GG2 DETECTOR

CH_4 / O_2 / CO / CO_2 / H_2S SENSOR UNITS

User Manual

Version: 4, October 2020

PN: 177870, 177871, 177872, 177873, 177874, 180733, 180734, 190998, 192855, 193071

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
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 4641:2007	Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels - general requirements and test methods
AS 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
IEC 60079.0:2011	Explosive atmospheres - Part 0: Equipment - General requirements
IEC 60079.11:2011	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
GG2	Gasguard 2

1 SAFETY AND OTHER WARNINGS

For safety reasons, the GG2 Detector 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 Detector 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 Detector functioning correctly it is highly recommended that all safety functions of the unit be periodically tested to ensure correct operation. The plant used to determine or monitor the presence of gas must be maintained in accordance with Australian Standards AS/NZS 2290.3-2018 Electrical equipment for coal mines - Maintenance and overhaul - Maintenance of gas detecting and monitoring equipment, as amended from time to time.

1.1.5.1 Electrochemical O2 Operation

AS/NZS 4641 Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels—General requirements and test methods, state that the concentration indicated by the output signal shall not vary from the test gas concentration by more than a volume fraction of ±0.3% v/v over the range 10% - 25% v/v oxygen. When exposed to other gases. Therefore, the 0-25% range Oxygen Sensor - Electrochemical (177872) may read high when exposed to concentrations of carbon dioxide exceeding 5%.

This meets the requirements of The “NSW Government Gazette No 52 Registration of design of Plant Used to Determine or Monitor the Presence of Gas Order 2015”. However, does not meet the requirements of AS/NZS 4641:2007 Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels—General requirements and test methods at a concentration of 10% CO2.

The warmup time is the 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. The warmup time of the O2 detector for a cold start is 30 Minutes.

This meets the requirements of The “NSW Government Gazette No 52 Registration of design of Plant Used to Determine or Monitor the Presence of Gas Order 2015” and the performance requirements of AS/NZS 4641:2018 Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels—General requirements and test methods. However, does not meet the requirements of AS/NZS 4641:2007 Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels—General requirements and test methods.

1.1.5.2 Catalytic CH4 Operation

Ampcontrol designed and in-house tested the 0-5% range Methane Sensor - Catalytic (177871) to comply with the performance requirements of AS/NZS 60079.29.1, Explosive atmospheres, Part 29.1: Gas detectors—Performance requirements of detectors for flammable gases.

The Mine Safety Technology Centre was engaged to verify the performance of the catalytic detector to AS/NZS 60079.29.1 and the NSW regulatory requirements. The test report issued states compliance with the long-term stability test however; this test was shortened from 33 days in total to 26 days in total.

1.2 Supplementary Documentation

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

- GG2B023 GG2 Display User Manual
- GG2B032 GG2 Communication User Manual
- GG2B033 GG2 Design, Installation and Maintenance Application Guide

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.

CAUTION!

The GG2 Detector **should not be stored in areas that contain solvent vapours**. Some of these vapours are known to create false "high" zero points and may even damage the sensor electrodes. Similarly, **the GG2 Detector should not be exposed to high levels of solvent vapours while in operation**.

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.

3 PRODUCT OVERVIEW

3.1 Overview

The GG2 Detector is an intrinsically safe apparatus for the purpose of gas concentration level detection and atmospheric monitoring. The equipment is housed in a metallic enclosure with a custom plug interface on the top and is powered by and connected to suitably certified compatible equipment.

The GG2 detector can be mounted via the custom plug interface and is secured with the integral retention clip. Optionally, the GG2 Detector may be mounted up to 10 meters away from a compatible module using the optional remote cable assembly. The remote cable assembly allows the GG2 Detector to be installed in an appropriate position for the target gas.

The GG2 Detector provides a high integrity digital output with extensive diagnostics and is factory configured for a specific gas technology, type, and range. The GG2 Detector is IECEx Ex ia Group I certified and the product shall only be used within the limitations of its entity parameters.

This document covers all gas sensor types for the GG2 Detector. The GG2 range of detectors types consists of electrochemical, catalytic and infrared sensor types each with built-in conversion and digital output of relevant gas values. The full range consists of:

- Electrochemical:
  - Carbon Monoxide (CO)
  - Oxygen (O_2)
  - Hydrogen Sulphide (H_2S)
- Catalytic:
  - Methane (CH_4)
- NDIR:
  - Methane (CH_4)
  - Carbon Dioxide (CO_2)

3.2 Key Features:

- Certified Intrinsically Safe - Ex ia I Ma
- Tested to performance requirements of AS4641 and AS/NZS 60079-29.1
- Rugged stainless steel construction
- Failsafe architecture and digital interface
- Extensive self-test routines
- Economical
- Reliable
- Quickly detachable for easy calibrations
- Wide range of gas types available

3.3 GG2 Display Module

Refer to GG2B023 GG2 Display User Manual for information on the GG2 Display.

3.3.1 Digital interface

The GG2 Detector communicates serially using a robust digital communication protocol across P1 pins 3 and 4.

NOTE

Compatible modules available from Ampcontrol fully implement the GG2 Detector digital interface.

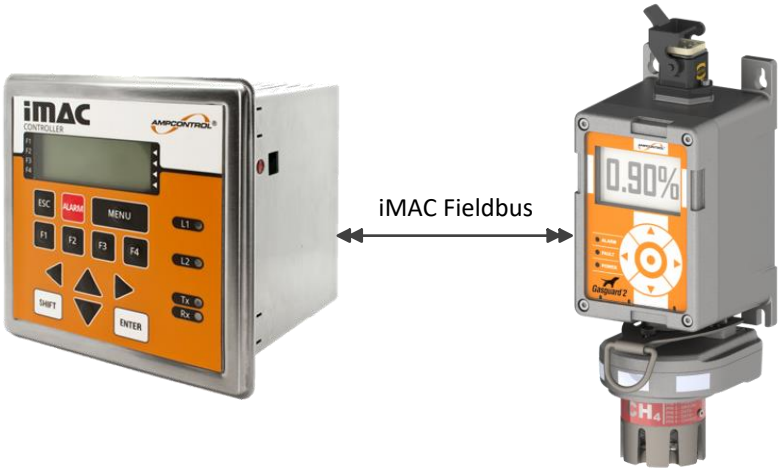

Figure 1: GG2 Example Compatible Modules (iMAC Communication)

