GG2 DISPLAY

4-20mA / IMAC / RS485

User Manual

Version: 8, October 2022

Designed and manufactured in Australia by Ampcontrol Pty Ltd

Gasguard®2

AMPCONTROL®

WARNING!

The **warning** symbol highlights a potential risk **malfunction** or loss of **performance**

Please share these warnings with other operators.

CAUTION!

The **caution** symbol highlights a potential risk of **damage to equipment**.

Please share these cautions with other operators.

NOTE

The **note** symbol highlights **key information**.

Please share these notes with other operators.

ENVIRO

The **enviro** (environmental) symbol highlights areas which may have an impact on the surrounding **fauna and/or flora**.

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Before You Begin

Thank you for purchasing from the Ampcontrol GG2 range.

WARNING!

In the interests of **safety and correct equipment operation**, please take the time to read and understand the content in this manual.

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DEFINITIONS

Term	Definition
CO_2	Carbon Dioxide
CH_4	Methane
CO	Carbon Monoxide
O_2	Oxygen
H_2S	Hydrogen Sulphide
NATA	National Association of Testing Authorities, Australia
NDIR	Non-Dispersive Infrared
Warm Up Time	Time interval, with the equipment in a stated atmosphere, between the time when the equipment is switched on and the time when the indication reaches and remains within the stated tolerances
AS/NZS 4641:2007	Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels - general requirements and test methods
AS/NZS 2290.3-2018	Electrical equipment for coal mines- maintenance and overhaul Part 3: maintenance of gas detecting and monitoring equipment.
AS/NZS 2290.3-1990	Electrical equipment for coal mines - maintenance and overhaul Part 3: maintenance of gas detecting and monitoring equipment.
AS/NZS 60079-29.1:2008	Explosive atmospheres part 29.1: Gas detectors - Performance requirements of detectors for flammable gases
AS/NZS 60079.0-2011	Explosive atmospheres - Part 0: Equipment - General requirements
AS/NZS 60079.11-2011	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
GG2	Gasguard 2
Time of response T90	Time interval, with the equipment in a warmed-up condition, between the time when an instantaneous change between clean air and the standard test gas, or vice versa, is produced at the equipment inlet, and the time when the response reaches a stated percentage (90%) of the stabilised signal on the standard test gas
RTGMS	Real Time Gas Monitoring System
SIS	Safety Instrumented Functions. A SIF is composed of any combination of detector(s), logic solver(s), and final element(s). A SIS usually has a number of safety functions with different SIL's so it is best avoid describing it by a single SIL
SIL	Safety Integrity Levels

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Term	Definition
SRS	Safety Requirement Specification - containing all the requirements of the safety functions that have to be performed by the safety-related system. It includes both what the functions must do and also how well they must do it. It is often a contractual document between companies and is one of the most important documents in the safety lifecycle process
ILAC	International Laboratory Accreditation Cooperation Mutual Recognition Arrangement. ILAC is the international organisation for accreditation bodies operating in accordance with ISO/IEC 17011 and involved in the accreditation of conformity assessment bodies including calibration laboratories (using ISO/IEC 17025), testing laboratories (using ISO/IEC 17025), medical testing laboratories (using ISO 15189), inspection bodies (using ISO/IEC 17020) and proficiency testing providers using ISO/IEC 17043.

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1 SAFETY AND OTHER WARNINGS

For safety reasons, the GG2 Display must be installed, operated and serviced only by competent personnel. Please read and understand this instruction manual completely before installing, operating or servicing this equipment. Failure to install or operate this instrument in accordance with the instructions contained in this manual may create hazardous operating conditions.

1.1 Safe Use of Equipment

The equipment supplied has been designed and manufactured to ensure safe operation. The equipment must only be used within the design parameters.

The instructions within this manual must be observed as an aid towards achieving the safest possible installation.

Persons responsible for installation, maintenance, or operation, must observe the following instructions:

1.1.1 Changes to Equipment

Changes in the design and modifications to the equipment are not permitted. Unauthorised changes made to the hardware or operating firmware will void the manufacturer's warranty and may compromise the integrity of the system into which it is installed and other connected equipment.

1.1.2 Equipment Knowledge

Experience with, or understanding of, this equipment is essential for the safe installation and removal of the equipment. Therefore, please read and understand this manual prior to use. Competency based training courses are recommended and are available on request.

1.1.3 Manual Handling

Precautions have been taken to ensure all equipment is safe to handle and free from sharp edges. However, care should always be taken when handling enclosures and gloves should be worn.

1.1.4 Installation

Correct operation and safety depend on GG2 Display and associated equipment being installed correctly. Mechanical and or electrical installation and maintenance of plant and equipment must only be carried out by appropriately qualified personnel and must be tested thoroughly prior to operation.

1.1.5 Operation

As safety depends on GG2 Display functioning correctly it is highly recommended that all safety functions of the unit be periodically tested to ensure correct operation.

1.2 Supplementary Documentation

The GG2 Display User Manual is expected to be read in conjunction with the following documentation:

- GG2B011 GG2 Detector User Manual
- GG2B032 GG2 Communication User Manual
- GG2B033 GG2 Detectors RTGMS Design, Installation and Maintenance Guide

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2 RECEIVING AND STORAGE

2.1 Receiving

All possible precautions are taken to protect the equipment against damage or losses during shipment; however, before accepting delivery, check all items against the packing list or bill of loading. If there is evidence of physical damage, notify Ampcontrol immediately.

Notify Ampcontrol immediately in the case of any discrepancies to the packing list. Keep a record of any claims and correspondence. Photographs are recommended.

Where practicable do not remove protective covers prior to installation unless there are indications of damage. Boxes opened for inspection and inventory should be carefully repacked to ensure protection of the contents or else the parts should be packaged and stored in a safe place. Examine all packing boxes, wrappings and covers for items attached to them, retain and store any approval documentation for your safety file as applicable prior to wrapping being discarded.

2.2 Inspection

Equipment that is found to be damaged or has been modified away from its published specifications must not be used. Please contact Ampcontrol if the equipment is suspected to be different than that ordered or if it does not match the published specifications.

2.3 Storage after Delivery

When the equipment is not to be installed immediately, proper storage is important to ensure protection of equipment and validity of warranty.

All equipment should be stored indoors between 0-40˚C, preferably on shelves and protected from moisture and sunlight.

2.4 Unpacking of Equipment

The method of packing used will depend on the size and quantity of the equipment. The following cautions should be interpreted as appropriate.

CAUTION!

Take care when unpacking crates as the **contents may have shifted during transport**.

ENVIRO

The disposal of packaging materials, replaced parts, or components must comply with environmental restrictions without polluting the soil, air or water.

Ensure that any timber and cardboard used as **packaging is disposed of in a safe and environmentally responsible manner**.

Where possible, dispose of all waste products i.e., oils, metals, plastic and rubber products by using an approved recycling service centre.

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3 PRODUCT OVERVIEW

3.1 Overview

The GG2 Display Module is an intrinsically safe apparatus for the purpose of displaying and transmitting sensor data and system information. The GG2 Display consists of a certified GG2 Display Module and associated wiring installed within an IP66 rated stainless steel enclosure.

The GG2 Display is available in three variants, a glanded display supporting iMAC/RS485 communication and two pluggable versions supporting 4-20mA+iMAC and 4-20mA+RS485 communication. The display connects to a variety of compatible detector modules via the robust proprietary connector. An optional Remote Cable Assembly is available for mounting compatible modules up to 10 metres from the GG2 Display.

3.2 Key Features

- Certified Intrinsically Safe – Ex ia I Ma
- Rugged stainless-steel construction
- Failsafe architecture and digital interface
- Extensive self-diagnostic routines
- Economical
- LCD Display
- 4-20mA, iMAC and RS485 communication support
- Compatible with a wide range of detectors:
    - Electrochemical
        - Carbon Monoxide (CO)
        - Oxygen (O2)
        - Hydrogen Sulphide (H2S)
    - Catalytic
        - Methane (CH_4)
    - Non-Dispersive Infrared
        - Methane (CH4)
        - Carbon Dioxide (CO_2)
- Backwards compatible with Ampcontrol's existing Gasguard equipment*

*Note: While mounting points remain the same, the additional space required by the GG2 Display/Sensor assembly must be taken into account. The remote head assembly will require a bracket modification to mount the detector.

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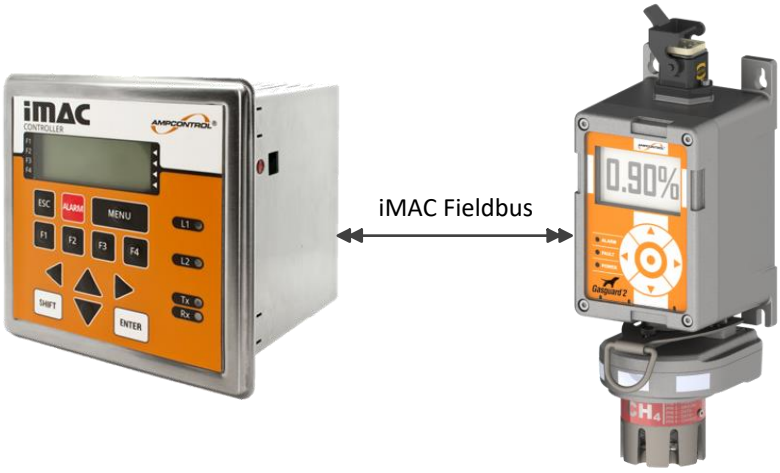

Figure 1: GG2 Example System (iMAC Communication)

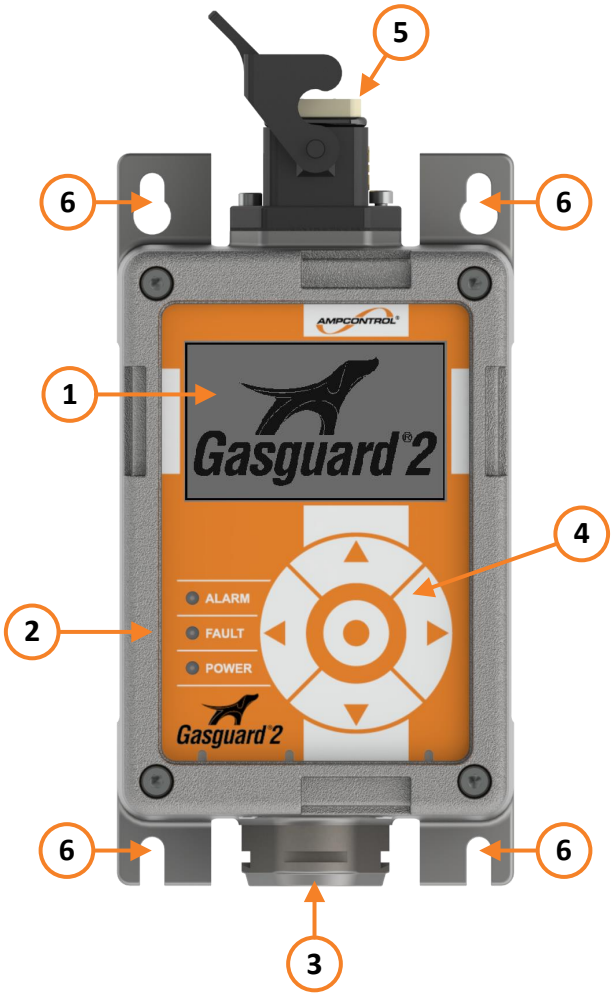

Figure 2: GG2 Display Overview

1. LCD Display
2. LED Indicators
3. Proprietary Connector (S2)
4. Magnetic Keypad
5. System Connector (S1)
6. Mounting Tabs

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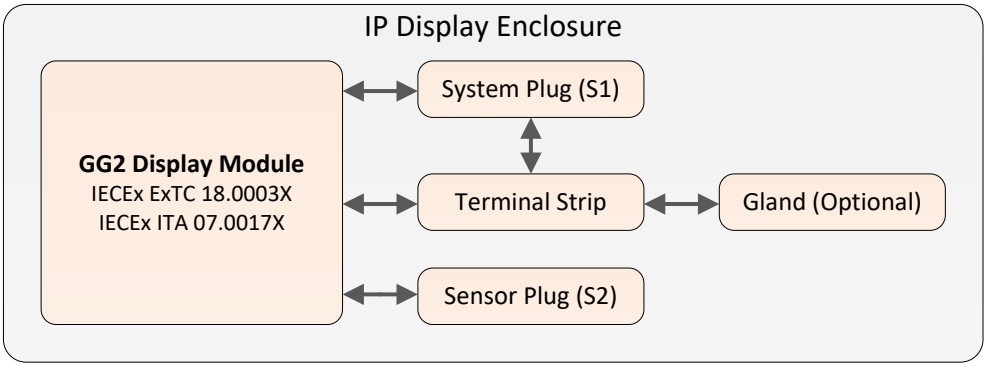

Figure 3: GG2 Display Block Diagram

Figure 4: Glanded GG2 Display

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3.3 Markings

3.3.1 GG2 Display

The GG2 Display Marking is shown below in Figure 5

Figure 5: GG2 Display Marking

3.3.2 GG2 Display Module

The Certified GG2 Display module has the following marking information inside the GG2 Display.

