SensAC VRF Refrigerant Leak Detector Specifications / Installation and Maintenance Guide.

General Safety Statements

- Carefully read and follow the instructions in the manual before you attempt to use this product.
- The use of this product is intended only for the purposes specified in this document and under the conditions listed.
- Comply with all local and national laws, rules, and regulations associated with this product.
- Only fully trained and competent personnel may install this product.
- Only fully trained and competent personnel may inspect, repair, and maintain the product as detailed in this manual. Maintenance detail not included in this manual must be performed only by SensAC.
- Only operate the product within the framework of a risk-based alarm signaling concept.
- Use only genuine SencAC spare parts and accessories.

⚠ HIGH CONCENTRATION LEVELS OF REFRIGERANT AND SUFFOCATION RISK: Large refrigerant leaks into occupied spaces can reach concentrations levels that pose a suffocation risk to the occupants. While SensAC can be used to detect refrigerant leaks well below those concentrations, it is not designed as a stand-alone safety device. Safety of the occupants must take a system design approach including ventilation, detection, early warning, mitigation, and design redundancy among other considerations.

⚠ **Failure to follow the instructions in this manual will result in death or serious injury.**

GENERAL
The information contained in this manual is subject to change without notice. While every effort has been made to ensure the accuracy of the information, your supplier shall not be held liable for errors contained herein.

Product Overview:

SensAC VRF Refrigerant gas leak detector with NDIR sensor technology meets the need for a cost-effective and reliable solution to continuously monitor and detect refrigerant gas in occupied space in commercial buildings.

Technical:

- Available in 90-240VAC or 24VAC/DC supply voltages
- Model numbers:
    - U4762R410A – 90-240 VAC
    - U4518R410A – 24 VAC/VDC
- Mounts in a standard 2-gang PVC junction box.
- NDIR Sensor technology (Non-dispersive Infrared)
- Microprocessor based IR sensor
- Requires no regular calibration
- Long maintenance interval
- Extended life span
- Patented IR optical path, 8 yr. life expectancy
- Sampling mode: continuous
- Sensor head: can be factory calibrated for any existing refrigerant gas, and those being contemplated (A2L)

Application:

Designed for use in detecting VRF System refrigerant leaks in anoccupied space.

Typical Application Includes:

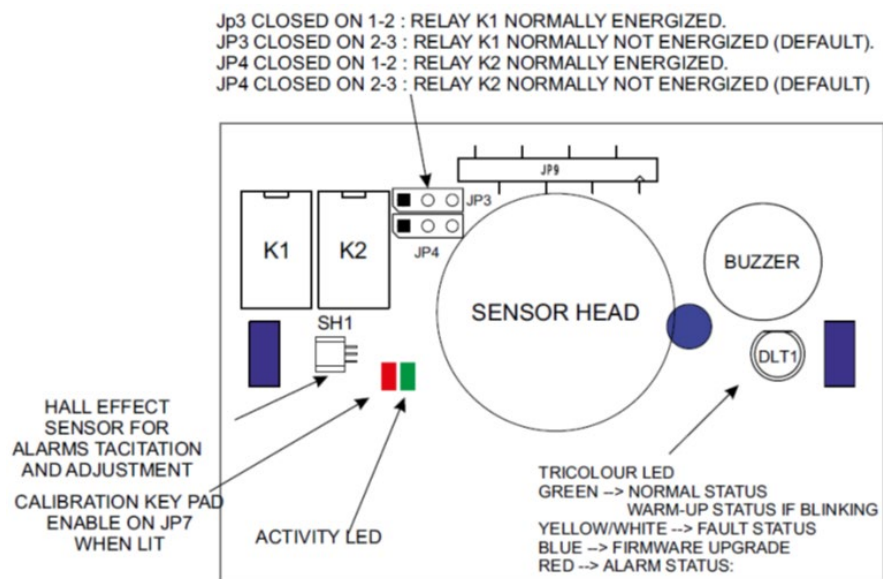|	
• Hotels	• Hospitals
• Schools	• Universities
• Senior Living	• Multi Family
• Hospitality	• Historic Buildings
• Restaurants	• Retail