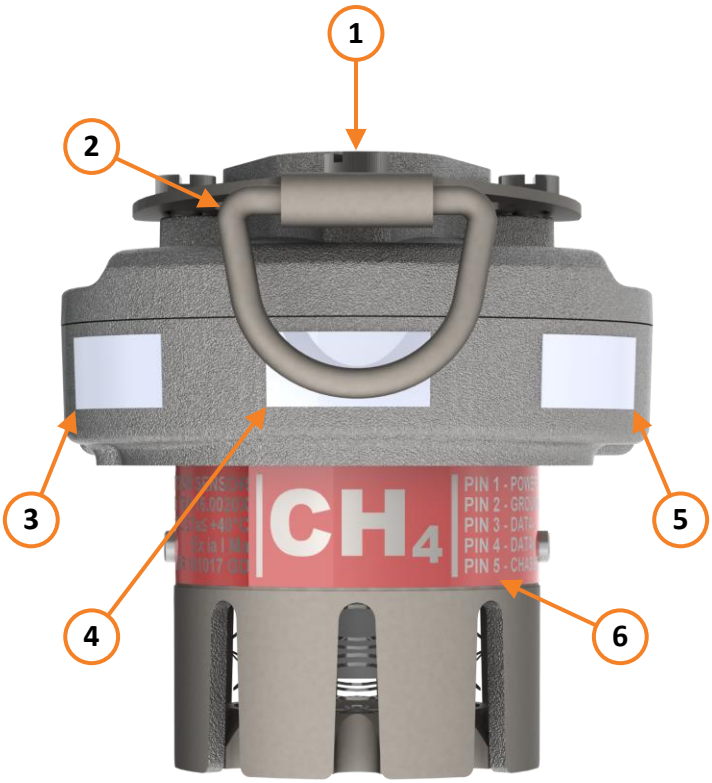

Figure 2: GG2 Detector Overview

1. Proprietary Connector (P1)
2. Retention clip
3. Serial number sticker
4. NATA sticker
5. Part number sticker
6. Detector Marking label

3.4 Markings

Table 1: Minimum Marking Information

THE MINIMUM MARKING MUST CONTAIN THE INFORMATION IN ONE OF THE FOLLOWING CELLS			
AMPCONTROL GG2 DETECTOR NDIR IECEx TRA 16.0020X Ex ia I Ma -20°C ≤ Ta ≤ +40°C SERIAL: XXXXX	AMPCONTROL GG2 DETECTOR EC IECEx TRA 16.0020X Ex ia I Ma -20°C ≤ Ta ≤ +40°C SERIAL: XXXXX	AMPCONTROL GG2 DETECTOR CAT IECEx TRA 16.0020X Ex ia I Ma -20°C ≤ Ta ≤ +40°C SERIAL: XXXXX	AMPCONTROL GG2 DETECTOR SENSOR IECEx TRA 16.0020X Ex ia I Ma -20°C ≤ Ta ≤ +40°C SERIAL: XXXXX

Table 2: Optional Marking Information

Optional Marking Information		
Connector P1		
Pin	**Function**	**Entity Parameters**
1	Power	Ui: 16.5V Ci: Negligible Li: Negligible
2	Ground	
3	Data -	
4	Data +	
5	Chassis	

3.5 Electrochemical Sensors

3.5.1 Oxygen, Carbon Monoxide and Hydrogen Sulphide Gas Sensors

Oxygen, Carbon Monoxide and Hydrogen Gas Sensors work on the principles of chemical oxidation and reduction. Electrochemical gas sensors contain electrodes, which promote a chemical reaction with the target gas when an electrical potential is applied. The chemical reaction of target gas within the sensor creates a current, which is proportional to the rate of target gas consumption. By measuring this current, the volume fraction of target gas can be calculated and converted into a digital value by the integrated sensor electronics. The GG2 Detector is temperature compensated and provides a linear output.

3.5.2 Humidity

Electrochemical sensors contain an electrolyte, which is a key component of sensor operation. Under low humidity conditions, the electrolyte can dry out leading to permanent sensor failure. Under high humidity conditions, the electrolyte can absorb too much water and leak from the sensor.

For Oxygen, Carbon Monoxide and Hydrogen Sulphide, the sensor can be operated in a non-condensing relative humidity of 15% to 90% continuously.

3.5.3 Pressure Effects

Electrochemical sensors are sensitive to the effects of pressure and should not be operated outside of their stated range of ±20 kPa.

3.5.4 Air Velocity

Electrochemical sensors are insensitive to typical air velocities.

3.5.5 Operational Restrictions

Field bump tests and calibrations using portable gas applicators are susceptible to external air velocities and pressurisation. These phenomena lead to incorrect concentrations of gas being applied to the detector during calibration, which may result in under reporting the environmental concentration of gas. The GG2 Calibration Cup and procedures detailed in this manual have been designed to prevent errors in the calibration process. Use of any calibration cup not detailed in this manual is prohibited.

3.6 Catalytic Sensors

3.6.1 Methane Gas Sensors

The Methane Gas Sensor, which operates on the catalytic combustible gas detection principle, is a small platinum element coated in a catalyst. Electrical current is passed through the platinum wire and the potential of the catalytic element is monitored by a simple Wheatstone Bridge arrangement. Combustible gases, once in contact with the heated catalytic surface of the measuring element, react and cause the surface temperature of the element to rise. Any increase in temperature affects the resistance of the platinum wire, causing a small shift in potential across the Wheatstone Bridge proportional to the concentration of the combustible gas. The GG2 Detector is temperature compensated and provides a linear output.

3.6.2 Poisoning of Sensors (Contamination)

High levels of or long exposure to certain compounds may poison the catalytically active detector filament thereby reducing or destroying its sensitivity.

Among these compounds are halides, sulphur compounds, leaded petrol, silanes, silicates and other products with silicon. Products such as aerosol sprays, polishes, waxes and lubricants with silicones and non-catalysed silicone rubbers such as “silastic”, phosphate esters and hydraulic fluids all damage catalytic sensors.

CAUTION!

