MT5538
REMORA-1

Instruction manual

n.e.t.
innovative gas sensing

THIS MANUAL MUST BE CAREFULLY READ BY ALL PERSONS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR INSTALLING, USING OR SERVICING THIS PRODUCT.

Like any equipment, this product will perform as designed only if installed, used, and serviced in accordance with the manufacturer's instructions.

OTHERWISE, IT COULD FAIL TO PERFORM AS DESIGNED AND PEOPLE WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUFFER SEVERE PERSONAL INJURY OR DEATH.

The warranties made by N.E.T s.r.l. with respect to this product are voided if the product is not installed, used, and serviced in accordance with the instructions in this user guide. Please protect yourself and others by following them.

We recommend our customers to write or call us regarding this equipment prior to use or for any additional information relative to use or repair.

Summary

1.0 Introduction

These instructions refer to the installation, use and maintenance of REMORA-1 family of products.

1.1 General description

REMORA-1 module is designed to detect the presence of different gases in environments where the principal constituent is air.

The sensing element inside REMORA-1 module is an infrared sensor which provides superior repeatability and long-term performances than any other technology on the market.

REMORA-1 module is a device characterised by the presence of the sensing element and the electronics required to process the signals, everything included inside the IP54 enclosure. A multi-core cable with multiple conductors depending by the configuration allow the connection to power supply and different outputs of the module.

Gas sensor module is designed to comply to the main norms for refrigerants and hydrocarbon detection as 60335-2-40 (annex LL), TS65432, 60335-2-89 and 60079-29-1.

Based on 60335-2-40 (annex LL), TS65432 and 60335-2-89, this product is either a Refrigerant Detection System or a Refrigerant Sensor depending on its configuration.

The internal microprocessor present on the sensor, is programmed with the following software algorithms that guarantees exceptional performances in terms of stability and accuracy:

➢ Self-monitoring procedures to control the main operational parts, both hardware and firmware

➢ Zero-point tracking to maintain the zero parameter of the sensor apart from possible drifts due to thermal or physical variations of the sensor.

➢ Digital filter employed in the analysis of the analogue values sampled. It is designed to prevent the effects of transients, which may cause instability or incorrect readings with possible false alarms.

➢ Hysteresis cycle applied to the digital and relay outputs to eliminate continuous switching close to the preset alarm thresholds.

➢ Watch-dog for the microprocessor control. In case of intervention, the communication through RS485 interface will be interrupted, the Fault signal (if present) will be activated, whereas the output current (if present) will drop down to 0mA.

1.2 REMORA-1 module identification

REMORA-1 module has a glass reinforced, flame retardant IP54 Polyamide enclosure. It's equipped with a multi-core cable terminated with a standard micro-fit Molex connector.
Connectors can be wired in different configurations based on the required output signals.
The following picture shows the REMORA-1 module.

Table 1)   *Main versions of the gas sensors**

Model	DSO	ASO	DSC	ASC
Input Power	12-24Vdc	24Vac±10%	12-24Vdc	24Vac±10%
Outputs	RS485+ Relays	RS485+ Relays	RS485+ Relays	RS485+ Relays
SS Relays	Normally Open	Normally Open	Normally Close	Normally Close

*Apart the above configurations, other characteristics as presence of 4-20mA output, electromechanical relays are available on request.

2.0 Technical specifications

Table 2)   Technical specifications of gas sensors

General	**Sensing Element:**	NDIR sensor
	Operating temperature range	-40 +60°C
	Storage temperature range	-40 +85°C
	Maximum temperature cycle variations	± 1°C/min
	Operating humidity range	0-100% Relative with maximum dew point 40°C
	Operating pressure range	800-1200 mBar
	Enclosure	25% Glass Reinforced, Flame Retardant, Polyamide 66
	Enclosure Protection	IP54
	Enclosure Flame Rating	UL94-V0
	Calibration	Individually calibrated with temperature compensation. Test report supplied.
	Weight	<150gr
	MTBF	> 15 yrs (IR Source MTTF > 15 years)
Measurement	**Sensing method**	NDIR
	Range	%vol (up to 100%LFL)
	Alarm Threshold	10% to 20% LFL
	Alarm hysteresis	2,5% LFL
	Response time	T_{90} <30 seconds
	Accuracy*	±2% LFL
	Resolution	0.5% LFL
	Temperature Performance	±5% LFL
	Pressure dependence	0.1 % to 0.2 % value per hPa
Electrical	**Power Voltage**	Nominal 12-24Vdc or 24VAC±10%
	Current Requirements	<200 mA
	Warm up time	60 s for full operation @ 25 °C 1 hour for full specification @ 25 °C
Signal Output	**Relays connection**	1 Fault+1 Alarm SSR relays Normally closed or open. 350mA 50Vp
	Digital communication	Modbus protocol RS485 (Termination resistance of 120Ω normally present)
	Baud Rate	Standard 4800bps; options: 9600;19200;38400 bps

