GM S5000 Gas Monitor Safety Manual

Order No.: MANS5000SAFETY/00

This manual describes the safety related information for the GM S5000.

For complete information regarding performance, installation, operation, maintenance, and specifications of the GM S5000 Gas Monitor, please refer to the associated product manual (P/N MANS5000).

The safety product you have purchased should be handled carefully, and installed and maintained in accordance with the associated product instruction manual. Remember, this product is for your safety.

WARNING

Toxic, combustible, and flammable gases and vapors are very dangerous. Use extreme caution when these hazards are present.

WARNING

Under no circumstances should equipment be connected or disconnected when under power. This is contrary to hazardous area regulations and may also lead to serious damage to the equipment.

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1. Introduction

The MSA/General Monitors (GM) S5000 Gas Monitor, hereafter also called the device, is designed to monitor the environment where mounted and alert the user to potentially dangerous levels of target gas. The GM S5000 uses various detection methods, depending on the gas of interest. Detection methods include electrochemical, infrared, catalytic bead or other technologies.

The GM S5000 is capable of communicating with and displaying information for two sensors at a time. The device generates two discrete analog outputs; one for each sensor connected to the transmitter. Each analog output is a standard 4 to 20 mA sourcing output. The analog output associated with Sensor 1 has HART (Highway Addressable Remote Transducer) communication encoded on it. If two sensors are connected, the HART communication on output 1 carries information for both sensors.

Relays and other communication protocols are available as an option.

The GM S5000 is suitable for installation in hazardous locations. It is intended for integration with a control system that can alert operations personnel to the presence of a gas alarm. GM S5000 Gas Monitor is regarded as Type B field device per IEC 61508.

2. Safety and Precautionary Measures to Be Adopted

WARNING

Failure to follow the recommendations shown below can result in an unsafe condition and persons who rely on this product for their safety could sustain severe personal injury or loss of life.

- The device described in this manual must be installed, operated and maintained in strict accordance with the labels, cautions, instructions and within the limitations stated.
- Protect the device from extreme vibration.
- Do not mount the device in extreme heat or sunlight as this may cause overheating. A sunshield is available to protect from extreme environments.
- Use only genuine MSA replacement parts when performing any maintenance procedures. Failure to do so may seriously impair device performance. Repair or alteration of the device beyond the scope of the product instructions or by anyone other than an authorized MSA service provider could cause the product to fail to perform as designed.
- Do not paint the device. If painting is done in an area where the device is located, exercise caution to ensure paint is not deposited on the device. Such paint deposits could interfere with the device operation. Solvents in the paint may also cause an alarm condition to occur.
- Do not use a high pressure wash on the device. Forced water entry to some sensor inlets can obstruct the gas path leading to degraded performance.
- IR400 Point IR sensors should be mounted horizontally. Sensors other than IR400 should be mounted vertically facing down. This will help ensure that environmental particulates will not block the gas path to the sensor. It is recommended to periodically perform a visual inspection of the sensor gas inlet as part of normal maintenance. Failure to follow this recommendation can lead to degraded performance.
- Do not use silicone type lubricants in assembling the device and do not allow silicone vapors to be drawn into the flow system while in operation. Silicone can desensitize the combustible gas sensor thereby giving incorrect readings.
- Before connection to a monitoring controller (PLC, DCS, etc.), the user or installer must be properly trained with respect to the specific controller operation, input/output hardware, configuration and startup procedures.

3. Operational Safety Concerns

For additional operational information refer to the product instruction manual (P/N MANGM S5000).

3.1. Calibration

The GM S5000 allows the user a method for sensor calibration. This typically includes a zero and span operation with target gas. Refer to the instruction manual for full details on calibration methodology for each sensor type.

The frequency of calibration gas testing depends on the operating time, chemical exposure and type of sensor. Especially in new installations or applications, it is recommended that the first sensors be calibrated more often to establish the sensor performance in this particular environment. For the purposes of compliance to IEC 61508 a proof test interval is required and is shown in this manual under the section titled “Certifications and Failure Rate Data”.

3.2. Changing or Replacing Sensors

SafeSwap

The GM S5000 comes with patented SafeSwap technology, which allows users to change or replace XCell sensors without needing to power down the instrument. For sensors other than IR400, passive Catalytic Bead and passive MOS, the main transmitter unit will accept different sensor modules. When a sensor is changed in the field, the main transmitter unit will communicate with the sensor module and identify its target gas type and calibration information. The gas type will show on the main transmitter display. When replacing a sensor, verify that the correct sensor has been installed by viewing the gas type shown on the instrument display. In addition, it is recommended that proper installation be verified by applying the gas of interest to the sensor to ensure a proper response.