Some sensor poisons can cause irreversible damage to the sensor rendering it unable to detect hazardous gas levels.

Table 3: Poisoning of Sensors

Chemical Type	Common Examples	Products Found in: (Examples)	Effect on Performance	Duration of Effect,
PERMANENT POISONS				
Silicones	Hexamethyldislioxane (HMDS) Dimethicone	Mould Release Agents Lubricants Cosmetics Cleaning Products	Signal output on gas is reduced. Effect is noticeable at levels above 2ppm (continuous exposure)	Permanent
Organo-metallic Compounds		Some Fuels Petrochemical Works Pharmaceutical	Signal output on gas is reduced. Effect is noticeable at levels above	Permanent

		Plants	2ppm (continuous exposure)	
Acetylene		Welding Applications Some Petrochemical Plants	Signal output on gas is progressively reduced, Zero Output increases. Effect is noticeable at levels > 5%LEL (Intermittent Exposure)	Permanent.
TEMPORARY POISONS				
Sulphurous Compounds	Hydrogen Sulphide	Sewage Digester Gas Landfill Gas Sour Gas	Signal output on gas is reduced. Effect is noticeable at levels above 2 ppm (continuous exposure)	Temporary - performance is restored when exposed to clean air or test gas, but the sensor's resistance to further poisoning is affected
Chlorinated Compounds	Carbon Tetrachloride Methyl Chloride Some Freons, such as R134A, R152B, Vinyl Chloride	Solvents, Freons	Signal output on gas is reduced. Effect is noticeable at levels above 100 ppm (continuous exposure)	Temporary - performance is restored when exposed to clean air or test gas, but the sensor's resistance to further poisoning is affected
Some Olefins	Propylene Styrene Acrylonitrile	Plastics Manufacturing	Signal output on gas is reduced. Effect is noticeable at levels above 100 ppm (intermittent exposure)	Usually temporary, except where high concentrations are encountered.

3.6.3 Humidity

Catalytic sensors cannot be operated in a condensing atmosphere or where the relative humidity exceeds 95%. High humidity and condensation can cause significant changes in sensitivity, which leads to incorrect gas values being read.

3.6.4 Pressure Effects

Catalytic sensors are sensitive to the effects of pressure and should not be operated outside of their stated range of ±20 kPa.

3.6.5 Air Velocity

Due to the complex dynamics associated within catalytic elements and particle filters, they are slightly sensitive to changes in air velocity. The GG2 filter assembly has been designed to greatly minimise this effect.

Specialist advice should be sought for applications in extreme air velocities.

3.6.6 Operational Restrictions

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% v/v when the gas concentration exceeds 5% v/v and will require the user to externally verify the ambient gas concentration is within the measurement range prior to resetting the latch using the digital latch command.

After a catalytic sensor has exceeded its measurement range, it is recommended that a bump test be performed to verify the integrity of the apparatus.

Field bump tests and calibrations using portable gas applicators are susceptible to external air velocities and pressurisation. These phenomena lead to incorrect concentrations of gas being applied to the detector during calibration, which may result in under reporting the environmental concentration of gas. The GG2 Calibration Cup and procedures detailed in this manual have been designed to prevent errors in the calibration process. Use of any calibration cup not detailed in this manual is prohibited.

3.7 NDIR Sensors

3.7.1 Methane and Carbon Dioxide Gas Sensors

NDIR Gas Sensors work on the infrared gas absorption principle. An infrared light source illuminates the sensor through a gas pathway with an optical filter that selects the appropriate wavelength for the gas being detected; the presence of this gas reduces the amount of infrared energy reaching the detector. This difference in infrared energy with and without gas is used to measure the amount of gas present, and is converted to a digital value by the integrated sensor electronics. The GG2 Detector is temperature compensated and provides a linear output.

3.7.2 Humidity

NDIR sensors cannot operate in a condensing atmosphere. In such an environment, a thin film of water can form across the membrane, effectively sealing it and stopping the passage of gas into the sensor. On evaporation of this water, the sensor usually resumes normal operation. Above 90% R.H. the sensor accumulates water vapour and may form condensation to block the infrared path used for gas detection. Provided the exposure to these extremes of humidity has not been for a long period, the sensors will recover when exposed to R.H. in the range 15% to 90%.

3.7.3 Pressure Effects

The NDIR sensors do not exhibit a permanent response to changes of pressure but respond to pressure on a directly proportional basis.

3.7.4 Air Velocity

NDIR sensors are insensitive to typical air velocities.

3.7.5 Operational Restrictions

Field bump tests and calibrations using portable gas applicators are susceptible to external air velocities and pressurisation. These phenomena lead to incorrect concentrations of gas being applied to the detector during calibration, which may result in under reporting the environmental concentration of gas. The GG2 Calibration Cup and procedures detailed in this manual have been designed to prevent errors in the calibration process. Use of any calibration cup not detailed in this manual is prohibited.

3.8 Enclosure

3.8.1 Stainless steel housing

The GG2 Detector circuitry and sensor elements are incorporated in a stainless steel housing. The

housing is robust and corrosion resistant. It is suitable for almost all applications and provides for easy installation.

3.8.2 Ingress protection rating:

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

When mated, the enclosure and electrical connection (P1) achieves an ingress protection rating of IP66.

The gas inlet is fitted with a hydrophobic barrier to prevent liquid water and dust from entering the gas-sampling chamber. The hydrophobic barrier has a three-dimensional structure to minimise the likelihood of total blockages occurring.

Table 4: Ingress Protection Rating

Section	Ingress protection rating
The enclosure and electrical connection P1 when mated	IP66
Gas sensing inlet and sensor elements	IP54

CAUTION!

IP ratings do not imply that the equipment will detect gas during and after exposure to those conditions

CAUTION!

If the Hydrophobic barrier is completely blocked no diffusion can occur and the GG2 Detector cannot respond to a change in gas concentration

A visual inspection and bump test should be performed if the GG2 Detector has been exposed to excessive dust and water.

3.9 Certification

3.9.1 IEC 60079-11 and IEC 60079-0

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 TRA 16.0020X. The controlled version of this certificate can be found on the IECEx website http://iecex.iec.ch/iecex/exs.nsf/ex_eq.xsp?v=e

3.9.2 AS/NZS 60079.29.1:2008 & AS 4641:2007

To maintain compliance with AS/NZS 60079.29.1:2008 a compatible module or user interface shall have the following features.

