Technical Manual

Honeywell



Series 3000 MkII
Gas Detector

1. Safety

Ensure that this Operating Manual is read and understood **BEFORE** installing / operating / maintaining the equipment.

Pay particular attention to **Warnings** and **Cautions**.

All document **Warnings** are listed here and repeated where appropriate at the start of the relevant chapter(s) of this Operating Manual.

Cautions appear in the sections / sub-sections of the document where they apply.

Warnings

Series 3000 MkII is designed for installation and use in Zone 1 or 2 or 21 or 22 hazardous areas in Europe and Class I Division 1 or 2 and Class II Division 1 or 2 area applications in North America.

Installation must be in accordance with the recognized standards of the appropriate authority in the country concerned.

Access to the interior of the detector, when carrying out any work, must only be conducted by trained personnel.

Before carrying out any work ensure local regulations and site procedures are followed.

Appropriate standards must be followed to maintain the overall certification of the detector.

To reduce risk of ignition of hazardous atmospheres, conduit runs must have a seal fitting connected within 18 inches of the enclosure.

To reduce the risk of ignition of hazardous atmosphere, de-classify the area or disconnect the equipment from the supply circuit before opening the detector enclosure.

Keep assembly tightly closed during operation.

Never attempt to open a junction box / enclosure in potentially hazardous atmospheres.

The detector must be earthed / grounded for electrical safety and to limit the effects of radio frequency interference. An earth / ground point is provided inside and outside the unit. The internal grounding shall be used as the primary equipment ground. The external terminal is only a supplemental bonding connection where local authorities permit or require such a connection.

The enclosure of the remotely mounted sensor assembly contains Aluminium.

Care must be taken to avoid ignition hazards due to impact or friction when installed in a Zone 1 location.

Take care when handling sensors as they may contain corrosive solutions.

Do not tamper or in any way disassemble the sensor.

Do not expose to temperatures outside the recommended range.

Do not expose sensor to organic solvents or flammable liquids.

At the end of their working life, sensors must be disposed of in an environmentally safe manner. Disposal should be according to local waste management requirements and environmental legislation.

Alternatively, sensors may be securely packaged and returned to Honeywell Analytics clearly marked for environmental disposal.

Electrochemical cells should NOT be incinerated as they may emit toxic fumes.

2. Information

Honeywell Analytics can take no responsibility for installation and / or use of its equipment if this is not done in accordance with the appropriate issue and / or amendment of the Operating Manual.

The reader of this Operating Manual should ensure that it is appropriate in all details for the exact equipment to be installed and / or operated. If in doubt, contact Honeywell Analytics for advice.

The following types of notices are used throughout this Operating Manual:

WARNING

Identifies a hazardous or unsafe practice which could result in severe injury or death to personnel.

Caution: Identifies a hazardous or unsafe practice which could result in minor injury to personnel, or product or property damage.

Note: Identifies useful / additional information.

Every effort has been made to ensure the accuracy of our documents, however, Honeywell Analytics can assume no responsibility for any errors or omissions in our documents or their consequences.

Honeywell Analytics greatly appreciates being informed of any errors or omissions that may be found in the contents of any of our documents.

For information not covered in this document, or there is a requirement to send comments / corrections about this document, please contact Honeywell Analytics using the contact details given on the back page of this document.

Honeywell Analytics reserve the right to change or revise the information supplied in this document without notice and without obligation to notify any person or organization of such revision or change. If information is required that does not appear in this document, contact the local distributor / agent or Honeywell Analytics.

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4. Introduction

The Series 3000 MkII gas detector is designed to detect toxic or oxygen gas hazards in Zone 1 or 2 or 21 or 22 hazardous areas in Europe and North American Class I Division 1 or 2 areas and Class II Division 1 or 2 areas. A local LCD provides gas type and concentration information and when magnetically activated enables non-intrusive one man calibration and operation. The sensor interface to the transmitter is Intrinsically Safe (IS) allowing it to be 'hot swapped' without the need for removing power to the detector. The replacement plug in smart sensors are supplied pre-calibrated. A remote sensor mounting kit allows the sensor to be mounted up to 50 feet (15 meters) from the explosion proof transmitter housing. The output from the transmitter is an industry standard 2 wire 4-20mA loop (sink) suitable for connection to a wide range Honeywell Analytics or 3rd party control equipment / PLCs.

4.1 Product overview

The Series 3000 MkII detector comprises of the main parts shown below.

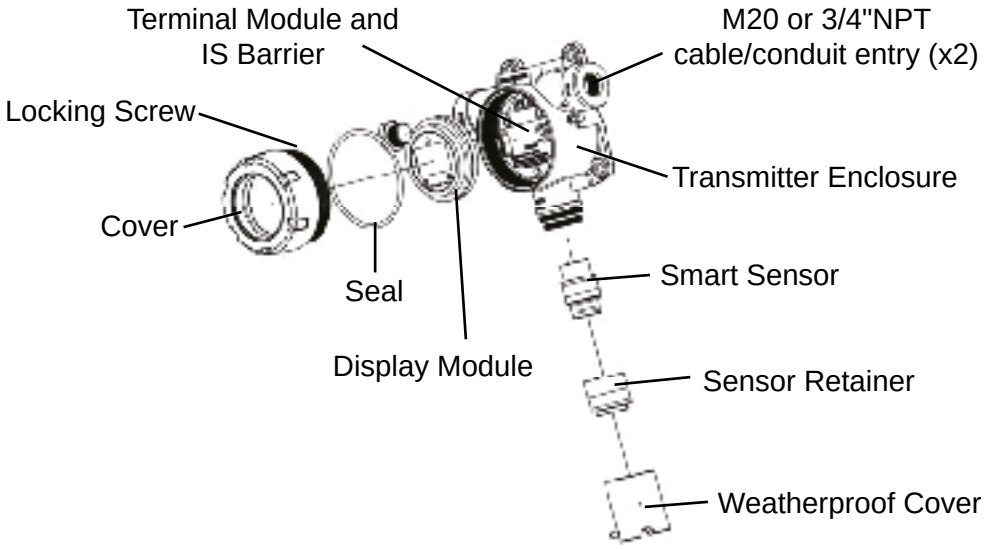


Diagram 1: Series 3000 MkII Exploded View

4.2 Transmitter

The transmitter cover has a glass window which allows use of the magnet to activate the three user interface magnetic switches that are located on the front of the display module. This allows for non-intrusive set up and operation. The display provides both numerical and icon information.

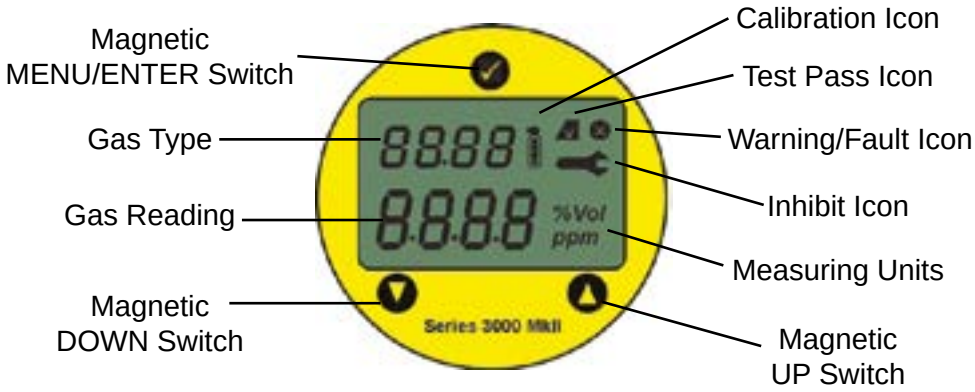


Diagram 2: Series 3000 MkII Display and Magnetic Switches

The cover can be unscrewed to allow removal of the display module. Beneath the display module is the terminal module and IS barrier where all electrical connections to the detector are made.

Electrical connections are made via 2 x M20 cable entries or 2 x 3/4"NPT conduit entries (certification dependent). A suitable blanking plug is supplied which must be used to seal any unused entry.

The smart sensor plugs into the bottom of the transmitter and is secured by the sensor retainer. The weatherproof cover is fitted over the top of the sensor and screws onto the bottom of the transmitter enclosure. The weatherproof cover has a spigot that allows the attachment of tubing for the application of bump test gas.

4.3 Smart sensor

The smart sensor is manufactured from stainless steel and is supplied 100% tested and calibrated (refer to section for start up procedure). The sensor is serviceable, allowing replacement of the sensor cell (see section 15 for details of sensor or cell replacement).

The sensor can be ‘hot swapped’ without the need to remove power to the detector (subject to local regulations and procedures).

4.4 Accessories

Series 3000 MkII has various accessories available as detailed below:

4.4.1 Pipe mounting bracket

The optional pipe mounting bracket (part number SPXCDMTBR) allows mounting of the Series 3000 MkII transmitter to a mounting pipe (horizontal or vertical) of diameter 20.0-80.0mm (0.8"-3.1").

4.4.2 Sunshade / Deluge Protection

The Sunshade / Deluge Deluge Cover (P/N:SPXCDSDP) is an optional accessory that may be fitted to the integral mounting plate. This accessory is designed to protect Series 3000 MkII from overheating in exposed hot and arid climates, particularly offering additional protection from thermal shock in Tropical Environments.

4.4.3 Remote sensor mounting kit

The remote sensor mounting kit (part number S3KRMK) allows the sensor to be remotely mounted via an IS cable kit, up to 50 feet (15 meters) from the transmitter. The kit includes 50 feet of screened cable, cable glands and remote terminal box. The cable can be cut to the required length and then terminated at the remote terminal box. See section 16 for further installation details.

4.4.4 Duct mounting kit

The duct mounting kit (part number S3KDMK) can be used to allow detection of O2, CO, H2 and H2S gases in ducts. Refer to manual part number MAN0639 for further details.

4.4.5 Calibration gas flow housing

The calibration gas flow housing (S3KCAL) is used to apply calibration test gas to the sensor. It push fits onto the bottom of the sensor and can be fitted without removing the weatherproof cover. See section 8.2 for further details on calibrating the detector.

Note: The spigot on the side of the weatherproof cover is supplied for bump test purposes only (see section 14.1 for further details).

4.4.6 Collecting cone

The collecting cone (part number S3KCC) can be used to assist in the detection of ‘non-sticky’ gases that are lighter air (i.e. Hydrogen only). It is simply fitted in place of the weatherproof cover.

5. Installation

Prior to installation refer to the transmitter control drawing 3000E3160 and remote sensor control drawing 3000E3157 shown in section 21.

Warnings

Series 3000 MkII is designed for installation and use in Zone 1 or 2 or 21 or 22 hazardous areas in Europe and Class I Division 1 or 2 and Class II Division 1 or 2 area applications in North America.

Installation must be in accordance with the recognized standards of the appropriate authority in the country concerned.

Access to the interior of the detector, when carrying out any work, must only be conducted by trained personnel.

Before carrying out any work ensure local regulations and site procedures are followed. Appropriate standards must be followed to maintain the overall certification of the detector.

To reduce risk of ignition of hazardous atmospheres, conduit runs must have a seal fitting connected within 18 inches of the enclosure.

To reduce the risk of ignition of hazardous atmosphere, de-classify the area or disconnect the equipment from the supply circuit before opening the detector enclosure. Keep assembly tightly closed during operation.

Never attempt to open a junction box / enclosure in potentially hazardous atmospheres.

The detector must be earthed / grounded for electrical safety and to limit the effects of radio frequency interference. An earth / ground point is provided inside and outside the unit. The internal grounding shall be used as the primary equipment ground. The external terminal is only a supplemental bonding connection where local authorities permit or require such a connection.

Take care when handling sensors as they may contain corrosive solutions.

Do not tamper or in any way disassemble the sensor.

Do not expose to temperatures outside the recommended range.

Do not expose sensor to organic solvents or flammable liquids.

At the end of their working life, sensors must be disposed of in an environmentally safe manner. Disposal should be according to local waste management requirements and environmental legislation.

Alternatively, sensors may be securely packaged and returned to Honeywell Analytics clearly marked for environmental disposal.

Electrochemical cells should NOT be incinerated as they may emit toxic fumes.

All cable entry devices and blanking elements shall be certified in type of explosion protection flameproof enclosure “d”, suitable for the conditions of use and correctly installed and have an ingress protection rating of at least IP6X.

Unused apertures shall be closed with suitable blanking elements.

5.1 Mounting and location of detectors

Caution: The location of the detectors should be made in accordance with any relevant local and national legislation, standards or codes of practice. Always replace detectors with a detector of the same type.

The detector should be mounted where the gas is most likely to be present. The following points should be noted when locating gas detectors.

- When locating detectors consider the possible damage caused by natural events e.g. rain or flooding.
- Consider ease of access for functional testing and servicing.
- Consider how escaping gas may behave due to natural or forced air currents.

Note: The placement of detectors should be determined following the advice of experts having specialist knowledge of gas dispersion, experts having knowledge of the process plant system and equipment involved, safety and engineering personnel. The agreement reached on the location of detectors should be recorded.

Mount the Series 3000 MkII with the sensor pointing downwards. Integral mounting lugs (suitable for M8 bolts) are provided on the Series 3000 MkII transmitter housing for mounting the detector to a wall. An optional pipe mounting bracket (part number SPXCDMTBR) is available for mounting to a pipe / pole of diameter 20.0¬-80.0mm (0.8" to 3.1").

