

Ambetronics Engineers Private Ltd

User Manual

Smart Gas Detector

Model No: GT-2511-FLP

For Oxygen/ Toxic/ Combustible/ PID/ NDIR (CO₂/ CH₄/ C₃H₈):

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1. SAFETY INFORMATION

Before installing / operating / maintaining the instrument ensure that, this 'Operating & Installation Manual' is read. Give particular attention to warning & cautions. All warnings are listed here and repeated in appropriate places of relevant subjects in the 'Operating & Installation Manual'. Cautions will appear in section / subsection of the 'Operating & Installation Manual' where require.

CONDITION OF SAFE USE

- Smart Gas Transmitter (GT-2511) is for use in an Ambient Temperature range of $-15^{\circ}\text{C} \leq T_a \leq +55^{\circ}\text{C}$.
- Users must follow the warnings and cautions as mentioned in the next section before use.

2. WARNINGS / CAUTIONS

- Access to the interior of the instrument when carrying out any work, must be conducted by qualified & trained personnel only.
- To reduce the risk of ignition of hazardous atmosphere, de-classify the area or disconnect the instrument supply before opening the instrument enclosure. Keep enclosure tightly closed during operating.
- Do not open Instrument enclosure or replace / refit the sensor in potentially hazardous atmospheres while power is still connected with the instrument.
- The body of Instrument enclosure must be earthen for electrical safety and to limit the effects of radio frequency interference. Earth points are provided outside of instrument enclosure.
- All screen / instruments earth / wiring is earthen at a single point to prevent false readings or always that may occur due to potential earth loops.
- At the end of their working life, replacement of sensor must be disposed in an environmentally safe manner. Disposal should be according to local waste management requirements & environment legislation. Alternatively, old replaceable sensors may be securely packaged & returned to 'Ambetronics'.

3. INTRODUCTION

3.1 OVERVIEW

The GT-2511-FLP is a microprocessor based Smart Gas Transmitter with an easy to read backlit LCD display. The Transmitter provides the industry standard Analog 4-20 mA output as well as optional RS-485 digital output. The Transmitter utilizes smart sensor technology, using pluggable Sensor Modules, where all of the sensor information & its calibration data, Alarm setting, offset setting, output current setting is stored in Sensor Module, which is easy maintenance, servicing.

The reader of this manual should ensure that it is appropriate in all details for the exact instrument to be installed and / or operated. If any doubt, contact 'Ambetronics' for advice. If any information is not covered in this manual, or if any comments / corrections are required in this manual, please contact Ambetronics using contact details given on the last page.

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FOR FLAMEPROOF INSTRUMENTS

Explosion proof certified sealing device, such as a conduit seal with setting compound, Suitable for the conditions of use and correctly installed, shall be provided immediately to the entrance of the housing.

Unused openings should be closed with suitable explosion proof certified closing elements. The unit must be protected from extreme vibration and direct sunlight in hot environments as this may cause the temperature of the detector to rise above its specified limits and cause premature failure.

3.2 FEATURES

- Provides a fast reliable output for detection a smallest leak of Oxygen, Toxic Gases, Combustible Gases and Volatile Organic Compound (VOC).
- Provision for smart – pluggable gas sensor module for Oxygen, Toxic, Combustible, PID sensor & NDIR sensor.
- Calibration data, Alarm data, Offset data, Output current data is saved in the particular sensor module, for easy maintenance & servicing.
- Highly resistant to poisoning and etching.
- Capable of detecting down to PPM, %V/V, %LEL, PPB, mg/m³, ug/m³.
- Digital display of Gas Concentration on LCD Display
- Indication for 'Sensor Open', 'Over Range', 'Sensor Replace', 'Cal Due', 'Cal Fail', mA Loop Open.
- Standard 4-20mA signal output with configurable range.
- Optional STEL and TWA set points can be configured for Toxic & VOC Gases.
- Optional RS-485 Communication Port with MODBUS RTU PROTOCOL.
- Non - Intrusive programming for Flameproof Model using Magnetic Wand.
- Password protected programming with Password Changing Facility.
- Alarm Acknowledgement Facility from front as well as rare terminal.
- 'Test Mode' provided to check the electronics as Alarm LEDs, Relays, 4-20mA Output current with or without sensor module.
- Optional Alarm Relay contacts on board with two configurable Alarm Levels & One Fail Safe Relay.

3.3 APPLICATIONS

- | | | |
|-----------------------------------|-----------------------------|---------------------------------------|
| • Refineries | • Cold Storage | • Chlorination Plant |
| • Fertilizers Plants | • Stack Monitoring | • Ambient Monitoring |
| • Gas Metering skid | • Gas Cylinder Bank | • Gas Pipeline Project |
| • Pulp & Paper Plants | • Oil & Gas Industries | • Chemical Storage Area |
| • Gas Metering Station | • Heat Treatment Plants | • Power & Industrial Plants |
| • Control Atmosphere | • Burner / Furnace Areas | • Coal Mine and Confined Area |
| • Bullet Yard / Storage Yard | • Sewage Plants | • Automotive Industries / Paint Shops |
| • Chemical & Petrochemical Plants | • Chemical Processing Plant | |

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- Offshore Drilling & Processing Platforms
- Acid Alkalizes & Dyes Mfg. Plants

3.4 TECHNICAL SPECIFICATIONS

Table 1

| GENERAL | | | |
|-----------------------------------|--|--|----------------------|
| Sensor Technology | : | Electrochemical / Catalytic / Pellistor / NDIR / PID | |
| Detection Method | : | Diffusion | |
| Gases Detected | : | (Please select Gas as specified in the table) | |
| Range & Resolution | : | (Please select Range & Resolution as specified in the table) | |
| Display | : | 8 x 2 Alphanumeric LCD with Configurable Backlit. 8 LEDs to indicate status of instrument. | |
| Control Action | : | I. Two independent alarm set points with Latch & Non-Latch Facility. II. User selectable Hysteresis and Logic option. III. Configurable STEL and TWA set points for Toxic & VOC Gases. | |
| Setting | : | Magnetic wand without opening enclosure cover for (FLP / FLP-PDA) | |
| PERFORMANCE | | | |
| SR.NO | SENSOR TECHNOLOGY | CALIBRATION ACCURACY | |
| 1 | Electrochemical | ±2 % F.S | |
| 2 | Catalytic / Pellistor | ±2 % F.S | |
| 3 | NDIR - CH ₄ / CO ₂ / C ₃ H ₈ | ≤ ±2 % of Applied Gas | |
| 4 | PID | 0 to 5000 PPM | ±10 % of Applied Gas |
| | | 0 to 1000 PPM | ±5 % of Applied Gas |
| | | 0 to 50 PPM | ±3 % of Applied Gas |
| Response Time | : | < 15sec/90% , < 10sec/50% | |
| ELECTRICAL | | | |
| Supply Voltage | : | 18 to 36 VDC, Typically 24 VDC | |
| Power Consumption | : | Less than 3.6 Watts. | |
| Connector cross section | : | 2.5 mm ² for Flexible or Armoured Shielded Cable. | |
| OUTPUT SIGNAL | | | |
| Standard Current / Voltage Output | : | 4-20mA / 0-10V/0-5V/0-1V Output with configurable range selection. | |
| Current Output Accuracy | : | Current Output Accuracy : ±0.125% F.S | |
| Voltage Output Accuracy | : | Voltage Output Accuracy : ±0.25% F.S | |
| Load Driving Capacity | : | 1) 560 ohm at 18VDC to 36VDC 2) 820 ohm load driving capacity at 22VDC to 36VDC. | |

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| | | |
|------------------------|---|--|
| Optional Relay | : | Three SPDT Relay (one for Failsafe and Two for Alarm indication) of rating NO: 10A 250VAC / 5A 30VDC & NC: 3A 125VAC / 3A 30VDC. |
| Optional Communication | : | Isolated RS-485 Communication Port with MODBUS RTU protocol. |

ERROR MONITORING

- During Sensor Break/ Open the Display Shows 'SENSOR OPEN' & Output Current / Voltage will be as per Upscale/ Downscale
- During Over Range the Display Shows 'OVER RANGE' & Output current will be as per Upscale/ Downscale
- During Output Current Open condition the display indicates "mA LOOP OPEN" & the message disappears after Acknowledgement
- mA Loop Open setting can be Enabled or Disabled
- Upscale current: 21mA/ 22mA Selectable
- Downscale current 1mA / 3.7mA Selectable
- Upscale voltage for 0-10V: 10V
- Upscale voltage for 0-5V: 5V
- Upscale voltage for 0-1V: 1V
- Downscale voltage for 0-10V/0-5V/0-1V: 0V
- Inhibit mode current is adjustable & user selective
 - Oxygen for 25% V/V range : 3.8mA / 17.4mA
 - Oxygen for 100% V/V range : 3.8mA / 7.34mA
 - Nitrogen for 100% V/V range : 3.8mA/ 16.656mA
 - Toxic / combustible / PID /NDIR : 2mA / 3.8mA / 4mA
- Inhibit mode for 0-10V voltage output is adjustable & user selective
 - Oxygen for 25% V/V range : 0V / 8.36V
 - Oxygen/N2 for 100% V/V range : 0V/ 2.09V
 - Nitrogen for 100% V/V range : 0V/7.91V
 - Toxic / combustible / PID /NDIR : 0V
- Inhibit mode for 0-5V voltage output is adjustable & user selective
 - Oxygen for 25% V/V range : 0V / 4.18V
 - Oxygen/N2 for 100% V/V range : 0V/ 1.045V
 - Nitrogen for 100% V/V range : 0V/3.955V
 - Toxic / combustible / PID /NDIR : 0V
- Inhibit mode for 0-1V voltage output is adjustable & user selective
 - Oxygen for 25% V/V range : 0V / 836mV
 - Oxygen/N2 for 100% V/V range : 0V/ 209mV
 - Nitrogen for 100% V/V range : 0V/791mV
 - Toxic / combustible / PID /NDIR : 0mV

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ENVIRONMENTAL

| | | |
|----------------|---|---------------------------------|
| Operating Temp | : | -15 to +50 °C |
| Storage Temp | : | -10 to +60 °C |
| Humidity | : | Less than 95% Non – Condensing. |

ACCESSORIES (OPTIONAL)

| | |
|--|---------------------------------------|
| • CE Certified 24 VDC Power Supply. | • Gas Sampling & Conditioning System. |
| • Canopy & Stand Mounting. | • Hooter cum Flasher. |
| • Gas Calibration Kit (0.5, 1, 3, 10) Litre. | • RS-485 to USB OR RS-232 Convertor |
| • PC Based SCADA Software, Modem. | • Ethernet converter |

COMMON DELIVERABLE

| | |
|--------------------------------|---|
| • Test calibration certificate | • Reference calibration gas certificate |
| • User manual | • Standard mounting hardware |

FLAMEPROOF HOUSING (GT-2511A-FLP)

| | | |
|------------------|---|---|
| Protection Class | : | IP-66 |
| Approval | : | CMRI approved for IIA & IIB or IIC gas group |
| Cabinet Material | : | Cast aluminium alloy,LM-6 |
| Cable Entry | : | Double compression cable gland (EX-proof, ¾ “ET-type) |
| Dimension | : | 225mm(H) with sensor holder × 225mm(W) × 122mm(D) |
| Mounting | : | Wall Mounting / Stand Mounting / Pipe Mounting |
| Weight | : | Approx. 2.2 kg |

FLAMEPROOF HOUSING (GT-2511A-FLP WITH HOOTER CUM FLASHER)

| | | |
|------------------|---|---|
| Protection Class | : | IP-66 |
| Approval | : | CMRI approved for IIA & IIB or IIC gas group |
| Cabinet Material | : | Cast aluminium alloy,LM-6 |
| Cable Entry | : | Double compression cable gland (EX-proof M20 X 1.5mm(P)) |
| Dimension | : | 225mm(H) with sensor holder × 266mm(W) with × 122mm(D) |
| Mounting | : | Wall Mounting / Stand Mounting / Pipe Mounting |
| Weight | : | Approx. 2.7kg |

SMART GAS DETECTOR: GT-2511-FLP

3.5 GAS WITH RANGE & RESOLUTION

Table 2

| ELECTROCHEMICAL SENSOR TECHNOLOGY | | | | |
|-----------------------------------|-------------------------------------|----------|--------|------|
| SR. NO | GASES | RANGE | UNIT | RES. |
| O1 | Oxygen (O ₂) | 25 | % Vol. | 0.01 |
| O2 | Oxygen (O ₂) | 0 to 100 | % Vol. | 0.01 |
| NT1 | Nitrogen (N ₂) | 0 to 100 | % Vol. | 0.01 |
| TOXIC GASES | | | | |
| T1 | Ammonia (NH ₃) | 100 | PPM | 1 |
| T2 | Ammonia (NH ₃) | 1000 | PPM | 1 |
| T3 | Bromine (Br ₂) | 10 | PPM | 0.01 |
| T4 | Carbon Monoxide (CO) | 1000 | PPM | 1 |
| T5 | Carbon Monoxide (CO) | 2000 | PPM | 1 |
| T6 | Chlorine (Cl ₂) | 10 | PPM | 0.01 |
| T7 | Ethylene Oxide (ETO) | 100 | PPM | 1 |
| T8 | Hydrogen (H ₂) | 2000 | PPM | 1 |
| T9 | Hydrogen Bromide (HBr) | 100 | PPM | 1 |
| T10 | Hydrogen Chloride (HCL) | 100 | PPM | 1 |
| T11 | Hydrogen Cyanide(HCN) | 100 | PPM | 1 |
| T12 | Hydrogen Fluoride (HF) | 10 | PPM | 0.01 |
| T13 | Hydrogen Fluoride (HF) | 100 | PPM | 1 |
| T14 | Hydrogen Sulfide (H ₂ S) | 100 | PPM | 1 |
| T15 | Ozone (O ₃) | 20 | PPM | 0.01 |
| T16 | Phosphine (PH ₃) | 10 | PPM | 0.01 |
| T17 | Nitrogen Dioxide (NO ₂) | 20 | PPM | 0.01 |
| T18 | Nitric Oxide (NO) | 250 | PPM | 1 |
| T19 | Sulphur Dioxide (SO ₂) | 50 | PPM | 0.1 |
| T20 | Sulphur Dioxide (SO ₂) | 2000 | PPM | 1 |

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CATALYTIC/ PELLISTOR SENSOR TECHNOLOGY

COMBUSTIBLE GASES

| SR.NO | GASES | RANGE | UNIT | RES. |
|-------|--|-------|------|------|
| C1 | Acetone (CH ₃) ₂ CO | 100 | %LEL | 1 |
| C2 | Acetylene (C ₂ H ₂) | 100 | %LEL | 1 |
| C3 | Ammonia (NH ₃) | 100 | %LEL | 1 |
| C4 | Butane/n-Butane (C ₄ H ₁₀) | 100 | %LEL | 1 |
| C5 | Carbon Monoxide(CO) | 100 | %LEL | 1 |
| C6 | Ethanol (C ₂ H ₅ OH) | 100 | %LEL | 1 |
| C7 | Ethyl Acetate (C ₄ H ₈ O ₂) | 100 | %LEL | 1 |
| C8 | Ethylene (C ₂ H ₄) | 100 | %LEL | 1 |
| C9 | Hexane/n-Hexane (C ₆ H ₁₄) | 100 | %LEL | 1 |
| C10 | Hydrogen (H ₂) | 100 | %LEL | 1 |
| C11 | Isopropanol (CH ₃ CH ₂ CH ₂ OH) | 100 | %LEL | 1 |
| C12 | Methane (CH ₄)/HC | 100 | %LEL | 1 |
| C13 | Methyl Ethyl Ketone (C ₄ H ₈ O) | 100 | %LEL | 1 |
| C14 | Methanol (CH ₃ OH) | 100 | %LEL | 1 |
| C15 | N-Heptane (C ₇ H ₁₆) | 100 | %LEL | 1 |
| C16 | N-Pentane (C ₅ H ₁₂) | 100 | %LEL | 1 |
| C17 | Pentane/n-Pentane (C ₅ H ₁₂) | 100 | %LEL | 1 |
| C18 | Propane/n-Propane (C ₃ H ₈) | 100 | %LEL | 1 |
| C19 | Toluene (C ₆ H ₅ CH ₃) | 100 | %LEL | 1 |
| C20 | Unleaded Petrol | 100 | %LEL | 1 |
| C21 | CNG/LNG/LPG/Natural Gas/Flammable Gas | 100 | %LEL | 1 |

NDIR SENSOR TECHNOLOGY

| SR.NO | GASES | RANGE | UNIT | RES. |
|-------|--|-------|------|------|
| N1 | Carbon Dioxide (CO ₂) | 50000 | PPM | 1 |
| N2 | Carbon Dioxide (CO ₂) | 5 | %V/V | 0.01 |
| N3 | Carbon Dioxide (CO ₂) | 100 | %V/V | 0.1 |
| N4 | Methane(CH ₄) | 100 | %LEL | 0.1 |
| N5 | Methane(CH ₄) | 5 | %V/V | 0.1 |
| N6 | Methane(CH ₄) | 100 | %V/V | 1 |
| N7 | Propane / LPG (C ₃ H ₈) | 100 | %LEL | 1 |
| N8 | Propane / LPG (C ₃ H ₈) | 5 | %V/V | 0.1 |
| N9 | Propane / LPG (C ₃ H ₈) | 100 | %V/V | 1 |

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| PID SENSOR TECHNOLOGY | | | | |
|-----------------------|---|-------|------|-----|
| SR.NO | GASES | RANGE | UNIT | RES |
| P1 | Isobutylene(C ₄ H ₈) / other VOC | 50 | PPM | 0.1 |
| P2 | Isobutylene(C ₄ H ₈)/ other VOC | 1000 | PPM | 1 |
| P3 | Isobutylene(SPAN C ₄ H ₈)/ other VOC | 5000 | PPM | 1 |

NOTE:

- In above Table, Range of gases start from zero.
- **Gases, which are not listed, are available on request & for other details contact factory.**
- All VOCs are available in PID detection principle in PPM ranges.
- PID detector will be provided by calibration with Isobutylene gas.
- In PID detector, VOC other than Isobutylene is calibrated with Isobutylene gas by setting VOC correction factor, In Calibration Report; VOC factor with respect to Isobutylene gas will be mentioned.
- Detection value of VOC = Isobutylene gas concentration value x factor

