





## 2.0 Electrical requirements

- 2.1 Operating Voltage – The transmitter shall operate between 18VDC and 32VDC (24VDC Nominal).
- 2.2 The transmitter shall utilize removable terminals for sensor input, power, and output wiring. Terminals shall be labeled and provide a minimum of two inputs per polarized wire connections to allow for daisy chain power configuration.
- 2.3 The transmitter must allow for user configured transmitter output options as one of the following:
  - 2.3.1 Three wire source 4-20mA
  - 2.3.2 Three wire sink 4-20mA
  - 2.3.3 Four wire isolated 4-20mA
- 2.4 The transmitter shall be capable of field upgradeable communication outputs. This must include Relays, Modbus® RTU, or Foundation™ Fieldbus.
  - 2.4.1 Post-installation upgrades shall be completed without the requirement to:
    - 2.4.1.1 Upgrade firmware
    - 2.4.1.2 Disconnect the electrical connections to the enclosure.

## 3.0 Mechanical requirements

- 3.1 The enclosure shall be constructed of either 316 Stainless Steel or LM25 Aluminum painted with a 5-coat marine finishing process for corrosion protection, or an unpainted electro-polished 316 Stainless Steel
- 3.2 The enclosure must have two standard integral mounting lugs.
  - 3.2.1 The enclosure shall be capable of mounting to a standard 2” to 6” pipe utilizing a pipe mounting kit.
  - 3.2.2 The enclosure shall be capable of mounting to a ceiling utilizing a ceiling mounting kit.
  - 3.2.3 The use of mounting straps or brackets will not be used for standard wall installations.
- 3.3 The enclosure shall have a minimum of five ¾” NPT or M25 threaded conduit/cable entries to allow for expanded mounting options.
- 3.4 The enclosure will include certified stopping plugs to close unused conduit/cable entries.
- 3.5 The transmitter shall allow access to the terminals, wiring connections, and PCBA without the use of tools.
- 3.6 The transmitter must allow for the start-up and commissioning procedure to be completed without opening the enclosure.

- 3.7 The PCBA housing must mechanically self align in the enclosure, without the use of tools.
- 3.8 The PCBA shall incorporate a field serviceable design, allowing for the PCBA to be removed without the need to remove the enclosure.

## 4.0 Transmitter features

- 4.1 The transmitter must utilize a common local user interface for electrochemical (toxic and oxygen), catalytic bead (combustible) and point and open path (combustible) infrared sensing technology.
- 4.2 The transmitter shall be capable of providing at least two levels of password controlled access security to the menu structure for calibration, maintenance, and configuration of the device.
- 4.3 The transmitter shall contain internal software diagnostics capable of reporting a fault within 3 seconds of detection.
- 4.4 The transmitter shall store at least 1,280 alarm and fault events in a circular buffer. Events shall be capable to be sorted by order of occurrence, hour, all events by day, only the alarm events, and only the fault events.
- 4.5 The transmitter shall be capable of simulating the alarm events for validation of proper system connection without the use of gas.
- 4.6 The transmitter shall be capable of producing a signal in the range of 4-20 mA to test warning and notification devices without the use of calibration gas.
- 4.7 The transmitter shall be capable of inhibiting the output during maintenance to avoid false alarms.
- 4.8 The transmitter shall allow for a user configured calibration intervals reminder which provides an advance notification to the user that calibration is due.
- 4.9 The transmitter shall provide user configurable warning and fault milliamp indications in the range of 1mA to 4mA and 20mA to 22mA. The transmitter must provide milliamp differentiation indication between a fault and warning signal.

## 5.0 Transmitter display

- 5.1 The transmitter display shall be a backlight liquid crystal display (LCD).
- 5.2 The LCD must have a backlight for operation in limited visibility environments which automatically illuminates during integration of the unit.
- 5.3 The LCD must have a heater actuated at temperatures below -20C to provide clear resolution at -40C.
- 5.4 The standard transmitter display shall provide both LED and LCD icon indication of proper operation.

5.4.1 The transmitter must include three LEDs for indication of proper operation (Green flashing), Fault (Amber) and Alarm (Red).

5.4.2 The LEDs shall be viewable from a minimum of 50 feet.

5.4.3 The display shall provide icons for normal operating condition, warning, alarm, and fault states.

5.5 The display must indicate the gas being monitored, status of the transmitter, sensor full scale range, alarm 1 and 2 set points, and measurement units on the LCD.

