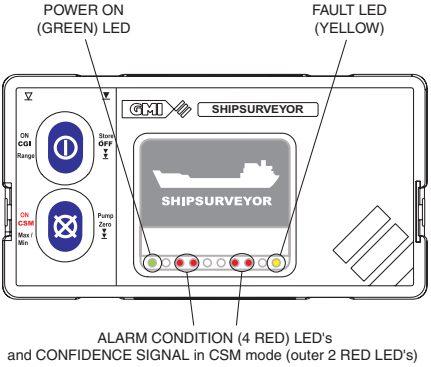


Fig. 4-1 Instrument Display Panel

Alarm levels are set at the time of instrument manufacture. It is important that the user ensures that the levels are in accordance with their company's alarm levels and with health and safety legislation. *The alarm levels are user configurable*.

All gas ranges can have alarm limits that trigger the alarm if the measured gas reading exceeds the set level. If a preset alarm level is exceeded, the audible alarm sounds, the LED's flash, and the gas range name alternates with the alarm type.

Note: Alarms are disabled in Combustible Gas Indicator (CGI) mode.

4.1.1 FLAMMABLE (LEL) ALARMS

Note: A configurable option allows the instrument to display this range type as LFL (Lower Flammable Limit).

Two (2) instantaneous alarm levels (Hi and HiHi) are configurable, each with different alarm indications, refer to Fig. 4-1. Both are rising alarms, i.e. if the detected gas concentration rises above the specific alarm level, the alarm is triggered. All alarms are user configurable to meet the needs of different companies.

4.1.2 OXYGEN (O_2) ALARMS

Three (3) instantaneous alarm levels (HiHi, Lo and LoLo) are configurable, each with different alarm indications, refer to Fig. 4-1. These consist of one rising, and two falling alarms (necessary to trigger alarms in oxygen deficient scenarios). All alarms are user configurable to meet the needs of different companies.

4.1.3 TOXIC ALARMS (e.g. CO)

Two (2) instantaneous alarm levels (Hi and HiHi) are configurable, each with different alarm indications, refer to Fig. 4-1. Both are rising alarms, i.e. if the detected gas concentration rises above the specific alarm level, the alarm is triggered. All alarms are user configurable to meet the needs of different companies.

Additionally, two (2) Time Weighted Average (TWA) alarm levels (STEL and LTEL) are configurable with alarm indications, refer to Fig. 4-1.

Two (2) TWA alarms are configurable for each toxic range within the instrument.

Note: A Time Weighted Average (TWA) value is the mean average gas level over a specific period. The Short Term Exposure Limit (STEL) is 15 minutes and the Long Term Exposure Limit (LTEL) is 8 hours. The time weighted averages are averaged over a full 24 hour period whether the instrument is ON or OFF. Such averaging essentially makes the instrument single user applicable.

The option is available to restart the averaging after each instrument switch-off, thus allowing for multiple user application.

4.2 Alarm Types

4.2.1 LATCHING / NON-LATCHING

Each alarm can be latching or non-latching.

Latching alarms can only be cleared by the user when the gas level returns to within the alarm limits. A latching alarm cannot be muted.

Non-latching alarms clear automatically when the gas level returns to within the alarm limits. A non-latching alarm can be muted.

4.2.2 MUTING / ACKNOWLEDGING

Muting of an alarm is achieved by a press and hold of the Bottom Button. Muting means that the audible alarm is cancelled. The audible alarm is reactivated if a new alarm occurs.

Acknowledging is only applicable to latching alarms and allows audible / visual alarms to be cancelled after the gas readings have returned to safe concentrations.

4.3 Default Alarm Settings

Fig. 4-2, shows the GMI default selections. Latching or non-latching options exist in all allowable alarms.

If an alarm is disabled (Dis), it will not function.