4. HARDWARE DETAILS

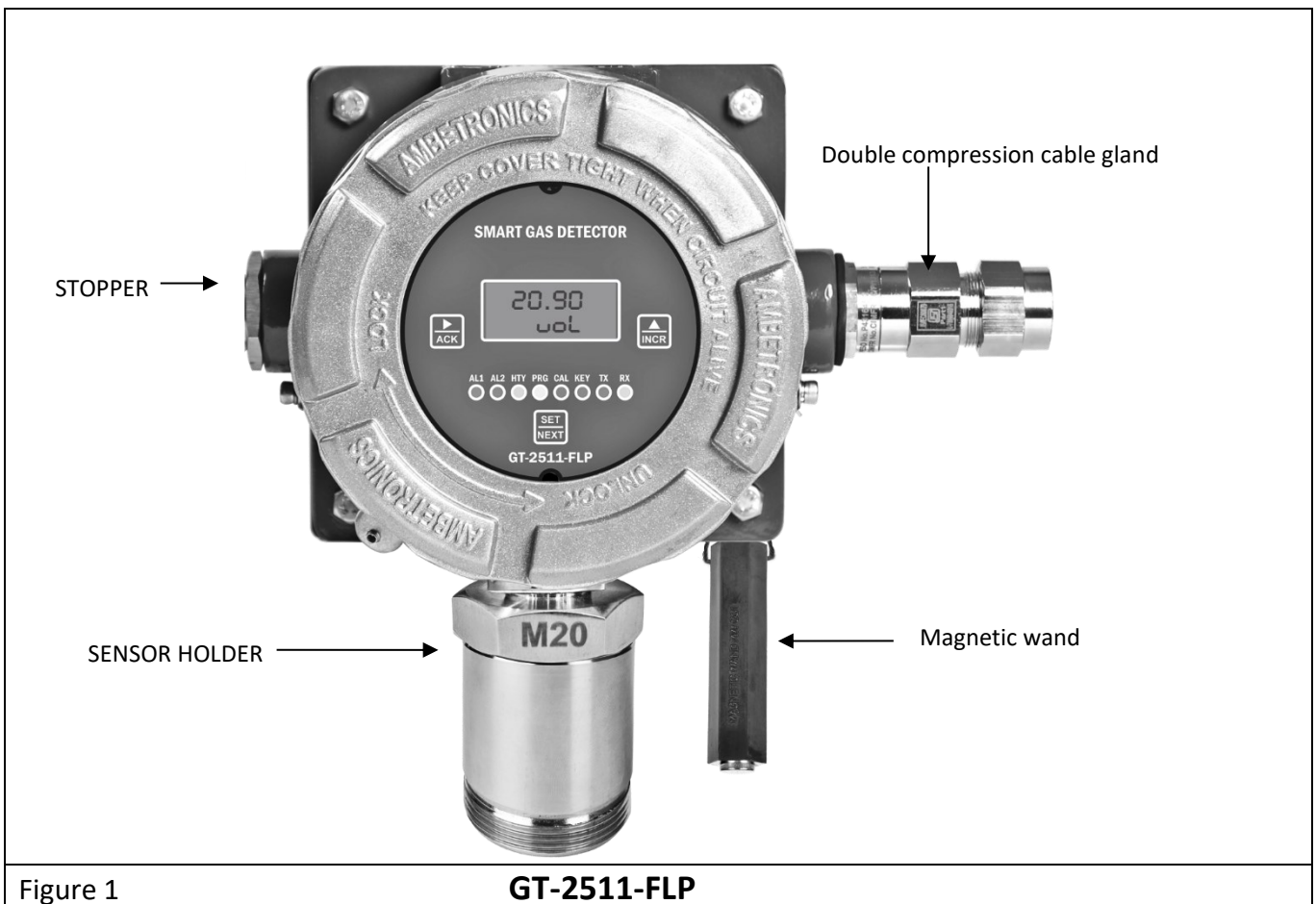
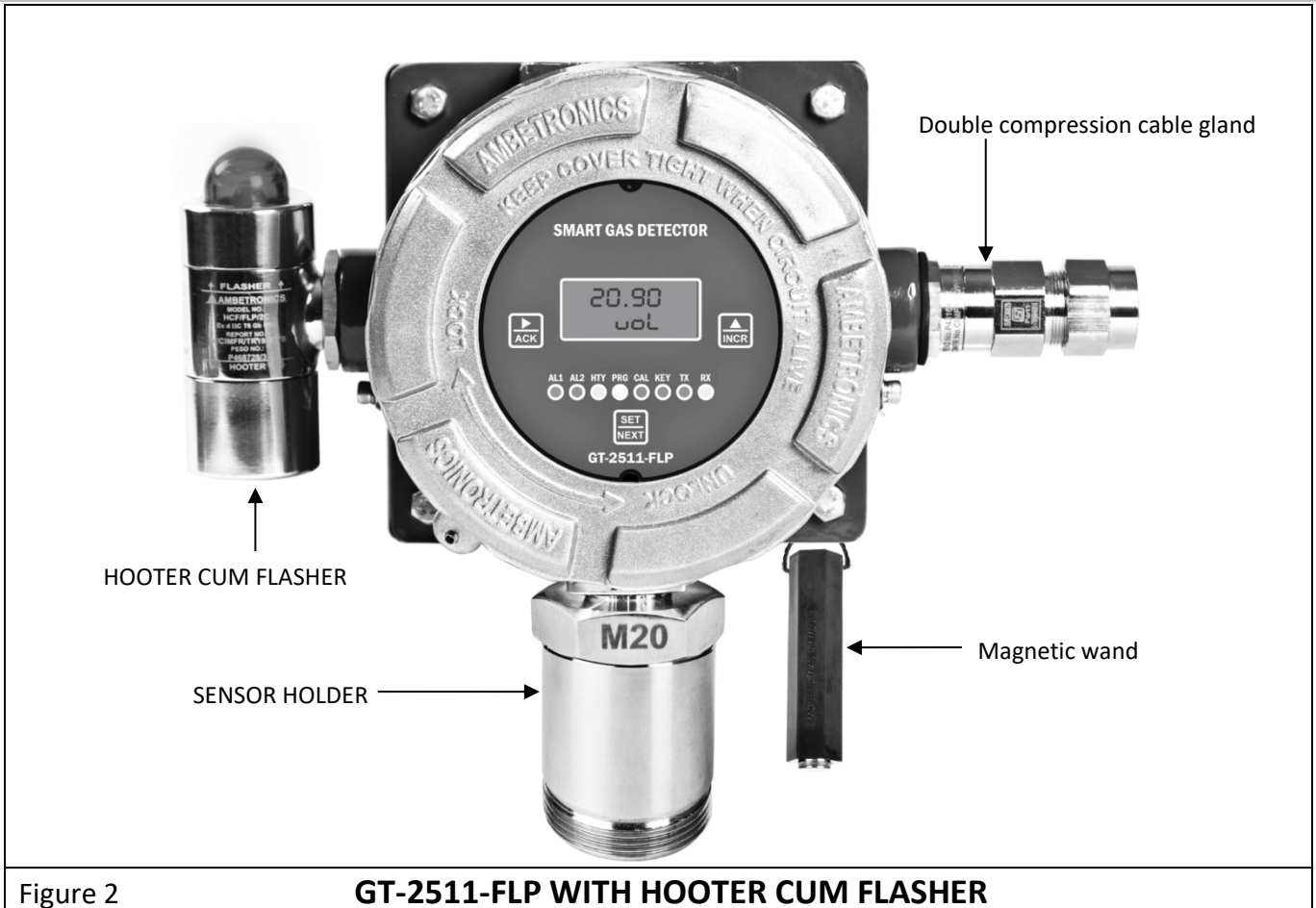


Figure 1

GT-2511-FLP

SMART GAS DETECTOR: GT-2511-FLP



5. INSTALLATION

5.1 INSTALLATION CONSIDERATION

FLP model can be mounted in two ways Wall mounting / Stand mounting.

Regardless of the installation type (wall mounting / stand mounting), the instrument should be installed at or near the location of a possible leak or the source of emission. Installation height depends on the density of the gas being monitored along with wind speed and direction of airflow and relative position to potential leaking points should be considered.

5.2 FLAMEPROOF ENCLOSURE ASSEMBLING DIAGRAM

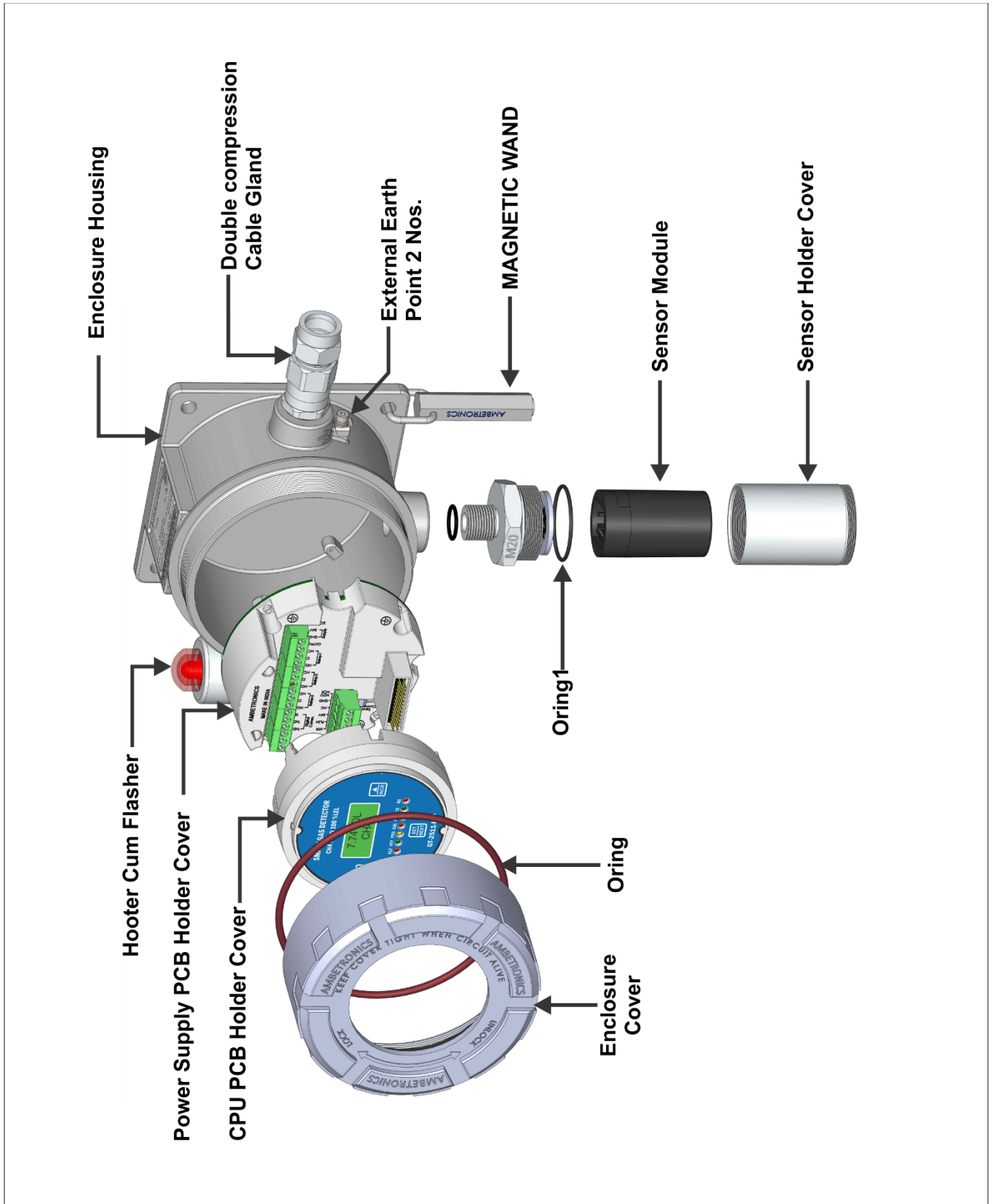


Figure 3

SMART GAS DETECTOR: GT-2511-FLP

5.3 FLAMEPROOF ENCLOSURE DIMENSION & MOUNTING DETAILS

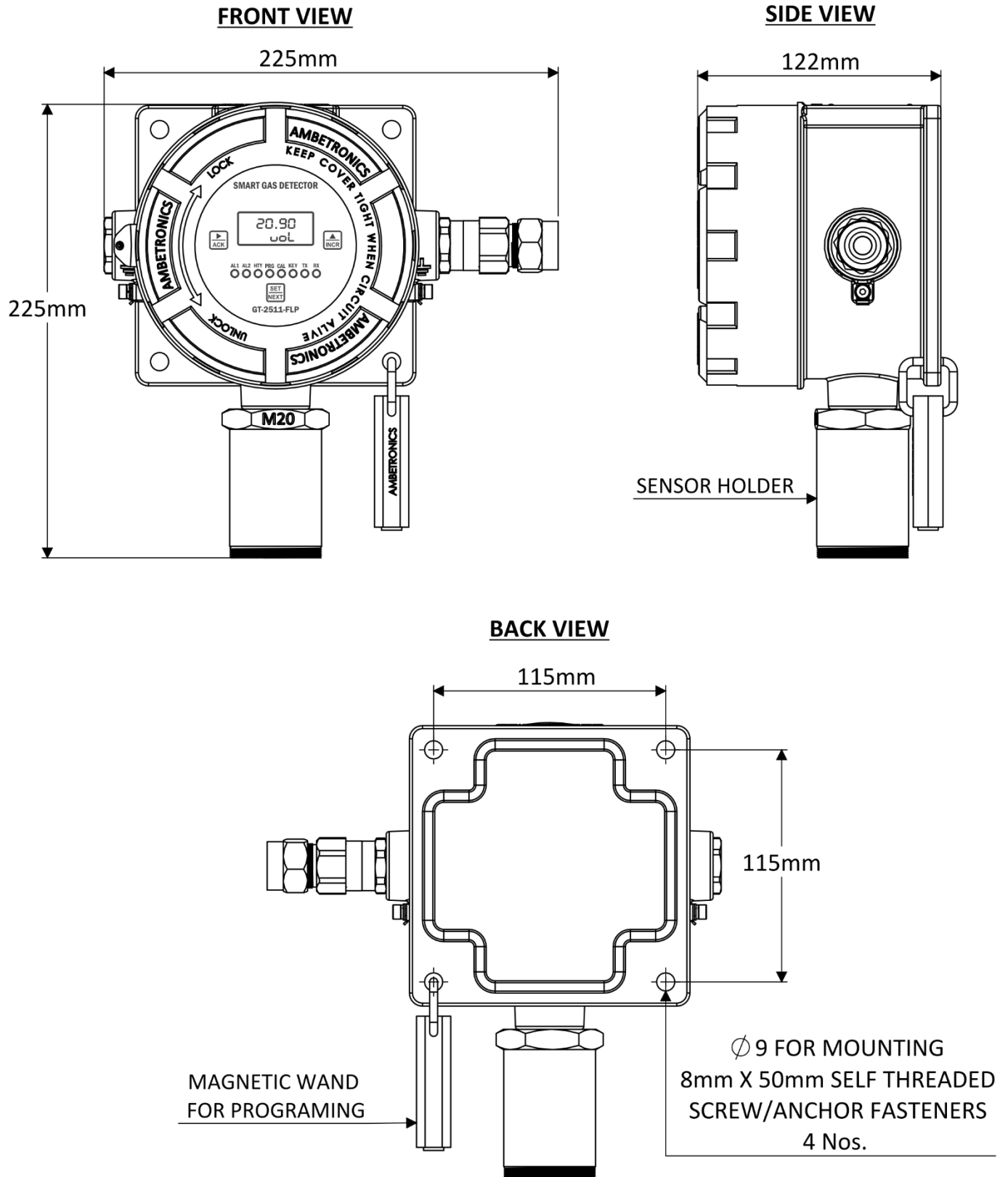


Figure 4

SMART GAS DETECTOR: GT-2511-FLP

5.4 FLAMEPROOF ENCLOSURE DIMENSION & MOUNTING DETAILS WITH HOOTER CUM FLASHER

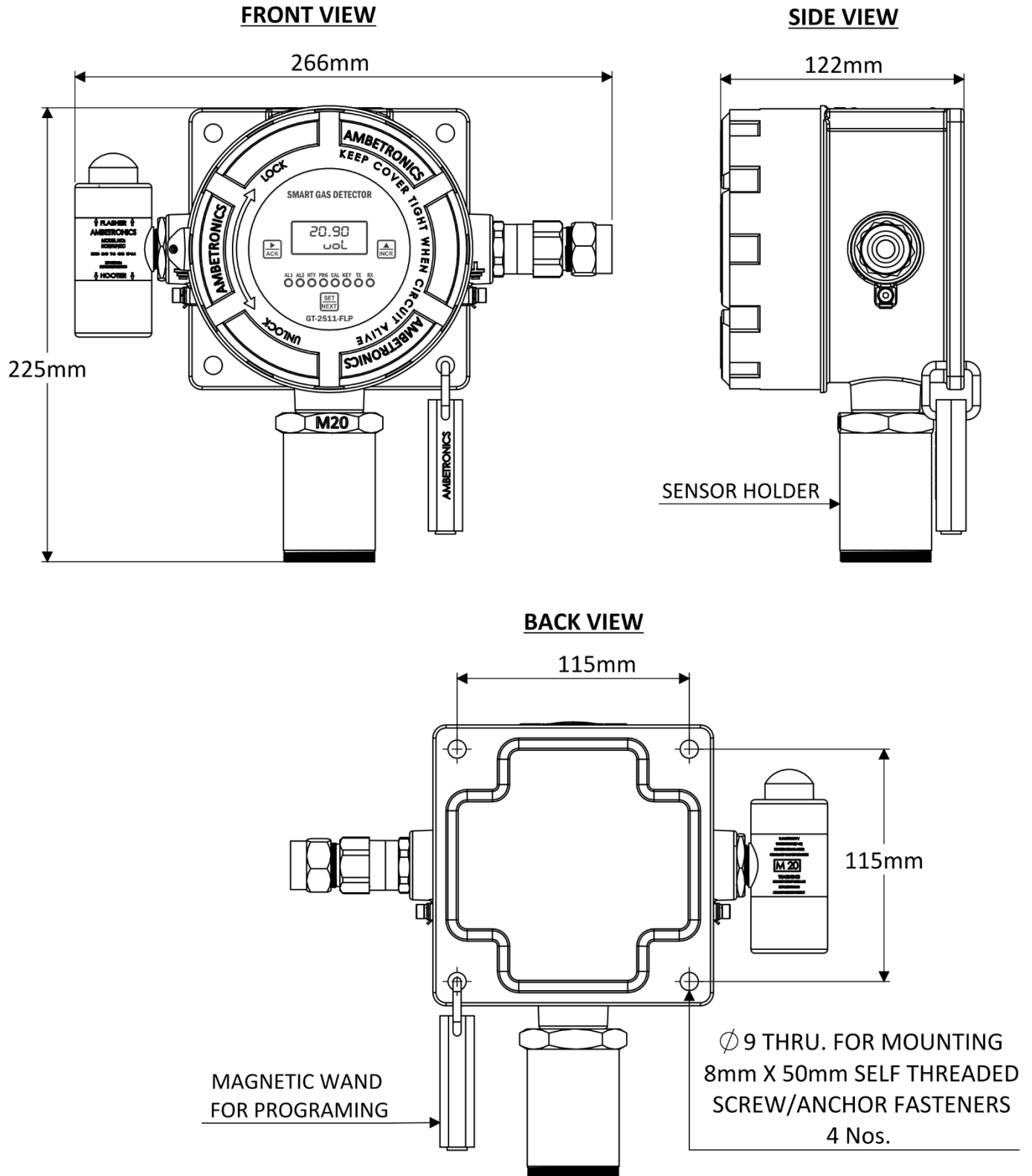


Figure 5

5.5 CANOPY WITH WALL MOUNTING

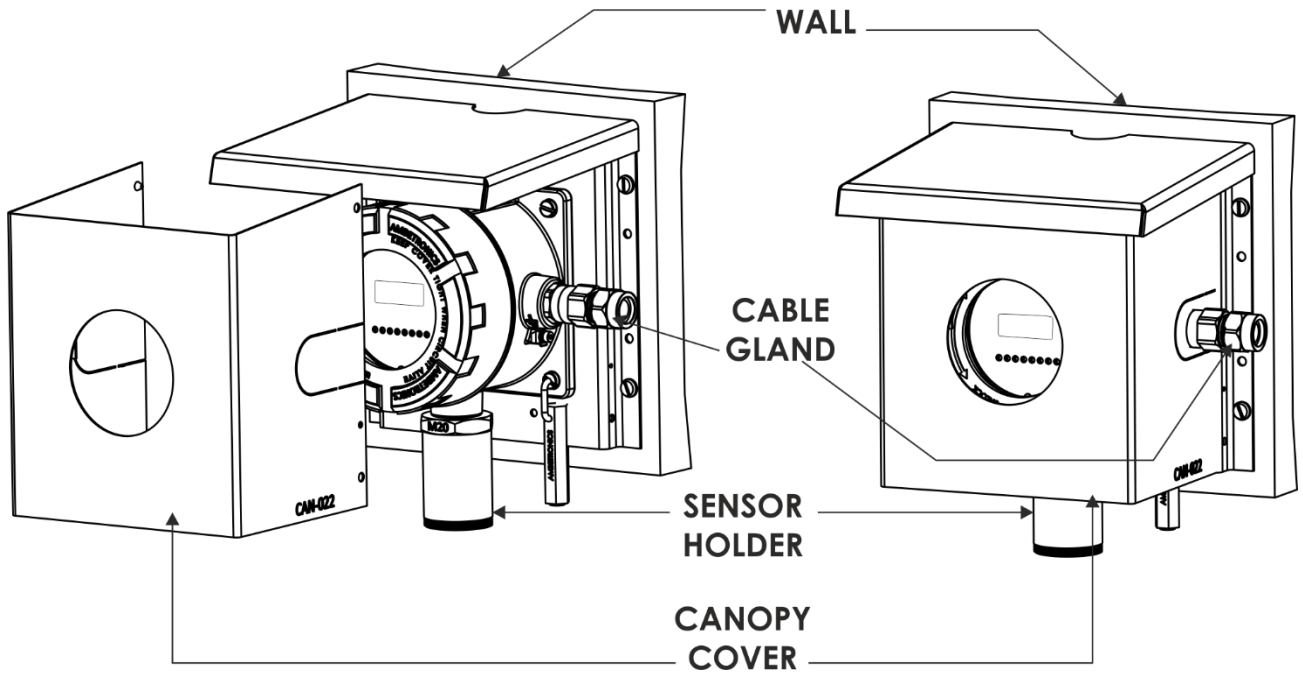


Figure 6

5.6 CANOPY WITH POLE MOUNTING

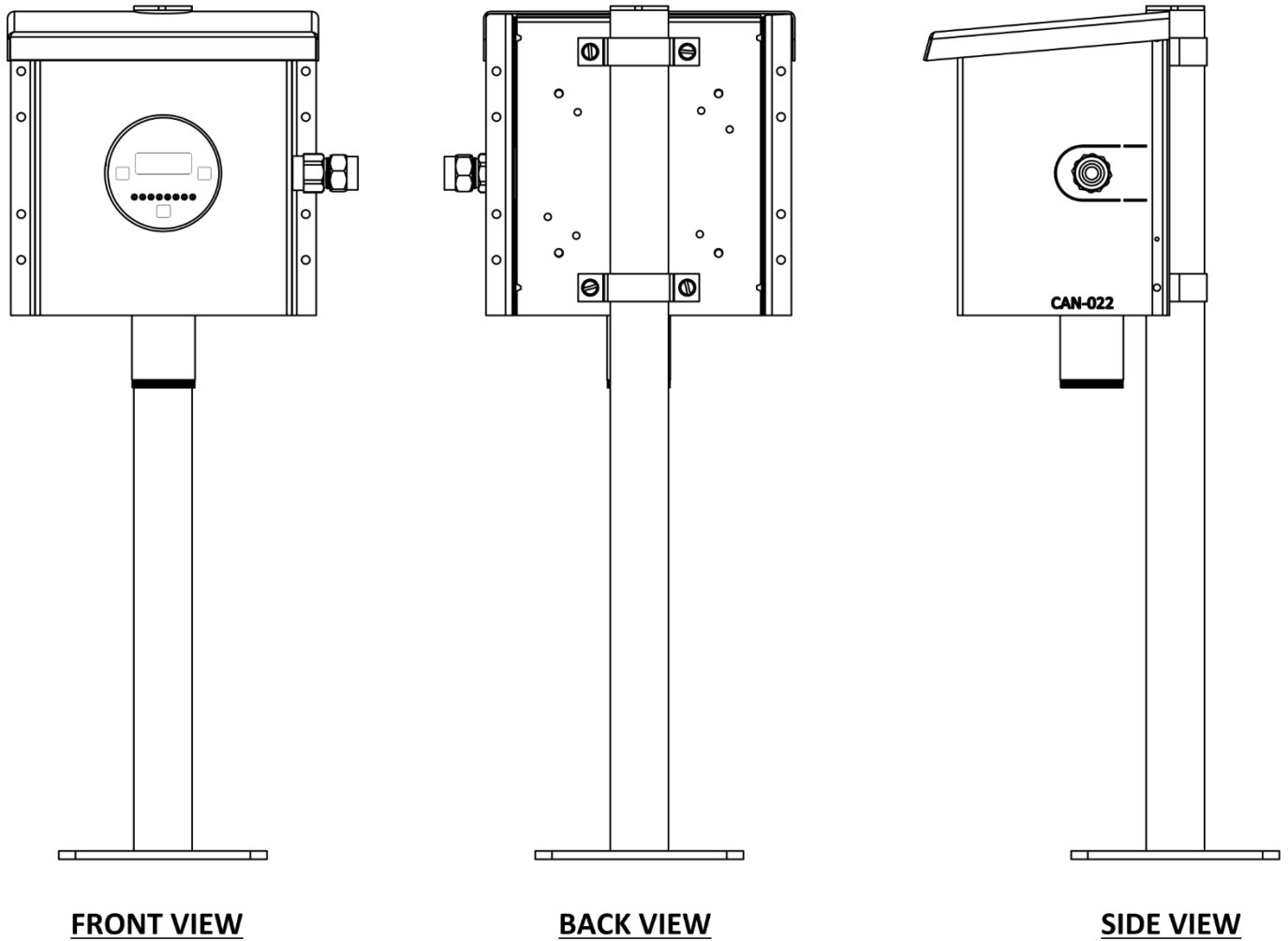


Figure 7

6. SYSTEM WIRING

6.1 WIRING INFORMATION

This topic outlines the steps in regarding for wiring the smart gas transmitter.