Table 1: Minimum Marking Information

THE MINIMUM MARKING MUST CONTAIN THE INFORMATION
AMPCONTROL
GG2 DISPLAY MODULE
IECEx ExTC 18.0003X
Ex ia I Ma
-20°C ≤ Ta ≤ +40°C
SERIAL: XXXXX

3.4 Enclosure

3.4.1 Stainless steel housing

The GG2 Display circuitry is incorporated in a stainless-steel housing. The housing is robust and corrosion resistant installation.

3.4.2 Ingress protection rating

The GG2 Display has been designed fit for purpose for the harsh environment of an underground coalmine.

The enclosure and electrical connection when mated achieves IP66.

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3.5 Certification

Entity parameters listed on the certificate must be taken into account during system commissioning.

The apparatus is designed to be used in hazardous areas and is certified intrinsically safe IECEx ExTC 18.0003X. The controlled version of this certificate can be found on the IECEx website https://www.iecex.com/

- The GG2 Display is compliant with the following standards:
  - IEC 60079-0: 2011 Ed 6.0 Explosive atmospheres - Part 0: General requirements
  - IEC 60079-11: 2011 Ed 6.0 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety “i”
- The detector is in conformance with IEC60079.11, section 6.3.13
- The detector is in conformance to IEC60079.0, section 7.4.2

4 INSTALLATION

The GG2 Display Module is suitable for installation in Group I hazardous areas when housed in an enclosure suitable for group I that provides a degree of protection not less than IP54 as per IEC 60529.

The GG2 Display is a suitable enclosure to house the GG2 Display Module and has been designed to connect and mount to other compatible modules. Contact Ampcontrol for the latest range of compatible modules.

NOTE

The GG2 Display is suitable for installation in Group 1 hazardous areas.

4.1 General Warnings

These instructions have been designed to assist users of the GG2 Display with installation.

Before the unit can be installed, there are a number of things that need to be considered and understood to prevent incorrect or unsafe operation of the unit or the system into which it is installed. Along with relevant competence, and an understanding of the target application, the following points should be considered:

4.1.1 Ensure that the information provided in this user manual is fully understood.

It is extremely important that the limitations and functionality of the unit are understood to prevent incorrect installation and use from creating a potentially dangerous risk. If in doubt as to the nature of the limitations or their implication, consult a competent authority such as a supervisor or Ampcontrol technical representative.

4.1.2 Ensure that the application into which the unit is being installed has been properly defined, designed, and approved.

Any system intended to mitigate the risk of injury needs to be properly designed and implemented. Such a system must be the result of structured risk analysis with the outcomes used to define the system requirements. These requirements, in turn, will guide the choice of instrumentation, logic solvers, and actuators needed to implement the system. Understanding the needs of the system will ensure proper selection of equipment.

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4.1.3 Ensure that the unit will properly perform the required functions within the system design.

It is important to understand how the unit is intended to interact with other equipment within a system. For safe and reliable use, it is crucial that neither the unit's logical operation nor its signalling be compromised by incompatibilities with connected equipment. For Group I installations, a full Intrinsic Safety Audit will be required, along with a correctly specified Safety File. Contact Ampcontrol for engineering services to undertake these assessments.

4.1.4 Modifications of any form to the unit are prohibited.

The unit as supplied has been designed and manufactured to comply with the requirements of protection and performance standards. If modifications of any form are made to the unit, the equipment may no longer be fit for use. If any modifications or damage to the unit is evident, do not use the equipment and contact Ampcontrol for advice.

4.2 Mandatory Installation Practices

The following information must be adhered to when installing the GG2 Display. Failure to adhere to this information may give rise to unsafe operation.

Using the unit in a manner that exceeds its electrical, functional or physical specifications, or in a way that is contrary to its operating restrictions, may result in equipment malfunction or loss of performance.

- The unit must be powered within the specified voltage range.
- The installation of the unit must be carried out by suitably trained and qualified personnel.
- Identification labels fixed to the unit must not be damaged, removed or covered before, during or after installation.
- The installation is to be in accordance with the relevant installation Standards/Codes of Practice.
- Modifications must not be made to any part of the unit. As supplied, the unit is built to, and complies with the relevant standards. Modifications to its construction will render the unit non-compliant.
- Complete and accurate records of the installation must be kept as part of the site installation.
- Confirm the Intrinsically Safe parameters of the GG2 Detector, cables and power supply are suitable for the application.
- Ensure that the Conditions of Safe Use, listed in the certificate, are adhered to.

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4.3 Conditions of Safe Use

1. The following input parameters are to be taken into account in the system:

> **NOTE**
> Refer to the IECEx website for the latest controlled documentation.

Table 2: Optional Marking Information

OPTIONAL MARKING INFORMATION:				
CONNECTION	**FUNCTION**	**PINS**	**NAME**	**PARAMETERS**
SYSTEM	VIN NOTE3	P2-3 **TO** P2-1/P1-4	VIN **TO** GND	U_I:16.5V C_I: NEGLIGIBLE NOTE1 L_I: NEGLIGIBLE NOTE1
	4-20mA NOTE3	P2-2 **TO** P2-1/P1-4	4-20mA **TO** GND	U_I:16.5V C_I: NEGLIGIBLE NOTE1 L_I: NEGLIGIBLE NOTE1
	RS485	P3-1/P3-2 **TO** P2-1/P1-4	RS485+/RS485- **TO** GND	U_I: 7.14V C_I: NEGLIGIBLE L_I: NEGLIGIBLE U_O: 5.88V I_O: 41.47 MA P_O: 62.2MW
	IMAC	P3-3 **TO** P3-4	L1+ **TO** L1--	U_I: 21.5V P_I: 2.66W C_I: NEGLIGIBLE L_I: NEGLIGIBLE
SENSOR	VOUT NOTE3	P1-3 **TO** P2-1/P1-4	VOUT **TO** GND	POWER FEED THROUGH U_I:16.5V C_I: NEGLIGIBLE L_I: NEGLIGIBLE U_O: NOTE2 I_O: NOTE2
	DATA NOTE3	P1-2/P1-1 **TO** P2-1/P1-4	DATA+/DATA- **TO** GND	U_I:16.5V C_I: NEGLIGIBLE L_I: NEGLIGIBLE

NOTE 1: THE C_I AND L_I FROM THE MODULE IS NEGLIGIBLE HOWEVER ANY CABLE OR LUMPED PARAMETERS APPLIED AT THE FEED THROUGH CONNECTION P1-3, P1-4 MUST BE TAKEN INTO ACCOUNT IN THE POWER SUPPLY'S ENTITY BALANCE.

NOTE 2: U_O AND I_O ARE EQUAL TO THE APPLIED U_O AND I_O FROM THE SUPPLY APPLIED AT P2-3 AND P2-1

NOTE 3: VIN, 4-20MA, VOUT AND DATA CONNECTIONS MAY BE CONSIDERED AS A SINGLE SET OF INPUT PARAMETERS WITH THE LUMPED PARAMETERS CONNECTED AT THE SENSOR INTERFACE TAKEN INTO ACCOUNT IN THE POWER SUPPLY'S ENTITY BALANCE

NOTE 4: P2-4 IS THE ISOLATED CHASSIS CONNECTION

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2. The GG2 Display Module must be housed in an enclosure suitable for Group I that provides a degree of protection not less than IP54 as per IEC 60529.

WARNING! 	The connections shown above are for the certified GG2 Display Module housed within the GG2 Display. The external connections for the GG2 Display are detailed in Section 0.

4.4 Mechanical Installation Information

To ensure continued reliable operation of the GG2 Display, the following should be considered when mounting the unit:

- Select a suitable central location for mounting with good access. The location should be as clean and dry as practicable and at a temperature as close to 20°C as practicable.
- Mount the display in a position that reduces the risk of mechanical damage.
- Mounting should be to a vertical surface, allowing for easy access and subsequent servicing.
- The installation requirements of any connected sensors shall be taken into account

4.4.1 Dimensions

While mounting points are backwards compatible with Ampcontrol's existing Gasguard equipment, the additional space required by the GG2 Display/Sensor assembly must be taken into account during installation. The remote head assembly will require a bracket modification to mount the detector.

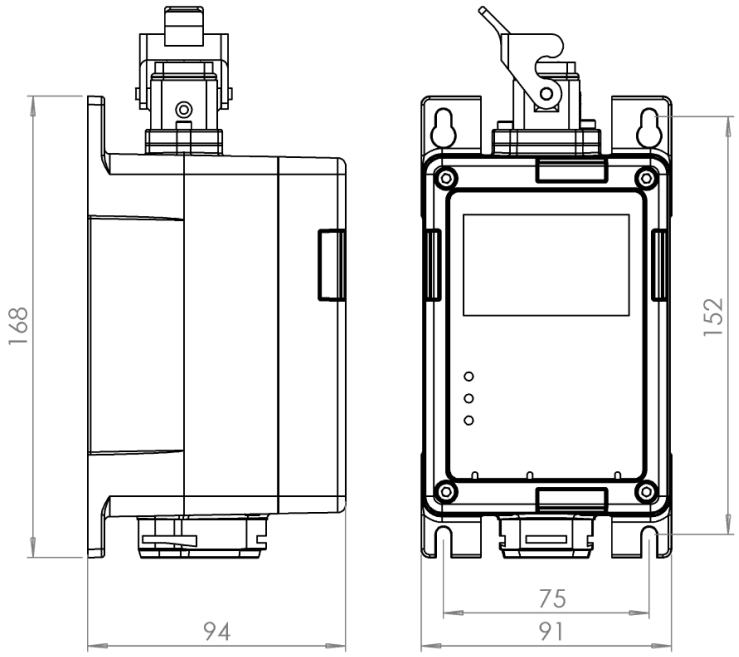

Figure 6: GG2 Display Dimensions (mm)

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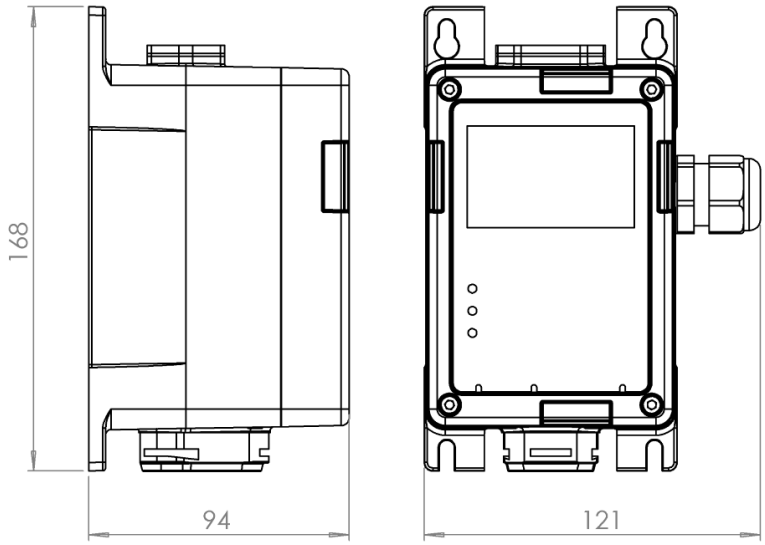

Figure 7: Glanded GG2 Display Dimensions (mm)

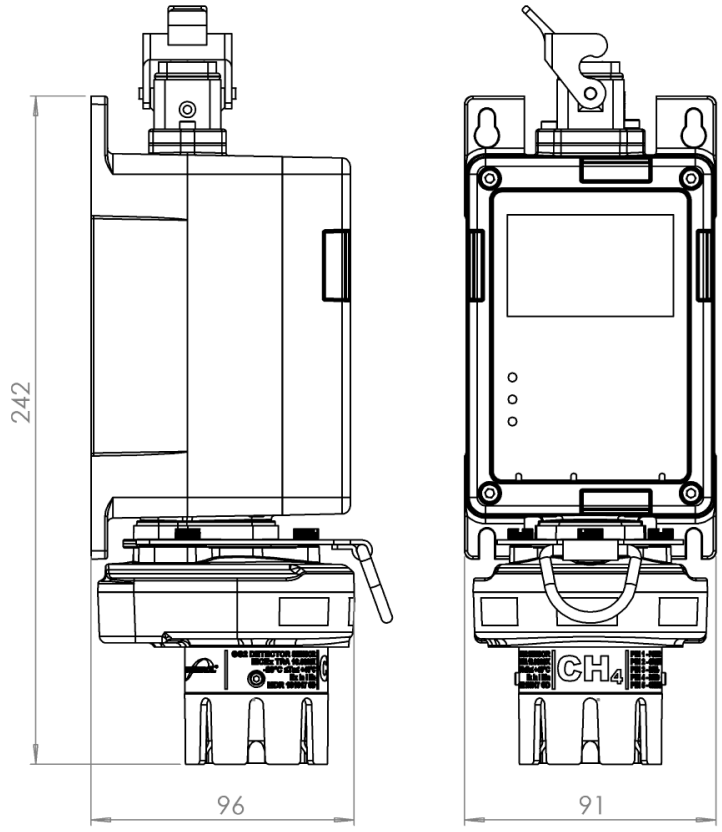

Figure 8: GG2 Display and CH4 Detector Dimensions (mm)

