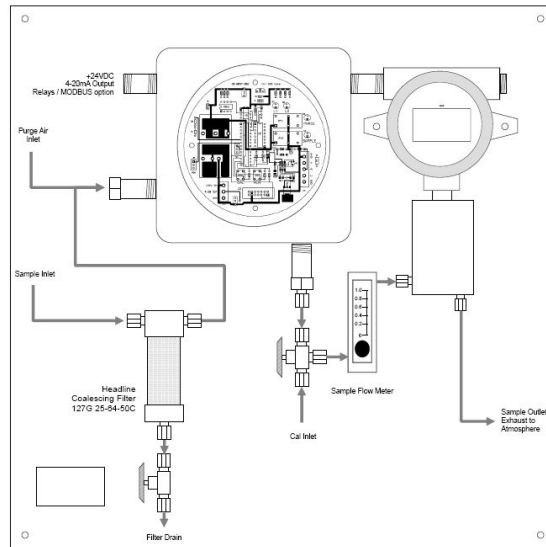


Operation & Maintenance Manual



GDS-68XP

Process Gas Monitor for Low Oxygen Applications

GDS
Corp

Gas and Flame Detection

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CAUTION: FOR SAFETY REASONS THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND INSTRUCTION MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

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CONTENTS

| | |
|---|-----------|
| 1 GDS-68XP PROCESS GAS MONITOR | 6 |
| 1.1 Description | 6 |
| 1.2 Features..... | 6 |
| 2 GDS-68XP SPECIFICATIONS | 7 |
| 3 HARDWARE INSTALLATION | 8 |
| 3.1 Installing the GDS-68XP | 8 |
| 3.2 Standard DC Power & Signal Wiring | 9 |
| 3.3 Sequencer Configuration | 9 |
| 3.4 Optional Alarm Relay / MODBUS Output..... | 10 |
| 3.5 Sample Inlet..... | 11 |
| 3.6 Purge Air Inlet | 11 |
| 3.7 Sample Outlet | 12 |
| 4 INITIAL SETUP | 14 |
| 4.1 Flow Setup | 14 |
| 4.2 Select Sample Sequence Period | 14 |
| 4.2 Adjust Alarm Levels | 15 |
| 4.3 Verify Remote Readings | 15 |
| 4.4 First Time Calibration | 15 |
| 5 OPERATION & MAINTENANCE..... | 16 |
| 5.1 Overview..... | 16 |
| 5.2 Operation | 16 |
| 5.3 Calibration..... | 17 |
| 5.4 Sensor Removal / Replacement | 18 |
| 6 SPARE PARTS..... | 19 |

6.1 GDS-68XP Spare Parts 19

7 WARRANTY 19

7.1 Overview..... 19

8 APPENDIX 20

8.1 Purge Timing Details (Positive Pressure)..... 20

8.2 MODBUS Registers 21

8.3 Moisture Calculations 21

8.3 Dimensional Drawings..... 23

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1 GDS-68XP PROCESS GAS MONITOR

1.1 Description

Thank you for choosing the GDS Corp GDS-68XP Process Gas Monitor for Low Oxygen Applications. The GDS-68XP provides a safe and reliable way to measure the level of H₂S, mercaptans and other gases in a stream that contains low levels of oxygen. The GDS-68XP uses a sample / purge sequencer to alternatively apply sample and purge air to a GASMAX II gas monitor and highly sensitive electrochemical sensor. Applying purge air periodically refreshes the sensor's chemistry, and user-adjustable sampling intervals extend the life of the sensor and reduce the total amount of sample gas required.

The GDS-68XP is designed to either draw samples from non-pressurized (ambient) sources or accept positive pressure samples, from +5 psig to +1500 psig. Multiple filter options are also available. The unit features low-flow monitor and long life brushless DC pump that doubles as a sample draw pump and purge air pump.

1.2 Features

- Designed for Class I Division 1 Hazardous Areas
- Long life Brushless DC sample pump with fixed 0.5 liters-per-minute flow rate
- Integrated flow switch generates 0 mA FAULT signal on 4-20mA output if sample or purge flow is blocked
- Optional 3X Alarm Relays and MODBUS slave interface
- Standard non-isolated 4-20mA current loop output (source)
- High resolution display shows engineering units and trend data
- Built-in user-prompted calibration without declassifying area
- Magnetic interface for non-intrusive operation in hazardous areas

