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User Manual
Gas Detection System
Manual version 15D

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User Manual
Gas Detection System
Manual version 15D

The purpose of this user manual is to provide the descriptions and procedures required to operate and maintain the Gas Detection System, Manual version 15D in a safe and efficient manner. This system is designed to detect hydrocarbon and other gases.

VIMEX-E-USM-003 / Rev. 02

Revision status

Revision	Date	Prepared	Checked	Approved
Rev. 01	08.08.2014	HJA		
Rev. 02	28.08.2017	ALI	HJA	TESA

Document history

Revision	Reason for issue
Rev. 01	First issue.
Rev. 02	Updated to Vimex new graphic profile.

Important

Before using the equipment, read all instructions thoroughly and follow all precautions and warnings contained within this document. Improper use may cause personal injury and/or damage to the equipment, and may void the warranty. Vimex AS disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

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Acronyms and abbreviations

GDS	Gas Detection System
PLC	Programmable Logic Controller
IR	Infrared
PLC	Programmable Logic Controller

Admonitions

Note	*Text set off in this manner presents clarifying information or specific instructions relevant to the immediate instruction.*
Caution	*Text set off in this manner provides a warning notice that failure to follow the directions in this caution can result in damage to equipment.*
Warning	***Text set off in this manner provides a warning notice that failure to follow the directions in this warning can result in bodily harm or loss of life and/or extensive damage to equipment.***
DANGER	***TEXT SET OFF IN THIS MANNER PROVIDES A WARNING NOTICE THAT FAILURE TO FOLLOW THE DIRECTIONS IN THIS WARNING WILL RESULT IN BODILY HARM OR LOSS OF LIFE AND/OR EXTENSIVE DAMAGE TO EQUIPMENT.***

1 Introduction

1.1 Purpose

The purpose of this user manual is to provide the descriptions and procedures required to operate and maintain the Gas Detection System, Manual version 15D (GDS) in a safe and efficient manner.

A thorough understanding of system functions and controls is necessary to optimise overall performance. Careful study of the information in this manual is highly recommended, preferably while exploring the system's various functions.

Please note that some of the topics described in this manual may be not valid for your system. Depending on the configuration on your system some functions may not be installed. The headings for these topics are in *italic*.

Please contact Vimex if you have questions regarding the configuration of your system.

1.2 Approval

Vimex GDS has been tested and evaluated by the Det Norske Veritas (technical report no. 97-1333). The gas detection system has been EMC/Environmentally tested according to the following specifications:

- Ship classification society: ABS, BV, DNV, GL, LR, NK and RINA.
- CENELEC standards: EN 50081-2, EN50082-2

The system is type approved by the following classification societies:

- DNV (certificate no. A-13791)

1.3 Contact details

For enquiries related to sales, service, support, maintenance and spare parts, please contact us at:

Vimex AS
Visiting address: Wirgenesvei 10
N-3157 Barkåker, Norway
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Service coordinator e-mail: service@vimex.no
Spare parts e-mail: spares@vimex.no

To assist us in making improvements to the product and to this manual, we welcome comments and constructive criticism at editor@vimex.no.

2 General safety rules

Safety precautions must be followed at all times during installation, operation and maintenance of the system.

Personnel shall be sufficiently qualified, and proper caution shall be taken to avoid injuries or damage to life, health, environment, equipment and property.

2.1 High voltage

Warning ***ShipCEMS operates at a potentially lethal AC voltage.***

Always switch off all power before installation or maintenance. Adhere to safety precautions and instructions as directed by company policy.

For safety reasons during troubleshooting on the equipment with power ON, two persons must always be present.

Whenever installation or maintenance is carried out, it is essential that a first aid kit is available, and that personnel are familiar with the first aid instructions for electrical shock.

2.2 Hazardous components

Gases may contain trace amounts of hazardous components.

Warning ***Many toxic gases are colourless, odourless and non-irritating, and may overcome exposed persons without notice.***

Personnel should have a thorough knowledge and understanding of the physical properties and safety precautions for the relevant gas samples before operating the system.

2.3 Heavy equipment

The cabinets for the Analyser System and the Sample Conditioning System are heavy units.

Caution	*During installation or replacement of larger units, appropriate safety clothing and certified lifting equipment must be used.*

Do not open cabinet doors while in rough seas. Doors may suddenly swing open and cause damage or injury.

3 System description

3.1 Main purpose

Vimex Gas Detection System is a fully furnished gas detection system for detecting concentrations of hydrocarbon gases below the lower explosion limit. It is especially suitable for monitoring enclosed rooms and void spaces, which normally should not contain gases. The system can also be used for detecting of various toxic gases and may be connected to Vimex's temperature and bilge alarm units.

Vimex GDS is based upon a sampling system for detection in ballast tanks and void spaces, but fixed electrical gas detectors can also be installed in pump rooms.

For the sampling system each point is monitored individually in a repeating cycle. The pump room is continuously monitored independent of the sampling system.

The GDS cabinet with operating panel is shown to the right.

