



# **Operation Manual Analyzer Transmitter SDM- V9.7**

(File: LKS Smoke Density Meter - V9.7.doc)

**Certify by: TÜV**

**Certification No: 17014563001**



## **Introduction**

### **1. SENDER & RECEIVER**

#### **☼ Location**

Both of these units are rigidly mounted on opposite sides of the stack or duct so that the sender light beam is at right angles to the flow of flue gases and gives unrestricted illumination of the receiver solar cell. The following considerations should be taken into account in choosing a suitable location.

#### **☼ Temperature**

The location of installation is preferable that units are installing where temperature is at minimum. Conducted heat usually is not a problem and radiated heat, which has the greater effect on the temperature of the units, must not exceed 1200 °C and where difficulty is experienced in achieving this manufacturer should be consulted.

#### **☼ Flue Gas Pressure**

##### *a. Positive pressure application*

Mean, the pressure inside the chimney or duct is greater than atmospheric; the sender and receiver units should be bolted to the mounting tubes using a gasket to provide an airtight seal between the flanges. On oil-fired boilers a pressure wave may be caused when the burner ignites, disturbing soot accumulations and depositing them on the lenses of the units. Because of this, the units must be located as far as possible from the actual flow gas outlet of the boiler. Injecting clean air to overcome the effect is not usually practical as the momentary pressure can be severe. Accordingly it is important to observe these precautions even when injected clean air is used during normal running conditions. To prevent sooting-up of the lenses during normal operations, air pressurized above the stack pressure should be fed via flexible tubing into the 3/8" BSP tapping provided on each unit. The air supply should be switch on before the boiler is fired and should not be switch off until after the firing equipment has been shut down.

##### *b. Negative pressure application*

Mean, the pressure inside the chimney or duct is less than atmospheric; the sender and receiver units should be bolted to the mounting tubes using washers to provide a 1/8" (3mm) spacing between the flanges. Atmospheric air will be drawn through the gap and into the units, so keeping the lenses free from soot. The 1/4" BSP tapping should be plugged.

## 2. STRATIFICATION

To ensure that the smoke measured by the instrument is representative of that emitted from the chimney, the influence of dampers, bends, tees, obstructions and draught balance doors should be considered when selecting a suitable position. Location of the units close to bends in the flue should also be avoided as momentum of the flue gases may deposit dust on the lenses.

## 3. ACCESSIBILITY

Sensor units must be located such that they are readily accessible for lens cleaning, routine maintenance and servicing distance. Whilst the sensor units will function correctly at temperatures up to 1200°C positions of high ambient temperature should be avoided as far as possible of high ambient temperature should be avoided as far as possible so that routine maintenance and service can be carried out whilst the plant is in operation.

## 4. SCANNING DISTANCE

The length of light path in the flue gases affects the response of the instrument and in general the obscuration for a given smoke density will be higher for a greater scanning distance. The scanning distance recommended is kept within the limits of 0 feet to 20 feet. Where the distance between the duct walls is greater than 20 feet, then the mounting tubes may be extended into the duct to reduce the scanning distance.

## 5. GENERAL

Sensor units must be located away from the flame area and downstream of any flue gas sampling or temperature tapping points, to avoid errors in these readings due to infiltration of air.

## 6. MOUNTING

Recommended methods for mounting the units are given on drawing Pages No. 6 & 7. Where a choice exists between mounting on a brick stack or steel duct, the former location is preferable by virtue of the rigidity of the brick work and much-reduced tendency to distort with changing temperature of the flue gases. In general, temperature requirements are more easily met where the units are mounted on a brick stack and there are fewer tendencies for soot to accumulate on the lenses.

It is essential that the mounting tubes are in correct alignment with one another and this can be achieved by inserting through them a pipe of sufficiently reduced diameter passing completely across the stack; the mounting tubes are then cemented or welded into place. The guide pipe is removed prior to mounting the sensor units. An alternative method is to install the mounting tubes as a complete length, the central portion being cut away when

the cement has set, or the welding has been completed. In this method, the mounting plates will be fitted when the mounting tubes are in position and care must be taken that each plate is accurately at right angles to its associated tube.

