Crowcon XgardIQ

Intelligent Gas Detector and Transmitter

LAUNCH PACK CONTENTS:

Launch Pack
Issue 1
November 2016

Introduction

XgardIQ is an intelligent and versatile gas detector and transmitter compatible with Crowcon's full range of sensor technologies. XgardIQ is available fitted with a variety of flammable, toxic or oxygen gas sensors and provides a bright OLED display with clear and comprehensive status information in a range of languages.

Confidence with Positive Safety™

Bright LED's indicate detector status at a glance; the unique '+ve Safety' LED confirms the detector is operating safely and alerts operators to any irregular events that may affect product integrity such as the ambient temperature exceeding sensor limits. When the detector is working safely the blue +ve Safety LED remains on constantly, if any abnormal operating conditions are detected the LED will flash and a warning message will be displayed.

Flexible signal output options

XgardIQ provides comprehensive output signal options. An analogue 4-20mA signal with auto-sink/source detection feature, and RS-485 Modbus communications are provided as standard. Alarm and fault relays featuring heavy-duty change-over contacts rated 230Vac 5A are available at purchase, or may be added at any time after installation. HART communications can be provided both over the analogue signal and via local I.S. terminals for diagnostics using any HART asset management system or hand-held device.

Improved user safety

XgardIQ minimises the time personnel spend in potentially hazardous locations by using simple hot-swappable sensor modules. Sensors can be bump tested/calibrated in-situ *or* removed in seconds (using one hand) and either replaced with a pre-calibrated sensor module or re-calibrated in a safe area and re-fitted.

Introduction (continued)

All functions and adjustments can be made via the integral keypad without the need for special tools or hot-work permits.

Rugged and robust

ATEX and IECEx certified for use in Zone 1 and Zone 2 hazardous areas, XgardIQ has been designed for long-life operation in extreme environments. Featuring rugged 316 stainless steel construction and a wide operating temperature range from -40°C to +75°C, XgardIQ is suitable for the most demanding applications.

Flexible cable installation options

XgardIQ comes with three cable entries as standard: the left-hand and lower right-hand entries are sealed using a certified ‘stopping gland’ which may be removed as required (eg for making relay connections or looping a cable to the next detector on an addressable network). Single cables (ie from a control system) will normally be connected to the upper right-hand entry.

Product Options

Sensor Modules

Where XgardIQ is to be installed potentially months ahead of scheduled commissioning, it can be supplied without a sensor module. This avoids the possibility of the sensor being poisoned or expiring whilst inactive. The XgardIQ transmitter is supplied with a cap protecting the sensor module entry and sensor modules can be delivered and installed prior to commissioning.

Option 1: XgardIQ with Sensor Module

XgardIQ will be supplied with the required type of sensor module and will be configured with appropriate settings (alarms levels etc) when the module is inserted. The pre-calibrated flammable, toxic or oxygen sensor module will be supplied packed in its own box (within the main transmitter carton) ready for plugging-in when the detector is ready for installation. A calibration certificate will be supplied referencing the sensor module and transmitter.

Option 2: XgardIQ Transmitter Only

This option enables XgardIQ transmitters to be ordered without a sensor module. On newly constructed sites instruments often may be installed potentially many months before the site is ready for commissioning. This option enables the sensor module to be fitted during commissioning removing the risk of sensors expiring during the time between installation and commissioning. A dummy sensor module is fitted to maintain the dust and water ingress protection of the transmitter.

This option also enables a complete un-configured XgardIQ transmitter to be stocked for rapid replacement of any detector on-site. Distributors can also stock an un-configured transmitter and fit any type of sensor module to satisfy customer orders quickly.

Signal/Output Options

Analogue 4-20mA signal with auto-sink/source detection feature, and RS-485 Modbus communications are provided as standard. The following outputs are also available as an option.

Relays

A simple plug-in module containing Alarm 1, Alarm 2 and Fault relays, with heavy-duty change-over contacts rated 230Vac 5A is available at purchase, or may be added at any time after installation. If a relay module is added after purchase (ie is not factory fitted) the XgardIQ transmitter will recognize the relay module and make all of the relevant menu options available after it has been power-cycled.

The relays can be used for local activation of sounders, beacons, gas valves etc, and are fully configurable as latching, non-latching, energised, de-energised etc. On-delays and off-delays may also be set for each relay.

Optional Relay Module Simply Plugs-In

HART Communications

HART communications can be enabled as an option at the time of order only. HART enabled transmitters can be identified by the part code shown on the label or via the display menu.

The HART (Highway Addressable Remote Transducer) Protocol is the global standard for sending and receiving digital information across analogue wires between smart devices and control or monitoring systems.

More specifically, HART is a bi-directional communication protocol that provides data access between intelligent field instruments (gas detectors, level gauges, pressure transmitters etc) and host systems. A host can be any software application from a technician's hand-held device or laptop to a plant's process control, asset management, safety or other system using any control platform.

HART communications is available as an option on XgardIQ in two formats:

1. **Local hand-held HART communicator connection**. Industry-standard HART communicators are used on industrial sites for maintaining and calibrating a host of instruments. The key benefit of HART is site maintenance staff can use a common communicator to maintain all of their safety and process instruments. The user simply needs to upload and install the DD (Device Description) file to their communicator to access the XgardIQ functions.

   Hand-held HART communicator connection is made using clips to connect to the I.S. pins located on the front of the display module.

Emerson 475 HART Communicator

2. **HART over the 4-20mA signal line:** the HART protocol is super-imposed over the XgardIQ transmitter 4-20mA signal to provide the additional data listed below. In this mode of operation the safety function is performed by the 4-20mA signal (connected to a conventional controller or PLC/DCS). A HART device can then be connected in parallel with the signal connections to read the XgardIQ transmitter status information. HART devices include hand-held communicators, a PLC with HART connectivity or a PC-based Asset Management System (AMS) communicating via a HART modem.

Functions available via HART:

- Gas concentration display
- Obscuration level display (for IR sensors)
- Supply voltage display
- Sensor and Transmitter temperature display
- Alarm status
- Relay status
- Calibration/bump test due dates
- Output signal trim and ramp
- Real time clock set
- Sensor range adjustment
- Select/deselect Inhibit mode
- Sensor zero, calibration and bump test
- Transmitter and sensor module serial number display
- Software version display
- Display and change HART password
- Read and adjust alarm thresholds
- Detailed +ve Safety, warning and fault status information.
- Configuration display: sensor type, relay module fitted Y/N.