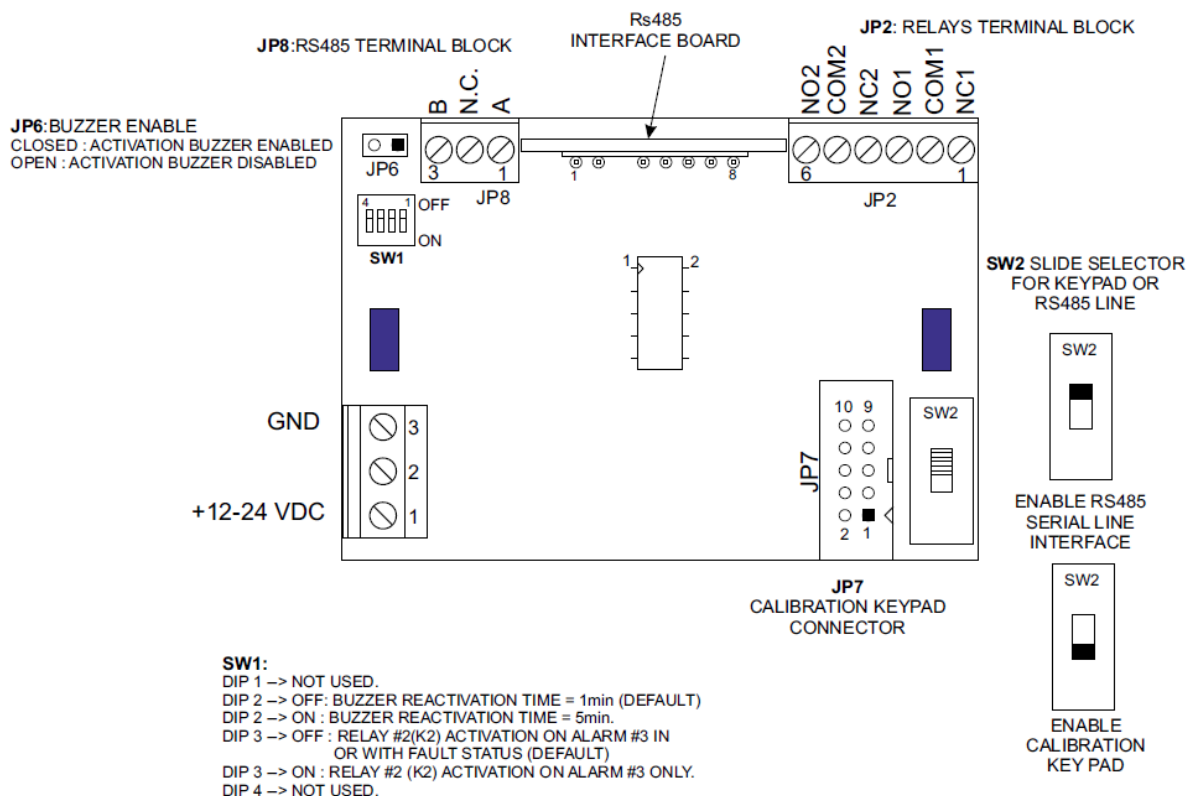*For use on non-classified areas only.

Specifications

Sensing Element	Non-Dispersive Infrared (NDIR)
Detectable Gases	R410a
Supply Voltage	24VAC, 120VAC, 60Hz
Power Consumption	44 mA amps @ 120VAC
Relay Output	Two SPDT (Form C) Dry Contacts 1.0A max. @ 24 VDC
Alarm Relays Actuation Points	Relay 1 & 2 at 2000 ppm
Multicolor Status LED Indication	Green Blinking Warm-up Green Fixed Normal status Yellow Fault Red blinking Alarm
Buzzer	83 dB at 10"
Serial Communications	Modbus RTU slave
Transmission Standard	RS485 (2-wire)
Installation	Mounted 18" from the floor, below the discharge of the fan coil. Fits in standard 2 gang PVC junction box.
Factory Calibration Range	5000 PPM
Accuracy	± 5% full-scale range under 50% full-scale, ±7% full-scale range above 50% of full-scale.
Storage Temperature	-15 to 140 F
Operating Temperature	-4 to 140 F
Relative Humidity	0-90 %RH non-condensing
Response time	T90 <30 seconds
Sensor Warmup time	2 min unit initialization – 1 hour for full specification performance
Recommended Maintenance	Accuracy and Bump Test once per year or as required by Code
Warranty	2 years
IP Rating	IP42
Approvals	EN 61000-6-3:2007 + A1:201; EN 50270:2015, IEC 60335-2-40Annex LL, EN 378-3, EN 50676 and EN 14624, ISP5149-3, REACH/RoHS, CE Mark
Product Weight	0.44 lb. (200 g)
Product Dimensions	Width 5.11 in (13.0 cm), Height 5.11 in (13.0 cm), Depth 2.36 in (6.0 cm)
Specifications Subject to Change Without Notice	