Swap Delay

For added convenience, all sensors with SafeSwap also have a Swap Delay which is enabled by default and may be disabled by the user. This feature gives users a 2 minute window to change sensors without triggering a fault condition. Once a sensor is disconnected from the transmitter, the user will have 2 minutes to reconnect a sensor. During this time, the device analog output will go to its Maintenance level. If a sensor is reconnected or replaced during the 2 minute window, the new sensor’s warm-up sequence will begin and the analog output will remain at the Maintenance level. After the sensor warm-up is complete, the analog output will return to reporting a live gas reading. If a sensor is not reconnected after the 2 minute window, the GM S5000 will enter a “Sensor Missing” fault condition.

3.3. System Faults

The GM S5000 monitors itself for many conditions and will report abnormalities to the user. Refer to Appendix A for a list of potential faults and troubleshooting recommendations.

3.4. Minimizing Undetected Faults

The GM S5000 was designed with a very high level of reliability and fault detection; however the possibility of an undetected fault still exists. Should an undetected fault occur, there is a chance that a potentially dangerous gas reading will not be registered.

While the chance of an undetected fault cannot be completely eliminated, certain steps can be taken to minimize the probability. Regular maintenance is crucial to proper operation of the equipment. Frequent gas application is also an excellent means of insuring proper operation of the equipment.

4. Specifications

Table 1 and Table 2 list specifications for the GM S5000 Gas Monitor. For a complete list of specifications refer to the product instruction manual.

Table 1 Environmental/Electrical Specifications

	Toxics & Oxygen	Combustible Catalytic	IR400
Operating temperature range	-55°C to +75°C	-55°C to +75°C	-55°C to +75°C
Storage temperature range	-40°C to +75°C	-40°C to +75°C	-40°C to +75°C
Humidity range	10-95% RH	0-95% RH	10-95% RH
Input voltage min		12 VDC	
Input voltage nominal		24 VDC	
Input voltage max		30 VDC	

Table 2 Analog Output Default Values

Output Setting (mA)	Custom 1	Custom 2	3.5 mA with HART	1.25 mA with HART	HART Disabled
Fault	1.25	1.25	3.5	1.25	0
Calibration (excl. O_2)	1.5	1.5	3.5	1.5	1.5
Calibration – O_2 only	1.5	21.7[3]	3.5	1.5	1.5
Ready/Zero Reading	4.04	4.04	4.04	4.04	4.04
Maintenance/Startup	3.5	3.5	3.5	3.5	3.5
WARN[1] Signal	5.6	5.6	5.6	5.6	5.6
ALARM[2] Signal	8.8	8.8	8.8	8.8	8.8
Over Range	21.7	21.7	21.7	21.7	21.7

[1] Assumes alarm level of 10% full scale

[2] Assumes alarm level of 30% full scale

[3] For an O_2 sensor, 21.7 mA is the default Custom 2 setting and is not configurable.

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5. Safety Function

The GM S5000 sensor head, utilizes oxygen, combustible and toxic sensors to monitor and alarm to dangerous and explosive atmospheres.

The element safety functions of the GM S5000 are defined as follows:
To provide the host system with a predefined 4-20 mA alarm signal output and to de-energize a relay (if included) in the event of a dangerous or explosive atmosphere depending on the sensor type configuration.

See Table 2 for 4-20 mA alarm signal details in different operation modes.

The analog output range is 0-22 mA. It is normal operation within minimum to maximum detection range is 4 mA to 20 mA respectively. Refer to Table 2 for more detail on specific analog output conditions.

NOTE: The analog indications below 4 mA are configurable by the user in the range (0-3.75 mA). Refer to operating manual for specific configuration details.