3.2 Main parts

Vimex GDS consists of the following main parts:

- GDS cabinet including
  - Operating panel on cabinet door
  - Detecting unit inside cabinet (consisting of suction pump, gas sensor and calibration equipment)
  - The control unit consists of mimic diagram, alarm- and operating panel, gas monitor, programmable logic controller (PLC), and necessary power supply and distributing equipment for the complete system.
  - Circuit breakers (F1 for main supply and F2 for all 24 VDC)
- Sample detector system
- Fixed gas detectors for pump room (optional)
- One or more remote alarm panels (optional)

4 Functional description

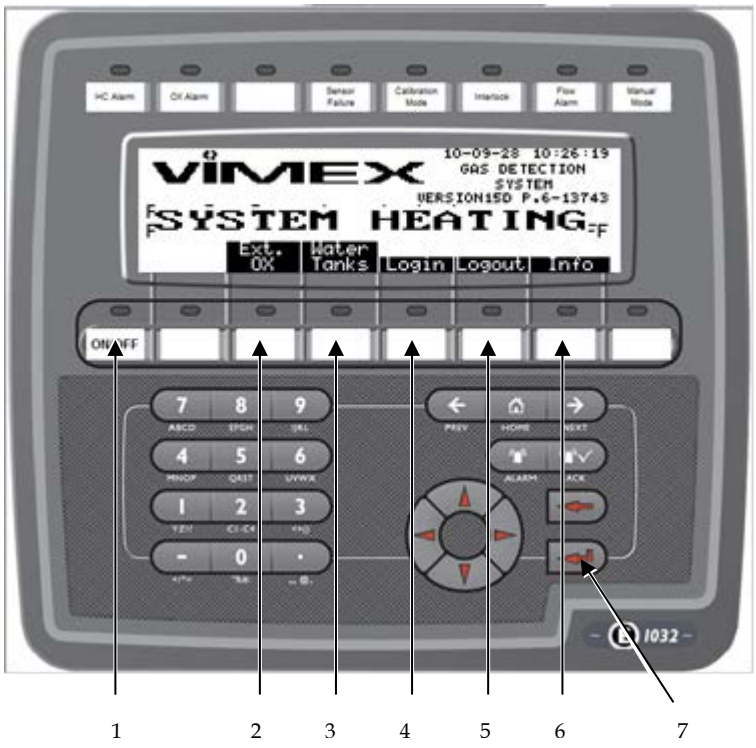
4.1 GDS cabinet

- Operating panel on cabinet door
- Detecting unit inside cabinet (consisting of suction pump, gas sensor and calibration equipment)
- The control unit consists of mimic diagram, alarm- and operating panel, gas monitor, programmable logic controller (PLC), and necessary power supply and distributing equipment for the complete system.
- Circuit breakers (F1 for main supply and F2 for all 24 VDC)

The lines and cables from all detecting units enter at the side of the cabinet.

4.2 Operating panel

The operating panel is located on the cabinet door and is operated without opening the door.

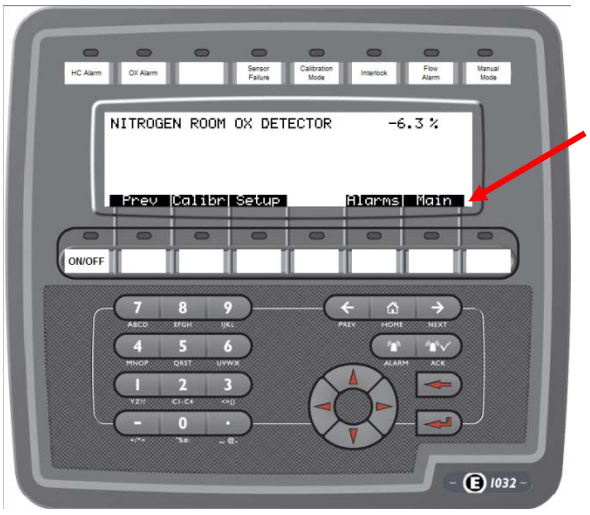


1. On/ Off
2. Pump-room menu
3. Ballast tank menu
4. Login(Default 1234)
5. Logout
6. Info menu
7. Enter

Figure 1 Operating panel

4.2.1 Layout for the Pump Room Menu

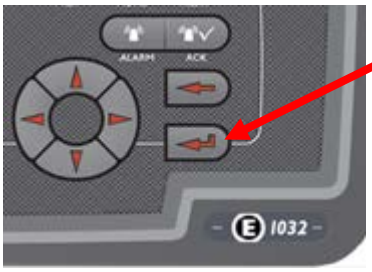
Refer to Figure 1 and press button 2 (Pump-room menu). Press "Prev" to return to previous view or "Main"

Pump Room Menu	
 *"Main" in Pump Room Menu*	This menu appears if fixed detectors are included in system. This menu shows the value of the fixed sensors. The sub-menus are: • Prev • Calibr • Setup • Alarms • Main (Refer to Figure 1)
Calibration Menu	
	Select "Calibr" to enter this menu. This menu shows the value of fixed sensors when calibrating and prevents alarm to occur. This menu also appears if fixed detectors are included in system. Refer to chapter 7.2.3.

Setup Menu, Al. Level	
	Select "Setup" to enter this menu. Settings of alarm levels on fixed detectors. This menu only appears if fixed detectors are included in yours system.
Alarm Menu	
	Select "Alarms" to enter this menu. All activated alarms will be shown in alarm list specified with date and time. Refer to chapter 8.