Board layout 24 Vac version
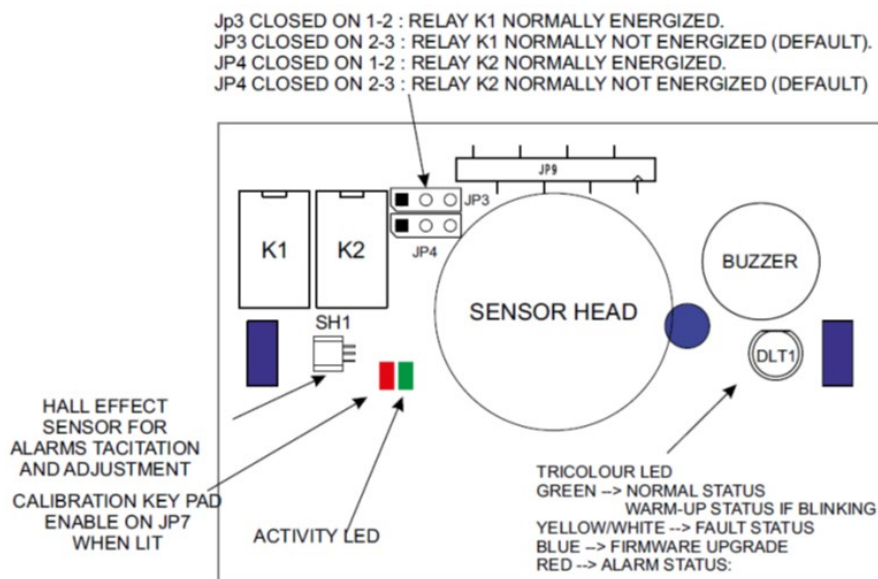
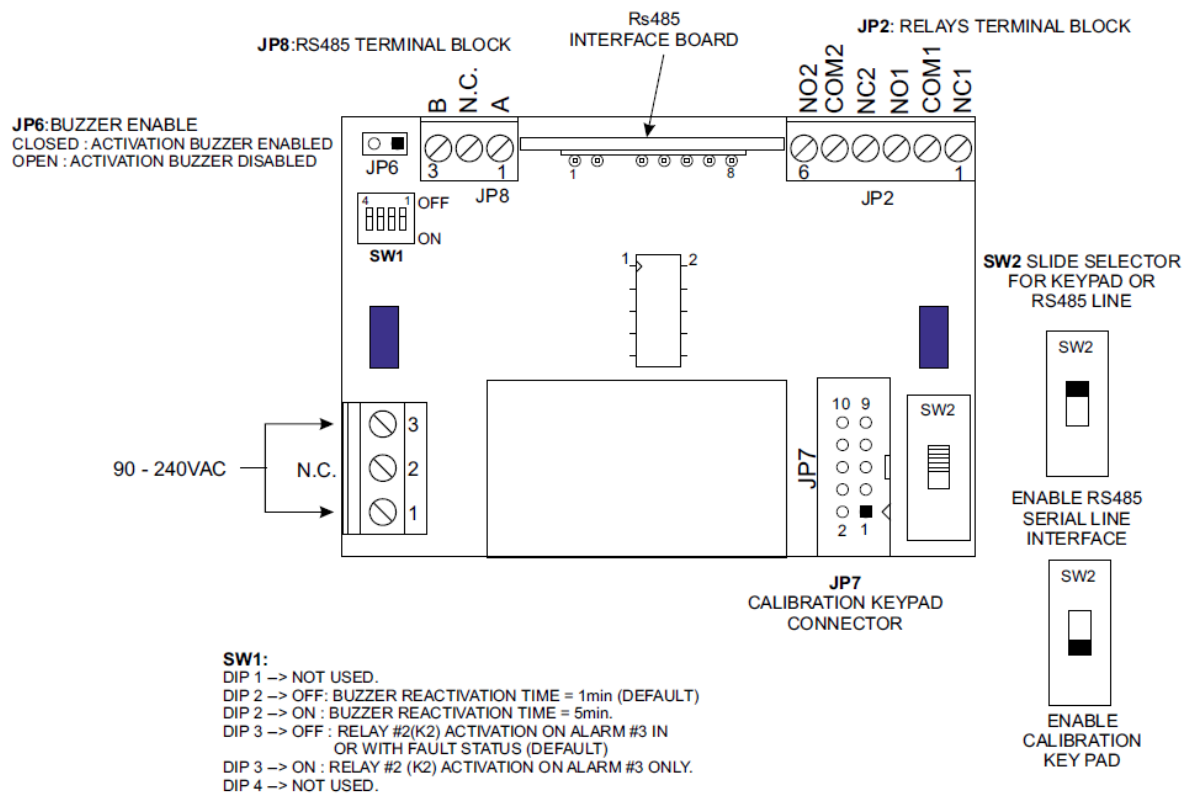*Figure 1) Board layout of 24 Vac/dc version*