## 7. CONTROLLER

### ✿ Location

Controller should be located to suit site conditions, subject to the following consideration:

-

The maximum distance between the receiver and the controller will be governed by the resistance of the cable used. A total resistance up to 200 ohms is acceptable, corresponding to 1370 metres (1500 yards) maximum separation when wired with 3/.029" copper wire alternatively 228 metres (250 yards) maximum separation with 7/.0076" copper wire.

To assist in the dissipation of heat from the internal components, it is advisable to select a location where the ambient temperature is at a minimum and in no case must this exceed 70°C. The unit should be mounted away from excessive dust or grit and must not be subjected to moisture or excessive vibration.

It is essential that the controller is located in a position where it shall be accessible and safe for servicing.

### ✿ MOUNTING

The method of mounting the controller is illustrated on Pages 12 showing flush mounting and surface (projection) mounting respectively.

The type number marked on the controller chassis indicates the supply voltage and frequency required and the calibration of the meter for Full Scale Deflection.

### ✿ MAINS SUPPLY

Mains supply is fed to the controller which supplies stabilized voltage to the projector. Standard equipment is available for operation over the ranges 85-260 volts at 50/60 Hz.

### ✿ ALARM CIRCUIT

Neon red and amber indicator lamps are incorporated in the controller. Two (2) Single pole contacts 5A 250 VAC non-inductive load give facility for external alarm circuit. Alarm also operates in the event of failure of the controller. The mute switch on the controller may be used to isolate the external alarm circuit.

### ✿ ANCILLARY EQUIPMENT

Two (2) Output of 4~20mA corresponding with 0-100% Full Scale Deflection on meter, available for graphic recorder or remote meter.

An output of 4-20mA is available on the corresponding 0-100% Full Scale Deflection equipment.

In both cases the external load should have an impedance of less than 600 ohm

## 8. FLANGED AND MOUNTING

Use the 3.1/8" thickness spacers draught stacks spacers are not required when mounting on forced draught stacks and should be discarded. In this case an air tight joint is necessary.

$$A + B = 101\text{mm}$$

Dimensions: "A & B" to suit ducting

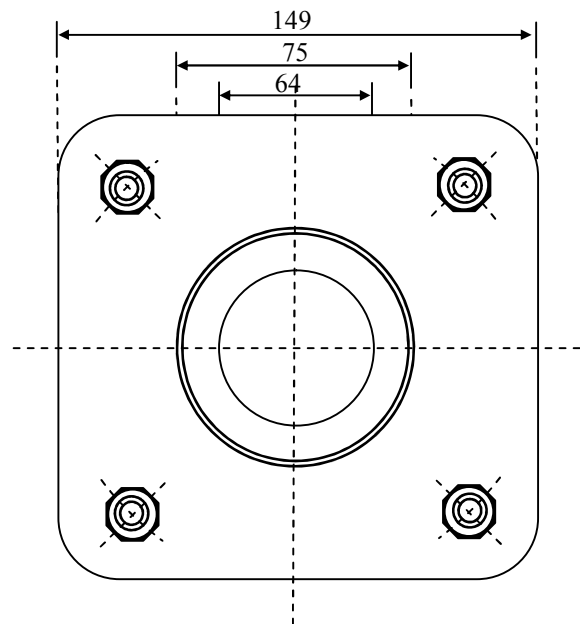
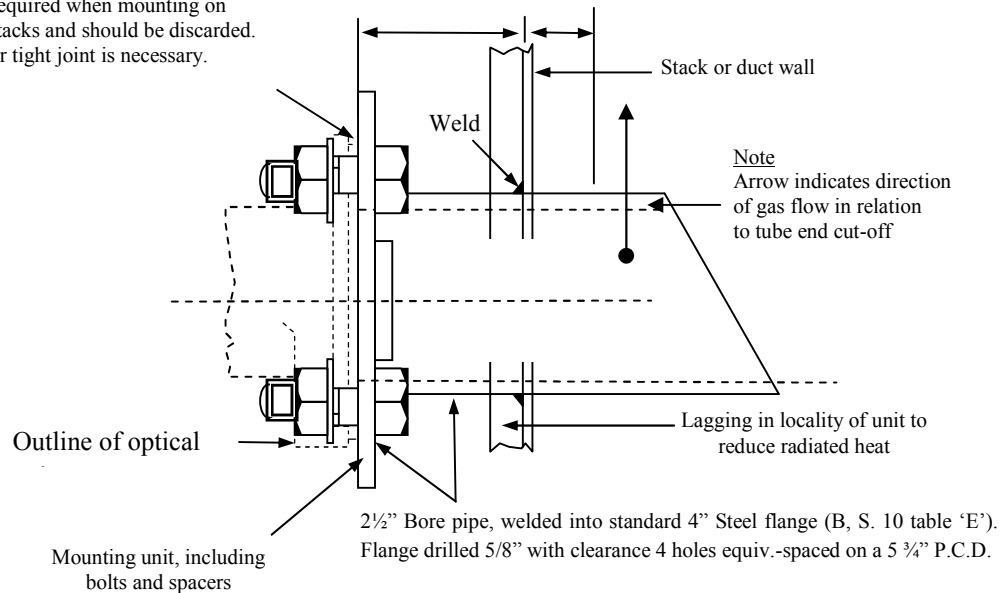