1. Three indicating lights utilising the following colour requirements
   a) The colour red is used to indicate alarms.
   b) The colour yellow is used to indicate faults.
   c) The colour green is used to indicate power.
2. On user request, the software version of the GG2 Detector provided through the digital interface must be displayed.

3.9.3 NSW Government Gazette 52 of June 2015

Extract from MDR Certificate “MDR 0001030 GD”

The ‘Limitations on the use of this Design’ must include the information below as a minimum:

a. Prior to being used, each plant used to determine or monitor the presence of gas must be tested for accuracy and calibrated by a test facility in Australia that is accredited by the National Association of Testing Authorities (NATA). The plant must be covered by a NATA endorsed certificate supplied to the underground coal mine.
b. The plant used to determine or monitor the presence of gas must be maintained in accordance with Australian Standard AS 2290.3-2018 Electrical equipment for coal mines - Introduction, inspection and maintenance - Part 3: Gas detecting and monitoring equipment, as amended from time to time.
c. Any repair that may affect the instrument’s explosion protection properties must be carried out at a recognised service facility licensed for that purpose under Part 9 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014.
d. Calibrations must be undertaken in accordance with the manufacturer’s instructions.

4 INSTALLATION

The GG2 Detector has been designed to connect and mount from compatible modules. Contact Ampcontrol for the latest range of compatible modules.

NOTE

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

4.1 General Warnings

These instructions have been designed to assist users of the GG2 Detector 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.

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 Detector. 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. 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.

4.3 Installation Guidelines

4.3.1 Mounting Location

To ensure continued reliable operation of the GG2 Detector, 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 sensor unit in a position that reduces the risk of mechanical damage.
- Mounting should be to a vertical surface, pointing downwards, allowing for easy wiring access and subsequent servicing.
- It is essential that the sensor be positioned to take into account the expected flow of the gas to be measured.
- Allow sufficient space under the sensor for fitting of calibration cups or accessories.
- Ensure to account for the relative density to air of the gas that is being detected.

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.

For more information call customer service on 1300 267 373

4.3.2 Relative Density of Gas Type

The relative density or buoyancy of the gas or vapour with respect to air determines its propensity to rise or fall when released into the atmosphere.

Gases or vapours with buoyancy less than air will tend to rise from the source of release.

Conversely, gases or vapours heavier than air will tend to fall and accumulate in concentrations over long periods of time. Normal air movements in and around such gas concentrations will have the inevitable effect of producing zones of highly toxic mixtures.

This knowledge of the characteristics of the gas assists when determining the location of the gas sensor. See Table 5 for gas density values.

For this reason, the detector should be installed in a location that is most suitable for the type of gas being detected. The services of a Risk Assessment Engineer or specialist should be used if additional assistance is required in selecting the position of, or the number of sensors required for the application.

Table 5: Gas Density Relative to Air

Gas	Density
Hydrogen	Lighter than Air
Ammonia	
Methane	
Carbon Monoxide	
Carbon Dioxide	Heavier than Air
Nitric Oxide	
Oxygen	
Hydrogen Sulphide	
Chlorine	
Nitrogen Dioxide	

4.4 Conditions of Safe Use

The GG2 Detector has one input circuit connected at P1, made up of pins 1 and 2 supplying power and ground, and pins 3 and 4 for the communication circuit.

The input parameters of P1 (Pins 1 to 4) are:

Table 6: Conditions of Safe Use

P1: Pins 1, 2, 3, 4	
Input Parameters	
Ui	16.5V
Ci	negligible
Li	negligible

4.5 Mechanical Installation Information

4.5.1 Enclosure Dimensions

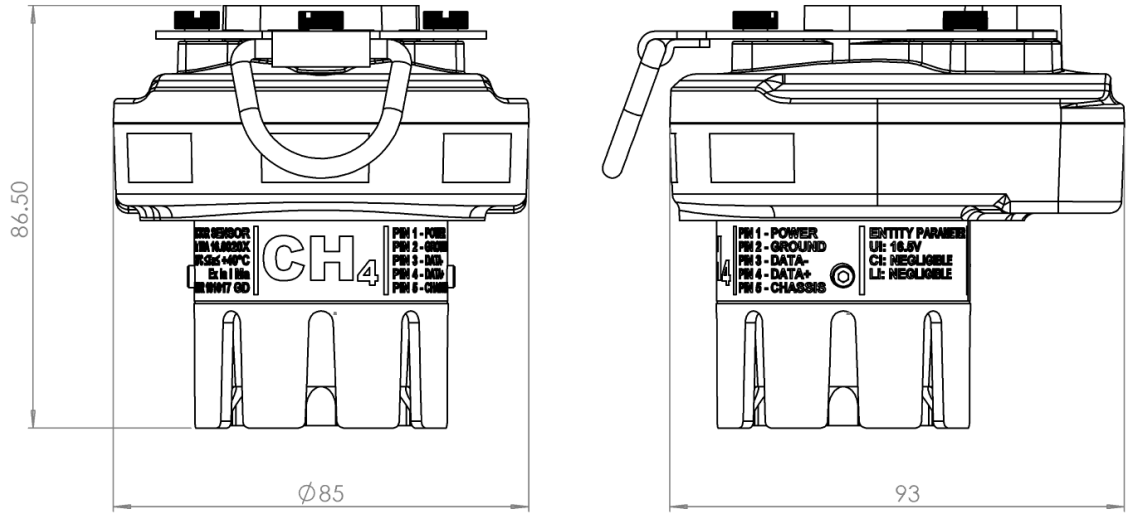

Figure 3: GG2 Detector enclosure nominal dimensions (mm)

4.5.2 Mounting Arrangements

The GG2 Detector is mounted using the custom plug interface directly to a compatible module and secured with the integral retention clip. Optionally, the GG2 detector may be mounted up to 10 meters away from a compatible module using the optional remote cable assembly. The remote cable assembly allows the GG2 Detector to be installed in an appropriate position for the target gas.

4.6 Electrical Installation Information

4.6.1 Compatible Module

The GG2 Detector 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.