These steps include the following.

- Wiring preparation.
- Alarm Relay wiring.
- Power & output wiring.
- Modbus interface wiring

NOTE:

1. Perform all wiring in accordance with local electrical code and local authorities wiring jurisdiction.
2. DC signal & AC power should not be run in the same conduit.
3. All filed wiring colours are arbitrary.

6.2 WIRING PREPARATION

1. Collect the appropriate type & length of wire.
 - For control wire, use insulated shielded cable with more than 80% shielding.
 - For Signal & AC power wire, use three conductor included & shielded cable with more than 80% shielding.
 - For Digital Modbus signal, use a minimum 3- conductor insulated & twisted shielded cable with more than 80% shielding.
2. Remove the top cover from the housing for FLP (flameproof) model.
3. For wiring, Release the gland for FLP (flameproof) model.
4. Connect control, signal & power wires in to the housing & connect shielding of cable to the GND of unit.
5. Connect Earthing cable to the Earthing Screw on the body of the instrument.
6. Do not supply power to the instrument until the connection are checked.

6.3 ALARM RELAY WIRING

Three relays are provided of rating 5A/30 VDC & 10A/250 VAC of which two relays can be used in latch/non-latch and 3rd relay can be used as fail safe which can be kept normally ON or normally OFF, for more details refer to the connection diagram.



INFORMATION: Once wiring is complete, place the display window electronic back in the housing. Be careful, ensure any wiring should not be pinched. After that place the top cover of the enclosure & power up the instrument.



WARNING /CAUTIONS

- It is recommended that on board relay should not be used to drive loads directly. On- board relays should be used to drive a secondary higher power relay, which is connected, to the control device (e.g. strobe, siren, exhaust, fan etc.)
- For Power, Output wiring & RS-485 wiring. Refer connection diagram.

SMART GAS DETECTOR: GT-2511-FLP

6.4 WIRING DIAGRAM

6.4.1 WIRING DIAGRAM FOR AMBETRONICS MAKE HOOTER CUM FLASHER

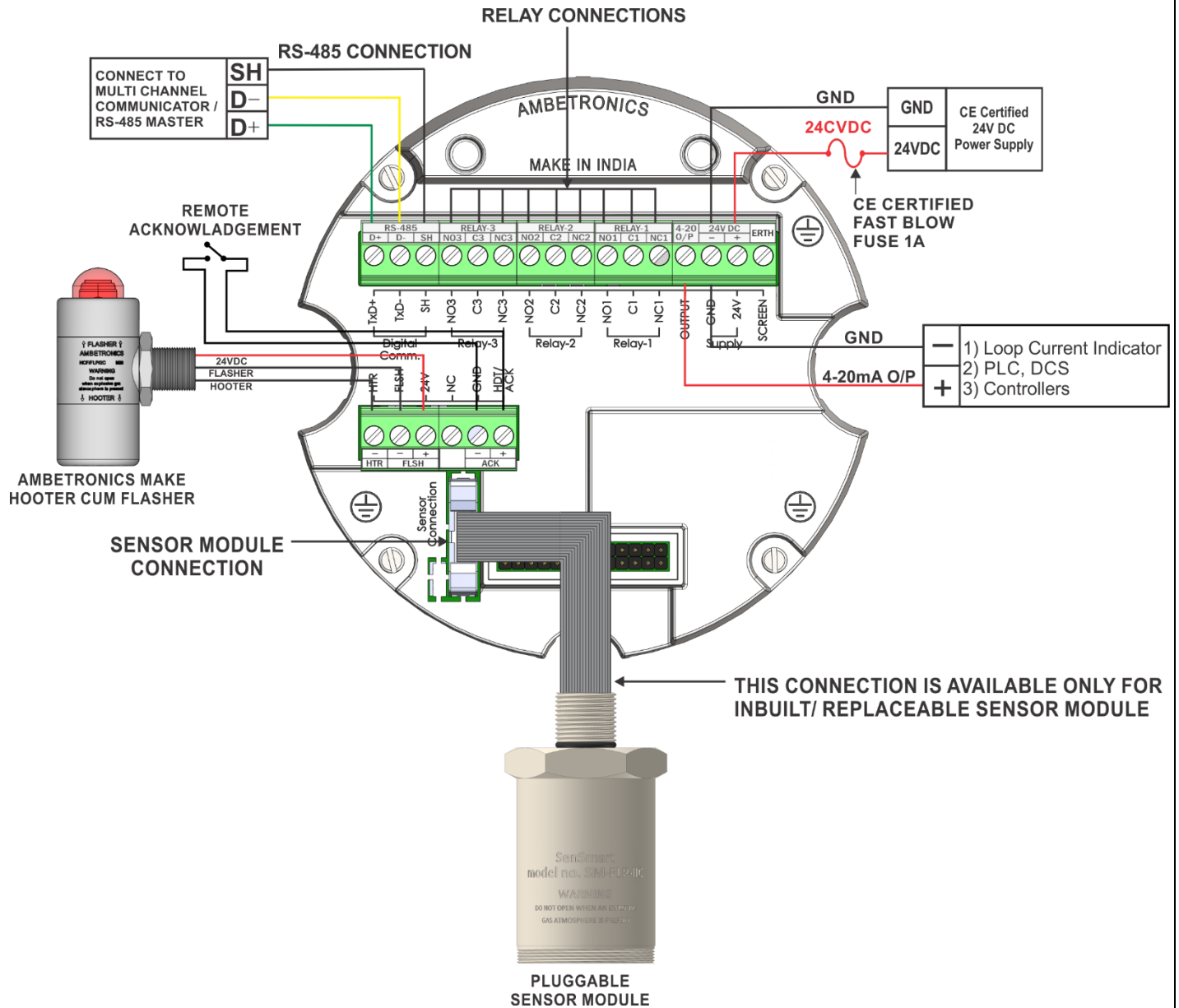





Figure 8

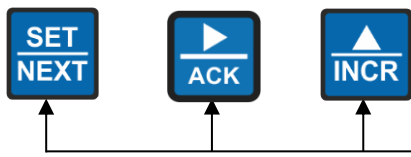
INFORMATION:

- Use CE Certified 24VDC Power Supply
- Use CE Certified Fast Blow Fuse of Rating 1A

7. KEY FUNCTIONALITY

Table 3

| SR. NO. | KEY TYPE | PROGRAMMING MODE | NORMAL MODE |
|---------|---|--|---|
| 1. | SET/NEXT key  | <ul style="list-style-type: none"> Setting of parameter and selecting the parameter Exiting the menu | <ul style="list-style-type: none"> To enter the user menu when pressed for about 5 sec |
| 2. | SHIFT/ACK key  | <ul style="list-style-type: none"> Shift the cursor when desired numerical value is to be edited Selecting the parameter | <ul style="list-style-type: none"> To Acknowledged the alarm & Relay Refer table no 3 for function when press for 5 sec |
| 3. | INCREMENT KEY  | <ul style="list-style-type: none"> To select the desired menu | <ul style="list-style-type: none"> To mute the buzzer |



These keys can be operated using Magnetic wand provided with the detector & can be operated without

Magnetic Wand

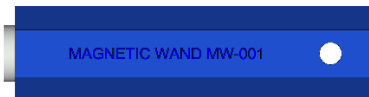

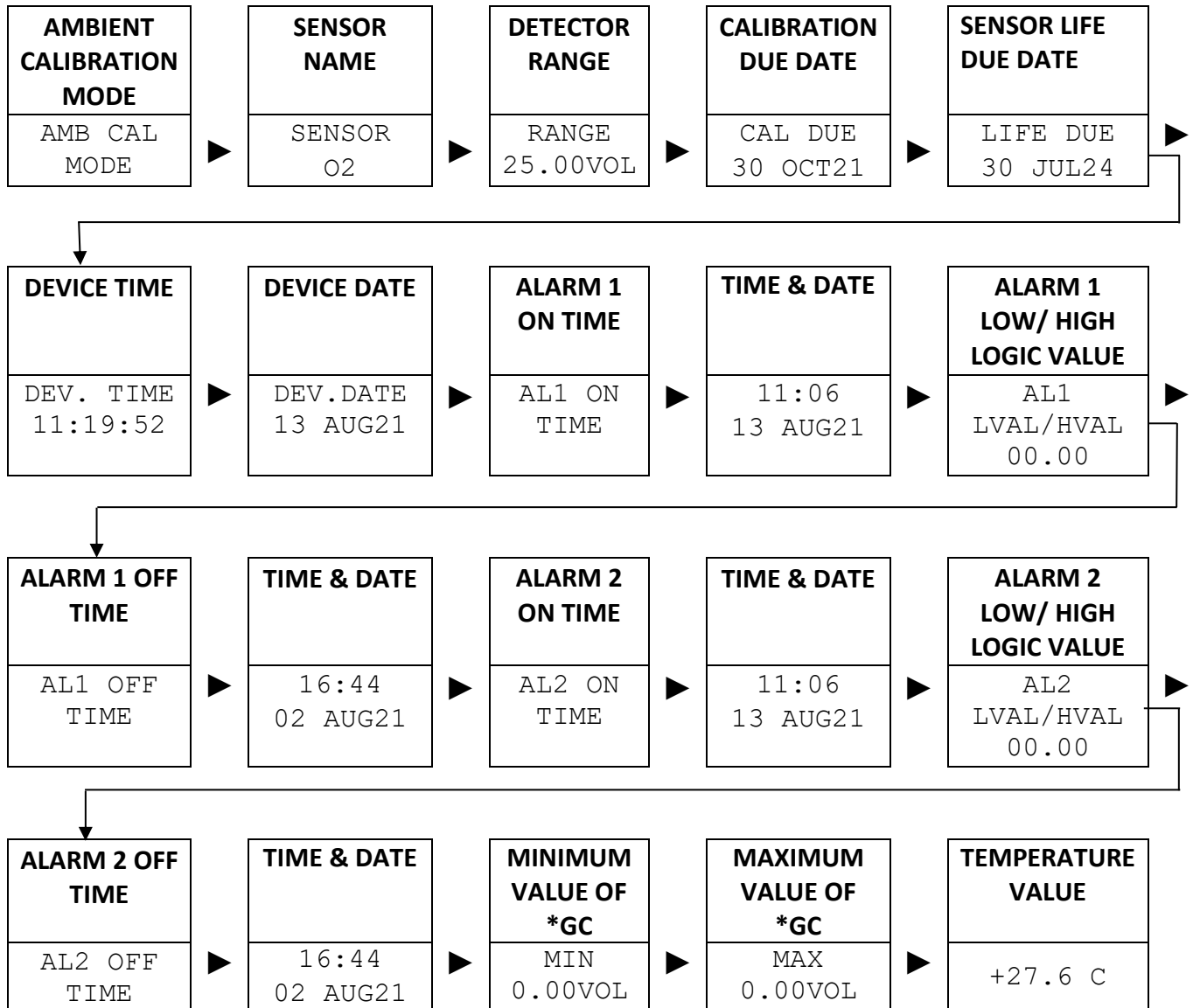


Figure 9

SMART GAS DETECTOR: GT-2511-FLP

7.1 STATUS MENU

When pressed Shift/ACK key  it will display the **STATUS MENU** which shows following parameters explained below.

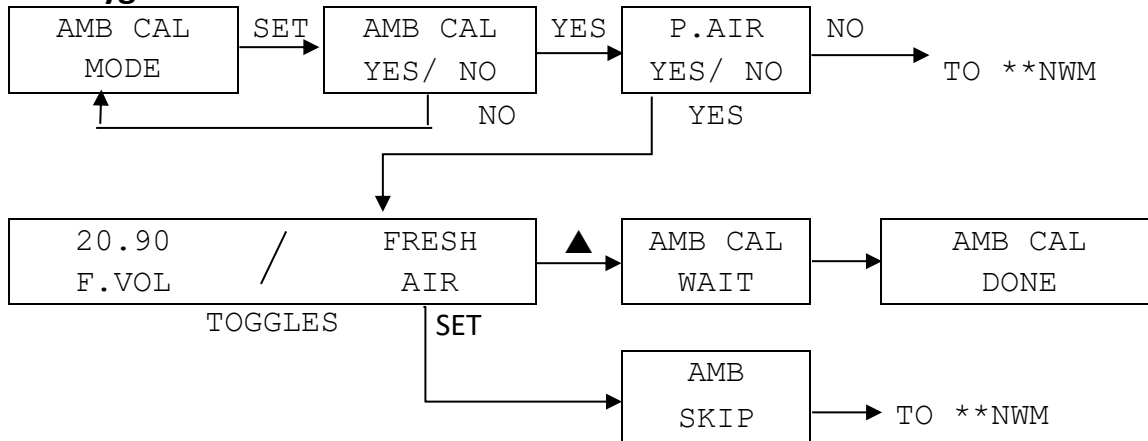


SMART GAS DETECTOR: GT-2511-FLP

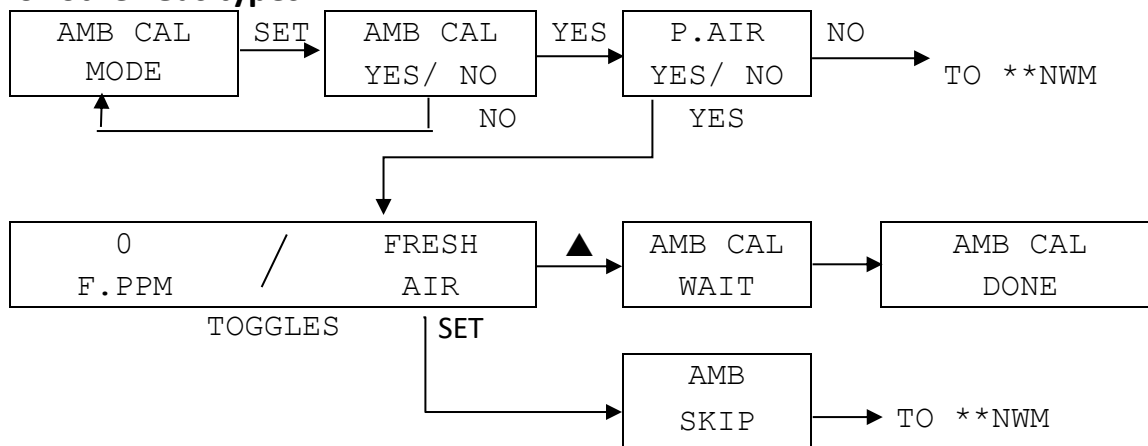
AMBIENT CALIBRATION MODE

Press  key to go inside Ambient Calibration Mode

For Oxygen



For other Gas types





Description

| | |
|--------------|---------------------------------|
| AMB CAL MODE | AMBIENT CALIBRATION MODE |
| P.AIR | PURGE AIR |
| F.VOL | FRESH VOLUME |
| F.PPM | FRESH PPM |
| FRESH AIR | FRESH AIR |
| AMB CAL | AMBIENT CALIBRATION |

NOTE: This menu is used to perform ambient calibration of Electrochemical/ Catalytic/ PID/ NDIR gas sensors.

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8. LED INDICATION

1. **ALARM 1 LED:** This LED will start blinking whenever the gas concentration crosses the ALARM1 set point. In Latch condition, when gas concentration crosses the set point value then after pressing  key for 3 secs then it will glow steadily and whenever the gas concentration comes within the set point it will turn off. During normal operation, it will be in OFF condition.
2. **ALARM 2 LED:** This LED will start blinking whenever the gas concentration crosses the ALARM2 set point. In Latch condition, when gas concentration crosses the set point value then after pressing  key for 3 secs then it will glow steadily and whenever the gas concentration comes within the set point it will turn off. During normal operation, it will be in OFF condition.
3. **HEALTHY LED:** This LED will start blinking whenever there is an occurrence of warning i.e. Sensor Open / Over Range. During normal operation this LED will be in 'STEADY ON' condition which shows that unit is working fine
4. **PROGRAMMING MODE LED:** This LED will start blinking whenever user enter into 'OPERATOR SETTING MODE' / TEST MODE' after entering the correct password. During normal operation, it will be in OFF condition.
5. **CALIBRATION MODE LED:** This LED will start blinking whenever user enter into 'CALIBRATION MODE'.
6. **KEY LED:** This LED glows when a key is pressed or magnetic wand placed on keys. If no key is pressed, it remains off.
7. **TX LED:** This is 'Transmit LED' & it blinks when device transmits the data through RS-485.
8. **RX LED:** This is 'Receive LED' & it blinks when device receives the data through RS-485.