Fig. 1

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED

### Installation of Optical Unit Mounting Flange on Steel Stack or Duct (Mounting Flange & Tubes Supplied by Others)

Developed and manufacturer by LKS

Use the 3,0 (1/8") thick spacers mounting on natural draught stacks. Spacers are not required when mounting on forced draught stacks and should be discarded in this case an air tight joint is necessary

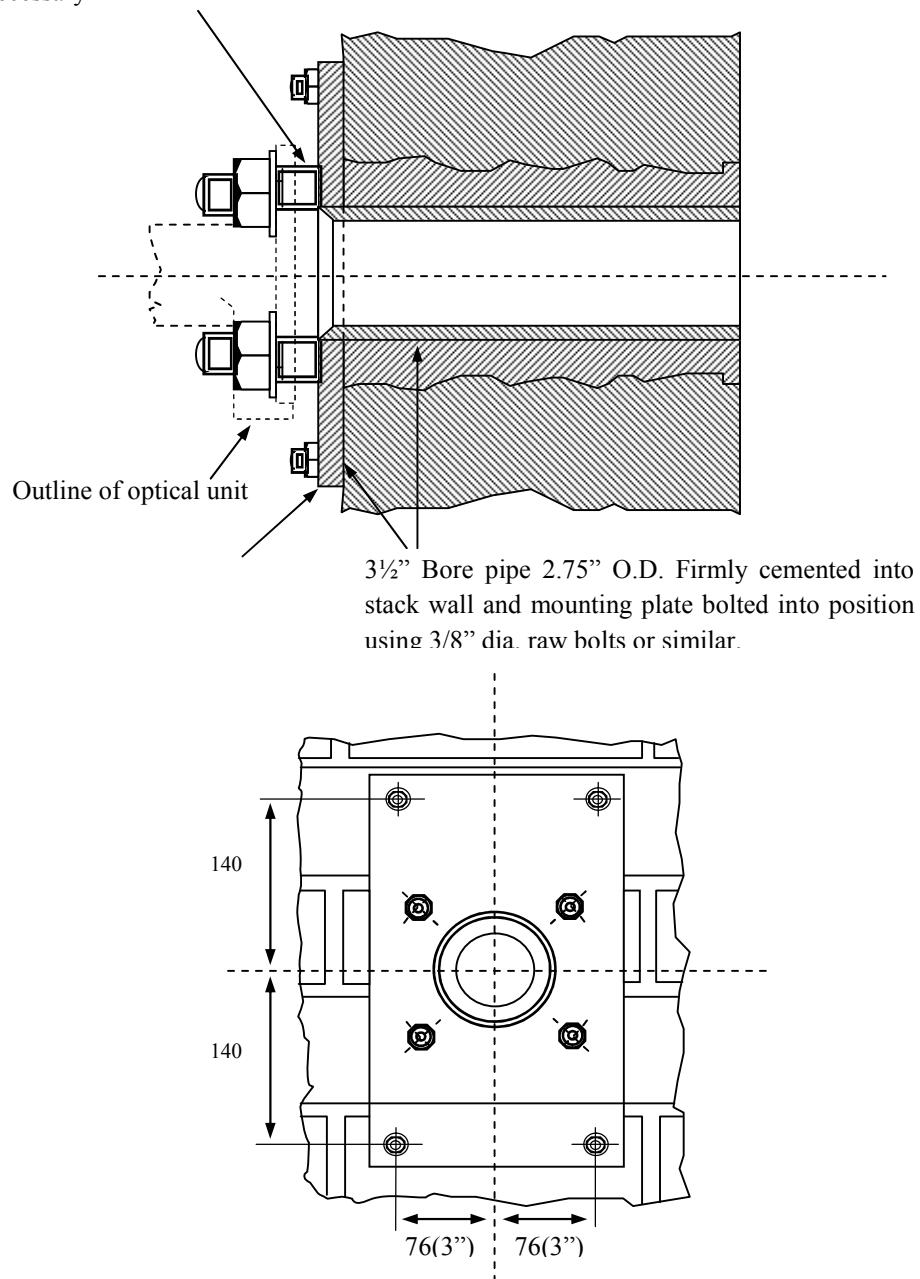
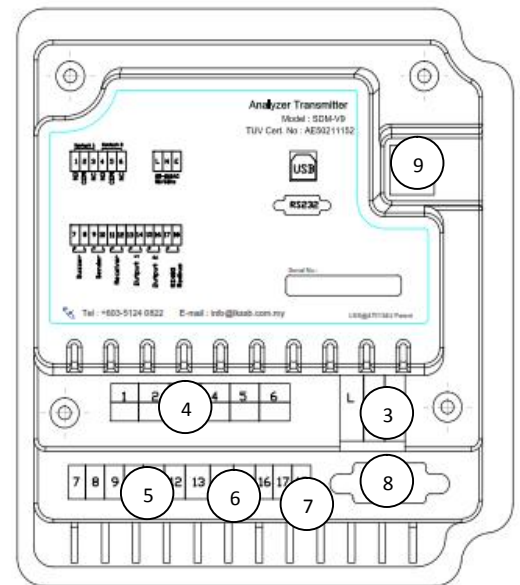
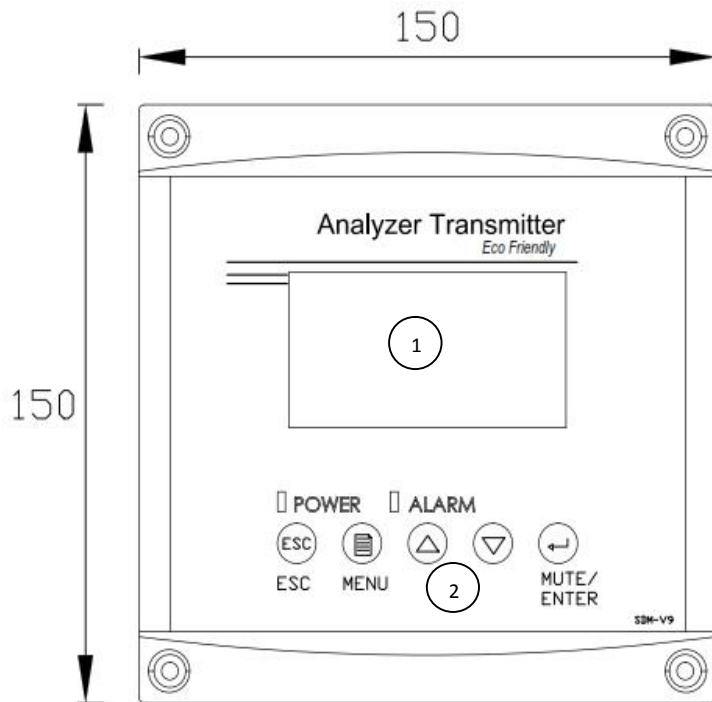


