

AGSVRF 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 AGS.
- Only operate the product within the framework of a risk-based alarm signaling concept.
- Use only genuine AGS 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 AGS 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:

AGSVRF 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:
 - AGSVRF410-110 =90-240 VAC
 - AGSVRF410-24 = 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
- Schools
- Senior Living
- Hospitality
- Restaurants
- Hospitals
- Universities
- Multi Family
- Historic Buildings
- Retail

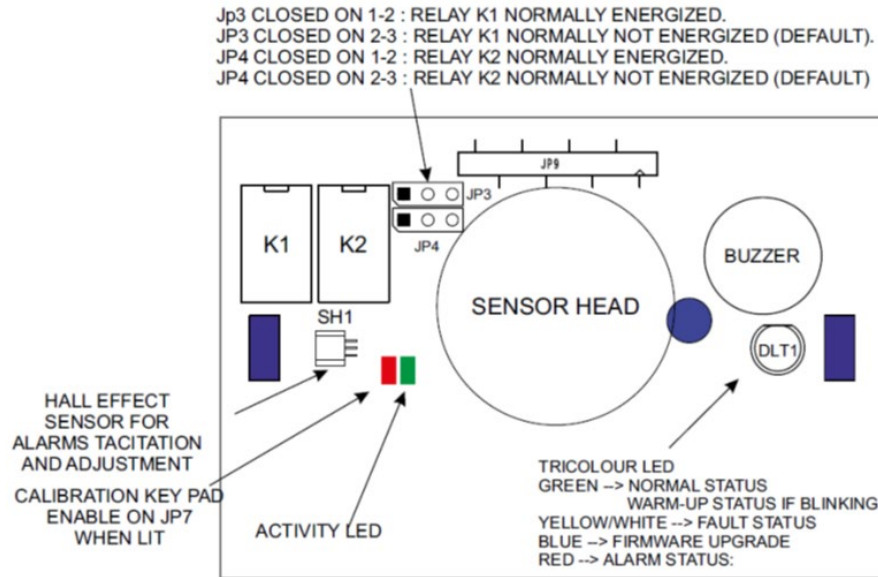
*For use on non-classified areas only.

Specifications

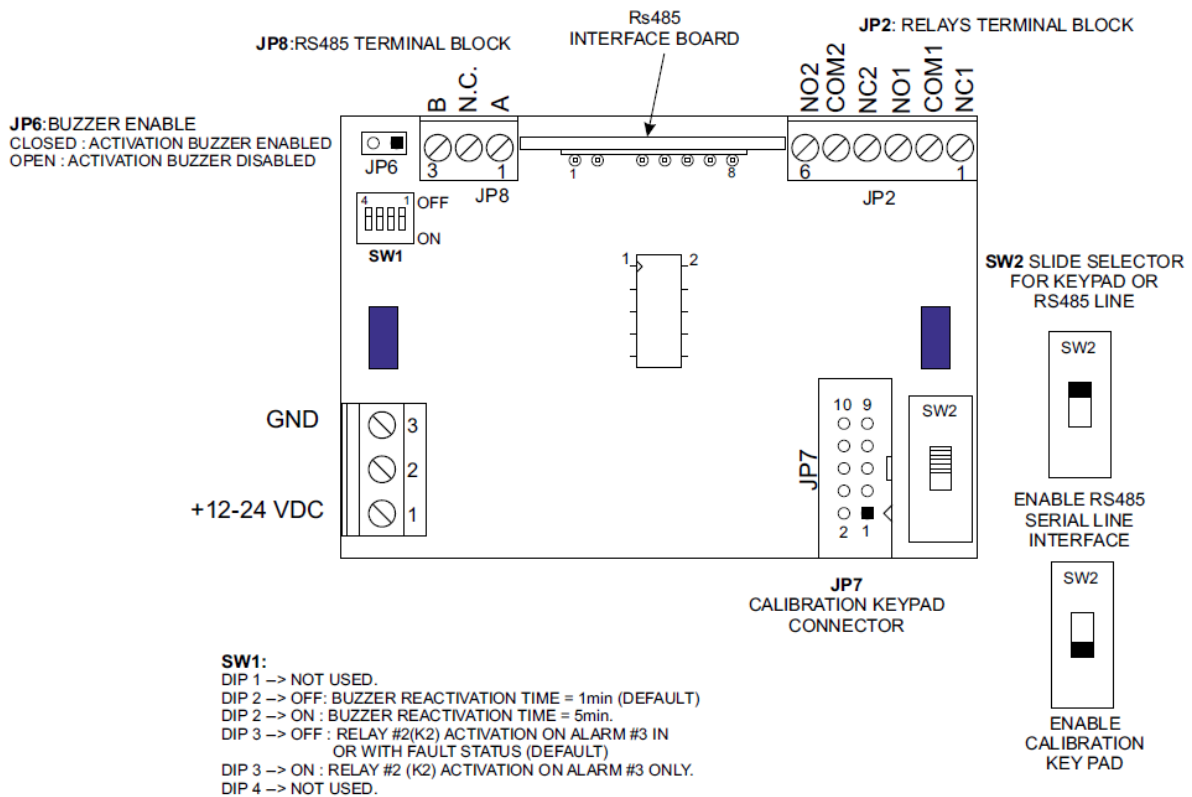
| | | |
|---|--|--|
| Sensing Element | Non-Dispersive Infrared (NDIR) | |
| Detectable Gases | R410a | |
| Supply Voltage | 24VAC, 120VAC, 60Hz | |
| Power Consumption | 44 mA amps @ 120VAC | |
| Relay Output | Two SPDT (Form C) Dry Contacts 1.0A max. @ 24 VDC | |
| Alarm Relays Actuation Points | Relay 1 & 2 at 2000 ppm | |
| Multicolor Status LED Indication | Green Blinking Green Fixed Yellow Red blinking | Warm-up Normal status Fault 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