* Test conditions: 25°C ambient temperature and 1000hPa absolute pressure

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3.0 Mechanical Specifications

REMORA-1 module
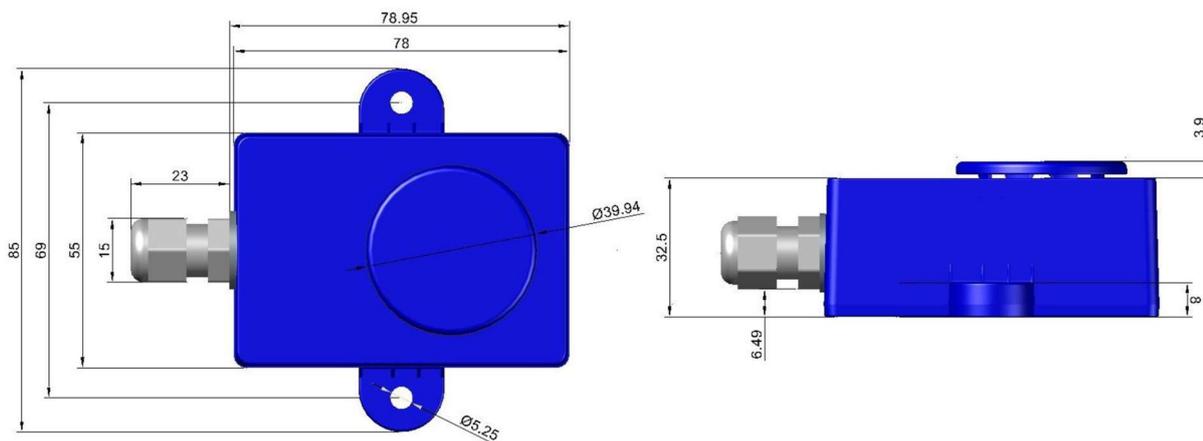
All dimensions are expressed in mm.
The standard length of the cable is 15cm, other lengths are available at the customer's request.

4.0 Sensor markings

Here is represented an example of the technical label present on the Remora module:

Example of label 1

Example of label 2 for A3 gases   Example of label 2 for A2L gases

Table 3) Label information

Field	Location	Marking	Comment
N.E.T Logo	Label1& Label2	N.E.T	
Model	Label 1	REM1-XXX-YYYY-ZZ	XXX = DSO/DSC YYYY = GAS and full scale ZZ = Threshold level
Version	Label1	RS485 +Normally open or normally closed relays sensor	Characteristics of the product
Gas	Label1	R290 / R454B	Gas to be detected
Vin	Label1	12-24Vdc	Power supply voltage range
Output	Label1	Threshold value	Level of intervention of the relay (in case is present) expressed as %F.S and %vol
Serial number	Label1	IRMXXXXXX	Sensor serial number
IP grade	Label1	IP54	IP protection level

Table 4) Certification information

EMC Certification	Test report number	EMCTR_185538-0
	Reference standards	EN IEC 61326-1:2021; EN 50270:2015;
IP Certification	Test report number	IPTR_185536-0
	Reference standards	EN 60529:1991+corr 1993+A1:2000+A2:2013+AC:2016

5.0 Installation site pre arrangement

5.1 General precautions

At the mounting and installation phase, be sure all safety precautions have been considered. Always remember how important the correct positioning of gas sensors is to get the optimum response.
The sensor must be handled, installed or replaced only by qualified personnel. It is not permitted to repair the sensor by the customer.
Be careful:
  ➢ never install gas sensor close to air intakes or fans causing strong air currents.
  ➢ the gas sensor is attached to a firm base to prevent vibration that can damage it, producing unreliable results. Although the electronics comply with the electromagnetic compatibility rules, it is advised to keep the sensor at a distance from any radio frequency senders (such as radio links or similar).
  ➢ sensor is placed in a convenient location for future maintenance and calibration requirements.