4.3.1 Default Alarms Table

Alarm Type	Level	Latch	Display	Audible	Visual (RED LED's)
LEL Hi	-	Dis	Hi	1 beep per second	4 - slow flashing
LEL HiHi	20%	Y	HiHi	Continuous warble	Alternate pairs flashing
O_2 HiHi	23%	Y	HiHi	Continuous warble	Alternate pairs flashing
O_2 Lo	-	Dis	Lo	1 beep per second	4 - slow flashing
O_2 LoLo	19.5%	Y	LoLo	Continuous warble	Alternate pairs flashing
H_2S Hi	-	Dis	Hi	1 beep per second	4 - slow flashing
H_2S HiHi	15ppm	Y	HiHi	Continuous warble	Alternate pairs flashing
H_2S STEL	10ppm	N	STEL	1 beep per second	4 - slow flashing
H_2S LTEL	5ppm	N	LTEL	1 beep per second	4 - slow flashing
CO Hi	-	Dis	Hi	1 beep per second	4 - slow flashing
CO HiHi	300ppm	Y	HiHi	Continuous warble	Alternate pairs flashing
CO STEL	200ppm	N	STEL	1 beep per second	4 - slow flashing
CO LTEL	35ppm	N	LTEL	1 beep per second	4 - slow flashing
CO_2 Hi	-	Dis	Hi	1 beep per second	4 - slow flashing
CO_2 HiHi	2.5%	Y	HiHi	Continuous warble	Alternate pairs flashing
CO_2 STEL	1.5%	N	STEL	1 beep per second	4 - slow flashing
CO_2 LTEL	0.5%	N	LTEL	1 beep per second	4 - slow flashing

Fig. 4-2 Alarm Indication

4.4 Alarm Examples

The following examples, in CSM mode, illustrate the instrument's display in various alarm conditions. **Examples are based on Default Alarm settings as detailed in Fig. 4-2.**

4.4.1 EXAMPLE 1 (LEL HiHi ALARM)

Fig. 4-3, illustrates a Shipsurveyor 1 instrument following a '**HiHi**' alarm condition. The audible alarm emits a continuous warble and the red LED's flash in alternate pairs.

alternates with

Fig. 4-3 LEL HiHi Alarm

The alarm is latching, and therefore, can only be acknowledged (cleared) by the user when the gas level returns below the 20% LEL alarm limit.

To clear the latching alarm:

- Press and hold 'ACK' (Bottom Button) for one second.

4.4.2 EXAMPLE 2 (O_2 LoLo ALARM)

This example, Fig. 4-4, illustrates a Shipsurveyor 2 instrument following a '**LoLo**' alarm condition. The audible alarm emits a continuous warble and the red LED's flash in alternate pairs.

alternates with

Fig. 4-4 O_2 LoLo Alarm

The alarm is latching, and therefore, can only be cleared by the user when the oxygen level rises above the 19.5% O_2 alarm limit.

To clear the latching alarm:

- Press and hold ‘ACK’ (Bottom Button) for one second.

4.4.3 EXAMPLE 3 (CO STEL ALARM)

This example, Fig. 4-5, illustrates a Shipsurveyor 5 instrument following an ‘**STEL**’ alarm condition. The audible alarm beeps every second and all four (4) red LED’s flash slowly.

alternates with

Fig. 4-5 CO STEL Alarm

The alarm is non-latching and therefore can be muted by the user, and is reset automatically when the STEL level returns below the 200ppm CO alarm limit.

To mute the non-latching alarm:

- Press and hold ‘MUTE’ (Bottom Button) for one second.

4.5 Fault Alarms

The **SHIPSURVEYOR** instrument features a series of fault alarms to alert the user that the instrument is not functioning correctly. The audible and visual indications used are both fault / type and mode (CSM or CGI) dependent.

Visual alarms are indicated by a series of LED’s, as illustrated in Fig. 4-6. The power ON LED will remain illuminated during all fault alarm indications.

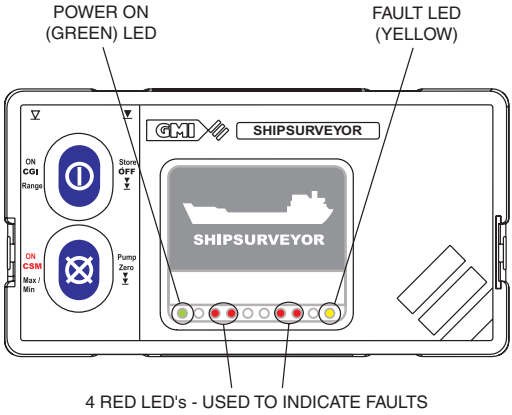


Fig. 4-6 Instrument LED Panel

4.5.1 Fault Alarms - CSM Mode

The following table, Fig. 4-7, illustrates the fault alarms in CSM mode. Muting options exist in selected alarms.