External Connections

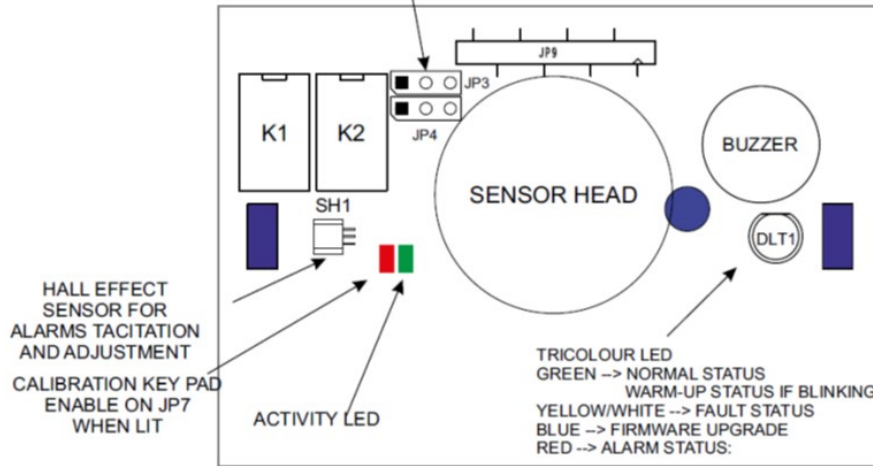


Board layout 90-240 Vac version

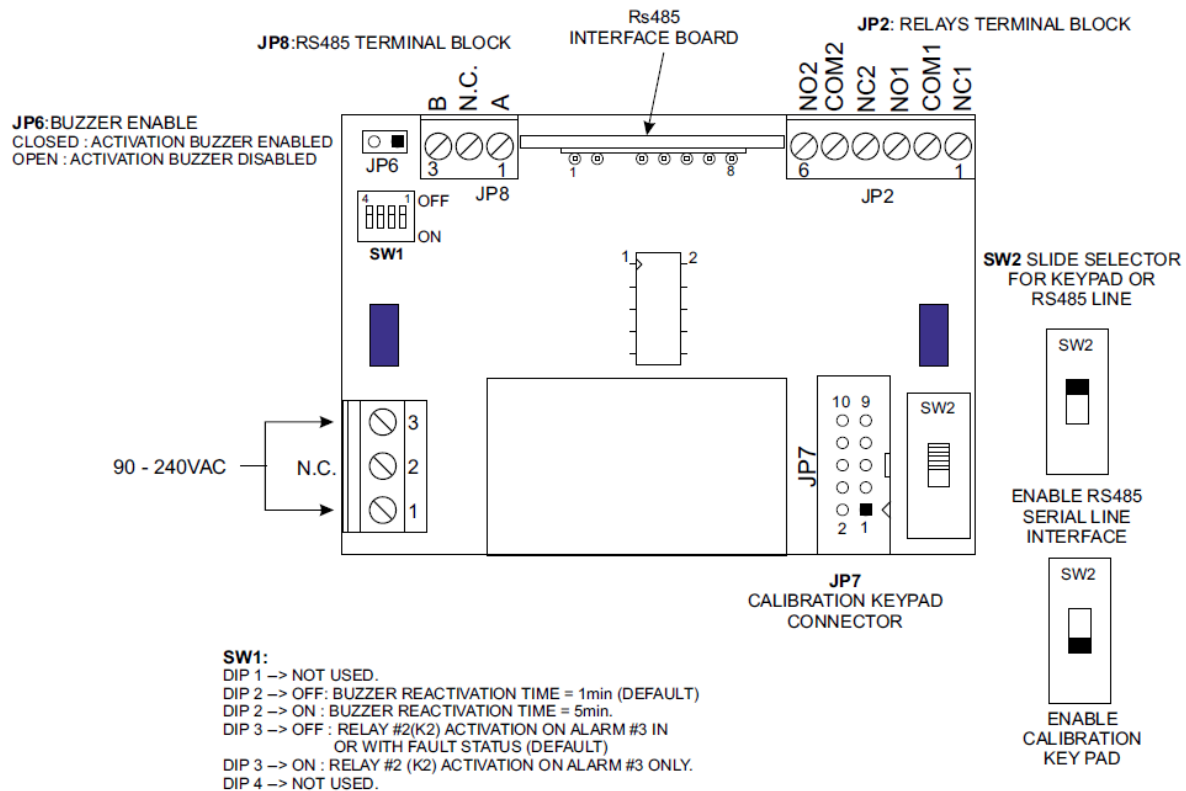
Internal Layout

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)



External Connection