Fig. 2

ALL DIAMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED

**Installation of Optical Unit Mounting Flange on Steel Stack or Duct**  
**(Mounting Flange & Tubes Supplied by Others)**

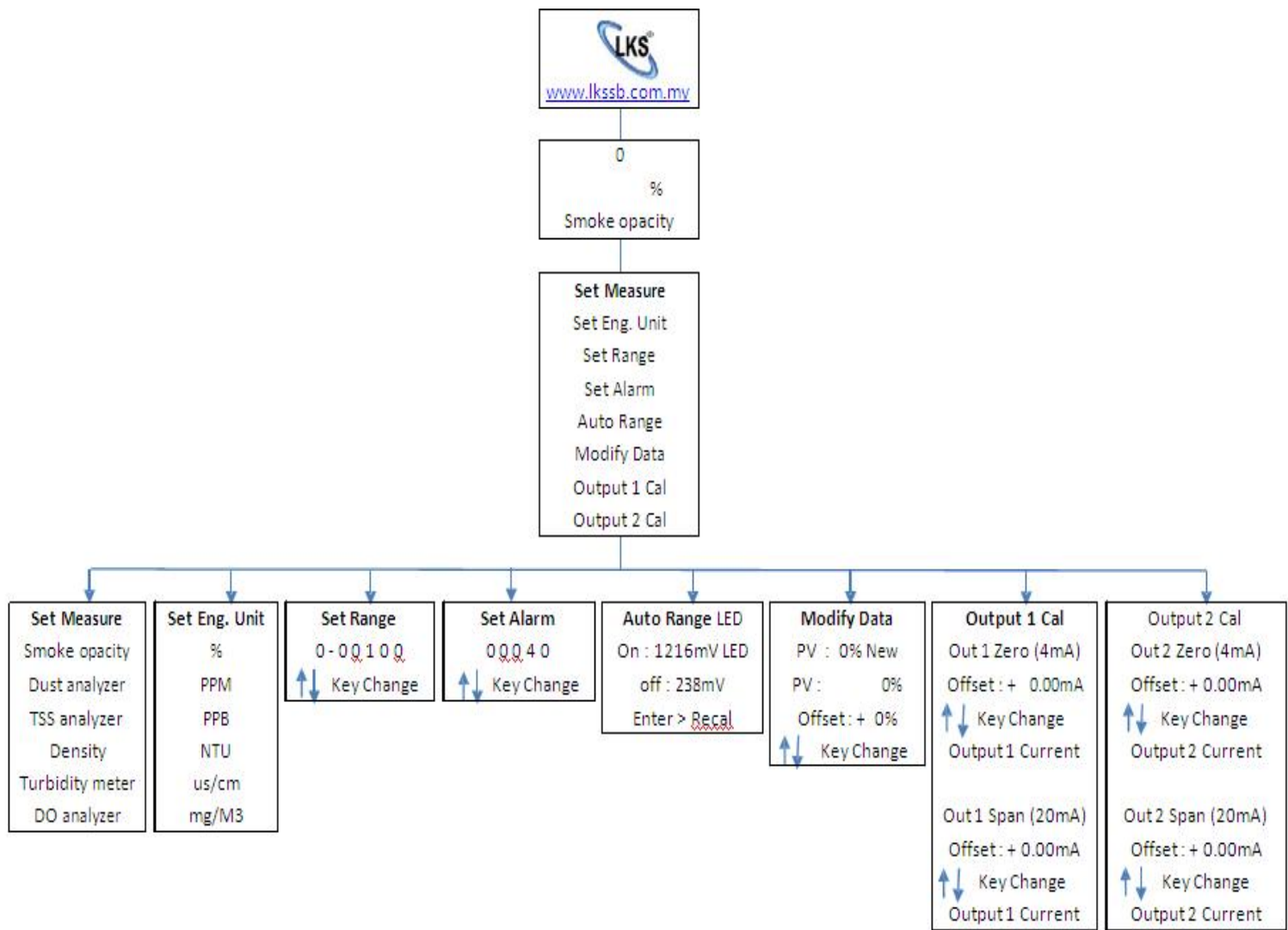
## 9. Unit Overview



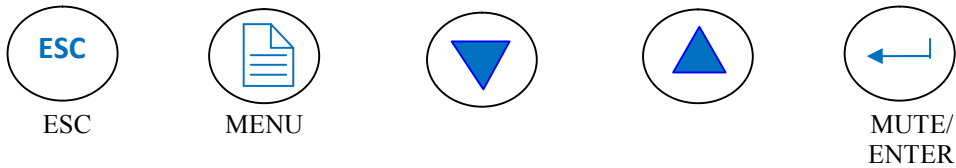
- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| 1. LCD Display                    | 6. Output Terminal 4-20mA (TB13-16) |
| 2. Five Touch Pad Navigation Key  | 7. RS485 Modbus (TB17-18)           |
| 3. Power Supply Terminal (L,N,E)  | 8. RS232 Terminal                   |
| 4. Alarm Terminal (TB1-6)         | 9. USB Interface Port               |