2 GDS-68XP SPECIFICATIONS

- Input Power: +24VDC +/- 10%, 12.5W max.
- Sensor Type: Electrochemical
- Selectable Sample Intervals: Five minutes to four hours
- Analog Output: Single 4-20mA calibrated current loop (source),
- Optional MODBUS / Relay Output with 3x alarm relays and MODBUS slave interface
- Sample flow rate: 0.5 to 1.0 liters / minute
- Purge air flow rate: 0.5 to 1.0 liters / minute
- Maximum sample draw distance: Approximately 500 ft / 160 m
- Inlet and Outlet Fittings: 1/4" Compression
- Dimensions: 21" x 21" x 8"
- Weight: 40 pounds, 18.2 kg
- GDS-68XP (draw) with standard filter: 0.1 micron coalescing filter
- GDS-68XP (positive pressure) with standard filter: 0.1 micron coalescing filter
- GDS-68XP (positive pressure) with combined coalescing / membrane filter

3 HARDWARE INSTALLATION

3.1 Installing the GDS-68XP

Install the GDS-68XP in a suitable location within 100 ft / 33 m of the intended sample location. The GDS-68XP features mounting holes that can be used to securely attach the monitor to a bulkhead or wall. Make sure there is sufficient clearance to install the sample inlet tubing and sample outlet tubing (if used). Also make sure that the Run / Cal valve can operate freely and that access to the Cal Port is not blocked for any reason.

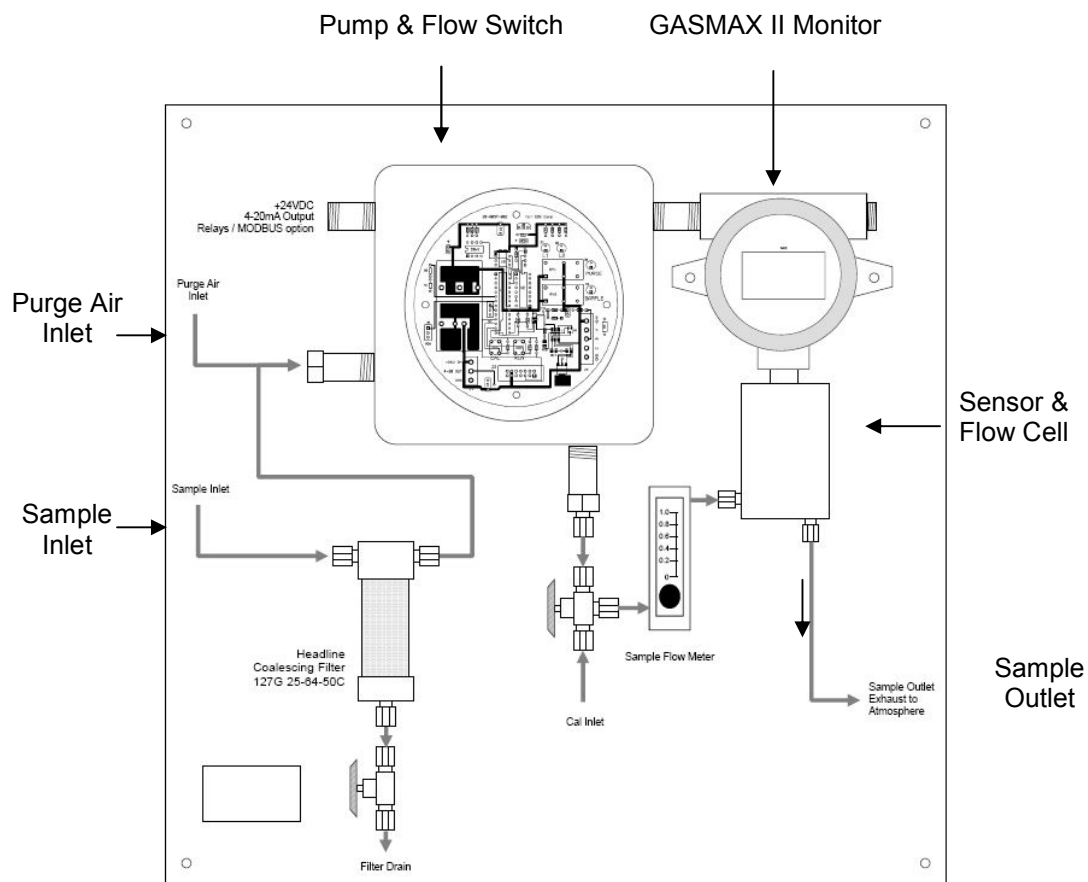


Figure 1 – GDS-68XP Layout (Ambient Pressure)

Note: To ensure that the low flow switch operates properly, the GDS-68XP must be mounted vertically.

3.2 Standard DC Power & Signal Wiring

Remove the cover from the Explosion Proof Enclosure. Connect a source of +24VDC, +/- 10% power to the J1 power supply wiring terminals at lower left (See Fig 2). An external power switch or circuit protection device should be provided by the customer's wiring to allow the unit to be powered off for maintenance. If the area is considered hazardous then all explosion proof wiring recommendations, guidelines and regulations should be observed.

