

Instruction Manual

Model GQ-CE8900

Toxic Gas Detector



REV: MAN-GQ-CE8900-D181204
P/N: GT-ID-MAN.02E

Warranty

GASENSOR TECHNOLOGY Pte., Ltd. (hereinafter referred to as GASENSOR TECHNOLOGY) warrants the Model GQ-CE8900 to be free from defects in workmanship or material under normal use and service, maintenance and installation within two years from the date of shipment. All warranties are contingent upon proper use in the application for which the product was intended and do not cover the product which has been modified or repaired without GASENSOR TECHNOLOGY's written approval or which has been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered.

GASENSOR TECHNOLOGY will repair or replace faulty parts found to be defective during the warranty period, free of charge. Determination of the nature of, and responsibility for defective or damaged equipment will be made by GASENSOR TECHNOLOGY's technical experts.

Defective or damaged equipment must be shipped to GASENSOR TECHNOLOGY plant or representative location from which the original shipment was made. In all cases, this warranty is limited to the cost of the equipment supplied by GASENSOR TECHNOLOGY. The customer will assume all liability for the misuse of this equipment.

Except for the express warranty stated above, GASENSOR TECHNOLOGY disclaims all warranties with regard to the product sold, including all implied warranties of merchantability and fitness, and the express warranties stated herein are in lieu of all obligations or liabilities on the part of GASENSOR TECHNOLOGY for damages including, but not limited to, consequential damages arising out of, or in connection with the performance of the product.

Important Notices

1. Please read the Instruction Manual carefully before using this equipment.
2. The operation and maintenance of this equipment must be carried out by suitably skilled and competent personnel only. GASENSOR TECHNOLOGY can provide such training.
3. Please follow strictly to the Instruction Manual for the installation of the equipment and comply strictly with the relevant national and corporate laws, regulations and standards, in order to fully ensure the safety of employees so as to avoid any undesired danger from happening.
4. We strongly recommend the user to engage GASENSOR TECHNOLOGY with a long-term maintenance service contract to ensure optimal operation of the instrument.

The information and technical data disclosed in this document may be used and disseminated only for the purposes and to the extent specifically authorized in writing by GASENSOR TECHNOLOGY.

Instruction Manual

REV: MAN-GQ-CE8900-C171212
P/N: GT-TD-MAN.02E

GASENSOR TECHNOLOGY reserves the right to change published specifications and designs without prior notice.



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1.0 Preparing for Installation

1.1 System Integrity Verification

GASENSOR TECHNOLOGY's mission is to benefit society by providing safety solutions through industry-leading products, services, and systems that save lives and protect capital resources from the danger of hazardous flames, gases and vapors.

GASENSOR TECHNOLOGY safety products should be handled carefully and installed, calibrated and maintained in accordance with product instruction manuals. To ensure operation at optimum performance, GASENSOR TECHNOLOGY recommends that prescribed maintenance procedures be followed.

1.2 Commissioning Safety System

Before power-up, verify wiring, terminal connections and stability of the mounting for all essential safety equipment including, but not limited to:

- Power supplies
- Control modules
- Field detection devices
- Signal input / output devices
- Accessories connected to field and signaling devices

After the application of power and any factory specified warm-up period of the safety system, verify that all signal outputs, to and from the devices and modules are within the manufacturer's specifications. Initial calibration, checking and testing should be verified according to the manufacturers' recommendations and instructions.

Proper system operation should be verified by performing a full, functional test on all components of the safety system, ensuring that the proper levels of alarm occur. Fault circuit operation should be verified.

1.3 Notes and Warnings



WARNING: The GQ-CE8900 detects many extremely toxic gases. Exposure to such gases may result in sickness or death.



WARNING: The GQ-CE8900 contains components that can be damaged by static electricity. In order to avoid static electricity, special care must be taken when wiring the system to ensure that only the connection points are handled..



WARNING: The GQ-CE8900 Base Unit is rated Explosion Proof (XP) and the Intrinsically Safe (IS) Interface Module is for use in hazardous areas.



WARNING: Certified conduit seals must be used to preserve the explosion proof integrity of GQ-CE8900 and help prevent ingress of water from the conduit systems.



WARNING: Silicone Room Temperature Vulcanization (RTV) is not an approved moisture barrier. If used, damage to internal components will arise.



WARNING: Substitution of electrical components within the GQ-CE8900 may impair intrinsic safety.



WARNING: A broken GQ-CE8900 housing may damage any internal components or protective seals, which shall compromise the safety and reliability of the device. A GQ-CE8900 with a damaged or open

housing should not be used in a hazardous environment.

Such damage includes fractures in the housing, cracks in any internal components, or cracks in the protective seals. Destruction of the electrochemical cell (ECC) will not affect the basic safety of the GQ-CE8900, however, the overall functionality of the GQ-CE8900 may be severely compromised.



WARNING: Do not use the GQ-CE8900 with a damaged housing in a hazardous environment.

IMPORTANT: Each GQ-CE8900 is shipped with an un-installed electrochemical sensor, to ensure that a fresh sensor is used during initial start-up. DO NOT install the electrochemical cell into the GQ-CE8900 until you are ready to apply power to the system. Since the GQ-CE8900 is not factory calibrated to a specific cell, an initial field calibration must be completed when installing this unit.

2.0 Product Descriptions

2.1 General Description

The GQ-CE8900 is a +24 VDC powered point type toxic gas detector comprised of a Base Unit, Interface Module, and Electrochemical Cell (sensor) – refer to Sections 2.4, 2.5, and 2.6 respectively for more information. The GQ-CE8900 supports a wide range of approved GASENSOR TECHNOLOGY's electrochemical cells, and can detect different types of toxic gases by simply replacing and calibrating the sensor. The microprocessor-based Interface Module collects the output signal of Electrochemical sensor and transforms it into the gas concentration for base unit's data processing and display.

The GQ-CE8900 Base Unit is certified as explosion proof and the Interface Module as intrinsically safe for use in hazardous locations. It can also be used for general-purpose, non-hazardous applications.

2.2 Features and Benefits

32-bit Microprocessor-Based Electronics: Providing faster processing speeds and greater data throughput.

One Person Adjustment-Free Calibration: Easy zero clearing and calibration operation, no requirements of manual adjustment.

4-20 mA Analog Output: Transmits fault, calibration, and gas concentration levels to a remote display, computer, or other devices such as an alarm, dispensing device, or master controller.

Dual Redundant Modbus RS-485 User Interface: Provides the ability to operate the GQ-CE8900 remotely, using 2 redundant channels. This interface allows the user to remotely change the alarm and warning relay settings, clear failure indication, issue calibration requests, enable gas check, issue end / abort commands, clear error counters, change baud rates, and change formats for serial communication lines.

HART User Interface: Provides the ability to operate the GQ-CE8900 remotely, using two-way communication protocol through a 4-20mA signal line. This interface allows the user to remotely change the alarm and warning relay settings, read/clear logged events, issue calibration and gas check requests, issue end / abort commands, and many more. For more details on HART commands, refer to the GQ-CE8900 HART Communication Manual.

2.3 Applications

The GQ-CE8900 Intelligent Sensor provides toxic gas detection for a wide range of applications, including, but not limited to the following:

Table 1: Sample Industry Applications

Industries	Sample Applications
Petroleum/ Petrochemicals	Refining, processing, storage, and liquefaction
Chemicals/Pharmaceuticals	Agricultural fertilizer production, dyes, inks, film processing, pigments, gas storage, refrigerants, and a wide range of toxic gases used in the manufacture of pharmaceuticals
Automotive	Plating processes and engine test cells
Primary Metals	Steel plants, aluminum plants, smelting, pickling, machining, and finishing
Pulp and Paper	Bleaching
Utilities	Coal gasification, incineration, and flue gas
Water and Waste	Chlorinating, sewage sludge and manhole entry

2.4 Base Unit

The GQ-CE8900 Base Unit provides the display / control device for the entire GQ-CE8900. The Base Unit is built on the proven Intelligent Sensor platform and incorporates the following key features:

- Bright LED Digital Display (outdoor readable).
- Modbus and HART Communications.
- High Rating Relays.
- Easy Setup and Calibration.
- Simplified Wiring and Field Connections.
- Remaining Sensor Life Indication.