| 5. Sensor Input Terminal (TB9-12) |                                     |



## 10. Menu Structure




## 11. Key Pad




Selecting the menu

Enter the desired main menu branch with the     or  keys to navigate through the menu branch.



### 1. Escape

Press the  key to return to the measurement page.


### 2. Menu

Press the  key to access the main menu.

### 3. Entry of data values, selection of data entry options

Press the  key to increase or the  key to decrease a digit. Use the same key to navigate the selection of options of the data entry field.

### 4. Mute/Enter

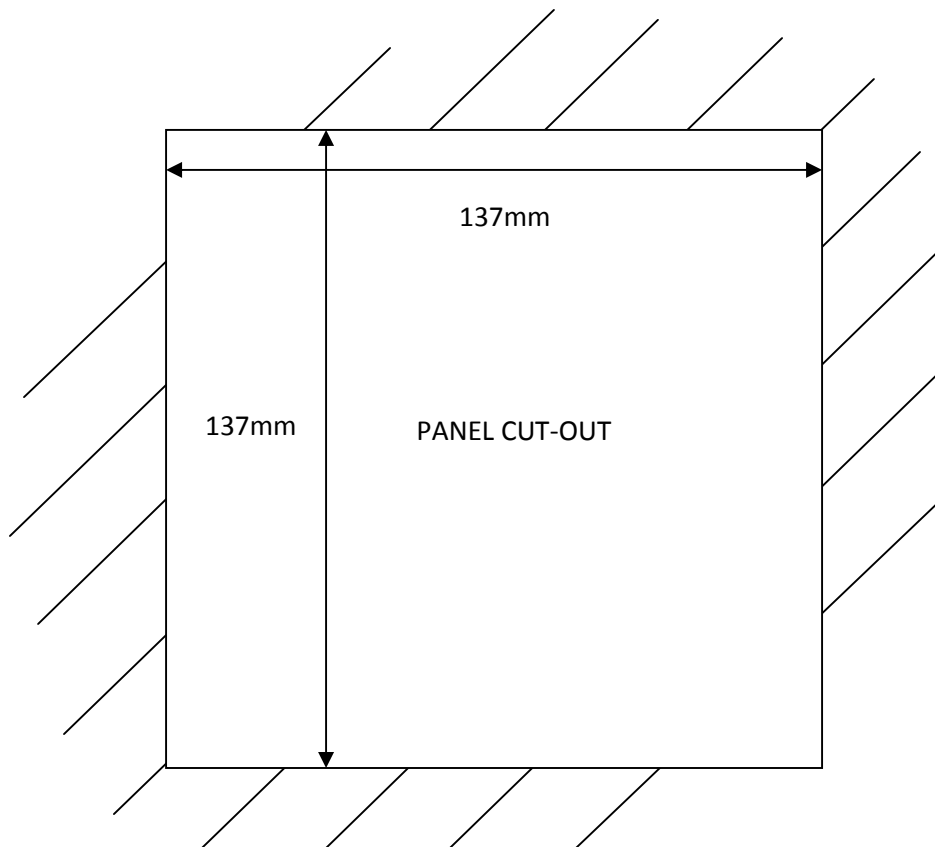
Press the  key to confirm the selection or to mute the alarm.