A detailed XgardIQ HART integration guide is available from Crowcon, which describes the data available to enable software engineers to develop an XgardIQ HART interface. For further information on HART, and to access and upload instrument DD's (Device Descriptors) visit:

www.hartcomm.org

Certification

XgardIQ is ATEX and IECEx certified for use in Zone 1 and Zone 2 hazardous areas. Two protection concepts have been deployed in its design: Flameproof (Exd) and Intrinsic Safety (Exia) delivering an overall certification code: Exd ia.

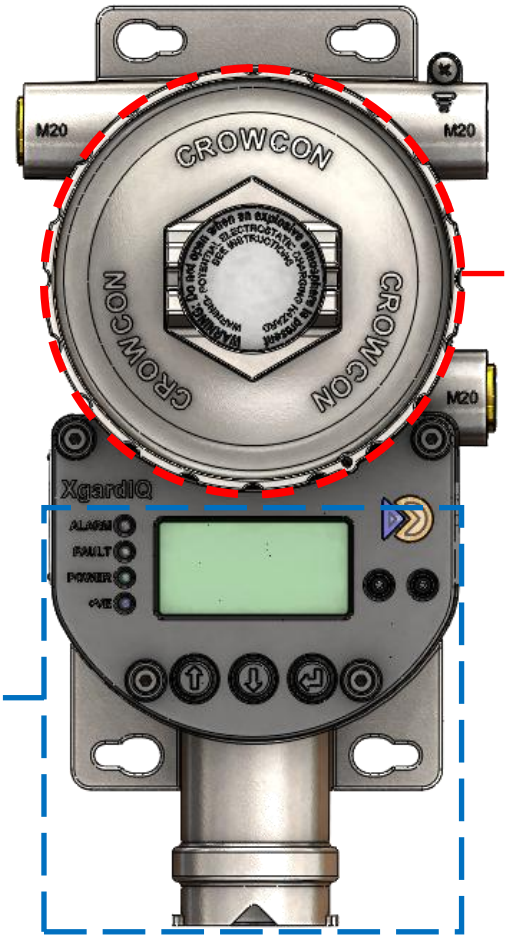
Unlike Crowcon's Xgard range of detectors which includes separate Flameproof (Exd) and Intrinsically Safety (Exia) models, the XgardIQ transmitter is one common Exd ia certified design suitable for use with electrochemical (toxic and oxygen), pellistor (flammable) and IR gas sensor modules.

Although the design incorporates Intrinsically Safe (Exia) elements, the overall concept is essentially Flameproof (Exd) and therefore XgardIQ cannot be used in Zone 0 applications as a purely Exia product could.

An I.S. isolating circuit designed by Crowcon is incorporated onto the circuits housed within the Exd section of the XgardIQ transmitter enclosure and provides the necessary protection to the I.S. elements of the product (display and sensor modules). **XgardIQ cannot and must not be connected to a control system via an I.S. barrier such as a Zener Barrier or Galvanic Isolator.**

The following diagram describes the combined Exd & Exia design concept.

XgardIQ Label



The area under the screw-on lid contains circuit boards, relays (optional) and connectors for terminating field cables.
An I.S. barrier is also incorporated to protect the I.S. elements of XgardIQ: the OLED display and sensor modules.
This area is Flameproof (Exd) by design and thus cables must be connected via Exd certified glands using the three cable entries (marked 'M20' or '½"NPT').

The OLED display, function buttons and sensor modules are Intrinsically Safe: the necessary isolation is provided by the I.S. isolating circuit contained on the circuit boards located within the Exd area under the screw-on lid.

The advantages of the XgardIQ design incorporating the two protection concepts are:

1. From an installation and operation view-point the product is Exd Flameproof as preferred by the majority of operators and is thus simple to install in Zone 1 and Zone 2 environments.
2. The display and function buttons are I.S. protected and thus do not need to be hidden away behind a thick Exd window. The display is thus more clearly visible, and simple push-buttons are provided whereas a purely Exd product requires a magnet to access calibration/menu functions.
3. Sensors on an Exd certified detector must be operated behind a sinter (flame arrestor) to prevent an ignition hazard. The sinter slows gas response, totally prevents reactive gases (eg chlorine) from passing through and also presents a risk of 'undiagnosed failure' if the sinter pores become blocked (and thus prevent gas from reaching the sensor). Deploying I.S. sensor modules enables XgardIQ to detect a very wide range of reactive toxic gases with the fastest possible response time.

   Sinters are still used on XgardIQ sensor modules for high power sensors (ie where the sensor poses an ignition risk): Pellistors and IR.

Markets and Applications

XgardIQ is designed to meet the requirements of safety-critical applications within Oil and Gas, Petrochemical and other heavy industrial applications. Featuring rugged construction, with genuine safety-enhancing features, XgardIQ is specifically designed for applications where dependability and durability are of paramount importance.

Oil and gas production

Oil and gas production platforms, vessels (FPSO's etc) and on-shore installations require hydrocarbon gas detectors to monitor for potentially flammable gas/vapour accumulations. Highly toxic hydrogen sulphide (H_2S) gas increasingly presents a significant hazard in locations where the oil/gas is 'sour'. The harsh offshore environment makes 316 stainless steel construction a pre-requisite for products installed off-shore. Compliance with Functional Safety standards (IEC 61508) is also required to demonstrate dependability. The ability to fit pre-calibrated sensor modules minimises the time personnel need to spend in hazardous areas of the facility; an important safety consideration.

XgardIQ complies with the general needs of this market:

- 316 Stainless Steel construction (corrosion resistance in saline environments).
- IEC 61508 SIL 2 compliance.
- Full range of flammable and toxic gas sensors
- Removable, hot-swap, pre-calibrated sensor modules.
- Long life with low maintenance costs
- ATEX & IECEx Zone 1 & 2 approval
- Operation from -40°C to +75°C (sensor dependant)

Oil refining & petrochemical

The requirements for gas detectors are similar to those of offshore installations; however a wider variety of flammable and toxic gas sensors are required to detect hazards as the crude oil is processed into other products. Fixed-point detectors may need to communicate with control systems via addressable networks (eg Modbus) rather than simply via 4-20mA. HART communications is widely required for compatibility with hand-held communicators and Asset Management Systems. Flammable gas/vapour detectors are required for monitoring around pipes, storage tanks and filling processes. Flammable, toxic and oxygen gas detection is required within analyser shelters and laboratories. Hydrogen detectors are required to monitor emergency power battery rooms where the highly flammable gas is generated from the battery charging process.