Table 3 Fault Reporting Time (Refer to Appendix A)

Fault	Minimum time	Maximum time
Integrated circuit memory	0.050 seconds	24 hours
Digital Sensor w/o Swap Delay	3 seconds	4 seconds
Digital Sensor w/ Swap Delay	120 seconds	121 seconds
Negative Drift	120 seconds	121 seconds
Life and Health Fault	6 hours	6 hours + 1 second
Other	1 second	8 seconds

When ordered the GM S5000 comes with three SPDT (single pole double throw) relays which include normally open, common and normally closed contact terminals. Two of the relays correlate to gas reading and can be configured for either de-energized or energized operation and also may be configured as latching or non-latching. The third relay is a dedicated fault relay. The fault relay is configured as normally energized, non-latching. This normally energized default setting is for fail-safe operation and cannot be reconfigured. In the event of a failure, including loss of power, the fault relay will change state to indicate a fault condition.

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The safety function of the GM S5000 Gas Monitor does not include:

- HART Communication
- RS-485 Modbus communication
- Bluetooth communication

HART, Modbus and Bluetooth communication are typically used for field device setup, diagnostics, and troubleshooting. Carefully observe requirements for interfacing in hazardous locations. HART, Modbus and Bluetooth communication are non-interfering functions and do not interrupt the safety critical function of the detector.

6. Certifications and Failure Rate Data

The GM S5000 Gas Monitor has been subjected to rigorous reliability and functional safety assessments which have culminated in the device being certified to IEC 61508. It is assumed that the field devices will be installed in a Safety Instrumented System (SIS) in a Low Demand environment per IEC 61508. The following tables list the SIL parameters for the various sensor combinations for the device. Systematic Capability is SC3.

Table 4 – Table 18 assume the following:

- Hardware Fault Tolerance (HFT)=0
- Low demand system
- Type B classification
- PFD_{Avg} 1oo1 assumes a 4 hour Mean Time to Restore and a 3 month Proof Test Interval
- FIT = Failures in $1X10^9$ hours

Table 4 SIL Parameters – XCell Toxic + No Sensor

	GM S5000 (Analog output) **Sensor1 = XCell toxic** **Sensor2 = no sensor**	**GM S5000 (Analog output/relays)** **Sensor1 = XCell toxic** **Sensor2 = no sensor**
λ_{dd} (fails per hour)	1380 FIT	1400 FIT
λ_{du} (fails per hour)	26.6 FIT	29.2 FIT
λ_s (fails per hour)	1290 FIT	1340 FIT
Safe Failure Fraction (SFF)	99.0%	98.9%
Probability of Failure on Demand (PFD)	3.47E-05	3.76E-5

Table 5 SIL Parameters – XCell Toxic + XCell Toxic

	GM S5000 (Analog output) **Sensor1 = XCell toxic** **Sensor2 = XCell toxic**	**GM S5000 (Analog output/relays)** **Sensor1 = XCell toxic** **Sensor2 = XCell toxic**
λ_{dd} (fails per hour)	1870 FIT	1890 FIT
λ_{du} (fails per hour)	53.2 FIT	55.7 FIT
λ_s (fails per hour)	1610 FIT	1670 FIT
Safe Failure Fraction (SFF)	98.5%	98.5%
Probability of Failure on Demand (PFD)	6.58E-5	6.88E-5

Table 6 SIL Parameters – XCell Toxic + XCell Oxygen

	GM S5000 (Analog output) **Sensor1 = XCell toxic** **Sensor2 = XCell oxygen**	**GM S5000 (Analog output/relays)** **Sensor1 = XCell toxic** **Sensor2 = XCell oxygen**
λ_{dd} (fails per hour)	1850 FIT	1870 FIT
λ_{du} (fails per hour)	28.3 FIT	30.8 FIT
λ_{s} (fails per hour)	1690 FIT	1740 FIT
Safe Failure Fraction (SFF)	99.2%	99.2%
Probability of Failure on Demand (PFD)	3.84E-5	4.13E-5

Table 7 SIL Parameters – XCell Toxic + IR400

	GM S5000 (Analog output) **Sensor1 = XCell toxic** **Sensor2 = IR400**	**GM S5000 (Analog output/relays)** **Sensor1 = XCell toxic** **Sensor2 = IR400**
λ_{dd} (fails per hour)	3630 FIT	3650 FIT
λ_{du} (fails per hour)	53.0 FIT	55.6 FIT
λ_{s} (fails per hour)	3390 FIT	3440 FIT
Safe Failure Fraction (SFF)	99.3%	99.2%
Probability of Failure on Demand (PFD)	7.28E-5	7.57E-5