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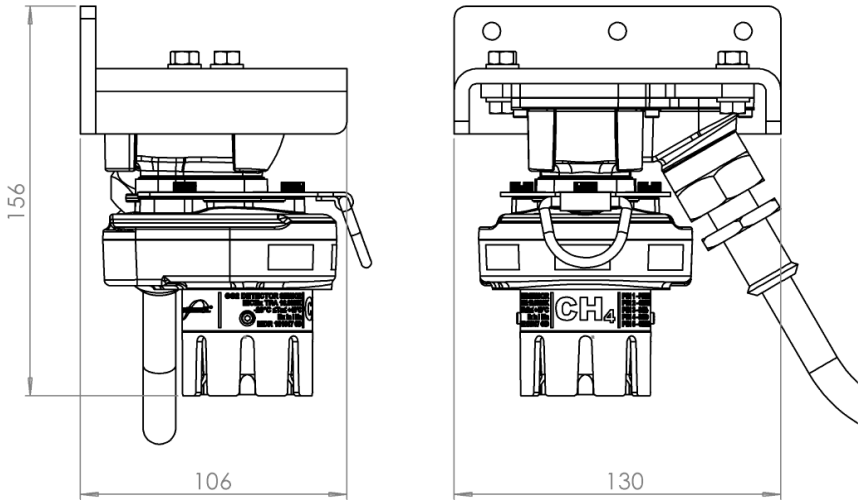

Figure 9: GG2 Remote Cable Assembly Dimensions (mm)

4.4.2 Mounting Arrangements

4.4.2.1 GG2 Display

The GG2 Display is mounted using the four screw tabs. The custom plug interface allows subsequent mounting of compatible modules. Optionally, the compatible modules may be mounted up to 10 meters away using the optional remote cable assembly. Refer to Figure 6 for mounting hole locations.

4.4.2.2 GG2 Remote Cable Assembly

The GG2 Remote Cable Assembly is mounted hanging down from a flat surface using the three screw tabs. The custom plug interface allows subsequent mounting of compatible modules. Refer to Figure 9 for mounting hole locations. The three mounting holes are spaced 50mm on centre.

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4.4.3 Connecting and Disconnecting a GG2 Detector

The process for connecting and disconnecting the GG2 Detector is outlined in Figure 10 and detailed in the following subsections. The detector must be isolated or in sleep mode prior to connection/disconnection. Refer to Section 5.3 for more information.

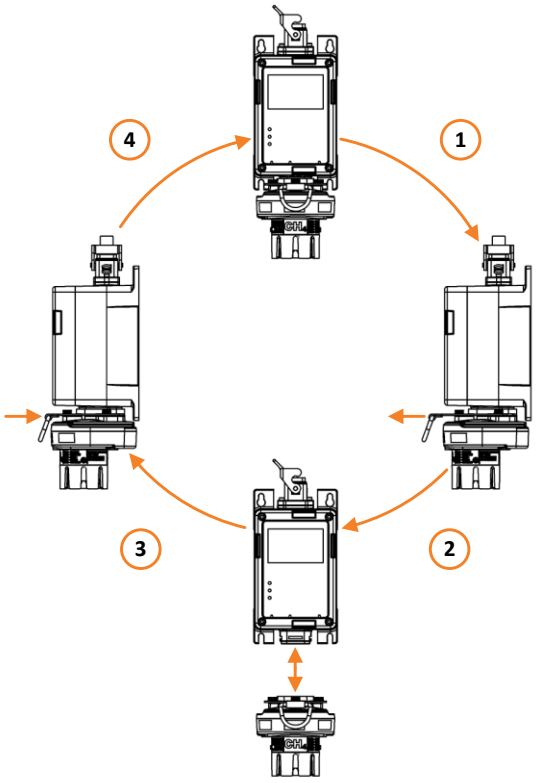

Figure 10: Connecting/Disconnection Detector

4.4.3.1 Disconnecting Detector

1. Release the retainer clip by pulling firmly away from the display. Ensure the detector is supported at all times to prevent potential damage.
2. After releasing the retainer clip, release the detector by pulling the detector firmly downwards.

4.4.3.2 Connecting Detector

3. Connect the detector to the GG2 Display via the proprietary connector. Press firmly to ensure the connection is fully engaged. Support the detector until the retainer clip is secured.
4. Secure the retainer clip by pushing it fully rearwards. The pull ring should be in line with the detector housing.

NOTE

The detector must be isolated or in sleep mode prior to connection/disconnection. Refer to Section 5.3 for more information.

NOTE

Ensure that the dust covers are in place when the GG2 Display is not in use.

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4.5 Electrical Installation Information

4.5.1 Compatible Module

The GG2 Display is a part of a GG2 range of products and is designed to interface directly with compatible modules. Contact Ampcontrol for a current list of compatible modules.

4.5.2 Remote Cable Assembly

The compatible modules can be mounted remotely from the GG2 Display using the GG2 remote cable assembly. The cable is supplied in 10 metre lengths and cut to size. The cable is pre-terminated at the detector end and contains white cores numbered “one”, “two”, “three” and “four” with black text.

Table 3: Remote Cable Connections

Remote Cable	***Function***
Core 1	Power
Core 2	Ground
Core 3	Data -
Core 4	Data +
Earth (Screen)	Chassis

4.5.3 Earthing Procedures

The metallic GG2 Display chassis is connected to S1 Pin 6 and S2 Pin 5.

The GG2 Detector passes the 500V dielectric strength test between intrinsically safe circuits and the metallic enclosure S1 Pin 6 and P2 Pin 5.

NOTE

The detector is in conformance to IEC60079.0, section 7.4.2 Dielectric strength requirement

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4.5.4 Maximum Loop Resistance

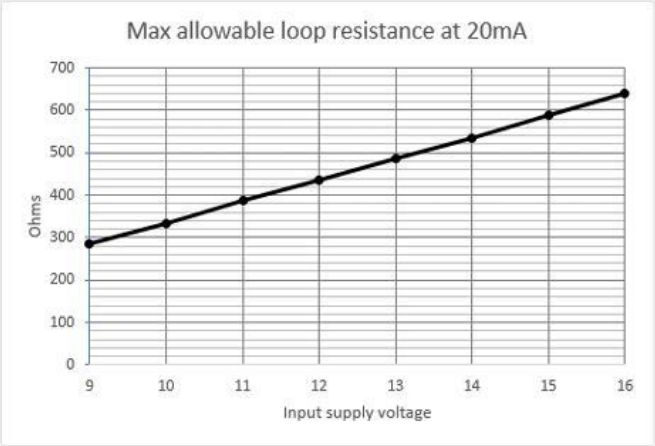

Figure 11: Maximum Allowable Loop Resistance at 20mA

4.5.5 Detector Wiring and Connectors

The GG2 Display has two connection facilities. S1 for the system interface and S2 for the sensor interface. The connector pins are shown below.

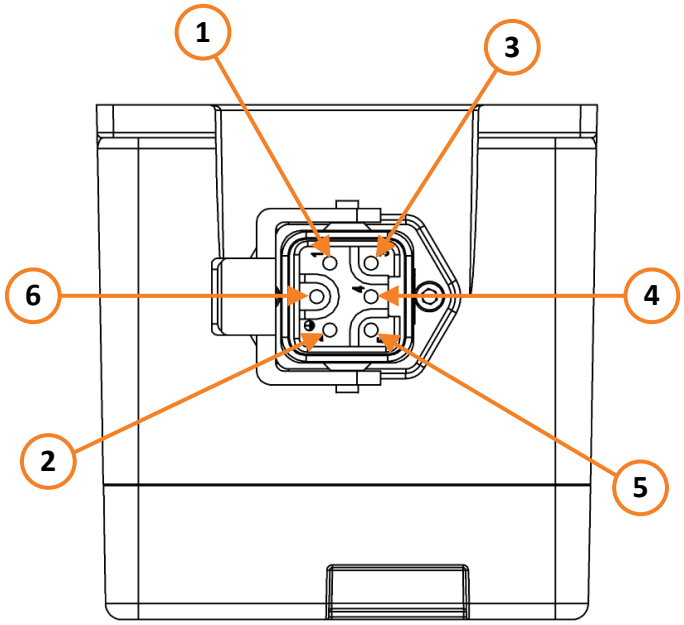

Figure 12: GG2 Display System (S1) Connector (Top) Pin Out

Table 4: GG2 Display System (S1) Connector Pin Out

Pin	Function
S1 – 1	Data +
S1 – 2	+VDC
S1 – 3	0VDC
S1 – 4	Data -
S1 – 5	4-20mA OUT
S1 – 6	Screen (not used)

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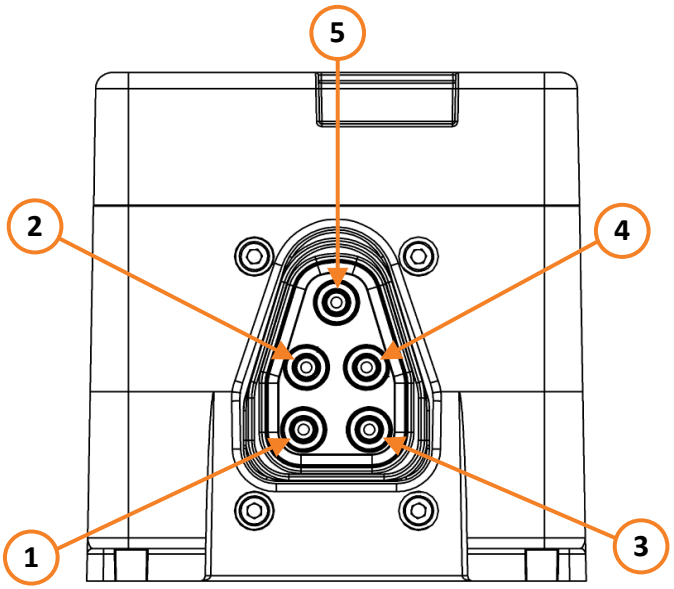

Figure 13: GG2 Display Sensor (S2) Connector (Bottom) Pin Out

Table 5: GG2 Display Sensor (S2) Connector Pin Out

Pin	***Function***
S2 – 1	Power
S2 – 2	Ground
S2 – 3	Data -
S2 – 4	Data +
S2 – 5	Chassis

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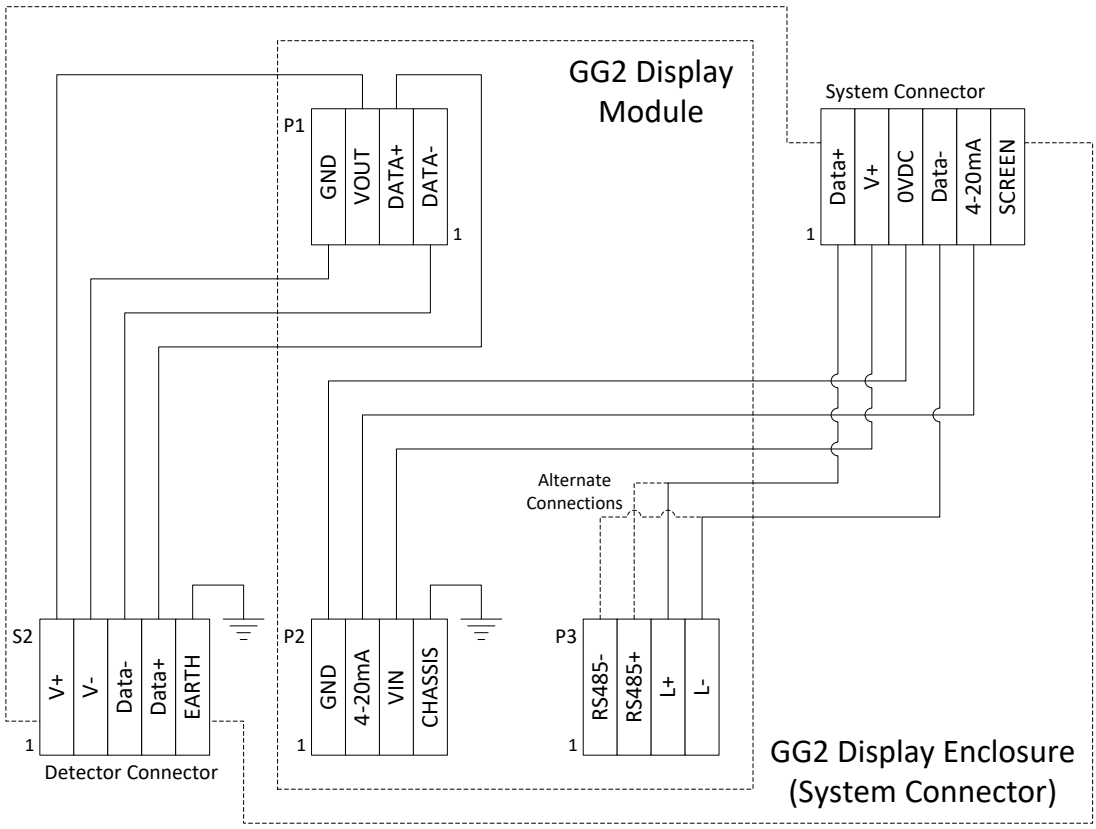