The non-isolated 4-20mA output (current source) is available at Pin 2 on J1. The GDS-68XP includes a built-in flow switch monitored by the internal microprocessor; if the flow switch 'drops out' during a sample draw or air purge cycle for more than 10 seconds, the GDS-68XP microprocessor will drive the 4-20mA output to a FAULT (0.0 mA) condition until flow returns to normal.

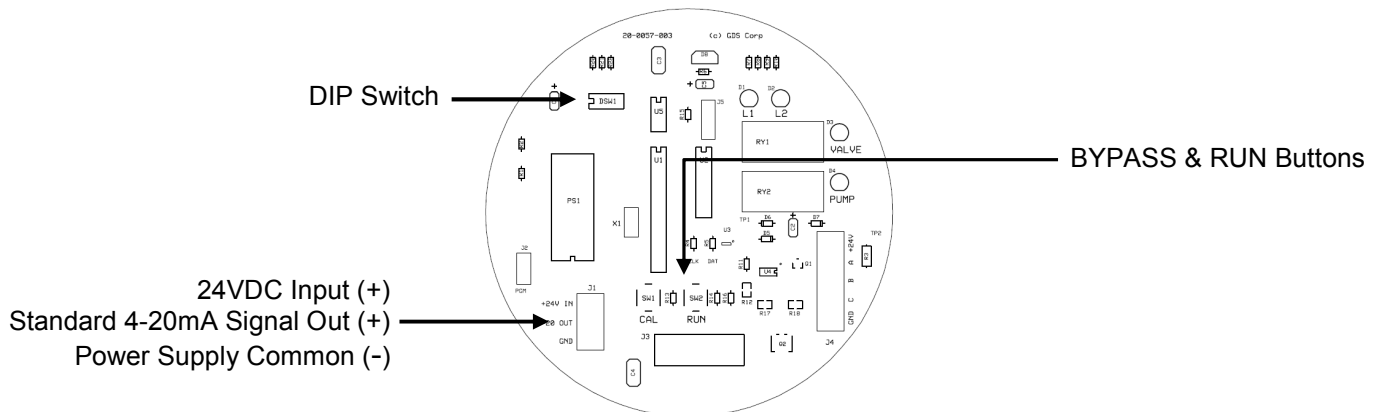


Figure 2 – GDS-68XP Standard DC Input & Signal Wiring

3.3 Sequencer Configuration

There are four LED indicators, two buttons and one dip switch located on the sequencer PCB. L1 and L2 indicate the current operational mode; the VALVE and PUMP LEDs indicate the status of each device, the CAL and RUN buttons are used to change modes and the dip switch is used to select the sample / purge cycle (see Section 4.2).

| Mode | L1 / L2 | Pump | Valve | Description |
|------------------|-------------------|------|-------|---|
| Sample | L1 Flashing | ON | ON | Output held; sample flowing to sensor |
| Store Reading | L1 + L2 Flashing | ON | ON | Calculating and storing new output |
| Purge | L2 Flashing | ON | OFF | Output held; purge air flowing to sensor |
| Sequencer Bypass | L1 / L2 Alternate | ON | ON | Output “live” for continuous reading |
| GMII In Cal | L2 On | ON | OFF | Purge air flowing to sensor while GMII in cal |
| GMII In Cal | L2 Flash | ON | OFF | 30 Second purge following cal cycle |

To enter ‘Sequencer Bypass’ mode, press and hold the BYPASS button on the sequencer PCB during any part of the cycle. Both L1 and L2 will begin to flash in an alternating pattern. When in Sequencer Bypass mode, the valve is configured to send a continuous stream of sample to the H₂S sensor, and the sequencer output tracks the real time value. To exit Sequencer Bypass mode, press and hold the RUN button until the sequencer enters the Sample mode. Sequencer Bypass mode will automatically exit after 15 minutes of operation. Selection of sequencer timing intervals is covered in section 4.2.

3.4 Optional Alarm Relay / MODBUS Output

If the GDS-68XP is ordered with the optional Alarm / Relay board, Alarm 1 (“Relay 1”, TB1 Pins 1, 2, 3) and Alarm 2 (“Relay 2”, TB1 Pins 4, 5, 6) contacts are located on the Relay / MODBUS board attached to the back of the GASMAX II display (See Fig 3). These relays can be programmed via the main menu to close at preset signal levels, and can operate as either “Alarm Above” or “Alarm Below” contacts.