Table 8 SIL Parameters – XCell Oxygen + No Sensor

	GM S5000 (Analog output) **Sensor1 = XCell oxygen** **Sensor2 = no sensor**	**GM S5000 (Analog output/relays)** **Sensor1 = XCell oxygen** **Sensor2 = no sensor**
λ_{dd} (fails per hour)	1370 FIT	1390 FIT
λ_{du} (fails per hour)	1.71 FIT	4.23 FIT
λ_{s} (fails per hour)	1360 FIT	1420 FIT
Safe Failure Fraction (SFF)	99.9%	99.9%
Probability of Failure on Demand (PFD)	7.36E-6	1.02E-5

Table 9 SIL Parameters – XCell Oxygen + XCell Oxygen

	GM S5000 (Analog output) **Sensor1 = XCell oxygen** **Sensor2 = XCell oxygen**	**GM S5000 (Analog output/relays)** **Sensor1 = XCell oxygen** **Sensor2 = XCell oxygen**
λ_{dd} (fails per hour)	1840 FIT	1860 FIT
λ_{du} (fails per hour)	3.34 FIT	5.86 FIT
λ_{s} (fails per hour)	1770 FIT	1820 FIT
Safe Failure Fraction (SFF)	99.9%	99.8%
Probability of Failure on Demand (PFD)	1.10E-5	1.39E-5

Table 10 SIL Parameters – XCell Oxygen + IR400

	GM S5000 (Analog output) **Sensor1 = XCell oxygen** **Sensor2 = IR400**	**GM S5000 (Analog output/relays)** **Sensor1 = XCell oxygen** **Sensor2 = IR400**
λ_{dd} (fails per hour)	3620 FIT	3640 FIT
λ_{du} (fails per hour)	28.1 FIT	30.6 FIT
λ_{s} (fails per hour)	3460 FIT	3520 FIT
Safe Failure Fraction (SFF)	99.6%	99.6%
Probability of Failure on Demand (PFD)	4.54E-5	4.82E-5

Table 11 SIL Parameters – IR400 + No Sensor

	GM S5000 (Analog output) **Sensor1 = IR400** **Sensor2 = no sensor**	**GM S5000 (Analog output/relays)** **Sensor1 = IR400** **Sensor2 = no sensor**
λ_{dd} (fails per hour)	3150 FIT	3170 FIT
λ_{du} (fails per hour)	26.5 FIT	29.0 FIT
λ_{s} (fails per hour)	3060 FIT	3110 FIT
Safe Failure Fraction (SFF)	99.6%	99.5%
Probability of Failure on Demand (PFD)	4.17E-5	4.45E-5

Table 12 SIL Parameters – Digital Cat Bead + No Sensor

	GM S5000 (Analog output) **Sensor1 = Digital Cat Bead** **Sensor2 = no sensor**	**GM S5000 (Analog output/relays)** **Sensor1 = Digital Cat Bead** **Sensor2 = no sensor**
λ_{dd} (fails per hour)	15480 FIT	15500 FIT
λ_{du} (fails per hour)	1600 FIT	1600 FIT
λ_{s} (fails per hour)	1070 FIT	1120 FIT
Safe Failure Fraction (SFF)	91.2%	91.2%
Probability of Failure on Demand (PFD)	1.82E-3	1.82E-3

Table 13 SIL Parameters – Digital Cat Bead + Digital Cat Bead

	GM S5000 (Analog output) **Sensor1 = Digital Cat Bead** **Sensor2 = Digital Cat Bead**	**GM S5000 (Analog output/relays)** **Sensor1 = Digital Cat Bead** **Sensor2 = Digital Cat Bead**
λ_{dd} (fails per hour)	30060 FIT	30080 FIT
λ_{du} (fails per hour)	3200 FIT	3210 FIT
λ_{s} (fails per hour)	1180 FIT	1230 FIT
Safe Failure Fraction (SFF)	90.7%	90.7%
Probability of Failure on Demand (PFD)	3.64E-3	3.64E-3

Table 14 SIL Parameters – Digital Cat Bead + XCell Oxygen

	GM S5000 (Analog output) **Sensor1 = Digital Cat Bead** **Sensor2 = XCell oxygen**	**GM S5000 (Analog output/relays)** **Sensor1 = Digital Cat Bead** **Sensor2 = XCell oxygen**
λ_{dd} (fails per hour)	15950 FIT	15970 FIT
λ_{du} (fails per hour)	1600 FIT	1610 FIT
λ_{s} (fails per hour)	1470 FIT	1530 FIT
Safe Failure Fraction (SFF)	91.6%	91.6%
Probability of Failure on Demand (PFD)	1.83E-3	1.83E-3