Jp3 CLOSED ON 1-2 : RELAY K1 NORMALLY ENERGIZED.
JP3 CLOSED ON 2-3 : RELAY K1 NORMALLY NOT ENERGIZED (DEFAULT).
JP4 CLOSED ON 1-2 : RELAY K2 NORMALLY ENERGIZED.
JP4 CLOSED ON 2-3 : RELAY K2 NORMALLY NOT ENERGIZED (DEFAULT)

JP9

JP3

JP4

K1   K2

BUZZER

SH1

SENSOR HEAD

DLT1

HALL EFFECT
SENSOR FOR
ALARMS TACITATION
AND ADJUSTMENT

TRICOLOUR LED
GREEN --> NORMAL STATUS
        WARM-UP STATUS IF BLINKING
YELLOW/WHITE --> FAULT STATUS
BLUE --> FIRMWARE UPGRADE
RED --> ALARM STATUS:

CALIBRATION KEY PAD
ENABLE ON JP7
WHEN LIT

ACTIVITY LED

External Connections

Rs485
INTERFACE BOARD

JP8:RS485 TERMINAL BLOCK

JP2: RELAYS TERMINAL BLOCK

B   N.C.   A

NO2   COM2   NC2   NO1   COM1   NC1

JP6:BUZZER ENABLE
CLOSED : ACTIVATION BUZZER ENABLED
OPEN : ACTIVATION BUZZER DISABLED

JP6

3   1

JP8

1   8

6   1

JP2

4   1   OFF
        ON

SW1

SW2 SLIDE SELECTOR
FOR KEYPAD OR
RS485 LINE

1   2

SW2

GND

3

10 9

SW2

+12-24 VDC

2

1

JP7

2   1

SW2

ENABLE RS485
SERIAL LINE
INTERFACE

JP7
CALIBRATION KEYPAD
CONNECTOR

SW2

ENABLE
CALIBRATION
KEY PAD

SW1:
DIP 1 –> NOT USED.
DIP 2 –> OFF: BUZZER REACTIVATION TIME = 1min (DEFAULT)
DIP 2 –> ON : BUZZER REACTIVATION TIME = 5min.
DIP 3 –> OFF : RELAY #2(K2) ACTIVATION ON ALARM #3 IN
              OR WITH FAULT STATUS (DEFAULT)
DIP 3 –> ON : RELAY #2 (K2) ACTIVATION ON ALARM #3 ONLY.
DIP 4 –> NOT USED.

Board layout 90-240 Vac version

Internal Layout

Figure 2) Board layout of 90-240 Vac version

Jp3 CLOSED ON 1-2 : RELAY K1 NORMALLY ENERGIZED.
JP3 CLOSED ON 2-3 : RELAY K1 NORMALLY NOT ENERGIZED (DEFAULT).
JP4 CLOSED ON 1-2 : RELAY K2 NORMALLY ENERGIZED.
JP4 CLOSED ON 2-3 : RELAY K2 NORMALLY NOT ENERGIZED (DEFAULT)

HALL EFFECT SENSOR FOR ALARMS TACITATION AND ADJUSTMENT

CALIBRATION KEY PAD ENABLE ON JP7 WHEN LIT

ACTIVITY LED

TRICOLOUR LED
GREEN --> NORMAL STATUS
WARM-UP STATUS IF BLINKING
YELLOW/WHITE --> FAULT STATUS
BLUE --> FIRMWARE UPGRADE
RED --> ALARM STATUS:

External Connection

JP8:RS485 TERMINAL BLOCK

Rs485 INTERFACE BOARD

JP2: RELAYS TERMINAL BLOCK

JP6:BUZZER ENABLE
CLOSED : ACTIVATION BUZZER ENABLED
OPEN : ACTIVATION BUZZER DISABLED

SW2 SLIDE SELECTOR FOR KEYPAD OR RS485 LINE

ENABLE RS485 SERIAL LINE INTERFACE

ENABLE CALIBRATION KEY PAD

90 - 240VAC   N.C.