NOTE: Channel 1 (“Toxic”) is used to measure the raw sensor data that rises and falls as the sample and air flows are directed across the sensor. Channel 2 (“Bridge / 4-20mA”) displays the stored engineering value that reflects the most recent sample sequence. ***Alarm settings should be programmed for Channel 2 only.***

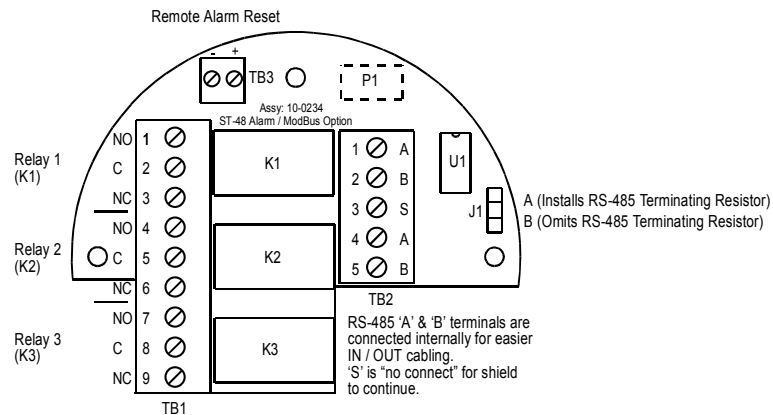


Figure 3 – GDS-68XP / GASMAX II Relay & MODBUS Wiring

Relay 3 (TB1 Pins 7, 8, 9) is programmed to indicate a FAULT condition under the following circumstances: 1) Excessive negative sensor drift; 2) Sensor removed or 3) Flow switch dropout (low flow).

NOTE: In addition to the FAULT relay indication, the GDS-68XP microprocessor monitors the flow switch and will drive the primary 4-20mA output to 0.0mA in the event that flow is blocked.

The GASMAX II provides a two-wire RS-485 serial data link via TB2 Pins A & B. See the GASMAX II manual for more information on MODBUS registers and operation.

3.5 Sample Inlet

Attach a length of tubing to the Sample Inlet using the supplied 1/4" compression fitting. If the sample location is excessively wet or dusty, GDS Corp recommends the installation of a coalescing or particulate filter on the intake end of the sample draw tubing. This will keep the particulate or moisture from being drawn into the sample tubing, sample draw pump and sensor. In the event the filter becomes clogged, the FLOW OK indication will be replaced by FAULT on the GASMAX II display and the optional Low Flow / Fault relay will energize.

3.6 Purge Air Inlet

Attach a length of tubing to the Purge Air Inlet using the supplied 1/4" compression fitting. Purge air should be clean and free of significant levels of H₂S.

3.7 Sample Outlet

Attach a length of tubing to the Sample Outlet using the supplied 1/4" compression fitting and route the tubing to a safe area. Do not use more than 25ft of tubing and do not allow back pressure to build up in the sample flow cell.

Important GDS Corp electrochemical sensors are designed to operate at ambient atmospheric pressure. Restricting the output in any way may create back pressure in the sensor flow cell that will generate incorrect readings and may damage the sensor if excessive pressure is present for long periods of time.

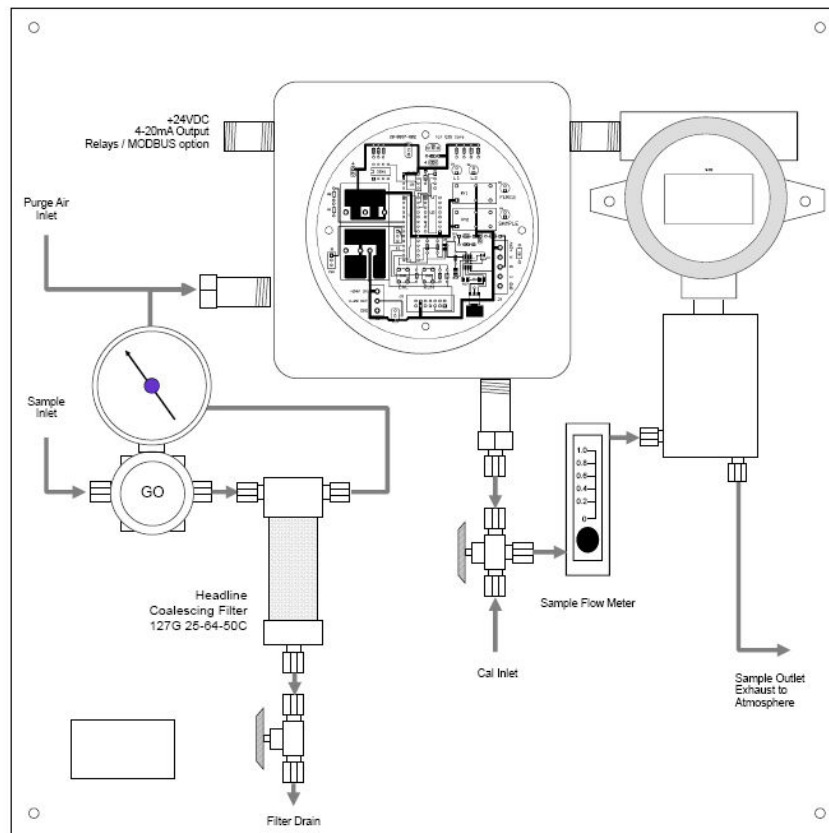


Figure 4 – GDS-68XP Layout (Positive Pressure – Standard Coalescing Filter)