4.6.2 Remote Cable Assembly

The GG2 detector can be mounted remotely from a compatible module using the GG2 remote cable assembly. The cable is supplied in 10 metre lengths and may be cut to size.

4.6.3 Earthing Procedures

The metallic GG2 Detector chassis is connected to Pin 5 and compatible modules use a high integrity multiple contact receptacle to equipotential bond the equipment's chassis together.

The GG2 Remote sensor cable screens are also connected to Pin 5 of the GG2 Detector and bonded to the chassis of compatible module.

The compatible modules are usually earthed at the power supply.

The GG2 Detector passes the 500V dielectric strength test between intrinsically safe circuits pins 1-4 and the metallic enclosure pin 5.

NOTE

GG2 Detector is in conformance to IEC60079.0, section 7.4.2 Dielectric strength requirement

4.6.4 Detector Wiring and Connectors

The GG2 Detector has a five-pin connector that interfaces directly to compatible modules available from Ampcontrol or the remote cable assembly. The connector pins are detailed in Table 7.

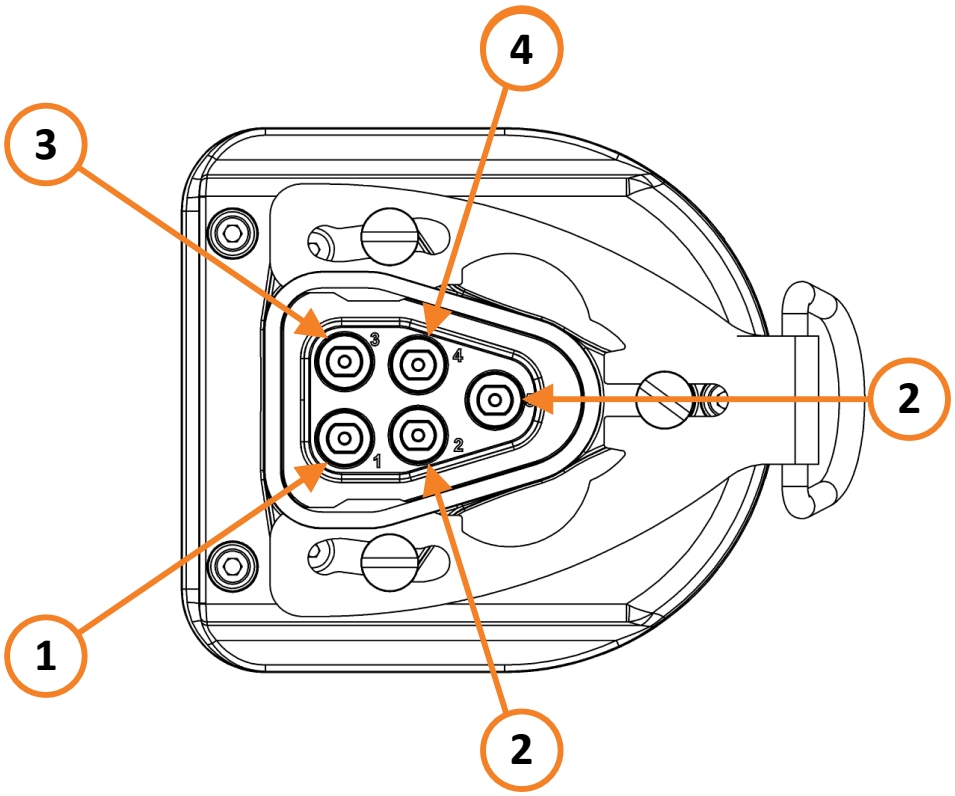

Figure 4: GG2 Detector Connector P1 Pin numbering

Table 7: GG2 Detector connector pin out

PIN	FUNCTION
1	POWER
2	GROUND
3	DATA-
4	DATA+
5	CHASSIS

5 COMMISSIONING AND CALIBRATION

Commissioning is the performance of initial checks, adjustments and calibration prior to placing the system in operation for the first time. Calibration, however, is not limited to performance of commissioning. Calibration is also performed throughout the life of the system on a periodic basis and after major repairs to the system.

During commissioning and subsequent re-calibration, it is vital to ensure that procedures are followed to prevent any abnormal sensor signal from initiating any fault, warning or alarm status indicator, or equipment control function on auxiliary equipment connected to the Detector. Consult the relevant control unit manual for details of how to do this.

The instruments supplied are NATA calibrated prior to delivery. However, before putting the system into operation, it is recommended to check the calibration. This is especially important if the instruments are commissioned sometime after delivery.

5.1 Preliminary Checks

Perform the following preliminary checks:

1. Verify that all connections are correct and installation complete as detailed in Section 4.
2. Check that the correct supply voltage is available to the GG2 Detector.
3. Apply power to the system.

5.2 Calibration

Before the start of calibration, if the GG2 Detector 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 Detector 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 sensors can only be achieved by using the appropriate span and zero gas. The volume fractions of zero and calibration gas components shall be known to a relative uncertainty of ± 2% of the nominal value.

Refer to GG2B023 GG2 Display User Manual for an overview of calibration and testing procedures.

Calibration gas should be applied to the sensor at a rate of 0.5 to 1.0 litres per minute, using the GG2 Calibration Cup. Allow sufficient time for sensor to stabilize before adjustment.

CAUTION!

GG2 Detectors should be tested regularly to verify proper operation. AS 2290.3 provides guidance depending on the application.

CAUTION!

GG2 Detectors should be NATA calibration at least every 6 months to ensure their proper operation.

5.3 Calibration Troubleshooting

If during calibration or zero of the GG2 Detector the status indicates a fault or the reading becomes

erratic then possible reasons are as follows:

5.3.1 Calibration Error

a) Check the calibration gas. It should be a correct range in air mixture although other trace gases may be present. Lower percentage gas mixtures will reduce the output leading to unnecessary change out of the sensor.
b) Check the gas flow to ensure it is 0.5 to 1.0 litres/min.
c) Check sensor is not blocked with dust or mud. The filter cage can be cleaned out with an antistatic brush before re-attempting calibration.

5.3.2 Zero Error

The sensor zero balance is required to be within a pre-set level and if the sensor is damaged the zero shift may take it outside the limit. Once this occurs an indication is shown when trying to zero the instrument, and the sensor should be replaced.