4.2.2 Layout for the Ballast Tank Menu

Refer to Figure 1 and press button 3 (Ballast Tank Menu). Press "Prev" to return to previous view.

Ballast Tank Menu	
	This is the operating window for sampling system. The sub-menus are: • Prev • Manual Sample • Manual Purge • Calibration • Interlock • Setup
Manual Sample Menu	
	Select "Manual Sample" to enter this menu. Press a numeric key to select wanted tank number. Press enter to activate manual sample of one specific tank.  Refer to chapter 7.4.

Manual Purge Menu	
	Select "Manual Purge" to enter this menu. Press a numeric key to select wanted tank number to purge. Press enter to activate manual purge of one specific tank. Also refer to 6.5.2.
Calibration Cabinet Menu	
	Select "Calibration" to enter this menu. This menu is for sensor inside of cabinet. Alarms will not occur when calibrating mode is activated. See also 4.1.1 • "Zero Calibr" zero calibrates sensor • "Stop Calibr" stops zero calibration. • "Span Calibr" span calibrates sensor • "Stop Calibr" stops span calibration. Alarms will not occur when calibrating mode is activated. Refer to chapter 7.1.1 Refer to chapter 7 for more information.

Interlock Menu	
	Select “Interlock” to enter this menu. In this menu tanks are interlocking. Interlocking means locked out of sequence. E.g. if tank 4, 5 and 6 are interlocked, the sequence will be 1, 2, 3, 7, 8 etc. Use arrow up and down to go to wanted tank and “Enter” to lock out or in selected tank. Text for selected tank will change from “Unlocked” to “Locked” if activated. *Note Locked tanks will not be analysed.* Refer to chapter 6.9.7 for more information.
Setup Menu, Al. Level	
	Select “Setup” to enter this menu. Set Sample time, Purge time, Low gas alarm, High gas alarm limits.

4.3 Power supply

The internal power distribution consists of:

- Main Supply
  The control cabinet must be connected to 110/220 VAC, 1 phase 50 to 60 Hz, from a 10-ampere circuit unless otherwise specified.

- Circuit Breakers
  F1: Main breaker for 110/220 VAC main supply
  F2: Main 24 VDC breaker

- 24 VDC Supply to power all 24 VDC parts in the system
- Pump room detectors (optional)

5 Installation

Refer to:

→ *[(004) VIMEX-E-INS GDS] - Installation Manual Gas Detection System*

6 Operation

1. Pump-room detection sensors start to operate when the circuit-breaker in cabinet is switched on. (*If fitted*)
2. To operate the buttons on the operating panel, log on to the system by pressing the "Login" button (4).

   Default password: 1234, for operator level 1.
3. Press "Ext. detectors" button, to see status at the external detection sensor, change al. level, calibration
4. Press "On/Off" button (1) to start the sampling-system.
5. When the system has been switch on, the screen will change to "Ballast Tank Menu". (Refer to chapter 6.1.1.)

6.1 Air purging

6.1.1 Automatic purging

All sample tubes will purge immediately before the sampling of each point is started. The purging takes place during the ventilating phase of the gas sensor house. The text display will give a message during the purging sequence.

Ballast Tank Menu

Note	*Locked-out points will not be purged. Ballast Tank Menu, start up mode.*

6.1.2 Manual purging

Manual purging can be done from the operating panel as follows:

When the text display is showing "Manual Purge", “Enter number of the tank(s)”, you want to manually purge, then “Enter” to select it. The system will then start purging the selected point. It will continue purge the selected point until "Manual Purge Menu" has been exit, or another point is selected.

Step	Description	
1	Start at main menu.	
2	Press “Ballast Tank Menu”. Where?	
3	Press "Manual Purge". Display message: “Select Sample point and press “Enter 0” Sample point.: _____”	 
4	Enter number of the tank(s)” to manually purge.	

Step	Description	
5	Press “Enter” to select it. The system will start purging the selected point. It will continue purging the selected point until "Manual Purge Menu" has been exit (press manually), or another point is selected.	

6.2 Central control unit= Operating panel

6.2.1 List of sampling points

A list of all sample points is found on all Vimex GDS operating panel. This is a customer specific application and identifies each sampling point. The sampling point number is the common identification throughout the system; it is used on main cabinet as well as in the drawings and documentation.

Correct figure?

a) If a gas concentration higher than the lower alarm limit, (normally 15% LEL), has been detected from the sample point, the Alarm Menu will appear automatically. The text in the Alarm Menu shows which point there is Low gas alarm.

b) If a gas concentration higher than the upper alarm limit, (normally 30% LEL), has been detected from the sample point, the Alarm Menu will appear automatically. The text in the Alarm Menu shows which point there is High gas alarm. To verify

the alarm press the "ACK" button.

"ACK" BUTTON

c) If the flow of air in the circuits are lower than the alarm limit, (normally 50-75 l/h), has been detected from the sample point, the Alarm Menu will appear automatically. The text in the Alarm Menu shows which point there is Flow alarm. To verify the alarm press the "ACK" button.

(E.g. blocked sample tube).