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Table 15 SIL Parameters – Digital Cat Bead + XCell Toxic

	GM S5000 (Analog output) Sensor1 = Digital Cat Bead Sensor2 = XCell toxic	GM S5000 (Analog output/relays) Sensor1 = Digital Cat Bead Sensor2 = XCell toxic
λ_{dd} (fails per hour)	15960 FIT	15980 FIT
λ_{du} (fails per hour)	1630 FIT	1630 FIT
λ_{s} (fails per hour)	1400 FIT	1450 FIT
Safe Failure Fraction (SFF)	91.4%	91.5%
Probability of Failure on Demand (PFD)	1.85E-3	1.86E-3

Table 16 SIL Parameters – Digital Cat Bead + IR400

	GM S5000 (Analog output) Sensor1 = Digital Cat Bead Sensor2 = IR400	GM S5000 (Analog output/relays) Sensor1 = Digital Cat Bead Sensor2 = IR400
λ_{dd} (fails per hour)	17730 FIT	17750 FIT
λ_{du} (fails per hour)	1630 FIT	1630 FIT
λ_{s} (fails per hour)	3170 FIT	3220 FIT
Safe Failure Fraction (SFF)	92.8%	92.8%
Probability of Failure on Demand (PFD)	1.85E-3	1.86E-3

Table 17 SIL Parameters – Passive Cat Bead + No Sensor

	GM S5000 (Analog output) Sensor1 = Passive Cat Bead Sensor2 = no sensor	GM S5000 (Analog output/relays) Sensor1 = Passive Cat Bead Sensor2 = no sensor
λ_{dd} (fails per hour)	15160 FIT	15180 FIT
λ_{du} (fails per hour)	1600 FIT	1600 FIT
λ_{s} (fails per hour)	680 FIT	730 FIT
Safe Failure Fraction (SFF)	90.8%	90.8%
Probability of Failure on Demand (PFD)	1.82E-3	1.82E-3

Table 18 SIL Parameters – Passive MOS + No Sensor

	GM S5000 (Analog output) **Sensor1 = Passive MOS** **Sensor2 = no sensor**	**GM S5000 (Analog output/relays)** **Sensor1 = Passive MOS** **Sensor2 = no sensor**
λ_{dd} (fails per hour)	16730 FIT	16750 FIT
λ_{du} (fails per hour)	13.4 FIT	15.9 FIT
λ_{s} (fails per hour)	700 FIT	760 FIT
Safe Failure Fraction (SFF)	99.9%	99.9%
Probability of Failure on Demand (PFD)	8.16E-5	8.44E-5

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7. Appendix A

Table 19 Troubleshooting

Fault Code	Description	Resolution
F001 Low Supply Voltage	This fault occurs if the supply voltage at the S5000 is below +10.5 VDC or higher than 31.5 VDC.	Ensure that the supply voltage is within the range of 12-30 VDC at the S5000.
F002 RAM Checksum Error	This fault indicates that the contents of the S5000's internal RAM memory have corrupted.	Cycle the power to the unit. If the fault persists, the unit must be returned to the factory or authorized service center for repair.
F003 Flash Checksum Error	This fault indicates that the contents of the S5000's program memory have changed. This usually occurs when powering the unit up after a lightning strike or large voltage transient on the power or signal lines to the unit.	The unit must be returned to the factory or authorized service center for repair.

Fault Code	Description	Resolution
F004 EEPROM Error	In the event of an EEPROM error, the user must recycle the power to potentially clear the error. After power reset, the following may occur:	(1) Unit returns to normal. a) This indicates the EEPROM writing did not keep up to changing events or the write cycle is too fast. (2) Unit goes to sensor faults. The user must recalibrate after 1-2 minutes sensor warm up. a) This means the non-critical part of the EEPROM was corrupted. b) This is probably caused by an event-logging problem. c) There is a possibility any of the following may be corrupted: Event logging data, Modbus settings, HART settings, Calibration information. (3) Unit returns to F004. a) This is a critical error. This fault occurs when an attempt to verify the setup/calibration parameters just written to the EEPROM memory fails. b) Reset transmitter settings to reload the factory default to the EEPROM. Sensor recalibration is required after this operation. All settings including, but limited to, alarm/warning, setpoint, relay, Modbus, AO output level should be verified and reprogrammed.
F005 Internal Circuit Error		An internal error has occurred. The unit must be returned to the factory for service. The possible errors are internal voltages are not at their proper values.
F006 Relay Fault	This fault indicates that either the relays or the relay driver is not working properly.	The unit must be returned to the factory or authorized service center for repair.