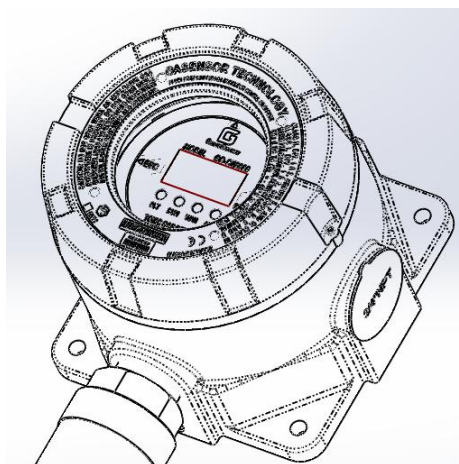


Figure 1: Base Unit

2.5 Interface Module

The GQ-CE8900 Interface Module is encapsulated in an anodized aluminum housing enabling sensor information to be processed at the point of detection. The GQ-CE8900 provides a 4-20 mA output signal proportional to 0 to 100% FS gas concentration at the Base Unit.

The Interface Module includes the following features:

- Galvanically isolated Intrinsic Safety Barrier to the internal electronics of the Interface Module.
- Electrical conditioning circuitry for the electrochemical cell.
- Mechanical and electrical interface for the electrochemical cell.
- Explosion proof seal from the Base Unit to the Interface Module.
- One I/O pair for digital serial communication to and from the Base Unit and Interface Module.
- One +24 VDC / COM GND pair for power into the Interface Module.

Monitored Faults: data memory failure, zeroing error and calibration error. For engineering specifications covering the electrochemical cell and control electronics, refer to Section 7.5.

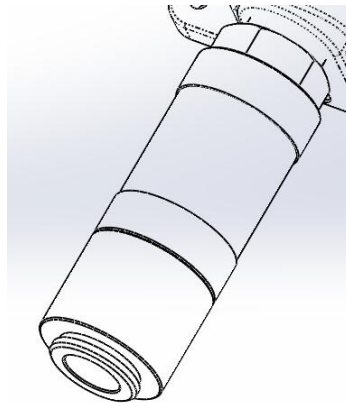


Figure 2: Interface Module

2.6 Electrochemical Cell

The GQ-CE8900 uses electrochemical cells with three electrodes and needs a sensor identification board customized by GASENSOR TECHNOLOGY (Figure 3). This design provides the most stable and accurate gas detector possible.

NOTE: The oxygen deficiency assembly contains only two electrodes. Some cells are installed with batteries or short wires during storage.

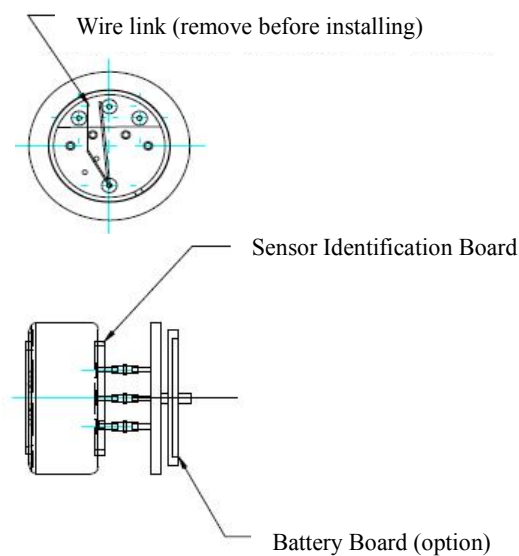





Figure 3: Electrochemical Cell Assembly

NOTE: For more information about the shelf life of electrochemical cell, please consult the manufacturer's documentation. Please refer to Table 15 to know more about the operation temperature of the Electrochemical Cell.

3.0 Installation

 **CAUTION:** The GQ-CE8900 contains components that can be damaged by static electricity. Always wear grounding apparel when handling or installing the unit.

 **CAUTION:** Cabling used shall have a high temperature tolerance; its temperature range must be higher than the maximum temperature of the environment.

 **CAUTION:** Only skilled and trained personnel shall perform the installation and maintenance of the equipment.

The basic steps in a typical installation are listed in the table below. The installation process may vary depending on the exact site configuration.

Table 2: Installation Overview

Installation Step		Detailed Description Section Number
1	Preparing for the installation	3.1 and 3.2
2	Installing the device	3.3
3	Mounting the GQ-CE8900	3.4
4	Installing cabling between the GQ-CE8900 and control room devices (including power, 4-20 mA, and Modbus)	3.5
5	Powering up the GQ-CE8900	3.6

3.1 Equipment Unpacking

All equipment shipped by GASENSOR TECHNOLOGY is pre-packed in shock absorbing containers which protect the products against physical damages. The contents should be carefully removed and checked against the enclosed packing list. If any damage has occurred or there is any discrepancy found with the order, please notify GASENSOR TECHNOLOGY immediately.

NOTE: Each GQ-CE8900 is completely tested at the factory. However, the electrochemical sensor must be calibrated after installation and a complete check prior to start-up must be finished in order to ensure system integrity.

3.2 Preparing for the Installation

The GQ-CE8900 has unique installation procedures for either local or remote hardware configurations. Before installation, evaluate the gas leak locations and other conditions at the facility and configure the unit for that particular need.

3.2.1 Tools Required

The following tools are required to install the GQ-CE8900:

Table 3: Tools Required

Tool	Function
2 mm Allen head wrench	To remove the GQ-CE8900 Base Unit enclosure lid
Flat-head screwdriver (5 mm maximum)	To connect wires into the Terminal Block
Adjustable wrench	To make conduit and cable gland connections

3.2.2 Detection Location Guidelines

There are no standard rules for detector placement since the optimum sensor location is unique for each application. Before installing the GQ-CE8900, check the conditions at the installation site to make this determination. The following guidelines can assist in determining a reasonable installation location.

Find a Suitable Installation Location

1. Locate the GQ-CE8900 near potential gas leak sources and away from excessive heat, light, wind, dust, water, vibration, shock, and radio frequency interference (RFI). For Environmental Specifications, refer to Section 7.6.
2. Ensure the installation location has sufficient space to accommodate the Base Unit, Interface Module, electrochemical cell, and all necessary cabling.
3. Mount the GQ-CE8900 with the electrochemical cell pointing down and in an easily accessible location for reading of the LED display and performing routine maintenance.



WARNING: Operation above or below temperature limits as specified may cause unstable readings, resulting in false alarms or alarm failures. For Environmental Specifications, refer to Section 7.6.

Electrochemical cells may be affected by exposure to certain gases. Please consult manufacturer to get the Gas Combination Table.



WARNING: When operating the GQ-CE8900 under the above conditions, all personnel operating and maintaining the units should be notified and made aware of the cross-sensitivity issues that are present at the site.



CAUTION: Do not paint the GQ-CE8900 assemblies. If the Base Unit is painted, the LED display cannot be read. If the Interface Module is painted, the gas is not able to diffuse into the sensor. Chlorine, Chlorine Dioxide, and Hydrogen Chloride cell may be sensitive to humidity variation (See Table 15 for Environmental Specifications).

3.3 Installation Overview

The GQ-CE8900 is shipped without the electrochemical cell installed. The electrochemical cell must be installed into the Interface Module and calibrated with respective known calibration after the instrument being put into operation.

For wiring connections, refer to Section 3.5. For calibration instructions, refer to Section 4.5.12.

Once correctly installed and calibrated, the GQ-CE8900 requires little or no maintenance, other than periodic calibration and routine check to ensure system integrity. For optimum performance, GASENSOR TECHNOLOGY recommends the user to establish a calibration check schedule, testing the entire system including all alarm circuits at least every 3 months.

The outline and mounting dimensions of the GQ-CE8900 should be used when making installation determinations.

3.3.1 Intrinsic Safety Barrier

The GQ-CE8900 has an Intrinsic Safety Barrier incorporated within the Interface Module. The Intrinsic Safety Barrier allows the user to change (hot swap) the electrochemical cell without powering down the GQ-CE8900 and without declassifying the area. The GQ-CE8900 can be used in hazardous areas without additional hardware.

3.3.2 Electrochemical Cell Maintenance

The removal of particulate matter from the electrochemical cell must be done carefully using clean water only. Solvents can never be used. The electrochemical cell must be thoroughly dried before refitting it to the Interface Module. Compressed air may be used to blow off the particles on electrochemical cell. Nevertheless, never blow compressed air directly into or near the surface of the electrochemical cell.



WARNING: To avoid injury, use extreme caution when using compressed air.