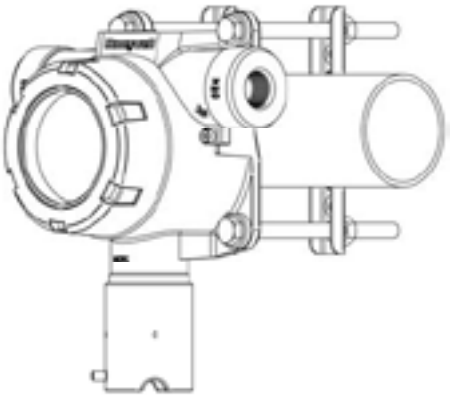


Diagram 3: Pipe Mounted

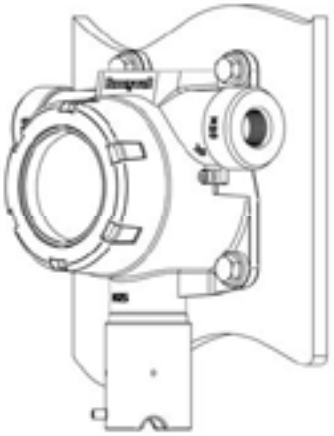


Diagram 4: Wall Mounted

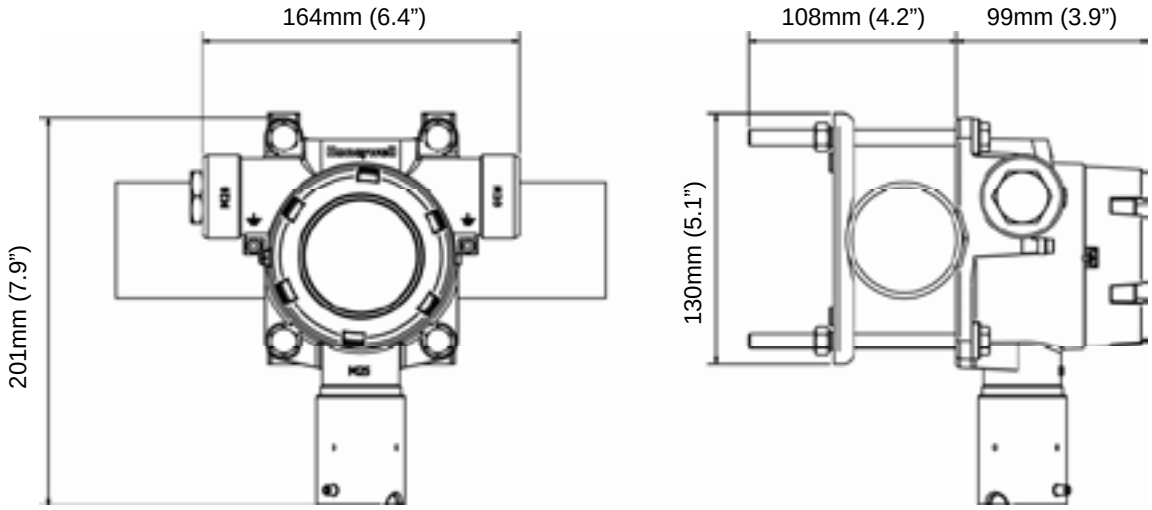


Diagram 5: Pipe Mounting Outline Dimensions

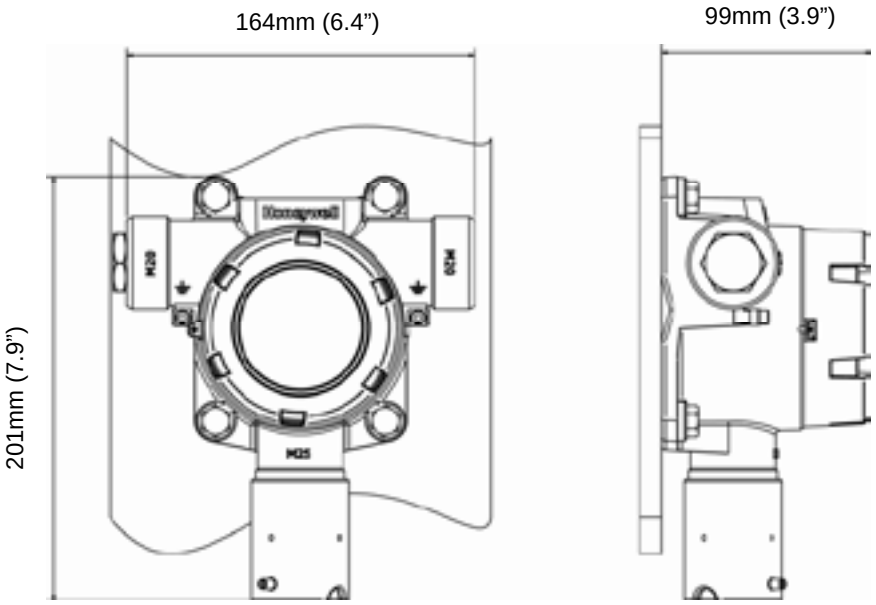


Diagram 6: Wall Mounting Outline Dimensions

6. Electrical connections

Prior to installation refer to the transmitter control drawing 3000E3160 and remote sensor control drawing 3000E3157 shown in section 21.

Warnings

Series 3000 MkII is designed for installation and use in Zone 1 or 2 or 21 or 22 hazardous areas in Europe and Class I Division 1 or 2 and Class II Division 1 or 2 area applications in North America.

Installation must be in accordance with the recognized standards of the appropriate authority in the country concerned.

Use copper wiring only.

Access to the interior of the detector, when carrying out any work, must only be conducted by trained personnel.

Before carrying out any work ensure local regulations and site procedures are followed. Appropriate standards must be followed to maintain the overall certification of the detector.

To reduce risk of ignition of hazardous atmospheres, conduit runs must have a seal fitting connected within 18 inches of the enclosure.

To reduce the risk of ignition of hazardous atmosphere, de-classify the area or disconnect the equipment from the supply circuit before opening the detector enclosure. Keep assembly tightly closed during operation.

Never attempt to open a junction box / enclosure in potentially hazardous atmospheres.

The detector must be earthed / grounded for electrical safety and to limit the effects of radio frequency interference. An earth / ground point is provided inside and outside the unit. The internal grounding shall be used as the primary equipment ground. The external terminal is only a supplemental bonding connection where local authorities permit or require such a connection.

Take care when handling sensors as they may contain corrosive solutions.

Do not tamper or in any way disassemble the sensor.

Do not expose to temperatures outside the recommended range.

Do not expose sensor to organic solvents or flammable liquids.

At the end of their working life, sensors must be disposed of in an environmentally safe manner. Disposal should be according to local waste management requirements and environmental legislation.

Alternatively, sensors may be securely packaged and returned to Honeywell Analytics clearly marked for environmental disposal.

6.1 Detector wiring schematic

Caution: All electrical connections should be made in accordance with any relevant local or national legislation, standards or codes of practice.

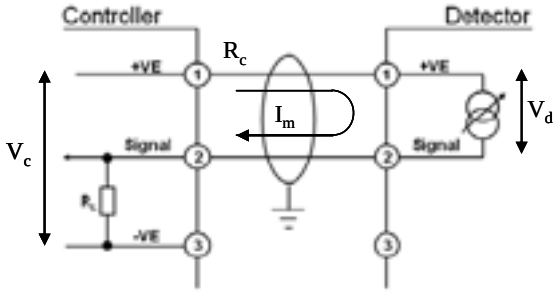


Diagram 7: Wiring Schematic Type 1

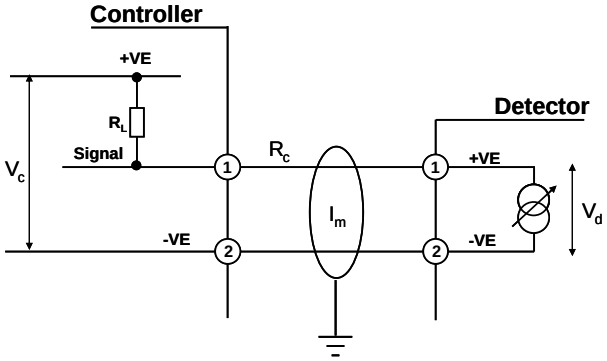


Diagram 8: Wiring Schematic Type 2

Detector Supply V_d

- 17Vdc (+/-10%) < V_d < 32Vdc (max)

Maximum Detector Signal I_m

- I_m = 22mA (over range)

Cable Resistance R_c

- Subject to cable type
- Typical values are:

$0.5mm^2$ (20AWG*) = 36.8Ω/km (59.2Ω/mi)
$1.0mm^2$ (17AWG*) = 19.5Ω/km (31.4Ω/mi)
$1.5mm^2$ (16AWG*) = 12.7Ω/km (20.4Ω/mi)
$2.0mm^2$ (14AWG*) = 10.1Ω/km (16.3Ω/mi)
*nearest equivalent

Load Resistor of Control Panel R_L

- Assumed 33Ω (min) / 250Ω (max)

Controller Supply Voltage V_c

- Subject to controller manufacturer
- Assumed nominal of 24Vdc

6.2 Typical maximum installed cable lengths

The formula for calculating the maximum installed cable length between a controller and detector D (meters) is given below.

D = (((Vc - Vdmin - (Im * RL)) / (2 * Im * Rc))) * 1000

Typical cable data		Cable distance km (mi)	
Cable size	Cable resistance Rc Ω/km (Ω/mi)	Example 1 Input impedance RL = 33Ω	Example 2 Input impedance RL = 250Ω
0.5mm2 (20AWG*)	36.8 (59.2)	3.9 (2.4)	0.9 (0.6)
1.0mm2 (17AWG*)	19.5 (31.4)	7.3 (4.5)	1.7 (1.1)
1.5mm2 (16AWG*)	12.7 (20.4)	11.2 (7.0)	2.7 (1.7)
2.0mm2 (14AWG*)	10.1 (16.3)	14.1 (8.8)	3.4 (2.1)
*Nearest equivalent			

Notes:

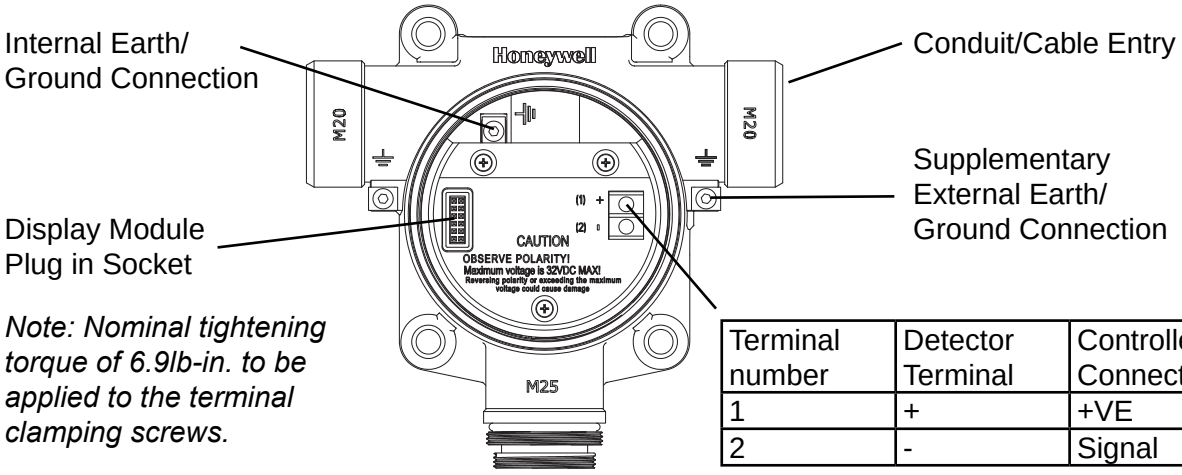
- *Distance km=kilometres, mi=miles.*
- *Assuming Vc=24Vdc, Vdmin=17Vdc, Im=22mA*

For the value of RC, use the data supplied by the manufacturer of the cable to be used for the specific installation.

6.3 Terminal connections

All electrical connections are made at the terminal module. To access the terminal module follow the procedure below:

1. Remove the detector's cover by unscrewing it in a counter-clockwise direction.
2. Remove the display module by pulling it firmly away from the enclosure without twisting it.



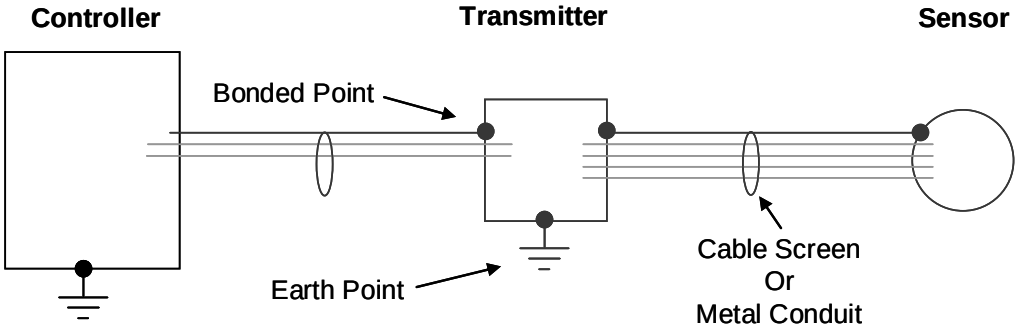
Note: Nominal tightening torque of 6.9lb-in. to be applied to the terminal clamping screws.