5.6 The display shall indicate gas concentration both numerically, via a horizontal bar graph, and with an alarm icon.

5.7 Alarm set points shall be indicated as part of the horizontal bar graph for alarm 1 and alarm 2.

5.8 The transmitter menu structure must provide both alphanumeric and visual icons for transmitter navigation.

5.9 The transmitter display language shall include eight standard languages that will be selectable in the menu structure, including a minimum of following languages: English, Spanish, French, Portuguese, German, Italian, Russian, and Mandarin.

## 6.0 Non-intrusive calibration

6.1 All sensor/transmitters can be calibrated without opening any enclosures.

6.2 Calibration shall be completed via the local display utilizing magnetic switches or a HART hand-held communicator.

6.2.1 The device shall not use clamp on devices or wireless remote controls to perform calibration or configuration operations.

6.3 Calibration of the sensor shall be so that only one person is required to complete calibration.

6.4 Successful calibration must be visually indicated via the LCD and / or HART hand held communicator.

## 7.0 Sensing technology

7.1 The transmitter must utilize a common local user interface for electrochemical (toxic and oxygen), catalytic bead (combustible), and point and open path (combustible) infrared sensing technology.

7.2 Electrochemical (toxic and oxygen) sensors

7.2.1 Sensors shall be contained in sensor modules mounted external to the main enclosure. All sensor modules shall have the capability of replacement while the unit is under power (hazardous areas) without the need for tools.

- 7.2.2 Sensor modules shall contain all relevant sensor information within the module. This information shall include sensor manufacturer date, gas type, gas range, calibration data, and default relay parameters.
  - 7.2.3 Sensor module shall store all calibration data so that the module may be calibrated off site and installed in the field without re-calibration. The sensor module shall not require a battery or power source to store this data.
  - 7.2.4 The transmitter shall employ a cell fault diagnosis routine to check for cell presence, cell dry out, and cell open or short circuit. In the event of a cell failing this test, a sensor fault is displayed. This fault diagnosis will be automatically initiated by the transmitter at 8-hour intervals. It must also be initiated on power up, sensor exchange, or sensor cell exchange.
  - 7.2.5 Sensors shall employ a dual-reservoir design to increase performance in extreme environments. The sensor design must allow for electrolyte expansion in high humidity environments to prevent cells from bursting.
- 7.3 Catalytic bead combustible sensors
- 7.3.1 The catalytic bead sensor must utilize specially matched pairs of poison resistant combustible gas detection elements.
  - 7.3.2 The catalytic bead sensor must have a typical operation life greater than 5 years.
  - 7.3.3 Sensors shall be contained in sensor modules mounted external to the main enclosure. The sensor modules shall have the capability of replacement of the sensing element, without the replacement of the external assembly.
  - 7.3.4 The catalytic bead sensor shall detect for an over range condition and report the condition.
- 7.4 Infrared point combustible sensors
- 7.4.1 The sensor shall utilize dual compensating optics to detect hydrocarbon gases in various concentration ranges through the means of an infrared absorption principle.
  - 7.4.2 The optics shall contain a means of preventing the build-up of condensation on the windows.
  - 7.4.3 The detector shall operate in the presence of catalytic poisons without impact to the operation of the sensor
  - 7.4.4 The detector shall not require the presence of oxygen.
  - 7.4.5 The detector shall operate from a range of 0 – 100% LEL Methane as standard with the capability of calibration to other hydrocarbon gases.
  - 7.4.6 The certified accuracy shall be  $< \pm 1\%$  LEL
  - 7.4.7 Response time
    - 7.4.7.1 The response time with the weather protection fitted shall be:  $T_{50} < 4.5$

seconds;  $T_{90} < 6.5$  seconds.

7.4.7.2 The response time of the device without any accessories shall be:  $T_{50} < 3$  seconds;  $T_{90} < 5$  seconds.

## 7.5 Infrared open-path combustible sensors

7.5.1 The Open Path Gas Detector consists of a Transmitter unit that sends an infrared beam to a Receiver unit up to 650 feet away and can be located where a flammable hydrocarbon gas cloud is likely to occur.

7.5.2 The detector shall operate on the principle of infrared absorption.

7.5.2.1 The transmitter shall produce a collimated infrared beam produced by a Xenon arc flashlamp.

7.5.2.2 The infrared signal shall be collimated using mirrors to enable a more uniform beam thus reducing alignment sensitivity.

7.5.3 The transmitter beam shall be produced in such a way that it generates a distinctive signature that allows the receiver to differentiate between the beam pulses and both natural and artificial sources of infrared radiation.