The Flow alarm will remain indicated on the LED until the system start purging the next point. Next time the system is scanning the same point; the Alarm will go off again if the alarm conditions are still present.

6.3 Detection Unit = Inside cabinetPicture

6.3.1 Explanation of principle

a) The suction tubes are run from the respective sample points on the ship (pump room, cofferdam. pipe tunnels etc.) to the cabinet placed in a safe area.

b) The scanning continues by alternating purging and sampling. When the last sample point in the sequence has been purged, sampling starts again from the first point and continues as previously described.

~~6.4 General~~

~~Vimex GDS consists of the following major items:~~

~~a) The control panel unit is placed in a separate operating cabinet or in main cabinet door. The detecting unit contains a suction pump, a gas sensor and calibration equipment, and may be placed in a common main cabinet with the control unit or the control unit in a separate cabinet.~~

~~b) Fixed gas detectors for pump room (*if fitted into system*)~~

c) The control unit consists of mimic diagram, alarm- and operating panel, gas monitor, programmable logic controller (PLC), and necessary power supply and distributing equipment for the complete system.

d) The system may be delivered with alarm log printer.

e) Option: One or more remote alarm panels

6.5 List of alarms

6.5.1 Flow alarm

Flow alarm is activated when the indicator-ball in the flow meter is under the adjusted flow alarm level. It indicates that one or more sampling points have a flow alarm. If the alarm goes in "Span Calibration" mode, the test gas bottle is empty.

6.5.2 H2S alarm

H2S alarm is activated when the gas monitor registers a gas concentration higher than the alarm level (6ppm default setting). This indicates that one or more sampling points have an H2S alarm (which points are indicated in alarm list).

6.5.3 Low gas

Low gas alarm is activated when the gas monitor registers a gas concentration higher than the lower alarm level (15% LEL default setting). This indicates that one or more sampling points have a low gas alarm (which points are indicated in alarm list).

6.5.4 High gas

High gas alarm is activated when the gas monitor registers a gas concentration higher than the upper alarm level (30% LEL default setting). It indicates that one or more sampling points have a high gas alarm (the actual point is indicated in alarm list).

6.5.5 Malfunction

Malfunction alarm is activated when there is a faulty connection/low signal output between gas sensor and monitor, or if a pump failure is registered (thermal relay for pump is activated).

6.6 Main components - Pump room / Sample detector system

6.6.1 *Crowcon Xgard Type 5 HC enten eller*

For more information on the detectors, please see section 4 of the Gas Detection Systems complete manual.

6.6.2 *Crowcon Xgard Type 2 H2S*

For more information on the detectors, please see section 4 of the Gas Detection Systems complete manual.

6.7 Main components - Sampling system skap

6.7.1 Calibration gas

Test gas, (50% LEL Methane in air and 25ppm H2S in N2 from disposable bottles). Test gas can be ordered from Vimex AS. This gas is certified and has a concentration of 50% LEL or 25ppm. Normal valve setting is 60 l/h.

Caution	*Use of lighter gas or other pure gases for test ~~would influe on~~ influence the sensitivity and will speed up gradually decrease of sensor head!*
	Use only 50% LEL gases.

6.7.2 Closing valves

Each sampling line is fitted with a closing ball valve.

The valve is used when a sampling tube is permanently disconnected from the system and during service of tubes or flame arrestor.

Regarding sampling tubes in the ballast tanks, the valve should be closed if the end of tube is below the water level in the tank.

6.7.3 Flame arrestors

These are installed inside the detection cabinet as a part of the sample tubes. When changing or servicing the flame arrestors, the respective closing valve must be closed (see Closing Valves). The purpose of the flame arrestor is to prevent a possible ignition of combustible gases in the detection cabinet.

6.7.4 Flow alarm

To indicate "Flow Alarm" a sensor is fitted on the flow indicator that is connected to a flow alarm unit. Output from the flow alarm unit is connected to input in the PLC and gives alarm when flow failure occurs (blocked tube). The flow alarm is only mounted on the flow indicator for the flow into the gas detector.

6.7.5 Flow Indicator (20-250l/h)

This consists of a glass tube with a steel ball and a regulating valve to allow adjustment of the gas flow. This flow regulator/indicator is used to regulate the flow of the sample into the gas detector. It is to be set to approx. 50-75l/h.

6.7.6 Solenoid valves/manifold

The system is fitted with 3-way solenoid valve to control the sampling and purging and calibration facilities. The valves are controlled directly from PLC outputs (24VDC)

6.7.7 Flow indicator (100-1000l/H), Bypass

Since the gas detector is connected to the pressure side of the vacuum pump, a flow indicator/regulator is installed for by passing the gas detector. This is to avoid the high flow output from vacuum pump to enter the gas detector. This would have caused unstable readings on the gas detector

The flow indicator is set to approx. 750-1000 l/h.

6.7.8 Steel cabinet

The cabinet is manufactured from cold rolled corrosion treated steel plate.
Final coat is epoxy varnish, Colour RAL 7035(grey).

