# GLACIÄR MICRO

Gas Leakage Detector for commercial applications




# USER MANUAL

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# 2 PRODUCT DESCRIPTION

**WARNING:** This device is neither certified nor approved for operation in oxygen-enriched atmospheres. Non-compliance can lead to EXPLOSION.

**WARNING:** This device has not been designed to guarantee intrinsic safety when used in areas classified as hazardous ("Directive 2014/34/EU ATEX" and "NFPA 70, Hazardous Location"). For operator safety, DO NOT use it in hazardous locations (classified as such).

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

## 2.1 General

**GLACIÄR MICRO** is a small-format refrigerant gas detector for installation integrated within OEM equipment. Gases measured are refrigerants including R32, R454x, and R290.
Typical examples include refrigerated display cases and heat pumps.

# 3 TECHNICAL DATA

| | |
|---|---|
| **Communication** | |
| **Modbus** | RTU over RS-485 (30V tolerant) |
| **Baud rate** | 9600, 19200 (default) or 57600 |
| **Data bits** | 8 |
| **Parity** | None (default), Odd or Even |
| **Stop bits** | 1 (default) or 2 |
| **Power Supply** | |
| **Operating voltage** | 11V to 15V |
| **Power consumption** | <= 25mA |
| **Operating effect** | < 0,4 W |
| **Wiring** | |
| **Cable size** | 22AWG x 2 twisted pairs +D+Aluminum foil shield,<br>Outer Diameter 5.5 mm |
| **Cable connector** | USB C form, waterproof |
| **Dimensions** | |
| **Enclosure Size (W×H×D)** | 56 x 128 x 27 / 2.2 x 5.04 x 1.06 inches |
| **Weight** | 75 g / 2.65 oz |
| **Environmental** | |
| **Operating temperature** | -20 to 60 °C / -4 to 140 °F |
| **Storage temperature** | -20 to 60 °C / -4 to 140 °F |
| **Humidity** | 0 to 99% RH, non-condensing |
| **Enclosure protection** | IP55 (Pending) |
| **Enclosure material** | ABS 777D, UL 94/V0 |
| **Maximum allowed air pressure** | 60 to 120 kPa |
| **Sensor** | |
| **Technology** | Infra-red |
| **Gas** | R32 / R454x / R290 (more available on request) |
| **Measuring range** | 0 - 100 %LFL |
| **Performance** | |
| **Warm-up Time** | 60 seconds (NOTE 1) |
| **Measuring range** | 0 - 50 %LFL |
| **Accuracy** | +/- 10% |
| **Response time** | T90 <= 30s |

*Table 1 Technical data*

**NOTE 1:** In prototype samples of GLACIÄR MICRO with firmware version 1.12, detectors for R454A, R454B, and R454C will achieve stability for measurement after 15 minutes of being powered. Gas readings before 15 minutes has elapsed should be deemed invalid. For R32 and R290 versions, measurement is possible immediately after the 60 second warm-up time is complete.

In the final production version of GLACIÄR MICRO, in versions for R32, R454A, R454B, R454C, and R290 gas measurement will be valid immediately after the 60 second warm-up time is complete.

# 4 USER INTERFACE

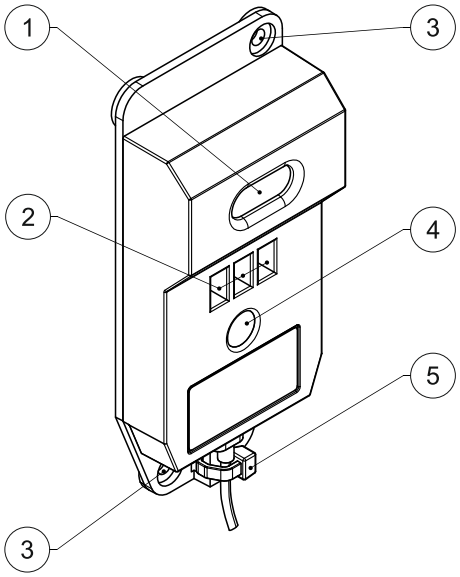



*Figure 1 User interface*

| Position | Function |
|---|---|
| 1 | Air inlet |
| 2 | LEDs |
| 3 | Mounting holes |
| 4 | Magnet sensor recess |
| 5 | USB C form cable with strain relief |