Terminal number	Detector Terminal	Controller Connection
1	+	+VE
2	-	Signal

6.4 Cable and earth / ground connection

Between the Controller and Transmitter use 2 core (plus screen 90% coverage), suitably mechanically protected copper cable with a suitable M20 explosion-proof gland, or ¾ in. NPT steel conduit, with 0.5 to 2.0mm2 (equivalent approx. 20 to 14AWG) conductors. Ensure the cable gland is installed correctly and fully tightened.

To ensure good EMC/RFI immunity bond the system to ground / earth as shown in the diagram below.



Notes:

- *No two 'Earth Points' should be connected via screen and / or conduit so as to avoid 'ground loops'. (Except between the sensor and transmitter which is a digital link).*
- *Where multiple 'Earth Points' are unavoidable (e.g. transmitter mounted on metal superstructure which is earthed then screen and / or conduit to controller should be isolated appropriately).*
- *'Bonded Points' (continuity of screen) may be achieved using appropriate glands / cable or conduit; internal and external 'Earth Points' in the transmitter are provided.*

When all electrical connections have been made, refit the display module and cover using the procedure below:

1. Ensure that none of the wires in the terminal area may cause an obstruction.
2. Align the display module plug with the socket on the terminal module.
3. Push the display module firmly, without twisting, until fully home.
4. Refit the cover by screwing clockwise until tight.

7. First time switch on

After mounting and wiring the transmitter, the plug in sensor should be fitted and the installation visually and electrically tested as below.

WARNING

Prior to carrying out any work ensure local and site procedures are followed. Ensure that the associated control panel is inhibited so as to prevent false alarms.
Minimum and maximum controller alarm levels should not be set at less than 10% or greater than 90% of the full scale range of the detector.

Caution: The following procedure should be followed carefully and only performed by suitably trained personnel.

1. Check that the transmitter is wired correctly according to this manual and the associated control equipment manual.
2. Unscrew the weatherproof cover, loosen the sensor retainer locking screw and unscrew the retainer.
3. Plug in the sensor taking care to align the sensor pins with the connector holes in the pcb.

Caution: For toxic sensors, remove the shorting clip from the bottom of the sensor prior to installation. For O2 sensor, there is no shorting clip provided.

Caution: Ethylene Oxide sensors are supplied on a transportation board in order to keep the cell biased at the correct level. Once removed from the transportation board the sensor should be fitted to the detector as soon as possible.

If the sensor is not fitted to the transportation board or a powered detector, its bias will decay and the sensor will take up to 24 hours to recover. During this period the sensor will not function as a gas detector, reporting a gas reading above full scale.

4. Refit the sensor retainer, tighten the locking screw and refit the weatherproof cover.
5. Apply power to the associated controller which will in turn provide power to the detector.
6. The detector output will be forced to 3mA (default fault / inhibit).
7. The detector display will enter a start up routine first displaying all the LCD segments and symbols, then the transmitter loads the data from the sensor and checks if it is the same type transmitter and sensor software version numbers, gas type, the detection range and span calibration gas level, estimated time to next calibration due, self test result, and finally warm up period shown as a countdown to 0. (Countdown time varies from 30 seconds to 3 minutes, depending on the sensor type).
8. Once countdown is complete, the detector will enter normal ‘monitoring’ mode.

Note: Calibration is mandatory before the detector can be used for gas monitoring. Refer to Section 8.2 Calibration for the proper procedure.

8. Magnetic switch activation

Series 3000 MkII uses magnetic switches to enable non-intrusive operation. To activate a magnetic switch, hold the magnet up to the glass window directly over the magnetic switch area. The switch is activated when you then remove the magnet. For example: to put the detector into Menu Mode hold the magnet over the '✓' magnetic switch for 5 seconds, and then remove the magnet. The detector enters menu mode on removal of the magnet (not automatically after 5 seconds). Similarly, when changing values or navigating in a menu using the '▲▼' magnetic switches, hold the magnet up to the glass window directly over the switch momentarily, and then remove to activate the switch. In some menus where the displayed value can be changed the magnet can be held over the switch and the numeral on the display will scroll through the available values. Remove the magnet when the required value is displayed.

For the purposes of this manual, the instruction to use '✓', '▲' or '▼', means to activate the relevant magnetic switch as described above.

8.1 Default configuration

Series 3000 MkII detectors are supplied with a default configuration as shown below. The settings for full scale range, calibration gas level, calibration interval, inhibit current & timeout and access password can be changed to suit individual applications.

Detector 4-20mA output signal					
Fault / Under-range		3mA			
Inhibit		3mA (default). Selectable 4mA (toxic), 17.4mA (oxygen)			
Zero signal		4mA			
Full scale		20mA			
Overrange		22mA			
Other settings					
Inhibit time out		0 (no time out). Selectable 0 to 240 minutes (5 min steps). If 0 is selected, output current is permanently inhibited.			
Calibration Interval & Display / Output.		Cal Interval 180 days (selectable 30-360). Three options for overdue warning indication (selectable off, via display only or via display and 3mA output).			
Password		000 (password disabled). If changed then password is activated. Change back to 000 to de-activate.			
Gas	**Selectable Full Scale Range**	**Default Range**	**Steps**	**Selectable Cal Gas Range**	**Default Cal Point**
Oxygen	25.0%/Vol only	25.0%VOL	n/a	20.9%/Vol (Fixed)	20.9%/Vol
Hydrogen Sulfide	10.0 to 50.0ppm	15.0ppm	0.1ppm	30 to 70% of selected full scale range	10ppm
Hydrogen Sulfide	50 to 500ppm	100ppm	10ppm		50ppm
Carbon Monoxide	100 to 1,000ppm	300ppm	100ppm		100ppm
Sulfur Dioxide	5.0 to 20.0ppm	15.0ppm	5.0ppm		5.0ppm
Ammonia	50 to 200ppm	200ppm	50ppm		100ppm
Ammonia	200 to 1,000ppm	1,000ppm	50ppm		300ppm
Chlorine	5.0 to 20.0ppm	5.0ppm	5.0ppm		2.0ppm
Chlorine Dioxide	1.00ppm only	1.00ppm	n/a		0.5ppm
Nitric Oxide	100ppm only	100ppm	n/a		50
Nitrogen Dioxide	5.0 to 50.0ppm	10ppm	5.0ppm		5ppm
Hydrogen	1,000ppm only	1,000ppm	n/a		500ppm
Hydrogen	9,999ppm only	9,999ppm	n/a		5000ppm
Hydrogen Chloride	10.0 to 20.0ppm	10ppm	1.0ppm		5.0ppm
Hydrogen Cyanide	30.0ppm only	30.0ppm	n/a		10.0ppm
Hydrogen Fluoride	12.0ppm only	12.0ppm	n/a		5.0ppm
Ozone	0.4ppm only	0.4ppm	n/a		0.2ppm
Phosphine	1.2ppm only	1.2ppm	n/a		0.5ppm
Flourine	4.00pm only	4.00ppm	n/a		2.00ppm
Ethylene Oxide	20.0 to 50.0ppm	25.0ppm	5.0ppm		10.0ppm

Notes:

1. *Default ranges have been selected based upon recommended exposure limits set around the world.*
2. *Where ranges significantly above the recommended defaults are needed select a gas cal point near to the required alarm point or between 30 and 70% of full scale. Consideration must be given to providing adequate ventilation of the calibration gas and ensure there is no exposure of the user to toxic levels of gas.*

For details of how to change the configuration for full scale range, calibration gas level, calibration interval, inhibit current & timeout and access password refer to section 12.

8.2. Calibration

WARNINGS

It is recommended to bump test the sensors frequently to ensure proper operation.

8.2.1 Zeroing and span calibration

Caution: Before initial calibration allow the detector to stabilize for 30 minutes after applying power. When in zeroing and span calibration mode the current output from the detector is inhibited (default 3mA) to avoid false alarms.

It is recommended for most sticky gases the tubing should be PTFE with short pieces of rubber tube to make the final connection due to the inflexibility of PTFE. This minimizes adhesion of the gas to the tube surface and allows for more accurate measurement.

For Hydrogen Sulfide or Ethylene Oxide-type sensors refer to to sections 8.2.2 or 8.2.3 respectively before conducting calibrations.

Note: It is recommended that the calibration is made where the sensor / transmitter have stabilized with their local environment. It is recommended that calibrations be performed at a stable temperature in which the system is to be used. Re-calibration is recommended if the temperature of local environment has varied by more than +/-15 degrees C from the temperature of calibration.

It is essential that the sensor is tested frequently to be sure the system is operating properly. Typically gas detectors should be tested at least twice per year. However it is recommended that testing is conducted on a more frequent basis after initial start up as sensor operation and performance will vary in different environmental conditions and in the presence of other gases. It is the responsibility of the user to determine ***an appropriate*** *calibration frequency for the application.*

To calibrate the detector, use an appropriate span gas cylinder, flow regulator set to 300-375mL/min, tubing, magnet and calibration gas flow housing. A compressed air cylinder (20.9%Vol oxygen) should be used to perform the zero calibration if the area where the detector is located contains any residual amount of the target gas. If no residual gas is present then the background air can be used to perform the zero calibration. Contact your Honeywell Analytics representative for details of suitable calibration kits.

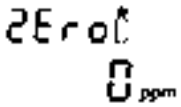
To calibrate the detector follow the procedure below.

Note: the Oxygen sensor does not require a zeroing procedure. Background air (20.9%Vol oxygen) can be used to span the oxygen sensor in place of a compressed air cylinder (20.9%Vol oxygen). For oxygen sensors only do parts 1-4, 13, 14 (if compressed air cylinder is used), 15-19 and 24 of the procedure below.

1. If using compressed air, push the calibration gas flow housing onto the bottom of the sensor and apply the gas.
2. To access the calibration mode, hold the end of the magnet over the switch located at the top centre of the detector display for at least 5 seconds and then remove.
3. The display will indicate the first menu mode menu ‘SEt CAL’.



4. Put the magnet over the '✓' switch and remove to enter the Calibration menu.
5. The display will show the current gas reading, 'ZEro' and the '' icon flashes.



6. When the zero gas reading is stable use '✓ to confirm zero calibration.
7. If successful the display shows 'ZEro PASS' (if not successful, the display shows 'ZEro FAIL' and returns to menu mode).



8. If using zero-air, turn it off. Zeroing is complete and saved.
9. The display shows 'SPAn' with 'YES' flashing.



10. If span calibration is required use '✓' proceed to the next step. If span calibration is not required, use '▲▼' to select 'No' and '✓' to return to menu mode.
11. The display shows the current calibration span gas concentration flashing. Use '▲▼' to change the calibration span gas concentration, and '✓' when required span calibration level is set.



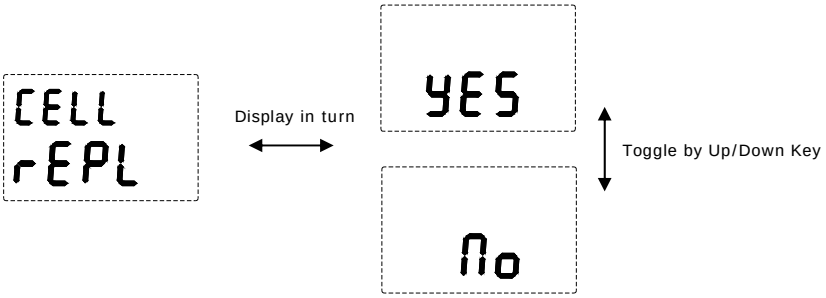
12. Span calibration point is displayed with 'YES' flashing. Use '✓' to confirm or '▲▼' to select 'No' and return and enter a new span calibration point.



13. The display will show the current gas reading, 'SPAN' and the '' icon flashes.



14. Connect the regulator to the span gas cylinder.
15. Apply the span gas to the sensor using the calibration gas flow housing. The live gas reading is displayed. When the reading is stable, use '✓' to confirm span calibration.
16. If the sensor cell has been replaced the following display may be shown.



17. Use '▲▼' to select 'YES' if the sensor cell has been replaced or 'No' if it has not been replaced.

WARNING

Answer Yes to "CELL/rEPL" ONLY in cases where the "Serviceable Sensor Cell Replacement" procedure (sec. 15.2) was been performed. Answering Yes in cases where the cell has not been replaced could result in the inability of the Series 3000 to recognize an old cell with an inadequate output.

It is recommended to bump test the sensors frequently to ensure proper operation.

18. If the sensor cell has been replaced use '✓' to confirm the gas reading.
19. If the span calibration is successful the instrument will briefly display 'SPAn PASS' (if fails 'SPAN FAIL' displayed and returns to menu mode).

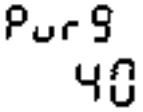
Note: the calibration due warning counter is reset after a successful calibration. See section 12 for further details of setting a calibration due warning.



20. The display alternates between "Pur GAS" and the gas reading to indicate that the unit is expecting the span gas to be removed from the sensor.



21. Promptly switch off the calibration span gas and remove the calibration gas flow housing from the sensor to allow the gas to disperse.
22. When the reading falls below 50% of the calibration gas level the display indicates a countdown (up to 180 seconds dependant on gas type).



23. When the countdown is finished, the calibration procedure is complete.
24. The instrument returns to the 'SEt CAL' menu. Activate the '▲' or '▼' switch to select another menu or select 'QuIT' to return to normal monitoring mode.