Alarm Type (CSM Mode)	Mute	Display	Audible	Visual (LED)
LOW BATTERY	No	LO<>BAT	Continuous Tone	Yellow & 4 Red
BATTERY EXHAUSTED	No	BAT<>BAT	Continuous Tone	Yellow & 4 Red
ZERO FAULT	Yes	Flashing Spanner	Continuous Tone	Yellow & 4 Red
SENSOR FAULT	No	Following Ranges Failed	Continuous Tone	Yellow & 4 Red
FLOW FAULT	No	'FLOW FAULT'	Continuous Tone	Yellow & 4 Red
IR SUPPLY FAULT	No	' P '	Continuous Tone	Yellow & 4 Red
COMMS. FAULT	No	' I '	Continuous Tone	Yellow & 4 Red
MEMORY FAULT	No	' C '	Continuous Tone	Yellow

Fig. 4-7 Fault Alarms in CSM Mode

4.5.2 Fault Alarms - CGI Mode

The following table, Fig. 4-8, illustrates the fault alarms in CGI mode. Muting options exist in selected alarms.

Alarm Type (CGI Mode)	Mute	Display	Audible	Visual (LED)
LOW BATTERY	No	LO<>BAT	No	Yellow
BATTERY EXHAUSTED	No	BAT<>BAT	No	Yellow
ZERO FAULT	N/A	Flashing Spanner	No	Yellow
SENSOR FAULT	N/A	Following Ranges Failed	No	Yellow
FLOW FAULT	N/A	'FLOW FAULT'	No	Yellow
IR SUPPLY FAULT	No	' P '	Continuous Tone	Yellow & 4 Red
COMMS. FAULT	No	' I '	Continuous Tone	Yellow & 4 Red
MEMORY FAULT	No	' C '	Continuous Tone	Yellow

Fig. 4-8 CGI Mode Fault Alarms

4.5.3 ZERO FAULT

If a zero fault occurs in CSM mode, the instrument's audible alarm will activate. The visual alarm (yellow and four red LED's) will also activate.

If a zero fault occurs in CGI mode, only the visual alarm (yellow LED) will activate.

In both modes, a spanner symbol flashes in the display adjacent to the corresponding gas type (H2S), as illustrated in Shipsurveyor 3 example, Fig. 4-9.

alternates with

Fig. 4-9 Zero Fault

To correct the zero fault, switch the instrument OFF then ON again in fresh air. If this does not correct the fault, return the instrument for service.

4.5.4 SENSOR FAULT

If a sensor fault occurs in CSM mode, the instrument's audible alarm will activate. The visual alarm (yellow and four red LED's) will also activate.

If a sensor fault occurs in CGI mode, only the visual alarm (yellow LED) will activate.

In both modes, a warning display is followed by a display showing a spanner symbol adjacent to the faulty range, as illustrated in Shipsurveyor 3 example, Fig. 4-10.

Fig. 4-10 H2S Sensor Fault

The instrument should be returned for service.

4.5.5 FLOW FAULT

A flow fault will occur if the flow path is restricted.

If a flow fault occurs in CSM mode, the instrument's audible alarm will activate. The visual alarm (yellow and four red LED's) will also activate.

If a flow fault occurs in CGI mode, only the visual alarm (yellow LED) will activate and the instrument's pump will stop running.

In both modes, the FLOW FAULT display will alternate between the two screens, illustrated in Fig. 4-11.

alternates with

Fig. 4-11 Flow Fault

Follow the instructions as displayed, i.e.

- Check the flow path
- Remove the blockage
- Acknowledge the alarm

To acknowledge flow fault alarm:

- Press and hold 'ACK' (Bottom Button) for one second.

4.5.6 MEMORY FAULT (Calibration / Configuration)

During warm-up, if the 'Calibration Required' screen is displayed as illustrated in Fig. 4-12, the instrument has detected a calibration / configuration memory fault and is unable to continue without re-calibration and / or configuration set-up.

Fig. 4-12 Calibration / Configuration Memory Fault

The instrument must be returned for service.

4.5.7 MEMORY FAULT (General Instrument)

At any time during operation, if a ‘C’ character is flashing in the top RH corner of the display as illustrated in Fig. 4-13, the instrument has detected a memory fault and is unable to continue. The fault activates the audible alarm and the (yellow) fault LED is illuminated.

Fig. 4-13 General Instrument Memory Fault

The instrument must be returned for service.