Some typical items to check during maintenance examinations are:

- Electrochemical cell mounting, to see that it is properly secured.
- Electrochemical cell cleanliness, to see that it is clear of oil, water, dust, or paint.
- Cable connections for tightness and possible damage.
- All detector placements are up-to-date with the layout of the facility.
- If the facility has been altered, placement may need to be adjusted.

3.4 Mounting Instructions

Mount the GQ-CE8900 using the bolt holes on the Base Unit. For easy access and readability, the Base Unit may be mounted away from the Interface Module (remote configuration).

NOTE: For remote configurations, an additional explosion proof junction box must be used.

3.4.1 Mounting Dimensions

The following figure shows the mounting dimensions of the GQ-CE8900.

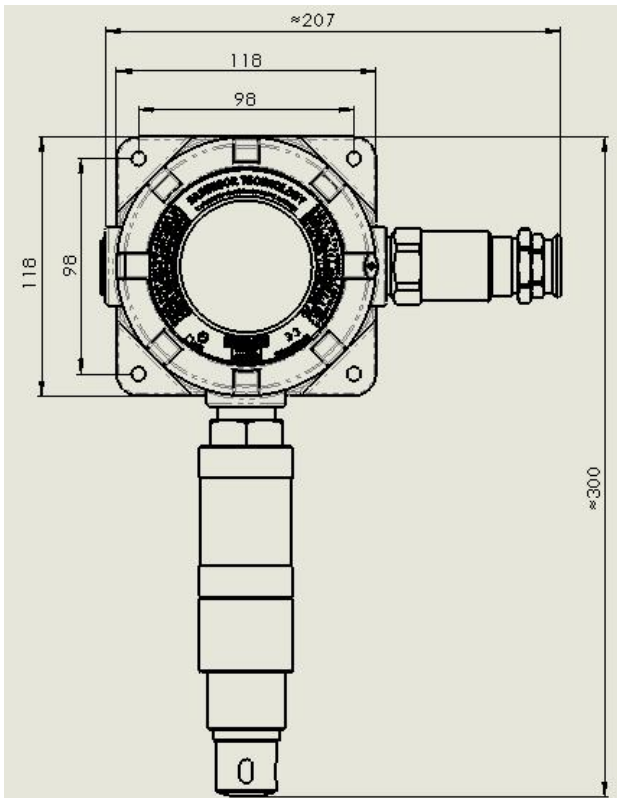


Figure 4: Wall Mounting

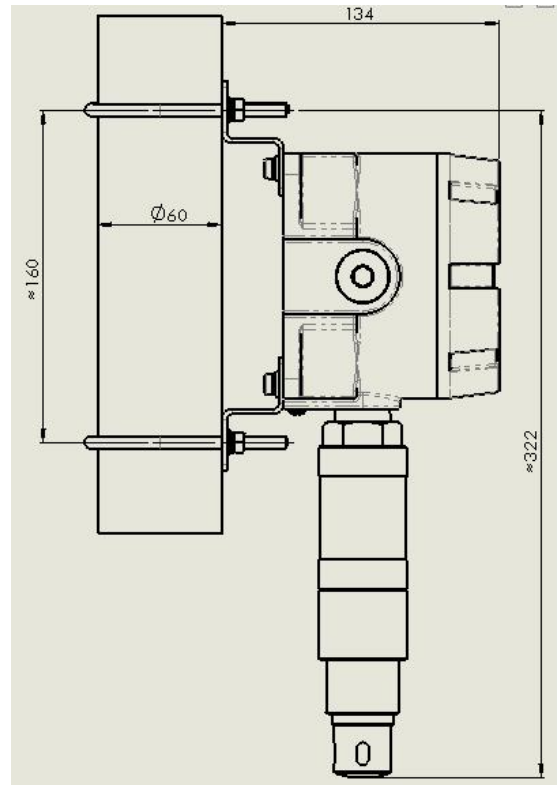


Figure 5: Pole Mounting

Before mounting, please refer to the following sections:
 Choosing the sensor Location Guidelines in Section 3.2.2.
 Environmental Specifications in Section 7.6.



WARNING: To maintain the explosion proof integrity of the GQ-CE8900, an explosion proof conduit must be used for remote mounting.

3.5 Wiring Connections

3.5.1 Wiring Safety Notices



WARNING: DO NOT OPEN explosion proof housing cover when power is “ON”. This is against hazardous area regulations and may lead to serious damage to the equipment. Equipment damaged in this manner is not covered under warranty.



WARNING: Connect Terminal TB1-2 to the DC Power Ground before all other wiring is connected. Power must remain disconnected until all wiring connections are securely terminated.



CAUTION: Avoid close proximity to radio transmitters, welders, switch mode power supplies, inverters, battery chargers, ignition systems, generators, switch gear, arc lights, and other high frequency or high power switching process equipment.

3.5.2 Field Wiring Procedure

Refer to the following instruction to connect wires to terminals of the detector (see Figure 7):

1. Loosen the set screw before unscrewing the detector housing cover.
2. Unscrew the knurled screws (see Figure 6), and remove the entire circuit board.
3. Insert flat head screwdriver into terminal plug reed and press down, then open the terminal plug. Refer to Section 3.5.3.
4. Insert wire with stripping length of 11mm into terminal plug, remove the screwdriver to fasten the wire, and gently pull the wire to ensure that it has been firmly locked into the cable terminal plug.
5. Insert the terminal plugs into appropriate terminal sockets, Refer to Section 3.5.4. put the circuit board in the housing and tighten the knurled screws.

NOTE: GASENSOR TECHNOLOGY recommends that a four-wire shielded cable should be used for making the power and serial communication connections on the GQ-CE8900.



Figure 6: Captive Screw

3.5.3 Ensure Interface Module Wiring

The red and black wires at the base of the Interface Module provide power for operation. The red wire is the positive (+) lead and the black wire is the negative (-) lead. The blue and green wires are for RS485 communication.

To Make the Wiring Connections

1. Ensure the Base Unit enclosure is connected to chassis ground or connected to the cable shield which is connected to chassis ground at the controller end.
2. Connect the red wire to Terminal TB4-1 (+24VDC).
3. Connect the black wire to Terminal TB4-2 (0VDC).
4. Connect the blue wire to Terminal TB4-3 (MOD+) and connect the green wire to Terminal TB4-4 (MOD-).

In order to prevent accidental shut down and ensure continual operation of the GQ-CE8900, a power switch is not included.

NOTE: Power must remain disconnected until all wiring connections are made. In all cases, the cables should be as short as possible. Refer to Section 7.5 for the recommended distance between the GQ-CE8900 and the power supply.

3.5.4 Base Unit Wiring

Figure 7 shows the GQ-CE8900 terminal block connectors TB1, TB2, TB3 and TB4. To ensure safety, install cabling from the GQ-CE8900 to DC Ground on the power supply first, then the Modbus and Analog device wiring connections. The +24 VDC on the power supply must be connected at last. Power to the GQ-CE8900 must remain OFF until all wiring is completed and the start-up readiness checklist has been verified. Refer to Section 3.6.1.