JP7 CALIBRATION KEYPAD CONNECTOR

SW1:
DIP 1 –> NOT USED.
DIP 2 –> OFF: BUZZER REACTIVATION TIME = 1min (DEFAULT)
DIP 2 –> ON : BUZZER REACTIVATION TIME = 5min.
DIP 3 –> OFF : RELAY #2(K2) ACTIVATION ON ALARM #3 IN
            OR WITH FAULT STATUS (DEFAULT)
DIP 3 –> ON : RELAY #2 (K2) ACTIVATION ON ALARM #3 ONLY.
DIP 4 –> NOT USED.

Installation instructions

⚠️ *Read all instructions carefully before attempting installation of this device.*

⚡ *Only qualified trained technicians should attempt installation*

- Turn off all power to product and all I/O circuitry (alarms, control I/O etc.) before starting the installation, removal, wiring, maintenance, or inspection of the product.
- Installer must comply with all national and local codes regarding the installation and wiring of line voltage devices.
- SensAC Refrigerant leak detector must be installed inside a PVC 2-gang electrical junction box, with suitable air space around the detector.
- Detector must be fully inserted and secured to the PVC junction box ensuring protection from dust and construction debris (See figure 4).
- Cover should be fully inserted and aligned to the sensor head using the guiding slots on the face of the sensor plastic housing (see figure 5)
- Be sure all wiring connections are properly terminated.
- Perform a magnet function test once installed.
    - Place magnet (provided) against the round port opposite to the LED indication actuates the function test
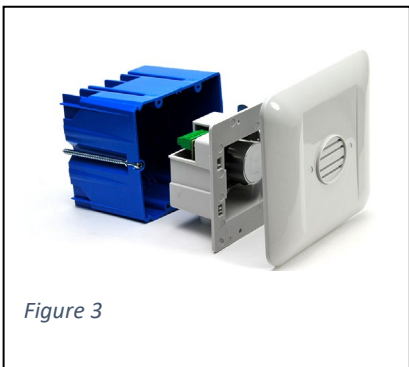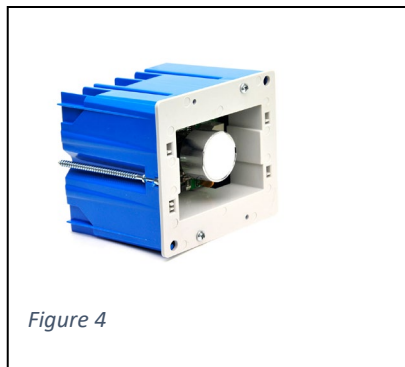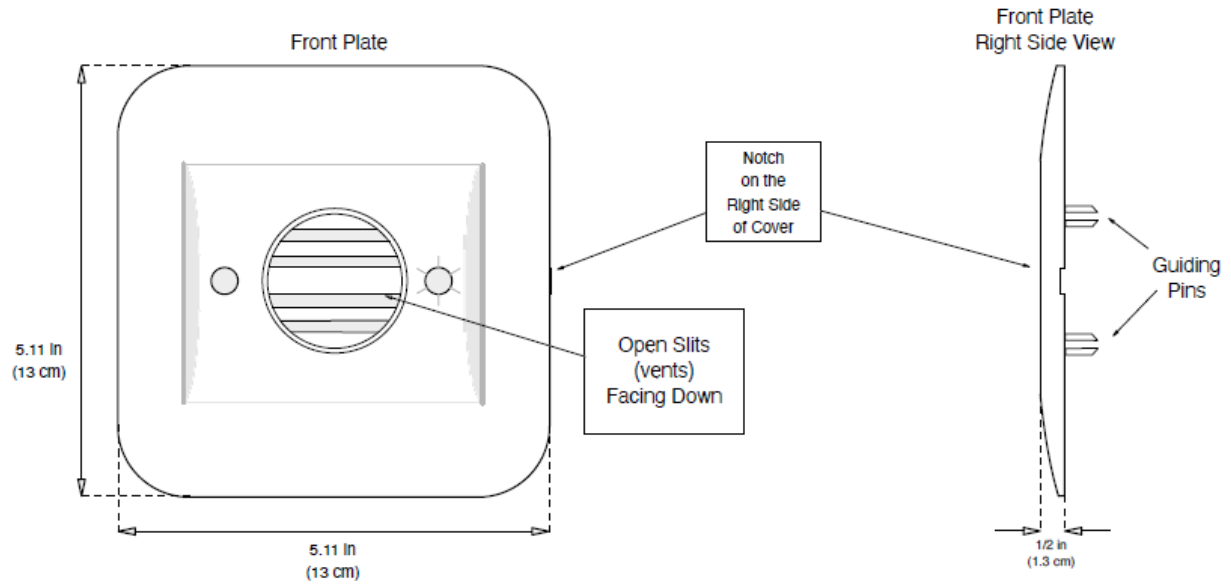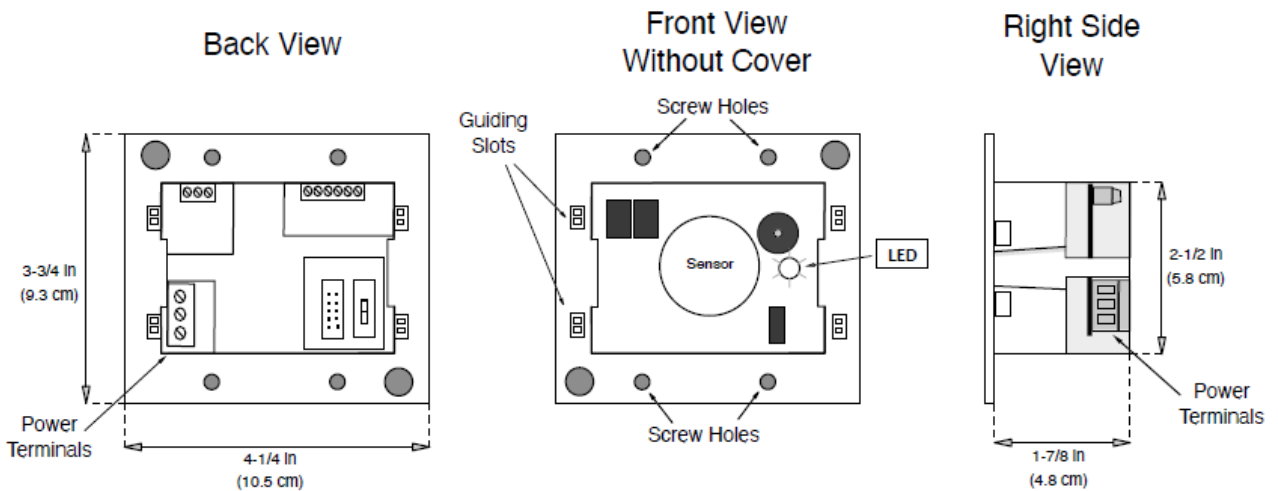
Figure 3