9. CAPTION MEANING

A. MAIN MENU AND GENERAL FUNCTIONS

| | | | |
|---------------|--------------------|---------------|-----------------|
| MENU ESC | Esc To Main Menu | MENU CODE | Menu Code |
| MENU ALARM | Menu Alarm | MENU OFFSET | Menu Offset |
| MENU CALIBRTN | Menu Calibration | MENU MIN-MAX | Menu Min-Max |
| MENU COMMUNCT | Menu Communication | MENU OUTPUT | Menu Output |
| MENU BACKLITE | Menu Backlight | MENU TEST | Menu Test |
| MENU BUMPTST | Menu Bumpstest | MENU RANG-LOK | Menu Range Lock |
| MENU RTC | Menu RTC | | |

B. CODE MENU

| | | | |
|----------------|------------------------------------|--------------------|----------------------------|
| ENTER PASSWORD | Enter Password to Set New Password | PASSWORD 0000 | Enter Password |
| NEW PSWD 0000 | Enter new password | CONFIRM? YES/NO | Confirm Password Yes/No |
| CHANGE SUCCESS | Password Change Successful | | |

SMART GAS DETECTOR: GT-2511-FLP

C. ALARM MENU

| | | | |
|-----------------------|---------------------------------------|------------------------|-------------------------------|
| ALARM PASSWORD | Enter Password to edit Alarm settings | | |
| PARAMETR BACK | Back to main menu | PARAMETR ALARM1 | Parameter Alarm 1 |
| PARAMETR ALARM2 | Parameter Alarm 2 | PARAMETR BUZZER | Parameter Buzzer |
| PARAMETR HOOTER | Parameter Hooter | PARAMETR FLASHER | Parameter Flasher |
| PARAMETR KEY BUZZ | parameter key buzz | PARAMETR SNOOZE | Parameter Snooze time |
| PARAMETR FAIL SAF | Parameter Fail Safe | PARAMETR FAIL DEL | Parameter Fail Delay |
| EVNT CLR | Event Clear | EVNT CLR YES/NO | Event Clear Yes/ No |
| ALARM BACK | Back to Alarm Password | | |
| ALARM 1/2ENABLE | Enable Alarm 1 or 2 | ENABLE YES/NO | Alarm Enable (Yes/No) |
| ALARM 1/2 SETPOINT | Alarm 1 or 2 Set Point | ALARM 1/2 HYS | Alarm 1 or 2 Hysteresis |
| ALARM 1/2 LATCH | Alarm 1 or 2 Latch | LATCH ENABLE /DISABLE | Latch Enable / Disable |
| ACK ENABLE/ DISABLE | Acknowledged Enable / Disable | | |
| ALARM 1/2 LOGIC | Alarm 1 or 2 Logic | LOGIC HIGH / LOW | Alarm Logic High / Low |
| ALARM 1/2 DELAY | Alarm 1 or 2 Delay | BUZZER DISABLE/ENABLE | Buzzer (Enable or Disable) |
| HOOTER ENABLE/DISABLE | Hooter Enable/Disable | FLASHER ENABLE/DISABLE | Flasher Enable/Disable |
| KEY BUZZ ON/OFF | Key Buzz On/Off | FAIL SAF ON/OFF | Fail Safe On/Off |
| SNOOZE 000 | Snooze 000 | FAIL DEL 0000 | Set Delay For Fail Safe Relay |

D. OFFSET MENU

| | |
|-----------------|--|
| OFFSET PASSWORD | Enter Password to edit Offset settings |
| OFFSET ±00.00 | View or edit offset Parameter |

E. CALIBRATION MENU

| | |
|-------------------|---|
| CALIBRTN PASSWORD | Enter Password to edit Calibration settings |
|-------------------|---|

For Oxygen/ Nitrogen Detector / Transmitter

| | | | |
|---------------|-------------------------|--------------|--------------------------|
| SPAN LOW | Low span | SPAN HIGH | High Span |
| LOW 00.00 | Set Low Span Cal* value | HIGH 20.90 | Set High Span Cal* value |
| CALIBRTN HIGH | Calibration High | CALIBRTN LOW | Calibration Low |
| HIGH SUCCESS | High CAL* success | LOW SUCCESS | Low CAL* success |
| HIGH FAIL | High CAL* fail | LOW FAIL | Low CAL* fail |
| HIGH SKIP | High CAL* skip | LOW SKIP | Low CAL* skip |

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| | |
|--------------|-------------------------|
| CALIBRTN ESC | Escape Calibration menu |
|--------------|-------------------------|

For Toxic / Combustible (Catalytic Pallister), PID, NDIR (CH₄/CO₂/C₃H₈)

Detector/Transmitter

| | | | |
|---------------|-------------------|---------------|-------------------------|
| SET SPAN | Set Span | CALIBRTN ESC | Escape Calibration menu |
| CALIBRTN SPAN | Apply Span gas | CALIBRTN ZERO | Apply zero gas |
| ZERO SUCCESS | Zero CAL* success | SPAN SUCCESS | Span CAL* success |
| ZERO FAIL | Zero CAL* fail | SPAN FAIL | Span CAL* fail |
| ZERO SKIP | Zero CAL* skip | SPAN SKIP | Span CAL* skip |

F. MIN-MAX (LOW/ HIGH) MENU

| | |
|----------------------|---|
| MIN-MAX PASSWORD | Enter Password to edit Min/Max settings |
| MIN-MAX CLEAR YES/NO | Min-Max Clear value of the Gas Yes/no |

G. COMMUNICATION MENU

| | | | |
|-------------------|---|--|--|
| COMMUNCT PASSWORD | Enter Password to edit Communication settings | | |
| COMMUNCT ID | Communication ID | ID 0001 | ID change or view |
| COMMUNCT BAUD RAT | Communication Baud rate | BAUD RAT 9600/19200 /38400/57600 | Baud rate 9600 /19200/ 38400/ 57600 |
| COMMUNCT PRTY BIT | Communication Parity bit | PARITY NONE | Parity none |
| PARITY ODD | Parity odd | PARITY EVEN | Parity Even |
| COMMUNCT STOP BIT | Communication Stop bit | STOP ONE/TWO | Stop bit (one or two) |
| COMMUNCT TEST | Communication Test | COMMUNCT ESC YES/NO | Communication Esc from menu |

H. OUTPUT MENU

For Current Output

| | | | |
|----------------------|--|-------------|------------------------------------|
| OUTPUT PASSWORD | Enter Password to edit Output settings | OUTPUT BACK | Back To Main Menu |
| OUTPUT HIGH | Current Output for High Range Value | OUTPUT LOW | Current Output for Low Range Value |
| 1mA | 1mA | 3.7mA | 3.7mA |
| 4mA | 4mA | 8mA | 8mA |
| 12mA | 12mA | 16mA | 16mA |
| 20mA | 20mA | 22mA | 22mA |
| OUTPUT SCALE DOWN/UP | Scale mode for Output | | |
| OUTPUT INHIBIT | Inhibit Mode for Output | | |

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| | |
|---------|----------------|
| mA LOOP | mA Loop Option |
|---------|----------------|

For 0-10V Voltage Output

| | | | |
|----------------------|--|----------------------|--|
| OUTPUT PASSWORD | Enter Password to edit Output settings | | |
| OUTPUT BACK | Back To Main Menu | | |
| OUTPUT LOW 00.00 | Voltage Output for Low Range Value | OUTPUT HIGH 00.00 | Voltage Output for High Range Value |
| 0 VOLT | 0VOLT | 2 VOLT | 2VOLT |
| 4 VOLT | 4VOLT | 6 VOLT | 6VOLT |
| 8 VOLT | 8VOLT | 10 VOLT | 10VOLT |
| OUTPUT SCALE DOWN/UP | Scale mode for Output | | |
| OUTPUT INHIBIT | Inhibit Mode for Output | | |

For 0-5V Voltage Output

| | | | |
|----------------------|--|----------------------|--|
| OUTPUT PASSWORD | Enter Password to edit Output settings | | |
| OUTPUT BACK | Back To Main Menu | | |
| OUTPUT LOW 00.00 | Voltage Output for Low Range Value | OUTPUT HIGH 00.00 | Voltage Output for High Range Value |
| 0 VOLT | 0VOLT | 1 VOLT | 1VOLT |
| 2 VOLT | 2VOLT | 3 VOLT | 3VOLT |
| 4 VOLT | 4VOLT | 5 VOLT | 5VOLT |
| OUTPUT SCALE DOWN/UP | Scale mode for Output | | |
| OUTPUT INHIBIT | Inhibit Mode for Output | | |

For 0-1V Voltage Output

| | | | |
|----------------------|--|----------------------|--|
| OUTPUT PASSWORD | Enter Password to edit Output settings | | |
| OUTPUT BACK | Back To Main Menu | | |
| OUTPUT LOW 00.00 | Voltage Output for Low Range Value | OUTPUT HIGH 00.00 | Voltage Output for High Range Value |
| 0mV | 0mV | 200mV | 200mV |
| 400mV | 400mV | 600mV | 600mV |
| 800mV | 800mV | 1000mV | 1000mV |
| OUTPUT SCALE DOWN/UP | Scale mode for Output | | |
| OUTPUT INHIBIT | Inhibit Mode for Output | | |

I. BACKLIGHT MENU

| | |
|-------------------|---|
| BACKLITE PASSWORD | Enter Password to edit Backlight settings |
| BACKLITE BACK | Back To Main Menu |
| BACKLITE ON/OFF | Backlight On/Off |

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| | |
|-------------------|---------------------------|
| BACKLITE FLASHING | Backlight Flashing On/Off |
|-------------------|---------------------------|

J. TEST MENU

| | | | |
|------------------|--------------------------------------|--------------------|---|
| TEST PASSWORD | Enter Password to edit test settings | | |
| DEV TEST | Device Test | MIN 0.00 | Set min increment value for virtual gas concentration |
| SNSR TES | Sensor Test | SNSR TES YES/NO | Sensor Test YES / NO |
| SNSR TES WAIT | Sensor Test Wait | MV 00000000 | Milivolt |

K. BUMP TEST MENU

| | |
|-------------------|--|
| BUMPTEST PASSWORD | Enter Password to operate Bump test settings |
| APPLY GAS | Apply Gas |

L. RANG-LOCK MENU

| | |
|-------------------|--|
| RANG-LOK PASSWORD | Enter Password to edit Range-Lock settings |
| RANG-LOK NO/YES | Range Lock NO/YES |

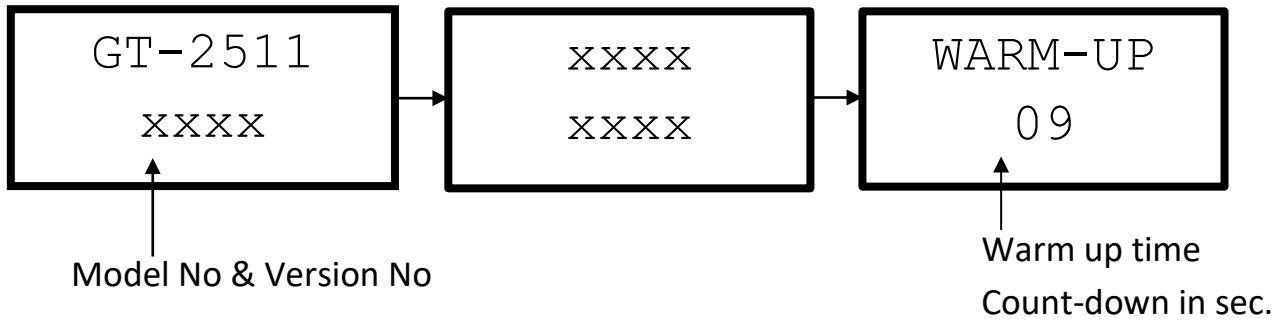
M. RTC MENU

| | | | |
|-----------------|---|------------|----------|
| RTC PASSWORD | Enter Password to operate RTC MENU settings | | |
| RTC TIME | RTC TIME | TIME 00.00 | Time |
| CHANG YES/NO | Time Change YES / NO | HOUR 00 | Hour |
| MIN 00 | Minute | SEC 00 | Seconds |
| SAVE YES/NO | Save Yes /No | | |
| RTC DATE | Set date | DATE 00 | Date |
| MONTH XXXX | Set month | YEAR 00 | Set year |

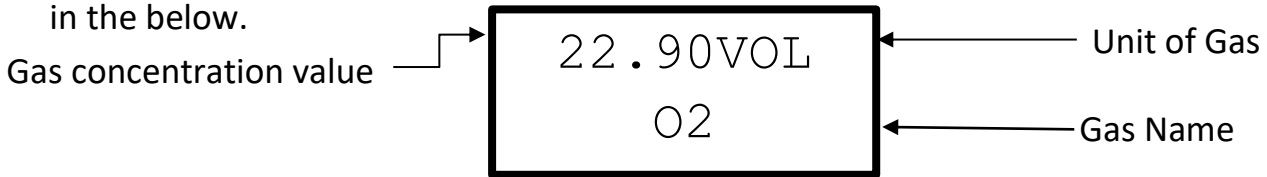
10. DISPLAY DETAILS

10.1 POWER ON INDICATION ON THE DISPLAY

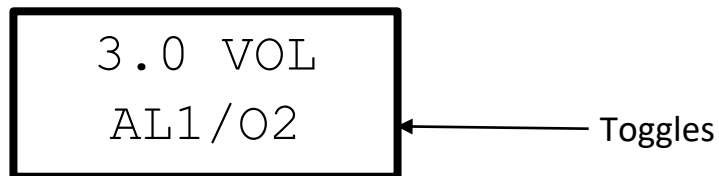
During Power ON Condition



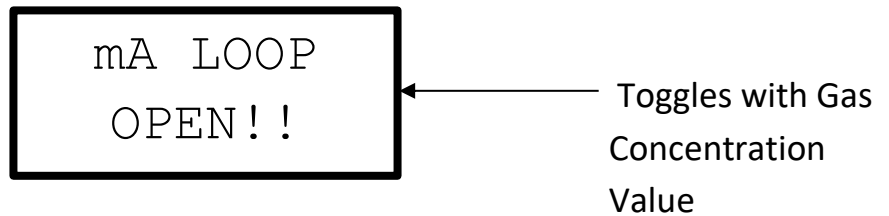
1. After warm up, the device switches to NWM* displaying the GC* and its units as shown in the below.



1) For Alarm condition



2) If Output Current is in open condition then display shows as below



NOTE: The values shown above are for representation purpose only.
As per Gas Unit, Gas Name, Gas Concentration value will be different.

10.2 SOME IMPORTANT INDICATIONS

Table 4

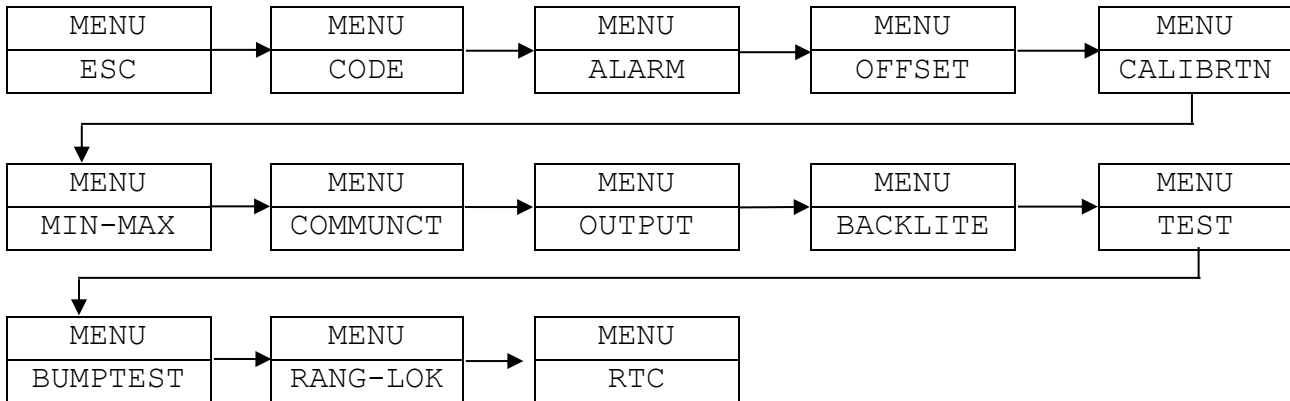
| | |
|-------------------|--|
| SENSOR OPEN | Indicates that sensor is disconnected. |
| OVER RANGE | Indicates that GC* has exceeded its range of instrument. |
| mA LOOP OPEN!! | Indicates that 4-20mA loop connection is open. |

11. MENU OPERATION

To enter the programming mode, press set key in the play mode for about 5 sec. Once we enter the programming mode, display shows **MENU**. Below that we see **ESC MENU**. Here on pressing **SET KEY**, we exit the menu.



To view menu headers, press **INCR KEY/ SHIFT KEY**, we see the headers in following order.



Below now we explain the options available in the different menu functions. To view the steps, refer to flowchart in the next section.

Table 5

| | |
|--|---|
| <p>CODE MENU (Refer Flowchart)</p> | <p>This mode is used to change the user password used for making changes in the menus.</p> |
| <p>ALARM MENU (Refer Flowchart)</p> | <p>This mode is used to make the changes in the Alarm set points. There are two Alarms Alarm 1 and Alarm 2. The Alarm condition can be set to high or low in the alarm logic submenu and alarm value can be set in Alarm set point submenu as per the requirement. When the GC* exceeds the set point limits, the buzzer alerts the operator if enabled. AL1/AL2 LED is used to indicate the Alarm. Increment key is used to silence the buzzer. ALARM LED shall remain ON till the GC* comes back in set point limits for gas. Alarm menu also contains STEL and TWA settings for Toxic & VOC gases.</p> |
| <p>OFFSET MENU</p> | <p>This menu is used to adjust any errors due to drift/calibration by setting the offset in the GC* of up to +/-25% of the full scale. The menu won't allow user to set more than its limit. Enter and exit Offset menu shall be the similar Alarm menu.</p> |

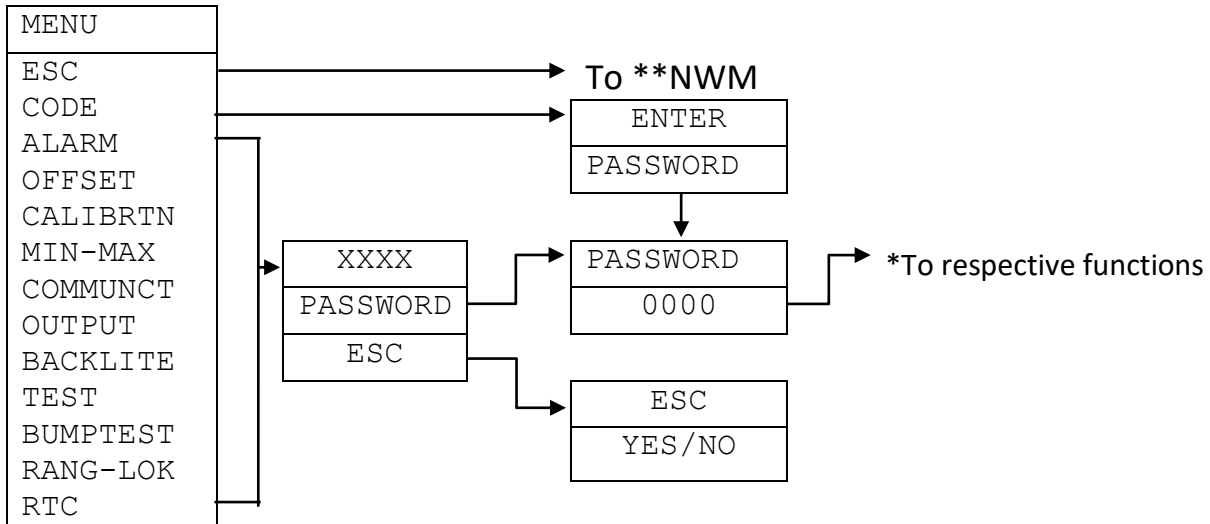
SMART GAS DETECTOR: GT-2511-FLP

| | |
|---------------------------|--|
| CALIBRATION MENU | This menu is used to perform the calibration of the detector. Qualified personnel must perform this calibration only. Ambetronics shall not be responsible for any changes done due to invalid procedure followed for calibration. |
| MIN-MAX MENU | This menu is used to view the Low / High (min/max) value of GC* |
| COMMUNICATION MENU | This menu is used to set the device ID, baud rate, parity, stop bit and test the RS-485 communication. |
| OUTPUT MENU | This menu is used to set/adjust (4-20mA) Current / (0-10V/0-5V/0-1V) Voltage output so that if any linearity issues present are aligned. |
| BACKLIGHT MENU | <p>The Backlight can be selected to as ON /OFF or Flashing-YES/NO.</p> <p>BACKLIGHT ON/OFF: If selected Backlight 'ON', it will continuous ON in normal working mode for all menus and submenus And If selected backlight 'OFF', it will remain OFF in all menus & sub menus.</p> <p>FLASHING YES: If selected flashing 'YES', When Alarm gets activated and fault condition appeared such as 'Sensor Open / Over range'. LCD backlight will start flashing irrespective of backlight 'ON/OFF' selection.</p> <p>FLASHING NO: If selected flashing is 'NO', LCD backlight will not flash even Alarm gets activated and fault condition appeared such as 'Sensor Open / Over range'.</p> |
| TEST MENU | This menu is used to check the electronics of the system by simulating the value of GC * for testing purpose. It is also used to check the condition of toxic gas sensors. |
| BUMP TEST MENU | A Gas response check is periodically required & carry out, is often called as 'Bump Test'. This test is performed by using calibration gas required to apply to the sensor via Calibration Cap. Bump Test helps user to take decision about recalibration of detector. |
| RANGE LOCK MENU | <p>This menu is used to lock the Gas Concentration at higher & lower range.</p> <p>1) If RANGE LOCK is selected 'Yes'</p> <p style="padding-left: 20px;">Whenever display value > Detector High range value, Display shows higher range value & Display value < Detector Low range value, Display shows lower range value.</p> <p>2) If RANGE LOCK selected 'No'</p> <p style="padding-left: 20px;">Whenever display value > Detector High range value, Display shows "OVER RANGE" & Display value < Detector Low range value, Display shows "SENSOR OPEN".</p> |
| RTC MENU | This menu is used to set date & time of the device |

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11.1 FLOWCHART

In the below flowchart below menu are available in the device. To scroll down in the list press '▲' key and to select the menu and save the setting, press SET key. In all menus if incorrect password is entered we can enter the menu but we can't set any values. Exceptions are Password, Calibration and Bump test menu. In these menus if wrong password is entered then we can see the WRONG PASSWORD on the display and the unit will return to PASSWORD screen. If you want to ESC then press ▲ key to return to NWM*



- * Note: Respective menu name will be seen in all menus except password menu
- * Refer Appendix
- 'XXXX': Means respective menu name

Time out Delay:

If no key is pressed for 2 minutes in any menu (except Calibration & Bump Test menu), the display will return to normal working mode.

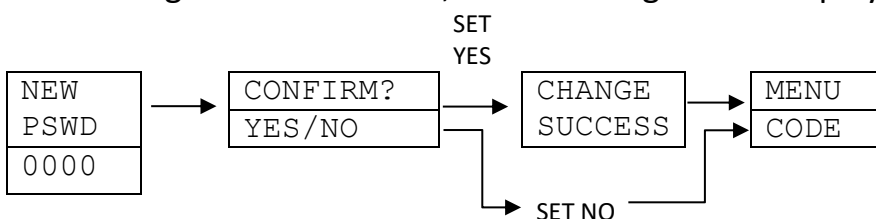
However, in calibration menu time out is 10 minutes & in Bump test menu time out is 20 minutes.