If left in Cal mode the instrument will revert to normal mode after about 2 minutes, retaining its last settings.

5.3.3 Erratic Readings

Check the calibration cup, gas cylinder and gas lines for leaks or improper flow regulation.

6 SERVICE, MAINTENANCE & DISPOSAL

NOTE

If a detector 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 Detector 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.

6.2 Equipment Maintenance

Refer to GG2B023 GG2 Display User Manual for an overview of calibration and testing procedures.

6.2.1 Periodic Maintenance

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

6.2.2 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 8: 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.

7 SPECIFICATIONS

7.1 Electrochemical O_2

Electrical	
Supply Voltage	10 - 16.5VDC
Max Power Consumption	0.1W
Mechanical and Environment	
Dimensions (H x W x D)	86.5mm x 85mm x 93mm
Weight	1kg
IP Rating	IP54
Humidity Range	15% to 90% r.h. non-condensing
Temperature Range	-20˚C to + 40˚C
Pressure Range	±20kPa
Response Time (t90) via diffusion	<60s
Warm-up Time	30 mins
Stabilization time (for calibration adjustments)	3 mins
Sensor Unit	
Detection Method	Electrochemical
Calibrated Range	0-25%
Accuracy	±0.3% v/v over the range 10% to 25% v/v ±0.5% v/v over the range 0% to 9.9% v/v
Drift	<1% per 3 months
Repeatability	±1% of reading
Sensing Element Life	>48 months
Resolution	<0.1% v/v[1]
Certification	
IECEx	IECEx TRA 16.0020X
DPI	MDR 0001030 GD

[1]The output measurement resolution is consistent across all gas types and does not infer the accuracy of the gas type

Table 9: Typical Oxygen Cross-Sensitivity

Test Gas Mixture	***Instrument variance from Standard Test Gas***
5% Methane in Air	±0.3% Oxygen
0.01% Hydrogen in Air	±0.3% Oxygen
0.1% CO in Air	±0.3% Oxygen
10ppm Hydrogen Sulphide in Air	±0.3% Oxygen
5% Carbon Dioxide in Air	±0.3% Oxygen
10% Carbon Dioxide in Air	±0.4% Oxygen
5% Nitric Oxide in Air	±0.3% Oxygen
5% Nitrogen Dioxide in Air	±0.3% Oxygen

7.2 Electrochemical CO

Electrical	
Supply Voltage	10 - 16.5VDC
Max power Consumption	0.1W
Mechanical and Environment	
Dimensions (H x W x D)	86.5mm x 85mm x 93mm
Weight	1kg
IP Rating	IP54
Humidity Range	15% to 90% r.h. non-condensing
Temperature Range	-20˚C to + 40˚C
Pressure Range	±20kPa
Response Time (t90) via diffusion	<60s
Warm-up Time	<5 mins (60 seconds typical)
Stabilization time (for calibration adjustments)	3 mins
Sensor Unit	
Detection Method	Electrochemical
Calibrated Range	0 - 50 ppm 0 - 100 ppm
Accuracy	±3 ppm over the range 0 ppm to 29 ppm ±6 ppm over the range 30 ppm to 100 ppm
Drift	10% per 6 months
Repeatability	1% reading
Sensing Element Life	>24 months
Resolution	0.01 ppm[1]
Certification	
IECEx	IECEx TRA 16.0020X
DPI	MDR 0001030 GD

[1]The output measurement resolution is consistent across all gas types and does not infer the accuracy of the gas type

Table 10: Typical Carbon Monoxide Cross-Sensitivity

Test Gas Mixture	***Instrument variance from Standard Test Gas***
50ppm CO + 5% Methane in Air	±5 ppm CO
50ppm CO + 0.01% Hydrogen in Air	±5 ppm CO
50ppm CO + 10% Oxygen in Nitrogen	±5 ppm CO
50ppm CO + 10 ppm Hydrogen Sulphide in Air	±5 ppm CO
50ppm CO + 5% Carbon Dioxide in Air	±5 ppm CO
50ppm CO + 5% Nitric Oxide in Air	±5 ppm CO
50ppm CO + 5% Nitrogen Dioxide in Air	±5 ppm CO

7.3 Electrochemical H_2S

Electrical	
Supply Voltage	10 - 16.5VDC
Max power Consumption	0.1W
Mechanical and Environment	
Dimensions (H x W x D)	86.5mm x 85mm x 93mm
Weight	1kg
IP Rating	IP54
Humidity Range	15% to 90% r.h. non-condensing
Temperature Range	-20˚C to + 40˚C
Pressure Range	±20kPa
Response Time (t90) via diffusion	<60s
Warm-up Time	<5 mins (60 seconds typical)
Stabilization time (for calibration adjustments)	3 mins
Sensor Unit	
Detection Method	Electrochemical
Calibrated Range	0 - 50 ppm 0 - 100 ppm
Accuracy	±1 ppm over the range 0 ppm to 9 ppm ±5 ppm over the range 10 ppm to 100 ppm
Drift	10% per 6 months
Repeatability	1% reading
Sensing Element Life	>24 months
Resolution	0-50 ppm 0.1 ppm[1] 0-100 ppm 1 ppm
Certification	
IECEx	IECEx TRA 16.0020X
DPI	MDR 0001558 GD

[1]The output measurement resolution is consistent across all gas types and does not infer the accuracy of the gas type

Table 11: Typical Hydrogen Sulphide Cross-Sensitivity

Test Gas Mixture	***Instrument variance from Standard Test Gas***
50ppm H_2S + 0.01% Hydrogen in Air	±5 ppm H_2S
50ppm H_2S + 10% Oxygen in Nitrogen	±5 ppm H_2S
50ppm H_2S + 0.01% Carbon Monoxide in Air	±5 ppm H_2S
50ppm H_2S + 5% Carbon Dioxide in Air	±5 ppm H_2S
50ppm H_2S + 5% Nitric Oxide in Air	±5 ppm H_2S
50ppm H_2S + 5% Nitrogen Dioxide in Air	±5 ppm H_2S