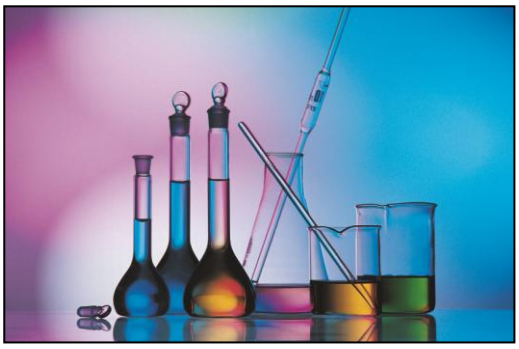
Fearsomely toxic and corrosive hydrogen fluoride (HF) gas may be used as a catalyst for the production of gasoline blending components. Staff working within the HF area will have to work in full chemical suits and the XgardIQ removable, hot-swappable, pre-calibrated sensor module removes the need to calibrate in-situ and thus minimises the time operators must spend in this potentially hazardous area.

XgardIQ complies with the general needs of this market:

- 316 Stainless Steel construction
- IEC 61508 SIL 2 compliance
- Full range of flammable and toxic gas sensors
- Removable, hot-swap, pre-calibrated sensor modules.
- RS-485 Modbus and HART communications
- Display with non-intrusive calibration
- ATEX & IECEx Zone 1 & 2 approval
- Operation from -40°C to +75°C

Chemical

Chemical plants present a diverse range of combustible and toxic gas hazards. The safety-critical applications require highly dependable detectors with a long operating life. Minimising the need for operators to enter hazardous areas is a key requirement: the ability to quickly remove the sensor module for calibration in a safe area such as a laboratory and re-insert without the need for a hot-work permit is a key benefit for this market.



Application examples:

Ammonia (NH_3) detection in fertiliser plants.

Chlorine (Cl_2) detection in PVC production plants and where it is used for sterilization processes.

Ethylene Oxide (EtO or EO) is used in the production of solvents, antifreeze, textiles, detergents, adhesives, polyurethane foam, and pharmaceuticals. It is also used as a powerful sterilizing agent.

Hydrogen Chloride (HCl) is used in the manufacture of industrial chemicals, fertilizers and dyes. It is also used to treat synthetic rubber and in metal processing treatments.

XgardIQ can be used to monitor for flammable and toxic gas leaks in laboratories and analyser shelters where chemicals are analysed. Nitrogen leaks can also pose a significant oxygen depletion risk in these shelters.

Butane detection is required where it is used as a propellant in aerosols or in cylinders on production lines. Methane detection is required in boiler rooms.

Gas storage and distribution

Point-type hydrocarbon detectors are used in combination with open-path IR detectors (OPIR) to monitor leaks from storage tanks, valve racks and pipelines. Point-type detectors with fast response are required for leak detection in gas compressor stations.

Open-path IR detectors are installed on fence-lines to detect gas clouds escaping from sites into the local environment.

H_2S detectors are required on 'gas sweetening' plants where the highly toxic and corrosive hydrogen sulphide gas is removed from 'sour' natural gas

Power generation

Where natural gas is used to generate power there is a real risk of leaks occurring around the pipe-work and burners at the front of the boiler. High integrity methane detectors that respond to leaks rapidly are required for monitoring boiler fronts, gas burners and the associated pipelines carrying natural gas.

Carbon monoxide presents a constant toxic threat to workers in all types of power station and thus rugged CO detectors are required to monitor many areas of the power station.

Areas around the boilers and burners may be very hot and thus XgardIQ and IRmax's ability to operate in environments up to 75°C is very important for this market.

Gas turbines consume large quantities of natural gas and run at very high temperatures. Flammable gas detection is required around the valves, in the load compartment, exhaust ducts and gas compressor compartment.

Steel Production

Due to the large number of processes involving burning of fossil fuels in steel making, it is essential that personnel are protected against carbon monoxide, sulphur dioxide and nitrogen dioxide poisoning in many areas of the plant including blast furnaces, power plant and coke ovens. Due to the use of nitrogen (N_2) and argon (Ar) in the BOS (Basic Oxygen Steel) plant and secondary steel making plants, oxygen monitors are also needed.

Carbon monoxide (CO) detectors are sometimes used in process areas to provide an early fire warning, large amounts of CO is produced as the coal/coke begins to smoulder.

In addition to process areas, offices and canteens and locker rooms should be monitored for toxic gas ingress.

Conditions within steel plants tend to be extreme with very high temperatures, high levels of gas, and soot deposits from coal/coke. XgardIQ's rugged design makes it ideal for these applications.

Clean water and Waste water

Methane, hydrogen sulphide and oxygen depletion present significant risks within waste water (sewage) treatment facilities.

Typical applications include methane, H_2S and oxygen monitoring in process areas, dry wells, sludge press houses, deodoriser plants, and ventilation ducts. Flammable vapour monitoring within wet-wells provides a challenging environment for which Crowcon has specialist accessories.

Highly toxic gases such as chlorine (Cl_2), ozone (O_3), sulphur dioxide (SO_2) and chlorine dioxide (ClO_2) are used for disinfecting drinking water. These chemicals are stored in cylinders within water treatment facilities which are often un-manned and within residential environments.

XgardIQ will be available to detect all of these gases and when installed with the optional relay module, will be capable of triggering external warning 'status lights' without needing a separate control system.

Sales Platform

XgardIQ complements IRmax and Spectrex OPIR and Flame detectors to provide premium gas detection solutions for safety critical applications in the most challenging environments.

XgardIQ offers powerful features that help to minimise the time that operators must spend in the hazardous area performing routine maintenance functions. Sensor modules can be simply and quickly “hot-swapped” without a hot-work permit either for replacement with a new pre-calibrated replacement module, or for temporary removal to a safe area for calibration. Engineers thus avoid the need to carry compressed gas cylinders on-site and the sensor module can be tested and calibrated in the safety of a laboratory. Temperature compensation algorithms stored in the sensor module ensure repeatable performance even if outside ambient conditions vary greatly from laboratory temperature.

Users have the option to perform a quick and simple bump test rather than full calibration to verify that sensors are fully operational. Using the ‘Speedy Bump’ and ‘Smart Bump’ options, users can perform interim safety checks in minimal time, and using the minimum amount of gas.

XgardIQ utilises buttons and a bright OLED (organic light emitting diode) display rather than conventional magnets and LCD’s for configuration and adjustments. The OLED display enables status checking at a glance and from a distance; whilst the use of buttons avoids the risk of special tools (eg magnets) being lost and thus resulting in aborted calibration attempts.

Features and benefits

OLED display: the brightly illuminated “organic light emitting diode” display clearly indicates the gas level, operating status and provides comprehensive menus for set-up and diagnosis. In low ambient light conditions, such as a dark room, the OLED display achieves a much higher contrast ratio than an LCD used on conventional gas detectors.

Universal transmitter: compatible with Crowcon’s full range of sensor technologies, XgardIQ provides the versatile solution for any gas hazard and minimizes training, maintenance and spares-holding requirements.