## 12. Installation Instruction

### Panel Cutout Dimension

This model analyzer transmitter are designed with an integral rear cover for stand-alone wall mount installation

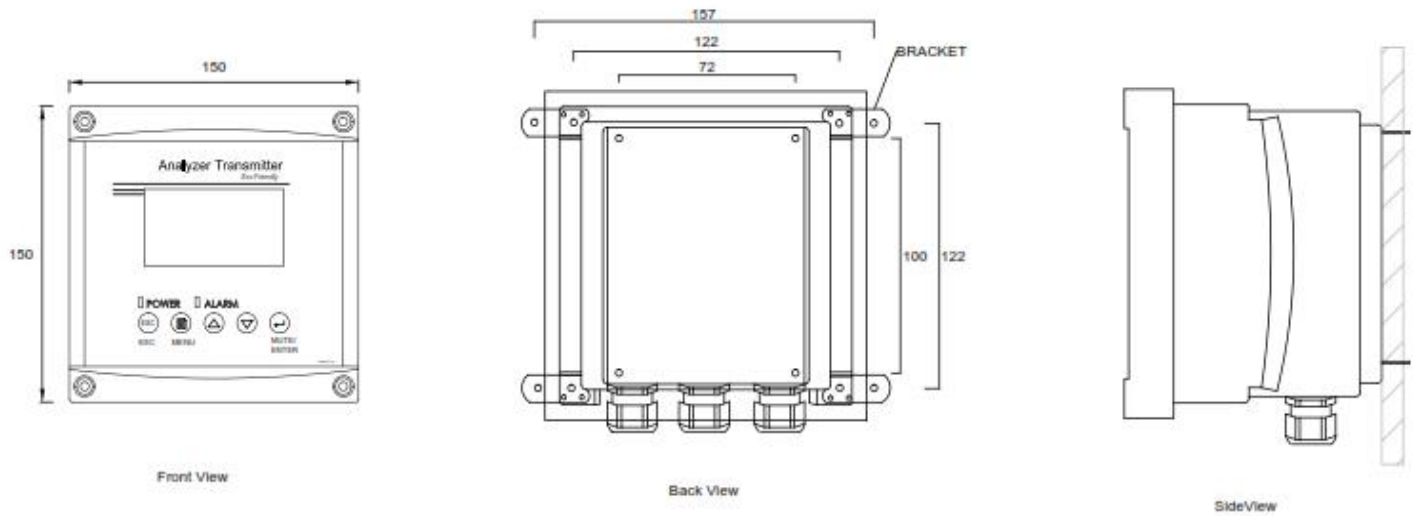
Below are cut-out dimensions required by the model when mounting on the panel or on a flat enclosure door.