WARNING!

Don't connect or disconnect the sensor once the appliance is powered, hot plugging the sensor can cause permanent malfunction.

5.2 Precautions based on the gas to detect and environmental inhibitors

When preparing the installation site, it is necessary to consider the nature of the gas to be detected and the presence of possible interference gases in the environment.
  ➢ All the gases lighter than air (Methane, Hydrogen) tend to spread upwards; in this case the sensor should be placed at 30 cm from the ceiling or to the highest part of the container, to maximise the effectiveness of the detection.

➢ All the gases heavier than air (Propane, Butane, others A2L gases) tend to spread downwards; in this case the sensor should be placed at 30 cm from the floor or to the lowest side of the container.
➢ Internal temperature of the gas sensor module is normally 15-20°C higher than ambient conditions, this feature allows to minimize significantly risk of internal condensation.

WARNING!

Please, take care that in case of ambient atmospheres with Oxygen concentrations above 21%vol the flammability level of the gas to be detected could be affected.

5.3 Special conditions for safe use

➢ The supply cable of the gas sensor must be protected against mechanical damage caused by impact or friction.
➢ The requested degree of protection IP shall be guaranteed following the specific mounting orientation of the sensor.
➢ It is strictly forbidden open the sensor as this action will void the warranty and may cause permanent malfunction.
➢ Although the internal temperature of the gas sensor is much higher than ambient temperature, in case of transient conditions, the customer is responsible to asses the risk of possible condensation inside gas sensor module that could inhibit or affect the functionality of the gas sensor module.

5.4 Protection against electrostatic current

Although the gas sensor complies with IEC 61000-4-2, it is recommended to protect it against electrostatic currents, here are listed three possible methods:
- Control of environmental humidity to minimize the generation of static electricity
- Protection from direct airflow causing a charge transfer
- The gas sensor must be cleaned with a damp cloth or antistatic products avoiding blocking gas inlet.

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6.0 Installation

The gas sensor must be handled, installed or replaced only by qualified personnel.
Mounting and dismounting operations are to be done in safety, being sure that power supply is off.
Installation of the gas sensor must be carried out by qualified personnel capable of identifying risk of potential hazards that could arise working with gas sensors.
The gas sensor module must be mounted on a smooth surface using the fixing holes provided, following a suitable connection system depending on the application. In case gas sensor is mounted by screws on a stainless-steel support, it is recommended to use screws with characteristics similar to DIN7976-C-A2-CH10-6,3X13; it is also recommended to use a suitable washer.

WARNING!

For safe use these mounting instructions are to be followed precisely.
The sensor cannot be disassembled.
It is strictly forbidden open the sensor as this action will void the warranty and may cause permanent malfunction

Installation must be performed verifying that gas sensor's inlet is not blocked, indeed any restriction may delay or inhibit the sensor's response.
Gas sensor shall be installed as indicated in below pictures 1,2 and 3; any other mounting angles maintaining the same type of installation could be used.

WARNING!

The gas sensor module must not be installed with the gas inlet facing upwards (picture 4) in applications where water or liquids might accumulate on the gas sensor. An accumulation of liquids in the sensor may inhibit or delay the sensor's response to the refrigerant gas.
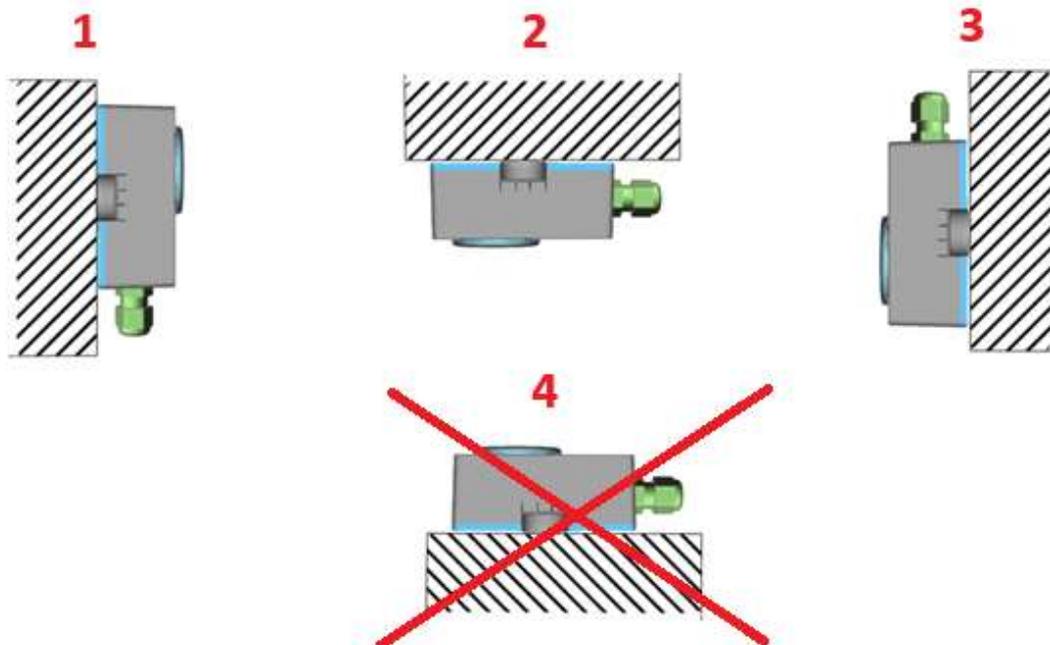
Picture 1) Mounting orientations