Auto-sense function: XgardIQ automatically detects whether the control system is a 4-20mA current sink or source and sets itself appropriately. This feature eliminates the risk of being incorrectly set, saving time and reducing faults during installation and commissioning.

Hot-swap sensor modules: sensor modules can be removed and replaced or re-fitted using one hand without the need for a hot-work permit in hazardous areas, or any special tools.

Auto-configure function: XgardIQ detects when a sensor module is plugged-in and uploads the appropriate gas type, range, units and alarm levels. Pre-set configurations can of course be retained within the transmitter if preferred.

Un-configured transmitters without a pre-fitted sensor module can be stocked for spares or re-sale purposes. The transmitter reads the configuration from the pre-calibrated sensor module when plugged-in and thus auto-configures to settings appropriate to the installed pellistor, IR, toxic or oxygen sensor.

XgardIQ without sensor: Where the XgardIQ is to be installed potentially months ahead of scheduled commissioning, it can be supplied without a sensor module. This avoids the possibility of the sensor being poisoned or expiring whilst inactive. Pre-calibrated sensor modules can be delivered and installed prior to commissioning.

Sensor range selection: the full-scale range of the sensor can be easily selected by the user. For example a CO sensor with a maximum range of 0-1000ppm can be set to 0-250ppm range at the press of a button. This reduces the variants of spare modules, and provides excellent flexibility for differing applications.

Smart and Speedy bump test functions: enable the sensor response to be tested and verified with gas by following a simple on-screen procedure. Successful bump tests are stored in the event log so that compliance can be demonstrated at a later date.

Calibration due warning: XgardIQ automatically reminds the user that calibration is due, and will produce a warning or fault signal if a full calibration is not performed by a specified date.

Non-intrusive calibration: zero and calibration functions (plus any tests and adjustments) are performed via the display and keypad, without the need for a hot-work permit or any special tools (eg no magnetic wand required).

+ve Safety indicator: confirms the detector is operating safely and warns of any events that might compromise detector or sensor performance (eg the ambient temperature having exceeded sensor limits).

Event log function: stores all alarm, fault and maintenance events to provide a history of gas alarms and detector usage. Can be viewed on-screen or uploaded to a PC using DetectorsPC software.

Addressable communications: up to 32 XgardIQ detectors can be connected on an addressable network using RS-485 Modbus or the HART communications protocol. This option significantly reduces cable and installation costs.

Crowcon's Energy Market Solutions

Oil and gas production facilities, oil refineries, petrochemical plants, gas storage sites and gas distribution pipelines are often located in harsh environments. Site operators need high integrity, highly reliable products that provide dependable performance for many years whilst continuously exposed to salt-spray, direct sunlight, high humidity, sand etc. Crowcon's fixed product range is designed to meet specifications demanded by end-users, and crucially to comply with 'EPC' (Engineering, Procurement and Construction) project specifications.

Safety instrument requirements for energy market projects typically comprise products as described on the following page. EPC's and end-users usually prefer to purchase all types of instrument from a single vendor: Crowcon is able to offer a comprehensive portfolio of products.

In addition to the basic functions expected of a gas or fire detectors, additional requirements for safety-critical applications in these markets are:

- IEC61508 SIL 2 compliance: this demonstrates the reliability and integrity of the product and enables the integrator to incorporate the instrument into a 'Safety Instrumented System'.
- HART communications: analogue 4-20mA signals remains the instrument signaling method of choice where dependability is paramount, however the addition of HART communications enables a much greater level of diagnostic information to be obtained from the instrument. Instruments providing HART communications can be readily integrated into customers' Asset Management Systems (AMS) and can be maintained using industry-standard HART portable communicators.
- Stainless steel construction: gas and fire detectors are expected to remain in service for a minimum of 10 years (and in many cases more than 20 years). Devices constructed using 316 stainless steel are most able to withstand the corrosive effects of atmospheres containing high levels of salt and/or corrosive gases such as H_2S.

Requirement	Application examples	Crowcon solution
Hydrocarbon point-type detectors 	Localised detection around pipe/vessel flanges, valves etc or in confined areas. Methane leaks from oil and gas drilling operations (conventional or shale gas operations). Methane leaks from oil and gas production activities. Hydrocarbon leaks from pipes and vessels. Hydrocarbon detection within air intake ducts. Fuel leak detection from fuel storage vessels. Methane leaks from gas turbines.	**IRmax infrared hydrocarbon detector** **Value proposition:** **Remote display and diagnostics:** the versatile IR Display accessory enables information such as gas level, obscuration level and status information to be viewed remotely from detectors installed in inaccessible locations. This removes the need for expensive scaffolding or cherry pickers for routine maintenance. **Lowest power consumption in class:** XgardIQ consumes less than 1 Watt; 75% lower than typical IR gas detectors, reducing energy costs and minimizing UPS/battery back-up system size. **Compact size:** XgardIQ is the smallest and lightest detector in its class simplifying transportation, installation and placing less stress on mobile/floating infrastructure.
H_2S point-type detectors 	H_2S leaks from oil and gas drilling operations ('sour' sites), shale shaker areas etc. H_2S leaks from oil and gas production activities in 'sour' sites. H_2S leaks from pipes and vessels within production areas, refineries and petrochemical sites.H_2S detection within air intake ducts. H_2S detection within sour gas sweetening plants.	**XgardIQ: intelligent gas detector and transmitter** **Value proposition:** **Universal transmitter:** compatible with Crowcon's full range of sensor technologies XgardIQ minimizes training, maintenance and spares-holding requirements. **Hot-swap sensor modules:** sensor modules can be removed and replaced or re-fitted using one hand in hazardous areas without the need for a hot-work permit

Oxygen and other toxic gas detectors	Toxic gas detection and oxygen depletion monitoring (through nitrogen leaks) in analyser shelters. Oxygen depletion is laboratories where nitrogen, CO_2, argon, helium etc may be stored/ used. Oxygen depletion in platform legs and vessels.	or any special tools. **Auto-configure function:** XgardIQ detects when a sensor module is plugged-in and uploads the appropriate gas type, range, units and alarm levels, eliminating the risk of incorrect settings. **Smart and Speedy bump test functions:** enable the sensor response to be tested and verified in minimum time. Successful bump tests are stored in the event log so that compliance can be demonstrated at a later date. **+ve Safety indicator**: confirms the detector is operating safely and warns of any events that might compromise detector or sensor performance (for example the ambient temperature having exceeded sensor limits).
Hydrogen point-type detectors	Hydrogen accumulation from power back-up battery charging operations (battery rooms).	
Open path IR hydrocarbon gas detectors 	Where wide area coverage is needed. Fence-line monitoring to detect gas cloud escapes from an installation. Across valve racks on petrochemical plants. Detecting hydrocarbons within air ducts. Gas leaks from pipelines. Monitoring around LNG/LPG storage tanks.	**SafEye OPIR gas detectors** **Up to 200 metre detection range** **316 stainless steel construction** **Built in event recorder**: real time record of the last 100 events **Heated optics** to prevent window-fogging in condensing atmospheres. **Multiple output options** for maximum flexibility and compatibility: 4-20mA, HART Communications, RS-485, Modbus Compatible **High reliability:** MTBF* minimum 100,000 hours