Figure 4

Figure 5

Dimensions:

Front Plate

Front Plate
Right Side View

Notch
on the
Right Side
of Cover

Guiding
Pins

Open Slits
(vents)
Facing Down

5.11 In
(13 cm)

5.11 In
(13 cm)

1/2 In
(1.3 cm)

Mounting Orientation:

Back View

Front View
Without Cover

Right Side
View

Guiding
Slots

Screw Holes

Sensor

LED

Screw Holes

3-3/4 In
(9.3 cm)

Power
Terminals

4-1/4 In
(10.5 cm)

2-1/2 In
(5.8 cm)

Power
Terminals

1-7/8 In
(4.8 cm)

Connection relays outputs

For relays terminal wiring see the board layout described in Figure 1 and 2. Please consider the following: NC indicates a relay with a normally closed contact. NO indicates a relay with a normally open contact, and COM is the common contact.

Testing, operation, and maintenance

Power ON
When the detector is powered on, the status LED starts blinking in green color during warm-up time. After two minutes, the LEDs start blinking green during normal status. Once the warm-up phase is over, the detector can work correctly, although the optimal performances will be achieved after two hours.

Testing
Detectors are factory calibrated for the specific gas required by the customers. Future adjustment of the preset calibration can be carried out by employing the calibration keypad. Testing should be carried out by using a gas mixture in the appropriate range, along with our calibration kit.

Use

The detector works autonomously and automatically. Once correctly wired, no further operations are required. The status LED on the front cover describes the detector's working condition. The status LED on the front cover describes the detector's working condition. See table 1.