4.5.8 LOW BATTERY

During operation, ‘LO’ alternating with ‘BAT’ is displayed, as illustrated in Fig. 4-14, when typically 30 minutes operating time remains at normal temperature and depending on battery type.

Fig. 4-14 LO-BAT

In CSM mode, the instrument audible alarm will activate. The visual alarm (yellow and four red LED's) will also activate.

In CGI mode, only the visual alarm (yellow LED) will activate.

4.5.9 BATTERY EXHAUSTED

When 'BAT' flashes in the display, as shown in Fig. 4-15, the instrument batteries are almost exhausted.

Fig. 4-15 BAT-BAT

In CSM mode, the instrument audible alarm will activate. The visual alarm (yellow and four red LED's) will also activate.

In CGI mode, only the visual alarm (yellow LED) will activate.

In both modes, the instrument automatically switches OFF.

The instrument batteries must be replaced.
(Refer to Chapter 5, 'Operator Maintenance').

5

OPERATOR MAINTENANCE

5.1 Batteries

The **SHIPSURVEYOR** contains two alkaline or rechargeable batteries that provides the power required to operate the instrument.

The alkaline batteries should be replaced, or the rechargeable batteries recharged in the following situations:

- The 'LO-BAT' flag is flashing in the display.

  Indicates that the remaining operating time of the instrument is low.

- The 'BAT' flag is flashing in the display.

  Indicates exhausted batteries and automatic switch-off.

The procedure to remove / discard alkaline cells or to remove rechargeable cells for charging is detailed in paragraph 5.1.1. Re-fitting of the cells is also included in this paragraph.

The rechargeable cells should be charged using a commercial type charger.

5.1.1 Replace Alkaline / Rechargeable Cells

WARNING 1: **To prevent ignition of flammable or combustible atmospheres, remove batteries before servicing.**

WARNING 2: **To prevent ignition of flammable or combustible atmospheres, read, understand and adhere to the manufacturer's live maintenance procedures.**

WARNING 3: **To reduce the risk of ignition of a flammable or explosive atmosphere, batteries must be changed only in a location known to be non-hazardous (safe area).**

WARNING 4: **To reduce the risk of explosion, do not mix old batteries with new batteries or mix batteries from different manufacturers.**

WARNING 5: **Never attempt to recharge non rechargeable cells.**

The following procedure should only be carried out in a safe area:

1) Using the Hex Driver, loosen the two instrument base screws then remove the battery cover.

2) Remove battery cover.

3) Remove the alkaline / rechargeable batteries.

4) Charge rechargeable batteries using a commercial type charger. Charging duration is dependent on charger type and condition of rechargeable batteries.

5) Check battery compartment for damage to spring contacts or corrosion on springs.

6) Insert new alkaline / fully charged rechargeable batteries, observing correct polarity indication in battery compartment base.

7) Replace battery cover and fasten both base screws.

8) Check that the instrument switches on and works to specification.

5.2 Filter Replacement

5.2.1 Internal Filter

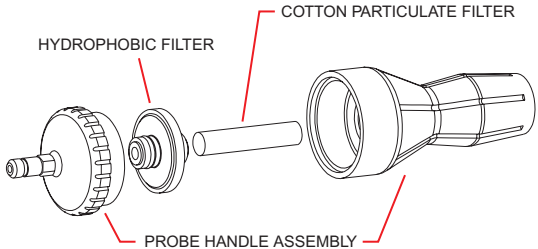
The **SHIPSURVEYOR** instrument has an integral hydrophobic filter fitted. To replace this filter, refer to Maintenance Manual (GMI Part No. 48166).

5.2.2 Probe Handle (Accessory) - Part No. 48120

Hydrophobic and cotton particulate filters in the probe handle minimise the danger of water and dust ingress.

To replace the filter(s), proceed as follows:

1) Unscrew the probe handle assembly.



2) Remove the cotton particulate filter and discard.

3) Remove the hydrophobic filter.

4) Clean the probe handle to make sure that it is free from dirt and water.

5) Fit a new cotton particulate filter.

6) Fit the hydrophobic filter. The yellow label on the filter fits against the yellow label on the probe handle.

7) Reassemble the probe handle assembly.

CALIBRATION

The instrument has been calibrated for a particular flammable gas mixture. Where any doubt exists, the instrument should be returned to GMI or an authorised distributor for calibration.