		IEC61508 SIL2 approved **User programmable:** via HART or RS-485 **3-Year warranty** (10 years for the Flash-Source) **ATEX/IECEx, FM, CSA, GOST-R approvals**
UV/IR & IR3 Flame detectors 	Offshore platforms and FPSOs, onshore oil refineries, processing plants, pipelines, storage farms and LPG/LNG plants all utilize or produce a wide range of hazardous flammable liquids and gases that pose a significant fire risk.	**SharpEye flame detectors** **Multi spectrum designs** for long distance detection and high false alarm immunity. **Aluminium or 316 stainless steel option** **Automatic and Manual Built-In-Test** (BIT) to assure continued reliable operation. **Heated window** for operation in harsh weather conditions (snow, ice, condensation). **Multiple output options** for maximum flexibility and compatibility: 4-20mA, Relays, HART Communications, RS-485, Modbus Compatible **High reliability** – MTBF* - minimum 150,000 hours **IEC61508 SIL2 approved** **5-Year warranty** **ATEX/IECEx, FM, CSA, GOST-R, MED approvals** *MTBF: Mean Time Between Failures

Smoke and heat detectors 	Oil and gas facilities present particularly challenging environments where the risk of explosion has to be taken into account. Smoke detection is required within buildings generally, whilst heat detectors are required to protect machinery such as compressors and generators.	**Apollo and Hochiki safe area and I.S. smoke/heat detectors** Crowcon can supply a wide range of conventional and addressable devices for safe areas, or 'intrinsically safe' models which are suitable for use in hazardous areas.
Manual call points 	Manual alarm call points enable alarms to be activated when personnel become aware of a fire or emergency condition. Call points may be activated by pressing a button or breaking a glass seal.	Safe area and Ex certified call points can be supplied at competitive prices from leading manufacturers such as **e2s and MEDC.**
Sounders and beacons 	Audible alarms (sounders, sirens or hooters) and visual alarms (beacons) are used throughout industrial plants. Alarms are used from local areas/rooms to warn of gas and fire hazards through to site-wide evacuation alarms. Status lights linked to gas detectors are used to indicate when it is safe to enter a potentially dangerous area.	Safe area and Ex certified alarms can be supplied at competitive prices from leading manufacturers such as **Klaxon**, **e2s and MEDC.**

Control systems     	Gas and fire detectors will be connected to a control system usually located in a safe area such as a plant room or control room. The control system displays the gas detector signals (gas concentrations) are will have alarm thresholds set for activating alarms and/or shutting-down gas supplies or processes. Control systems may be entirely centralised using an industrial controller such as a DCS or PLC system, or may utilise specific fire and gas panels located within specific areas. Some areas such as cranes on offshore platforms and analyser shelters on refineries and petrochemical sites are classified as hazardous areas and therefore require Ex certified control system for local control.	**Gasmaster, Gasmonitor and Vortex modular control systems** Crowcon's control panels have extensive proven track records in oil and gas, petrochemical and power generation applications. **Gasmaster** features a large display showing complete status of up to four gas detectors at a glance. **Gasmonitor** is our 19" rack-based limitlessly expandable control system featuring individual input modules/display per detector. **Vortex** is a modular system for up to twelve detectors per panel offering programmable relays and Modbus communications. **Vortex Flameproof** is an Exd certified control system suitable for use in Zone 1 or 2 hazardous areas.

Where gas is stored or transported under pressure there may also be a requirement for 'acoustic' (otherwise know as 'ultrasonic' leak detection). Crowcon can offer detectors from market-leading manufacturers to meet such demands where necessary.

Accessing Energy Markets

XgardIQ and the supporting products listed in the previous section are designed for industrial applications where a premium price can be commanded for high integrity products.

Target applications include oil and gas production facilities (onshore and offshore), petrochemical plants, chemical plants etc. End users will typically be oil and gas 'giants' such as Shell, ExxonMobil, Petronas etc as well as smaller regional operators. These companies may purchase directly, but often outsource procurement to 'EPC's (Engineering, Procurement & Construction contractors).

These markets are heavily reliant on instrument specifications which are defined by the end users or by the EPC's. Compliance with the technical detail of these specifications is critical, and XgardIQ has been specified to comply with the majority from target customers.

ZAKUM DEVELOPMENT COMPANY (ZADCO)
SATAH FULL FIELD DEVELOPMENT PROJECT
PROJECT NO. P-7218
DATASHEET FOR H2S GAS DETECTOR

Proj.	Doc.	Unit	Disc	Seq.	Rev.	F
P7218	DS	WHP-01	J	6050	Page	8 of 9

GENERAL	1	Tag Number		SEE LIST[W01-YTGD -0201]
	2	Quantity		14 NOS.
	3	Service Description		SEE LIST
	4	Location / Platform		SEE LIST
	5	Fire Zone		SEE LIST
	6	Area Classification		ZONE 1, GAS GR. IIB, TEMP. CLASS T3
DESIGN DATA	7	Operating Method		SOLID-STATE MOS CONTINUOUS ADSORPTION DIFFUSION TYPE
	8	Sensitivity		VTA
	9	Detection Range / Field View		0 - 25 ppm H2S (NOTE 7)
	10	Response Time		T50 < 30s
	11	Start-up Time		VTA
	12	Self Test / Fault Alarm		POWER ON (NOTE 1)
	13	Calibration		H2S (NOTE 2 & 3)
	14	Signal Type		3-WIRE, 4-20 mA SIGNAL
	15	Supply Voltage / Tolerance		24V DC
	16	Power Consumption		< 5 WATTS (VTA)
	17	Accuracy		+/- 2 PPM
	18	Connection Type		N/A
	19	Vibration Tolerance		SHALL MEET THE VIBRATION TOLERANCE REQ. OF BS 6020 PT.4
	20	3-Wire Bridge Interface Option		N/A
	21	Enclosure Material		SS 316 (PAINTED)
	22	Finish		VTA
	23	Approx. Dimensions		VTA
	24	Fastening / Screws		VTA
	25	Mounting		DIRECT MOUNTED AT VENDORS MOUNTING BRACKET
	26	Cable Entry		2 NOS. OF ISO M20X1.5 (NOTE 4)
	27	Terminals		SCREW CLAMP TERMINALS SUITABLE FOR UP TO 2.5 mm2 CORE
	28	Indication		STATUS INDICATION LED
	29	Operating Temperature °C		3 - 48
	30	Operating Humidity %RH		0 - 98
	31	Max. / Min. Air Velocity m/s		48
	32	RFI Immunity		AS PER IEC 61000
	33	Poison Resistance		VTA
	34	Hazardous Area Certification		EE xd
	35	IP Rating		IP 66
ACCESSORIES	36	Weather Protection Cover		REQUIRED
	37	Sample Flow Housing		NOTE 2
	38	Mounting Brackets		REQUIRED
	39	Junction Box		REQUIRED
	40	Quantity		14 NOS.
	41			
PURCHASE	42	Manufacturer		VTA
	43	Model No. / Weight kg		VTA / VTA
	44			