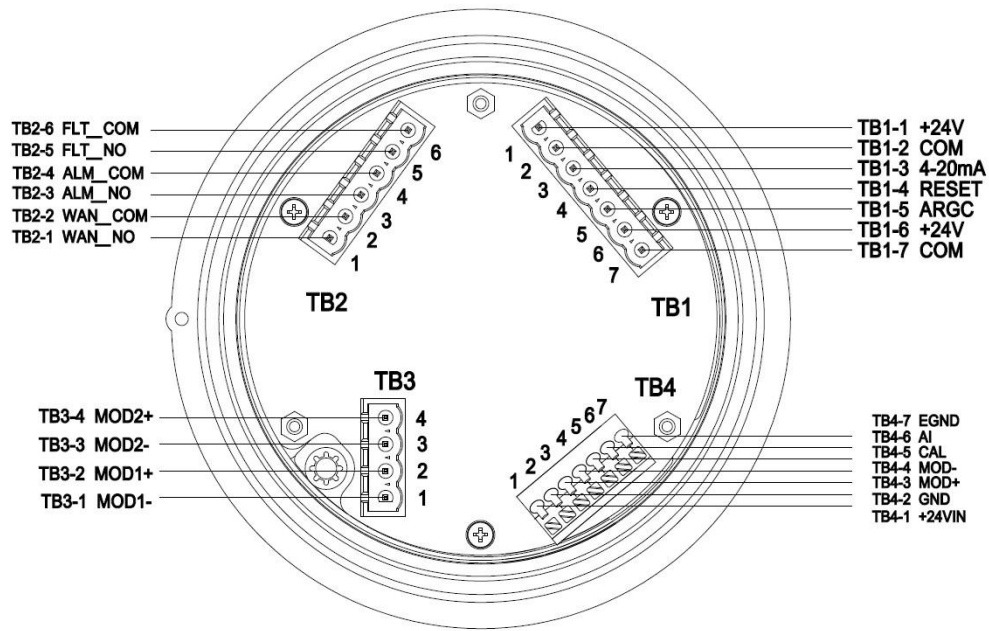


Figure 7: Terminal Block

Table 4: Terminal Block Connector Pin outs

No.	TB1	No.	TB2	No.	TB3	No.	TB4
1	+24V	1	WAN_NO	1	MOD1-	1	+24VIN
2	COM	2	WAN_COM	2	MOD1+	2	GND
3	4-20mA	3	ALM_NO	3	MOD2-	3	MOD+
4	RESET	4	ALM_COM	4	MOD2+	4	MOD-
5	ARGC	5	FLT_NO			5	CAL
6	+24V	6	FLT_COM			6	AI
7	COM					7	EGND



CAUTION: Direct body contact with PCB components should be avoided to prevent damage by static electricity. All wire connections are securely made to the terminal blocks. The following procedure is for wiring to connectors on the GQ-CE8900 terminal blocks TB1, TB2, TB3, and TB4.

3.5.3 Connecting Relay Devices

If ordered, terminal block TB2 contains the connections for the relay contacts for alarm equipment such as a Sounder and Beacon. The function of the Alarm and Warning relay connections varies as whether the relays are configured Energized or De-Energized.

NOTE: The default GQ-CE8900 configuration menu setting for the Warning and Alarm relays is De-Energized. The Fault relay is normally energized. It will change state after power up. Use the following table as a guide for determining the Normally Open (NO) and the Normally Closed (NC) contacts for the Energized versus De-Energized setting.

Table 5: TB2 Relay Contacts Energized / De-Energized Settings

Relay type	TB2 location	De-Energized	Energized
Warning	1	Normally Open	Normally Closed
	2	Common	Common
Alarm	3	Normally Open	Normally Closed
	4	Common	Common
Fault	5		Common
	6		Normally Closed



WARNING: Relay contacts must be protected against transient and over-voltage conditions.

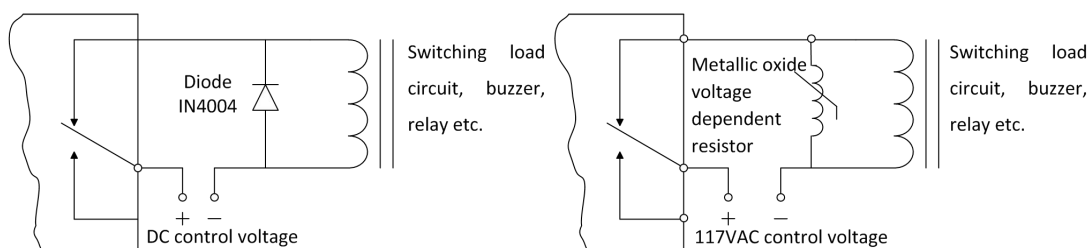


Figure 8: Relay Protection for DC and AC Loads

3.6 Power-Up and Start-Up

Upon completion of cable terminations and alarm contacts terminations, the GQ-CE8900 is ready for power-up. Prior to applying +24 VDC power supply, please read and fully understand the following procedures:

3.6.1 Start-up Checklist

Before applying power to the system for the first time, check the following items:

Table 6: Start-up Checklist

Step	Description
1	Verify that the GQ-CE8900 is properly mounted. Make sure that the conduit / cable gland entries are pointed downward
2	Verify that all the signal wiring is installed correctly
3	Verify connections between the GQ-CE8900 Base Unit and Interface Module
4	Verify connections between the GQ-CE8900 Base Unit and any control room devices



5	Ensure GQ-CE8900 explosion proof integrity.
6	Verify that the power supply is connected properly. The GQ-CE8900 is powered by +24 VDC (20 to 36 VDC voltage range). The GQ-CE8900 will output a low voltage fault at 18.5 VDC or below.

3.6.2 Start-up

Upon first power-up, the GQ-CE8900 should be allowed to stabilize for a while. The GQ-CE8900 goes through the following process during this time period:

- Display and EEPROM self-check
- Sensor warm-up, LED display reads “SU”
- The unit then enters monitoring mode. It displays the current reading for the electrochemical cell in the following format:

- ###.# — for FS concentrations (≤) less than or equal 50
- #### — for FS concentrations (>) greater than 50

NOTE: If the reading is over the range of the electrochemical cell, the GQ-CE8900 displays “Or”.

3.7 Maintaining the Explosion-Proof Integrity

The GQ-CE8900 Base Unit and Interface Module are rated explosion-proof for use in the following hazardous locations: Ex db ib IIC T6 Gb IP66

Some of the factors that influence the explosion proof integrity of the GQ-CE8900 housing are:

- Strength of the enclosure material.
- Thickness of the enclosure wall.
- Flame path between the housing and cover.
- Flame path of threaded joints.

Anytime the GQ-CE8900 Base Unit cover bolts or the Interface Module are loosened while power is on, it is necessary to de-classify the area. When replacing the cover, make sure it is securely tightened with captive screws.

There are two unused NPT 3/4” entry holes on each GQ-CE8900 base unit housing, one fitted with a plug and the other attached with a electrical interface label(for dust-proof only). Remove the label before making GQ-CE8900 wiring connections and any unused threaded holes should be fitted with a GASENSOR plug.

NOTE: Always follow appropriate local or national wiring and installation requirements and use approved conduit plugs at the time of installation.

When a GQ-CE8900 Interface Module is attached to the Base Unit or a remote junction box for remote configuration, it must be screwed into the Base Unit / remote junction box housing by more than five threads to ensure that the explosion proof integrity of the housing is maintained.

NOTE: DO NOT clean plastic parts of the Interface Module with a dry cloth to prevent electrostatic accumulation.

4.0 Operation

This section describes the menu instructions in detail for completing several start-up operation and configuration tasks within the GQ-CE8900 menu system. Information regarding the use of GQ-CE8900 Modbus commands as an alternate method for operating and configuring the unit is introduced in Modbus Interface.



CAUTION: To avoid the possibility of false alarms, always remove or turn-off power supply prior to servicing, removing, or replacing a sensor.

4.1 User Menu Structure

The GQ-CE8900 includes various selectable options that provide the most flexibility for various gas detectors manufactured by GASENSOR TECHNOLOGY. These options include Selectable Sensor Range, Warning and Alarm Relay Set points and Configuration, Modbus Communications Settings, and HART Communication Settings if HART is being ordered with the device. These options allow the unit to operate as a standalone device or in conjunction with a wide variety of controllers, computers, PLC, and DCS based systems. The following sections explain the available options and how they can be customized.