Figure 14: Electrical Connections - Display Enclosure with System Connector

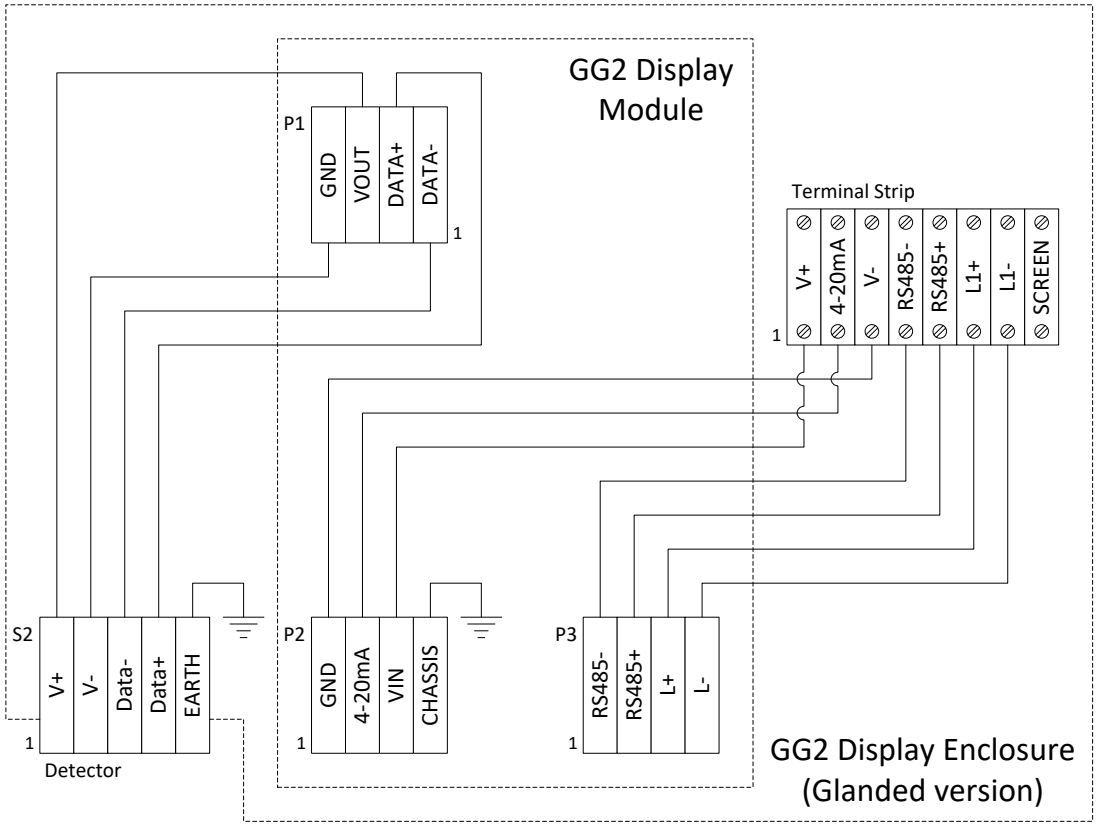

Figure 15: Electrical Connections - Display Enclosure with Glanded Connector

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5 PRODUCT OPERATION

The GG2 Display is an integral part of an environmental monitoring system. The GG2 Display provides the user interface for gas detectors and facilitates the interface to communication system infrastructure.

The GG2 Display has the following interface options:

- Modbus – refer to Section 5.4.3
- iMAC – refer to Section 5.4.4
- 4-20mA analogue output – refer to Section 5.4.5

The GG2 Display communicates with compatible modules such as the GG2 Detector using a robust digital communication protocol. The GG2 Display is fully compatible with the GG2 Detector's digital interface.

5.1 Human-Machine Interface

The GG2 Display is controlled via the HMI. The system is menu driven and navigated via the magnetic keypad outlined in Figure 2. Refer to Section 5.1.1 for an overview of the magnetic keypad operation. The HOME screen of the GG2 Display will appear similar to that of Figure 16. The interface has a number of features identified in this image numbered circles. Items identified in this figure are detailed below.

Figure 16: GG2 Display UI Home Screen Example

- Item 1: Menu Title – Displays the name of the current menu selection. For an overview of the menu structure, refer to Section 5.1.2.
- Item 2: Menu Level – This area of the display indicates the current menu level.
- Item 3: Gas Type – Indicates the gas type for the GG2 Detector connected to the display.
- Item 4: Detector Reading – Indicates the current detector reading.
- Item 5: Gas Units – Indicates the units of the current detector reading.
- Item 6: Keypad Guide – these correspond to the five reed switches located on the front of the GG2 Display.

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5.1.1 Navigating the User Interface

The user interface is controlled via the magnetic keypad on the front of the GG2 Display, refer to Figure 17. The keypad requires the magnetic wand to activate the five magnetic reed switches located directly beneath the orange symbols. The valid keypad events will vary according to the current menu selection. The GG2 Display's keypad guide (Item 6 of Figure 16) illustrates which keypad events will be accepted for the current menu selection. The dark segments represent valid keypad events while the lighter keys represent invalid keypad events, refer to Figure 18.

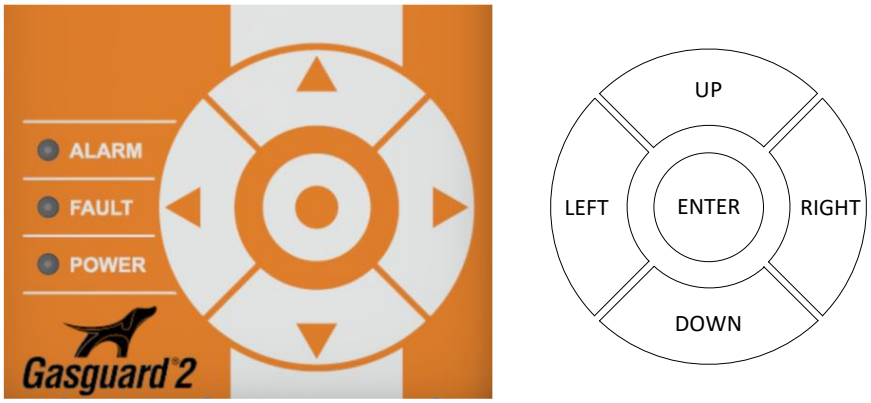

Figure 17: Keypad Overview

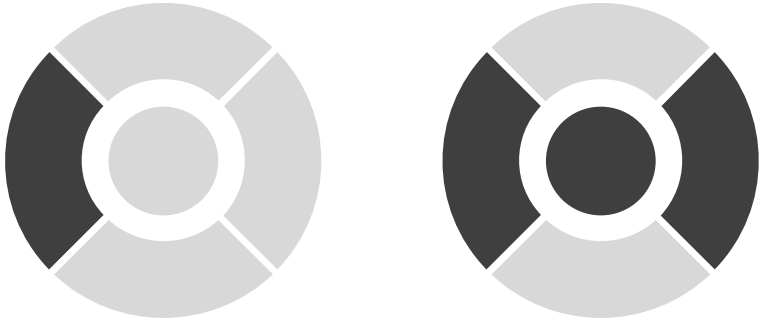

Figure 18: Keypad Guide

5.1.1.1 Using the Magnetic Wand

For best results during operation of the GG2 Display, the display should be at eye level and the following points should be observed.

- To activate a button/switch:
  - Move the magnetic wand to the desired segment of the keypad whilst keeping the wand approximately 5cm away from the display.
  - Move it in a direction perpendicular to the display until the keypad operation is registered. A small amount of lateral movement is tolerable as long as other segments are not crossed.
- For consecutive button/switch events, it is important that the magnetic wand is moved far enough away (approximately 5cm) from the keypad, such that the previous keypress is cleared, before the next keypress is made.

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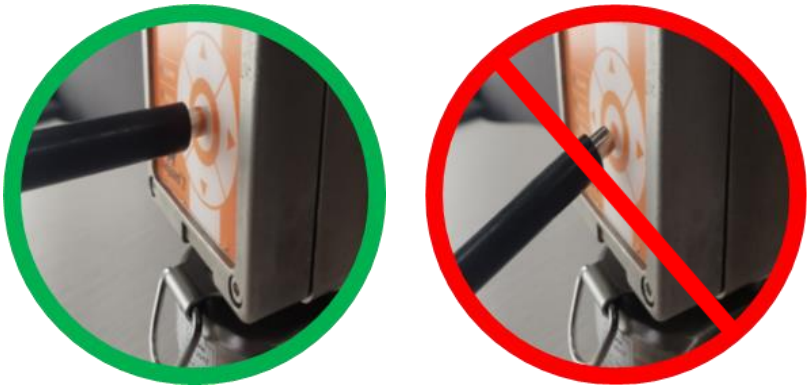

Apply the magnetic wand perpendicular to the magnetic keypad

Do not apply the magnetic wand at any other angle

Figure 19: Using the Magnetic Wand

NOTE

For best results, the magnetic wand should be orientated horizontally to the GG2 Display.

5.1.2 Menu Overview

The GG2 Display's menu has been implemented in a tree structure to provide an intuitive interface for interacting with the various features and configuration options provided. The menu can be accessed after completion of the system boot sequence. From the HOME screen, the menu is accessed by pressing any of the five segments of the magnetic keypad. Once in the menu, the current menu level will be shown (Item 2 of Figure 16) along with the title of the current menu (Item 1 of Figure 16).

The selected menu option is identified by the black horizontal line running across the display and the black box bounding the text, refer to Figure 20. Actioning up or down on the keypad will move the selection up or down respectively, the selection will wrap around once the top or bottom has been reached. To return to the previous menu level action left on the magnetic keypad. Repeatedly actioning left will eventually return the user to the HOME screen. Actioning right on the magnetic keypad will take the user into the selected menu.

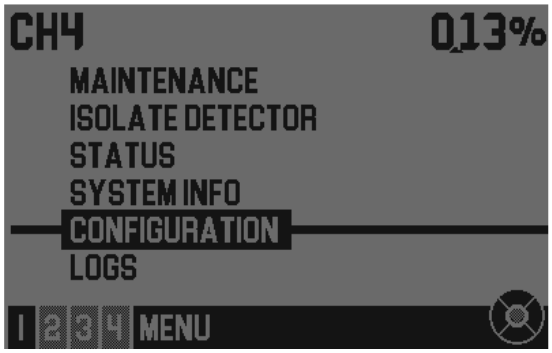

Figure 20: Menu Level 1 (Configuration Option Selected)

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The following provides an overview of the menu options.

- Maintenance
  - Gas Calibration (Electrochemical and Catalytic)
    - Zero Adjustment
    - Span Adjustment
    - ILAC Linearity Test (Requires authorisation)
  - Gas Calibration (NDIR)
    - Scaling Adjustment
    - ILAC Linearity Test
  - Response Test
  - Telemetry Test
  - System Resets
    - Reset Last Peak Value
    - Factory Default Reset (Requires authorisation)
    - Reset latched catalytic (Catalytic GG2 Detectors only, Requires authorisation)
  - LED Indication Test
- Isolate Detector
- Status
- System Info
  - Pg1 Configuration data
  - Pg2 Modbus or iMAC configuration data
  - Pg3 Display data
  - Pg4 Detector data
  - Pg5 Last Min/Peak values
- Configuration (Requires authorisation)
  - 4-20 mA Setup
    - 4-20 mA Settings
    - 4 mA Calibration
    - 20 mA Calibration
  - Setpoints
  - Protocol Select
  - Protocol Config (Behaviour is dependent on selected protocol)

    With Modbus selected
    - Settings

    With iMAC selected
    - Addresses
    - General
- Logs
  - Detector Logs
  - Display Logs

5.1.2.1 Menu Authorisation

Certain functions of the GG2 Display may only be completed by authorised and competent personnel. Before proceeding with these functions, an authorisation screen is presented to the user, refer to Figure 21. The authorisation screen may either be acknowledged with a centre keypad action or cancelled by actioning left. Cancelling will return the user to the previous menu selection.

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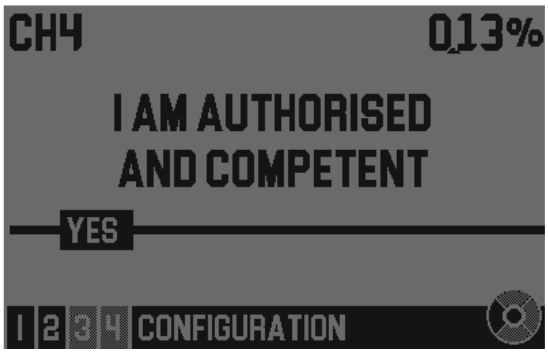

Figure 21: Menu Authorisation

The Configuration menu can be locked via the iMAC and Modbus protocols, This feature can be applied from either of the digital protocols to prevent unauthorised configuration changes to the instrument once commissioned. Refer to GG2B032 - GG2 Communications User Manual for implementation details

Figure 22: Menu Authorisation

5.1.2.2 Parameter Changes

Most of the configuration screens are organised in the following uniform way, such as the setpoints configuration screen, represented below in Figure 23. Each adjustable field is represented on a single line and the menu may be navigated similarly to the menu previously described. Fields can be selected by actioning up or down on the magnetic keypad and the selection will wrap around upon reaching the top or bottom.