11.2 CODE MENU / PASSWORD MENU

This menu is used to change the user password used for making changes in the menus. In main menu select code menu and enter correct password.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select menu parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ " Back "to go out of the setting parameter / menu.

After entering the CODE MENU, the following will be displayed



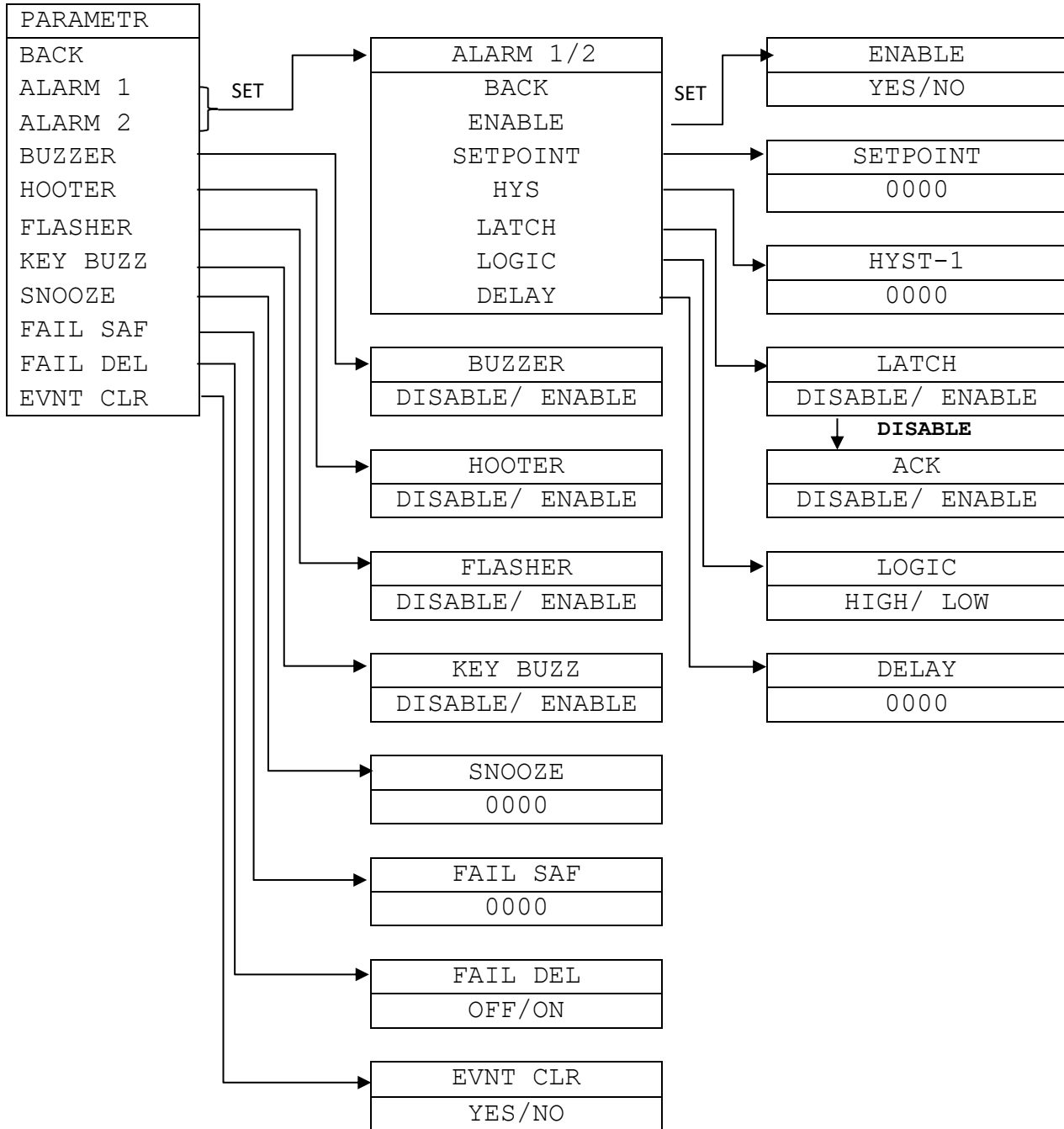
SMART GAS DETECTOR: GT-2511-FLP

11.3 ALARM MENU

This menu is used to set Alarm set points.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select menu parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "Back" to go out of the setting parameter / menu.

After entering the ALARM MENU, the following will be displayed.



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Table 6

| | |
|------------------------------------|---|
| ALARM1 AND ALARM2 | AL1/AL2's set point for GC * can be set. Upon violation of AL1/AL2 set points "AL1/AL2" indication on LCD display is seen as shown in display details and automatically disappear when GC * value comes within set point limits. |
| BUZZER | Buzzer generates sound to alert the user for alarm violation. |
| HOOTER | Hooter generates sound to alert the user for alarm violation. |
| FLASHER | Flasher generates RED light to alert the user for alarm violation. |
| KEY BUZZ | Buzzer generates sound while pressing individual key |
| SNOOZE | Turns ON the alarm again after set seconds if the alarm condition still holds true. Settable range: 0 to 999 seconds. Snooze time starts after ACK key is pressed & Relay are acknowledged. |
| FAIL SAFE RELAY | <ul style="list-style-type: none"> • 'NORMALY-OFF': Fail safe relay will be 'OFF' in normal conditions and will be 'ON' if any fault occurs. Fault maybe OPEN /OVER. • 'NORMALY -ON': Failsafe relay will be 'ON' in normal conditions and will be 'OFF' if any fault occurs. Fault maybe OPEN /OVER. |
| FAIL-DELAY (Fail safe delay) | Failsafe delay setting is for failsafe relay. When fault such as Open/Over occurs, failsafe relay will be operated after set fail safe delay. Fail safe delay can be set from 0 to 999 sec. |
| HYSTERESIS | Hysteresis of up to +/-10% of the full scale range can be set. The Gas level may sometimes fluctuate during an Alarm condition, which causes repeated Alarm indications. To avoid repeated Alarms, Hysteresis is used. Hysteresis works with the High & Low Alarm SP* When Logic is High, Alarm is on when $GC * > SP*$ & Alarm is turned off when $GC * < (SP* - Hysteresis)$. When Logic is Low, Alarm is ON when $GC * < SP*$ & Alarm is OFF when $GC *$ is $> (SP* + Hysteresis)$. |
| LATCH | <p>Latch Disable: ACK Disable:</p> <ul style="list-style-type: none"> • When $GC > SP$, Alarm indication (AL1, AL2) LEDs, Relay, Hooter & Flasher will turn on. • When $GC > SP$, pressing Acknowledgement key will only turn off Hooter & Buzzer, Alarm indication (AL1, AL2) LEDs & Flasher will keep blinking. • When $GC < SP$ Alarm indication (AL1, AL2) LEDs, Relay, Hooter Flasher will turn off. <p>Latch Disable: ACK Enable:</p> <ul style="list-style-type: none"> • When $GC > SP$, Alarm indication (AL1, AL2) LEDs, Relay, Hooter & Flasher will turn on. • When $GC > SP$, pressing Acknowledgement key will turn off Hooter, Buzzer & Relay, Alarm indication (AL1, AL2) LEDs & Flasher will keep blinking. |

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| | |
|-------------|--|
| | <ul style="list-style-type: none"> • When GC < SP, Alarm indication (AL1, AL2) LEDs, Relay, Hooter Flasher will turn off. Latch: Enable • When GC > SP, Alarm indication (AL1, AL2) LEDs, Relay, Hooter & Flasher will turn on. • When GC > SP, pressing Acknowledgement key will turn off Hooter, Buzzer & Relay. Flasher will keep blinking & Alarm LED will become stable. • When GC < SP, If Acknowledgement key is not pressed, Flasher, Alarm LED & Relay will remain ON. • Acknowledgement is compulsory in Latch: Yes condition |
| LOGIC | <p>If Logic is High for set point value AL1/AL2 then particular alarm indication appears on display if GC * value > set point value.</p> <p>If Logic is Low for set point value AL1/AL2, then particular alarm indication appears on display if GC * value < set point value.</p> |
| EVENT CLEAR | Clears Alarm event values stored in status menu. |

11.4 OFFSET MENU

To adjust any errors due to drift/calibration can be done by setting an Offset.

An offset of maximum $\pm 25\%$ of full scale value / range can be set.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select menu parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC" / " Back "to go out of the setting parameter / menu. After entering the OFFSET MENU, the following will be displayed.

| |
|------------|
| OFFSET |
| ± 0.00 |

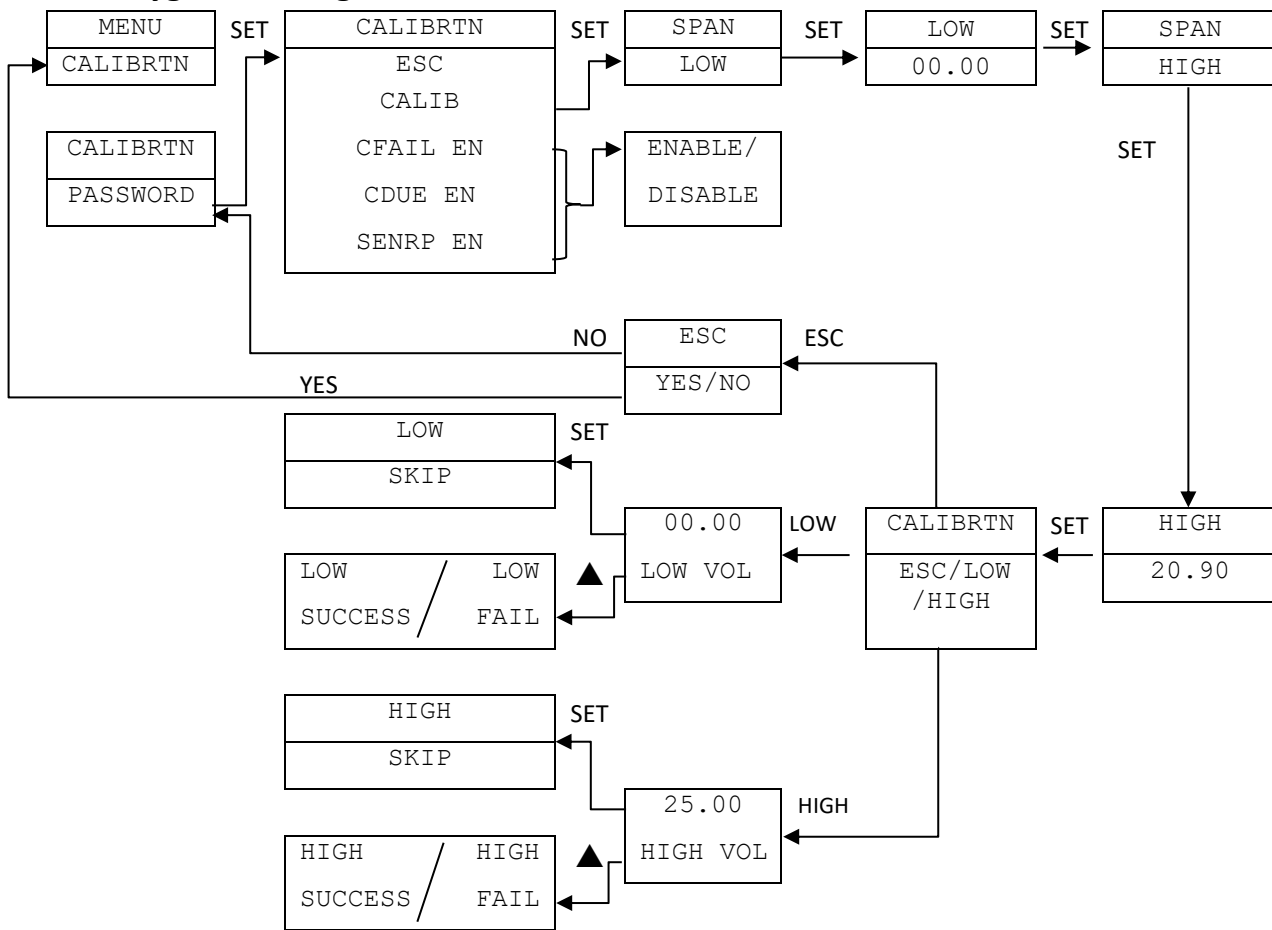
SMART GAS DETECTOR: GT-2511-FLP

11.5 CALIBRATION MENU

Before initial calibration, allow the detector to stabilize as per the warm up time after applying power. To calibrate the detector, use an appropriate span calibration gas cylinder, constant Gas flow regulator & Ambetronics calibration cap & user manual for calibration procedure.

Press set key to enter the menu and set/save the parameter. Use '▲' key to select parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "BACK" to go out of the setting parameter / menu. After entering the password, the following menu will be displayed.

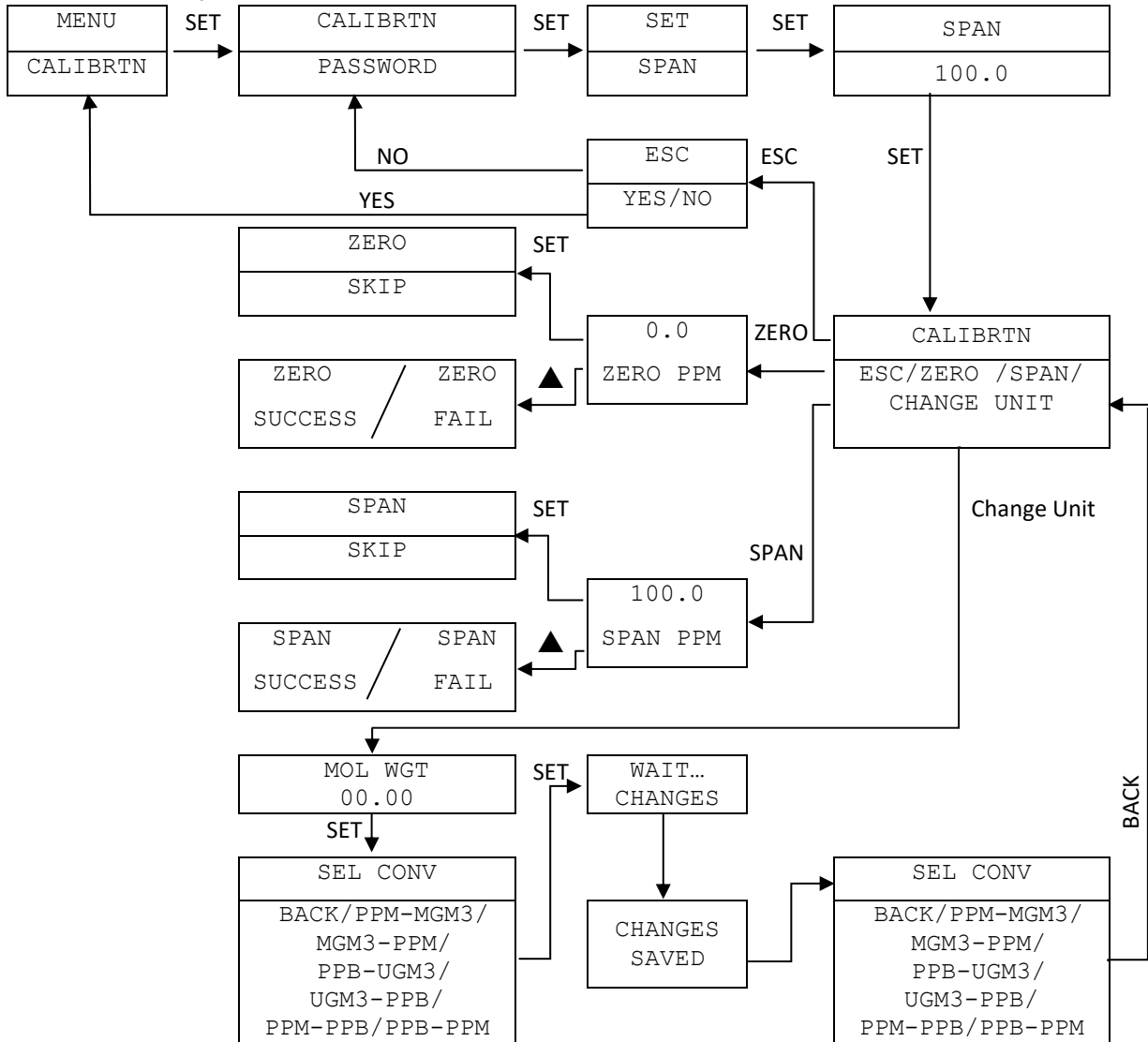
For Oxygen / Nitrogen Transmitter/Detector:



After cal success/fail, Display return to CALIBRTN PASSWORD
As per Gas Unit, Gas Name, Gas Concentration value will be different.

SMART GAS DETECTOR: GT-2511-FLP

**For Toxic, PID, NDIR (CH₄/CO₂/C₃H₈) , Combustible (Catalytic /Pellistor)
Transmitter / Detector**



After cal succ/fail, Display return to CALIBRTN PASSWORD
As per Gas Unit, Gas Name, Gas Concentration value will be different.

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Table 7

| | | |
|---|---|---|
| CAL FAIL | : | This setting allows you to Disable/ Enable Calibration Fail message that toggles on main display when calibration is failed. |
| CAL DUE | : | This setting allows you to Disable/ Enable Calibration Due message that toggles on main display when Calibration days are over. |
| SENSOR REPLACE | : | This setting allows you to Disable/ Enable Sensor Replace message that toggles on main display when Sensor Life days are over. |
| LOW/ZERO SKIP | : | Skips the Low/Zero calibration, when set key is pressed while calibration. |
| HIGH /SPAN SKIP | : | Skips the High/Span calibration, when set key is pressed while calibration. |
| LOW /ZERO SUCCESS or LOW/ZERO FAIL | : | } This message is displayed to inform the status of the calibration whether the particular calibration is done successfully or has failed. |
| HIGH /SPAN SUCCESS or HIGH / SPAN FAIL | : | |
| CHANGE UNIT (CUNT) | : | <p>This menu is used for unit conversions.</p> <ul style="list-style-type: none"> • PPM-MGM3 • MGM3-PPM • PPB-UGM3 • UGM3-PPB • PPM-PPB • PPB-PPM |

Table 8

| Calibration STEPS & Policy: | | | |
|--|-----------------|-------------------------|--|
| HIGH/SPAN | LOW/ZERO | Status | REMARKS |
| Success | Success | CAL* success | Unit will work as per new CAL* data |
| Success | fail | CAL* fail | Unit will work as per previous CAL* data |
| Fail | X | CAL* fail | Unit will work as per previous CAL* data |
| Success | X | LOW/ZERO CAL* not done | Unit will work with new GAS SPAN & old LOW SPAN data |
| X | Success | HIGH/SPAN CAL* not done | Unit will work with old GAS SPAN & new LOW SPAN data |

SMART GAS DETECTOR: GT-2511-FLP

| | | | |
|---|------|---------------|--|
| X | Fail | CAL* fail | Unit will work as per previous CAL* data |
| X | X | CAL* not done | Unit will work as per previous CAL* data |

NOTE:

After 'Span / High Cal Success / Fail' Display return to 'Calibration Password'

After 'Zero / Low Cal Fail' Display return to 'Calibration Password'

11.5.1 CALIBRATION INSTRUCTION FOR OXYGEN / NITROGEN DETECTOR / TRANSMITTER

For Low calibration use: Set 'Low Cal' between 0% V/V to 5 % V/V

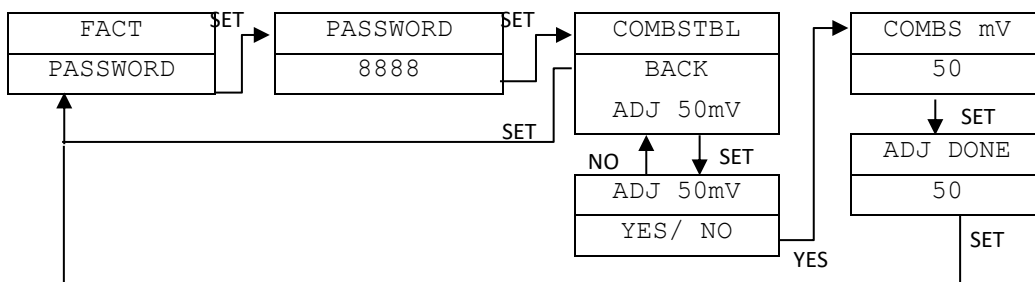
- For 0 % V/V use Pure Nitrogen gas (99.999%V/V [5.0 Grade], Moisture & Oxygen Level <2 PPM & CO+ CO₂ level < 0.5PPM & T.H.C. < 0.2 PPM & other components should be nil.)
- 1 % V/V to 5 % V/V use Oxygen Gas Balance Nitrogen (Use O₂ Gas for accurate linearity)

For High Calibration use: Set 'High Cal' between 18% V/V to 23 % V/V

- Normally set 20.9 % V/V & for 20.9 % V/V
Use **Ambient fresh air** or **Compressed Air Cylinder (20.9 % V/V, O₂ Balance Nitrogen)** as calibration gas for 'High Cal'.
- OR use 18 % V/V to 23 % V/V Oxygen gas Balance Nitrogen as calibration gas for 'High Cal'.
- Regulator flow Rate = 0.5 LPM for Low & High Calibration.
- Low / High calibration can be skipped.
- For Oxygen, Nitrogen Detector warm up time is 2 hours.