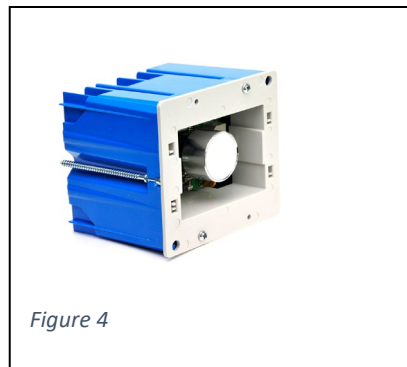
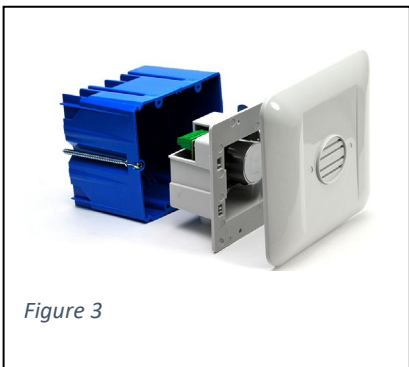


Installation instructions

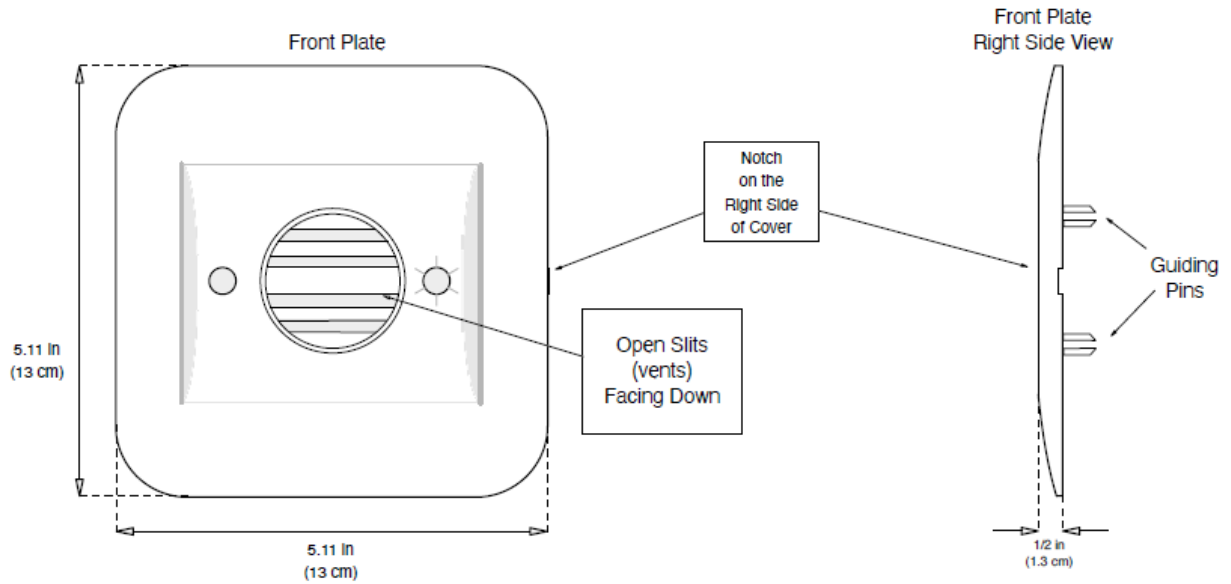
! *Read all instructions carefully before attempting installation of this device.*