6.1 Earth ground connection

WARNING!

No earth ground connection is required on enclosure.

6.2 I/O Connections

REMORA-1 gas sensor family could be configured to manage different output connections based on the type of specific request of the customers.
Here is following a list of some* of possible signals managed inside REMORA-1 gas sensor:

Table 5) Remora Configurations pinout

PIN	WIRE COLOR	Cable 9536 Connector 4 positions	Cable 9536 Connector 8 positions	Cable 9538 Connector 8 positions
2	RED	VCC/Power 1	VCC	VCC/Power 1
4	BLACK	GND/Power2	GND	GND/Power2
3	GREEN	RS485-A	RS485-A	RS485-A
1	BLUE	RS485-B	RS485-B	RS485-B
5	WHITE		OUT 4-20mA	FAULT-A
6	BROWN			FAULT-B
7	YELLOW			ALARM-A
8	ORANGE			ALARM-B

*Other options/configurations are available on request

Connector type (female): MOLEX 43025-0400, 43025-0800
Mating connector: MOLEX 43020-0401 (4 positions), 43020-0801(8 positions)

Here it is following the wire assembly present only REMORA-1 gas sensor version with 4 wires (Power supply and RS485 bus):
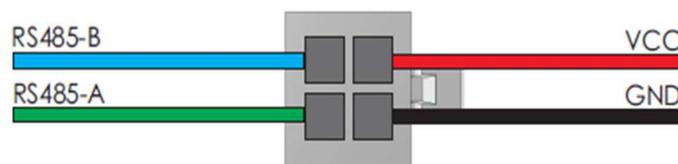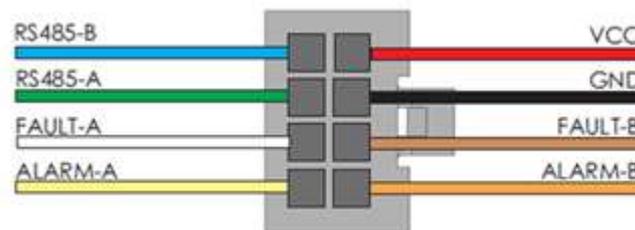

Picture 2) 4 wires version connections

Here it is following the wire assembly available with REMORA-1 gas sensor version with 5 wires (Power supply, RS485 bus,4-20mA):
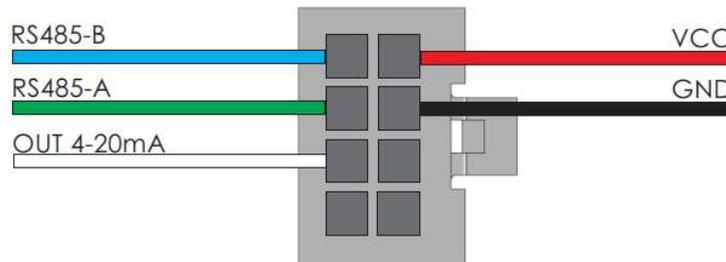
Picture 3) 5 wires version connections

Here it is following the wire assembly available with REMORA-1 module version with 8 wires (Power supply, RS485 bus, fault and alarm):

Picture 4) 8 wires version connections

6.3 RS485 digital connection

Connection of the gas sensor to the RS485 bus line should be performed by using a 2-wires cable. It is also necessary that:

> Wiring between the gas sensor and the control panel should be made by using connection cable EIA RS485: 2 core wires with section 0.22 / 0.35 mm2 and shield (twisted pair). Nominal capacity between the wires <50pF/m, nominal impedance 120 Ω. These features can be found in BELDEN cable 9536/9538 or similar (data transmission cable in EIA RS485).
> Using this wiring, the total length of the line should not exceed 1000 m.
> Make sure that each multi-polar wire includes just one RS485.
> Take in consideration that a 120 Ω end line resistor is placed on the gas sensor between A and B lines.
> For the power supply connection, we recommend using a 2-wire cable with suitable section according to the distance between power supply and gas sensor.

When sensors are RS485 connected, the proportional 4-20mA and relays outputs remains active.

Please refer to the specific Modbus communication protocol for any additional information.

6.4 Relays output

Remora 1 gas sensor may be provided with 2 relays signals, 1 associated to identify a possible fault state of the sensor and the other one to identify the alarm condition.

The connection of the relays signals to the external device should be performed by using wires with section 0.22 / 0.35 mm^2.

It is important to note that around the alarm threshold level associated to the alarm relay is active an hysteresis of 2,5%F.S this feature avoid a possible continuous activation/deactivation of the relay in case of gas concentration close to the alarm level.

Considering hysteresis functionality it means that once gas concentration becomes higher than alarm level then the related relay is activated and it will remain active until gas concentration will remain above a gas concentration level equal to: Alarm threshold level-2,5%F.S.

Two possible types of Solid-state relays are available:
- Normally open version
- Normally closed version

WARNING!

In case the relays are stuck at the normal condition state, then Alarm or Fault conditions can be indicated by the gas sensor; once the sensor is powered it is not possible to identify through Self-test if the relays are stuck.

To safely identify the correct functionality of the relays it is recommended to power off the gas sensor module during maintenance operations, once it is assured that a possible gas leak is not present. During this operation it is only needed to check the variation of the status of the relays between off state and normal operation condition that appears after 60 seconds of warmup.

It is recommended to repeat the same procedure also in case during maintenance operations, has been identified a possible misuse by the end user that could cause a malfunction of the gas sensor module.

Take care of the following characteristics of the relays:

Table 6) Relays Characteristics

Parameter	Ratings	Units
Blocking Voltage	50	Vp
Load Current*	350	mA$_{rms}$/mA$_{DC}$

*Load current derates linearly from 350mA @ 25°C to 200mA @60°C

Excess current or voltage on the relays must be avoided as it could be cause of permanent damage.

6.5 4-20 mA output connection

Remora 1 gas sensor optionally may be provided with 4-20mA output signal.

This output mode is only possible in case remora gas sensor is powered in DC mode, moreover this version is not a standard one, please contact N.E.T to receive order code information.

The connection of the 4-20mA signal to the external device should be performed by using wires with section 0.22 / 0.35 mm^2, section of the cable is depending by the distance between gas sensor and interfacing system (e.g control panel).

Output signal in normal working conditions is clamped to a maximum current level of 24mA corresponding to 120%F.S.

In case of short circuit on the load then the output current is limited to around 35mA

Depending by the power supply level here are indicated the maximum values of the load resistors that are allowed to be connected to the 4-20mA signal:

From 12V up to 15V: 330 Ohm (with a maximum loop current of 24mA).
From 15V up to 24V: 500 Ohm (with a maximum loop current of 24mA).

7.0 Safety data

REMORA-1 gas sensor has been designed to be used also in applications requiring SIL Capability. Based on the different type of configuration chose, specific values of SIL Capability have been obtained. Please refer to the specific document to check each value or ask to technical support to receive the related information.

It is the responsibility of the appliance manufacturer to provide mitigation action when appropriate. These instances include, but are not limited to, whenever the refrigerant detection system triggers a mitigation action, whenever the detected refrigerant concentration exceeds the limit set by the appliance manufacturer, whenever a sensor error is present, whenever environmental conditions exceed limits specified inside datasheet, whenever sensor readings cannot be considered relevant (e.g., during sensor startup, lack of or insufficient sensor response due to clogging of gas inlet or any other reasons), and in any other situation that can result in personal injury (including death) or property damage.