Table 1) LED status indication

Colour	Meaning
Green blinking	Warmup
Green fixed	Normal status
Yellow	Fault
Red blinking	Alarm

Buzzer silence

To silence the buzzer, the special magnet must be brought near the point on the left of the gas sensor, in correspondence with the hall effect sensor. If the alarm condition persists, after 1 minute the buzzer is reactivated.

Maintenance

Accuracy and bump test procedures of gas detectors are required by code. These standards give guidance on the selection, installation, use and maintenance of gas detectors intended for use in industrial and commercial applications. The standards require accuracy and bump testing as well as recording of the performed checks and it defines that all gas detectors should undergo periodical operational testing according to the manufacturer's specifications. Test results should be properly recorded.

Modbus and Serial Communications

RS485 Connection serial line

RS485 bus lines wiring should be done using a RS-485, 4 conductors, 24AWG, shielded twisted pair cable.

- Nominal capacity between the wires <50pF/m, nominal impedance 120 Ω. Use cable BELDEN cable 9842 or similar (data transmission cable in EIA RS485).
- The total length of the line should not exceed 3280 ft.
- Detectors are to be wired in daisy chain mode. We recommend avoiding star or tree mode connection as interference immunity would be reduced.
- Make sure that each multi-polar wire includes just one RS485.
- Make sure that a 120 Ω end line resistor is placed at the beginning and at the end (on the last detector) of the bus line.
- For power supply connection, it is recommended to use a 2-wire cable with suitable section according to the distance and number of detectors.
- Once the installation is completed, verify that each detector reaches at least 12 Vdc.

Modbus settings

Baud rate: 19200 bps
Parity: None
Stop bits: 1

Modbus Registers

READ INPUT REGISTERS

The following table lists the MODBUS INPUT REGISTERS with address and function.

MODBUS ADDRESS	DATA LENGTH	R/W	Register's Name	Function Description	Measuring Unit
0x0006 0x0007	Input reg. (float 32bit)	r	Sensor[0].Temperature	Temperature Sensor #0	Kelvin
0x0008 0x0009	Input reg. (float 32bit)	r	Sensor[0].Concentration	Target Gas Concentration Sensor #0.	Current measuring unit (ppm, %LEL or %VOL)
0x0016 0x0017	Input reg. (float 32bit)	r	Sensor[0].Warning	Warning Code on Sensor #0	See Table
0x0018 0x0019	Input reg. (float 32bit)	r	Sensor[0].Status	Status Code on Sensor #0	See Table
0x001A 0x001B	Input reg. (float 32bit)	r	Sensor[0].Error	Error Code on Sensor #0	See Table
0x005A 0x005B	Input reg. (float 32bit)	r	Detector.Error	Detector.Error	See Table

Warning Code List:

NO_WARNING	All bits in 0 state.
WARMUP_WARNING	If BIT 0 in 1 state.
INVALID_TEMPERATURE_WARNING	If BIT 1 in 1 state
INVALID_ACTIVE_WARNING	If BIT 2 in 1 state
INVALID_REFERENCE_WARNING	If BIT 3 in 1 state
INVALID_PEAK_WARNING	If BIT 4 in 1 state
INVALID_DATA_WARNING	If BIT 5 in 1 state
CALIBRATION_MODE_ACTIVE	If BIT 6 in 1 state
CALIBRATION_MODE_FAULT	If BIT 7 in 1 state
MISMATCH_HYBRID_VALUE_WARNING	If BIT 8 in 1 state
SENSOR_HW_TEST_WARNING	If BIT 9,in 1 state
SENSOR_END_OF_LIFE_WARNING	If BIT 10 in 1 state
SENSOR_MANTEINANCE_WARNING	If BIT 11 in 1 state
SENSOR_HW_TEST_TIMEOUT_WARNING	If BIT 12 in 1 state
SENSOR_HW_TEST_CAPA_WARNING	If BIT 13 in 1 state
SPARE0 Not used (To be Masked by user)	
SPARE1 Not used (To be Masked by user)	
INVALID_ZERO_WARNING	If BIT 16 in 1 state
INVALID_SENSITIVITY_WARNING	If BIT 17 in 1 state

Bits from 18 up to 31 are not used. To be masked by user.