7.4 NDIR CH_4

Electrical	
Supply Voltage	10 - 16.5VDC
Max Power Consumption	0.1W
Mechanical and Environment	
Dimensions (H x W x D)	86.5mm x 85mm x 93mm
Weight	1kg
IP Rating	IP54
Humidity Range	15% to 90% r.h. non-condensing
Temperature Range	-20˚C to + 40˚C
Pressure Range	±20kPa
Response Time (t90) via diffusion	<30s
Warm-up Time	<5 mins (60 seconds typical depending on ambient temperature)
Stabilization time (for calibration adjustments)	3 mins
Sensor Unit	
Detection Method	Non-dispersive infrared
Calibrated Range	0-5% v/v
Accuracy	±0.1% v/v or ±5% of indication[1]
Drift	±0.1% v/v or ±5% of indication[1] over 3 months
Repeatability	±0.1% v/v or ±5% of indication[1]
Sensing Element Life	>5 years
Resolution	0.01% v/v[2]
Certification	
IECEx	IECEx TRA 16.0020X
DPI	MDR 0001030 GD

[1]Whichever is greater
[2]The output measurement resolution is consistent across all gas types and does not infer the accuracy of the gas type

Table 12: Typical NDIR Methane Cross-Sensitivity

Test Gas Mixture	***Instrument variance from Standard Test Gas***
2% Methane + 13% Oxygen in Nitrogen	±0.2% Methane
2% Methane + 5% Carbon Dioxide in Air	±0.2% Methane
2% Methane + 0.075% Ethane in Air	±0.2% Methane
2% Methane + 0.020% Ethane in Air	±0.2% Methane

7.5 NDIR CO_2

Electrical	
Supply Voltage	10 - 16.5VDC
Max power Consumption	0.1W
Mechanical and Environment	
Dimensions (H x W x D)	86.5mm x 85mm x 93mm
Weight	1kg
IP Rating	IP54
Humidity Range	15% to 90% r.h. non-condensing
Temperature Range	-20˚C to + 40˚C
Pressure Range	±20kPa
Response Time (t90) via diffusion	<60s
Warm-up Time	<5 mins (60 seconds typical)
Stabilization time (for calibration adjustments)	3 mins
Sensor Unit	
Detection Method	NDIR
Calibrated Range	0-2% 0-5%
Accuracy	±0.05 v/v over the range 0% to 0.5% 10% of applied test gas over the range 0.5% to 2.5% ±0.25 v/v over the range 2.5% to 5%
Drift	±0.05 v/v % v/v or ±5% of indication[1] over 3 months
Repeatability	±0.05 v/v
Sensing Element Life	>5 years
Resolution	0.01% v/v[2]
Certification	
IECEx	IECEx TRA 16.0020X
DPI	MDR 0001030 GD

[1]Whichever is greater
[2]The output measurement resolution is consistent across all gas types and does not infer the accuracy of the gas type

Table 13: Typical Carbon Monoxide Cross-Sensitivity

Test Gas Mixture	***Instrument variance from Standard Test Gas***
0.5% CO2 + 5% Methane in Air	±0.05% CO2
0.5% CO2 + 0.01% Hydrogen in Air	±0.05% CO2
0.5% CO2 + 10% Oxygen in Nitrogen	±0.05% CO2
0.5% CO2 + 10 ppm Hydrogen Sulphide in Air	±0.05% CO2
0.5% CO2 + 5% Carbon Dioxide in Air	±0.05% CO2
0.5% CO2 + 5% Nitric Oxide in Air	±0.05% CO2
0.5% CO2 + 5% Nitrogen Dioxide in Air	±0.05% CO2

7.6 Catalytic CH_4

Electrical	
Supply Voltage	10 - 16.5VDC
Maximum Power Consumption	1W
Mechanical & Environmental	
Dimensions (H x W x D)	86.5mm x 85mm x 93mm
Weight	1kg
IP Rating	IP54
Humidity Range	0% to 95% r.h. non-condensing
Temperature Range	-20˚C to + 40˚C
Pressure Range	±20kPa
Response Time (t90) via diffusion	<30 seconds
Warm-up Time	<5 mins (60 seconds typical)
Stabilization time (for calibration adjustments)	3 mins
Sensor Unit	
Detection Method	Catalytic[2]
Calibrated Range	0-5%
Accuracy	±0.1% v/v or ±5% of indication[1]
Drift	±0.1% v/v or ±5% of indication[1] over 3 months
Repeatability	±0.1% v/v or ±5% of indication[1]
Sensing Element Life	>24 months
Resolution	0.01% v/v[3]
Certification	
IECEx	IECEx TRA 16.0020X
DPI	MDR 0001030 GD

[1] Whichever is greater
[2] Catalytic sensors require oxygen to operate
[3] The output measurement resolution is consistent across all gas types and does not infer the accuracy of the gas type

Table 14: Cross sensitivity of catalytic methane gas sensors

Test Gas Mixture	***Instrument Variance From Standard Test Gas***
2% Methane + 13% Oxygen in Nitrogen	±0.2% Methane
2% Methane + 5% Carbon Dioxide in Air	±0.2% Methane
2% Methane + 0.075% Ethane in Air	±0.2% Methane
2% Methane + 0.020% Ethane in Air	±0.2% Methane

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

Part Number	*Category*	*Description*
177870	5%	GG2 Detector NDIR CH4 5%
180733	5%	GG2 Detector NDIR CO2 5%
180734	5%	GG2 Detector NDIR CO2 2%
177871	5%	GG2 Detector CAT CH4 5%
177872	25%	GG2 Detector EC O2 25%
177873	50 ppm	GG2 Detector EC CO 50 ppm
177874	100 ppm	GG2 Detector EC CO 100 ppm
192855	50 ppm	GG2 Detector EC H2S 50 ppm
193071	100 ppm	GG2 Detector EC H2S 100 ppm
177875	Accessory	GG2 Calibration Cup
177876	Accessory	GG2 Connector Dust Cover
178994	Accessory	GG2 Remote Sensor Cable Connection Module
177878	Accessory	GG2 Retainer Clip

9 APPROVALS

9.1 MDR 0001030 GD

The GG2 Detector has be independently tested by the Mine Safety Technology Centre and several reports for different gas types were used to register the product for use in NSW underground Coalmines.