6.7.9 Tubes and fitting

a) All fittings are manufactured to withstand vibration, temperature changes and other external stress, which may influence normal operation of the gas detection. It is recommended to re-check all fittings after a reasonable time of operation. Possible leaks in the system will cause false air to be drawn in and result in a lower reading of gas concentration.

b) Test gas should be applied directly to the sample point inlets at least four times a year. The readings obtained from the gas monitor must correspond to those obtained during span calibration. If a lower reading is obtained, it indicates a leak in the system, which must be located and corrected.

6.7.10 Vacuum pumps

Caution	*Do NOT lubricate the vacuum pump. It is a dry "oil less" type of air pump.*

The precision-made carbon vanes have a limited lifetime. Make sure that the pump is always working with an atmosphere as clean as possible. It is important to clean/replace filters and perform regular purging.

To ensure that the system will have an operational vacuum pump in backup to avoid operational downtime, the system has two vacuum pumps installed operating on a duty-standby configuration. The standby vacuum pump will automatically start and take over for the duty vacuum pump in case this pump breaks down or faces any malfunction.

6.8 Operating panel

6.8.1 Accept (ACK)

This cancels the audible alarm and reset common alarm LED's without resetting any alarm indications.

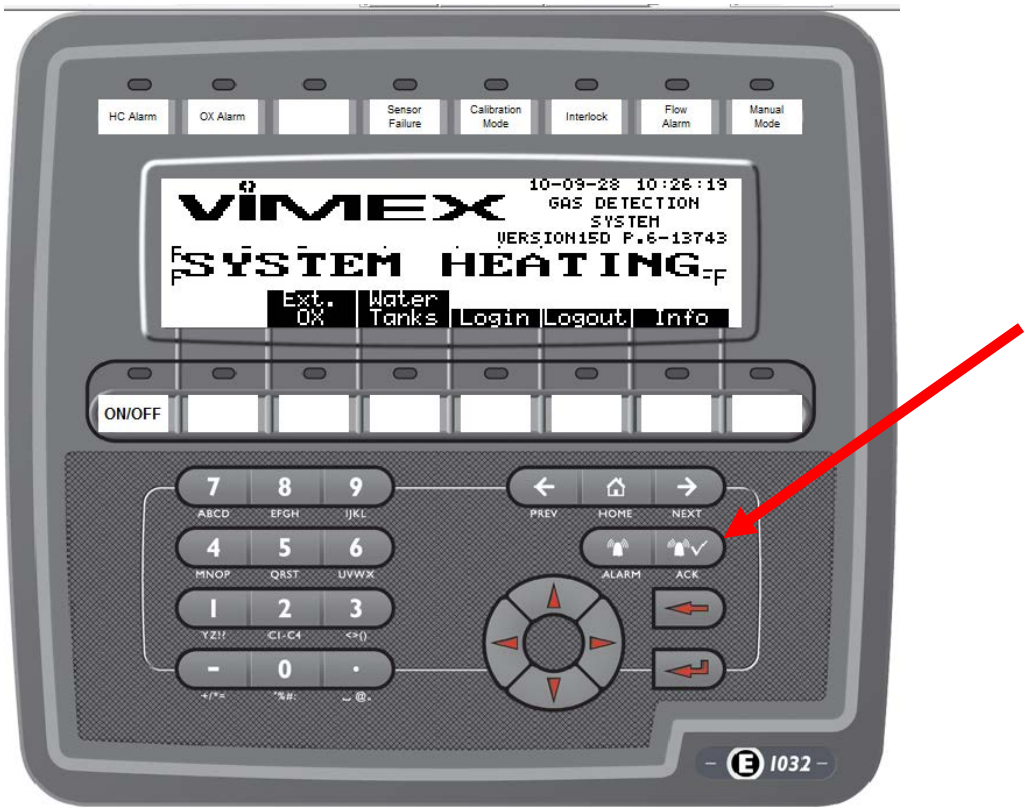


Figure 2 Accept button (ACK)

6.8.2 Adjust setup

The “Setup” mode is used to set purge/ sample timer and gas alarms.

It is accessed either through:

- 2. Pump-room menu or
- 3. Ballast tank menu

Note	*If you do not want to change any of the values when system is in "Setup" mode, press “Prev” to go back to “Ballast tank menu”.*

6.8.2.1 PURGE TIMER

When entering “Setup” the Purge time is the first value to adjust, you are able to set purge timer input. (Use numeric keys to enter new value and then press "Enter".) After pressing "Enter", use “Prev” (previous) if you like to go to previous mode without adjusting Sample or other alarm levels.

Purge timer input is set for approx. 10 seconds from factory. This time is only a recommendation. Ensure that the purging air reaches the end of the sampling point when the system is purging.

6.8.2.2 SAMPLE TIME

Use the "arrow down" button to select Sample time and set the new sample time input. (Use numeric keys, and then press enter to take effects.)

Sample timer input is set for about 50 seconds from factory. This is a recommendation, but note that the system must scan all sampling points within half an hour and the sensor must have time to react if combustible gases occur.

Note	*You could check the time it takes from the farthest off tank to enter the detector, to find out how long time you have to set on sample. It is best to get this time as little as possible, but make it long enough to give the sensor time to analyse the air.*

6.8.2.3 LOW LEVEL ALARM

After adjusting the Sampling time, you will be able to set the low level alarm (15 % LEL) by using the arrow one step down then use numeric keys and then press “Enter”.