8.2.2 Zeroing and span calibration of Hydrogen Sulfide sensors

Hydrogen Sulfide sensors can be affected by extreme humidity changes. A sudden increase in ambient humidity can result in a short-term positive drift in the instrument's reading. A sudden decrease in ambient humidity can result in a short-term negative drift in the instrument's reading. These are most likely to be noticed during calibration with dry or cylinder gas.

When calibrating Hydrogen Sulfide cartridges the following should be taken into account while following the procedure in 8.2.1:

1. To zero the sensor, use a compressed air cylinder of 20.9%Vol oxygen (not Nitrogen). Do not use background air.
2. Apply the gas to the sensor for three minutes before using '✓' to confirm the zero calibration.
3. If a span calibration is to be performed, the span calibration gas should be applied to the sensor immediately after the zeroing procedure. Do not allow the sensor to return to ambient air conditions between steps 2 and 3.
4. Apply the span gas for two minutes before using '✓' to confirm the span calibration.

8.2.3 Zeroing and span calibration of Ethylene Oxide sensors

Ethylene Oxide sensors can be affected by extreme humidity changes. A sudden increase in ambient humidity will result in a short-term positive drift in the instrument's reading. A sudden decrease in ambient humidity will result in a short-term negative drift in the instrument's reading. These are most likely to be noticed during calibration with dry or cylinder gas.

When calibrating Ethylene Oxide sensors the following should be taken into account while following the procedure in 8.2.1:

If the sensor is to be zero calibrated only (no span calibration), the calibration should be performed in clean ambient air or cylinder air (not Nitrogen) humidified to approximately ambient humidity levels.

If performing a full calibration (zero and span) the following procedure should be used:

1. Apply clean, dry air (not Nitrogen) to the sensor for 5 minutes. Do not use background air.
2. Zero the sensor using ' ' to confirm the zero calibration.
3. Apply the span calibration gas to the sensor immediately after the zeroing procedure. Do not allow the sensor to return to ambient air conditions between steps 2 and 3.
4. Apply the span gas to the sensor for five minutes before using ' ' to confirm the span calibration.
5. After the span calibration, the sensor should be allowed to recover in clean ambient air, or cylinder air humidified to approximately ambient humidity levels for fifteen minutes and then should be zero calibrated under these conditions. Note that this does not affect the span sensitivity of the instrument.

9. Display and user interface

The display module comprises of an LCD and 3 magnetic user interface switches. The three switches ('▲' UP, '▼' DOWN and '✓' MENU / ENTER) are located above and below the LCD display as shown below:

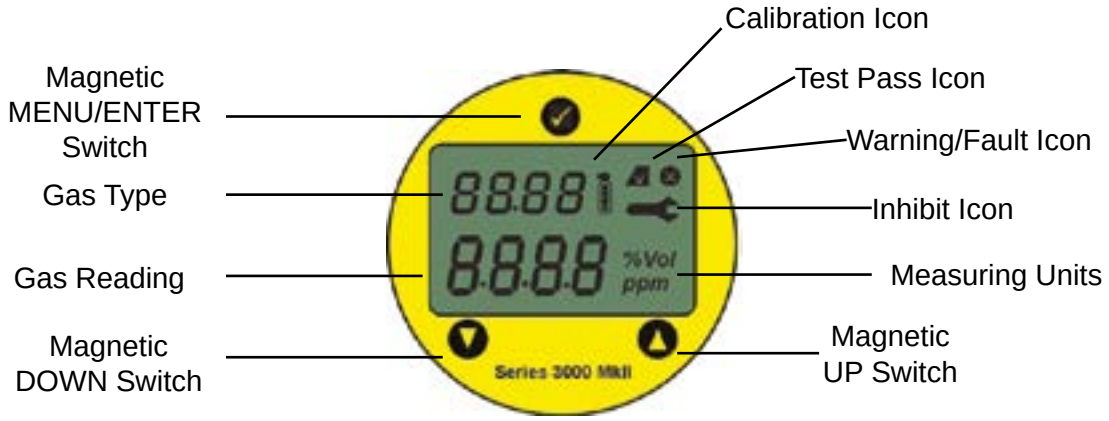


Diagram 11: Display and User Interface

Magnetic DOWN switch (▼)
The DOWN switch is used to scroll through status or menu items or to decrease a value.

Magnetic UP switch (▲)
The UP switch is used to scroll through status or menu items or to increase a value.

Magnetic MENU / ENTER switch (✓)
The MENU / ENTER switch is used to enter the Review and Menu modes, to enter a selected value and to clear a Warning / Fault that has been rectified.

Gas Type
Series 3000 MkII can be fitted with different sensors to measure 15 different gases. So the user can identify which gas the detector is measuring, it shows the gas formula of the sensor fitted on the display. See diagram 12 for a list of the different gases and their corresponding gas formula displays.

Gas Reading
The gas reading displays the current measured gas concentration.

Measuring units (%Vol/ppm)
The toxic gas measurement units are in parts per million (ppm) and the oxygen gas measurements units are in percent by volume (%Vol).

Calibration icon
When performing a zero calibration, the zero calibration icon ( ) is displayed. When performing a span calibration the span calibration icon ( ) is displayed.

Inhibit icon ( )
The inhibit icon displayed when in the configure inhibit, bump test and force current menu modes.

Warning / Fault icon ( )
The warning / fault icon is displayed if a warning or fault is detected and if a zero or span calibration fails.

Test Pass icon ( )
The test pass icon is displayed after a successful zero / span calibration. In monitoring mode it flashes every second indicating that no warnings / faults are detected and that the unit is functioning properly.

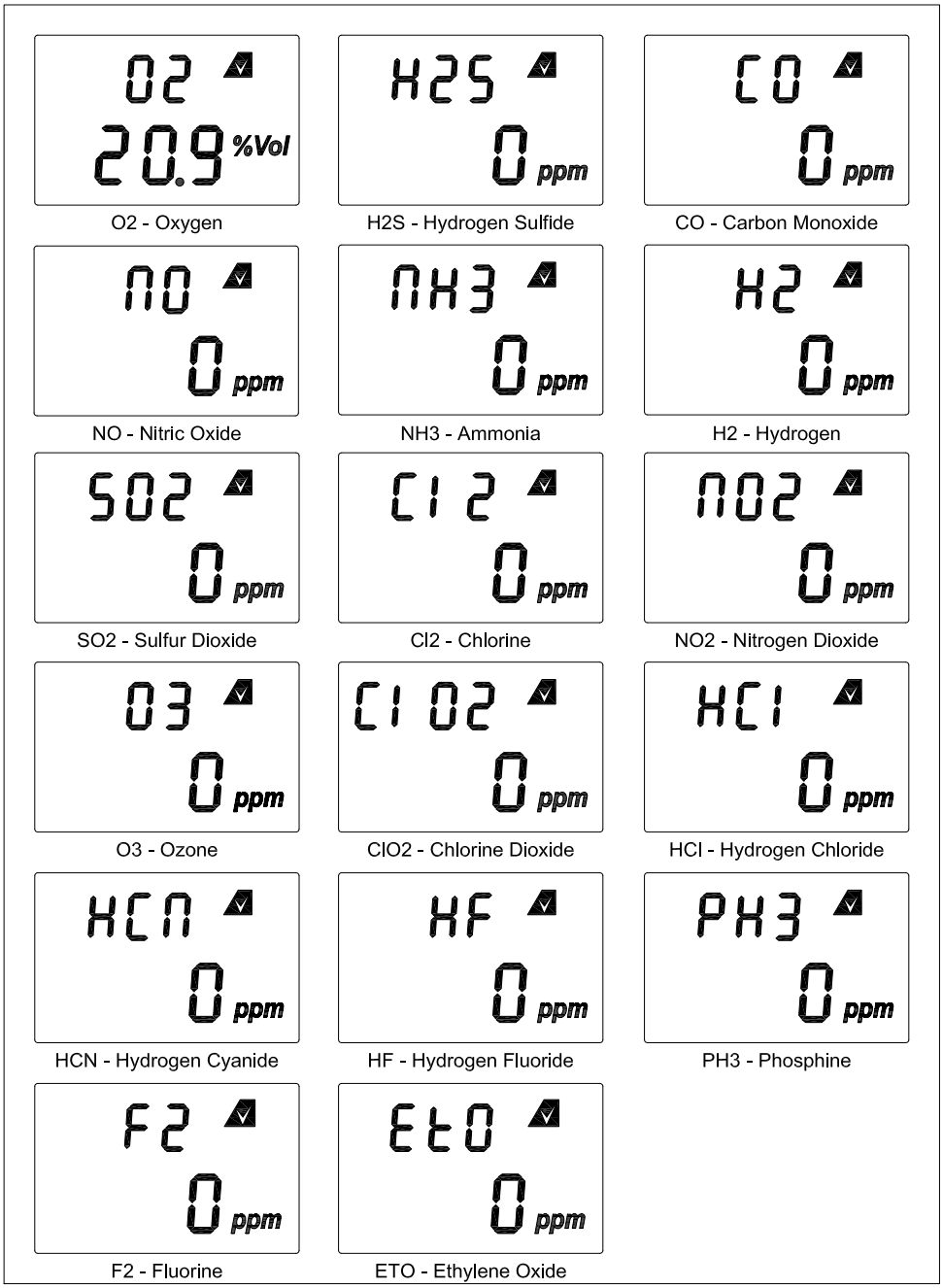


Diagram 12: Gas Type and Formula displays

10. Monitoring mode

After power up and successful completion of the start up routine the detector will enter monitoring mode. The detector display shows gas type and measuring units that it is configured for and the current gas reading (e.g. CO 0ppm in the example below).



11. Review mode

Review mode allows the user to review the software version of the transmitter and sensor, gas type, full scale range, span calibration point, estimated time to next calibration and test result. To activate review mode hold the magnet over the MENU/ENTER switch for more than 2 seconds (and less than 5 seconds). The information is shown in sequential order and then the detector returns to monitoring mode. The mA output of the detector continues to represent the current gas reading (i.e. the output is not put into inhibit). If any fault exists, the output will be 3mA (Fault default).

12. Menu mode

Menu mode has 9 menus. A description of the menus and their function is given in the table below:

Menu	Display	Description
Calibration	SEt CAL	Allows zero and span calibration of the detector. The calibration point can also be selected. See section 8.2 for detailed calibration instructions.
Set Range	SEt rAn9	Allows the detector full scale range to be changed. See section 8.1 for default and selectable full scale ranges by gas sensor type.
Configure Inhibit	Conf Inhb	Set the inhibit current to 3 or 4mA (toxic sensors) or 3 or 17.4mA (oxygen sensors). Set inhibit timeout period, or put unit into permanent inhibit (set timeout to 0).
Set Password	SEt PASS	Set or disable password protection of menu mode.
Calibration Interval	CAL Int	Enable/disable calibration due warning. Set the calibration due warning interval. Select if warning is off, via display or via display and 3mA output.
Bump Test	bUMP tESt	Allows checking of detector response to gas with the output inhibited.
Force Current	ForC Curr	Force the detectors current output to a value between 4 and 20mA.
Change Sensor	CHAn SEnS	Change a sensor without causing the unit to display an F04 ‘no sensor detected’ fault message.
Quit	QUIt	Quit menu mode and return to monitoring mode.

12.1 Menu mode operation table

Menu mode allows the user to perform calibration and configure parameters such as full scale range, calibration gas level, calibration interval, inhibit current & timeout and set a password. To activate menu mode hold the magnet over the MENU/ENTER switch for at least 5 seconds and then remove. Menu mode can be password protected to prevent unauthorized person from changing parameters. Initially the password is set to '000' meaning it is disabled. While in menu mode, the output current of the detector is inhibited to prevent false alarms.
Use the table below to help navigate the menus and make configuration changes. The menus are shown in the left hand column. Use ▲▼ to select the required menu and '✓' to enter. Follow the information and instructions in the table from left to right from the required menu.