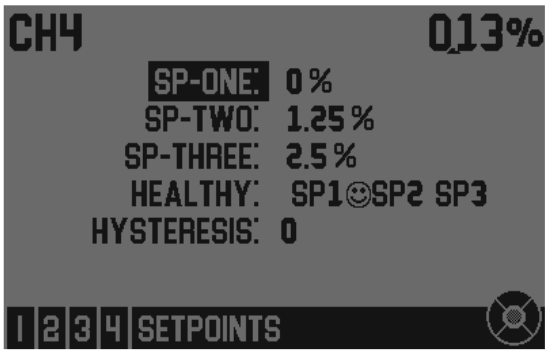

Figure 23: Setpoints Configuration Screen

To edit the selected field, press right. Edit mode is indicated by the right arrow → on the selected field as shown in Figure 24. The example shown in this figure is of a numerical field and accepts a large range of values, including negative values. Fields that will accept negative values will contain a positive or a negative sign. To set the desired value, action right to select the character (digit or sign) you wish to change and press the up or down key/s to increase or decrease the value. The values will wrap around.

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To select a different character, press the left or right key. Moving to the right will result in wrap around on the digit selection. By pressing left and navigating past the first digit, edit mode can be exited. Changes are temporarily stored while the user remains in the current menu level.

To save changes press enter when in field selection mode. The saving changes screen will appear as shown in Figure 25. It is possible to make several changes and perform a bulk save provided the user does not navigate out of the menu level. Some options are not numerical, but have several possibilities. These fields are edited and saved in the same way as the numerical fields.

By pressing left when in field selection mode the option menu will be exited. If changes were made the abandoning changes screen, as shown in Figure 26, will be shown briefly and the changes will be lost.

NOTE

Pressing left and navigating out of the menu level will discard all changes.

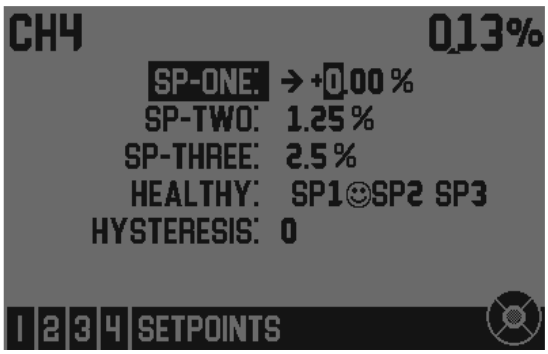

Figure 24: Numerical field edit mode

Figure 25: Save Screen

Figure 26 - Discarding Changes Screen

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Several screens within the menu structure require the operator to enter a single value and appear similar to that of Figure 27, below. A value editor can be identified when a displayed number has a single highlighted character (digit or sign). These screens will function similarly to that described above with the exception that moving left past the leftmost digit will exit the screen and only one value may be changed at a time.

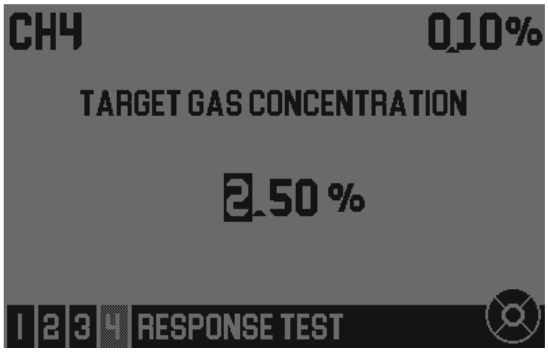

Figure 27 - Response test target value editor

5.2 System States

5.2.1 Display Boot

After a short delay, the Gasguard 2 title screen will be displayed as depicted on the left of Figure 28. Whilst the GG2 title screen is shown (approx. 6s) the detector is powered on and the communications protocols will be initialised. GG2 displays have a power-up slot assigned to them based on the serial number; there are 50 slots of 100ms each. This feature reduces the power-up impact on a power supply with multiple devices connected. After this, the display will then attempt to establish communications with an attached GG2 Detector (right of Figure 28).

Figure 28: Title Screen (left) & Establishing GG2 Detector Communications (right)

5.2.2 GG2 Detector initialisation

Once the display has made a successful connection with the GG2 Detector the initialisation period of 60s will begin. During the initialisation period, the screen controls are locked and the gas reading is not displayed. The countdown timer shown on this screen may take a few seconds to appear due to the time required to initialise communications with the detector.

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Figure 29 - Initialisation Screen

5.2.3 GG2 Detector warmup

On power-up, any attached GG2 Detector will take some time to warm up, known as the warmup period. During the warmup period, the GG2 Detectors do not provide accurate measurements. Each GG2 Detector type has its own warmup period, which is documented in the respective manual/datasheet. The current gas reading will flash on the screen (1s on 0.5s off) while the home screen is in warm-up mode. The behaviour of the external interfaces during the warmup period is specified in the relevant sections. During the warm-up period, the Calibration menu is inaccessible.

In cases where the warmup period is equal to or less than the initialisation period (60s) the home screen in warmup mode will not show as the warm-up time may have already elapsed. The warmup timer may take a few seconds to appear.

Figure 30 - The Home Screen when in warmup

5.2.4 Sleep Mode

When the display is in sleep mode (as shown in Figure 31), power is not supplied to the detector port. Sleep mode or detector isolation is a safe state for connection/disconnection of detectors or whenever the detector port must be exposed. Sleep mode can normally only be entered by powering up the display without a detector attached.

By powering up the display without a detector attached, the display will first attempt to communicate with a detector and must therefore apply power, refer to Section 5.2.1.

Figure 31: Display Sleep Mode

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5.2.5 Detector Isolation

Detector isolation only differs from sleep mode in how it is triggered and what is displayed on the screen. Detector isolation is an intentional state and is entered when disconnecting a detector, refer to Section 5.3.2.

5.3 Connecting and Disconnecting a GG2 Detector

5.3.1 Connecting a GG2 Detector

The following steps detail connecting a detector to the display. Refer to Section 0 for more information.

1. Ensure that the device is Isolated or in Sleep Mode, refer to Section 5.2.4 and Section 5.2.5.
2. Attach the new detector to the display or extension cable and secure the clip retainer by pushing it fully rearwards, the pull ring should be in-line with the detector housing.
3. Take the device out of sleep mode by pressing any of the magnetic segments.
4. The display will attempt to communicate with the new detector (refer to Figure 28).

> **NOTE**
>
> The “Establishing Detector Comms” screen may only appear for a brief period.

5. At this stage the display will either;
    a. Show the detector warmup screen, please see 5.2.2, or
    b. Show the different gas sensor warning, please see 5.3.1.1

5.3.1.1 Connection of the First Detector

Figure 32: Connecting a Detector for the first time

A special warning screen is displayed when the first detector is connected to the system, refer to Figure 32. After acknowledging this screen by pressing the centre magnetic button, the display will either:

- Begin the detector image update process, please see Section 5.3.1.4, or
- Show the detector warmup screen, please see Section 5.2.2.

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5.3.1.2 Changing Gas Sensor Type

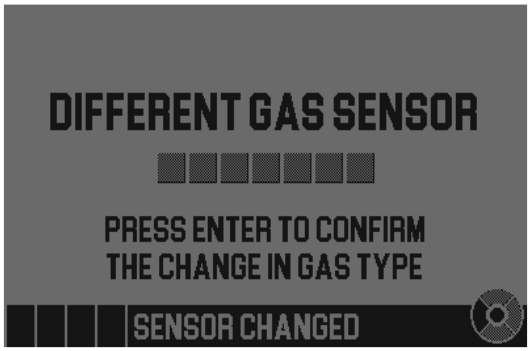

Figure 33: Different Gas Sensor Warning

A warning screen is displayed when the detector type is changed. This is to prevent accidental detector type changes. A gas sensor type change results in the loss of all gas specific information from the display, including:

- Setpoints
- Healthy region setting
- Hysteresis setting
- Last response test target

In addition, the data listed under Section 5.3.1.3 is removed.

After acknowledging this screen by pressing the centre magnetic button, the display will either:

- Begin the detector image update process, refer to Section 5.3.1.4, or
- Show the detector warmup screen, refer to Section 5.2.2.

5.3.1.3 Replacement of Detector (with same type)

On replacement of the detector (with another detector of the same type), several pieces of information are removed from the system, namely:

- Last max and min (peak) values and their timestamps
- Linearity test results

There is no visual indication of this process.

5.3.1.4 Detector Image Update

Each gas detector contains a detector image that describes the functionality of the display. In the case that the image on the detector is different to the one loaded into the display, the new image will be downloaded.

1. Flash erase - The previous image is erased from the display

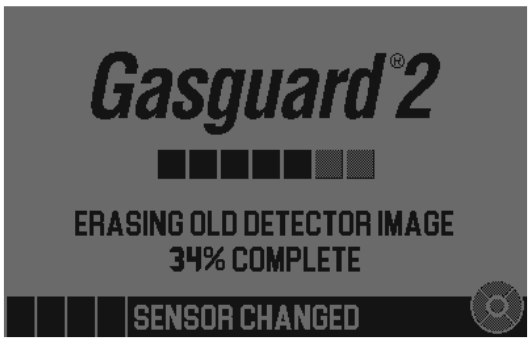

Figure 34: Erasing the Old Detector Image

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2. New image is loaded from the detector.

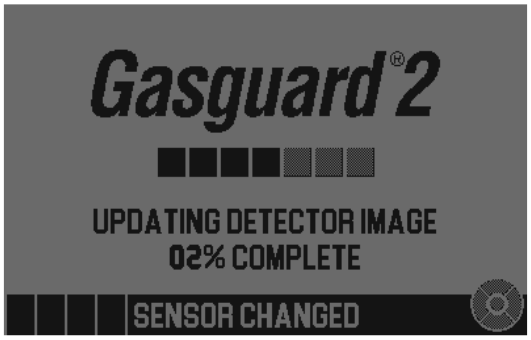

Figure 35: Updating the Detector Image

NOTE

This process can take up to 5 minutes.

3. On completion of the process the display should show the detector warmup screen (Figure 30) or the home screen (Figure 16), depending on the warmup duration.

5.3.2 Disconnecting a Detector

The process for disconnecting a detector is as follows:

1. From the home screen, access the menu by pressing any button.
2. Navigate down to “ISOLATE DETECTOR”.

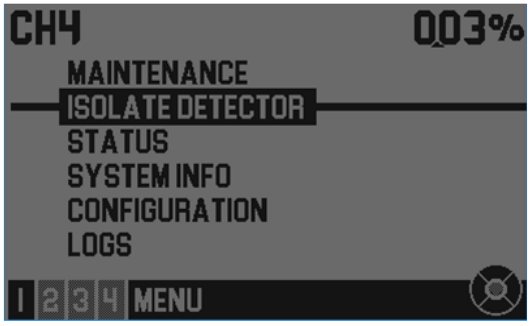

Figure 36: Isolate Detector

3. Press right to access the “ISOLATE DETECTOR” screen.

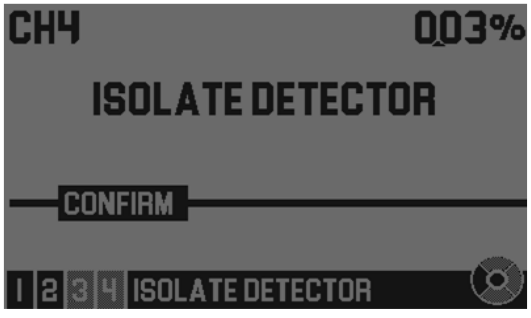

Figure 37: Isolate Detector Confirmation

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4. Press enter to confirm. The text “DETECTOR ISOLATED” will display. Once this message is on the display, the detector is safe to remove. The detector port is unpowered.

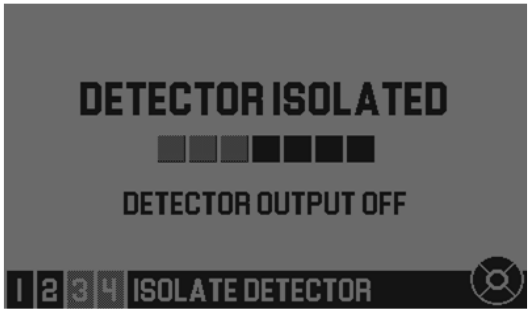

Figure 38: Detector Isolated

5. Whilst preventing the detector from falling, pull the ring attached to the locking plate away from the display passing the two friction points. The detector can now be removed, refer to Section 0 for more information.