Status Code List:

NO ALARM	No Alarm, Detector OK. All bits in 0 state.
FAULTLOW	Bit 0 in 1 state1 (Concentration < -10% of Full Scale, or Hardware Error).
UNDERSCALE	Bit 1 in 1 state (Reading < 0% of Full Scale)
THRESHOLD1	Bit 2 in 1 state (Threshold #1 of Alarm reached)
THRESHOLD2	Bit 3 in 1 state (Threshold #2 of Alarm reached)
THRESHOLD3	Bit 4 in 1 state (Threshold #3 of Alarm reached)
OVERSCALE	Bit 5 in 1 state (Reading > 100% of Full Scale)
FAULTHIGH	Bit 6 in 1 state (Reading > 110% of Full Scale)

Bits from 7 up to 31 are not used. To be masked by user.

Error Code List:

NO_ERROR	0	(No Error, Detector OK).
WARMUP_ERROR	1	(Detector is in Warm-up phase).
DETECTOR_FRAM_ERROR	2	(Fram Memory on Detetcor Base Board Error)
FLASH_ERROR	3	(Internal FLASH EPROM Error).
RAM_ERROR	4	(Internal RAM Error).
VIN_ERROR	5	(External Power Supply Voltage Error. Voltage is under 10V or above 30V).
I2C_ERROR	6	(I2C Interface Error).
WD_ERROR	7	(External Watch Dog Error).
ADC_ERROR	8	(Internal ADC Error).
VDD_ERROR	9	(Internal 3.3V Power Supply Voltage Error. Voltage 3.3V +/- 5% Out of range).
HEAD_FRAM_ERROR	10	(Fram Memory on Sensor Head Error)
VREF_ERROR	11	(Internal Voltage Reference Error).
ANALOG_420MA_ERROR	12	(Analog Output 4-20mA Error).
ANALOG_OUTPUT_TYPE_ERROR	13	(Number of analog outputs Set-up).
AVERAGE_VALUE_ERROR	14	(Analog Input Out of Range).
DETECTOR_CONFIGURATION_ERROR	15	(Invalid Configuration Error)
HEAD_MISMATCH_ERROR	16	(Invalid Head Type for the Detector).
HEAD_UNCONFIGURED_ERROR	17	(Head Unconfigured Error)
HEAD_MISSING_ERROR	18	(Head Not Recognized By Detector Base)
HEAD_PLACEMENT_ERROR	19	(Head Not Correctly Installed)
HEAD_PAIRING_ERROR	20	(Head Not Paired On the Detector)
UART0_BAUD_RATE_ERROR	21	(Invalid Baud Rate Setting for UART0)
FIRMWARE_ERROR	22	(Invalid Firmware for the Detector Base)
HEADS_MAINTENANCE_ERROR	23	(Maintenance on Heads not allowed)
HEADS_MAINTENANCE	24	(Maintenance on Heads allowed)
RESERVED	25	(Reserved Error Code)
SENSOR_END_OF_LIFE_ERROR	26	(Timeout Expired on Sensor End Of Life).
SENSOR_MAINTENANCE_ERROR	27	(Timeout Expired on Periodic Sensor EOL)
ANALOG_EXT_420MA_ERROR	42	(Error on 4-20mA feedback)
KEY_ERROR	43	(Magnetic Key locked)

READ HOLDING REGISTERS

The following table lists the MODBUS HOLDING REGISTERS with address and functions.

MODBUS ADDRESS	DATA LENGTH	R/W	REGISTER NAME	DESCRIPTION	Measuring Unit
0x01CE 0x01CF	Holding reg. (32bit)	r	FwMajor	Firmware Revision Major Number	Number MSWORD – LSWORD
0x01D0 0x01D1	Holding reg. (32bit)	r	FwMinor	Firmware Revision Minor Number	Number MSWORD – LSWORD
0x01D2 0x01D3	Holding reg. (32bit)	r	FwRev	Firmware Revision	Number MSWORD – LSWORD
0x01D4 0x01D5	Holding reg. (32bit)	r	FwDD	Firmware Revision Date (DD)	Number of Day MSWORD – LSWORD
0x01D6 0x01D7	Holding reg. (32bit)	r	FwMM	Firmware Revision Date (MM)	Number of Month MSWORD – LSWORD
0x01D8 0x01D9	Holding reg. (32bit)	r	FwYYYY	Firmware Revision Date (YYYY)	Number of Year MSWORD – LSWORD
0x01F6 -- 0x01FD	Holding reg. String	r	Hardware Model	String oof ASCII Chars forDetector Model.	ASCII String 16char MAX.

UNLIMITED CONTROLS
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