Three methods of calibration are possible:

- Field Calibration.
- Manual or Automatic Calibration using flexiCal Plus software CD-ROM (GMI Part No. 99553). CD-ROM includes user instructions.
- The GMI Instrument Management System (IMS) provides all the facilities of Automatic Calibration with the added feature of instrument database management.

Note: The calibration systems above (hardware and software) are manufactured by GMI. For more details contact GMI or an authorised distributor.

6.1 Calibration Validity

Calibration validity is the responsibility of the user. Under normal operating conditions a 12 month period can be expected. This is no guarantee however, as the precise application of the product is unknown to GMI. Individual codes of practice may dictate shorter periods.

Regular checking establishes a pattern of reliability and enables the calibration check period to be modified in line with operational experience. The higher the risk, the more frequently calibration should be checked.

ACCESSORIES

Instrument complete with (c/w) Hard Case & Accessories:

48021	Shipsurveyor 1	(LEL ; Vol Gas)
48022	Shipsurveyor 2	(LEL ; Vol Gas ; O_2)
48023	Shipsurveyor 3	(LEL ; Vol Gas ; O_2 ; H_2S)
48024	Shipsurveyor 4	(LEL ; Vol Gas ; O_2 ; CO_2)
48025	Shipsurveyor 5	(LEL ; Vol Gas ; O_2 ; CO_2 ; CO)
48026	Shipsurveyor 6	(LEL ; Vol Gas ; O_2 ; H_2S ; CO)
48027	Shipsurveyor 7	(O_2 ; CO_2)
48028	Shipsurveyor 8	(LEL ; Vol Gas ; O_2 ; H_2S ; CO_2)

Note: All Shipsurveyor instruments are supplied in a hard Carry Case c/w: Neck / Shoulder Harness; 4mm Hex Driver; Probe Handle c/w 1m (39ins.) Conductive Tubing; 15cm (6ins.) Open End Probe; Box (10) Cotton Filters x 2; User Handbook; Quick Operating Instructions; Calibration Certificate; Configuration Report; Datalogging & flexiCal Plus (Calibration) Software & IrDA Adaptor.

Accessories available for SHIPSURVEYOR:

Part Number	Description
48100	Hard Carry Case
48101	Leather Field Case
12370	Neck / Shoulder Harness
12371	Waist Harness
48120	Probe Handle c/w 1m (39in.) Conductive Tubing
12358	Hydrophobic Filter
10077	Cotton Filters (Box of 10)
12688	Sample Line Adaptor
12712	Clear Sample Line - per metre
48102	Ball Float
48142	Sample Line Adaptor c/w Waist Harness, Quick Connect, and Conductive Tubing x 10m (32ft.)
48145	Sample Line Adaptor c/w Waist Harness, Quick Connect, and Conductive Tubing x 25m (80ft.)
48147	Sample Line Adaptor c/w Waist Harness, Quick Connect, and Conductive Tubing x 35m (114ft.)
13427	35cm (14in.) Open End Probe
13413	35cm (14in.) S/Steel Open End Probe
12287	50cm (20in.) S/Steel Open End Probe

48110	Rechargeable Option Kit (Charger, Universal Power Supply, 2 Rechargeable Batteries)
47280	Rechargeable Batteries x 2
48150	Data Downloading Package
99553	flexiCal Plus Calibration Software CD-ROM
48151	flexiCal Plus Calibration Package
48160	Shipsurveyor User Handbook
48164	Shipsurveyor Configuration &. Field Calibration User Handbook
48166	Shipsurveyor Maintenance Manual

Note: For other sampling probes and accessories, contact GMI Ltd.

8

ADDITIONAL INFORMATION

8.1 Training

Training courses are available on all GMI products. Contact GMI Marketing Department for further details:

Tel: +44 (0) 141 812 3211

Fax: +44 (0) 141 812 7820

e-mail: sales@gmiuk.com

8.2 World Wide Web

Visit GMI web site at www.gmiuk.com

TYPICAL OPERATING PARAMETERS

Typical operating parameters for the **SHIPSURVEYOR** instrument are as follows:

Gas Range	Range	Resolution	Accuracy
LEL	0 to 9.9% 10 to 100%	0.1% * 1%	± 2% / ± 5% of reading
VOL	0 to 9.9% 10 to 100%	0.1% 1%	± 1% / ± 5% of reading
O_2	0 to 20.9% 21 to 25%	0.1% 1%	± 0.1% / ± 5% of reading ± 5% of reading
H_2S	0 to 100ppm	1ppm	± 1ppm / ± 5% of reading
CO_2	0 to 5% 5 to 20%	0.1% 0.5%	± 0.1% / ± 5% of reading ± 5% of reading
CO	0 to 1000ppm	1ppm	± 5ppm / ± 5% of reading

* *Configurable option, see page 2-2.*

Notes:

All the values above are at normal temperature and pressure.
Humidity is between 0% and 100% RH (non-condensing).
Pressure changes at the inlet and exhaust should be minimised as they may cause transient changes in reading.