6.8.2.4 HIGH LEVEL ALARM

After adjusting the low level alarm use arrow down to jump to High level alarm(30 % LEL) and use the numeric key, then press "Enter".

6.8.2.5 OXYGEN LEVEL

(*Only when fitted into system*): Use arrow to select Oxygen and use numeric keys to enter new value, and then press "Enter". A new "oxygen alarm level" for the system is now set.

6.8.2.6 H_2S ALARM LEVEL

(*Only when fitted into system*): Use arrow to select "H_2S" and use numeric keys to enter new value, then press "Enter". A new "H_2S alarm level" (PPM) for the system is now set.

6.8.3 Arrow down

Use arrows to select detectors in pump room.

6.8.4 Arrow up

Use arrows to select detectors in pump room.

6.8.5 Calibration

Select "Calibration" from Ballast tank menu window ~~to go to Calibration~~. This affects only sample sensor inside of cabinet.

Zero calibration is initiated by pressing "Zero Calibration" button. It is acknowledged by the text display. This allows fresh air to be sampled through gas detector for performing zero calibration. To quit, press "Stop Calibration".

Note	*Putting system in "zero calibration" will block any alarms while performing calibration of detectors in pump room.*

Span calibration is initiated by pressing "Span Calibration". It is acknowledged in the text display. To quit, press "Stop Calibration". This allows calibration gas to flow through the gas detector for performing span calibration.

The gas alarms (HIGH- and LOW alarm level) are blocked during the span calibration mode. No alarms caused by the calibration gas will be indicated. Should the test gas bottle become empty, a flow alarm in span mode will start.

Note	*During all calibration automatic scanning is stopped. The system is still, continuously drawing gas samples from all open sampling points.*

6.8.6 Enter

Accepts and stores selections and settings.

6.8.7 Interlock points

This function button can lock out any sample point selected. It can be used if the space outside a sample point is filled with liquid.

In such case:

1. Go to the actual sample point and use numeric keys to select point(s)
2. Press enter.
3. The lamp “Interlock point” is activated and the corresponding text to the actual point(s) change to “locked”. This point is now locked out of the sequence, and the sample point will automatically be by-passed during the sampling and purging sequence.

Note	*No gas samples will be registered from a locked-out point.*
Note	*Always remember to close the closing valve just after the sample points are locked out.*

It is necessary to close a sample point, when the sample area is filled with oil or water, when a continuous gas concentration higher than the lower alarm limits, or during service (e. g. changing a flame barrier).

Closed point may be re-opened as follows:

1. Open the closing valve.
2. Find the right sampling point display in "Interlock" menu.
   Give an impulse by pushing the "ENTER" button at this point.

The system has a built-in “lock all wet” function. This function is shown under the interlock menu, and will, when activated, lock out all ballast tanks from the sampling sequence.

When the “lock all wet” function is used the system cannot open any of the already interlocked tanks. To only interlock a few tanks you must use the normal interlock mode.

6.8.8 Main password where?

The system is protected by password on E-1032 panel. The security consists of two password levels.

Level one (1) gives restricted use. Password is 1234.

Level eight (8) gives un-restricted use of the system. Only qualified personnel as Chief Engineer should enter. The password is 5678.

6.8.9 Manual purge

Press the "Manual Purge" function button to enter manual purge. This is acknowledged by the text display. To select sample point, enter the desired sample point number and press enter. To end manual purge and return auto mode, press "Prev". The display will show the number of the last sample point as is been examined.

6.8.10 Manual sample

Used for manual sampling (same menu as Manual Purge).

6.8.11 System on

A green indication lamp shows that the system is on. ~~The lamp is always on if the system is turned "On"~~.

If the lamp turns off, it is either a power failure or a system failure in the PLC. If it is a system failure, call Vimex AS for further instruction.

6.8.12 ~~Resetting to default values~~

~~*Note This function is not fitted on all systems.*~~

~~Follow the steps below to restore factory settings:~~

1. ~~Shutdown system Where?~~
2. ~~Press "Fuse F2" off. Where? Inside cabinet~~
3. ~~Wait 10 sec~~
4. ~~Press Fuse F2 on again.~~

~~The "First Scan" on PLC will reset default purge/sample timer and alarm levels.~~

~~Contact Vimex if you have questions regarding the configuration of your system.~~

6.9 Programmable Logic Controller (PLC)

The central control cabinet is built up around a PLC. This is the "brain" of the system which receives all signals from operating panel, control units, motor contactor, sensors etc. and controls all solenoid valves, contactors, relays, indication lamps, LED's and audible alarms.

6.10 Remote alarm panel

This consists of:

- Audible alarm
- Lamp test push button
- Low gas alarm indication
- High gas alarm indication
- Malfunction alarm indication
- Flow failure alarm indication
- Accept push button
- H_2S alarm pump room indication (Only when fitted into system)
- HC alarm pump room indications (Only when fitted into system)
- Oxygen alarm pump room indication (Only when fitted into system)
- System on indication
- Sample points interlock common indication
- Dimmer for LED's

7 Operating instructions

7.1 Calibration of detectors

~~Please note that in this chapter we have included calibration instructions for all detectors available for the Vimex gas detection system. Please select the detectors your system is equipped with and ignore the others.~~

The detector heads sensitivity will decrease with time. It is therefore necessary to check the zero level and sensitivity of the detector once every third calendar month, and if necessary, adjust to correct values.