The following diagram provides a detailed view of the GQ-CE8900 menu structure:

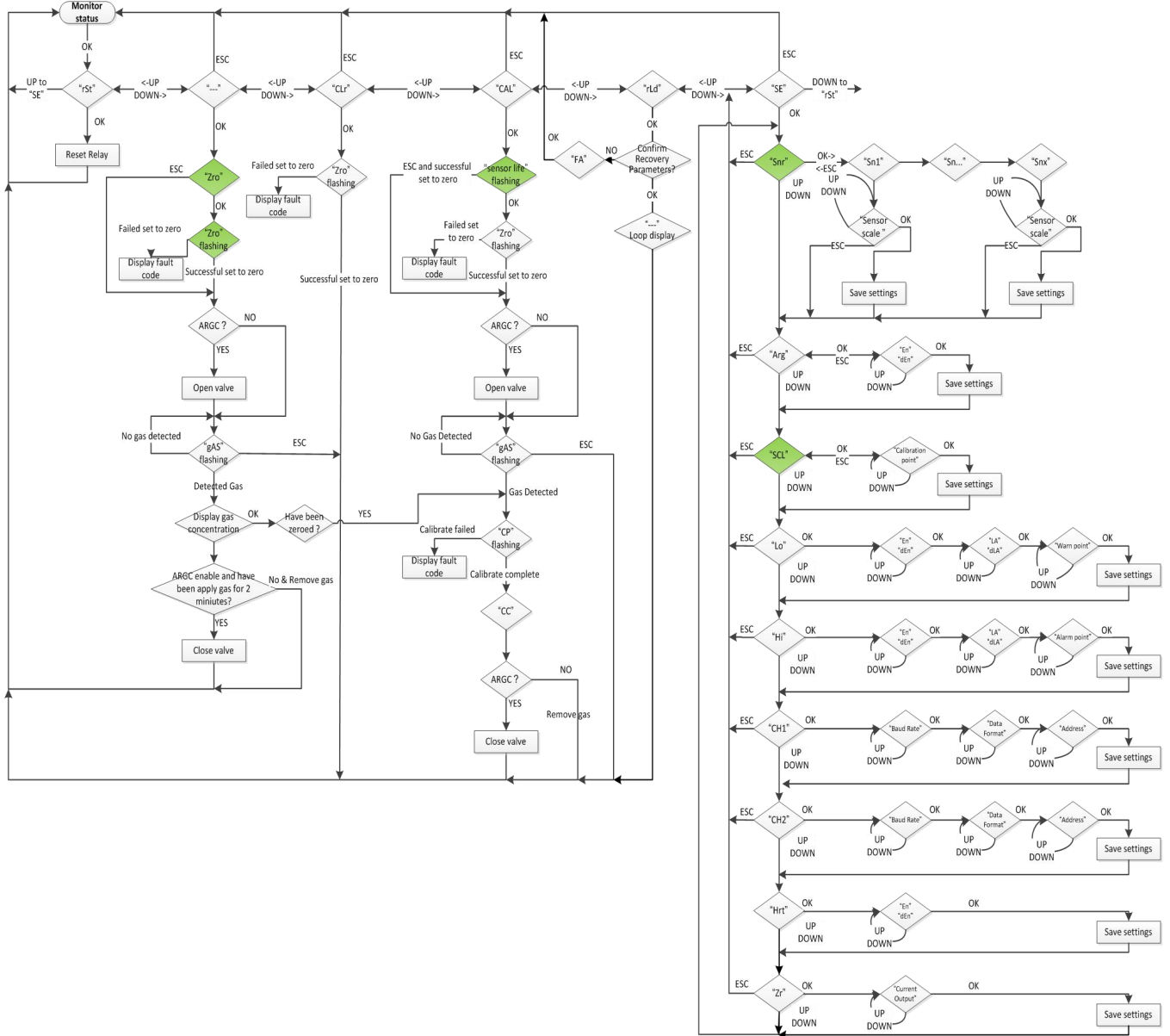


Figure 9: User Menu Structure

NOTE: If the GQ-CE8900 is purchased without relays or Modbus communications, changing the relay or Modbus configuration settings will have no effect on the operation of the unit.

4.2 User Menu Display

By activating “OK” key, it shows the start of Main Menu. “UP” or “DOWN” key is to scroll Main Menu in sequence as shown. Use “ESC” key to return to monitor status.

4.2.1 Main Menu

“UP” or “DOWN” key is to toggle through Main Menu in sequence as shown. Use “ESC” key to return to monitor status.

- “rSt”: Reset Relays
- “---” : Gas Check
- “CLr” : Only Clear Zero Point
- “CAL” : Calibration
- “SE”: Setup
- “rLd”: Restore Parameters

4.2.2 Reset Submenu

When display shows “rSt”, by activating “OK” key, it will reset relay status and return to monitor status.

4.2.3 Gas Check Submenu

When display shows “---”, by activating “OK” key, display will show Gas Check Submenu as follow. Activating the “ESC” key is to return to monitor status.

- “Zro”: Non-Flashing, await user to select Gas Check with zeroing or without zeroing. During this stage, if “ESC” key is activated, it will bring user into the “ARGC” sub-menu. Refer to “Arg” Sub Menu in section 4.5.2 for detail.
- “Zro”: Flashing, user has selected Gas Check with zeroing, system is in zeroing state.
- “gAS”: Flashing, unit is now ready for required calibration gas to be applied.
- “###”: Non-Flashing, displays the gas concentration currently measured.

4.2.4 Independent Zeroing Submenu

- “CLr”: Flashing, unit is in the process of zeroing. Unit returns to monitor status after independent zero operation is completed.

NOTE: In order to ensure the accuracy of the instrument detection, please calibrate the unit after the operation of a independent zeroing.

4.2.5 Calibration Submenu

When display shows “CAL”, by activating “OK” key, display will show Calibration Submenu as follow. Activating the “ESC” key is to return to monitor status.

- “###”: Flashing, indicate the remaining sensor life – Unit performing zeroing in Calibration.
- “100”: Non-Flashing, Remaining sensor life is reset to 100, unit is still zeroing.
- “gAS”: Flashing, Zeroing is complete, wait for application of gas.
- “CP”: Flashing, Unit is seeing gas, calibration is in progress.
- “CC”: Non-Flashing, Unit has finished calibration and tell user to remove the gas.

4.2.6 Submenu Setup

When display shows “rLd”, by activating “OK” key, display will show reload parameters as follow.

- “--”: Recovering parameters, "--" loop display;
- “FA”: Probe type is oxygen probe, current probe type is inconsistent with the last probe type;
- Reload parameters are forbidden:** such as, Warning, alarm generation, no electrochemical sensors, IM communication failure, IM EEPROM and RAM failure.

4.2.7 Submenu Setup

When display shows “SE”, press “OK” key to enter Submenu Setup.

“**Snr**”: Sensor range/ type setting

“**Arg**”:

“**En**”: Enable Automatic Remote Gas Calibrator Function.

“**dEn**”: Disable Automatic Remote Gas Calibrator Function.

“**SCL**”: Set calibration point.

“**Lo**”/“**Hi**”: Warning/Alarm relay set.

“**En**”: Energized.

“**dEn**”: De-energized.

“**LA**”: Latching.

“**dLA**”: Non-latching.

“**CH1**”/“**CH2**”: Modbus channel 1/ channel 2 settings.

Baud rate: “24”, “48”, “96”, “192”

Data Format: “8n1”, “8E1”, “8o1”, “8n2”

“**Hrt**”: HART

“**En**”: HART Enable

“**dEn**”: HART Disable

“**Zr**”: Zero current adjustment

4.3 Start-up

Upon power-up, three 7-segment digital displays will briefly display “8.8.8.” and the software revision letters “**rN**” (N – revision letter) . Then the unit enters Start-up Mode “**SU**”. Upon sensor stabilization, the unit enters Operation Mode and displays the current gas concentration.

4.4 Main Menu

On the display board, there are four reed switches, representing the “UP”, “Down”, “ESC”, “OK” keys. When applying a magnet, keep it close to the respective key position, remove the magnet after the corresponding LED is on.

In the monitor mode, press “OK” key to enter the main menu. Then use “Down” key to toggle through the options in sequence:

“rSt”->“---” ->“CLr” ->“CAL” ->“rLd”->“SE” ->“rSt”

“Up” key to toggle through the options in sequence:

“rSt”->“SE” ->“rLd” ->“CAL” ->“CLr” ->“---” ->“rSt”

By activating “ESC” key, it returns to monitor status.

NOTE: In the main menu, if no key is activated, the unit will return to monitor status after 15 seconds.

4.5 Selectable Options

When display shows “SET” menu, use “OK” key to enter and “UP” or “DOWN” key to select required submenu as follow and “ESC” key to return to monitoring status.

“**Snr**” -> “**Arg**” -> “**SCL**” -> “**Lo**” -> “**Hi**” -> “**CH1**” -> “**CH2**” -> “**Hrt**”-> “**Zr**”

4.5.1 Sensor Range Selection

In the “Snr” sub-menu, by activating “OK” key, the display shows current sensor type, then activate “OK” key once more, the unit enters sensor range selection menu, it displays current sensor range. Use “UP” or “Down” key to select appropriate sensor operating range, activate “OK” key to save current setting and return to “Snr” sub-menu. Use “DOWN” key to proceed to “Arg” Sub-menu.

4.5.2 ARGC Setting

Factory default setting for ARGC (Automatic Remote Gas Calibrator) is set to de-energized (dEn). User who has installed automatic remote gas calibration device must open ARGC function through menu selection or Modbus communication.