It is the responsibility of the appliance manufacturer to implement the correct mitigation actions in case of any sensor failure and/or malfunctioning. Failure to do so could result in personal injury (including death). The appliance manufacturer is responsible for the safety of the systems it builds, and that failure of the product does not result in death, injury or property damage. It is also responsible for the correct integration, maintenance, inspection, and servicing of the product and to ensure that the product operates within the limits specified by the present datasheet.

8.0 Testing and use

8.1 Power on

When the gas sensor module is powered on, it has a warmup duration of 60 seconds, in this time frame the outputs are maintained in these conditions:
Alarm relay: it is not activated, it means it is in status of NO ALARM
Fault relay: it is activated, it means it is in status of FAULT
Concentration through digital communication: It is maintained at -20%F.S
***4-20mA output**: It is maintained at 2mA

Once warmup condition is expired the status of the outputs is set in these conditions:
Alarm relay: it is not activated, it means it is in status of NO ALARM
Fault relay: it is not activated, it means it is in status of NO FAULT
Concentration through digital communication: It is changed to 0%F.S
***4-20mA output**: It is changed to 4mA

* in case it is present in the module

Once the warm-up phase is over, gas sensor module is fully operative, although the optimal performances will be achieved after one hour from power supply.
Here it is represented a simple table with all the conditions in which could be the different output signals of the gas sensor module:

Table 7) Output levels

State	RS485	Fault Relay	Alarm Relay	4-20mA
Power off	No communication	Fault state	Alarm state	0mA
Warmup	Warmup warning and concentration at -20%F.S	Fault state	No Alarm	2mA
Normal condition	Concentration at 0%F.S	No Fault	No Alarm	4mA
Fault condition	Presence of error and concentration at -20%F.S	Fault state	No Alarm	2mA
Alarm condition	Gas concentration above threshold level	No Fault	Alarm state	Current related to gas concentration value

WARNING!

It is strictly forbidden hot plugging the module as it could generate a permanent malfunction of the module.

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8.2 Testing (Bump Test)

Remora gas sensor modules are factory calibrated for the specific gas required by the customers. Bump test and adjustment of the calibration is normally not necessary as it is expected that the IR sensor will not need any adjustment for many years. In case customer is interested to perform bump test then it is recommended to follow these recommendations:

- Testing of the module must be performed by a qualified and trained person.
- To perform bump test, it is needed the use of the specific accessory REM1-GAS-CAP and a gas cylinder with a concentration of minimum 25%LFL of the target gas identified on the REMORA gas sensor module

Here are following the steps to be followed to perform bump test:

1. Remove Oil/Dust cover cap from the Remora module and connect REM1-GAS-CAP
2. Connect one side of a tube with diameter 6x4mm to the gas inlet present on REM1-GAS-CAP
3. Connect flow controller to the gas cylinder
4. Connect the other side of gas tube to the flow controller
5. Open the valve of the flow controller at 0,5 litres per minute and keep it opened for 5 minutes
6. Check correspondence of the response of the gas sensor module with the applied gas concentration, verifying that state of the alarm relay is changing correspondingly to the application of the gas, or digital concentration and/or 4-20mA signal provided is consistent with the applied gas concentration.

In case customer for any reason, will be interested to adjust the calibration it is required to contact N.E.T. for further details.

Picture 5) Oil/Dust cover cap & REM1-GAS-CAP

IMPORTANT!

NOTE: Recalibration of the module is not allowed in products certified over IEC/UL/EN 60335-2-40 standards or IEC TS64532.

IMPORTANT!

To maintain Safety integrity level (SIL) certification, it is requested to check the functionality at least once per year, by testing gas sensor module response with application of gas, to check gas sensor's response and activation of the relays.

WARNING!

It is strictly forbidden open and close the equipment.
It is strictly recommended the use of personal protective equipment during operations on the gas sensor module.

9.0 Maintenance

The sensor must be handled, installed, cleaned or replaced only by qualified personnel. It is not permitted to repair the sensor by the customer.

9.1 Note on IP grade

Please note that the IP rating indicated on the instrument label does not imply that the gas sensor module will detect gas during and after exposure to those conditions of dust and water intrusion.
The filter present on the gas sensor module should by no means be touched by bare hands as this may alter the protection and the response in gas.
If exposed to the condition's representative of the IP rating, it is recommended to check regularly the gas sensor module to verify that gas sensor's inlet is not clogged by dust or grease.
Whenever the Oil/Dust cover cap will not be any more suitable to allow gas to enter inside the gas sensor module, due to clogging, it should be replaced with the specific spare part indicated in chapter 12. To replace the cap it should be followed instructions described inside 9.2.