*Table 2 User interface functions*

# 5 MECHANICAL

## 5.1 Dimensional drawing

| Reference | mm | inch |
|---|---|---|
| A | 27 | 1.06 |
| B | 18,5 | 0.73 |
| C | 56 | 2.2 |
| D | 114 | 4.5 |
| E | 128 | 5.04 |
| F | 4,5 | 0.18 |
| G | 32,5 | 1.28 |

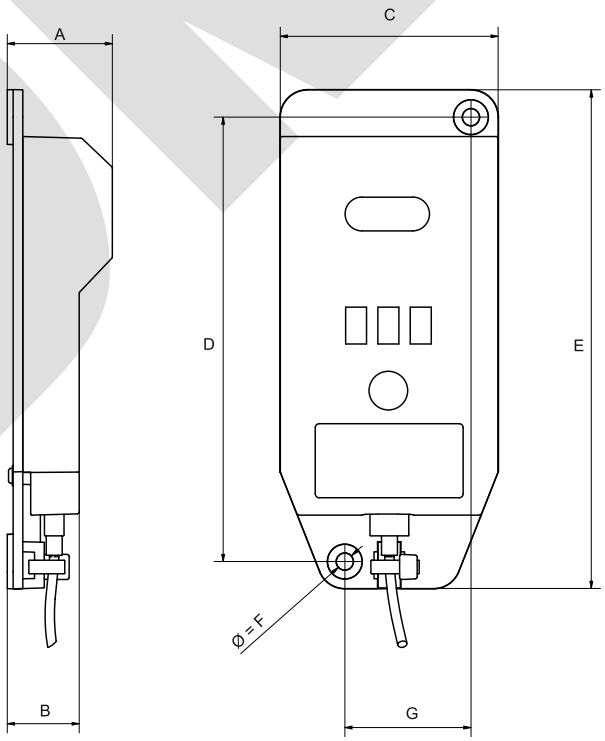



*Figure 2 Dimensional drawing and mounting holes*

# 6 MODBUS

**IMPORTANT:** Each device connected to the same RS485 bus must have its own address, otherwise there will be conflicts in transmission/reception that prevent serial communication.

## 6.1 Modbus serial port settings

| | |
|---|---|
| **Variant** | RTU |
| **Data bits** | 8 |
| **Baud rate** | 9600, 19200 or 57600 Bauds, Default=19200 |
| **Parity** | Odd, Even, None, Default=None |
| **Number of stop bits** | 1 or 2, Default=1 |
| **Addressing** | Configurable, via Modbus connection or Magnet Wand, Default=1 |

*Table 3 Modbus settings*

## 6.2 Modbus registers

| Address | Function code | Name | Description | Data format | Default Value | Read/Write |
|---|---|---|---|---|---|---|
| | | | | | | |
| 256 (0x100) | 3/4 | ID | If OEM CUSTOMER register is 1 then this reads 768 (0x0300). If OEM CUST is 0, reads value written to ID | 16-bit WORD UINT16 Response 0x300 for OEM CUSTOMER | 0x300 | Read-only |
| 257 (0x101) | 3/4 | OEM CUSTOMER | Unique value determining OEM variant<br>0: Samon standard<br>1: OEM1<br><br>See B2 in OEM requirements (2.2) | 16 bit WORD UINT | 0 | Read-only |
| 258 (0x102) | 3/4 | Gas group | Read from the sensor on power up. User overridable by writing to register. Writing 0 defaults to using the sensor value. If fails to get the sensor data, defaults to 0.<br><br>0 = NONE<br>1 = R290<br>2 = R32 | 16-bit WORD<br><br>0 = NONE<br>1 = R290<br>2 = R32<br>…… | 2 | Read-only |
| 259 (0x103) | 3/4 | Range | Sensor range – manually entered<br><br>Scaled value depending on MEASURING UNIT.<br><br>If set to 0, the sensor range is displayed | 16-bit WORD UINT16 | 50 | Read-only |
| 260 (0x104) | 3/4 | Measuring unit | Code for measurement unit<br><br>0: ppm<br>1: Vol%<br>2: %LEL | 16-bit WORD UINT16 | 2 | Read-only |