- For flammable gas detectors clean air is used for the zero calibration, while span calibration is achieved using a test gas, (calibrating gas), with a concentration of 50% LEL Metane in air, (0,9% volume Butane in air).

- For oxygen detectors clean air is used for span calibration (20.9 % oxygen), while zero calibration is achieves disconnecting sensor head or using nitrogen (100%).

7.1.1 Calibration of detectors

7.1.1.1 Crowcon Xgard Type 5 HC

See manual section 4

7.1.1.2 Crowcon Xgard Type 2 H2S

See manual section 4

7.1.2 Safety precautions

- Always carry out "Zero Calibration" after span calibration.
- All scanning is automatically stopped during calibration.
- Observe the central control cabinet for at least a complete cycle after calibration.
- Enter all calibrations in the logbook.
- Calibrate once every 3 month.
- Report to ship's Safety Officer before calibration. Calibrating while system is "zero calibration" will block alarms when calibrating detectors in pump room.

7.1.3 Operation

Calibration of the detector in the Vimex GDS sampling system is carried out from the central control cabinet and fixed sensor at their location.

7.1.4 System shut down

Push the "Off" button to stop the system. The pump will run for approx. 1 minute to dry up pump.

Display shows: “System shutting down, running pump dry”

7.1.4.1 Main supply

To disconnect the control cabinet, disconnect circuit breaker F1 inside control cabinet. Main voltage will still be present up to the breaker, unless power is switched off at an external main breaker, or fuses removed externally. If you have an external breaker in the circuit to the control cabinet, write this in this chapter and on the circuit diagram.

7.1.4.2 Sample tube closing valves

It is recommended to shut all closing valves outside the cabinet, if the system is to be disconnected for a longer period.

7.2 Manual purging

a) From the Main Menu: Enter “Ballast Tank Menu”, then "Manual Purge" button.
b) When the text display shows "Manual Purge" turn to the point desired by using the numeric buttons then press “Enter”.
c) Return to automatic mode by pressing "Prev" or “Main”

7.3 Manual sampling

If for any reason a sampling point should be checked further, it could be manual checked as follows:

a) From the Main Menu: Enter “Ballast Tank Menu”, then "Manual Sample" button.
b) When the text display shows "Manual Sample" turn to the point desired by using the numeric buttons then press “Enter”.
c) Observe the gas concentration in the display.
d) Return to automatic mode by pressing "Prev" or “Main”

7.4 Start-up procedure

Use for the first time or after black out.

a) Check that “On/Off” LED is not lighted (system off).
b) Check that all circuit breakers (F1, F2) inside the cabinet are on.
c) Check that filters for vacuum pump and purging air are OK.
d) Log on to system
e) Push the On button to On position (green light indicate start) and check that the vacuum pump starts.
f) Check that the text display shows "Start Up Procedure, Purging All Sampling Points".
g) After the start-up procedure, the system goes to auto mode. Check that the following indication lamps are lit:
    - Green lamp system “On/Off" are lighted.
    - Green LED's on PLC inside cabinet labeled "Run".
    - Text display shows 0% LEL, (no gas in the system).
h) The gas flow indicated on the flow meter, (top edge of the floating ball), should be between 50 and 100 liters/hours. The regulating valve adjacent to the flow meter can adjust this. It is recommended to remain at the central control station for at least a complete cycle to check all functions.
i) The flow in the by-pass flow meter should be adjusted to maximum flow.
j) Adjust Sample timer to 50 seconds, and Purge timer to 10 seconds, if not already adjusted.
k) Please note that when the system is put into operation after being shut off for a while, all alarms from the detectors are inhibited for 30 minutes. This is to avoid false alarms that might occur when the detectors are heating up to enter normal operation.
l) Check the lamp test on the remote panel(s) at the earliest opportunity.

8 Alarms

8.1 Response to alarms

8.1.1 Flow alarm

1. Cancel audible alarm with “ACK”.
2. Check on the alarm list which sample tubes are completely or partly blocked.
3. Change to manual sample described above in ~~1.1 (c).~~ 7.3 Manual Sample?
4. Select point on display as described above.
5. Press "Sample Manual" as described above for at least one minute or until a new flow alarm is obtained.
6. Cancel audible alarm with “ACK”.
7. Purge the sample tube manually by pushing "Purge Manually" button.
8. Repeat (c) if no flow alarm occurs. Return to automatic mode. If the manual purging not clear the tubes, shut the sample tube by closing the valve and lock out the point as described earlier (Interlock).
    a) Check the flame barrier and clean if necessary.
    b) Check the pipes for damage or blockage and correct faults.
    Remember to cancel "Lock Out" to ensure that the sample point is included in the scanning sequence.

8.1.2 Gas alarm

1. Cancel the audible alarm with “ACK”.

2. Check alarm list to locate in which sampling point the gas has been registered.

3. Press "Sample Manual", read the gas concentration.

4. If gas is present, necessary steps to be taken according to the Vessel's Safety Manual.

Note *Vimex GDS cannot detect any combustible gases in an inert gas atmosphere unless an IR detector is fitted (special delivery).*

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5. If a continuous gas concentration is registered, (alarm triggered by this sample point in every cycles), the respective closing valve should be shut and the point locked out. The space must be considered hazardous until it is cleared of gas, for maintenance and repairs.