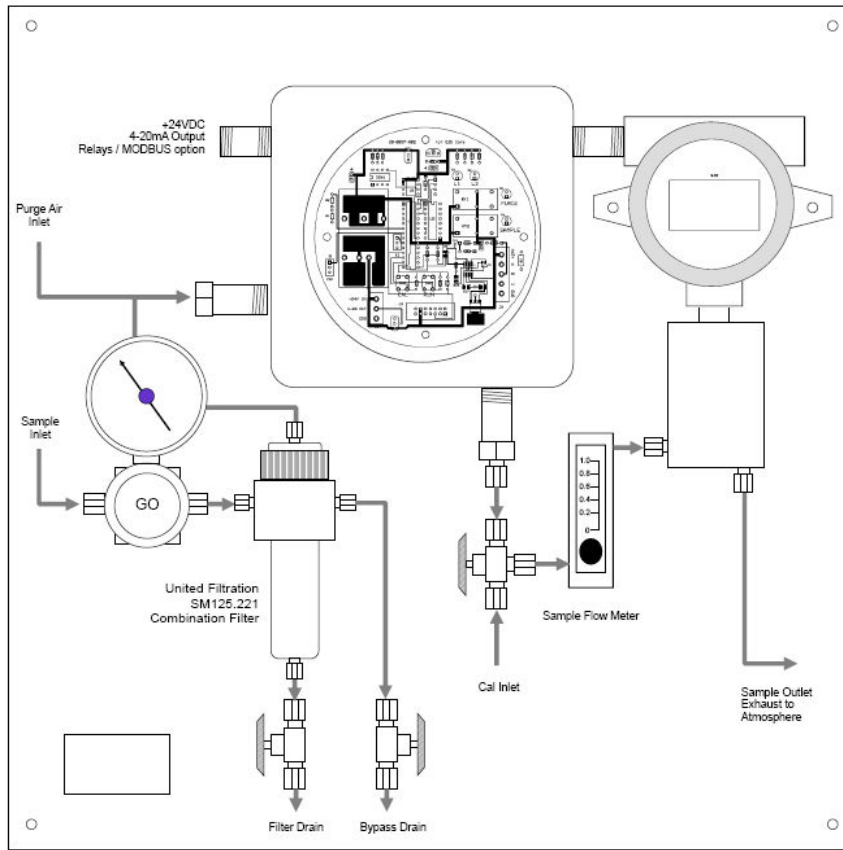


Figure 5 – GDS-68XP Layout (Positive Pressure – Combination Coalescing / Membrane Filter)

4 INITIAL SETUP

4.1 Flow Setup

Once hardware installation is completed, apply power to the GDS-68XP and verify that the GASMAX display is operational. The sequencer L1 and L2 indicators should cycle on and off and after a few seconds L1 should begin to flash and the PUMP and VALVE indicators should show steady ON. At this point the GDS-68XP is in sample mode and will be flowing sample gas across the sensor. Adjust the Sample Flow Meter to indicate 0.5 liters per minute of flow. If the flow meter does not indicate proper flow, check the inlet tubing for restrictions or blockage. If full scale flow cannot be obtained, check the sample outlet tubing for blockage.

Using a magnetic wand, activate the GASMAX II “NEXT” key several times to select the ‘dual numeric’ display mode (see Figure 4).

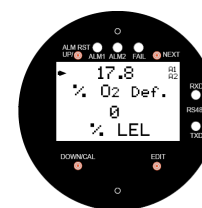


Fig 4 – Dual Display Mode

To check the Low Flow switch, set the Run / Cal valve to the CAL position.

After ten seconds the channel 2 “PPM H2S” text should be replaced by “FAULT”.

4.2 Select Sample Sequence Period

Seven sequence selections are available that offer different sample and purge times. To select a specific sequence, set the DIP SWITCH as shown (0 = down, 1 = up). In general, the shorter the period, the more often the output is updated; on the other hand, for longer periods, less sample gas is used and sensor life is


| Seq # | Dip Switch | Sample | Purge | Total |
|-------|------------|--------|---------|-----------|
| 0* | 000 1 | 1 min | 1 min | Test Only |
| 1 | 001 1 | 2 min | 3 min | 5 min |
| 2 | 010 1 | 3 min | 7 min | 10 min |
| 3 | 011 1 | 3 min | 12 min | 15 min |
| 4 | 100 1 | 3 min | 27 min | 30 min |
| 5 | 101 1 | 5 min | 55 min | 60 min |
| 6 | 110 1 | 5 min | 115 min | 2 hours |
| 7 | 111 1 | 5 min | 235 min | 4 hours |

extended, especially if the average concentrations are above 100 ppm. The selection of sequence timing takes place at the beginning of each sample / purge cycle. To force a new cycle to begin, press and hold the BYPASS button until the Bypass indication appears on L1 / L2, then press the RUN button. The GDS-68XP will restart the sample / purge sequence using the current settings on the DIP switch). Another

way to restart the sequencer cycle is to place the GASMAX Channel 1 in CAL mode and then exit using the NEXT key.