| Address | Function code | Name | Description | Data format | Default Value | Read/Write |
|---|---|---|---|---|---|---|
| | | | | | | |
| 261 (0x105) | 3/4 | Firmware version | Version number in decimal | 16 bit<br>WORD<br>UINT<br><br>SW version such as dec 0101 => v01.01 | 0101 | Read-only |
| 262 (0x106) | 3/4 | Hardware version | Hardware version in decimal | 16 bit<br>WORD<br>UINT<br><br>SW version such as dec 0101 => v01.01 | 0101 | Read-only |
| 263 (0x107) | 3/4 | Concentration | Scaled output depending on MEASURING UNIT<br><br>PPM is x1<br>%LEL is x1<br>%VOL is x100<br><br>Negative concentration is clamped to 0 | 16 bit<br>WORD<br>UINT<br><br>Depends on measuring unit | | Read-only |
| 264 (0x108) | 3/4 | Temperature | Unit is in Kelvin, no scaling, nearest 1 K. Taken from the sensor | 16-bit<br>WORD<br>INT16 | | Read-only |
| 265 (0x109) | 3/4 | Status register | Bit0 = Warmup<br>Bit1 = Sensor fault<br>Bit2 = Sensor comms<br>Bit3 = Underrange<br>Bit4 = Overrange<br>Bit5 = SelfTest (PSU volts < approx. 10V, Magnet sensor stuck at 0V or 3.3V for over 2 minutes)<br>Bit6 = EEPROM corrupt<br>Bit7 = FLASH corrupt<br>Bit8 = Magnet config in progress<br>Bit9 = End of life indication<br>Bit10 = Alarm on<br>Bit11 to 15 =<br>Reserved | 16-bit<br>WORD | | Read-only |
| 266 (0x10A) | 3/4 | SerialNumber1 | Manufacturer ID<br><br>ASCII<br>ex. 'H' | 16-bit<br>WORD<br><br>ASCII 1 byte | 0 | Read-only |
| 267 (0x10B) | 3/4 | SerialNumber2 | Manufacturer batch number<br><br>year-week<br>ex. 2327 | 16-bit<br>WORD<br><br>Decimal year-week | 0 | Read-only |
| 268 (0x10C) | 3/4 | SerialNumber3 | Manufacturer incrementing number<br>ex. 0001 | 16-bit<br>WORD | 0 | Read-only |