7.5.3.1 The transmitter flashlamp shall pulse at precisely 4Hz for approximately one microsecond.

7.5.3.2 The precise timing and short duration shall produce a distinct optical signature.

7.5.4 The receiver shall collect the infrared radiation from the transmitter and perform measurements to enable hydrocarbon gases in the beam path to be detected.

7.5.4.1 The receiver shall utilize two filtered detectors which serve as the reference and the sample.

7.5.4.2 The sample detector input is filtered at wavelengths where strong infrared absorption is exhibited by the target gas.

7.5.4.3 The reference detector input is filtered at nearby wavelengths where strong infrared absorption is not exhibited by target gas.

7.5.5 The system shall incorporate heated optics designed to minimize the build-up of humidity, condensation, snow, or ice on the glass windows that could obscure the optics in extreme conditions.

7.5.5.1 The transmitter shall be capable of configuration in turbo heating mode for use in conditions of low ambient temperature to provide additional heating power to minimize condensation, frosting, and snow buildup.

7.5.5.2 The receiver shall utilize proportional heating controlled by the internal microcontroller and adjusted based on window temperature.

## 7.5.6 Repeatability

7.5.6.1 The certified repeatability shall be  $< \pm 0.4$  LELm

## 7.5.7 Response time

7.5.7.1 The system speed of response shall be  $T_{90} < 3$  seconds

## 7.5.8 Operating Humidity

7.5.8.1 The detector shall operate in a range of 0 – 99% rH (non-condensing)

## 8.0 Transmitter Outputs

8.1 The standard transmitter output signal shall be 4 to 20mA with a HART digital signal superimposed on the traditional 4 to 20mA current loop.

8.2 The transmitter shall provide as an option an Intrinsically Safe port for connection of a HART handheld device.

8.3 The transmitter shall have a HART enhance DD file.

8.4 The transmitter shall provide for the addition of one of the following outputs:

8.4.1 Modbus® digital communication protocol via a pluggable terminal block on the Modbus® interface circuit board. The Modbus® RTU protocol shall use ASCII/Hex protocols for communication.

8.4.2 Foundation™ Fieldbus communication protocol via a pluggable terminal block on the Foundation™ Fieldbus interface circuit board.

8.4.3 Three form “C” alarm and fault relays.

8.4.3.1 Relays shall be single-pole, double-throw rated at 5 amps at 240VAC.

8.4.3.2 The transmitter shall provide a remote reset for alarm silencing.

8.4.3.3 The relays shall be capable of configuration for:

8.4.3.3.1 Latching / Non-Latching

8.4.3.3.2 Energized / De-Energized

8.4.3.3.3 Normally Open / Normally Closed

8.4.3.3.4 Alarms rising / Alarms falling

8.5 The transmitter shall be capable of interchangeable communication outputs. This must include relays, Modbus® RTU or Foundation™ Fieldbus.

8.5.1 Post-installation upgrades shall be completed without the requirement to:

8.5.1.1 Upgrade firmware

8.5.1.2 Disconnect the electrical connections to the enclosure.

## 9.0 Approvals

9.1 The transmitter shall have the following hazardous area approvals:



- 9.1.1 UL Class I, Div 1, Groups B, C, and D; Class 1, Zone 1 (-40C to 65C)
- 9.1.2 CSA Class 1, Div 1, Groups B, C and D; T5 Tamb (-40C to 65C)
- 9.1.3 ATEX – EX II 2 (1) G Ex D[ia IIC] IIB + H2 T4 (Tamb -40C to 65C)
- 9.1.4 IECEx - EX [ia] IIC Ga] + H2 T4 Gb IP66 Tamb (-40C to 65C)
- 9.2 The transmitter shall have the following performance approvals:
  - 9.2.1 CSA 22.2 No. 152
  - 9.2.2 FM 6310, 6320
  - 9.2.3 ANSI/ ISA 92.0.01
  - 9.2.4 IEC/EN 60079-29-1, EN 61779-4:2000 Toxic and Oxygen
- 9.3 The transmitter shall be “certified for use in a SIL 2 system” with approval to EN 61508 Part 1, 2, and 3 component certification.
  
- 10.0 Manufacturer Capability Requirements - As a minimum, the gas monitoring equipment manufacturer must meet the following requirements:
  - 10.1 Manufacturer shall be capable of supplying all equipment necessary to check or calibrate the sensor/transmitter.
  - 10.2 The manufacturer must be capable of providing on site service with factory trained personnel.
  
- 11.0 The transmitter shall be a Honeywell Analytics XNX Universal Transmitter or equivalent.