NOTE: If automatic remote gas calibration device has not been installed, ARGC needs to be set to 'dEn'. Otherwise, calibrate line cannot be used.

4.5.3 SCL Settings

The user can adjust the SCL Settings for all sensors. The SCL settings parameters are as follows:

- 50%FS (Default setting)
- 25%FS (Minimum)
- 100%FS (Maximum)

Under “SCL” menu, place magnet on “OK”, display will show calibration gas value. Use “DOWN” function to set appropriate decimal point for tenth or hundredth (flashing decimal point). Use “UP” function to set incremental for gas value. Activate 'OK' to save the setting and display will skip to 'Lo' menu automatically.

4.5.4 Lo Settings

The user can adjust the Warning Relay Settings for all sensors. The factory default settings and adjustment range for all gases (excluding O2) are as follows:

- Non-latching (default)
- De-energized (default)
- 25% FS set point (default)
- 5% FS (minimum)
- Alarm relay set point (maximum)

Under “Lo” menu, place magnet on “OK” to set alarm relay for energized or de-energized mode. Use “UP” or “DOWN” to switch between “dEn” and “En”, and press 'OK' to save settings. Similar procedures are used to set latching or non-latching of alarm relay. Refer to SCL Setting for alarm setting.

4.5.5 Hi Settings

The user can adjust the Warning Relay Settings for all sensors. The factory default settings and adjustment range for all gases are as follows:

- Non-latching (default)
- De-energized (default)
- 50% FS set point (default)
- 95% FS (maximum)
- Warning relay set point (minimum)

Under “Hi” menu, place magnet on “OK” to set alarm relay for energized or de-energized mode. Use “UP” or “DOWN” to switch between “dEn” to “En” and press “OK” to save settings. Similar procedures are used to set latching or non-latching of alarm relay. Refer to SCL Setting for alarm setting.

4.5.6 CH1, CH2 Settings

NOTE: The available channel settings are 1-247 for both Channel 1 and Channel 2.

The default settings for Channel 1 are:

- Address 1
- 9,600 baud rate
- 8-N-1

The default settings for Channel 2 are:

- Address 2
- 9,600 baud rate
- 8-N-1

Baud rate settings: “UP”, “DOWN” key to select baud rate.

“24”: 2400

“48”: 4800

“96”: 9600

“192”: 19200

Data format settings: “UP”, “DOWN” key to select data format.

“8n1”: 8-N-1

“8E1”: 8-E-1

“8o1”: 8-O-1

“8n2”: 8-N-2

Use “ESC” to return to previous menu. Place magnet on “OK” to enter the communication address menu.

Communication address settings: In this menu, cursors will first flash on the hundreds’ digit. At this point, “UP” key is used to increment the data figure from 0 to 9, “DOWN” key is used to switch flashing cursor among hundreds’ digit, ten’s digit, and unit’s digit, “ESC” key is used to return to the previous menu and “OK” key is used to save current settings and jump to “SE” submenu.

4.5.7 HART Settings

The default settings for HART is de-energized (dEn). To set HART function, activate “OK” key in HART sub-menu. Use “UP” or “DOWN” to switch between “dEn” and “En”. Activate “OK” key to save current settings and jump to the “Snr” menu.

4.5.8 Zr Setting

Under the menu “Zr”, apply magnetic wand to the key “OK” and the detector shows zero current. Apply magnetic wand to the key “DOWN” to lower the present zero current set value for 0.01 each time, till it reaches 3.91mA; Apply magnetic wand to the key “UP” to increase the present zero current set value for 0.01 each time, till it reaches 4.15 mA. Apply magnetic wand to the key “OK” to save the present zero current set value.

4.5.9 Warning/Alarm Relay Reset

If warning or alarm relay is set to latching, once the measured gas concentration falls below set point, these relays need to be reset manually. There are three methods to reset relay:

1. The relays can be reset using the Modbus Interface.
2. The relays can be reset using the magnetic switch on the Base Unit. Activate “OK” key to enter main menu, select “rSt” sub menu and select “OK” to reset the relay.

3. The relays can be reset using the Remote Reset input terminals on TB1 on the relay board.

4.5.10 Gas Check

1. In the “---” menu, activate “OK” key, enter “Zro” sub-menu, the users decide whether to set to zero.
2. In the “Zro” submenu, if “OK” key is activated, “Zro” display will flash and unit begins its zeroing process. Upon completing zeroing set, display will show “gAS”. Meanwhile, at the “Zro” menu, if “ESC” key is being activated, gas check will be aborted.
3. “gAS” flashing indicates that the unit is ready for calibration gas. If “ESC” key is activated at this time, unit exit gas check process.
4. Apply the testing gas to the sensor, the value of the gas concentration is then indicated by the flashing display (with readings typically stabilizing within one minute).
5. Display shows flashing “CP” while concentration of calibration is measured.
6. When the reading becomes stabilized and the test is complete, remove the gas. When the gas concentration drops below 5% FS the unit will return to normal operation.

NOTE: In this status, warning and alarm are inactive.

4.5.11 Independent Zero Operation

When “Zro” is selected in the main menu, by activating “OK” key, “Zro” starts to flash and zeroing begins. After successful completion of the zeroing process, the unit will return to normal monitor status. Otherwise, fault code will be displayed.

NOTE: In this stage, warning and alarm are inactive. The independent zero operation is used to check the zeroing function of the unit. User must perform gas calibration, so as to ensure the unit works normally. If the unit has not been properly calibrated, independent zero operation is invalid. GASENSOR TECHNOLOGY is not responsible for the consequences caused by such invalid gas calibration.

4.5.12 Calibration

1. Select “CAL” in the main menu, activate “OK” key to bring the unit into calibration mode and the zeroing process begins. While the unit is being set to zero, the display window flashes the Remaining Sensor Life.
2. The user can choose to reset or not to reset the sensor life. By activating “OK” key, it resets sensor life to 100. Activate “ESC” key not to reset sensor life, and the current sensor life display stops flashing.
3. The unit will enter the “gAS” menu after a successful zeroing, activate “ESC” to exit calibration process.
4. Apply the calibration gas to the sensor (50% FS of target gases). The display changes from “gAS” to “CP”, which indicates that the sensor is responding to the calibration gas.
5. After calibration, the display changes from “CP” to “CC”, which indicates that the calibration is complete.
6. Remove the gas and wait for the unit to return to normal operation. The display may indicate a few percent of FS and will gradually drop to “0” If a unit time out occurs the user receives a calibration fault.

NOTE: In this status, warning and alarm are inactive. Calibration gas is 50% target gas.

Table 7: Sensor Type and Flow Rates

Sensor Type	50% of Full-Scale	Recommended Flow Rates (mL/Minute)
Carbon Monoxide	50 ppm, 250 ppm	500
Chlorine	5 ppm, 10 ppm	1000
Chlorine Dioxide	1.5 ppm	1000
Hydrogen	250 ppm	500
Hydrogen Chloride	10 ppm, 15ppm	1000
Hydrogen Sulfide	15 ppm, 25 ppm, 50 ppm	500
Nitric Oxide	50 ppm	500
Nitrogen Dioxide	10 ppm	1000
Ozone	0.5 ppm	1000
Sulfur Dioxide	10 ppm	500

5.0 Preventive Maintenance

5.1 General Maintenance



WARNING: Please disconnect or inhibit the external equipment such as Controller, PLC and DCS systems before performing any maintenance of the GQ-CE8900.

5.2 Storage

It is recommended that GQ-CE8900 should be stored in a clean and dry environment. The temperature and humidity should be within the parameters as listed in Appendix 7.6.

Please remove the EC sensor from the GQ-CE8900 for a long time storage. The sensor assembly must be fitted with a short wire link and placed into the original box.

6.0 Troubleshooting



CAUTION: Under the warranty terms, only GASENSOR TECHNOLOGY or its authorized representative is allowed to repair the GQ-CE8900. Any unauthorized repair will void the warranty.

NOTE: Inhibit all external alarm devices during the maintenance service of the GQ-CE8900 to avoid undesirable activation of alarm signal.

6.1 Fault Code and Action

The GQ-CE8900 has a built-in self-test function. An occurrence of internal fault will cause the analog output current to 0mA, the fault relay will be activated and unit will display the fault code.

Table 8 lists all available fault codes with relevant fault analyses and provides possible solution respectively of the GQ-CE8900. Please contact GASENSOR TECHNOLOGY when any unsolvable error is encountered.