| Address | Function code | Name | Description | Data format | Default Value | Read/Write |
|---|---|---|---|---|---|---|
| | | | | | | |
| 269 (0x10D) | 3/4 | SerialNumber4 | Samon batch number<br><br>year-month<br>ex. 2307 | 16-bit WORD<br><br>decimal year-month | 0 | Read-only |
| 270 (0x10E) | 3/4 | Gas | If gas group = 2:<br>1 = R32<br>2=R454A<br>3=R454B<br>4=R454C<br>If gas group = 1:<br>Always 1 | 16-bit WORD UINT<br>If Gas group=1:<br>1=R32<br>2=R454A<br>3=R454B<br>4=R454C<br>For Gas group 2:<br>Always 1 | 1 | Read-only |
| 272 (0x110) | 3/4/6/16 | Modbus address | Set Modbus address, applied on power cycle.<br><br>Limited from 1 to 247 | 16-bit WORD<br><br>1..247* | 1 | Read/Write |
| 273 (0x111) | 3/4/6/16 | Modbus speed | Set Modbus baud rate. Minimum is 9600. Maximum is 57600.<br>Applied on power cycle | 16-bit WORD | 19200 | Read/Write |
| 274 (0x112) | 3/4/6/16 | Modbus parity check | Represented by character:<br><br>69 ('E') = Even<br>79 ('O') = Odd<br>78 ('N') = None<br><br>Applied on power cycle | 16-bit WORD UINT | 78 ('N') | Read/Write |
| 275 (0x113) | 3/4/6/16 | Modbus stopbit | 1 = 1 stop bit<br>2 = 2 stop bit<br><br>Applied on power cycle | 16-bit WORD UINT | 1 | Read/Write |
| 278 (0x0116) | 3/4/6/16 | PRODUCTION MONTH | | 16-bit UINT | | Read-only |
| 279 (0x0117) | 3/4/6/16 | PRODUCTION YEAR | | 16-bit UINT | | Read-only |
| 280 (0x0118) | 3/4/6/16 | PRODUCT LIFETIME | Sensor lifetime counter in days. | 16-bit UINT | | Read-only |
| 281 | 3/4/6/16 | Alarm level | 50% LFL | 16-bit UINT | | Read-only |

*Table 4 Modbus registers*

* Modbus addresses above 7 are only programmable via "Modbus address" register.
All registers should be Holding when factory password is sent to the unit.

# 7 REFRIGERANTS

- R32
- R454A
- R454B
- R454C
- R290

# 8 INSTALLATION

## 8.1 General information

The performance and overall effectiveness of the system strictly depend on the characteristics of the place where the device is installed. It is therefore necessary to scrupulously comply with and carefully analyse every detail of the installation process, including (but not limited to) the following aspects:

- local, state and national regulations and standards governing the installation of gas monitoring equipment
- electrical standards governing the laying and connection of power and signal cables to gas monitoring equipment
- all possible environmental conditions that the devices will be exposed to
- the physical characteristics of the gas to be detected (in particular, its specific weight)
- the characteristics of the application (e.g., possible leakages, movement of air, areas where gas may stagnate, high pressure areas, etc.)
- the accessibility needed for routine maintenance and repairs
- the types of equipment and accessories needed to manage the system
- any limiting factors or regulations that may affect system performance or installations.

**IMPORTANT:** the installation surfaces must not be exposed to continuous vibrations so as to prevent damage to the connections and electronic devices.

## 8.2 Installation tips

**CAUTION:** THERE IS NO GENERAL RULE for establishing the appropriate number of sensors and their location for each application. Therefore, the guidelines described below are intended as support for installers, and not as rules in their own right. **SAMON accepts no liability for the installation of the gas detectors.**

## 8.3 Detector position

| Gas type | Mounting height |
|---|---|
| HFC / HFO / $C_3$ $H_8$ Propane (R290) | 20 cm above the floor |

*Table 5 Detector position*

## 8.4 **Mounting**

Once the optimal position has been chosen, it is recommended to install the device as follows:

- Drill the holes in the wall using the measures from Figure 2 Dimensional drawing and mounting holes.
- Fix the device using two screws, chosen according to the type of installation and the type of wall, maximum diameter 4 mm, minimum length 15 mm and torque 2,5 Nm.

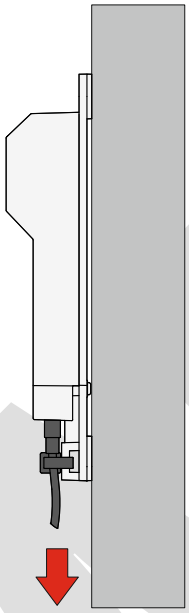


*Figure 3 Mounting direction (arrow pointing down)*

## *8.5* **Cable Connection**

| Wire number | Color | Function |
|---|---|---|
| 1 | Brown (or red) | Power 11 to 15V DC* |
| 2 | Blue (or white) | RS 485 Comm B |
| 3 | Green | RS 485 Comm A |
| 4 | Black | 0V DC |
| 5 | Black isolation | Cable screen to Chasis Ground (Silver colored wire) |

*Table 6 Wiring*

* All external circuits connected to device shall be double or reinforced isolated from mains meet SELV and Limited energy requirements according to clause 9.4 of UL61010-1 3rd edition.