NOTES: REFER GENERAL NOTES ON SHEET 3.
1. EACH DETECTOR SHALL HAVE INTEGRAL MICROPROCESSOR BASED SELF TEST FACILITY, INCLUDING A FAULT ALARM FOR LENS OBSCURATION. EACH DETECTOR SHALL HAVE TWO INTEGRAL LED INDICATORS, ONE TO SIGNAL A FAULT CONDITION AND THE OTHER TO SIGNAL AN ALARM CONDITION.
2. VENDOR SHALL PROVIDE CALIBRATION KIT AND ACCESSORIES SUCH AS TEST GAS CYLINDER, CALIBRATION BOTTLE, QUICK CONNECTIONS (ADAPTERS) FOR CALIBRATION, PRESSURE REDUCER, FLOW DEVICE, END CAP, PAN & TILT, SUN SHADES, DUST BARRIERS/FILTERS ETC.
3. REMOTE CALIBRATION FACILITIES (WITH ALL NECESSARY ACCESSORIES) SHALL BE PROVIDED FOR ALL TOXIC (H2S) GAS DETECTORS INSTALLED AT INACCESSIBLE LOCATION.
4. SPARE CABLE ENTRY SHALL BE PLUGGED USING SUITABLE EE xd CERTIFIED PLUG.
5. VENDOR SHALL SUPPLY GAS PORTABLE CALIBRATOR CONTAINING THE SPECIFIED ppm VALUE OF H2S.
6. VENDOR SHALL SUPPLY DUST GUARD WITH SCREEN AND SPLASH GUARD FOR DEFLECTING WATER SPRAY.
7. HIGH ALARM : 10 ppm AND HIGH HIGH ALARM : 20 ppm.
8. THE GAS DETECTORS TRANSMITTER HOUSING SHALL BE FURNISHED WITH LOCAL DISPLAY LCD.

Example Instrument Specification Sheet

Identifying the influencers within the oil and gas companies and EPC's is crucial to success. Crowcon's experienced team of sales managers and distributors now have a comprehensive portfolio of products to promote for projects in key geographic areas.

Of course succeeding in these markets also requires the vendor to be acceptable to the customer. Typical vendor requirements:

- An established manufacturer/supplier with a proven track-record in relevant markets.
- A single vendor should be able to provide all of the instrument types required for a project.
- The vendor must be able to supply instrument reference lists proving a track record in related applications.
- Demonstrable compliance and implementation of robust quality systems (eg ISO9001).
- Commercial ability to accept payment through Open Credit, Letter of Credit, to negotiate Performance Bond Guarantees, Advance Payment Guarantees, Warranty Bonds Liquidated Damages, Delay Damages etc.
- Contractual agreements may be required to be covered by group company guarantees (whereby a related third-party guarantees vendor performance).
- Covered by Product Liability, Public Liability, Professional Indemnity insurances.
- Vendor registration (EPC, end-user or both) may be necessary in order to qualify to bid on projects.
- Able to provide supporting documents/information on award of an order (Quality Plan, FAT/SAT Procedure, Project Schedule, Bill of Materials, Instrument Datasheets, Hazloc certificates etc).
- Be able to provide comprehensive on-site support during commissioning and the operating life on the equipment.
- In addition to product and accessory pricing, customers may require information on life-time costs (cost of calibration gases, spare parts etc) and extended warranty costs to enable the end-user to budget for a extended period of operation (eg 10 years).

Ordering Information

Product codes:

XgardIQ product codes are compiled by selecting the required product options using the table below or the configurator tool on the Crowcon website. The XgardIQ transmitter and required sensor module must be ordered as separate line items.

XgardIQ Transmitter:

	Sensor Module		Enclosure Type		Certification		HART Communications		Output Options		Language	
	Description	Code	Description	Code	Description	Code	Description	Code	Description	Code	Description	Code
XIQ -		ZZ -	Stainless Steel M20	S1 -	ATEX/IECEx	011 -	No HART comms	Z -	No Relays	Z -	English	A
			Xgard IQ Stainless Steel 1/2" NPT	S2			HART Comms Enabled	H	With Relay Module	R	French	C
											Dutch	D
											German	E
											Polish	F
											Italian	G
											Spanish	H

XgardIQ Sensor Modules:

XIQ-IG	CO sensor module (0-250ppm)
XIQ-AH	CO sensor module (0-500ppm)
XIQ-LJ	CO sensor module (0-1000ppm)
XIQ-AV	HF sensor module (0-10ppm)
XIQ-II	H_2S sensor module (Electrochem, 0-25ppm)
XIQ-IL	H_2S sensor module (Electrochem, 0-50ppm)
XIQ-AI	H_2S sensor module (Electrochem, 0-100ppm)
XIQ-IN	H_2S sensor module (Electrochem, 0-200ppm)
XIQ-AG	Oxygen sensor module (0-25%, 2-year life)
XIQ-AF	Hydrogen sensor module (pellistor)
XIQ-AA	Methane sensor module (pellistor)
XIQ-AB	Propane sensor module (pellistor)

Example:

The product code for a transmitter in a stainless steel enclosure with M20 cable entries, ATEX/IECEx certification, HART communications, relay module and the display/manual in English would be: **XIQ-ZZ-S1-011-H-R-A**.

The product code for a 0-500ppm CO sensor module (for example) would be: **ZIQ-AH**.

Price list format:

The total price is calculated by summing the required options from the tables within the price list. For example a detector with the specification described in the example above would comprise:

XgardIQ transmitter in stainless steel enclosure price + HART price + relay module price.

Plus: CO sensor module price as a separate line on the order.

Notes:

Sensor modules will be supplied in a separate carton (packed within the main XgardIQ carton if ordered with the transmitter).