11.5.2 CALIBRATION INSTRUCTION FOR TOXIC, PID, COMBUSTIBLE CATALYTIC OR PELLISTOR, NDIR- CH₄, NDIR- C₃H₈ DETECTOR / TRANSMITTER.

- ❖ For Combustible gas type setting to adjust zero offset millivolts (mV) of sensor mV will adjust between 50-150mV



ZERO CALIBRATION:

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Compressed Air Cylinder (20.9 % V/V, O₂ Balance Nitrogen) should be used to perform the Zero calibration if the surrounding area contains any residual amount of Target Gas. If no residual gas is present, then atmospheric background Ambient fresh air can be used to perform the Zero Calibration.

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SPAN CALIBRATION:

Use Target gas concentration with balance air $\frac{1}{4}$ th or $\frac{1}{2}$ of Target gas Detector range.

- Regulator flow Rate = 0.5 LPM for Zero & Span Calibration.
- For Toxic / PID / Combustible Detectors Zero / Span calibration can be skipped.
- For NDIR-CH₄ & C₃H₈, zero calibration is recommended & cannot be skipped.
- For NDIR-CH₄ & C₃H₈, warm up time is 5 minutes.

11.5.3 IMPORTANT NOTE FOR TOXIC GAS DETECTOR / TRANSMITTER

- Use Surrogate gas for specified Toxic Gas Detector as recommended by manufacturer or refer calibration & Test report for factor.
- For ETO/NO Detector warm up time is 1 day & for other detectors warm up time is 2 hours.

11.5.4 IMPORTANT NOTE FOR COMBUSTIBLE GAS DETECTOR / TRANSMITTER

For Combustible Catalytic / Pellistor gas detector other than Methane / LPG / Hydrogen, Other Combustible Gas detector are calibrated with methane & factors for those gases are mentioned in the Calibration & Test report.

For Combustible Gas Detector warm up time is 1 hour.

11.5.5 IMPORTANT NOTE FOR PID DETECTOR / TRANSMITTER

- All VOCs are available in PID detection principle in PPM ranges.
- PID detector will be provided by calibration with Isobutylene gas.
- In PID detector, VOC other than Isobutylene is calibrated with Isobutylene gas by Setting VOC correction factor.
- In Calibration Report, VOC factor with respect to Isobutylene gas will be Mentioned.
- Detection value of VOC = Isobutylene gas concentration value x factor.
- For PID Detector warm up time is 1 hour.
- While Calibration of PID Detector, ensure environment should be free from VOC or other Gases.

11.5.6 CALIBRATION INSTRUCTION FOR NDIR- CO₂ DETECTOR / TRANSMITTER

ZERO CALIBRATION:

Use Pure Nitrogen gas (99.999%V/V Moisture & Oxygen Level <2 PPM & CO+ CO₂ level < 0.5PPM & T.H.C. < 0.2 PPM & other components should be nil.)

SPAN CALIBRATION:

Use CO₂ gas concentration with balance Nitrogen $\frac{1}{4}$ th or $\frac{1}{2}$ of CO₂ gas range.

Regulator flow Rate = 0.5 LPM for Zero & Span Calibration.

For NDIR- CO₂, zero calibration is recommended & cannot be skipped.

For NDIR-CO₂, warm up time is 5 minutes.

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SPAN CALIBRATION:

Use CO₂ gas concentration with balance Nitrogen ¼ th or ½ of CO₂ gas range.

Regulator flow Rate = 0.5 LPM for Zero & Span Calibration

For NDIR- CO₂, zero calibration is recommended & cannot be skipped.

For NDIR-CO₂, warm up time is 5 minutes

11.5.7 STANDARD CALIBRATION SET UP

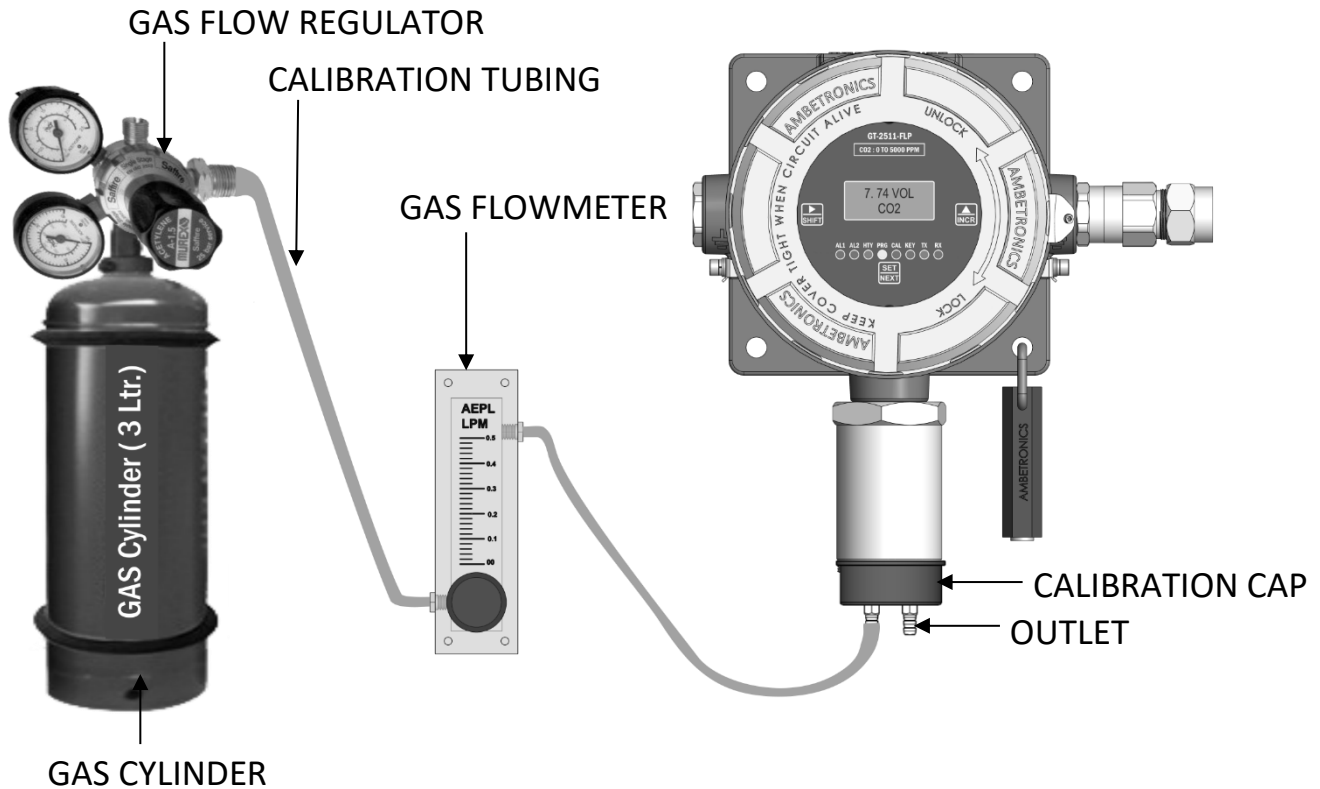


Figure 10

STEPS FOR PREPARATION OF CALIBRATION SET UP:

- 1) Arrange all require component like Calibration Gas Cylinder with Gas Flow Regulator, Calibration Cap, Calibration Tubing, and Detector to be calibrated & connect as shown in Calibration set up.
- 2) Keep Calibration tubing length as short as possible.
- 3) While connecting tubing use short piece of rubber tube.
- 4) Before starting calibration, ensure Calibration Cap, Calibration Tubing, are connected properly to avoid leakage.
- 5) Use soap water to observe leakage.
Pour soap water over joints. If leakage is there, bubbles will be seen & if leakage is not there, bubble will not be seen.
Use Teflon tape between joints to avoid leakage.
- 6) After ensuring leakage is not found, open Calibration Gas Cylinder & set flow rate as recommended & connect Calibration tubing to Detector to be calibrated.

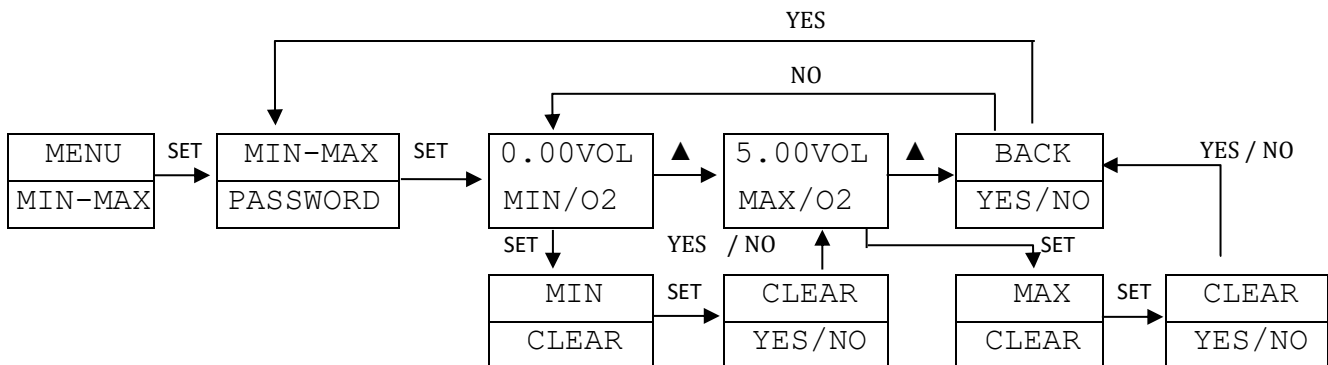
SMART GAS DETECTOR: GT-2511-FLP

- 7) For Toxic corrosive, gas such as CL₂, HCL, H₂S, SO₂, VOC, NH₃, HF, NO₂ etc. Use Teflon tubing or recommended by manufacturer.
- 8) For Combustible gases, NDIR- CH₄ /NDIR-CO₂ use normal Tygon tubing or recommended by manufacturer.
- 9) Follow the calibration procedure mentioned in Operator / User manual.
- 10) For Zero / Low calibration, Apply Gas maximum 2 min or up to Stabilisation of reading & save Zero / Low calibration as per Calibration procedure.
- 11) For Span/ High calibration, Apply Gas maximum 2 min or up to Stabilisation of reading & save Span/ High calibration as per Calibration procedure.
- 12) For any assistance contact factory.

11.6 MIN-MAX MENU

This menu is used to view Low/High (Min/Max) of the Gas Concentration. This value can be cleared to by selecting YES.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "Back "to go out of the setting parameter / menu. After entering the password, the following menu will be displayed.



Min-Max value for oxygen as an example is given. As per Gas Unit, Gas Name, Min-Max value will be different.

NOTE:

1. This menu is used to see Low peak & High peak of Gas Concentration during operation. After Power On Min & Max value of Gas Concentration are updated after 1 minute only once. After that you can clear the Min & Max value of Gas Concentration as per your requirement & will be updated in online operation as per Low Peak & High peak of Gas concentration.
2. Minimum Value is only for Oxygen Gases and for Toxic Gases.
3. Maximum value is for Oxygen Gases and for Toxic Gases & Combustible Gases.

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11.7 COMMUNICATION MENU

It is used to set Serial Communication parameters to communicate with remote terminal/ PC.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select menu parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "Back "to go out of the setting parameter / menu. After entering the COMMUNICATION MENU, the following will be displayed.

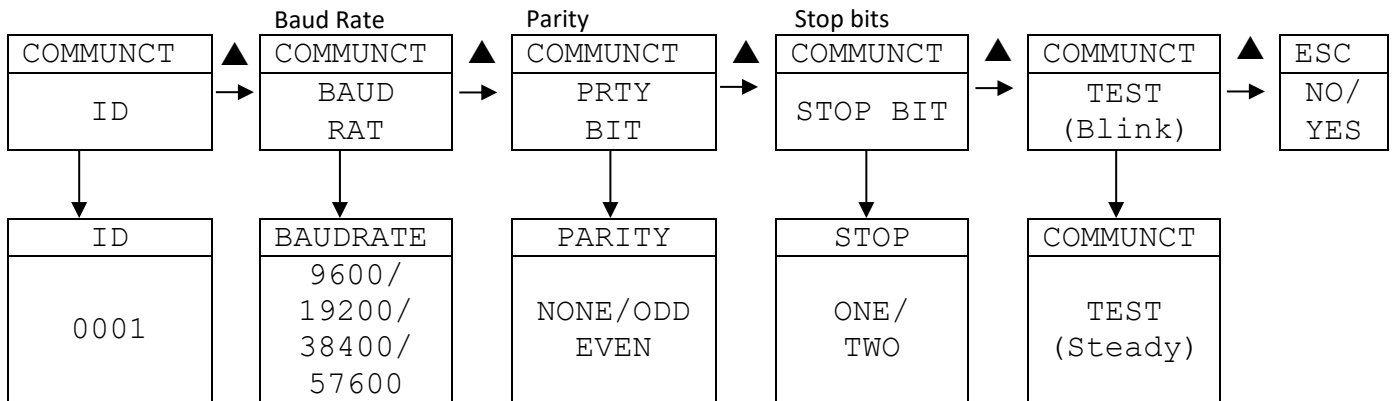


Table 9

| | | |
|-----------|---|---|
| DEVICE ID | : | ID can be set from 1 to 250 as per the requirement |
| BAUD RATE | : | This value can be set at 9600/ 19200/ 38400/ 57600 bps. |
| PARITY | : | This is the parity bit ODD, EVEN & NONE can be set. Same setting is to be done in computer software also. |
| STOP BITS | : | The stop bits indicate the end of data string; selection can be done as 1/ 2 bits. It is usually set ONE |
| DATA BITS | : | Data Bits are not shown but should be considered as 8. |
| TEST | : | When 'Test' is selected 'Test" on display get steady & "Ambetronics Engineers Pvt Ltd" on Hyper-Terminal will be displayed. |

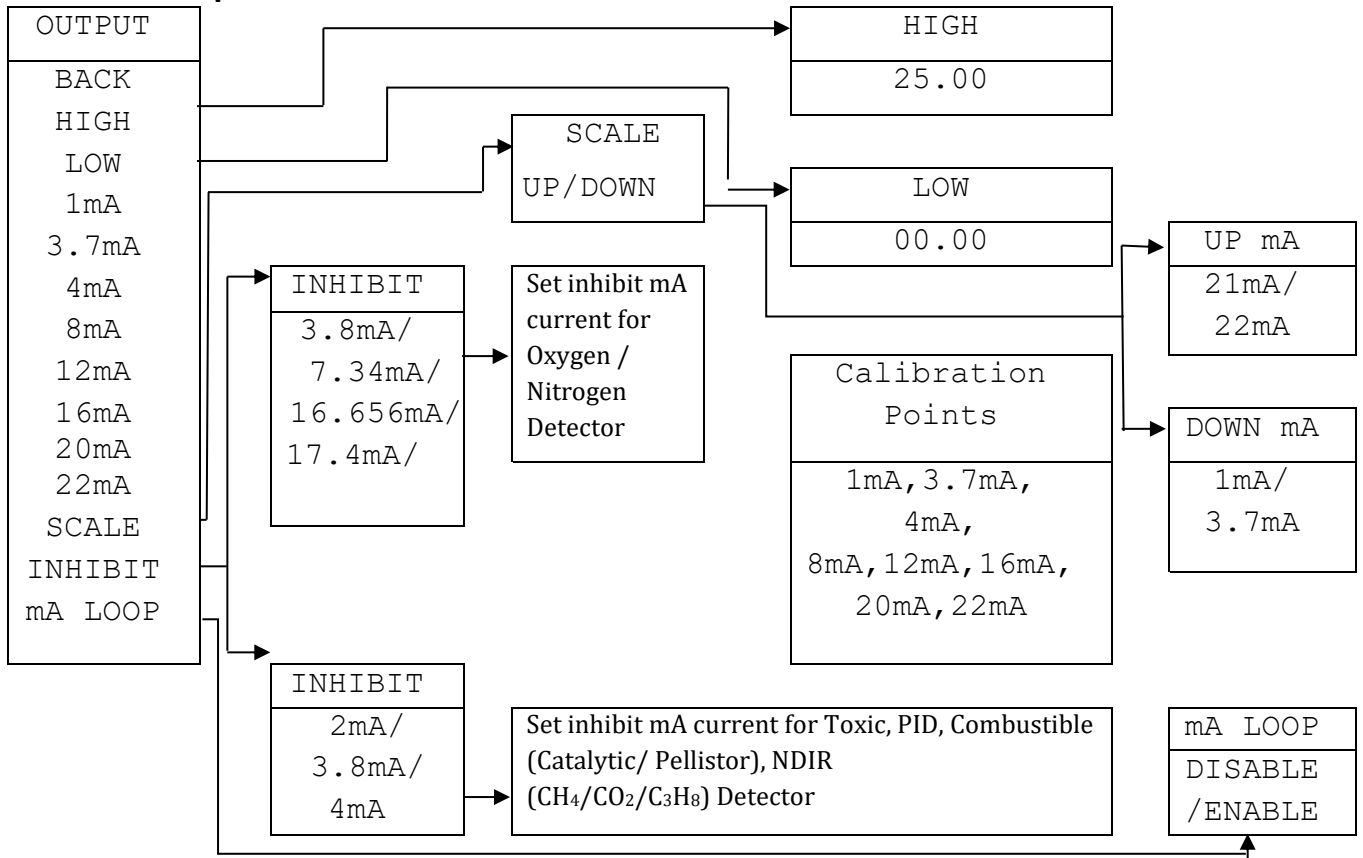
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11.8 OUTPUT MENU

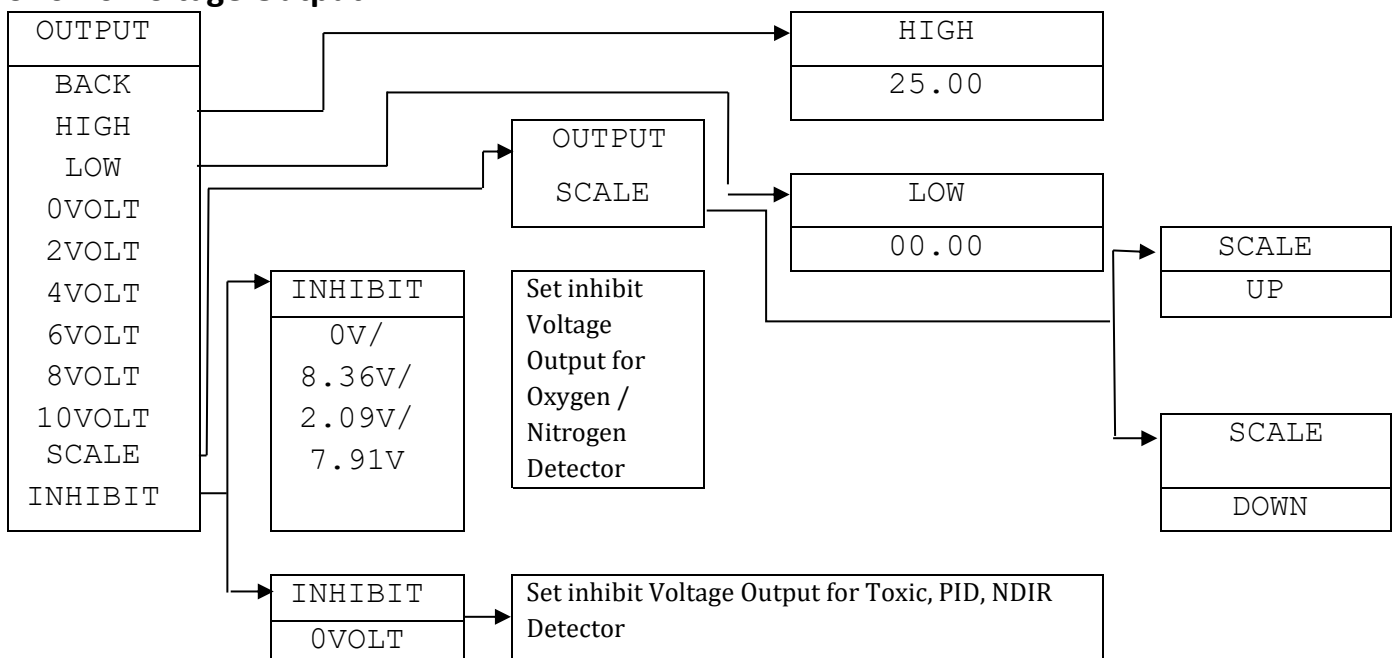
This menu is used to set output range & current output of Parameter. The current output must be checked with the Multimeter.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select menu parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "Back "to go out of the setting parameter / menu. After entering the OUTPUT MENU, the following will be displayed.