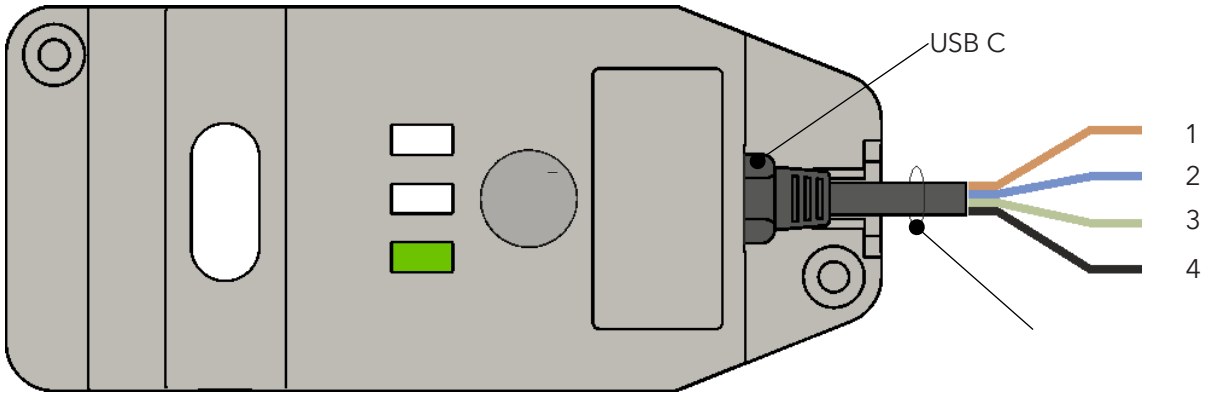



*Figure 4 Cable Form USB C. Free wire ends 4 core with screen 24AWG*

## 8.6 **USB C form connector**

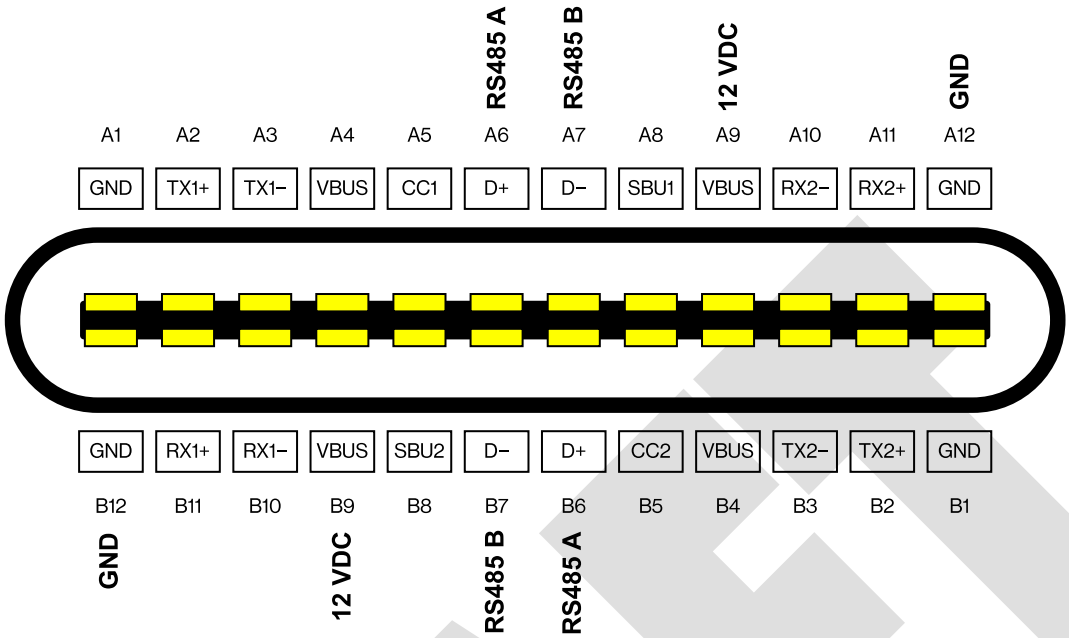



*Figure 5 USB-C form, water proof , with strain relief - Front view*

### 8.7 Additional installation notes

Before commencing electrical installation and wiring, carefully read the following notes:

- The cable must be sized and fitted with fuses based on the rated voltages, currents, and environmental conditions.
- To comply with RFI immunity regulations, the communication cable shield on the supervisor must be earthed (e.g., to the chassis, earth bar, etc.)
- Complete all wiring before powering on.

# 9 OPERATION

### 9.1 Magnet wand application

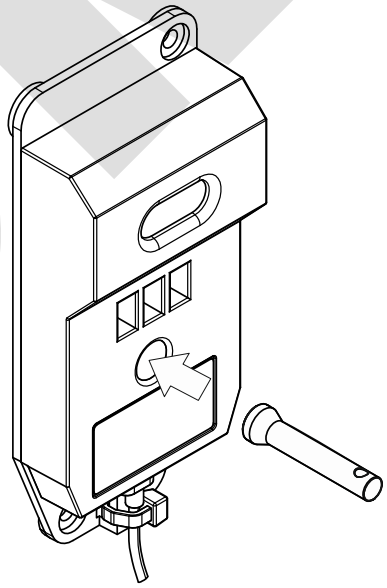


*Figure 6 magnet wand application*

## 9.2 LED signaling

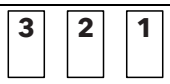
| | |
|---|---|
| **LED order** |   |
| **Indicates a Flashing LED** |  |
| **Indicates a constantly lit LED** |  |

*Table 7 LED signalling*

## 9.3 Device operating states

When power is connected, the device begins the 60 seconds warm-up cycle. Modbus address programming is possible only during the warm-up phase.

The device provides visual indications of it's current operating status. Visual indication of device operating status is provided by three LEDs (red/green/blue).