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Fault Code	Description	Resolution
F007 Invalid Sensor Configuration Fault	This fault occurs when the sensor channel configuration is invalid.	Verify at least one sensor channel is enabled. Cycle the power to the unit. If the fault persists, the unit must be returned to the factory or authorized service center for repair.
F008 Other System Level Fault	This fault occurs when other fault conditions not covered above happen.	The unit must be returned to the factory or authorized service center for repair.
F101/F201 Sensor Missing Fault	This fault occurs when the sensor is disconnected or wiring is faulty or damaged.	Check the wiring and sensor connection.
F102/F202 Sensor Supply Voltage Fault	This fault occurs when the power supply to the sensor is faulty.	Check the wiring and sensor connection.
F103/F203 Invalid Sensor Parameters in Main EEPROM Fault	This fault occurs when the sensor parameters stored in the main EEPROM is incorrect.	Check the sensor parameters, including Calibration Level, Full Scale, Warning and Alarm set points. Correct any mis-configured parameters.
F104/F204 Sensor Element Fault	This fault occurs when the sensor sensing element is faulty or damaged.	Check the wiring and sensor connection. Replace the sensor if needed.
F105/F205 Sensor Heater Fault	This fault occurs when the sensor heater is faulty or damaged.	Check the wiring and sensor connection. Replace the sensor if needed.
F106/F206 Other Sensor Internal Fault	This fault occurs when the sensor has other internal faults.	Check the wiring and sensor connection. Replace the sensor if needed.
F107/F207 Sensor Internal Data CRC Error Fault	This fault occurs when the internal data of the sensor has CRC error.	Replace the sensor.
F108/F208 Sensor EOL Fault	This fault occurs when the sensing element of the sensor is at the end of life state.	Replace the sensor.
F109/F209 Sensor Blockage Fault	This fault occurs when the sensor gas sensing path and/or opening is blocked.	Clean out any debris or foreign objects blocking the sensing path/opening.
F110/F210 Negative Drift Fault	This fault occurs when the sensor has severe negative drift.	Re-calibrate the sensor. Replace the sensor if this fault persists.
F111/F211 Cal Line Shortage Fault	This fault occurs when the IR400/IR700 sensor Cal Line (brown wire) is shorted to ground.	Check the wiring and sensor connection.
F112/F212 Zero Calibration Failed Fault	This fault occurs when last zero calibration has failed.	Use the “Reset Sensor” entry in main menu to reset the fault. Re-calibrating the sensor will also clear the fault. Replace the sensor if this fault persists.

Fault Code	Description	Resolution
113/F213 Full Span Calibration Failed Fault	This fault occurs when last full span calibration has failed.	Use the "Reset" entry in UI menu to reset the fault. Re-calibrate the sensor will also clear the fault. Replace the sensor if this fault persists.
F114/214 Cal Check Timeout Fault	This fault occurs when the last Cal Check has failed due to timeout.	Check whether test gas is left on for Calibration Check mode. Remove the test gas if it is left on. Once it is cleared, the unit will return to normal operation.
F115/F215 Sensor Configuration Reset Fault	This fault occurs when the configuration parameters for sensor have been reset.	Check the sensor parameters, including calibration level, Range, Warning and Alarm set points. Verify all these parameters are configured as intended. Recalibrate the sensor to clear the fault if needed. Running through the Calibration Check is recommended.
F116/F216 Calibration Required Fault	This fault occurs when the sensor is in need of calibration.	Recalibrate the sensor.
F117/F217 Bead Off Fault	This fault occurs when the bead of the Catalytic Bead sensor is turned off when over 100 % LEL gas has been detected by the sensor.	Make sure the environment is free of dangerous combustible gas and then use the “Reset” entry in UI menu to reset the fault.
F118/F218 Analog Output Mismatch Fault	This fault occurs when the 4-20 mA analog output loop is malfunctioning.	Check the 4-20 mA analog output loop is closed properly with nominal 250 ohm load resistor installed. The fault will be cleared automatically once the loop is closed and wires are properly connected.

Notes

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For local MSA contacts, please visit us at ***MSAsafety.com***

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