5.4 External Interfaces

5.4.1 Gas Reading Units

As the protocols Modbus and iMAC are both limited to 16bit wide data registers, a system has been used to encode the current gas reading of the device. The readings are transmitted in units of ‘permyriad of full-scale’. A permyriad is 1/10000 (one ten thousandth) and can be denoted with a ‰ symbol. The relationship between the real world units (e.g. PPM, %) and the permyriad is as follows:

$$RWGV = G_0 + \frac{T_p}{10\,000} \times G_s$$

Where:

G_0 = gas zero value (i.e. 0% v/v)

G_s = gas span value (i.e. 5% v/v)

T_p = transmitted permyriad value (i.e. 123 ‰)

$RWGV$ = Real World Gas Value (i.e. 1.25% v/v)

These permyriad values therefore correspond to different gas concentrations on different detectors. Some example values are calculated in the following table.

Table 6: Example of Permyriad to Gas Concentration Conversion

	Gas Range and Units		
Permyriad (‰)	***0-5% v/v***	***0-100% v/v***	***0-10 ppm***
-100 ‰	-0.05% v/v	-1% v/v	-0.1 ppm
0 ‰	0% v/v	0% v/v	0 ppm
5000 ‰	2.5% v/v	50% v/v	5 ppm
10000 ‰	5% v/v	100% v/v	10 ppm
10100 ‰	5.05% v/v	101% v/v	10.1 ppm

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5.4.2 Protocol Selection

Before a protocol can be configured it must first be selected as the active protocol. Protocol selection must be done via the “PROTOCOL SELECT” screen in the configuration menu, refer to Section 5.3.2.

The options are:

- IMAC
- MODBUS, or
- NONE

For general guidance on editing these options, please refer to Section 5.1.2.2.

5.4.3 Modbus

5.4.3.1 Configuration

After selecting the Modbus protocol, it may be configured. Protocol configuration must be done via the “PROTOCOL CONFIG” screen in the configuration menu. Within this menu, there is a single option - SETTINGS. For general guidance on editing options, please refer to Section 5.1.2.2.

Table 7: Modbus - Protocol Configuration - Settings

Field Name	Value
ADDRESS	Specifies the Modbus address for the system. Validity: 1-247
PARITY	Specifies the parity setting for Modbus. Options: EVEN, NONE or ODD
BAUD	Specifies the Baud Rate of the RS485 bus. Options: 19200, 9600, 38400 or 115200
STOP BITS	Specifies the number of stop bits. Options: 1 or 2
POWER MODE	Options: HIGH or LOW

*Power Mode can selected between 5V logic (HIGH) and 3.3V logic (LOW).

LOW power mode will sightly reduce current consumption and should only be connected to compatible logic devices over short cables.

NOTE

LOW power mode should only be connected to compatible logic devices over short cables.

5.4.4 iMAC

5.4.4.1 Configuration

After selecting the iMAC protocol, it may be configured. Protocol configuration must be done via the “PROTOCOL CONFIG” screen in the configuration menu. Within this menu, there are two screens, ADDRESSES and GENERAL. For general guidance on editing options, please refer to Section 5.1.2.2.

The ADDRESSES screen may be used to configure data addresses on the iMAC.

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Table 8: iMAC - Protocol Configuration - Addresses

Field Name	Value
STATUS	Specifies the iMAC address for system status information. Validity: 0-255.
ANALOGUE	Specifies the iMAC address for analogue (4-20mA output) information. Validity: 0-255.
POWER SUPPLY	Specifies the iMAC address for system power supply information. Validity: 0-255.
SYS CLOCK	Specifies the iMAC address for system clock information. Validity: 0-255.
CAT RESET	Specifies the iMAC address for catalytic reset command. Validity: 0-255.
BYPASS	Specifies the iMAC address for system bypass command. Validity: 0-255.

The GENERAL screen may be used to configure the following:

Table 9: iMAC - Protocol Configuration - General

Field Name	Value
VOLTAGE (WARN)	Specifies the power supply warning voltage. Once the supply voltage to the display drops below this value, the supply voltage warning bit is set. Validity: 0-24V.
VOLTAGE (ALARM)	Specifies the iMAC address for analogue (4-20mA output) information. Once the supply voltage to the display drops below this value, the supply voltage alarm bit is set. Validity: 0-24V.
ANALOG EXC TRG	Specifies the setting for the analogue exception trigger. The setting is the percentage difference between successive analogue sample values that will cause an exception scan, measurements are taken at 1Hz. Validity: 0-99.0.

5.4.5 4-20mA

The GG2 Display can drive a 4-20mA loop current. The operation of the 4-20mA loop is independent of the other communications (iMAC and Modbus).

5.4.5.1 Behaviour

The 4-20mA output is being monitored by the GG2 Display to ensure that; the desired output is being driven and that the full range of outputs should be able to be driven. In cases of excessive loop impedance, a device fault will occur. The estimated 4-20mA loop impedance can be seen on the “SYSTEM INFO” screens (Section 5.6.2).

5.4.5.2 Connection

The 4-20mA output should be connected from the 4-20mA out pin through the measurement device back to the ground pin of the system interface connector.

5.4.5.3 Settings

Activation of the 4-20mA output is done from the “4-20mA SETTINGS” screen, refer to Section 5.1.2.

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Table 10: 4-20mA Settings

Field Name	Value
ACTIVATION	Options: TRUE or FALSE. Specifies if the 4-20mA loop is powered
WARMUP/FAULT	Options: HIGH or LOW. Specifies whether the warmup/fault range is high or low. I.e. LOW: warmup = 3mA, fault = 2mA. HIGH: warmup 21mA, fault = 22mA.

5.4.5.4 Calibration

Before the start of calibration, if the GG2 Display has spent considerable time at low or elevated temperatures, please allow the device to stabilise to room temperature in powered-up operational (no fault) state for 24 hours before beginning calibration.

If the GG2 Display has not experienced exposure to temperature extremes the apparatus should be left in a powered-up operational (no fault) state for one hour before beginning calibration.

Calibration of the 4-20mA output should be completed in line with regulatory and operational requirements.

Please note that the 4-20mA calibration procedures are similar to the telemetry test and all outputs of the device will be forced to zero or full-scale.

CAUTION!

The 4-20mA calibrations may trigger alarms and setpoint flags.

The calibration procedure calibrates each of the outputs independently. The calibration procedure should be completed as follows:

1. Connect the 4-20mA loop to the NATA calibrated current measurement device and ensure that the 4-20mA output is enabled (see 5.4.5.3). If the device is working normally, the measurement should be between approximately 2 and 22mA.
2. Access the “4MA CALIBRATION” or “20MA CALIBRATION” screen; refer to Section 5.1.2. The notice below will be displayed for a few seconds.

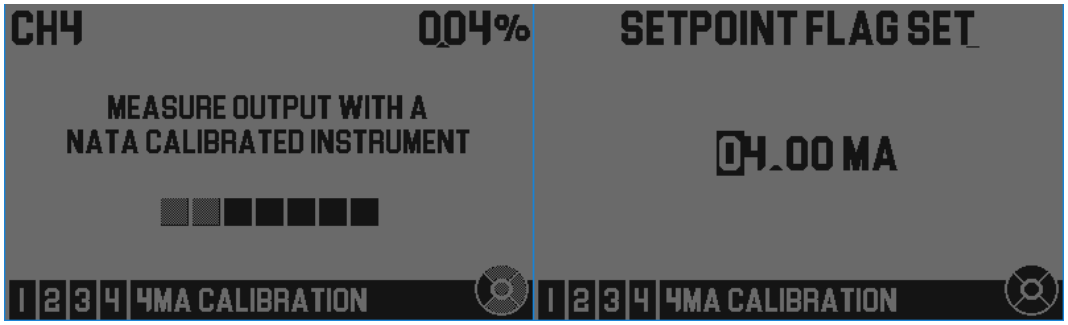

Figure 39: Calibration Notice (left) & 4mA Calibration (right)

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3. The calibration measurement input screen will appear and the 4-20mA output will be forced to what the device expects to be 4mA (or 20mA).

> **NOTE**
>
> In this example the “SETPOINT FLAG SET” status is present, as the device is at 0% gas which is below setpoint 1.

4. Take the measurement from the NATA calibrated device and enter that measurement into the device. Section 5.1.2.2 provides further guidance on editing values. Once the desired value has been entered, press the centre segment of the keypad.
5. The saving changes screen will be shown and the calibration stage is complete.
6. It is recommended that, following a pair of calibrations (4mA and 20mA), a telemetry test is performed to verify that the output varies as intended.

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5.5 Gas Alarm and Setpoint Configuration

The GG2 Display is capable of comparing the current gas measurement against predefined setpoints. These setpoints, coupled with a user defined healthy region, determine how setpoint flags may be set and cleared. This system allows for a large amount of flexibility. The alarm LED indicator (red) on the GG2 Display is driven by the current health status, when the current gas reading doesn't lie within the healthy region the alarm light will flash. Setpoints may be set to negative values to detect changes in the measurement bias over time. Concepts in this section will be explained using examples.

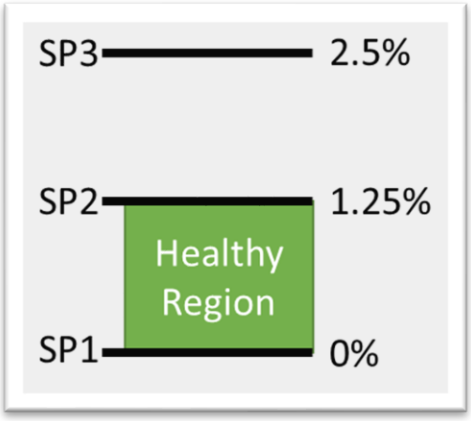

Figure 40: Example Setpoint Configuration

The example in Figure 40 can be summarised as:

- The gas reading is healthy when greater than SP1 (0%) and less than SP1 (1.25%)
- Setpoint 3 is 2.5%

Looking at the example, we explain how the setpoint flags are set/cleared:

- Setpoint flags are set when the gas reading moves away from the healthy region (positive or negative gradient) and reaches a setpoint's value. E.g. the SP3 flag will be set whenever the gas reading is 2.5% or greater.
- Setpoint flags are cleared when the gas reading moves toward the healthy region (positive or negative gradient) and the setpoint's value is crossed. E.g., the SP3 flag will be cleared whenever the gas reading is less than 2.5%.

The corresponding settings in the GG2 Display for the example above are shown in Figure 41.

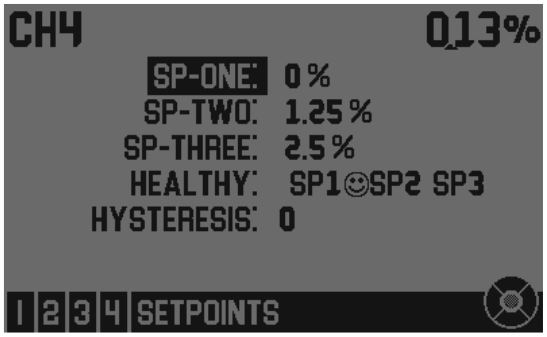

Figure 41: Configuration - Setpoints

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5.5.1 Configuring Setpoints

The setpoints and healthy region setting can be configured on the “SETPOINTS” screen (refer to Section 5.1.2). Please refer to Section 5.1.2.2 for further information about changing options.

Table 11: Setpoint Configuration

Field Name	Value
SP-ONE	Numerical gas value between –span value and span value. Setting must follow the rule that SP1 < SP2 < SP3.
SP-TWO	
SP-THREE	
HEALTHY	Healthy region setting. The smiley face indicates where the healthy region lies relative to the setpoints. If the healthy region is set to always, the hysteresis setting has no effect
HYSTERESIS	0-7.5%, increasing in 0.5% steps. See 5.5.2 for more information about the hysteresis setting

5.5.2 Hysteresis Setting

The hysteresis setting can help to reduce the number of events which may occur when the gas reading fluctuates about a setpoint. The hysteresis setting is particularly important in rapid response systems such as iMAC where exception scans (priority data transmissions) are triggered by high criticality events. Hysteresis solves this is by padding the setpoint value when clearing the setpoint flag. The example in Figure 42 shows how the gas reading fluctuates about SP2 (1.25%). The first time the gas reading reaches SP2, the SP2 flag is set. Then the value decreases and the SP2 flag is cleared. In the diagram this will happen a further 4 times.

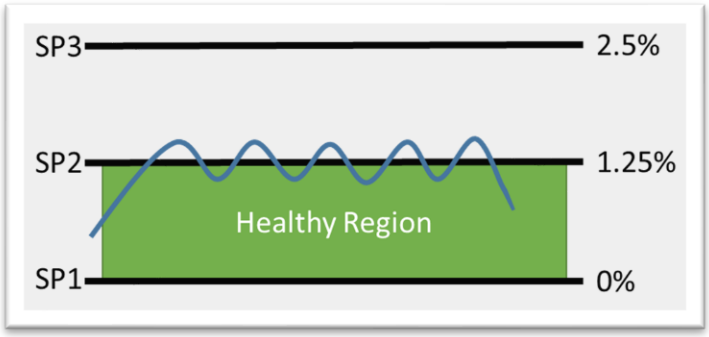

Figure 42: Multiple Triggering Scenario

Hysteresis enables a different value to clear the SP2 flag, i.e. therefore, the SP2 value sets the setpoint flag but a lower value is needed to clear it. The orange line in Figure 43 represents the value needed to clear the SP2 flag. This is called the hysteresis value.