For Current Output

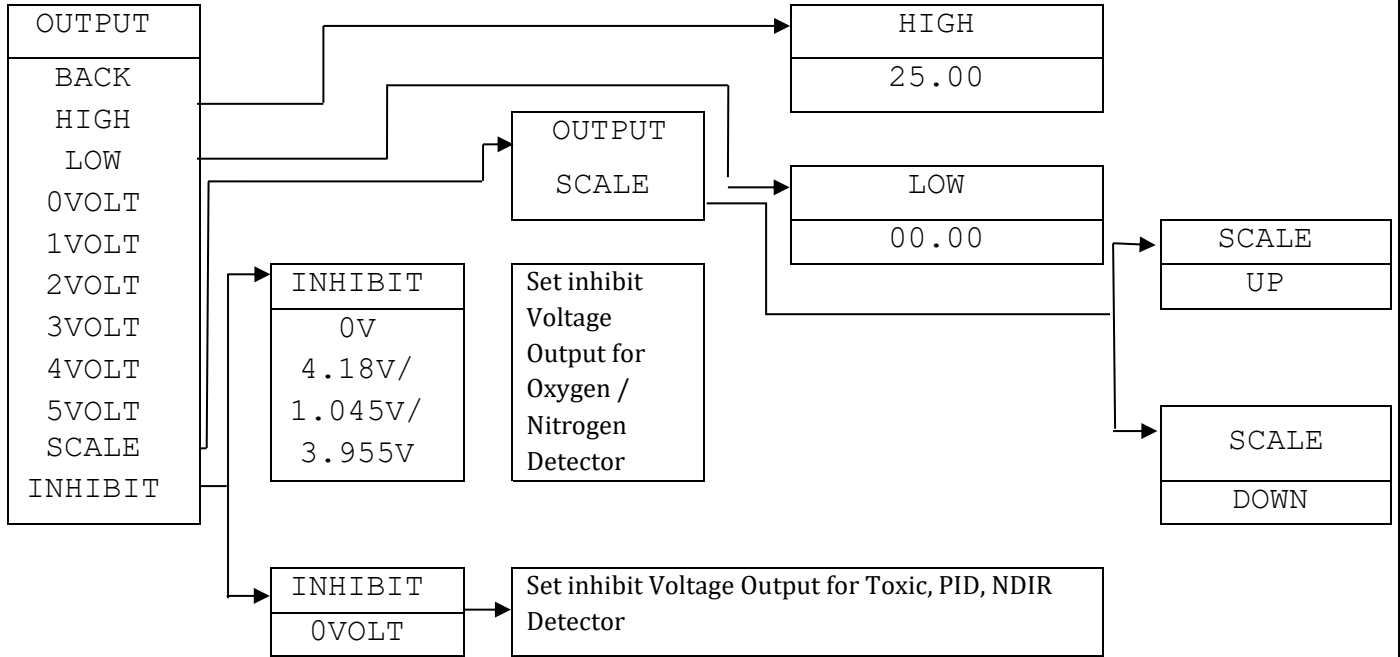


For 0-10 Voltage Output



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For 0-5 Voltage Output



For 0-1 Voltage Output

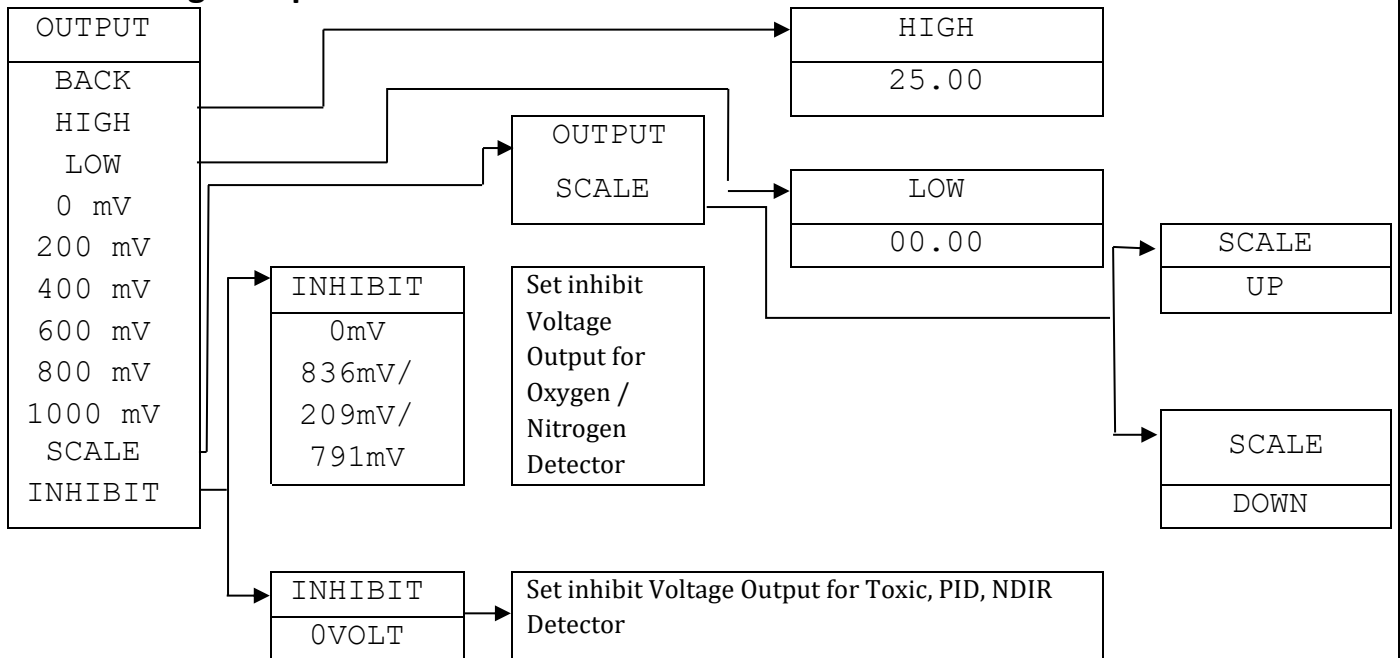


Table 10

| | | |
|-------------|---|---|
| HIGH (High) | : | Set High range of Detector for which 20mA & 10V/5V/1V output is required. |
| LOW (Low) | : | Set Low range of Detector for which 4mA & 0V output is required. |
| SCALE | : | This menu is used to set scale of the output Current / Voltage in fault condition, which may be "Sensor Open/Over Range". Upscale Current/ Voltage = 21 mA/22mA & 10V/5V/1V Down scale Current/ Voltage = 1mA/3.7 mA & 0V |

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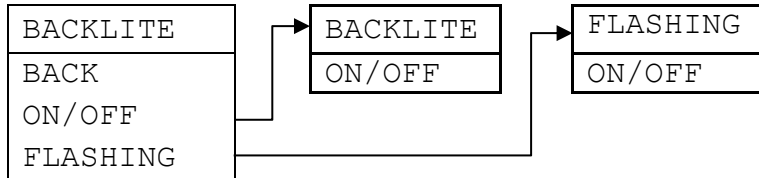
| | | |
|---------------------------|---|--|
| Current calibration point | : | This calibration point is used to set Current / Voltage output. For this Digital multimeter is required to connect to Detector. |
| INHIBIT | : | <p>This mode is required for servicing & programming other parameters in detector setting to avoid false alarm & to give information about servicing & setting of parameters are going on.</p> <ul style="list-style-type: none"> • Inhibit mode current is adjustable & user selective <ul style="list-style-type: none"> Oxygen for 25% V/V range : 3.8mA / 17.4mA Oxygen for 100% V/V range : 3.8mA / 7.34mA Nitrogen for 100% V/V range : 3.8mA/ 16.656mA Toxic / combustible / PID /NDIR : 2mA / 3.8mA / 4mA • Inhibit mode for 0-10V voltage output is adjustable & user selective <ul style="list-style-type: none"> Oxygen for 25% V/V range : 0V / 8.36V Oxygen/N2 for 100% V/V range : 0V/ 2.09V Nitrogen for 100% V/V range : 0V/7.91V Toxic / combustible / PID /NDIR : 0V • Inhibit mode for 0-5V voltage output is adjustable & user selective <ul style="list-style-type: none"> Oxygen for 25% V/V range : 0V / 4.18V Oxygen/N2 for 100% V/V range : 0V/ 1.045V Nitrogen for 100% V/V range : 0V/3.955V Toxic / combustible / PID /NDIR : 0V • Inhibit mode for 0-1V voltage output is adjustable & user selective <ul style="list-style-type: none"> Oxygen for 25% V/V range : 0V / 836mV Oxygen/N2 for 100% V/V range : 0V/ 209mV Nitrogen for 100% V/V range : 0V/791mV Toxic / combustible / PID /NDIR : 0mV <p>* Note: Refer last point of important notes for more details</p> |
| mA LOOP | : | While this option is enabled if 4-20mA Loop connection is broken or gets disconnected. mA Loop Open message will display on screen. |

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11.9 BACKLITE MENU

The Backlight can be selected to ON /OFF or Flashing-YES/NO.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select menu parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "Back" to go out of the setting parameter / menu. After entering the Backlight MENU, the following will be displayed.



BACKLIGHT ON/OFF: If selected Backlight 'ON', it will continuous ON in normal working mode for all menus and submenus and If selected backlight 'OFF', it will remain OFF in all menus & sub menus.

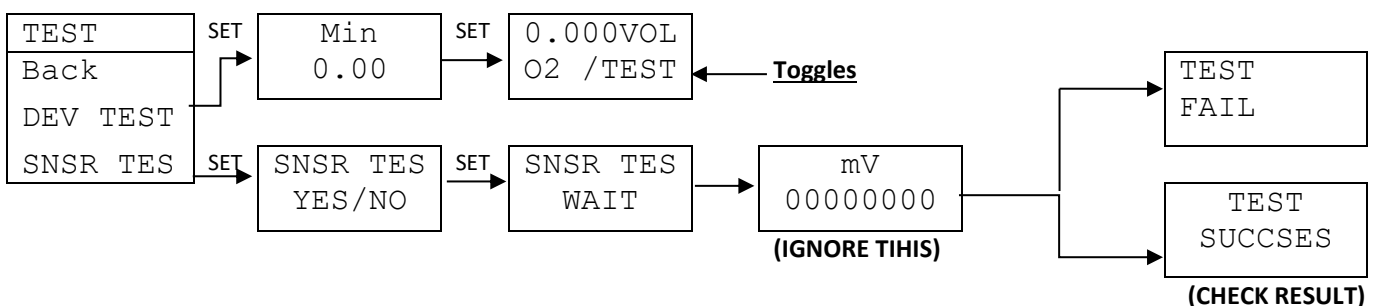
FLASHING YES: If selected Flashing 'YES', When Alarm gets activated and fault condition appeared such as 'Sensor Open / Over range'. LCD backlight will start flashing irrespective of backlight 'ON/OFF' selection.

FLASHING NO: If selected Flashing is 'NO', LCD backlight will not flash even Alarm gets activated and fault condition appeared such as 'Sensor Open / Over range'.

11.10 TEST MENU

This menu is used to check the electronics of the system by simulating the value of the virtual Gas Concentration for testing purpose.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select menu parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "Back" to go out of the setting parameter / menu. After entering the TEST MENU, the following will be displayed.



DESCRIPTION

| | |
|-----------|------------------------------------|
| TEST | TEST MODE |
| DEV TEST | DEVICE TEST MODE |
| SNSR TES | SENSOR TEST MODE |
| Min | MINIMUM GAS INCREMENT VALUE |
| TEST FAIL | SENSOR TEST FAIL |

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TEST SUCC

SENSOR TEST SUCCESS

DEVICE TEST MODE

Set Minimum Value of the Virtual Gas concentration manually to check working of Alarm settings, Indication for Alarms & current output with respect to virtual gas concentration.

Test mode operation: In Test mode if increment in virtual GC* is done above High range 'Over range' will be displayed & corresponding current output will be as per upscale/downscale.

In Test mode if Decrement in virtual GC* is done below Low range 'Sensor Open' will be displayed & corresponding current output will be as per upscale/downscale

SENSOR TEST MODE

1. This mode is used to check the condition of sensor Toxic sensor.
2. Oxygen, Nitric oxide (NO) & ethylene oxide (ETO) cannot be checked with this mode.
3. If sensor test succeeds, then sensor is ok.
4. If sensor test fails, then sensor needs to be replaced.

Warning:

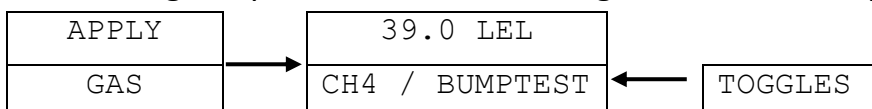
Use 'Test mode' only to check the device is working properly or not. That is 4-20mA output, Relay, LED Indication are working properly without connecting the sensor to device just by incrementing and decrementing the virtual GC* with the help of '▲' & '▶' keys. Do not use 'Test mode' when the detector is completely installed on the site. For the operation take permission from your senior authority, otherwise it may be very dangerous.

11.11 BUMP TEST MENU

NOTE: A Gas response check is periodically required & carried out is often called as 'Bump Test'. This test is performed by using Calibration Gas required to apply to the sensor via calibration cap. Bump test helps user to take decision about calibration required for detector.

Press SET key to enter the menu and set the parameter. Use '▲' key to select parameters. Use '▲' & '▶' keys to edit the parameter value. Use "Back" to go to the previous menu or setting and use "ESC"/ "BACK" to go out of the setting parameter / menu.

After entering the password, the following menu will be displayed.



When 'Apply Gas' will be displayed, apply particular calibration gas for one minute & Corresponding Gas Concentration will be displayed.

During Bump Test current output will be as per Set current in inhibit mode.

Warning:

After Gas Concentration observation, do not exit directly from 'Bump Test' menu.

Ensure that Applied Gas Concentration reaches within safe limit to avoid false alarm while exit.

11.12 RANGE LOCK MENU

This menu is used to lock the Gas Concentration at Higher & Lower range.

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select menu parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "Back "to go out of the setting parameter / menu.

After entering RANGE LOCK MENU, below setting will be displayed.

| |
|--------------------|
| RANG-LOK YES/NO |
|--------------------|

This menu is used to lock the Gas Concentration at higher & lower range.

1) If RANGE LOCK is selected 'Yes'

Whenever display value > Detector High range value, Display shows higher range value & Display value < Detector Low range value, Display shows lower range value.

2) If RANGE LOCK selected 'No'

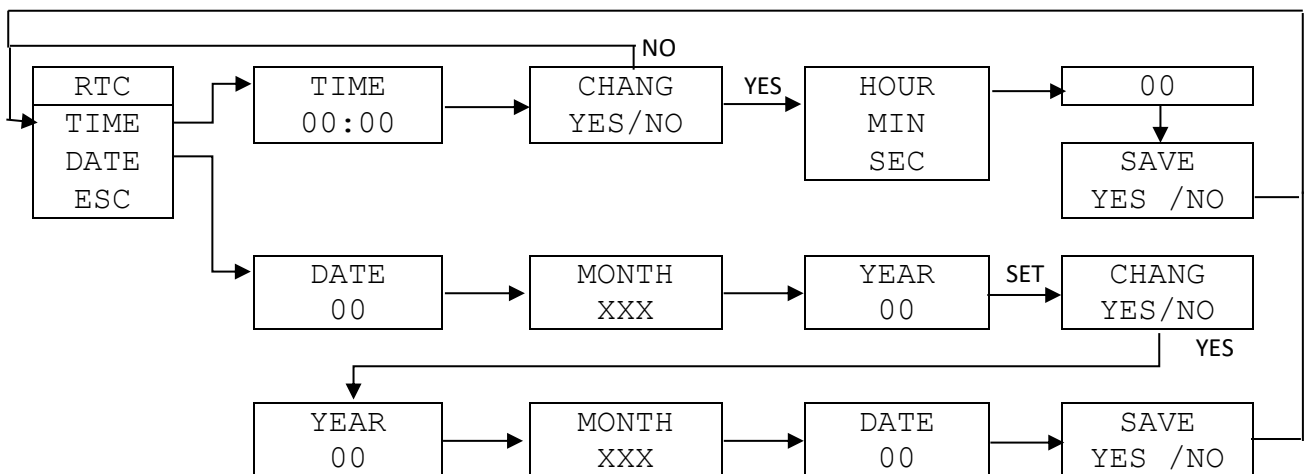
Whenever display value > Detector High range value, display shows "OVER RANGE" & Display value < Detector Low range value, Display shows "SENSOR OPEN".

11.13 RTC MENU

This menu is used to set RTC (Real Time Clock).

Press SET key to enter the menu and set/save the parameter. Use '▲' key to select parameters. Use '▲' & '▶' keys to edit the parameter value. Use "BACK" to go to the previous menu or setting and use "ESC"/ "Back "to go out of the setting parameter / menu.

After entering the password, the following menu will be displayed.



12. APPENDIX

12.1 ACRONYMS USED IN THIS MANUAL

NWM* – Normal Working Mode

GC* – Gas Concentration

SP* – Set point

PV* – Process Value

PV* & GC* are of same meaning

Operator Setting menu & User menu are of same meaning.

Device/Detector/transmitter/instrument/Unit are of same meaning.

Operator/User are of same meaning

13. MODBUS ADDRESS DESCRIPTIONS

13.1 READ/ WRITE REGISTER DETAILS

Table 11

| READ/ WRITE REGISTER DETAILS | |
|-------------------------------------|------------------------------|
| 0X01 | READ COIL REGISTER |
| 0X03 | READ HOLDING REGISTER |
| 0X04 | READ MULTIPLE INPUT REGISTER |
| 0X05 | WRITE COIL REGISTER |
| 0X06 | WRITE SINGLE REGISTER |
| 0X16 | WRITE MULTIPLE REGISTER |

13.2 MODBUS ADDRESS

Table 12

| HOLDING REGISTERS | | | |
|--------------------------|-------------------------|----------------|---|
| SR.NO | GATE ID | ADDRESS | DESCRIPTION |
| 1 | Gas Concentration value | 40000 | Holds the Gas Concentration value. |
| 2 | Use AL1 | 40001 | Holds alarm setting condition. 01=Alarm 1 Enabled 00=Alarm 1 Disabled |
| 3 | AL1 Set Point | 40002 | Holds the set point value for Alarm 1. Can be set from 0 to range of instrument |
| 4 | AL1 Hysteresis | 40003 | Holds the hysteresis value for Alarm 1. Can be set up to 10% of range selected. |
| 5 | AL1 Logic | 40004 | Holds the logic value for alarm 1. 01=Alarm 1 Logic High. 00=Alarm 1 Logic Low. |
| 6 | AL1 Time Delay | 40005 | Holds the delay time for alarm 1. can be set from 0 to 999 sec |
| 7 | Use AL2 | 40006 | Holds alarm enable condition. 01=Alarm 2 Enabled 00=Alarm 2 Disabled |

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| | | | |
|----|-----------------------------|-------|---|
| 8 | AL2 Set Point | 40007 | Holds the set point value for Alarm 2. Can be set from 0 to range of instrument. |
| 9 | AL2 Hysteresis | 40008 | Holds the hysteresis value for Alarm 2. Can be set up to 10% of range selected. |
| 10 | AL2 Logic | 40009 | Holds the logic value for alarm 2. 01=Alarm 1 logic High. 00=Alarm logic Low. |
| 11 | AL2 Time Delay | 40010 | Holds the delay time for Alarm 2. Can be set from 0 to 999 sec |
| 12 | STEL ENABLE / DISABLE | 40011 | Holds the STEL setting condition. 01=STEL enabled. 00=STEL Disabled |
| 13 | STEL Set Point | 40012 | Holds the set point value for STEL. Can be set from 1 to range of the instrument |
| 14 | TWA ENABLE / DISABLE | 40013 | Holds the TWA setting condition. 01=TWA enabled. 00=TWA Disabled |
| 15 | TWA Set Point | 40014 | Holds the set point value for TWA. Can be set from 1 to range of the instrument. |
| 16 | BUZZER ENABLE / DISABLE | 40015 | Holds the Buzzer condition for Alarms 01= Buzzer ON 00= Buzzer OFF |
| 17 | Buzzer On Key | 40016 | Holds the Buzzer on key condition for Alarms 01= Key Buzz ON 00= Key Buzz OFF |
| 18 | Hooter On/Off | 40017 | Holds the Hooter status 0 = Hooter OFF 1= Hooter ON |
| 19 | Flasher On / Off | 40018 | Holds the Flasher status 0 = Flasher OFF 1= Flasher ON |
| 20 | snooze | 40019 | Holds the value for snooze. Can be set Min: 000 Max : 999 |
| 21 | Relay1 On/ Off | 40020 | Holds the Relay1 status 0 = Relay1 OFF 1= Relay1 ON |
| 22 | Relay1 Latch ENB / DIS | 40021 | Holds the Relay1 Latch setting condition. 01= Relay1 enabled. 00= Relay1 Disabled |

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| | | | |
|----|------------------------|-------|---|
| 23 | Relay2 On/ Off | 40022 | Holds the Relay2 status 0 = Relay2 OFF 1= Relay2 ON |
| 24 | Relay2 Latch ENB / DIS | 40023 | Holds the Relay2 Latch setting condition. 01= Relay2 enabled. 00= Relay2 Disabled |
| 25 | Relay3 On/ Off | 40024 | Holds the Relay3 status 0 = Relay3 OFF 1= Relay3 ON |
| 26 | Relay3 Latch ENB / DIS | 40025 | Holds the Relay3 Latch setting condition. 01= Relay3 enabled. 00= Relay3 Disabled |
| 27 | Relay4 On/ Off | 40026 | Holds the Relay4 status 0 = Relay4 OFF 1= Relay4 ON |
| 28 | Relay4 Latch ENB / DIS | 40027 | Holds the Relay4 Latch setting condition. 01= Relay4 enabled. 00= Relay4 Disabled |
| 29 | Device ID | 40028 | Here Device ID can be set from 1 to 250 |
| 30 | Baud rate | 40029 | Holds the Baud Rate setting 0 = 9.6 kbps 1 = 19.2 kbps 2 = 38.4 kbps 3 = 57.6 kbps |
| 31 | Parity | 40030 | Holds the Parity Bit setting 0 = None 1 = Odd 2 = Even |
| 32 | Stop bit | 40031 | Holds the stop bit setting 0=one 1= two |
| 33 | Output High Range | 40032 | Holds the Higher set value for 4-20 mA output. |
| 34 | Output Low Range | 40033 | Holds the Lower set value for 4-20 mA output. |
| 35 | Counts Adj ENB / DIS | 40034 | This setting allows you to adjust the counts for current calibration points. 0=Disable 1=Enable |