WARNING!

In case gas sensor's inlet is clogged by dust or grease, then response to the gas may be delayed or inhibited.

9.2 Cleaning

Cleaning operation must always be performed only by qualified personnel indeed wrong cleaning operations may damage the sensor or block the gas inlet inhibiting or delaying response of the gas sensor module.
It is responsibility of the customer and/or the end user to instruct maintenance personnel to perform these operations.
Before to perform any cleaning procedure it is important to power off the gas sensor module.
Gas sensor module must be kept clean of dust or grease deposits. Cleaning must be performed with damp cloths or with cloths that do not accumulate electrostatic charges. It is strictly forbidden cleaning gas sensor module using compressed air.
Dust or grease that may be accumulated on the gas sensor module must be removed in case are obstructing completely or partially the gas sensor inlet.
Normal cleaning procedure can be performed without removal of the Oil/Dust cover cap, only in case of big amounts of dust or grease on the cap, it is required to remove it from the gas sensor and to clean also the cap. In case Oil/Dust cover will be considered not anymore suitable to guarantee correct flow of the gas inside the sensor then it should be replaced with the specific spare part defined inside chapter 12.

Picture 6) Oil/Dust cover cap

9.3 Disassembly instructions

It is strictly forbidden open and close the equipment when it is installed in hazardous area, and it is powered-on.
Power the unit off, disconnect the wires on the terminals and dismount the housing from any blocking systems.
Remora module can't be opened by the customer otherwise its IP rating could be compromised.
It is strictly recommended the use of personal protective equipment during operations inside the enclosure.

9.4 Trouble shooting guide

The following table lists all the error messages, which can be encountered, with corrective actions to resolve them. When the gas sensor module is in error status then digital concentration trough RS485 is set to -20%F.S, Fault relays is in fault condition, and 4-20 mA output is set to 2mA or lower.

Table 8) Error messages with their corrective actions for Remora gas sensor module

Error Code	Error Name	Error Description	Corrective action
0x00	NO_ERROR	None	None
0x02	E2PROM_CKSM_ERROR	Internal E2PROM error	➢ Turn power off, then power on again. ➢ If the previous action does not resolve the error, please contact N.E.T.
0x03	FLASH_CKSM_ERROR	Internal FLASH error	
0x04	RAM_ERROR	Internal RAM error	
0x05	VDD_ERROR	Internal Power supply fail	
0x06	I2C_ERROR	Internal communication error	
0x08	SPI_ERROR	Internal communication error	
0x09	VREF_ERROR	Internal Vref error	
0x0A	DAC_ERROR	Internal DAC error	
0x0C	ANALOGUE_4-20MA_ERROR	Current/voltage output generated is not correct	
0x0E	ADC_ERROR	Internal ADC error	
0x0F	SW_ERROR	Internal calculation error	
0x10	VIN_ERROR	Power supply level is not correct	Verify input power that meets product's power supply range
0x11	FLASH_READ_ERROR	Internal FLASH error	➢ Turn power off, then power on again. ➢ If the previous action does not resolve the error, please contact N.E.T.
0x12	FLASH_WRITE_ERROR		
0x13	FLASH_ERASE_ERROR		
0x14	E2PROM_WRITE_ERROR	Internal E2PROM error	
0x16	RFI_ERROR	Internal signals not stable	Verify if Electromagnetic disturbances, flow rate or pressure changes are present in the working environment.
0x17	VBG_ERROR	Internal Band gap error	➢ Turn power off, then power on again. ➢ If the previous action does not resolve the error, please contact N.E.T.
0x18	LAMP_ERROR	IR LAMP not work	
0x19	AMP_ERROR	OP AMP not work	
0x22	VPWRLAMP_ERROR	Internal power supply error	
0x23	MAXIMUM_DRIFT_EXCEEDED	Internal signals drifted too much to guarantee correct functionality	Replace the gas sensor module, it is a permanent error

Remora gas sensor module also indicates presence of warning condition
Inside the following table are indicated warning of the gas sensor module and the related codes:

Table 9) Warning messages with their descriptions for Remora gas sensor module

Warning Code	Warning Name	Warning Description
0x00	NO_WARNING	Normal operation
0x01	WARMUP_WARNING	(warm-up) This condition remains active for 60 seconds after power-on
0x02	INVALID_ACTIVE_WARNING	Active signal not included within the functional limits expected
0x04	INVALID_REFERENCE_WARNING	Reference signal not included within the functional limits expected
0x08	INVALID_TEMPERATURE_WARNING	Temperature value not included within the functional limits expected
0x10	INVALID_READINGS_WARNING	active and/or reference signals changed too fast. This condition can appear in case of fast gas flow rate transient, fast temperature changes or presence of radio frequency interferences. In case this flag is active then gas concentration is freezed for some seconds
0x20	INVALID_ACTIVERMS_WARNING	WRONG VALUES on the active channel. Active signal is too low
0x40	INVALID_REFERENCERMS_WARNING	WRONG VALUES on the reference channel. Reference signal is too low
0x80	HW_TEST_WARNING	HW test in progress. It remains active for some seconds

10.0 Restorations

Restoration is not allowed; in case the product is still in warranty period then the customer must send back the complete gas sensor module to N.E.T with the RMA number requested in advance to return the goods.

11.0 Packing instructions

To grant a stout protection against impacts we recommend using the original package or protect the device with bubble wrap sheets.

12.0 Accessories/Spare parts

Table 10) Table of available accessories/spare parts that can be purchased. Please contact N.E.T for further information.

Part number	Description
REM1-GAS-CAP	Plastic calibration adapter for REMORA-1 module. It allows the right quantity of gas inlet to flow to the gas sensor module.
REM1-OIL-COVER	Plastic cover to reduce quantity of Oil/Dust will enter inside the sensor
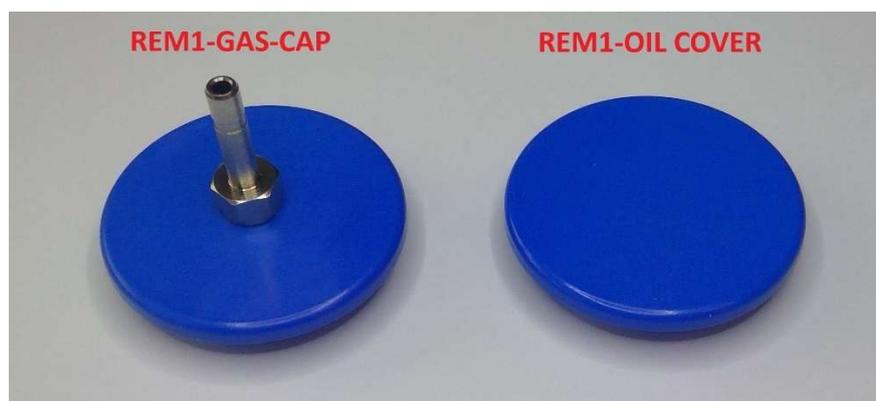
Picture 7) REM1-GAS-CAP & REM1-OIL-COVER

13.0 Warranty for repairing

The warranty on N.E.T. products is valid 3 years from the delivery date, which can be found in the relevant transportation documents. This warranty, however, is not valid for articles that are broken, are repaired by a third party or are not used according to the instructions included in this document or supplied with the products, related to storage, installation, operation, maintenance, or servicing of the products.
The 3-year warranty does not cover the functionality of the sensor; in this case, the specific warranty of the sensor defined inside its datasheet will be considered. Defective products can be returned to N.E.T. only after a previous agreement and with a description of the fault. N.E.T. has the right to replace or repair all the products that, according to its unquestionable judgement, are found to be defective, without being held responsible for any possible direct or indirect damage the Customer may suffer from. According to the above-mentioned warranty, dismantling, shipping, packaging and reassembly charges and any other incidental expenses for the products returned to N.E.T. will be charged to the Customer at their own risk.

N.E.T reserves the right, without further notice to:
- Change the product specifications and/or the information in this document
- Improve reliability, functions and design of this product.

14.0   Instructions for disposal

When the device reaches the end of its life, it should be disposed of in accordance with local waste management requirements and environmental legislation. Employed materials are subdivided into the following categories:

- ➢ Gas sensor module enclosure: PBT (25% Glass Reinforced, Flame Retardant, Polyamide 66)
- ➢ Electronic boards: Waste Electrical & Electronic Equipment (WEEE)
- ➢ Sensing element: Waste Electrical & Electronic Equipment (WEEE)

Contact details: N.E.T s.r.l. Via Campania, 5 - 20006 – Pregnana Milanese (MI) Italy