The performance criteria assessed was taken from NSW Government Gazette No 52 of 26 June 2015, which incorporates conformance to both AS/NZS 60079-29.1:2008 and AS/NZS 4641:2007

While the design order does incorporate conformance to the two Australian standards, there are sections in the Design Order, which are to a lower standard to that of aforementioned standards;

- Catalytic CH4 Detector - Long-term Stability Test
  - The Mine Safety Technology Centre was engaged to verify the performance of the catalytic detector to AS/NZS 60079.29.1 and the NSW regulatory requirements. The test report issued states compliance with the long-term stability test however; this test was shortened from 33 days in total to 26 days in total.
- Electrochemical O2 Detector - Cross Sensitivity Test

  AS/NZS 4641 Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels—General requirements and test methods, state that the concentration indicated by the output signal shall not vary from the test gas concentration by more than a volume fraction of ±0.3% v/v over the range 10% - 25% v/v oxygen, when exposed to the standards nominated combinations of laboratory test gasses. However when independently tested by MSTC the 0-25% range Oxygen Sensor - Electrochemical (177872) was found to vary from the test gas concentration by a volume fraction ±0.4% v/v oxygen when exposed to the test gas combination containing 10% Carbon Dioxide.

  - The warmup time is the 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. The warmup time of the O2 detector for a cold start is 30 Minutes.

9.2 MDR 0001558 GD

MDR 0001558 GD has be independently tested by the Mine Safety Technology Centre and the performance report was used to register the product for use in NSW underground Coalmines.

9.3 IECEx TRA 16.0020X

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.

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 TRA 16.0020X	Issue No: 0	Certificate history: Issue No. 0 (2016-12-23)
Status:	**Current**	Page 1 of 3	
Date of Issue:	**2016-12-23**		
Applicant:	**Ampcontrol CSM Pty. Ltd.** 7 Billbrooke Close Cameron Park NSW 2285 **Australia**		
Equipment:	**GG2 Detector**		
Optional accessory:			
Type of Protection:	**Ex i**		
Marking:	Ex ia I Ma		

Approved for issue on behalf of the IECEx Certification Body: James Bes

Position: Certification Authoriy

Signature:
(for printed version)

Date: 2016/12/16

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:

TUV Rheinland Australia Pty. Ltd
1/30 Kennington Drive
Tomago NSW 2322
Australia

IECEx Certificate of Conformity

Certificate No:	IECEx TRA 16.0020X	Issue No: 0
Date of Issue:	**2016-12-23**	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 electrical 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 Edition:6.0	Explosive atmospheres - Part 0: General requirements
IEC 60079-11 : 2011 Edition:6.0	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

*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/TRA/ExTR16.0027/00

Quality Assessment Report:

AU/TSA/QAR06.0007/08

IECEx Certificate of Conformity

Certificate No: IECEx TRA 16.0020X Issue No: 0

Date of Issue: **2016-12-23** Page 3 of 3

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

The GG2 Detector is an intrinsically safe apparatus for the purpose of gas concentration level detection and atmospheric monitoring. The equipment is enclosed in a metallic enclosure with a custom plug interface on the top and is powered and connected to suitably certified compatible equipment.

See annex for further details.

CONDITIONS OF CERTIFICATION: YES as shown below:

See Annex for further details

Annex:

IECEx 16.0020X-0 Certificate Annex.pdf

IECEx Certificate of Conformity Annexe			
Annexe for Certificate No.:	**IECEx TRA 16.0020X**	**Issue No.:**	**0**

Description:

(continued from the 'Equipment' field of the certificate)

There are three printed circuit boards, containing power conditioning, barriers, processing and sensors. The boards are encapsulated except the measurement PCB which is not encapsulated.

Several types of sensor technology are available in GG2 Detector models, as described in the table below:

Type	Sensor Technology
NDIR	Non-Dispersive Infrared Gas Detection and optional atmospheric monitoring
EC	Electrochemical Gas Detection and optional atmospheric monitoring
CAT	Catalytic Gas Detection and optional atmospheric monitoring
SENSOR	Atmospheric monitoring

The equipment also contains an encapsulated coin cell battery for real-time clock backup.

Conditions of Certification pertaining to Issue 0 of this Certificate:

The GG2 Detector has one input circuit connected at P1, made up of pins 1, 2 supplying power and ground, and pins 3, 4 for the communication circuit.

The input parameters of P1 (Pins 1 to 4) are :

P1: Pins 1, 2, 3, 4	
Input Parameters	
Ui	16.5V
Ci	negligible
Li	negligible

Note: P1 pin 5 connects to the chassis.

IECEx Certificate of Conformity

Annexe

Annexe for Certificate No.:	IECEx TRA 16.0020X	Issue No.:	0

Drawing list pertaining to Issue 0 of this Certificate:

Manufacturer's Documents				
Title:	Drawing No.:	Pages	Rev. Level:	Date:
GG2 Detector CONN BOM	GG2B001	1	0	2016-12-13
GG2 Detector CPU BOM	GG2B002	1	0	2016-12-13
GG2 Detector CAT BOM	GG2B003	1	0	2016-12-13
GG2 Detector NDIR BOM	GG2B004	1	0	2016-12-13
GG2 Detector EC BOM	GG2B005	1	0	2016-12-13
GG2 Detector CONN Schematic	GG2E001	1	0	2016-12-13
GG2 Detector CPU Schematic	GG2E002	1	0	2016-12-13
GG2 Detector CAT Schematic	GG2E003	1	0	2016-12-13
GG2 Detector NDIR Schematic	GG2E004	1	0	2016-12-13
GG2 Detector EC Schematic	GG2E005	1	0	2016-12-13
GG2 Detector Coversheet Schematic	GG2E011	1	0	2016-12-13
GG2 Detector CONN PCB	GG2P001	5	0	2016-12-13
GG2 Detector CPU PCB	GG2P002	7	0	2016-12-13
GG2 Detector CAT PCB	GG2P003	7	0	2016-12-13
GG2 Detector NDIR PCB	GG2P004	7	0	2016-12-13
GG2 Detector EC PCB	GG2P005	7	0	2016-12-13
GG2 Detector Certification Detail	GG2Z001	1	0	2016-12-19
IECEX TRA 16.0020X User Manual Inclusion	GG2Z002	3	0.2	2016-11-08