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| For Current Output | | | |
|---|---|-------|--|
| 36 | 1mA counts Set | 40035 | Holds the value for 1mA. Default value is 0 adjust the counts if needed. |
| 37 | 3.7mA counts Set | 40036 | Holds the value for 3.7mA. Default value is 0 adjust the counts if needed. |
| 38 | 4mA counts Set | 40037 | Holds the value for 4mA. Default value is 0 adjust the counts if needed. |
| 39 | 8mA counts Set | 40038 | Holds the value for 8mA. Default value is 0 adjust the counts if needed. |
| 40 | 12mA counts Set | 40039 | Holds the value for 12mA. Default value is 0 adjust the counts if needed. |
| 41 | 16mA counts Set | 40040 | Holds the value for 16mA. Default value is 0 adjust the counts if needed. |
| 42 | 20mA counts Set | 40041 | Holds the value for 20mA. Default value is 0 adjust the counts if needed. |
| 43 | 22mA counts Set | 40042 | Holds the value for 22mA. Default value is 0 adjust the counts if needed. |
| 44 | Scale select | 40043 | Holds the value for Scale Current 0=down 1=up |
| 45 | Inhibit select * Note: Refer last point of important notes for more details | 40044 | Holds the value for Inhibit Current |
| | | | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> a. For O₂/N₂ gas type 0=3.8mA 1=17.4mA / 7.34mA/ 16.656mA </td> <td style="width: 50%; vertical-align: top;"> b. For other gas types 0=2mA 1=3.8mA 2=4mA </td> </tr> </table> |
| a. For O ₂ /N ₂ gas type 0=3.8mA 1=17.4mA / 7.34mA/ 16.656mA | b. For other gas types 0=2mA 1=3.8mA 2=4mA | | |
| For Voltage Output | | | |
| 46 | 0 VOLT/ 0 mV Set | 40035 | Holds the value for 0V/0mV. Default value is 0 Note: Counts can be adjusted by adding or subtracting from existing value |
| 47 | 2 VOLT/ 1 VOLT/ 200 mV Set | 40036 | Holds the value for 2V/1V/200mV. Default value is 0 |
| 48 | 4 VOLT/ 2 VOLT/ 400 mV Set | 40037 | Holds the value for 4V/2V/400mV. Default value is 0 |
| 49 | 6 VOLT/ 3 VOLT/ 600 mV Set | 40038 | Holds the value for 6V/3V/600mV. Default value is 0 |
| 50 | 8 VOLT/ 4 VOLT/ 800 mV Set | 40039 | Holds the value for 8V/4V/800mV. Default value is 0 |
| 51 | 10 VOLT/ 5 VOLT/ 1000 mV Set | 40040 | Holds the value for 10V/5V/1000mV. Default value is 0 |
| 52 | - | 40041 | - |

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| | | | |
|---------------------------|---|-------|--|
| 53 | - | 40042 | - |
| 54 | Scale select | 40043 | Holds the value for Scale Voltage 0=down 1=up |
| 55 | Inhibit select * Note: Refer last point of important notes for more details | 40044 | Holds the value for Inhibit Voltage |
| | | | a. For O2/N2 gas type 0= 0V 1= 8.36V / 2.09V / 7.91V & 1.045V / 3.955V & 209mV/791mV |
| 56 | - | 40045 | - |
| 57 | - | 40046 | - |
| 58 | - | 40047 | - |
| 59 | - | 40048 | - |
| 60 | Backlight on / off | 40049 | Holds the Backlight status 0 = Backlight OFF 1= Backlight ON |
| 61 | Flashing on / off | 40050 | Holds the flashing status 0 = FLASHING OFF 1= FLASHING ON |
| 62 | Range lock ENB/DIS | 40051 | Holds the value for range lock 0= NO 1= YES |
| 63 | Password | 40052 | Holds the value for password Eg. 0000 For setting a different password just enter new value Eg. 1234 |
| 64 | OFFSET | 40053 | Holds the Offset value for Alarm 1 & 2. Can be set up to 25% of range selected. |
| CALIBRATION POINTS | | | |
| 1 | Zero Calibration Enter | 40080 | 1= Enters Zero Calibration Setting. |
| 2 | Low Span Enter | 40081 | 1= Enters Low Span Setting. |
| 3 | Zero Calibration Start | 40082 | 1= Starts Zero Calibration |
| 4 | Zero Calibration Success | 40083 | 1= Succeeds Zero Calibration |
| 5 | Span Calibration Enter | 40084 | 1= Enter Span Calibration Setting. |
| 6 | Span Range Enter | 40085 | Enter Span Range Value as required |

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| | | | |
|------------------------|--------------------------|-------|--|
| 7 | Span Calibration Start | 40086 | 1= Starts Span Calibration |
| 8 | Span Calibration Success | 40087 | 1= Succeeds Span Calibration |
| 9 | Temperature CAL Value | 40088 | Shows Temperature of the sensor in real time. Applicable only for O ₂ & toxic sensors. |
| 10 | Gas Concentration Value | 40089 | Shows Gas Concentration value in real time. |
| INPUT REGISTERS | | | |
| 1 | Gas Concentration value | 30000 | Holds the Gas Concentration value. |
| 2 | Channel Status | 30001 | Refer to Channel Status table 13. |
| 3 | Sensor Status | 30002 | Refer to Sensor Status table14. |
| 4 | Decimal point | 30003 | Holds the decimal point. 0 = NO RESOLUTION 1 = 0.1 RESOLUTION (1DP) 2 = 0.01 RESOLUTION (2DP) |
| 5 | MIN Value | 30004 | Holds the Minimum value of gas concentration |
| 6 | MAX Value | 30005 | Holds the Maximum value of gas concentration |
| COIL REGISTERS | | | |
| 1 | Alarm + Ack | 10000 | This address is used to Acknowledge Alarm condition. |
| 3 | MIN Value clear | 10001 | This address is used to reset Minimum value |
| 4 | MAX Value clear | 10002 | This address is used to reset Maximum value |

Table 13

| CHANNEL STATUS | | | | |
|----------------|------------------------|------------------------|-----------|--------------|
| SR.NO | DETECTOR STATUS | INPUT REGISTER ADDRESS | HEX VALUE | BINARY VALUE |
| 1 | NO FAULT / NO ALARM | 30001 | 0x00 | 00000000 |
| 2 | SENSOR OPEN INDICATION | 30001 | 0x01 | 00000001 |
| 3 | OVER RANGE INDICATION | 30001 | 0x02 | 00000010 |
| 4 | WARM UP CONDITION | 30001 | 0x04 | 00000100 |
| 5 | CURRENT LOOP OPEN | 30001 | 0x100 | 100000000 |

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| CHANNEL STATUS FOR ALARM | | | | | | |
|---------------------------------|--|--------------|--------------|------------------|------------------|---------------------|
| SR.NO | CONDITIONS | Latch | Logic | DEC VALUE | HEX VALUE | BINARY VALUE |
| 1. | AL1 Triggered, AL2(Disabled)/(OFF STATE) | No & Yes | High | 2056 | 0x808 | 100000001000 |
| 2. | AL1 Ack, AL2(Disabled)/(OFF STATE) | Yes | High | 10248 | 0x2808 | 10100000001000 |
| 3. | AL1 Ack, AL2 Triggered | Yes | High | 14376 | 0x3828 | 0011100000101000 |
| 4. | AL2 Triggered, AL1(Disabled) / (OFF STATE) | No & Yes | High | 4128 | 0x1020 | 1000000100000 |
| 5. | AL2 Ack, AL1(Disabled)/(OFF STATE) | Yes | High | 20512 | 0x5020 | 101000000100000 |
| 6. | AL2 Ack, AL1 Triggered | Yes | High | 22568 | 0x5828 | 101100000101000 |
| 7. | AL1 Triggered, AL2(Disabled) / (OFF STATE) | No & Yes | Low | 2064 | 0x810 | 100000010000 |
| 8. | AL1 Ack, AL2(Disabled) / (OFF STATE) | Yes | Low | 10256 | 0x2810 | 10100000010000 |
| 9. | AL1 Ack, AL2 Triggered | Yes | Low | 14416 | 0x3850 | 11100001010000 |
| 10. | AL2 Triggered, AL1(Disabled)/(OFF STATE) | No & Yes | Low | 4160 | 0x1040 | 1000001000000 |
| 11. | AL2 Ack, AL1(Disabled) / (OFF STATE) | Yes | Low | 20544 | 0x5040 | 0101000001000000 |
| 12. | AL2 Ack, AL1 Triggered | Yes | Low | 22608 | 0x5850 | 101100001010000 |
| 13. | AL1 Triggered And Ack, AL1 (OFF STATE) | Yes | High/low | 8192 | 0x2000 | 10000000000000 |
| 14. | AL2 Triggered And Ack, AL2 (OFF STATE) | Yes | High/low | 16384 | 0x4000 | 1000000000000000 |

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| | | | | | | |
|-----|--|-------------|--------------|-------|--------|-----------------|
| 15. | AL1 Triggered, AL2 Triggered | No & Yes | High | 6184 | 0x1828 | 1100000101000 |
| 16. | AL1 Triggered, AL2 Triggered and Ack | Yes | High | 30760 | 0x7828 | 111100000101000 |
| 17. | AL1 Triggered, AL2 Triggered and Acked (OFF STATE) | Yes | High/ low | 24576 | 0x6000 | 110000000000000 |
| 18. | AL1 Triggered, AL2 Triggered | No & Yes | Low | 6224 | 0x1850 | 1100001010000 |
| 19. | AL1 Triggered, AL2 Triggered and Ack | Yes | Low | 30800 | 0x7850 | 111100001010000 |

2nd Iteration Of Alarm Triggering (Latch: Yes only)

| SR.NO | CONDITIONS | Latch | Logic | DEC VALUE | HEX VALUE | BINARY VALUE |
|-------|-----------------------------------|-------|-------|--------------|--------------|-----------------|
| 1. | AL1 Triggered, AL2 (OFF STATE) | Yes | High | 18440 | 0x4808 | 100100000001000 |
| 2. | AL1 ACK, AL2 (OFF STATE) | Yes | High | 26632 | 0x6808 | 110100000001000 |
| 3. | AL2 Triggered, AL1 (OFF STATE) | Yes | High | 12320 | 0x3020 | 11000000100000 |
| 4. | AL2 ACK, AL1 (OFF STATE) | Yes | High | 28704 | 0x7020 | 111000000100000 |
| 5. | AL1 Triggered, AL2 (OFF STATE) | Yes | Low | 18448 | 0x4810 | 100100000010000 |
| 6. | AL1 ACK, AL2 (OFF STATE) | Yes | Low | 26640 | 0x6810 | 110100000010000 |
| 7. | AL2 Triggered, AL1 (OFF STATE) | Yes | Low | 12352 | 0x3040 | 11000001000000 |
| 8. | AL2 ACK, AL1 (OFF STATE) | Yes | Low | 28736 | 0x7040 | 111000001000000 |

Note: "OFF STATE" means alarm setting is enabled but not triggered or it was triggered and brought to off state by lowering gas value

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Table 14

| SENSOR STATUS | | | | |
|---------------|--|------------------------|-----------|--------------|
| SR.NO | DETECTOR STATUS | INPUT REGISTER ADDRESS | DEC VALUE | BINARY VALUE |
| 1 | CALIBRATION SUCCESS | 30002 | 0 | 00000000 |
| 2 | CAL DUE | 30002 | 1 | 00000001 |
| 3 | CALIBRATION FAIL | 30002 | 2 | 00000010 |
| 4 | PASS & SENSOR REPLACE | 30002 | 4 | 00000100 |
| 5 | SENSOR REPLACE WITH LIFE DAYS ARE OVER | 30002 | 8 | 00001000 |

13.3 DECIMAL POINT VALUE DESCRIPTION

In case of unit as %V/V, %LEL, PPM - %V/V & PPM - %LEL, the actual value of reading or writing for process value, AL1_set pt., AL1_Hyst, AL2_set pt., AL2 Hyst, Min/Max value, output low, output high & Range of unit will depend on the decimal point set in the instrument.

For reading:

If value coming from instrument is 'x' then,

$$\text{Actual value to be read} = \frac{\text{'x'}}{\text{DP Factor}}$$

For writing:

If you want to send 'y' value to the instrument then,

Please refer following table for DP factor.

Table 15

$$= y \times \text{DP Factor}$$

| Sr .No | DECIMAL POINT | DP FACTOR |
|--------|-----------------|-----------|
| 1. | Two - DP (DP=2) | 100 |
| 2. | One - DP (DP=1) | 10 |
| 3. | No - DP (DP=0) | 1 |

13.4 FAULT INDICATION VALUE

Table 16

| Sr .No | FAULT INDICATION | HEX VALUE | DECIMAL VALUE |
|--------|--------------------------|-----------|---------------|
| 1. | 'SENSOR OPEN' INDICATION | FFFF | 65535 |
| 2. | 'OVER RANGE' INDICATION | FFFF | 65535 |

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13.5 FAULT CONDITIONS

Table 17

| SR NO | SYMPTOMS | PROBLEMS | SOLUTION |
|-------|--|--|--|
| 1. | Instrument doesn't turn 'ON' | 1) Instrument has failed. 2) Connection Problem. | Check Power Supply connection & make sure that connection is proper as per the connection diagram shown in Operating Manual. OR Contact the factory. |
| 2. | Display shows 'OVER RANGE' / 'SENSOR OPEN RANGE' & Current Output (1mA, 3.7mA, 21mA, 22mA) / Voltage Output (0V, 1V, 5V, 10V). | 1) The gas concentration is more or less than the Selected range. 2) The sensor module is not properly connected. 3) Calibration Problem | Check the Sensor Module is properly interfaced to the unit as per the connection diagram shown in operating manual. OR Contact the factory. |
| 3. | 4-20mA / 0-10V / 0-5V / 0-1V Output is not proper. | 1) Check the output range 2) Electronic module has Failed. 3) 4-20mA / 0-10V / 0-5V / 0-1V Output setting | 1) Check O/P range and current O/P 2) Contact the factory. |
| 4. | Magnetic keys not Working. | 1) Magnetic key/ wand problems 2) Switch is damaged. | 1) Contact the factory. |

13.6 IMPORTANT NOTES

When 'Gas Concentration' crosses the Set Point limits for the Relays during the process, it is shown by the activation of the Relays with their respective LED indications i.e. 'AL1' & 'AL2'.


- a) i) If Latch is given for the Relays, then Relays will be activated & latched when 'Gas Concentration' crosses the Set Point limits for the Relays during the process & LED indications for the Relays will also be activated. Relays will stay in that condition even if the 'Gas Concentration' comes below the Set Point. This condition of the Relays is called as 'LATCH'. Latched Relays will be unlatched or acknowledged by pressing the 'Shift' key. for the Relays gets activated as per the 'Gas Concentration'. When the 'Gas Concentration' crosses the Set Point limits for the Relays, it will get activated & will automatically deactivate when the 'Gas Concentration' comes within the Set Point limits.

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The relay and LED indications when alarm is in latch condition are as follow:

- If Process Value (PV) crosses set point and not acknowledged: Relay 'ON', LED 'Blinks', Flasher 'Blinks'.
 - If PV crosses set point and acknowledge: Relay 'OFF', LED'ON', Flasher 'ON'.
 - If PV is within set point and not acknowledge: Relay 'ON', LED 'Blinks', Flasher 'Blinks'.
 - If PV is within set point and acknowledge: Relay 'OFF', LED 'OFF', Flasher 'OFF'.
- a)ii) If Latch is not given for the Relays then the Relays & their LED indications will get activated when 'Gas Concentration' crosses the Set Point limits & will get automatically deactivated when 'Gas Concentration' comes within the Set Point limits for the Relays.
- a)iii) For "latch: disable, Acknowledgement: enable setting", When the Relays & their LED indications will get activated when 'Gas Concentration' crosses the Set Point limits. At that condition if you press Acknowledgement key then only Relays will turn off. If you don't press Acknowledgement key then the Relays & their LED indications will turn off automatically when gas concentration comes below set points.

The relay and LED indications when alarm is in Non-Latch condition are as follow.

- If Process Value (PV) crosses set point: Relay 'ON', LED 'Blinks, Flasher 'Blinks':
 - If PV is within set point: Relay 'OFF', LED'OFF' Flasher 'OFF'.
- b) While ordering the 'GT-2511' Specify the Logic (HIGH / LOW) for the Set Points for the Relays, Latch / Unlatch condition for the Relays.
- c) In 'Operator Setting Mode' if no key is pressed within two minute then the Unit will automatically return to the 'Normal Working Mode' except Calibration & Bump test mode time out 10 minutes & 20 minutes respectively.
- d) To set or select any parameter or Go to the next parameter with or without doing any setting in any Programming mode, Press "  " key.
- e) If device enters any of the operator setting mode or calibration mode & bump test mode, if password is correct or when device is in start-up routine, then current output will be set current in Inhibit mode.
- f) If the gas concentration crossed gas range as per display will show 'OVER RANGE' and current output will get as Up Scale / Down Scale
- g) System response for 5 seconds at the time of system check.
- g.1) On display "SYSTEM CHECK" will be flashing.
 - g.2) All L.E.D. will be ON.
 - g.3) All Relays will be ON.
 - g.4) Hooter & Flasher will be ON
 - g.5) The Current / Voltage output will be 12mA / 5V/ 2.5V/ 500mV.
- h) Do not use 'Test Mode' / 'System Check' when the unit is completely installed on the site. For the operation take permission from your senior authority; otherwise it may be very dangerous.
- i) Relation between inhibit Current/ Voltage & Gas value for Oxygen & Nitrogen sensor module

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| For 4-20mA output current range | | |
|--|------------------------|--------------------------------------|
| GAS WITH RANGE | INHIBIT CURRENT | GAS VALUE FOR INHIBIT CURRENT |
| O2 (25 %V/V) | 17.4mA | 20.90 %V/V |
| O2 (100 %V/V) | 7.34mA | 20.90 %V/V |
| N2 (100 %V/V) | 16.656mA | 79.10 %V/V |
| For 0-10 output voltage range | | |
| GAS WITH RANGE | INHIBIT VOLTAGE | GAS VALUE FOR INHIBIT CURRENT |
| O2 (25 %V/V) | 8.36V | 20.90 %V/V |
| O2 (100 %V/V) | 2.09V | 20.90 %V/V |
| N2 (100 %V/V) | 7.91V | 79.10 %V/V |
| For 0-5 output voltage range | | |
| GAS WITH RANGE | INHIBIT VOLTAGE | GAS VALUE FOR INHIBIT CURRENT |
| O2 (25 %V/V) | 4.18V | 20.90 %V/V |
| O2 (100 %V/V) | 1.045V | 20.90 %V/V |
| N2 (100 %V/V) | 3.955V | 79.10 %V/V |
| For 0-1 output voltage range | | |
| GAS WITH RANGE | INHIBIT VOLTAGE | GAS VALUE FOR INHIBIT CURRENT |
| O2 (25 %V/V) | 836mV | 20.90 %V/V |
| O2 (100 %V/V) | 209mV | 20.90 %V/V |
| N2 (100 %V/V) | 791mV | 79.10 %V/V |

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14. ORDERING INFORMATION

14.1 MODEL NO: GT-2511-FLP

Table 18

| | | |
|-----------|---|--|
| GT | → | GT |
| ↓ | | |
| A. | → | A) MODEL NO 1) 2511 |
| ↓ | | |
| B. | → | B) ENCLOSURE TYPE 1) FLP (Flame Proof) |
| ↓ | | |
| C. | → | C) GAS 1) Please select the Serial No of the gas from the list given above |
| ↓ | | |
| D. | → | D) RETRANSMISSION OUTPUT 1) None 2) 4 to 20mA |
| ↓ | | |
| E. | → | E) RELAY OUTPUT 1) None 2) 3 Relays (AL1, AL2 Failsafe Relay) |
| ↓ | | |
| F. | → | F) COMMUNICATION PORT 1) None 2) RS-485 Serial Port |
| ↓ | | |
| G. | → | G) SENSOR HOUSING 1) Stainless steel (SS-316) |

NOTE:

- Before placing order refer the above ordering information or contact factory for assistance.
- **Select order code e.g. GT-2511-1-T8-2-2-1-1 i.e. GT-2511 – FLAMEPROOF – HYDROGEN 2000 PPM – 4-20mA OUTPUT– 3 Relays (AL1, AL2, Failsafe Relay) – NO COMMUNICATION PORT –STAINLESS STEEL SENSOR HOUSING.**

← THE END →

SMART GAS DETECTOR: GT-2511-FLP

Contact Details:

Registered Office and Factory:

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