Dimensions
180mm (7.1in.) x 95mm (3.7in.) x 100mm (3.9in.)

Weight
1.35kg (3.0lb.) with two alkaline batteries

Operating Temperature
-20 °C to 50 °C (-4 °F to 122 °F)

Humidity
0 – 100% RH, non-condensing.

Construction
Moulded polypropylene case protected to IP54

Display
Dot Matrix LCD (128 x 64)

Warm-Up / Stabilization Time
~ 60 seconds

Typical Flow Rate Information
Nominal pump flow rate is 0.5 to 0.7 litres per minute.
Typical flow fail rate is 0.1 to 0.2 litres per minute.

Response Time (T90)
Typical O_2 response time (0.0 to 18.8% O_2) > 15 seconds.

Power Source
Two 'D' size alkaline cells typically providing in excess of 20 hours runtime at 20°C (68°F).

or

Two 'D' size rechargeable cells typically providing in excess of 8 hours runtime at 20°C (68°F).

QUICK OPERATING INSTRUCTIONS

The following multi-language instructions provide the user with a quick guide to the operation of the . . .

GMI SHIPSURVEYOR instrument.

Each language and page reference is as follows:

- **English** - pages B-2 to B-6

CHECKLIST

1. Check the instrument has no obvious faults.
2. Read and understand handbook before use.
3. Switch ON
4. Check battery levels.
5. Check “ZERO” in fresh air.
6. Check that the sample line and any accessories are in good condition and leak free. Make sure that the instrument displays a flow fault when the instrument inlet / sample line is blocked. If fault is not displayed, check tightness of all fittings.

SAFETY

- The instrument must be regularly serviced and calibrated by fully trained personnel in a safe area.
- **Batteries:** Alkaline or *Rechargeable batteries must be exchanged (*and recharged) in a safe area and fitted correctly before use. Never use damaged batteries or expose to extreme heat. See Chapter 5: OPERATOR MAINTENANCE.
- Only GMI replacement parts should be used.
- If the instrument detects gas, follow your own organisation’s procedures and operational guidelines.
- The combustion chamber is a flameproof assembly and must not be opened in the presence of a flammable atmosphere.
- Shipsurveyor instruments are certified as:

  ATEX ⟨Ex⟩ II 2 G Exd ia IIB T3 Gb (-20°C ≤ Tamb ≤ 50°C).

  IEC Ex d ia IIB T3 (-20°C < Ta < +50°C)
- This equipment conforms to standard EN 50104.
- This equipment is also designed and manufactured to comply with MED Directive ⎈ 0038/YY (Module B&E). Further detail of the Marine Equipment Directive, is located on the MED declaration of conformity, supplied with the instrument.

Any right of claim relating to product liability or consequential damage to any third party against GMI is removed if the warnings are not observed.

WARNING: To prevent ignition of flammable or combustible atmospheres, remove batteries before servicing.

WARNING: To prevent ignition of flammable or combustible atmospheres, read, understand and adhere to the manufacturer's live maintenance procedures.

WARNING: To reduce the risk of ignition of a flammable or explosive atmosphere, batteries must be changed only in a location known to be non-hazardous.

WARNING: To reduce the risk of explosion, do not mix old batteries with used batteries or mix batteries from different manufacturers.

WARNING: Never attempt to recharge non rechargeable cells.

CAUTION: Not for use in oxygen enriched atmospheres.

CAUTION: Replace batteries only with approved batteries, as follows:

ATEX Approved Instruments:

Alkaline (LR20 'D' size)**:** Duracell Procell; Duracell Industrial; Duracell Plus; Energizer Ultra; Energizer Industrial.

Rechargeable (LR20 'D' size)**:** Uniross 2600mAh NiMH.