Device status is shown in the table:

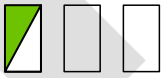
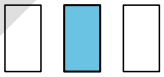
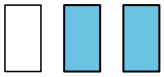
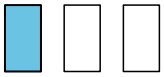
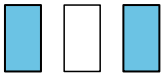
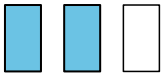
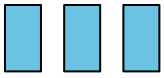
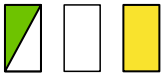
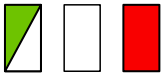
| Function | LEDs | Address |
|---|---|---|
| Device Warm Up, Flashing in Sequence: 3-2-1 |  | |
| Powered no Comms |  | |
| Powered and Comms |  | |
| • Hold Magnet for 10s.<br>• Each magnet swipe increments address until goes back to add 1<br>• The magnet is used to exit and save. Hold the magnet for 10 s and remove it to exit. Wait for 60 s for it to exit automatically.<br>• Device goes back to normal operation<br>• Restart the device to initialize with the new address |  | 1 |
| |  | 2 |
| |  | 3 |
| |  | 4 |
| |  | 5 |
| |  | 6 |
| |  | 7 |
| If the modbus address is set to a value above 7, all LEDs will blink once entering the programming state. If the wand is used, it will start again from 1. |  | > 7 |
| Fault Detected, Internal Fault |  | |
| Fault Detected, Under Range |  | |
| Fault Detected, Over Range |  | |
| Alarm state |  | |