4.2 Adjust Alarm Levels

Using a magnetic wand, select the GASMAX Main Menu by placing the magnet next to the EDIT switch located on the lower right side of the GASMAX II display. Select Channel 2 (“Bridge / mA”) and then ALARMS to adjust the levels, polarity on/off delays and other alarm-related settings.

 **NOTE:** Alarm settings only affect the GASMAX front panel LEDs and internal relays (if installed). Local alarm settings will have no effect on alarm settings at any remote device that monitors the GDS-68XP 4-20mA output.

4.3 Verify Remote Readings

Often, the GDS-68XP output is connected to a remote DCS or PLC. Due to the nature of 4-20mA current loop technology, in order for the remotely displayed value to match that on the GDS-68XP, the zero and span range for the remote DCS or PLC must be set to match the zero and span range on the GDS-68XP. If there are any problems in getting these values to match, the GASMAX II gas monitor in the GDS-68XP has a “Diagnostics” function that enables the output of fixed mA values that can be used to verify operation.

Display the Main Menu by activating the EDIT key and selecting the BRIDGE/MA channel. From the Main Menu, select DIAGNOSTICS. The GASMAX II will request an Access Code (4 “UP” keys). The UP key is located on the upper left side of the GASMAX display. Activate the EDIT key to confirm. Select OUTPUT SIMULATION to set the 4-20mA signal to any value between 4ma (Zero) and 20mA (Full Scale). Confirm that the reading on the GASMAX matches the reading shown on any remote display or controller. If the optional relay / MODBUS board is installed, select RELAY TEST to activate the internal alarm relays and confirm that any remotely connected devices operate as expected.

4.4 First Time Calibration

The GDS-68XP is now ready for initial calibration. Even though the GDS-68XP is factory calibrated, on-site, post-installation calibration is strongly recommended to ensure accuracy during initial operation. See section 5 for detailed calibration instructions.

5 OPERATION & MAINTENANCE

5.1 Overview

Standard maintenance for the GDS-68XP consists of periodic checks on flow settings and sensor calibrations. Each time a toxic sensor is calibrated, a Sensor Life reading will appear that gives an approximate indication of the remaining sensitivity. Sensor Life is not necessarily linear and a rapid reduction in the sensor life reading can be due to temperature extremes, high levels of target gas, the presence of certain gases that ‘poison’ toxic sensors and other environmental factors.

Sensor life readings also appear for combustible or PID sensors, but as these sensors operate on different principles and/or contain microprocessors that compensate for aging effects, the values shown may not accurately represent sensor life over time.

Always check the flow meter for the presence of moisture. In the event that moisture or liquid is drawn in the GDS-68XP, the entire unit should be disassembled and cleaned. In some cases the flow meter or flow switch may need to be replaced. If liquid is drawn into the GDS-68XP, always inspect the sensor for any sign of damage.

5.2 Operation

At the beginning of each sequence cycle, the GDS-68XP opens the sample valve and allows sample to flow into the electrochemical sensor. The sensor, connected to the GASMAX gas monitor Channel 1 (“Raw Sensor”) input, will respond to the input, eventually reaching a stable reading. Sequence options include one minute, two minute and three minute periods to allow the sensor to stabilize. At the end of the sample sequence, the Channel 1 reading is transferred to Channel 2 (“PPM H₂S”) and held. Immediately after the reading, the input valve is closed and purge air is applied to the sensor, for a period of between 3 minutes and 4 hours. For periods of greater than one hour, the sample pump runs periodically instead of continuously to increase pump life. At the end of the purge cycle the sample cycle restarts. Channel 2 always maintains the most recent reading.

To view a record of the sample / purge cycles, use the magnetic wand to activate the “NEXT” key to select a display mode. There are five display modes: Dual numeric, Ch1 only, Ch2 only, Ch 1 trend, Ch2 trend. Ch1 trend will show the sample / purge sequence; Ch2 trend will show the latest stored data.

In the event of an over-range condition during sample input, the valve will automatically close as soon as the sensor input exceeds full scale, even if the programmed sample time is not yet complete. The output value will then be set to over-range and the purge cycle will be initiated. This process will occur as long as the input sample exceeds the GDS-68XP range.