⚡ *Only qualified trained technicians should attempt installation*

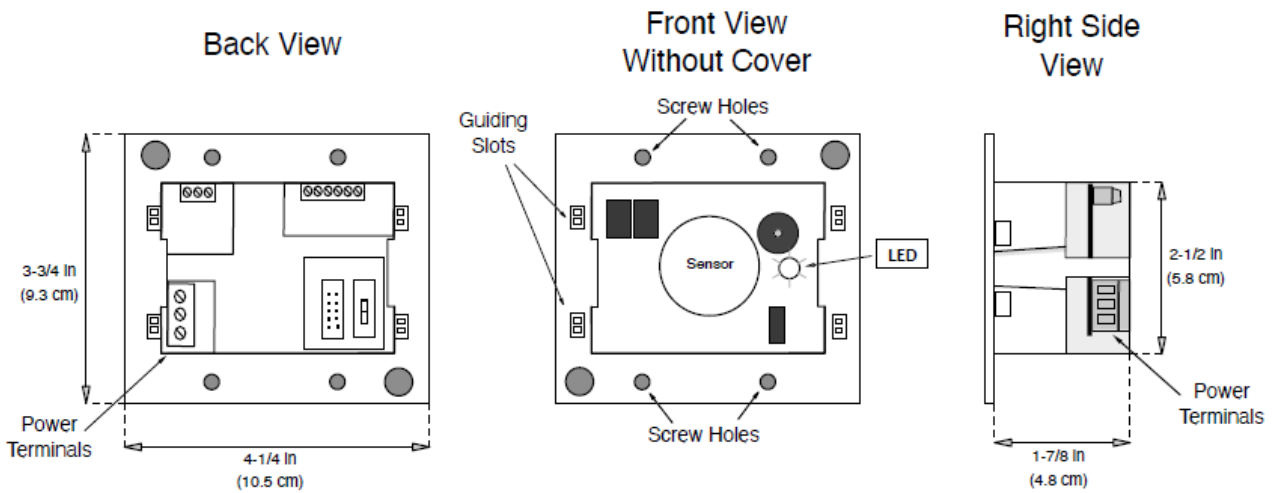
- Turn off all power to product and all I/O circuitry (alarms, control I/O etc.) before starting the installation, removal, wiring, maintenance, or inspection of the product.
- Installer must comply with all national and local codes regarding the installation and wiring of line voltage devices.
- AGS 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



Dimensions:



Mounting Orientation:



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.

Adjustment with magnet

The AGSVRF410 gas detector can be calibrated in place with the use of the magnet provided by AGS. This allows a non-intrusive, simple and fast calibration in the field, avoiding the removal of the detector from the flush mounted box.

WARNING

IT IS IMPORTANT TO SPECIFY THAT THE PROCEDURE ALWAYS INCLUDES ZERO CALIBRATION AS A PRIMARY OPERATION, THIS STEP CANNOT BE SKIPPED. THEREFORE, IF THE USER NEEDS TO CHECK THE GAS RESPONSE, HE WILL STILL HAVE TO CHECK THE ZERO VALUE BELOW.

- Position the magnet near the point on the left of the gas sensor, in correspondence with the hall effect sensor for 5 seconds.
- In the calibration menu, the LED starts flashing between green and blue.
- To perform the zero calibration, check that the sensor is exposed to clean air and leave the magnet in place for 2 seconds.
- If the operation was successful, the LED will flash green. If not, e.g. when the zero calibration is done while the sensor is reading a non-zero concentration, the LED remains lit yellow. In this case, calibration is not performed and the procedure must be repeated.
- To exit the calibration menu, if the user only wants to check the zero, wait 1 minute.
- If the user wants to check the span calibration, position the magnet for 5 seconds.
- After 5 seconds, the LED starts flashing alternately red and blue.
- Connect the calibration cap adapter ZMCAP/1 and expose the equipment to a gas of a cylinder of known concentration (corresponding to the value of the highest threshold) and wait 1 or 2 minutes for the stabilization of the reading.
- To set the span value, leave the magnet in this position for 2 seconds.
- If the operation was successful, the LED will flash green. If not, the LED remains lit yellow.
- To exit calibration menu, the user can either wait 3 minutes or position the magnet for 5 seconds.

WARNING

IF THE USER LEAVES THE MAGNET POSITIONED FOR MORE THAN 1 MINUTE, AN ERROR IS GENERATED AND THE LED FLASHES YELLOW. TO GET OUT OF THIS CONDITION, IT IS NECESSARY TO REMOVE THE MAGNET AND REPOSITION IT FOR 5 SECONDS.

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 <math><50\text{pF/m}</math>, 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_MANTAINANCE_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 state (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. |



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