XgardIQ detectors ordered without a sensor module will be delivered with a dummy sensor module which should be inserted if the detector is installed ahead of commissioning to maintain the ingress protection of the enclosure.

XgardIQ Transmitter Configuration

The XgardIQ transmitter will be delivered without pre-set sensor configuration. Only relay module (if fitted) and Modbus defaults will be set (Alarm relays: de-energised/latching, Fault relay: energised/latching, no relay on/off delays Modbus address 1).

The sensor configuration (gas type, range, alarm levels, bump test/calibration dates) will be uploaded from the sensor module when it is first inserted and will then be stored within the transmitter.

The transmitter will accept any sensor module (ie any gas type) on first insertion, but once the configuration has been uploaded the transmitter will subsequently only accept sensor modules of the same gas type. This is a safety feature to prevent sensor modules for incorrect gas types being fitted on-site.

Accessories

Calibration Cap
Enables calibration gas to be applied to the sensor.

Splash Guard
Protects the sensor from water.

Flow Adaptor
For gas sampling applications.

Sensor Module
Smart module can be supplied with the transmitter or as a spare.

Dummy Sensor Module
Maintains the IP rating of the transmitter when no sensor module is installed.

Relay Module
A1, A2, Fault relays can be supplied with the transmitter or fitted at any time.

Calibration Station
For calibrating sensor modules away from the XgardIQ transmitter.

PC Comms Kit
For calibrating sensor modules away from the XgardIQ transmitter.

Accessories (continued)

Collector Cone
Aids detection of lighter than air gases such as methane and hydrogen.

Sun Shade
Protects the detector from elevated temperatures due to direct sunlight.

Pipe Mounting Kit
Enables XgardIQ to be mounted to a 2” (50mm) pipe.

Dust Filter
Self-adhesive filter to protect the sensor in very dusty environments.

Sensor Module Removal Tool
Lever simplifies sensor module removal.

Specifications

Size	XgardIQ transmitter	H278 x W140 x D89mm (10.9 x 5.5 x 3.5 inches)
Weight	XgardIQ transmitter	4.1Kg (9lbs)
Enclosure material		316 stainless steel
Ingress protection		IP66
Connection		Three M20 or ½"NPT cable gland entries. Certified, removable plugs are fitted to left-hand and lower right-hand entries
Power		14-30Vdc. <4W
Display	Main display	OLED 128 x 64 pixels, yellow text on black background
	Indicators	Amber, Red and Green LED's for detector status Blue +ve Safety LED
Electrical output		4-20mA current sink or source (Auto-Sense or manual selection) Warning and fault signals are configurable. NAMUR NE 43 compliant
		RS-485 Modbus RTU
		HART 7 over 4-20mA signal and via local I.S. test points (optional)
		Foundation Fieldbus (option pending, contact Crowcon)
	Relays (optional)	Alarm 1, Alarm 2, Fault SPCO contacts rated 5A, 230Vac
	Relay configuration options	Energised or de-energised Latching or non-latching. Rising or falling. Configurable On and Off delays on alarm relays.
Event logging		Records alarm, fault and maintenance events. Events can be viewed on-screen and downloaded to a PC.
Operating temperature		Transmitter only: -40°C to +75°C (-40°F to 167°F)†
Humidity		Transmitter only: 0 to 95% RH non-condensing
Repeatability		+/- 2% FSD
Zero drift		+/- 2% FSD per year maximum
Response time		Sensor dependant: contact Crowcon for specific sensor data.
Performance	Designed for compliance with:	EN60079-29-1 (flammable gas sensors)*
		EN50104 (oxygen sensors)*
		EN45544 (toxic gas sensors)*
Functional safety		IEC61508, EN50402 SIL 2*
Approvals		⟨Ex⟩ ATEX and IECEx Ex II 2 G Ex db ia IIC T4 Gb (-40 to +75°C)
EMC Compliance		EN50270:2015 FCC CFR47 Part 15B ICES-003

† Note: sensor operating temperature and humidity limits vary widely. Contact Crowcon for specific sensor data.
* Features outstanding at the time of issue, contact Crowcon for details.

Competitor Comparisons

Key selling propositions

XgardIQ Feature	Benefit	Comment on Honeywell XNX	Comment on MSA Ultima XE	Comment on Scott Meridian	Comment on NET Safety Millenium II	Comment on Dettronics FlexVu	Comment on Drager Polytron 8000
+ve Safety	Highly visible blue LED clearly indicates the detector is working safely and flashes when detector integrity may be compromised.	Relies on a conventional Fault LED and LCD screen icons which may not be recognized by operators. Conveys two states only: 'healthy' or 'in fault'.	Provides only a conventional Fault LED with LCD screen messages. Conveys two states only: 'healthy' or 'in fault'.	Provides only a conventional Fault LED with LCD screen messages. Conveys two states only: 'healthy' or 'in fault'.	Provides only a conventional Fault LED with OLED screen messages. Conveys two states only: 'healthy' or 'in fault'.	Provides only a conventional Fault LED with LCD screen messages. Conveys two states only: 'healthy' or 'in fault'.	Provides only a conventional Fault LED with LCD screen messages. Conveys two states only: 'healthy' or 'in fault'.
Push-button operation	XgardIQ status information and calibration functions are performed without requiring a special tool. This eliminates potential down-time due to lost tools.	Requires a magnetic wand which may become lost. Users would then not be able to interrogate or calibrate the detector in a hazardous area.	Requires an expensive IR remote control which may become lost. Users would then not be able to interrogate or calibrate the detector in a hazardous area.	Requires a magnetic wand which may become lost. Users would then not be able to interrogate or calibrate the detector in a hazardous area.	Requires a magnetic wand which may become lost. Users would then not be able to interrogate or calibrate the detector in a hazardous area.	Requires a magnetic wand which may become lost. Users would then not be able to interrogate or calibrate the detector in a hazardous area.	Requires a magnetic wand which may become lost. Users would then not be able to interrogate or calibrate the detector in a hazardous area.