▲▼	OK	▲▼	OK	▲▼	OK	▲▼	OK	▲▼
SEt CAL[1]	✓	GAS READING, 'ZEro' AND FLASHING '' ICON DISPLAYED. APPLY ZERO GAS AND USE '✓' WHEN READING IS STABLE. 'ZEro PASS' DISPLAYED IF OK, FAULT CODE AND RETURNS TO MENU IF NOT. '		'SPAN YES' DISPLAYED TO ASK IF YOU NOW WANT TO PERFORM SPAN CALIBRATION. USE '✓' TO PROCEED OR USE ▲▼ TO SELECT 'No' AND RETURN TO MENU MODE.	✓	CURRENT SPAN CALIBRATION FLASHING. USE ▲▼ TO CHANGE AND '✓' TO CONFIRM. NEW SPAN CALIBRATION POINT DISPLAYED WITH 'YES' FLASHING. USE '✓' TO CONFIRM (OR ▲▼ TO SELECT 'No' AND RETURN TO SELECT NEW VALUE).	✓	GAS READING, 'SPAn' AND FLASHING '' ICON DISPLAYED. APPLY SPAN GAS AND USE '✓' WHEN READING STABLE. IF OK 'PASS' & 'PurG' DISPLAYED (IF FAIL 'SPAN FAIL' DISPLAYED AND RETURNS TO MENU). REMOVE SPAN GAS. WHEN READING <50% OF SPAN POINT, COUNTDOWN BEGINS & UNIT RETURNS TO MENU MODE.
SEt rAn9	✓	'rAn9' DISPLAYED & CURRENT RANGE FLASHES. USE ▲▼ TO SELECT DIFFERENT RANGE (SEE SECTION 8.1 FOR AVAILABLE RANGES).	✓	NEW RANGE DISPLAYED. 'YES' FLASHES. USE '✓' TO CONFIRM (OR ▲▼ TO SELECT 'no' AND RETURN TO STEP 1).	✓	UNIT RETURNS TO MENU MODE.		
ConF Inhb	✓	'Curr' DISPLAYED WITH '' ICON. CURRENT INHIBIT mA VALUE FLASHES. USE▲▼ TO SELECT NEW VALUE (3 OR 4mA TOXICS, OR 3 OR 17.4mA OXYGEN VERSION).	✓	'tImE' DISPLAYED WITH '' ICON. CURRENT INHIBIT TIMEOUT PERIOD (MINUTES) FLASHES. USE ▲▼ TO SET NEW TIMEOUT. (IF SET TO 000 OUTPUT IS PERMANENTLY INHIBITED).	✓	NEW TIMEOUT DISPLAYED. 'YES' FLASHES. USE '✓' TO CONFIRM (OR ▲▼ TO SELECT 'no' AND RETURN TO SELECT NEW VALUE).	✓	UNIT RETURNS TO MENU MODE
SEt PASS	✓	'PASS' DISPLAYED WITH FIRST DIGIT OF THE PASSCODE FLASHING. USE ▲ TO SELECT 1ST DIGIT OF CURRENT PASSWORD. USE ▼ TO MOVE TO NEXT DIGIT AND SET REST OF PASSCODE.	✓	NEW PASSCODE DISPLAYED WITH 'YES' FLASHING. USE '✓' TO CONFIRM (OR ▲▼ TO SELECT 'No' AND RETURN TO SELECT NEW VALUE).	✓	UNIT RETURNS TO MENU MODE		
CAL Int[2]	✓	Int' DISPLAYED WITH CURRENT CALIBRATION INTERVAL FLASHING. USE ▲▼ TO CHANGE INTERVAL.	✓	NEW INTERVAL DISPLAYED WITH 'YES' FLASHING. USE '✓' TO CONFIRM (OR ▲▼ TO SELECT 'no' AND RETURN TO SELECT NEW INTERVAL).	✓	'duE' DISPLAYED WITH 'No', 'LCD' OR 'both' FLASHING. USE ▲▼ TO SELECT REQUIRED CAL DUE WARNING OUTPUT.	✓	UNIT RETURNS TO MENU MODE
bumP tESt	✓	CURRENT GAS CONCENTRATION DISPLAYED WITH OUTPUT INHIBITED '' ICON FLASHING. APPLY BUMP TEST GAS AND CHECK PEAK READING ON DISPLAY.	✓	REMOVE GAS. FALLING REAL TIME GAS READING DISPLAYED.	✓	UNIT RETURNS TO MENU MODE		
ForC Curr	✓	Curr' DISPLAYED WITH '' ICON. DEFAULT FORCE CURRENT '4.00' FLASHES. USE ▲▼ TO CHANGE TO REQUIRED MA LEVEL.	✓	UNIT RETURNS TO MENU MODE				
CHAn SEnS[3]	✓	'SENS' DISPLAYED. REMOVE SENSOR. FIT NEW SENSOR. DISPLAY SHOWS 'LOAd SENS'. 'SAmE GAS' DISPLAYED ('NEW GAS' IF DIFFERENT GAS TYPE SENSOR FITTED) THEN 'WArm' COUNT DOWN.		UNIT RETURNS TO MENU MODE				
9u It	✓	QUITS MENU MODE AND RETURNS TO MONITORING MODE.						

1 Refer to section 8.2 for detailed zero and span calibration procedures. A detector fitted with an oxygen sensor will skip the zeroing procedure. Re-calibrate the detector if left un-powered for periods in excess of 24 hours.
2 The calibration due warning counter is automatically reset after a successful calibration.
3 To exit the Change Sensor Menu without changing the sensor, use '✓'.

13. Detector fault / warning message display

The table below shows the warning / fault codes, their meaning and recommended action.

Warning / Fault Code	Description	Action
Warnings		
W01	Sensor operating temperature limits exceeded.	Use '✓' to clear when within limits
W02	Calibration overdue.	Re-calibrate detector. Disable warning
W03	Transmitter temperature limits exceeded.	Use '✓' to clear when within limits
Faults		
F01	Sensor / transmitter comms failure	Replace sensor
F02	Cell failure	Replace sensor
F03	Zero drift (>5% of scale)	Re zero / calibrate
F04	No sensor detected	Replace sensor
F05	Sensor EEPROM corrupted	Replace sensor
F06	Low supply voltage	Check supply voltage. Replace detector.
F07	Comms monitoring failure	Use '✓' to clear. Replace detector.
F08	RAM read / write fault	Cycle power to detector. Replace detector
F09	Flash memory corrupted	Replace detector
F10	Flash code memory corrupted	Replace detector
F11	DAC output mismatch	Cycle power to detector. Replace detector

13.1 Detector fault / warning operation

Faults are signalled via the code on the display and 3mA (default) output. If the condition causing the fault clears the 4-20mA returns to normal operation, but the display will continue to indicate the fault code. This allows the user to see the code before using '✓' (>2 seconds and <5 seconds) to clear the code from the display.

Warnings are signalled via the code on the display. Warnings do not affect the mA output of the detector*. If the condition causing the warning clears, the display will continue to show the warning code until user uses '✓' to clear the code from the display.

Any faults or warnings where the condition causing it still exists cannot be cleared.

**Note: The calibration due warning can be configured to produce a fault output (see section 12 for further details).*

13.2 Reflex™ cell fault diagnosis

Series 3000 MkII employs the patented Reflex™cell fault diagnosis routine. Reflex™ checks for cell presence, cell dry out and cell open or short circuit. In the event of an electrochemical cell failing this test, the sensor fault code is displayed. Reflex™ is automatically initiated by the transmitter at 8 hourly intervals. It is also initiated on power up, sensor exchange or sensor cell exchange.

Note: Regular response gas checks and calibrations should still be carried out. Reflex™ is not used on Nitric Oxide or Oxygen cells.

14. General maintenance

WARNINGS

Appropriate standards must be followed to maintain the specified operation of the detector. It is recommended to bump test the sensors frequently to ensure proper operation.

Note: It is recommended that the system is visually and functionally checked regularly to ensure correct operation. The frequency of the checks should be determined subject to particular site conditions.

As a guide Honeywell Analytics recommend the following checks and frequency.

Frequency	Check
Every 3 months	Visual check of controller, detectors and installation for mechanical damage. Ensure the sensor is clear of obstruction.
Every 6 months	Functional gas test (see below). Adjust frequency according to site conditions.

Caution: The following procedure should be followed carefully and only performed by suitably trained personnel. The system will produce alarms unless suitably inhibited at the controller.

14.1 Functional gas test

It is essential that the sensor is tested frequently to be sure the system is operating properly. Typically gas detectors should be tested at least twice per year. However it is recommended that testing is conducted on a more frequent basis after initial start up as sensor operation and performance will vary in different environmental conditions and in the presence of other gases. It is the responsibility of the user to determine **an appropriate** calibration frequency for the application. The weatherproof cover has a spigot for attaching tubing from a gas cylinder. This may be used for a simple functional (or bump) test of the sensor. However, this method may not be suitable for all gas types and / or applications due to environmental conditions. It is the responsibility of the user to ensure suitability of this method for each application.

1. Follow the procedure for Bump Test in section 12.1.
2. If the difference between reading and applied gas concentration is outside the acceptable limits for the application follow the procedures for zeroing and calibrating the detector (see section 8.2.1).
3. If reading is still inaccurate replace the sensor (see section 15.1).

14.2 Detector operational life

Typical life of a toxic gas sensor is dependant on the application, frequency and amount of gas exposure. Under normal conditions (3 monthly visual inspection and 6 monthly test/re-calibration) the toxic sensor has an expected life equal to or greater than the lifetime as listed below:

18 months for chlorine, chlorine dioxide and fluorine sensors.

12 months for ammonia, hydrogen chloride, and hydrogen fluoride sensors (see ammonia note below).

24 months for oxygen and other toxic sensors.

Refer to section 15 for sensor replacement procedures.

Caution: Oxygen deficient atmospheres (less than 6%V/V) may result in inaccuracy of reading and performance.

Note: Ammonia electrochemical cells are reliable and suitable for applications where no background concentration of ammonia exists. Under these conditions the cells are expected to operate for 12 to 24 months.

These ammonia cells are of the consumptive type. Their operating life can be adversely affected by continuous or excessive exposure to ammonia, or by prolonged exposure to high temperatures and moisture.

To ensure continued detection availability it is recommended that the detectors are regularly bump tested and a relevant cell replacement program be implemented.

15. Servicing

WARNINGS

Take care when handling sensors as they may contain corrosive solutions. Do not tamper or in any way disassemble the sensor. Do not expose to temperatures outside the recommended range. Do not expose sensor to organic solvents or flammable liquids.

At the end of their working life, sensors must be disposed of in an environmentally safe manner. Disposal should be according to local waste management requirements and environmental legislation. Alternatively, sensors may be securely packaged and returned to Honeywell Analytics clearly marked for environmental disposal. Sensors should NOT be incinerated as they may emit toxic fumes.

Caution: The following procedure should be followed carefully and only performed by suitably trained personnel.
A fault condition will be signalled by the detector if the sensor is removed with the unit under power.

15.1 Sensor replacement

Caution: For biased sensors (e.g. Nitric Oxide and Ethylene Oxide) remove the sensor stabilizer from the bottom of the sensor prior to installation.

Using diagram 13 as a guide, follow the procedure below:

1. Check that the label on the new sensor is the correct gas type.
2. Enter the change sensor menu (see section 12).
3. Unscrew the weatherproof cover, loosen the retainer locking screw and unscrew the sensor retainer.
4. Remove the old sensor by pulling without twisting.
5. Plug in the new sensor taking care to align the sensor pins with the connector.
6. Refit the sensor retainer, tighten the locking screw and refit the weatherproof cover.
7. Countdown time of up to 180 seconds (dependant on sensor type) is displayed.
8. Re-calibrate the detector following the procedures in section 8.2.

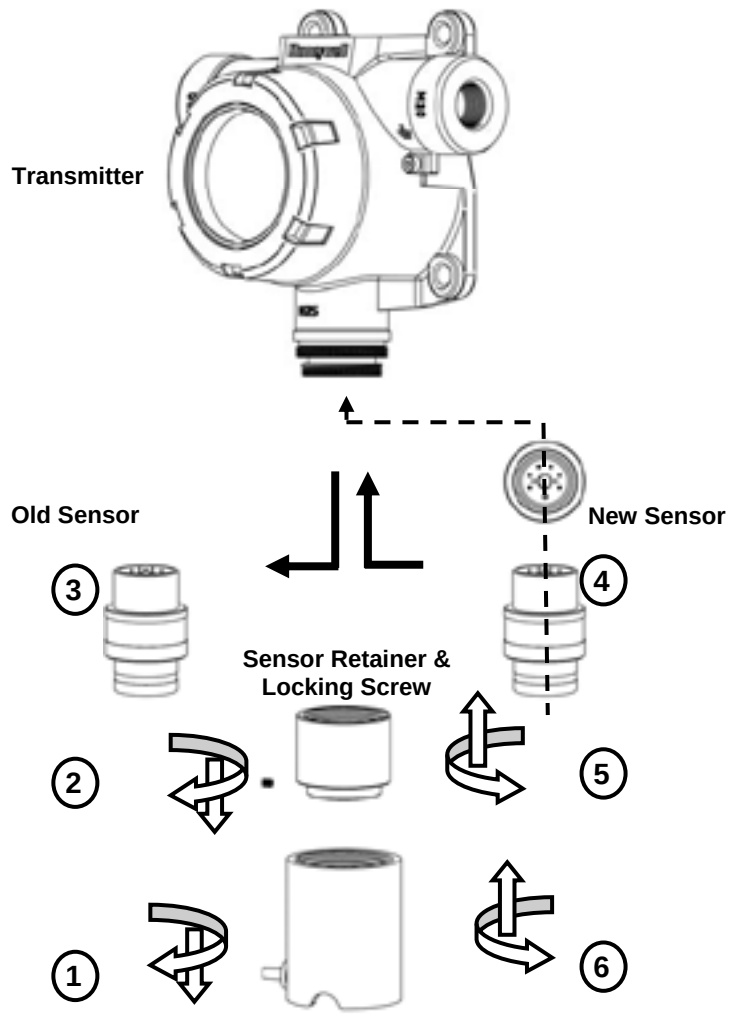


Diagram 13: Replacing Plug In Sensor

15.2 Serviceable sensor cell replacement

Caution: For toxic sensors, remove the shorting clip from the bottom of the sensor prior to installation. For O2 sensor, there is no shorting clip provided.

Caution: There are two types of sensor cap – teflon coated (black) and stainless steel. Ensure that a teflon coated sensor cap is refitted for S3KXSF1SS (HF), XSR1SS (HCl) and XSU1SS (F2) cells.

The serviceable sensor allows replacement of the cell inside the sensor. The cell can only be replaced with the same type cell. To replace the cell follow the procedure below.