5.3 Calibration

On average, calibration should be performed approximately every two to three months, depending on target gas and sensor performance. Obtain a **cylinder of calibration gas** that is approximately ½ scale (For example, for a 0-100 ppm range, obtain 50 ppm gas). If it cannot be guaranteed that the ambient air contains no target gas, also **obtain a cylinder of “zero air”**. In addition, a fixed flow regulator (0.5 to 1.0 liters / minute) and connecting tubing is required. Finally, make sure you have a **magnetic wand** to activate the GASMAX II monitor.

Before beginning, verify that the span calibration gas matches the expected value stored in the GASMAX memory. Using a magnetic wand, activate (“press”) the EDIT key to display the main menu. Press EDIT again to confirm, and then select the “O2/Toxic” channel. Select the System Config menu using the UP/DN keys and press EDIT. The **Cal Span Value** entry is shown at the bottom of the screen. Select and edit the value to match the available calibration gas if necessary. For best overall accuracy, the calibration gas value should be between 25% and 75% of the full scale range. See the GASMAX manual for more information. Exit the menu by pressing the NEXT key.

To perform a full system calibration, perform the following steps:

1. Using a magnetic wand, activate (“press”) the CAL button on the GASMAX gas monitor (lower left side of display). **Be sure to select the O2/TOXIC channel.** Display should show “Apply zero RAW SENSOR”. Placing the GASMAX Channel 1 in CAL MODE will cause the sequencer to switch to PURGE mode and clean air will flow to the sensor.
NOTE: An alternative is to connect a cylinder of Zero Air to the Cal port and set the Run / Cal valve to “Cal”.
2. Allow purge or zero air to flow into the sensor for at least 3 minutes. Press the EDIT key to continue. The screen should indicate “Zero Cal Successful”.
3. The GASMAX screen will now display “Apply xxx RAW SENSOR” where xx is the calibration span value.

4. If not already done in step 1, set the Run / Cal valve to “Cal”. Connect a bottle of calibration gas to the Cal port and turn on the fixed flow regulator. Verify sample is flowing by checking the reading on the flow meter. Allow the reading to stabilize (~3 minutes) and press the EDIT key to continue. If the limits on calibration values were met, the screen will display “Span Cal Successful”.
5. Disconnect the calibration gas cylinder and set the Run / Cal valve to RUN. Calibration is now complete.

5.4 Sensor Removal / Replacement

To remove & replace the GDS-68XP sensor:

- 1) Loosen and remove the stainless steel tubing that is attached to the sensor flow cell.
- 2) Remove the flow cell by unscrewing the flow cell.
- 3) Unscrew the sensor head cover. Use sensor head wrench (p/n 10-0187) if stuck.
- 4) Remove the sensor by pulling straight down. DO NOT TWIST.
- 5) Install the new sensor by aligning the arrow on the sensor with the engraved arrow on the sensor head. Press UP to install sensor. DO NOT TWIST.
- 6) Reinstall the stainless steel sensor head cover. Tighten securely.
- 7) Reinstall the sensor flow cell.
- 8) Reinstall the stainless steel tubing and tighten securely.
- 9) Verify operation and calibrate new sensor.

6 SPARE PARTS

6.1 GDS-68XP Spare Parts

| | |
|-----------|---|
| 1200-0047 | Flow switch, non-explosive |
| 1200-0234 | Pump, 24VDC brushless |
| 1200-0056 | Flow meter, 0-1 liter / minute |
| 1200-0034 | Flashback arrestors |
| 10-0205 | Flow cell |
| 10-0232 | GASMAX display module |
| 10-0233 | GASMAX power supply board |
| 10-0234 | GASMAX MODBUS / Relay board (optional) |
| 20-0057 | Sequencer control board assembly |
| 20-0058 | Sequencer interface board assembly (includes pump, valve and flow switch) |

7 WARRANTY

7.1 Overview

The GDS-68XP electronics is warranted for a period of two years from date of shipment. The Sample Pump and Sensor are warranted for a period of one year from date of shipment.

Toxic sensors have a limited shelf life and will lose sensitivity if not powered within 3 months of installation.

8 APPENDIX

8.1 Purge Timing Details (Positive Pressure)

During extended purge cycles, the air pump will pause once the sensor is purged, and then restart. These cycles extend the life of the sample / purge air pump and sensor and reduce the amount of power used by the GDS-68XP.