Competitor Comparisons

Key selling propositions (continued)

XgardIQ Feature	Benefit	Comment on Honeywell XNX	Comment on MSA Ultima XE	Comment on Scott Meridian	Comment on NET Safety Millenium II	Comment on Dettronics FlexVu	Comment on Drager Polytron 8000
OLED display	Highly visible, self-illuminating display is easy to read from long distances and extreme angles.	LCD display is far less easy to read than XgardIQ's OLED display.	LCD display is far less easy to read than XgardIQ's OLED display.	LCD display is far less easy to read than XgardIQ's OLED display.	Also uses an OLED display but is not as bright as XgardIQ's black-on-yellow screen. Display is also placed behind flameproof glass.	LCD display is far less easy to read than XgardIQ's OLED display.	LCD display is far less easy to read than XgardIQ's OLED display.
One-hand, hot-swap sensor modules	Makes sensor replacement simple and minimises the time an operator has to spend in the hazardous area.	Only toxic sensors (not flammable) are hot-swappable in a hazardous area. Sensor module requires more time-consuming disassembly than XgardIQ.	Only e'chem and pellistor sensors are hot-swappable in a hazardous area. Sensor module requires more time-consuming disassembly.	Similar concept to XgardIQ. Focus on the XgardIQ auto-configure function and how quickly and simply the configuration is uploaded.	Sensors are not hot-swappable: requires a hot-work permit and is thus a far more onerous and time-consuming procedure.	Sensor module requires more time-consuming disassembly than XgardIQ.	Sensors are not hot-swappable: requires a hot-work permit and is thus a far more onerous and time-consuming procedure.
Low power consumption.	Power consumption typically of <4 Watts requires smaller PSU's and battery systems saving purchase and energy costs.	Power: 6.2 Watts (toxic) 6.5 Watts (flam) 9.7 Watts (IR)	Power consumption of the flammable gas version is 10.8 Watts!	5.8 Watt power consumption with heated display.	2.4 Watts (varies according to sensor).	Power consumption is 7.2 Watts with internal heater activated.	2.4 Watts (100mA) maximum with relays and remote sensor.

Competitor Comparisons

Key selling propositions (continued)

XgardIQ Feature	Benefit	Comment on Honeywell XNX	Comment on MSA Ultima XE	Comment on Scott Meridian	Comment on NET Safety Millenium II	Comment on Dettronics FlexVu	Comment on Drager Polytron 8000
Auto-Sense function	XgardIQ automatically configures the 4-20mA signal to sink/source. Saves time and avoids faults on installations.	Must be manually set using an internal switch and thus requires knowledge of control system configuration.	3-wire version is current source only? Incompatible with control systems set as current source.	Must be manually set and thus requires knowledge of control system configuration.	Must be manually set and thus requires knowledge of control system configuration.	Must be manually set and thus requires knowledge of control system configuration.	Drager also have an auto-sense function.

Competitor Comparisons

General comments

Comment on Honeywell XNX	Comment on MSA Ultima XE	Comment on Scott Meridian	Comment on Emerson/NET Safety Millenium II	Comment on Dettronics FlexVu	Comment on Drager Polytron 8000
					
The transmitter is not truly universal: there are different modules for compatibility with electrochemical, pellistor or IR sensors. The remote sensor option requires cable connection using conventional glands and cable: far more time consuming and expensive to install that XgardIQ's pre-formed remote sensor cables.	I.S. infrared remote control for calibration and adjustments. The remote sensor option requires cable connection using conventional glands and cable: far more time consuming and expensive to install that XgardIQ's pre-formed remote sensor cables.	Only available with ¾"NPT cable entries as standard (M20 is only available using gland adaptors).	A second sensor can be fitted to the transmitter (eg a HC and H_2S sensor can be fitted to one transmitter). includes datalogging facility. Only supports H_2S and NH_3 toxic gases. IR sensor has a "flame arrestor beam protector"; assume the product must utilise a sinter and thus will have a comparatively slow response time.	Incorporates GTX transmitter and GTS sensor module, can be combined with FlexVu display. Very low operating temperature range achieved using a thermostatically controlled heater which increases power consumption significantly (7.2 Watts).	The transmitter is not universal: there are different models for different sensors. Profibus communications available as an option. Enclosure hinges open.

Standard Product References

Product name:

XgardIQ Intelligent gas detector and transmitter

Important note: our trademark stipulates that the ‘IQ’ cannot be separated by space from ‘Xgard’ and that we cannot promote the product quoting ‘IQ’ in isolation. Hence only “XgardIQ” as shown may be used when referring to, or promoting the product.

Product description:

XgardIQ is an intelligent and versatile gas detector and transmitter compatible with Crowcon’s full range of sensor technologies. XgardIQ is available fitted with a variety of flammable, toxic or oxygen gas sensors and provides a bright OLED display with clear and comprehensive status information in a range of languages.

Bright LED’s indicate detector status at a glance; the unique +ve Safety LED confirms the detector is operating safely and alerts operators to any irregular events that may affect product integrity such as the ambient temperature exceeding sensor limits.

XgardIQ provides comprehensive and powerful output signal options. Analogue 4-20mA signal with auto-sink/source detection feature, and RS-485 Modbus communications are provided as standard. Alarm and fault relays featuring heavy-duty change-over contacts rated 230Vac 5A are available at purchase, or may be added at any time after installation. HART communications can be provided both over the analogue signal and via local I.S. terminals for diagnostics using any HART asset management system or hand-held device.

XgardIQ minimises the time personnel spend in potentially hazardous locations by using simple hot-swappable sensor modules. Sensors can either be bump tested/calibrated in-situ or removed in seconds using one hand and either replaced with a pre-calibrated sensor module or re-calibrated in a safe area before being re-fitted. All functions and adjustments can be made via the integral keypad without the need for special tools or hot-work permits.

ATEX and IECEx certified for use in Zone 1 and Zone 2 hazardous areas, XgardIQ has been designed for long-life operation in extreme environments. Featuring rugged 316 stainless steel construction and a wide operating temperature range from -40°C to +75°C, XgardIQ is suitable for the most demanding applications.

Quote text:

XgardIQ is an intelligent and versatile gas detector and transmitter compatible with Crowcon’s full range of sensor technologies. XgardIQ is available fitted with a variety of flammable, toxic or oxygen gas sensors.

Providing analogue 4-20mA and RS-485 Modbus signals as standard, XgardIQ is optionally available with Alarm and Fault relays and HART communications.

The 316 stainless steel enclosure is available with three M20 or ½”NPT cable entries

UK 172 Brook Drive I Milton Park I Abingdon I Oxfordshire OX14 4SD I +44 (0)1235 557700 I sales@crowcon.com

US 1455 Jamike Avenue, Suite 100 I Erlanger I Kentucky 41018 I +1 800 527 6926 I salesusa@crowcon.com

NL Vlambloem 129 I 3068JG I Rotterdam I +31 10 421 1232 I eu@crowcon.com

SG Block 194 Pandan Loop I #06-20 Pantech Industrial Complex I Singapore 128383 I +65 6745 2936 I sales@crowcon.com.sg

CN Unit 316, Area 1 I Tower B I Chuangxin Building I Hongda North Road I Beijing Economic Technological Development Area Beijing, China 100176 I Tel +86 10 6787 0335 I saleschina@crowcon.com