1. Enter the change sensor menu (see section 12).
2. Unscrew the weatherproof cover, loosen the sensor retainer locking screw and unscrew the sensor retainer.
3. Remove the old sensor by pulling without twisting.
4. Unscrew the sensor cap.
5. Remove the old cell by pulling without twisting.
6. Ensure the new cell is the same type as the old cell.
7. Plug the new cell into the sensor, taking care to align the sensor pins with the connector holes in the pcb.
8. Refit the sensor, taking care to align the sensor pins with the connector.
9. Refit the sensor cap, ensuring that it is the correct type. Refit the sensor retainer, tighten the locking screw and refit the weatherproof cover.
10. Countdown time of up to 180 seconds (dependant on sensor type) is displayed.
11. Re-Calibrate the detector following the procedures in section 8.2.

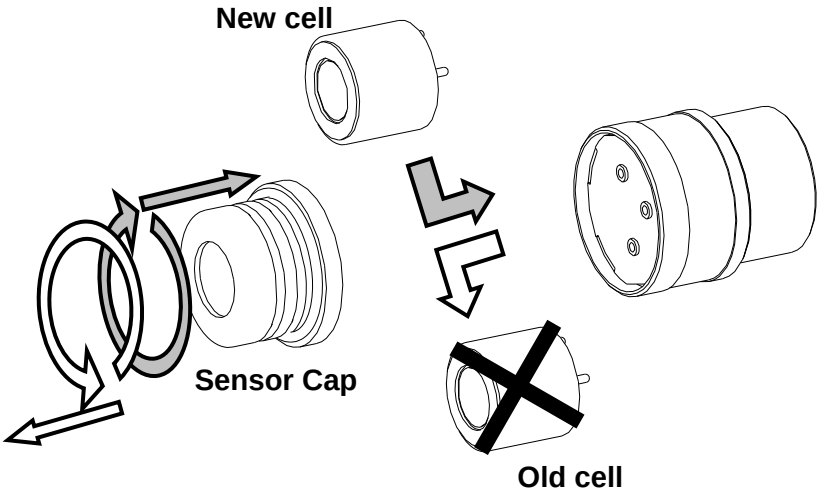
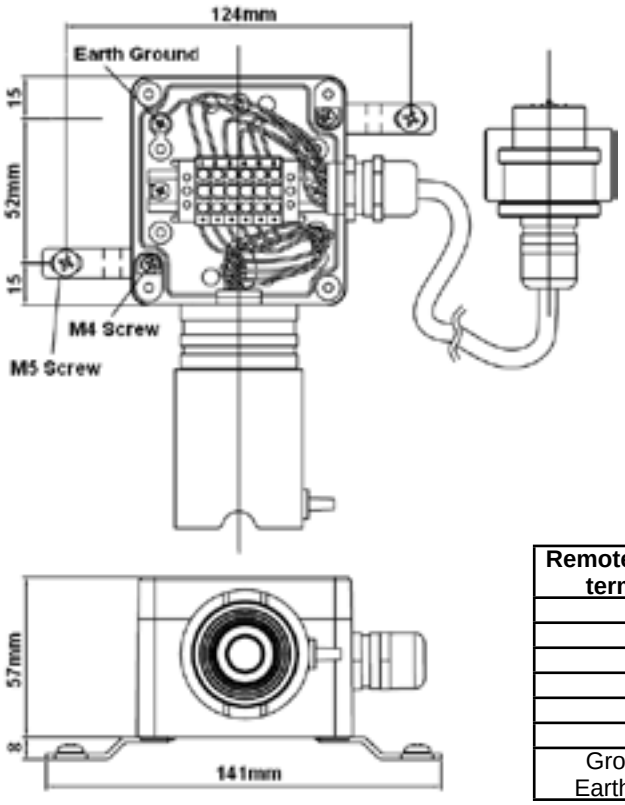


Diagram 14: Serviceable Sensor Cell Replacement

16. Remote sensor mounting kit installation details

Cautions: Take care not to cut the cable too short. Once cut, additional lengths of cable cannot be added as this will invalidate the I.S certification. We also recommend that a loop of cable is made at the junction box to allow slack for any future re-termination.
The enclosure of the remotely mounted sensor contains aluminium. Care must be taken to avoid ignition hazards due to impact or friction when installed in the Zone 1 location.
All cable entry devices and blanking elements shall be certified in type of explosion protection flameproof enclosure "d", suitable for the conditions of use and correctly installed.

The remote sensor mounting kit is used to remotely mount the sensor from the transmitter. To remotely mount the sensor, follow the procedure below and refer to Control Drawing 3000E3157 in section 21.



Remote sensor terminal	Wire Colour	Description
1	Yellow	Power
2	Green	RX
3	Blue	TX
4	White	Clock
5	Red	Stabilizing pin
6	Black	Ground
Ground / Earth point	Shield	Ground / Earth point

Diagram 15: Remote Sensor Mounting Kit

1. Unscrew the weatherproof cover, loosen the retainer locking screw and unscrew the sensor retainer.
2. Remove the sensor by pulling without twisting.
3. Plug the remote sensor cable connector into the bottom of the transmitter.
4. Route the cable to the location where the remote sensor is to be mounted.
5. If necessary, cut the cable to the required length.
6. Mount the remote sensor junction box ensuring enough room below to fit the sensor and weatherproof cover.
7. Attach the cable to the remote terminal box via the gland provided.

8. Make the wiring connections as shown.
9. Fit the terminal box lid.
10. Plug the sensor into the socket at the bottom of the terminal box.
11. Fit the sensor retainer, tighten the locking screw and fit the weather proof cover.
12. Calibrate the detector following the procedure is section 8.2.1.

17. General specifications

Series 3000 MkII Detector	
Use	Rugged and reliable gas detector for the protection of personnel from toxic and oxygen gas hazards. Suitable for use in European Zone 1 or 2 or 21 or 22 hazardous areas and North American Division 1 or 2 areas.

Detectable Gases & Performance (See notes below)

Gas	Selectable Full Scale Range	Default Range	Steps	Selectable Cal Gas Range	Default Cal Point	Response Time (T90) secs	Accuracy (ppm or % of applied gas)	Drift over time	Operating Temperature*	
									Min	Max
Oxygen	25.0%/Vol only	25.0%VOL	n/a	20.9%/Vol (Fixed)	20.9%/Vol	15	+/-0.5% O2	<4%/yr	-30°C / -22°F	55°C / 131°F
Hydrogen Sulfide	10.0 to 50.0ppm	15.0ppm	0.1ppm	30 to 70% of selected full scale range	10ppm	30	+/-0.3 or +/-20%	<0.5ppm/ yr	-40°C / -40°F	55°C / 131°F
Hydrogen Sulfide	50 to 500ppm	100ppm	10ppm		50ppm	30	+/-2 or +/-20%	<0.5ppm/ yr	-40°C / -40°F	55°C / 131°F
Carbon Monoxide	100 to 500ppm	300ppm	100ppm		100ppm	30	+/-2 or +/-20%	<2ppm/yr	-40°C / -40°F	55°C / 131°F
Sulfur Dioxide	5.0 to 20.0ppm	15.0ppm	5.0ppm		5.0ppm	40	+/-0.3 or +/-20%	<2%/mo	-40°C / -40°F	55°C / 131°F
Ammonia	50 to 200ppm	200ppm	50ppm		100ppm	180	+/-10 or +/-20%	<5%/6 mo	-20°C / -4°F	40°C / 104°F[1]
Ammonia	200 to 1,000ppm	1,000ppm	50ppm		300ppm	180	+/-15 or +/-20%	<5%/6 mo	-20°C / -4°F	40°C / 104°F
Chlorine	5.0 to 20.0ppm	5.0ppm	5.0ppm		2.0ppm	90	+/-0.3 or +/-20%	<2ppm/yr	-10°C / 14°F	55°C / 131°F
Chlorine Dioxide	1.00ppm only	1.00ppm	n/a		0.5ppm	120	+/-30%	<5%/yr	-20°C / -4°F	55°C / 131°F
Nitric Oxide	100ppm only	100ppm	n/a		50ppm	50	+/-3 or +/-20%	<2%/mo	-20°C / -4°F	55°C / 131°F
Nitrogen Dioxide	5.0 to 50.0ppm	10ppm	5.0ppm		5ppm	60	+/-3 or +/-20%	<2%/mo	-20°C / -4°F	55°C / 131°F
Hydrogen	1,000ppm only	1,000ppm	n/a		500ppm	90	+/-10 or +/-25%	<2%/mo	-20°C / -4°F	55°C / 131°F
Hydrogen	9,999ppm only	9,999ppm	n/a		5000ppm	90	+/-25 or +/-30%	<10%/6 mo	-20°C / -4°F	55°C / 131°F
Hydrogen Chloride	10.0 to 20.0ppm	10ppm	1.0ppm		5.0ppm	150	+/-1 or +/-20%	<20%/yr	-20°C / -4°F	40°C / 104°F
Hydrogen Cyanide	30.0ppm only	30.0ppm	n/a		10.0ppm	200	+/-1.0ppm or +/-30%	<2%/mo	-20°C / -4°F	55°C / 131°F
Hydrogen Fluoride	12.0ppm only	12.0ppm	n/a		5.0ppm	300	+/-30%	<20%/yr	-20°C / -4°F	55°C / 131°F
Ozone	0.400ppm only	0.400ppm	n/a		0.200ppm	60	+/-0.020ppm or +/-30%	<5%/mo	-20°C / -4°F	55°C / 131°F
Phosphine	1.2ppm only	1.2ppm	n/a		0.5ppm	33	+/-0.03 or +/-20%	<10%/yr	-20°C / -4°F	40°C / 104°F
Fluorine	4.00ppm only	4.00ppm	n/a		2.00ppm	35	+/-0.3ppm or +/-20%	<10%/yr	-20°C / -4°F	55°C / 131°F
Ethylene Oxide	20.0 to 50.0ppm	25.0ppm	5.0ppm		10.0ppm	125	+/-1.5ppm or +/-20%	<5%/yr	-20°C / -4°F	55°C / 131°F

Electrical	
Connections and Power	2 wire loop powered 17Vdc (+/-10%) to 32Vdc (max.) 22mA max. overrange
Recommended Cable	2 wire with screen (90% coverage) or conduit. 0.5mm^2 (20AWG) to 2.0mm^2 (14AWG) Max.
Signal	0-100% FSD 4-20mA Max. overrange 22mA Inhibit = Selectable 3mA (fault) or 4mA for toxic sensors or 3mA (fault) or 17.4mA for oxygen sensors. Fault = 3mA
Construction	
Material	Transmitter: Epoxy painted aluminium alloy LM25 or 316 Stainless Steel. Sensor: 316 Stainless Steel with PTFE filter
Entries	2 x M20 (for ATEX/IECEx Approval) or 2 x 3/4NPT (for UL Approval)
Maximum Dimensions	164 x 201 x 99mm (6.4 x 7.9 x 3.9 inches)
Weight	Aluminium alloy LM25 : 1.7kg (3.75lbs.) Stainless Steel 316: 3.7kg (8.16lbs.)
Environmental	
IP Rating	IP66 (EN 60529). NEMA 4X (Not tested by UL but by another Third Party Laboratory)
Certified Operating Temperature	ATEX/IECEX: -20°C to +55°C (-4°F to +131°F) UL/cUL: -40°C to +55°C (-40°F to +131°F)
Operating Humidity	Continuous 20-90%RH (non condensing) Intermittent 0-99%RH (non condensing)
Operating Pressure	90-110kPa
Storage Conditions	Transmitter:15°C to 30°C (59°F to 86°F) 30-70% RH (non condensing) To ensure the optimum operational life of electrochemical cell sensors, replacement cells should be stored in sealed packaging in cool dry conditions and preferably kept refrigerated at temperatures between 0 and 20 degrees C.
Certification	Transmitter: UL/c-UL Class I, Div. 1 & 2, Groups B, C & D; Class II, Div. 1 Groups E, F & G, Class II, Div. 2, Groups F & G; Class I, Zone 1, Group IIB + H2 Hazardous Locations. Remote Sensor Accessory: UL/c-UL = Class I, Div. 1, Groups A, B, C & D; Class II Division 1 & 2, Groups E, F & G; Class 1, Zone 0, Group IIC; Class II, Zone 20
	Transmitter: ATEX: II 2 (1) GD db [ia IIC Ga] IIB + H2 T4 Gb, Ex tb [ia IIIC Da] IIIB T135°C Db Remote Sensor Accessory: ATEX: II 1GD Ex ia IIC T4 Ga Ex ia IIIC T135ºC Da Transmitter: IECEx Ex db [ia IIC Ga] IIB + H2 T4 Gb, Ex tb [ia IIIC Da] IIIB T135°C Db Remote Sensor Accessory: IECEx: Ex ia IIC T4 Ga Ex ia IIIC T135ºC Da
Approvals	CE compliant in accordance with: ATEX Directive 94/9/EC EMC Directive 2004/108/EC (EN50270:2006)

Notes: Detection performance is temperature and humidity dependent. Listed data is based at 20°C, 50% RH only. Response time is longer when operating in colder temperatures.