| Cycle Length | Valve Status | Pump Status | Start Time to End | Stop Time to End | Notes |
|--------------|---|-------------|-------------------|------------------|------------------------------------|
| 240 Minute | ON | OFF | 240 Minutes | 235 Minutes | Sample |
| | OFF | ON | 235 Minutes | 225 Minutes | Purge |
| | OFF | OFF | 225 Minutes | 215 Minutes | Rest |
| | Pump runs for 10 minutes and then rests for 10 minutes until end of cycle | | | | |
| 120 Minute | ON | OFF | 120 Minutes | 115 Minutes | Sample |
| | OFF | ON | 115 Minutes | 105 Minutes | Purge |
| | OFF | OFF | 105 Minutes | 95 Minutes | Rest |
| | Pump runs for 10 minutes and then rests for 10 minutes until end of cycle | | | | |
| 60 Minute | ON | OFF | 60 Minutes | 55 Minutes | Sample |
| | OFF | ON | 55 Minutes | 45 Minutes | Purge |
| | OFF | OFF | 45 Minutes | 35 Minutes | Rest |
| | Pump runs for 10 minutes and then rests for 10 minutes until end of cycle | | | | |
| 30 Minute | ON | OFF | 30 Minutes | 27 Minutes | Sample |
| | OFF | ON | 27 Minutes | 17 Minutes | Purge |
| | OFF | OFF | 17 Minutes | 7 Minutes | Rest |
| | OFF | ON | 7 Minutes | End | Purge |
| | | ON | 27 Minutes | End | Pump remains ON for shorter cycles |
| 15 Minute | ON | OFF | 15 Minutes | 12 Minutes | Sample |
| | OFF | ON | 12 Minutes | End | Purge |
| 10 Minute | ON | OFF | 10 Minutes | 7 Minutes | Sample |
| | OFF | ON | 7 Minutes | End | Purge |
| 5 Minute | ON | OFF | 5 Minutes | 3 Minutes | Sample |
| | OFF | ON | 3 Minutes | End | Purge |

8.2 MODBUS Registers

The GASMAX II gas monitor provides more than 100 readable MODBUS variables. Shown below are three that can be used to read system values and alarm status. See the GASMAX manual for more information and a complete listing of registers.

| Register | Alias | Read | Value | Notes |
|-------------------|-------|------|----------|--|
| D2A Raw Ch 2 | 31002 | 4 | 200-1000 | Raw D/A output, 200 = 0, 1000 = full scale |
| Alarm Status Word | 31007 | 4 | Bits | See GMII manual for bit definitions |
| Ch1 Sensor Life | 31009 | 4 | 0-100 | Calculated sensor life % remaining |

8.3 Moisture Calculations

When drawing a sample that contains significant moisture, it is important to understand how much moisture may be entrained within the coalescing filter. At 0.5 liters per minute, the GDS-68XP will draw approximately 720 liters (0.72 m³) of sample in a 24 hour period*.

| Sample Temp | Sample RH | Water content, g/m ³ | Total water content | Total coalesced water in 24 hrs* |
|--------------|-----------|---------------------------------|-----------------------|----------------------------------|
| 20°C / 68°F | 40% RH | 9.4 g/m ³ | 3.8 g/m ³ | 2.7 g = 0.09 oz |
| | 60% RH | 9.4 g/m ³ | 5.6 g/m ³ | 4.0 g = 0.13 oz |
| | 80% RH | 9.4 g/m ³ | 7.5 g/m ³ | 5.4 g = 0.18 oz |
| | 100% RH | 9.4 g/m ³ | 9.4 g/m ³ | 6.8 g = 0.23 oz |
| 30°C / 86°F | 40% RH | 30.4 g/m ³ | 12.1 g/m ³ | 8.7 g = 0.29 oz |
| | 60% RH | 30.4 g/m ³ | 18.2 g/m ³ | 13.1 g = 0.44 oz |
| | 80% RH | 30.4 g/m ³ | 24.3 g/m ³ | 17.5 g = 0.59 oz |
| | 100% RH | 30.4 g/m ³ | 30.4 g/m ³ | 21.8 g = 0.73 oz |
| 40°C / 104°F | 40% RH | 51 g/m ³ | 20 g/m ³ | 14.4 g = 0.48 oz |
| | 60% RH | 51 g/m ³ | 31 g/m ³ | 22.3 g = 0.75 oz |
| | 80% RH | 51 g/m ³ | 41 g/m ³ | 29.5 g = 0.99 oz |
| | 100% RH | 51 g/m ³ | 51 g/m ³ | 36.7 g = 1.2 oz |
| 50°C / 122°F | 40% RH | 83 g/m ³ | 33 g/m ³ | 23.8 g = 0.8 oz |
| | 60% RH | 83 g/m ³ | 50 g/m ³ | 36 g = 1.21 oz |
| | 80% RH | 83 g/m ³ | 66 g/m ³ | 47.5 g = 1.6 oz |
| | 100% RH | 83 g/m ³ | 83 g/m ³ | 59.8 g = 2.0 oz |

For example, the standard filter will hold approximately 3 oz of coalesced water. At 20°C / 40% RH, the filter will need to be drained every 30 days. For a sample at 40°C and 80% RH, the filter may need to be drained every three days.

For high moisture applications, GDS Corp recommends the combination coalescing / bypass filter that will remove moisture and particulate in a continuous stream. For ambient sources of sample gas, this may require the installation of an upstream pump to force the sample through the filter and bypass port.

8.3 Dimensional Drawings