Table 8: Fault Code

Fault Code	Fault type	Fault Analysis	Solution
F0**	Base unit ROM fault	ROM checksum error.	<ul style="list-style-type: none"> • Replace control board. • Return to factory.
F1**	Base unit RAM or EEPROM fault	RAM or EEPROM checksum error.	<ul style="list-style-type: none"> • Return to factory. • Check whether the instrument has been affected by strong interference.
F2	Power supply low	Power supply lower than +18.5VDC	<ul style="list-style-type: none"> • Check whether the power supply voltage is conforming to the requirements of the instrument.
F3	Reference voltage fault	The reference voltage of base unit error.	<ul style="list-style-type: none"> • Return to factory.
F4**	4-20mA fault	4-20mA analog signal open circuit.	<ul style="list-style-type: none"> • Check the 4-20 mA analog signal line connection. • Return to factory.
F5	Switch fault	<ol style="list-style-type: none"> 1. Reed switches on the display board are faulty. 2. Remote reset line or remote CAL line short to GND long time. 	<ul style="list-style-type: none"> • Replace the display board. • Check the remote calibration and remote reset connection is correct and reliable.
F10**	IM Communication Or RAM/ROM fault	<ol style="list-style-type: none"> 1. Interface module communication failures. 2. The RAM or ROM of interface module failures. 	<ul style="list-style-type: none"> • Make sure the input power to the base unit is +20VDC at least. • Return to factory
F11**	Sensor negative drift	Sensor negative drift	<ul style="list-style-type: none"> • Re-calibrate. • Replace with a new sensor. • Return to factory for repair.
F12	Zeroing failure	Interface module zeroing operation incomplete.	<ul style="list-style-type: none"> • Check whether sensor reset conditions are achieved (environment, zero gas). • Replace a new sensor. • Return to factory for repair.
F13**	Calibration failure	Interface module calibration operation incomplete.	<ul style="list-style-type: none"> • Check the calibration gas is in accordance with the requirements. • Replace with a new sensor. • Return to factory for repair.
F14**	No sensor	Sensor is not installed.	<ul style="list-style-type: none"> • Install the sensor provided by G..T. • If it has been fitted with right sensor, then returned to factory for repair.
F15	Calibration timeout	Failed to timely remove calibration gas.	<ul style="list-style-type: none"> • Re-calibrate according to the calibration procedure.
F16	Gas check timeout	Failed to timely provide gas of a certain concentration or too much gas	<ul style="list-style-type: none"> • Re-check according to the gas check procedure.
F17**	IM EEPROM failure	EEPROM of Interface module error.	<ul style="list-style-type: none"> • Return to factory.
F20**	Uncalibrated IM calibration	New sensor without calibration.	<ul style="list-style-type: none"> • Perform sensor calibration according to the calibration procedure.

F21	Sensor output fluctuates	The output of the sensor has abnormal changes.	<ul style="list-style-type: none"> • Check whether there is a strong interference on the instrument. • Check whether the sensor is overdue. • Return to factory.
<p>*INFORMATION: The resistance of power cable for the GQ-CE8900 should be less than 20Ω and the loop resistance should be less than 40Ω (at +24VDC) .</p> <p>** INFORMATION: Faults marked with * * are not covered by alarm or alert status, their priority is higher than other faults. Other fault priority is below alarm or warning .</p>			

The fault code with a higher priority will be displayed if two or more faults occur at the same time. The following table shows fault code priority:

Table 9: Fault Code Priorities

Priorities	CODE	Priorities	CODE
1	F0	9	F13
2	F1	10	F8
3	F10	11	F21
4	F14	12	F15
5	F17	13	F16
6	F20	14	F3
7	F11	15	F2
8	F12	16	F5

7.0 Appendix

7.1 Hazardous Area Specification

Table 10: Hazardous area specification

Item	Description
Type of protection	Ex db ib
ATEX classification	Group II Category 2 II G
Certification marking	II 2G Ex db ib IIC T6 Gb IP66
Ambient temperature	-40°C ~ 70°C (without sensor)
EC type examination Certification No.	TI17ATEX 1091X
Degree of protection	IP66 acc. To EN60529/IEC60529
Approval of the production Quality assurance	ATEX 1354

7.2 Regular Test/Calibration

The regular test and calibration of GQ-CE8900 must be done in accordance with the procedures described in the manual. Test and calibration procedures shall include, but not limited to:

- . Check the zero reading value
- . Check the gas reading value

GQ-CE8900 should be calibrated or repaired if the test result is beyond the scope of parameters of GASENSOR TECHNOLOGY.

7.3 Regular System Check

It is essential to verify the whole system once a year.

. Check the stability of all wiring, terminal connections and installation of integrated safety equipment, which includes, but not limited to:

- . Power supply unit
- . Control module
- . Field testing equipment
- . Signals and display equipment
- . Accessories connected to field signal and display device

. Check the full function of all equipment, verify the security system is running correctly, and ensure the alarm and warning conditions are set correctly.

. Check the fault detect circuit is running correctly.

7.4 Conversion Table
Table 11: Conversion Table

% of Scale	Full Scale Value							
	1.00	3.00	10.0	20.0	25.0	50	100	500
0	0.00	0.00	0.0	0.0	0.0	0	0	0
1	0.01	0.03	0.1	0.2	0.3	1	1	5
2	0.02	0.06	0.2	0.4	0.5	1	2	10
3	0.03	0.09	0.3	0.6	0.8	2	3	15
4	0.04	0.12	0.4	0.8	1.0	2	4	20
5	0.05	0.15	0.5	1.0	1.3	3	5	25
6	0.06	0.18	0.6	1.2	1.5	3	6	30
7	0.07	0.21	0.7	1.4	1.8	4	7	35
8	0.08	0.24	0.8	1.6	2.0	4	8	40
9	0.09	0.27	0.9	1.8	2.3	5	9	45
10	0.10	0.30	1.0	2.0	2.5	5	10	50
11	0.11	0.33	1.1	2.2	2.8	6	11	55
12	0.12	0.36	1.2	2.4	3.0	6	12	60
13	0.13	0.39	1.3	2.6	3.3	7	13	65
14	0.14	0.42	1.4	2.8	3.5	7	14	70
15	0.15	0.45	1.5	3.0	3.8	8	15	75
16	0.16	0.48	1.6	3.2	4.0	8	16	80
17	0.17	0.51	1.7	3.4	4.3	9	17	85
18	0.18	0.54	1.8	3.6	4.5	9	18	90
19	0.19	0.57	1.9	3.8	4.8	10	19	95
20	0.20	0.60	2.0	4.0	5.0	10	20	100
21	0.21	0.63	2.1	4.2	5.3	11	21	105
22	0.22	0.66	2.2	4.4	5.5	11	22	110
23	0.23	0.69	2.3	4.6	5.8	12	23	115
24	0.24	0.72	2.4	4.8	6.0	12	24	120
25	0.25	0.75	2.5	5.0	6.3	13	25	125
26	0.26	0.78	2.6	5.2	6.5	13	26	130
27	0.27	0.81	2.7	5.4	6.8	14	27	135
28	0.28	0.84	2.8	5.6	7.0	14	28	140
29	0.29	0.87	2.9	5.8	7.3	15	29	145
30	0.30	0.90	3.0	6.0	7.5	15	30	150
31	0.31	0.93	3.1	6.2	7.8	16	31	155
32	0.32	0.96	3.2	6.4	8.0	16	32	160
33	0.33	0.99	3.3	6.6	8.3	17	33	165
34	0.34	1.02	3.4	6.8	8.5	17	34	170
35	0.35	1.05	3.5	7.0	8.8	18	35	175
36	0.36	1.08	3.6	7.2	9.0	18	36	180
37	0.37	1.11	3.7	7.4	9.3	19	37	185
38	0.38	1.14	3.8	7.6	9.5	19	38	190
39	0.39	1.17	3.9	7.8	9.8	20	39	195