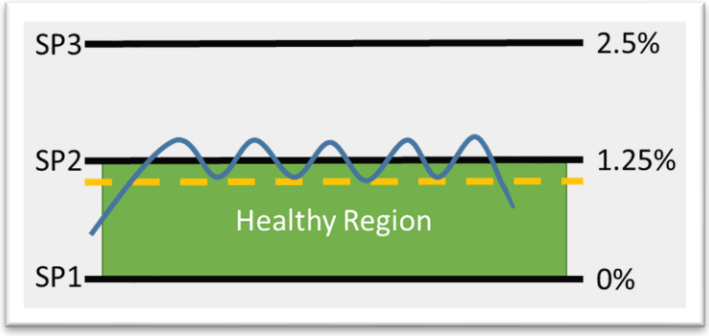

Figure 43: Using Hysteresis Setting

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In Figure 43, the value decreases below the SP2 value, but does not go smaller than the SP2 hysteresis value and therefore the flag isn't cleared. In this scenario there are only two transitions, one to set and one at the end (on the right) to clear.

The hysteresis value is a percentage of the detectors span value, i.e. for a 0-5% v/v CH4 sensor a hysteresis setting of 3% corresponds to 3% of 5% which is 0.15%. The hysteresis value must be between 0% and 7.5% of the span value, with options increasing by 0.5% each step. The hysteresis will act on all of the setpoints and the hysteresis threshold, i.e. the dotted yellow line (hysteresis value) will always be closer to the healthy region (as shown in Figure 44). This can be summarised as:

- Reaching the setpoint value when moving away from the healthy region will instantly set the respective setpoint flag.
- Crossing the setpoint value when moving toward the healthy region will not trigger a change.
- Crossing the setpoints' hysteresis value (dotted lines) when moving toward the healthy region will clear the respective setpoint flag.

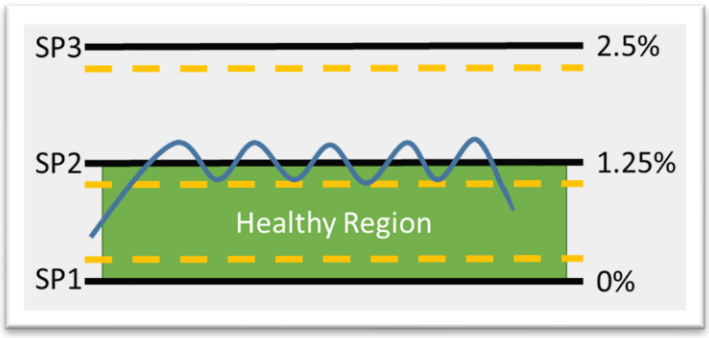

Figure 44: Hysteresis Value for each of the Setpoints

5.6 System Status and Information

5.6.1 Status

The status titles are shown on the screen whenever status flags are set. If multiple status flags are set, the titles will change every five seconds. There may be a maximum of five status flags set in the system at any time.

Figure 45: The HOME Screen with a Status Title "FAST PRESSURE CHANGE"

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The STATUS screen can be accessed from the menu (Section 5.1.2) and provides more detail about the current status flags. Once on the status screen, provided that there are multiple status flags, up and/or down presses will change the display to the next/previous status.

As can be seen in Figure 46, the periodically changing status titles will be shown on ALL screens. The status screen shows further information about each of the current status flags. The thick black line separates the changing status titles and the content of the status screen. The descriptions will generally provide some indication of which corrective actions should be taken. In the case of “LOW CELL SENSITIVITY”, the device needs to be re-assessed by Ampcontrol as the detector element may have reached the end of its normal operational lifespan.

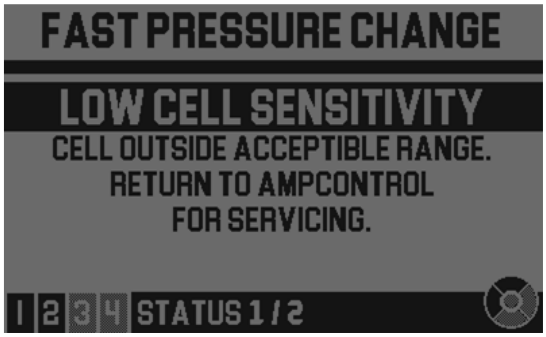

Figure 46: The Status Screen - Low Cell Sensitivity

5.6.2 System Info

The “SYSTEM INFO” screens (refer to Section 5.1.2 for details on navigating the menu) provide a variety of data about the system. The data contained on each of the screens is described in Table 12. Each of the screens is a snapshot of the information when the screen is first entered. Press up/down on the magnetic keypad to navigate through the screens.

Table 12: System Info Data Fields

Screen number	Field name	Field description	Note
0	POWER SUPPLY	Power supply voltage (V)	
	4-20 MA STATE	4-20 mA output state (ON/OFF)	
	4-20 MA OHMS	4-20 mA ohms. Estimated loop resistance.	
	SETPOINT ONE	First setpoint	
	SETPOINT TWO	Second setpoint	
	SETPOINT THREE	Third setpoint	
1	LPV – LOW	Last minimum value. Lowest measured gas value since last LPV reset.	
	DATE	Date of occurrence	Using detector time
	TIME	Time of occurrence	Using detector time
	LPV – HIGH	Last maximum value. Highest measured gas value since last LPV reset.	
	DATE	Date of occurrence	Using detector time

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Screen number	Field name	Field description	Note
	TIME	Time of occurrence	Using detector time
2	DETECTOR PRESSURE	Detector pressure (Hectopascals, hPa)	Measurement is indicative only
	DETECTOR HUMIDITY	Detector relative humidity (%)	Measurement is indicative only
	DETECTOR TEMP	Current temperature of the detector element (°C)	
	DETECTOR SERIAL	Serial number of the attached GG2 Detector	
	DETECTOR FW VER	Detector's firmware version	
3	DISPLAY SERIAL	Serial number of the GG2 Display	
	DISPLAY FW VER	Display's firmware version	
	DISPLAY APP VER	Version of the application running on the display	
	DATE	Current detector date	
	TIME	Current detector time	

5.6.3 Logs

The GG2 keeps logs to record significant events. There are screens for detector logs and display logs, which may be used to view the recorded log entries.

5.6.3.1 Detector Logs

The detector logs can be accessed from the "DETECTOR LOGS" screen (Refer to Section 5.1.2 for details on navigating the menu). The detector logs are loaded on request from the detector hence "LOADING LOG.." is shown momentarily. To select an older/newer log press down/up respectively. The detector will store at most the last 20 logs. An example log is shown in Figure 47. The log display structure is as follows:

a. Log number (of 20)
b. Timestamp of the log, YYYY-MM-DD HH:MM:SS
c. Log text

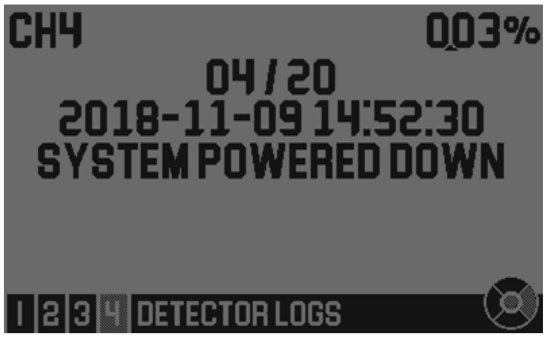

Figure 47: Detector Log Example

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5.6.3.2 Display Logs

Figure 48: Display Log Example

The display log screen is similar to the detector logs screen, and is titled “DISPLAY LOGS” (Refer to Section 5.1.2 for details on navigating the menu). The log display structure is as follows:

a. Timestamp of the log YYYY-MM-DD HH:MM:SS
b. Log text

The display will store, at most, the 50 most recent logs. To select an older/newer log press down/up respectively.

5.7 Display Maintenance

5.7.1 Peak Values Reset

Resetting of the recorded Last Peak Values (LPVs) can be done from the “RESET LAST PEAK VALUES” screen. Refer to Section 5.1.2 for details on navigating the menu. On this screen, the current LPVs are displayed. To reset the LPVs, press the centre segment of the magnetic keypad. The saving changes screen will then be shown.

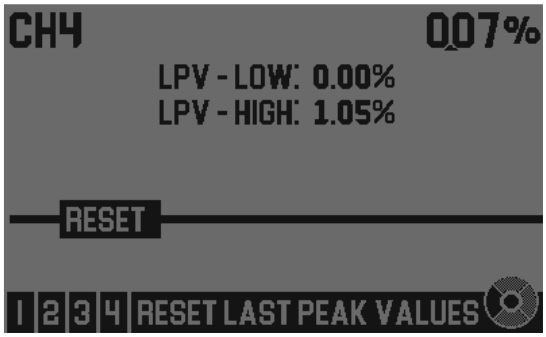

Figure 49: Reset Last Peak Values Screen

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5.7.2 Factory Reset

The factory reset allows all settings to be cleared from the display, restoring it to an un-configured and unused state with exception of the display logs and the display total runtime counter.

To perform a factory reset:

1. Navigate the menu to the “FACTORY DEFAULT RESET” screen. Refer to Section 5.1.2 for details on navigating the menu.
2. The authorisation screen will be shown (refer to Section 5.1.2.1). Press the centre segment to proceed.
3. The prompt “RESET TO FACTORY SETTINGS” will be shown. Press enter to proceed or left to cancel.

Figure 50: Reset to Factory Defaults

4. The factory defaults saving screen will be shown. After this the system will reset.

Figure 51: Reverting to Factory Defaults

5. The new detector attached screen will be shown (see Section 5.3.1.1). Press centre to acknowledge and proceed. The device may now be configured, refer to the GG2 RTGM Design Installation and Maintenance Guide for more information.

5.7.3 Reset Latched Catalytic Detector

This section applies only to GG2 Displays with a catalytic detector attached. Methane gas concentrations above the specified range may cause incorrect operation due to limitations of the catalytic bead. The catalytic sensor will latch the reading to 5.25% v/v when the gas concentration exceeds 5.25% v/v and will require the user to externally verify that the ambient gas concentration is within the measurement range prior to resetting the latch.

WARNING!

Before resetting a catalytic detector latch, the actual methane concentration at the detector must be confirmed safe; otherwise, the device may show false readings.

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To reset a latched catalytic from the GG2 Display HMI, perform the following steps:

1. Navigate to the “RESET LATCHED CATALYTIC” screen. Refer to Section 5.1.2 for details on navigating the menu.
2. The authorisation screen will be shown (refer to Section 5.1.2.1). Press the centre segment to proceed.
3. On the next screen, press centre to proceed and reset the catalytic latch or press left to cancel.

Figure 52: Catalytic latch reset

NOTE

There may be several status titles displayed which correspond to the catalytic latch event. e.g. FULL SCALE LOCK, SETPOINT FLAG SET and READING OVER RANGE.

4. The display will return to the menu without showing a confirmation. Once the latch is successfully reset the gas reading should again reflect the actual gas value and the status flags should in turn become unset.

5.7.4 LED Indicator Test

The LED indicator test can be used to verify the function of the three LED indicators on the GG2 Display. The test sequence should be as follows:

1. One LED flashes several times, this repeats for the other LEDs, after which the cycle repeats. This should happen approximately four times per LED.
2. The three LEDs should then flash together with increasing frequency until the end of the test.
3. On completion, the menu is displayed.

The behaviour of the LED test cannot be ensured when the fault/alarm LEDs are flashing due to alarm or fault

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6 SERVICE, MAINTENANCE & DISPOSAL

NOTE	If a GG2 Display Module is damaged a replacement may be obtained from the manufacturer. See the Conditions of Safe Use for details. Otherwise, there are no user serviceable parts. For repairs or decommissioning, return to the manufacturer.

6.1 Equipment Service

A number of external system based checks should be completed on a regular basis. These 'routine inspections' must be carried out by suitably trained people with knowledge of the GG2 Display and the systems into which it is fitted. Routine inspections may take the form of either visual-only checks, or visual and 'hands-on' checks.

6.1.1 Visual Only Inspections

A basic visual inspection focuses on looking at the installation for signs of physical damage, water or dust ingress, and the condition of cables and labels. This type of inspection may involve opening cabinets to gain access to the unit and other equipment. This level of inspection may also include cleaning display windows that have become obscured by dirt.

Observations would typically be:

- Check that equipment enclosures, cable trays, conduits, etc. are in good order with no physical damage.
- Check that sealed wall boxes are free from water and dust ingress internally. Door seals are in good condition.
- Check that connected cables are free from cuts, abrasions and obvious signs of damage. Cable restraints are in good order and correctly fitted.
- Check that labels on equipment, wall boxes and cables are present and in good condition (especially certification labels).
- Check that no modifications have been carried out to installed equipment.