**When operating in Hazardous Area applications the detector must not be operated outside the certified temperature range. See Certification details for UL, c-UL and ATEX/IECEx certified temperature ranges. [1] +55C intermittent*

18. Ordering information

Transmitter	
Part number	Description
S3KAL2	ATEX/IECEx approved Series 3000 MkII toxic and oxygen transmitter, Aluminium LM25 and 2 x M20 Entries
S3KAS2	ATEX/IECEx approved Series 3000 MkII toxic and oxygen transmitter, Stainless Steel 316 and 2 x M20 Entries
S3KUL2	UL/cUL approved Series 3000 MkII toxic and oxygen transmitter, Aluminium LM25 and 2 x 3/4"NPT Entries
S3KUS2	UL/cUL approved Series 3000 MkII toxic and oxygen transmitter, Stainless Steel 316 and 2 x 3/4"NPT Entries
S3KNL2	Inmetro approved Series 3000 MkII toxic and oxygen transmitter, Aluminium LM25 and 2 x 3/4"NPT Entries
S3KNS2	Inmetro approved Series 3000 MkII toxic and oxygen transmitter, Stainless Steel 316 and 2 x 3/4"NPT Entries
Series 3000 MkII transmitter is supplied complete with integral wall mounting lugs, 2 x M20 or 3/4"NPT (certification dependent) entries, 1 x hex wrench set, weatherproof cap, operating magnet, test certificate and instruction manual. Units are 100% inspected prior to despatch from the factory.	
Serviceable Sensor (316 Stainless Steel)	
S3KXSO1SS	Oxygen 0-25%VOL
S3KXSC1SS	Carbon Monoxide 0-300ppm (100 to 500ppm, 100ppm)
S3KXSH1SS	Hydrogen Sulfide 0-15.0ppm (10.0 to 50.0ppm, 0.1ppm)
S3KXSH2SS	Hydrogen Sulfide 0-100ppm (50 to 500ppm, 10ppm)
S3KXSL1SS	Chlorine 0-5.0ppm (5.0 to 20.0ppm, 5.0ppm)
S3KXSZ1SS	Ozone 0-0.40ppm
S3KXSS1SS	Sulfur Dioxide 0-15.0ppm (5.0 to 20.0ppm, 5.0ppm)
S3KXSX1SS	Chlorine Dioxide 0-1.00ppm
S3KXSM1SS	Nitrogen Monoxide 0-100ppm
S3KXSN1SS	Nitrogen Dioxide 0-10.0ppm (5.0 to 50.0ppm, 5.0ppm)
S3KXSG1SS	Hydrogen 0-1000ppm
S3KXSG2SS	Hydrogen 0-9,999ppm
S3KXSR1SS	Hydrogen Chloride 0-10.0ppm (10.0 to 20.0ppm, 1.0ppm)
S3KXSY1SS	Hydrogen Cyanide 0-30.0ppm
S3KXSF1SS	Hydrogen Fluoride 0-12.0ppm
S3KXSA1SS	Ammonia 0-200ppm (50 to 200ppm, 50ppm)
S3KXSA2SS	Ammonia 0-1000ppm (200 to 1000ppm, 50ppm)
S3KXSP1SS	Phosphine 0-1.20ppm
S3KXSU1SS	Fluorine 0-4.00ppm
S3KXSE1SS	Ethylene Oxide 0-25.0ppm (20.0 to 50.0ppm, 5.0ppm)
Accessories	
SPXCDMTBR	Pipe Mounting Bracket
SPXCDSDP	Sunshade / Deluge Protection
S3KCAL	Calibration gas flow housing
S3KCC	Collecting cone (for use when detecting Hydrogen gas only)
S3KDMK	Duct mounting kit (for use when detecting O2, CO, H2S or H2 gas)
S3KRMK	ATEX/UL/cUL approved remote sensor mounting kit (includes enclosure with sensor socket, 50 feet of digital cable and glands, transmitter cable plug, mounting screws)
Consumables: Spare Cells for use with Serviceable Sensor	
S3KO1SS	Oxygen 0-25%VOL
S3KC1SS	Carbon Monoxide 0-300ppm (100 to 500ppm, 100ppm)
S3KH1SS	Hydrogen Sulfide 0-15.0ppm (10.0 to 50.0ppm, 0.1ppm)
S3KH2SS	Hydrogen Sulfide 0-100ppm (50 to 500ppm, 10ppm)
S3KL1SS	Chlorine 0-5.0ppm (5.0 to 20.0ppm, 5.0ppm)
S3KZ1SS	Ozone 0-0.40ppm
S3KS1SS	Sulfur Dioxide 0-15.0ppm (5.0 to 20.0ppm, 5.0ppm)
S3KX1SS	Chlorine Dioxide 0-1.00ppm
S3KM1SS	Nitrogen Monoxide 0-100ppm
S3KN1SS	Nitrogen Dioxide 0-10.0ppm (5.0 to 50.0ppm, 5.0ppm)
S3KG1SS	Hydrogen 0-1000ppm
S3KG2SS	Hydrogen 0-9,999ppm
S3KR1SS	Hydrogen Chloride 0-10.0ppm (10.0 to 20.0ppm, 1.0ppm)
S3KY1SS	Hydrogen Cyanide 0-30.0ppm
S3KF1SS	Hydrogen Fluoride 0-12.0ppm
S3KA1SS	Ammonia 0-200ppm (50 to 200ppm, 50ppm)
S3KA2SS	Ammonia 0-1000ppm (200 to 1000ppm, 50ppm)
S3KP1SS	Phosphine 0-1.20ppm
S3KU1SS	Fluorine 0-4.00ppm
S3KE1SS	Ethylene Oxide 0-25.0ppm (20.0 to 50.0ppm, 5.0ppm)
Spares	
S3KM20P	M20 Blanking Plug
S3KNPTP	3/4"NPT Blanking Plug
S3KDM	Replacement display module
S3KTM	Replacement terminal module
S3KTMTS	Terminal screw and ‘U’ clamp (bag of 20)
S3KWP	Weatherproof cap
S3KMKIIMAN	Instruction manual
SPXCDMAG	Magnet
SPXCDHWES	Hex wrench for earth screw
SPXCDEBS	Earth Bracket and Screws

19. Warranty / liability statement

All products are designed and manufactured to the latest internationally recognized standards by Honeywell Analytics under a Quality Management system that is certified to ISO 9001. As such Honeywell Analytics warrants its products against defective parts and workmanship and will repair or (at its option) replace any instruments which are or may become defective under proper use within 12 months from date of commissioning by an approved Honeywell Analytics representative or 18 months from date of shipment from Honeywell Analytics, whichever is the sooner. This warranty does not cover disposable batteries or damage caused by accident, abuse, abnormal operating conditions or poisoning of sensor.

Defective goods must be returned to Honeywell Analytics premises accompanied by a detailed description of any issue. Where return of goods is not practicable Honeywell Analytics reserves the right to charge for any site attendance where any fault is not found with the equipment. Honeywell Analytics shall not be liable for any loss or damage whatsoever or howsoever occasioned which may be a direct or indirect result of the use or operation of the Contract Goods by the Buyer or any Party.

This warranty covers instrument and parts sold to the Buyer only by authorized distributors, dealers and representatives as appointed by Honeywell Analytics. The warranties set out in this clause are not pro rata, i.e. the initial warranty period is not extended by virtue of any works carried out there under.

In no event will Honeywell Analytics be liable for any incidental damages, consequential damages, special damages, punitive damages, statutory damages, indirect damages, loss of profits, loss of revenues, or loss of use, even if informed of the possibility of such damages. Honeywell Analytic's liability for any claims arising out of or related to this product will in no case exceed the order value. To the extent permitted by applicable law, these limitations and exclusions will apply regardless of whether liability arises from breach of contract, warranty, tort (including but not limited to negligence), by operation of law, or otherwise.

20. EC Declaration of Conformity

A full EC declaration of conformity is available on the CD accompanying the product. This document lists the European Standards with which the Series 3000 MKII complies.

21. Certification

The Series 3000 MkII main unit is available in 6 versions: ATEX/IECEx approved version (Aluminium version part number S3KAL2, Stainless Steel version part number S3KAS2) and UL/CSA approved version (Aluminium version part number S3KUL2, Stainless Steel version part number S3KUS2) and Inmetro approved version (Aluminium version part number S3KNL2, Stainless Steel version part number S3KNS2). The remote sensor accessory has both ATEX and UL/CSA approval on the same part (part number S3KRMK). The following sections detail the approvals and certification nameplates.

ATEX / IECEx Special Conditions of Use

S3KX***** Series EC Cartridges

When installed in the Series 3000 MkII Transmitter, the Transmitter's Tamb rating of -20°C to +55°C must be observed. When the Cartridge is installed remotely using the S3KRMK, a Tamb of -40°C to +55°C is permissible however "W03 Sensor Operating Limits Exceeded" will be issued when temperatures are outside limits published in Sec 17. General Specifications.

S3KRMK Remote Mount Sensor Kit

The enclosure of the S3KRMK contains aluminium. Care must be taken to avoid ignition hazards due to impact or friction when installed in Zone 1 locations.

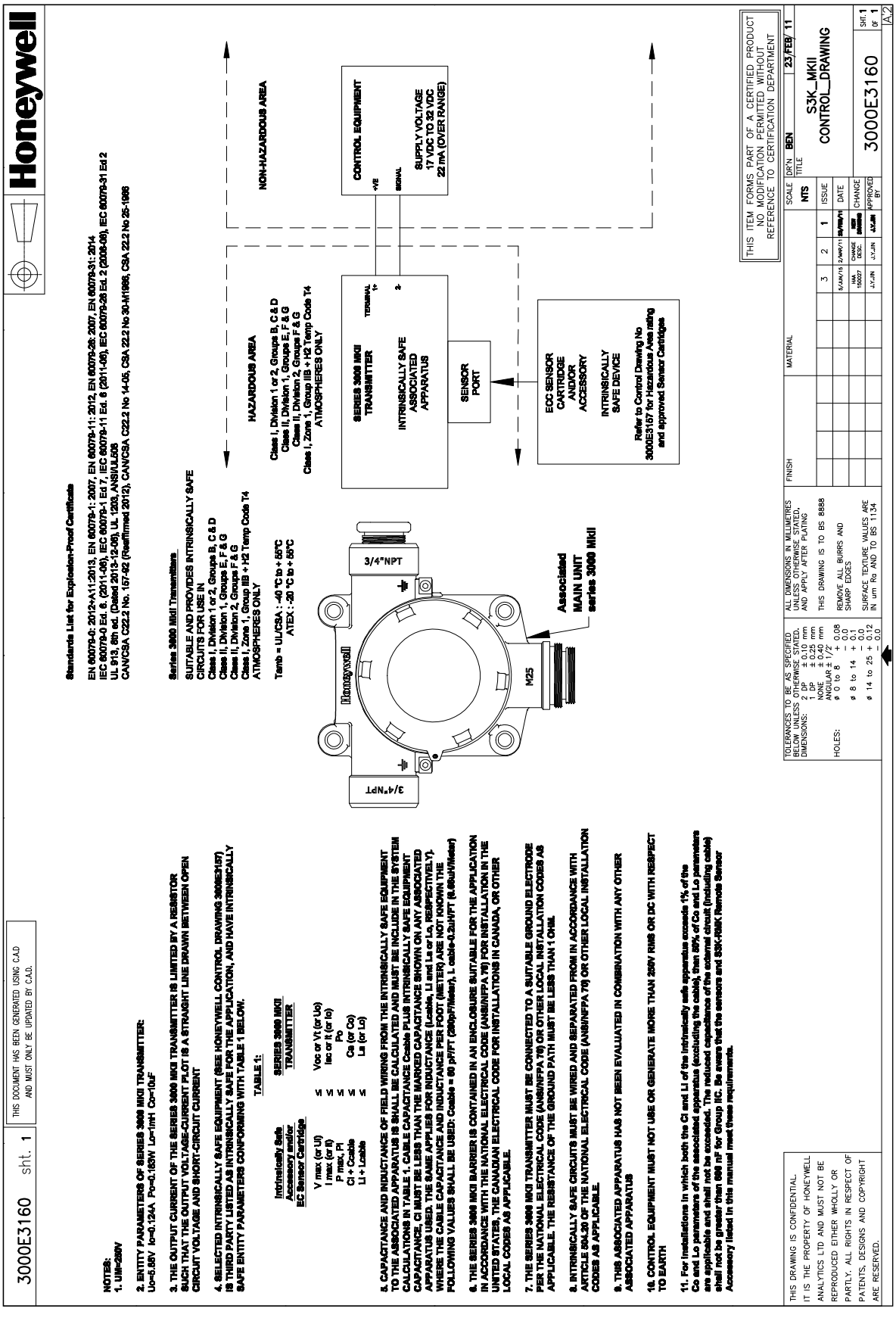
Intrinsic Safe Information for Capacitance and Inductance

For installations in which both the Ci and Li of the intrinsically safe apparatus exceeds 1% of the Co and Lo parameters of the associated apparatus (excluding the cable), then 50% of Co and Lo parameters are applicable and shall not be exceeded. The reduced capacitance of the external circuit (including cable) shall not be greater than 600 nF for Group IIC. Be aware that the sensors and S3K-RMK Remote Sensor Accessory listed in this manual meet these requirements.