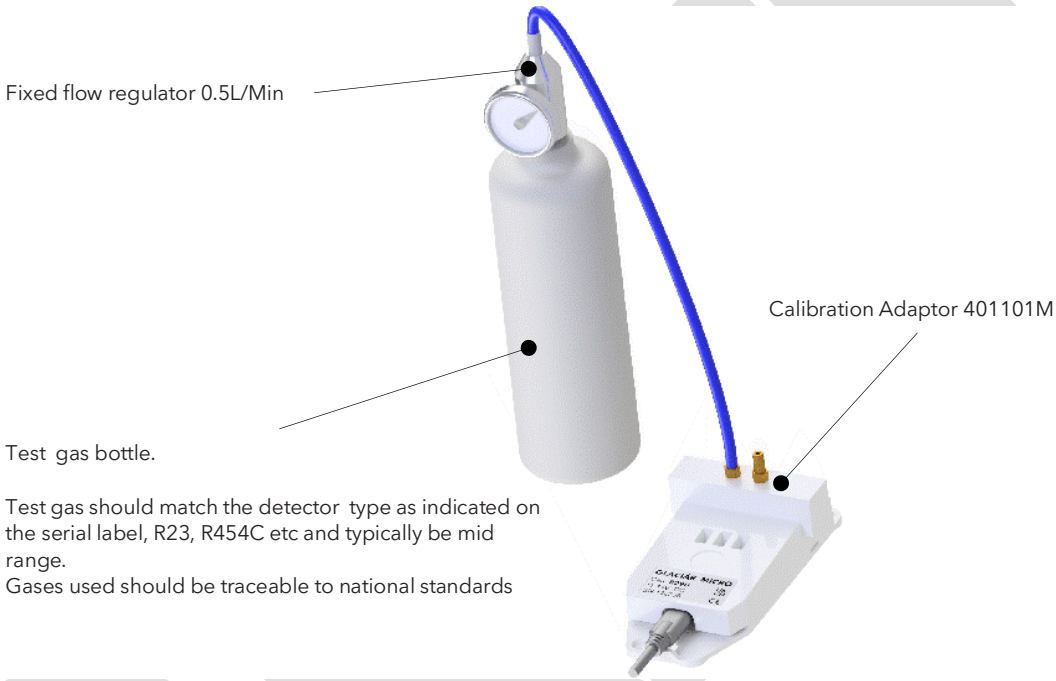
*Table 8 LED functions*

# 10 VERIFICATION

## 10.1 Gas response test

With a GLACIÄR MICRO unit connected via Modbus over its RS485 port.

1. Ensure the unit is out of warm up
2. Ensure the LED's indicate normal operation (refer to manual)
3. Ensure You have the correct gases and calibration adaptors
4. Flow the test gas for a minimum of 120 Seconds.
5. Read out the value from the Modbus input register 263
6. Check the result is within tolerance




Test gas should match the detector type as indicated on the serial label, R23, R454C etc and typically be mid range.
Gases used should be traceable to national standards

# 11 COMPLIANCE

## 11.1 Standards

- EN 50270 (pending)
- EN50271 (pending)
- IEC 61010-1 / UL61010-1 / CSA C22.2 No. 61010-1 (pending)
- IEC 60335-2-40:2022, Annex LL (pending)
- UL 60335-2-40, Edition 4, Annex LL (pending)
- UL 60335-2-89, Edition 3, Annex DVP.101 (pending)
- EN 14264:2020 (pending)
- EN378:2016 (pending)
- CFR Title 47 FCC Part 15B (pending)

# 12 DISPOSAL

## 12.1 Disposal of electrical and electronic equipment

Since August 2012, rules governing the disposal of electrical and electronic equipment defined in European Directive 2012/19/ EU (WEEE) and national laws, which apply to this device, have been in force throughout the European Union. Common house- hold appliances can be disposed of via special collection and recycling sites. However, this device has not been registered for home use. Therefore, it must not be disposed of using these services. Do not hesitate to contact **SAMON** if you have any further questions on this topic.

**WARNING:** Observe local regulations regarding waste disposal. For information, contact your local environmental agency, local government offices or appropriate waste disposal services.

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