6. Return to automatic mode.

8.1.3 Malfunction alarm

8.1.3.1 Pump failure

The cause of this can be broken fuses or motor break down.

1. Check contactor K1 and over current relay.
2. Check the electric motor.

8.1.3.2 Sensor failure

1. Calibrate the sensor. After calibrating, return to auto mode. If no alarm occurs, the system can continue in auto mode.
2. If pt. 1 is done, but you still have malfunction sensor failure, the sensor head must be changed. Average lifetime of a sensor head is 3 years for HC detectors, 18-24 months for H2S detectors and 12-18 months for O2 detectors.

9 Maintenance

9.1 Maintenance schedule

Maintenance routines must be performed regularly as stated in the following tables to ensure optimal performance and a long operational life of the system and its components.

The preventive maintenance program shall by defined time intervals guide the technician through an inspection, repair and replacement program. This will reduce the number of alarms.

The proposed maintenance schedule must be accommodated to authoritative legislation and actual operational conditions. The customer should thus work out a local maintenance plan.

Note	*The maintenance schedule indicates the maximum recommended intervals between which the various routines should be performed. Intervals should be decreased with increased use of the system.*

9.1.1 Daily routine

Unit	**Remarks**
Heated sample line	Check temperature by hand Sample tube should be noticeably warm at probe outlet and cabinet inlet
All instruments	Check instrument displays for fault messages

9.1.2 Weekly routine

Unit	**Remarks**
Cooler unit	Check that air inlet and outlet vents are free from sand, dust or other foreign matters
Analyser Module	Check flow on span and air inlets by using flowmeter mounted on lower support bracket of Analyser Cabinet. (LOGO Function F4) Normal flow is 1 to 1.5 l/min Alarm if flow < 0.8 l/min

Unit	Remarks
	Use span check (LOGO function F2) if readings differ from value on calibration gas bottle carry out calibration procedure (LOGO function F3) Intervals for span check may be extended if deviations are insignificant.

9.1.3 Bi-weekly routine

Unit	Remarks
Calibration	Perform bi-weekly calibration (LOGO function F3) Vimex recommends calibration every two weeks to make sure the analyser is accurate at all time. Intervals may be extended if the deviation is insignificant

9.1.4 Monthly routine

Unit	Remarks
Detector head	Check the zero level and sensitivity of the detector monthly, and if necessary, adjust to correct values.
Cabinet and unit exterior	Clean all surfaces. Protect fixed detectors (oxygen) from water.
Calibration	MANDATORY (but bi-weekly is recommended by Vimex) To be in compliance with the type approval certificate issued for this analyser, manual calibration must to be performed every 30 days. Perform calibration (LOGO function F3)
Sample line inside cabinet	Check all tubing visually for condensation, contamination and leaks
Sample probe filter	Check for contamination and physical damage Replace filter element if required. Vimex part no: 500840
Sample gas filter	Visual check for contamination and physical damage, replace as required. May be replaced earlier if flow is reduced to such a level that alarms are active Vimex part no: 500831
Particle filter in optional Air Filter Unit	Check filter for contamination. Replace if required. Vimex part no: 500827

Unit	Remarks
Oil absorbing filter in optional Air Filter Unit	Check filter for contamination. Replace if required. Vimex part no: 500828

9.1.5 Routine every three months

Unit	Remarks
Detectors	Calibrate
Sample probe filter	Replace filter element Vimex part no: 500840
Sample gas filter	Replace filter element (May be replaced earlier if flow is reduced to such a level that alarms are active.) Vimex part no: 500831
Particle filter in optional Air Filter Unit	Replace filter Vimex part no: 500827
Oil absorbing filter in optional Air Filter Unit	Replace filter Vimex part no: 500828
Calibration gas cylinder	Check expiration date on cylinder. Order new cylinder if pressure drops below 50 barg

9.1.6 Yearly routine

Unit	Remarks
Sensor head oxygen detector	Replace sensor.
Heated sample line	Check for moisture and contaminations Clean as required
Gas pump membrane	Check physical condition Replace if required (*) Vimex part no: 500838
Solenoid valves	Perform functional test Perform leakage test

9.1.7 Routine every 18-24 months

Unit	Remarks
Sensor head H2S detector	Replace (Average lifetime is 18-24 months for H2S detector). Replace before if necessary. Vimex part no: TBA

9.1.8 Routine every three years

Unit	Remarks
Sensor head HC detector	Replace (Average lifetime is 3 years for HC detector). Replace before if necessary. Vimex part no: TBA

10 Spare parts lists

Note that item numbers refer to general arrangement drawing TBA.

Item no.	Description	Vimex part no.
	Sensor head H2S detector TXgard-D H2S Sensor head 0-25ppm ??	500015 ??
	Sensor head HC detector Analox HC Sensor head ??	500908 ??

11 Drawing references

Note that [nnnn] is used as number identification for standard product drawings, but this is subject to change when specified by contract.

DWG	Description			

VIMEX

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