6.1.2 Hands-On (Detailed) Inspections

A more detailed inspection would include all of the elements of a visual inspection, plus some checks that cover the integrity of connections, fixtures and fittings.

In addition to basic visual observations, more detailed integrity checks would involve:

- Verify that equipment housings, wall boxes and other mechanical fixtures are secured in place. This includes terminal box lids, tightness of cable glands, integrity of wall-box mountings, security of equipment fixing to walls/DIN rails etc.
- Verify all electrical connections are secure with no loose screw terminals or DIN rail terminals not fitted to rails etc.

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6.2 Equipment Maintenance

Refer to the **GG2 RTGM Design Installation and Maintenance Guide** for an overview of calibration and testing procedures.

WARNING!

Maintenance operations should not compromise safety in the area being protected. Maintenance procedures should only be undertaken by personnel trained in the operation, maintenance and repair of flammable gas detection equipment.

Inadequate maintenance, incorrect zero and span adjustment are all causes for errors in gas detection. It is important to remember that errors and failures in gas detection equipment or systems may not be self-evident. I.e. the DC offset (adjustment away from zero either positive or negative), if incorrectly adjusted, will compromise the DC gain or span of the instrument resulting in the incorrect values/safety function of the detector/safety system.

6.2.1 General Maintenance practices

The equipment or kit used for challenging or adjusting the Gasguard 2 instruments should be maintained to a high standard and includes the following items:

- Zero Gas, synthetic air and Nitrogen
- Span Gas suitable for the instruments
- Gasguard 2 Calibration mask
- 0.5l/m regulator
- Tubing

NOTE

Each item shall be inspected prior to use.

Spares may deteriorate in storage owing to mishandling or age and should always be tested before use.

6.2.2 Periodic Maintenance

Periodic maintenance consists mainly of scheduled checks to ensure the instrument remains in adjustment and gives the required response to the sampled gas. For recommended maintenance tasks and schedules, refer to the AS/NZS 2290 series.

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6.2.2.1 AS/NZS2290.3:2018 - Schedule of Tests

AS/NZS2290.3:2018 prescribes the maintenance requirements of Gas Detectors for Coal Mines.

Table 13: AS/NZS2290.3.2018 - Schedule of Inspection and Tests

Maintenance Frequency	Fixed	AS/NZS 2290.3 Associated Clause	Machine Mounted	AS/NZS 2290.3 Associated Clause
Daily	External Inspection	4.2	External inspection	4.2
Weekly	N/A	N/A	Zero test Span test Response time test	4.3 4.4 4.5
Monthly	External inspection Zero test Span test Response time test	4.2 4.3 4.4 4.5	Telemetry test	4.6
Six Monthly	Calibration Telemetry test Dynamic range test	4.7 4.6 4.8	Calibration Dynamic range test	4.7 4.8
On Relocation	External inspection Zero test Span test Response time test Telemetry test Dynamic range test	4.2 4.3 4.4 4.5 4.6 4.8	External inspection Zero test Span test Response time test Telemetry test Dynamic range test	4.2 4.3 4.4 4.5 4.6 4.8
On Return to Service	Zero test Span test Response time test Telemetry test Dynamic range test Confirm calibration is current	4.3 4.4 4.5 4.6 4.8 1.3.4	Zero test Span test Response time test Telemetry test Dynamic range test Confirm calibration is current	4.3 4.4 4.5 4.6 4.8 1.3.4

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6.2.3 Corrective Maintenance

During maintenance, it is vital to ensure that suitable procedures are followed to prevent any abnormal sensor signal from unintentionally operating any fault, warning or alarm status indicator, or equipment control function. Consult the relevant control unit manual for details as to how to do this.

There are no user serviceable parts. If a fault develops, the detector must be returned to an accredited repair facility.

Table 14: Corrective Maintenance Checks

Fault	Checks
GG2 Detector will not respond to digital commands	a) Check that voltage and polarity applied to the instrument is correct. b) Check the external interface is wired correctly to a compatible module. c) Check for loose plug and terminal connections.
GG2 Detector cannot be Spanned or Zeroed	a) Gas element has been damaged or is end of life, return to manufacturer.
Measurement range exceeded	a) Apply span gas and verify the result is within accuracy.
Device status remains in warm-up continuously	a) Check that voltage and polarity applied to the instrument is correct. b) Turn the instrument off for >1 min before turning it back on. c) Gas element has been damaged or is end of life, return to manufacturer.
T90 Time exceeded	a) Inspect and remove blockages from the filter cage. b) Gas element has been damaged or is end of life, return to manufacturer.

6.3 Disposal

ENVIRO

The electronic equipment discussed in this manual **must not be treated as general waste**. By ensuring that this product is disposed of correctly, you will be helping to prevent potentially negative consequences for the environment, which could otherwise be caused by incorrect waste handling of this product.

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7 SPECIFICATIONS

7.1 GG2 Display

Electrical	
Supply Voltage	10 - 16.5VDC
Max Power Consumption	12mA
Mechanical and Environment	
Dimensions (H x W x D)	168mm x 90mm x 94mm
Weight	3kg
IP Rating	IP66
Housing Material	Cast Stainless Steel
Operating Temperature	-20°C to +40°C
Humidity Range	15% to 90% r.h. non-condensing
Pressure Range	±20kPa
Communications (iMAC L1)	
Hardware interface	2 wire (+/-18VDC I.S.)
Line Speed	300 - 1000 baud
Bit protocol	iMAC proprietary
L1 Isolation	5.3kV RMS
L1 Line Loading (baud)	1mA (300 - 1000 baud)
Certification	
IECEx	IECEx ExTC 18.0003X Issue No. 0
	IECEx ITA 07.0017X Issue No. 2

8 EQUIPMENT LIST

NOTE

Customised gas panels and systems are also available as well as sample draw panels. These can be designed specifically to your gas sensing needs.

Refer to **GG2B026 GG2 Monitoring Solution Technical Datasheet** for a detailed equipment list.

For more information call customer service on 1300 267 373

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9 APPROVALS

9.1 IECEx ITA 07.0017X Issue No. 2

iMAC System:

The official controlled version of the certificate may be obtained online from the IECEx website

9.2 IECEx ExTC 18.0003X Issue No. 0

GG2 Display Module:

The official controlled version of the certificate may be obtained online from the IECEx website

The attached certificate below was current when this document was published but is to be considered an uncontrolled version.

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IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: IECEx ExTC 18.0003X — Issue No: 0

Status: **Current**

Page 1 of 3

Date of Issue: **2018-05-02**

Applicant: **Ampcontrol CSM Pty. Ltd.**
7 Billbrooke Close
Cameron Park NSW 2285
Australia

Equipment: **GG2 Display Module**
Optional accessory:

Type of Protection: **Intrinsic Safety**

Marking:
Ex ia I Ma

Approved for issue on behalf of the IECEx Certification Body: David Price

Position: Certification Authority

Signature:
(for printed version)

Date: 2018-05-02

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by:

Ex Testing and Certification Pty Ltd
1/30 Kennington Drive
Tomago NSW 2322
Australia

TESTING & CERTIFICATION

APPROVED FOR EXTERNAL DISTRIBUTION – PROPERTY OF AMPCONTROL PTY LTD – NOT TO BE REPRODUCED IN PART

IECEx Certificate of Conformity

Certificate No: IECEx ExTC 18.0003X Issue No: 0

Date of Issue: **2018-05-02** Page 2 of 3

Manufacturer: **Ampcontrol CSM Pty. Ltd.**
7 Billbrooke Close
Cameron Park NSW 2285
Australia

Additional Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:

The apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Explosive atmospheres - Part 0: General requirements
Edition:6.0

IEC 60079-11 : 2011 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
Edition:6.0

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:

AU/EXTC/ExTR18.0008/00

Quality Assessment Report:

AU/TSA/QAR06.0007/09

APPROVED FOR EXTERNAL DISTRIBUTION – PROPERTY OF AMPCONTROL PTY LTD – NOT TO BE REPRODUCED IN PART

IECEx Certificate of Conformity

Certificate No: IECEx ExTC 18.0003X Issue No: 0

Date of Issue: **2018-05-02** Page 3 of 3

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

The GG2 Display module is an intrinsically safe apparatus for the purpose of displaying and transmitting sensor data and system information. The GG2 Display consists of an LCD and several PCB's mounted in and around a plastic carrier. The plastic carrier forms a chamber in which several PCB's are encapsulated. The apparatus is powered from the system interface which also passes through the unit to supply power to the sensor interface.

SPECIFIC CONDITIONS OF USE: YES as shown below:

See annex for details

Annex:

ex.IECEx_ExTC_18.0003X_0 Annex Final.pdf

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IECEx Certificate of Conformity Annexe			
Annexe for Certificate No.:	**IECEx ExTC 18.0003X**	**Issue No.:**	**0**

Description:

As provided in the main body of the certificate.

Conditions of Certification pertaining to Issue 0 of this Certificate:

1. The following input parameters are to be taken in to account in the system:

OPTIONAL MARKING INFORMATION:				
CONNECTION	FUNCTION	PINS	NAME	PARAMETERS
SYSTEM	VIN NOTE3	P2-3 TO P2-1/P1-4	VIN TO GND	Ui: 16.5V Ci: NEGLIGIBLE NOTE1 Li: NEGLIGIBLE NOTE1
	4-20mA NOTE3	P2-2 TO P2-1/P1-4	4-20mA TO GND	Ui: 16.5V Ci: NEGLIGIBLE NOTE1 Li: NEGLIGIBLE NOTE1
	RS485	P3-1/P3-2 TO P2-1/P1-4	RS485+/RS485- TO GND	Ui: 7.14V Ci: NEGLIGIBLE Li: NEGLIGIBLE Uo: 5.88V Io: 41.47mA Po:62.2mW
	IMAC	P3-3 TO P3-4	L1+ TO L1-	Ui: 21.5V Pi: 2.66W Ci: NEGLIGIBLE Li: NEGLIGIBLE
SENSOR	VOUT NOTE3	P1-3 TO P2-1/P1-4	VOUT TO GND	POWER FEED THROUGH Ui: 16.5V Ci: NEGLIGIBLE Li: NEGLIGIBLE Uo: NOTE2 Io: NOTE2
	DATA NOTE3	P1-2/P1-1 TO P2-1/P1-4	DATA+/DATA- TO GND	Ui: 16.5V Ci: NEGLIGIBLE Li: NEGLIGIBLE
NOTE 1: THE Ci AND Li FROM THE MODULE IS NEGLIGIBLE HOWEVER ANY CABLE OR LUMPED PARAMETERS APPLIED AT THE FEED THROUGH CONNECTION P1-3, P1-4 MUST BE TAKEN INTO ACCOUNT IN THE POWER SUPPLY'S ENTITY BALANCE NOTE 2: Uo AND Io ARE EQUAL TO THE APPLIED Uo AND Io FROM THE SUPPLY APPLIED AT P2-3 AND P2-1 NOTE 3:VIN, 4-20mA, VOUT AND DATA CONNECTIONS MAY BE CONSIDERED AS A SINGLE SET OF INPUT PARAMETERS WITH LUMPED PARAMETERS CONNECTED AT THE SENSOR INTERFACE TAKEN INTO ACCOUNT IN THE POWER SUPPLY'S ENTITY BALANCE. NOTE 4: P2-4 IS THE ISOLATED CHASSIS CONNECTION.				

2. The GG2 Display Module must be housed in an enclosure suitable for Group I that provides a degree of protection not less than IP54 as per IEC 60529

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Annexe

Annexe for Certificate No.:	IECEx ExTC 18.0003X	Issue No.:	0

Drawing list pertaining to Issue 0 of this Certificate:

Title:	Drawing No.:	Pages	Rev. Level:	Date:
GG2 Display LCD (BOM)	GG2B017	1	0	2018-04-24
GG2 Display CPU (BOM)	GG2B018	2	0	2018-04-26
GG2 Display PWR (BOM)	GG2B019	2	0	2018-04-24
GG2 Display CONN (BOM)	GG2B020	2	0	2018-04-26
GG2 Display Coversheet Schematic	GG2E012	1	0	2018-04-26
GG2 Display LCD Schematic	GG2E013	1	0	2018-04-26
GG2 Display CPU Schematic (various titles)	GG2E014	4	0	2018-04-26
GG2 Display PWR Schematic (various titles)	GG2E015	2	0	2018-04-26
GG2 Display CONN Schematic	GG2E016	1	0	2018-04-26
GG2 Display LCD PCB	GG2P006	5	0	2018-04-26
GG2 Display CPU PCB	GG2P007	7	0	2018-04-26
GG2 Display PWR PCB	GG2P008	7	0	2018-04-26
GG2 Display CONN PCB	GG2P009	5	0	2018-04-26
GG2 Display Shield PCB	GG2P010	5	0	2018-04-26
GG2 Display Module Certification Detail	GG2Z005	2	0	2018-05-01
IECEX EXTC 18.0003X User Manual Inclusion	GG2Z006	4	0.2	2018-02-12

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