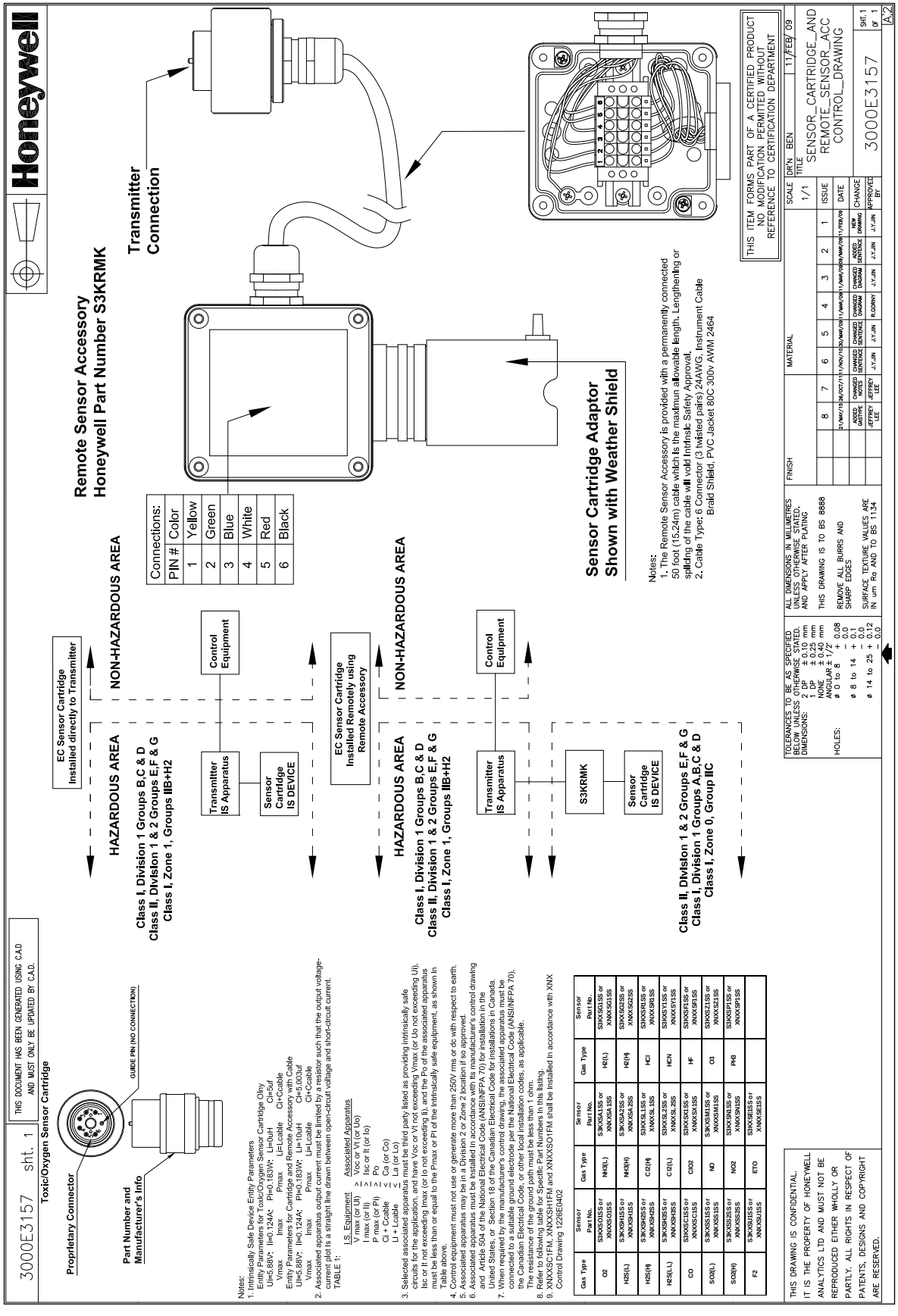
Flameproof Joints

The flameproof joints are not intended to be repaired.

21.1 UL/CSA control drawing



21.2 Sensor Cartridge and Remote Sensor Accessory control drawing



Notes:
1. Intrinsically Safe Device Entity Parameters:
Entity Parameters for Toxic/Oxygen Sensor Cartridge Only
Ui=5.88V; Ii=0.124A; Pi=0.183W; Li=0uH Ci=0uf
Vmax Imax Pmax Li=1cable Ci=1cable Ci+Ccable
Entity Parameters for Cartridge and Remote Accessory with Cable
Ui=5.88V; Ii=0.124A; Pi=0.183W; Li=10uH Ci=5.003uf
Vmax Imax Pmax Li=1cable Ci+Ccable
2. Associated apparatus output current must be limited by a resistor such that the output voltage-current plot is a straight line drawn between open-circuit voltage and short-circuit current.
TABLE 1:

IS. Equipment	Associated Apparatus
Voc or Vt (or Uo)	≥
I max (or Ii)	≥
P max (or Pi)	≥
Po	≥
Ca (or Co)	≤
Li + Lcable	≤

3. Selected associated apparatus must be third party listed as providing intrinsically safe circuits for the application, and have Voc or Vt not exceeding Vmax (or Uo not exceeding Ui), Isc or It not exceeding Imax (or Io not exceeding Ii), and the Po of the associated apparatus must be less than or equal to the Pmax or PI of the Intrinsically safe equipment, as shown in Table above.
4. Control equipment must not use or generate more than 250V rms or dc with respect to earth.
5. Associated apparatus must be installed in accordance with manufacturer's control drawing and Article 504 of the National Electrical Code (ANSI/NFPA 70) for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.
6. Associated apparatus must be installed in accordance with its manufacturer's control drawing and Article 504 of the National Electrical Code (ANSI/NFPA 70) for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.
7. When required by the manufacturer's control drawing, the associated apparatus must be connected to a suitable ground electrode per the National Electrical Code (ANSI/NFPA 70). the Canadian Electrical Code, or other local installation codes, as applicable. The resistance of the ground path must be less than 1 ohm.
8. Refer to following table for Specific Part Numbers in this listing.
9. XNXXSC1FM, XNXXSH1FM and XNXXSO1FM shall be Installed in accordance with XNX Control Drawing 1220E0402

Gas Type	Sensor Part No.	Gas Type	Sensor Part No.	Gas Type	Sensor Part No.
O2	S3KXSO2S5 or XNXXSA1SS	NH3(L)	S3KXSA1S5 or XNXXSG1SS	H2(L)	S3KXSG2S5 or XNXXSG1SS
H2S(L)	S3KXSH1S5 or XNXXSH1SS	NH3(H)	S3KXSA2S5 or XNXXSA2SS	H2(H)	S3KXSG2S5 or XNXXSG2SS
H2S(H)	S3KXSH2S5 or XNXXSH2SS	Cl2(H)	S3KXSL2S5 or XNXXSL1SS	HCl	S3KXSR1S5 or XNXXSR1SS
H2S(LL)	S3KXSH3S5 or XNXXSH3SS	Cl2(L)	S3KXSL3S5 or XNXXSL2SS	HCN	S3KXSY1S5 or XNXXSY1SS
CO	S3KXSC1S5 or XNXXSC1SS	ClO2	S3KXSX3S5 or XNXXSX1SS	HF	S3KXSR2S5 or XNXXSR1SS
SO2(L)	S3KXSS1S5 or XNXXSS1SS	NO	S3KXSN1S5 or XNXXSN1SS	C3	S3KXSZ1S5 or XNXXSZ1SS
SO2(H)	S3KXSS2S5 or XNXXSS2SS	NO2	S3KXSN2S5 or XNXXSN1SS	PH3	S3KXSP1S5 or XNXXSP1SS
F2	S3KXSQ1S5 or XNXXSQ1SS	ETO	S3KXSE5S5 or XNXXSE5SS		

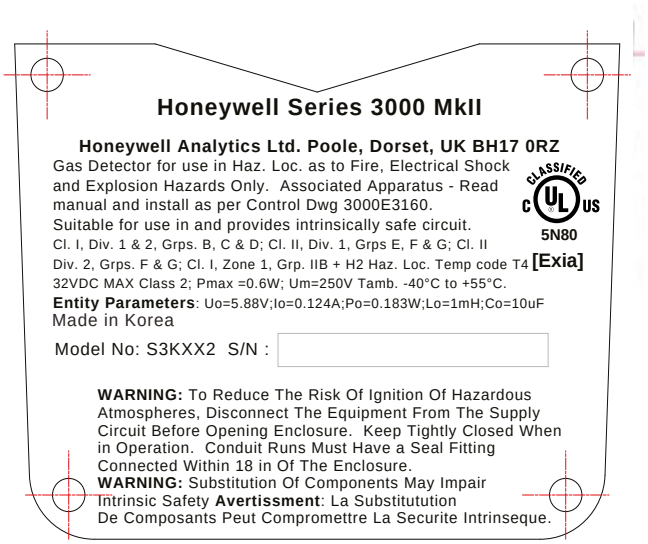
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TOLERANCES TO BE AS SPECIFIED BELOW UNLESS OTHERWISE STATED. DIMENSIONS: 2 DP ± 0.10 mm 1 DP ± 0.25 mm NONE ± 0.40 mm ANGULAR ± 1/2° HOLES: ø 0 to 8 + 0.08 − 0.0 ø 8 to 14 + 0.1 − 0.0 ø 14 to 25 + 0.12 − 0.0
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED, AND APPLY AFTER PLATING
THIS DRAWING IS TO BS 8888
REMOVE ALL BURRS AND SHARP EDGES
SURFACE TEXTURE VALUES ARE IN um Ra AND TO BS 1134
FINISH
MATERIAL

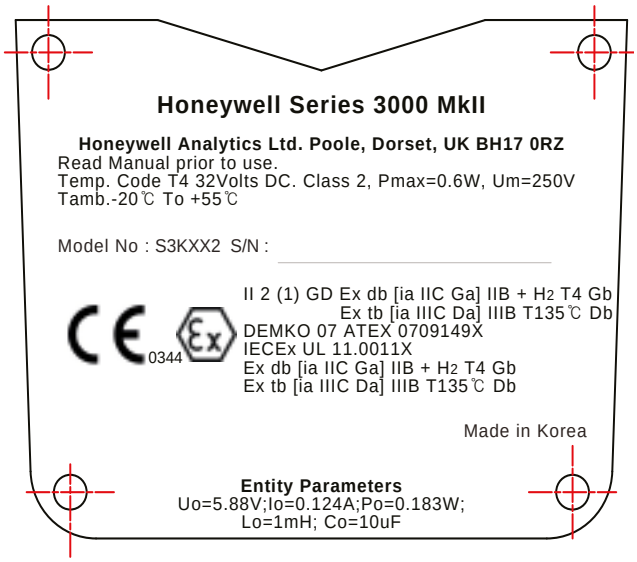
ISSUE	DATE	CHANGE	APPROVED BY
1	11/FEB/09	NEW DRAWING	J.Y.JIN
2		ADDED SENTENCE	J.Y.JIN
3		CHANGED DIAGRAM	J.Y.JIN
4		CHANGED SENTENCE	R.DORNY
5		CHANGED SENTENCE	J.Y.JIN
6		CHANGED NOTES	JEFFREY LEE
7		ADDED GASTYPE	JEFFREY LEE
8			

SCALE 1/1 DRN BEN 11/FEB/09
TITLE

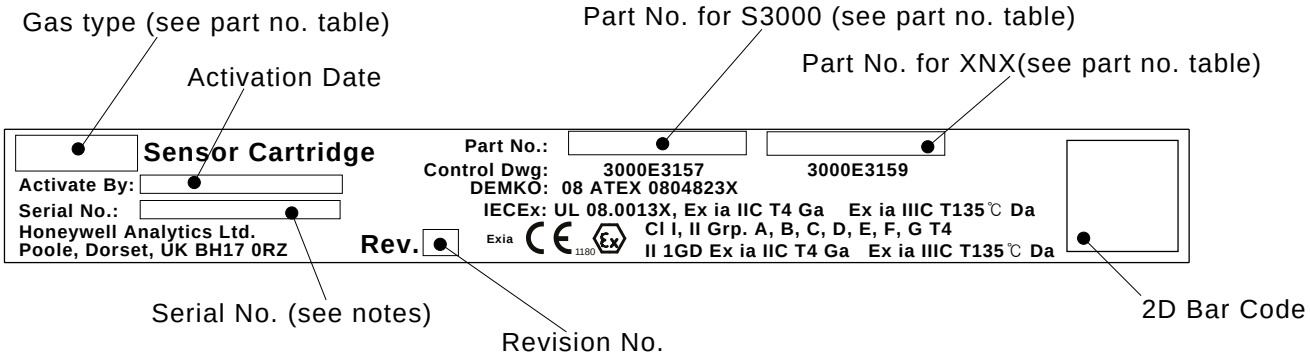
21.3 Main unit UL/CSA hazardous area nameplate



21.4 Main unit ATEX/IECEx hazardous area nameplate



21.5 Sensor label ATEX/UL/c-UL



21.6 Remote sensor ATEX/UL/c-UL hazardous area nameplate

Honeywell
Model # S3KRMK Remote Sensor Accessory

Honeywell Inc. Miramar, FL, USA 33025 (optional)
Honeywell Analytics Ltd, Poole, Dorset, UK BH17 0RZ

GAS DETECTOR FOR USE IN HAZARDOUS LOCATIONS ONLY AS TO INTRINSIC SAFETY
Intrinsically Safe for use in Class I, Division 1, Groups A, B, C & D; Class II, Division 1 & 2, Groups E, F & G; Class I, Zone 0, Group IIC; Class II, Zone 20; ATEX II 1GD Ex ia IIC T4 Ga, Ex ia IIIC T135℃ Da Hazardous Loc.
When installed per either Control Drawing 3000E3157 or 3000E3159 and applicable requirement of Associated Apparatus

Tamb -40℃ to 55℃ Temp Code T4

5N80

1180

II 1GD Ex ia IIC T4 Ga
Ex ia IIIC T135℃ Da
DEMKO 08 ATEX 0804823X
IECEx UL 08.0013X
Ex ia IIC T4 Ga
Ex ia IIIC T135℃ Da

S/N:

Ui=5.88V; Ii=0.124A; Pi=0.183W; Li=0mH; Ci=5uF

Find out more

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