% of Scale	Full Scale Value							
	1.00	3.00	10.0	20.0	25.0	50	100	500
40	0.40	1.20	4.0	8.0	10.0	20	40	200
41	0.41	1.23	4.1	8.2	10.3	21	41	205
42	0.42	1.26	4.2	8.4	10.5	21	42	210
43	0.43	1.29	4.3	8.6	10.8	22	43	215
44	0.44	1.32	4.4	8.8	11.0	22	44	220
45	0.45	1.35	4.5	9.0	11.3	23	45	225
46	0.46	1.38	4.6	9.2	11.5	23	46	230
47	0.47	1.41	4.7	9.4	11.8	24	47	235
48	0.48	1.44	4.8	9.6	12.0	24	48	240
49	0.49	1.47	4.9	9.8	12.3	25	49	245
50	0.50	1.50	5.0	10.0	12.5	25	50	250
51	0.51	1.53	5.1	10.2	12.8	26	51	255
52	0.52	1.56	5.2	10.4	13.0	26	52	260
53	0.53	1.59	5.3	10.6	13.3	27	53	265
54	0.54	1.62	5.4	10.8	13.5	27	54	270
55	0.55	1.65	5.5	11.0	13.8	28	55	275
56	0.56	1.68	5.6	11.2	14.0	28	56	280
57	0.57	1.71	5.7	11.4	14.3	29	57	285
58	0.58	1.74	5.8	11.6	14.5	29	58	290
59	0.59	1.77	5.9	11.8	14.8	30	59	295
60	0.60	1.80	6.0	12.0	15.0	30	60	300
61	0.61	1.83	6.1	12.2	15.3	31	61	305
62	0.62	1.86	6.2	12.4	15.5	31	62	310
63	0.63	1.89	6.3	12.6	15.8	32	63	315
64	0.64	1.92	6.4	12.8	16.0	32	64	320
65	0.65	1.95	6.5	13.0	16.3	33	65	325
66	0.66	1.98	6.6	13.2	16.5	33	66	330
67	0.67	2.01	6.7	13.4	16.8	34	67	335
68	0.68	2.04	6.8	13.6	17.0	34	68	340
69	0.69	2.07	6.9	13.8	17.3	35	69	345
70	0.70	2.10	7.0	14.0	17.5	35	70	350
71	0.71	2.13	7.1	14.2	17.8	36	71	355
72	0.72	2.16	7.2	14.4	18.0	36	72	360
73	0.73	2.19	7.3	14.6	18.3	37	73	365
74	0.74	2.22	7.4	14.8	18.5	37	74	370
75	0.75	2.25	7.5	15.0	18.8	38	75	375
76	0.76	2.28	7.6	15.2	19.0	38	76	380
77	0.77	2.31	7.7	15.4	19.3	39	77	385
78	0.78	2.34	7.8	15.6	19.5	39	78	390
79	0.79	2.37	7.9	15.8	19.8	40	79	395
80	0.80	2.40	8.0	16.0	20.0	40	80	400
81	0.81	2.43	8.1	16.2	20.3	41	81	405
82	0.82	2.46	8.2	16.4	20.5	41	82	410
83	0.83	2.49	8.3	16.6	20.8	42	83	415
84	0.84	2.52	8.4	16.8	21.0	42	84	420

% of Scale	Full Scale Value							
	1.00	3.00	10.0	20.0	25.0	50	100	500
85	0.85	2.55	8.5	17.0	21.3	43	85	425
86	0.86	2.58	8.6	17.2	21.5	43	86	430
87	0.87	2.61	8.7	17.4	21.8	44	87	435
88	0.88	2.64	8.8	17.6	22.0	44	88	440
89	0.89	2.67	8.9	17.8	22.3	45	89	445
90	0.90	2.70	9.0	18.0	22.5	45	90	450
91	0.91	2.73	9.1	18.2	22.8	46	91	455
92	0.92	2.76	9.2	18.4	23.0	46	92	460
93	0.93	2.79	9.3	18.6	23.3	47	93	465
94	0.94	2.82	9.4	18.8	23.5	47	94	470
95	0.95	2.85	9.5	19.0	23.8	48	95	475
96	0.96	2.88	9.6	19.2	24.0	48	96	480
97	0.97	2.91	9.7	19.4	24.3	49	97	485
98	0.98	2.94	9.8	19.6	24.5	49	98	490
99	0.99	2.97	9.9	19.8	24.8	50	99	495
100	1.00	3.00	10.0	20.0	25.0	50	100	500

7.5 Technical Parameters

Table 12: Technical Parameters

Item	Description
Sensor type	Electrochemical sensor
Normal life(EC Sensor)	2~3years (under the normal conditions)
Guarantee period	- Base unit and IM unit: 2 years - Electrochemical sensor: 1 year
Measure range	- CO: 0-100 ppm, 0-500 ppm - CL ₂ : 0-10 ppm, 0-20 ppm - CLO ₂ : 0-3 ppm - H ₂ : 0-500 ppm - HCL: 0-20 ppm,0-30ppm - H ₂ S: 0-30 ppm, 0-50 ppm, 0-100 ppm - NO: 0-100 ppm - NO ₂ : 0-20 ppm- O ₂ : 0-25%VOL - O ₃ : 0-1 ppm - SO ₂ : 0-20 ppm
Response time (50% full scale)	- CL ₂ 、CLO ₂ : T ₉₀ < 60s - CO、H ₂ 、NO ₂ : T ₉₀ < 30s - H ₂ S: T ₉₀ < 45s - HCL: T ₉₀ < 70s

	- O ₃ : T ₉₀ < 90s - NO、SO ₂ : T ₉₀ < 10s - O ₂ : T ₉₀ < 15s
Repeatability	Normal:±2%FS, O ₃ : ±0.1ppm, ClO ₂ : ±0.2ppm, O ₂ : ±1% FS
Zero drift	< 5% per year
* Please consult the manufacturer if user wants to detect other gases.	

Table13: Cable Requirement
Maximum distance between the GQ-CE8900 and 24VDC power

AWG	m
14	2500
16	1600
18	1000
20	600

Maximum distance of analog output(500 Ohm load) :

AWG	m
14	2700
16	1600
18	1200
20	750

Maximum distance between base unit and IM unit

AWG	m
14	600
16	400
18	300
20	200

7.6 Electrical Specification

Table 14: Electrical Specification

Item	Description
Normal installation	Refer to Table 13
Rated input	20~36VDC, 120mA@24VDC, 3.5W Max
Relay capacity	<u>8A@250VAC/8A@30VDC</u> Impedance load (3x) SPST – Warning, Alarm, Fault
Current output	Impedance load: MAX 500Ω@24VDC Without HART: Output range: 0-22mA Output range with gas: 4-20 mA Start-up: 1.5mA Calibration: 1.5 mA Gas check: 1.5mA Setup model: 1.5 mA

	Fault: < 1.0 mA Over range: 21.5 mA HART: Output range: 3.5-22mA Output range with gas: 4-20 mA Start-up: 3.5mA Calibration: 3.5 mA Gas check: 3.5mA Setup model: 3.5 mA Fault: 3.5 mA Over range: 21.5 mA HART(Compatible): Output range: 1.25-22mA Output range with gas: 4-20 mA Start-up: 1.5mA Calibration: 1.5 mA Gas check: 1.5mA Setup model: 1.5 mA Fault: 1.25 mA Over range: 21.5 mA
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Table15: Environmental requirements

Item	Description
Operating temperature range (excluding H2S)	-20°C~+50°C
Operating temperature range (H2S)	-40°C~+50°C, -30°C~+70°C
Storage temperature range (without sensor)	-40°C~+85°C
Storage temperature range (sensor)	0°C~+20°C H ₂ , CO, O ₂ : +16°C~+27°C
Relative humidity range	15% ~ 90%, non-condensing
Atmospheric pressure range	±10% of Normal atmospheric pressure

History Record

S/N	Rev. #	Change Description	Remark
1	A140308	First Edition	
2	B160307	1. Delete Table 4 "Cross-sensitivity Table"; 2. Amend the ATEX certificate no. in Table 10 to "ATEX1354"; 3. Change data in Table 13 "Cable Requirements"; 4. Revise the rated power in Table 14 to 3.5W; 5. Add output current parameters under HART(Compatible) mode in Table 14; 6 Other modifications in detail.	GT-ECR00012
3	C170817	New ATEX directive 2014/34/EU and standard evolution	GT-ECR00030
4	C171212	Detail adjustment & Uniform Operating Temperature range & Increase warning terms.	
5	D180612	1. Modify the sequence of Table 3 in Figure 7; 2. Modify the description and sequence of the fault relay in Figure 7; 3. Modify the information of terminal in Table 4.	
6	D181204	Add content about H ₂ S electrochemical sensor	



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