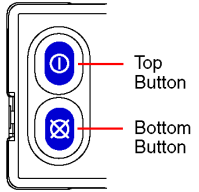
AREAS OF USE

Exposure to certain chemicals can result in a loss of sensitivity of the flammable sensor (not applicable to infrared flammable sensor). Where such environments are known or suspected it is recommended that more frequent response checks are carried out. The chemical compounds that can cause loss of sensitivity include Silicones, Lead, Halogens and Sulphur. Do not use instrument in potentially hazardous atmospheres containing greater than 21% Oxygen. The enclosure material is carbon loaded polypropylene and must not be exposed to environments which are liable to result in mechanical or thermal degradation or to damage caused by contact with aggressive substances. Additional protection may be required in environments where the instrument enclosure is liable to damage.

OPERATION

Switch ON

Press and hold either, Bottom Button ⊗ (CSM mode), or Top Button ⏻ (CGI mode), for one second, to switch the instrument and pump ON in fresh air.

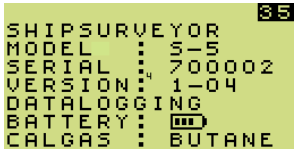


The instrument now begins its 60 second warm-up cycle, during which, a countdown timer appears in the top right hand corner of the display.
The display backlight illuminates and remains ON until the warm-up cycle is complete and then automatically switches OFF.

During the warm-up cycle, if configured, the instrument displays language option then model, serial number, software version, datalogging, battery status and calgas information as shown below.

The battery capacity level is displayed for approximately five seconds during the warm-up cycle, then on the bottom RH corner of the display during normal operation.

Next, the current time and date is displayed. This is followed by the Calibration Due Date then the Service Due Date (if configured).



Each feature has five configurable options:

1. Cal Due / Service Due message is not displayed.

2. Cal Due / Service Due date and overdue date messages are displayed.

3. Cal Due / Service Due message is displayed with user acknowledge if expired.

4. Cal Due / Service Due message is displayed with user acknowledge for extended period, if expired.

5. Cal Due / Service Due message is displayed with user shut-down, if expired.

The next feature in the instrument warm-up cycle is sensor zeroing.

Finally, in CGI mode only and if configured, a ‘WARNING’ display alerts the user that alarms are disabled in this mode and provides the option of continuing operation or automatically switching the instrument off .

On completion of the warm-up cycle, the instrument will automatically select, as default, the LEL range and display the current gas detection reading, as shown opposite.

Range Selection (CGI only)

To change range LEL-VOL GAS-LEL, single press the 'RANGE' Top Btn ⓘ.

Switch Pump OFF / ON (CGI only)

Press and hold 'PUMP' Bottom Button ⊠ to switch the pump OFF / ON.

Zero All Ranges (CGI only) in Fresh Air

Press and hold Bottom Button ⊠ for approximately five (5) seconds.

Then, press and hold 'YES' (Top Button) ⓘ for one second to zero all ranges and return to live readings.

Manual Datalogging

To store a snapshot reading, press and hold 'STORE' (Top Button) ⓘ.

Max / Min Values

To display max. value since switch-on, press 'MAX' (Bottom Button) ⊠.

To display min. value since switch-on, press 'MIN' (Bottom Button) ⊠.
Note: 'MIN' Only applicable to instruments with Oxygen (O_2) sensor fitted.

To erase Max / Min values, press and hold 'CLEAR' (Top Button) ⓘ.

To return to live readings, press and hold 'LIVE' (Bottom Button) ⊠.

Enter (LOC) Location List

Press and hold Top Button  and Bottom Button  simultaneously.

To select next entry in LOC list, press ‘DOWN’ (Bottom Button)  .

To scroll through next entries in LOC list, press and hold ‘DOWN’ (Bottom Button)  .

To select previous entry in LOC list, press ‘UP’ (Top Button)  .

To scroll through previous entries in LOC list, press and hold ‘UP’ (Top Button)  .

To select location and exit LOC list, press and hold Top Button  and Bottom Button  simultaneously. Note that ‘LOC’ names must be pre-loaded.

Acknowledge Alarms (CSM only)

To clear a latching alarm, press and hold ‘ACK’ (Bottom Button)  after the detected gas level has fallen below the alarm limit.

To mute a non-latching alarm, press and hold ‘MUTE’ (Bottom Button)  .

Switch OFF

Press and hold the Top Button  . Keep button depressed while OFF sequence countdown completes.

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