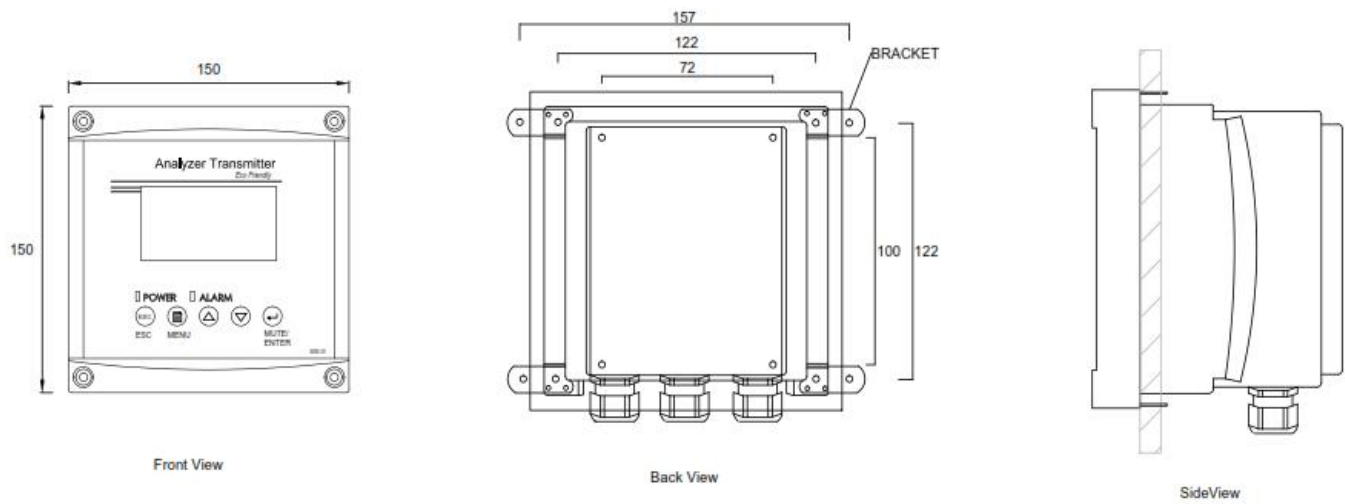
### Installation Procedures

1. Make cut- out of the panel, see the dimension cut-out above.
2. Slide face around transmitter from the back of the unit.
3. Place transmitter to the cut-out hole. Be sure there are no gap between the transmitter and panel surface.
4. Place the 4 mounting bracket to the transmitter, once is secure, use a screwdriver to tighten the bracket against the panel.

## 12.1 Surface (Wall) Mounting

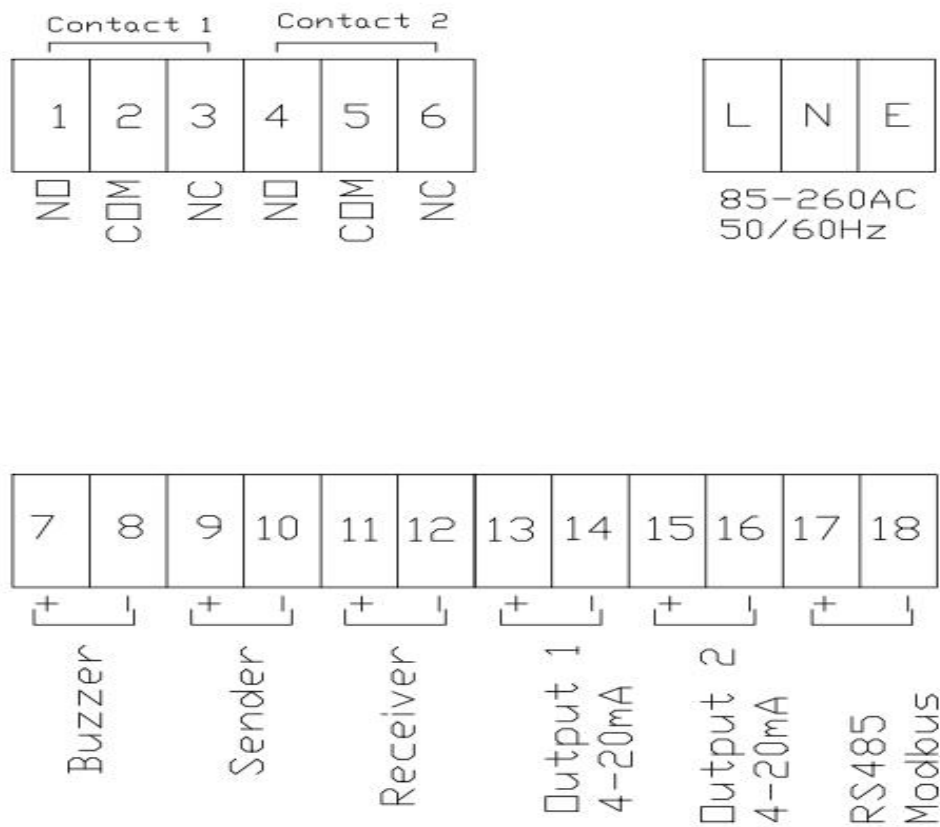


## 12.2 Flush Panel Mounting



### 13. Connection of Power Supply

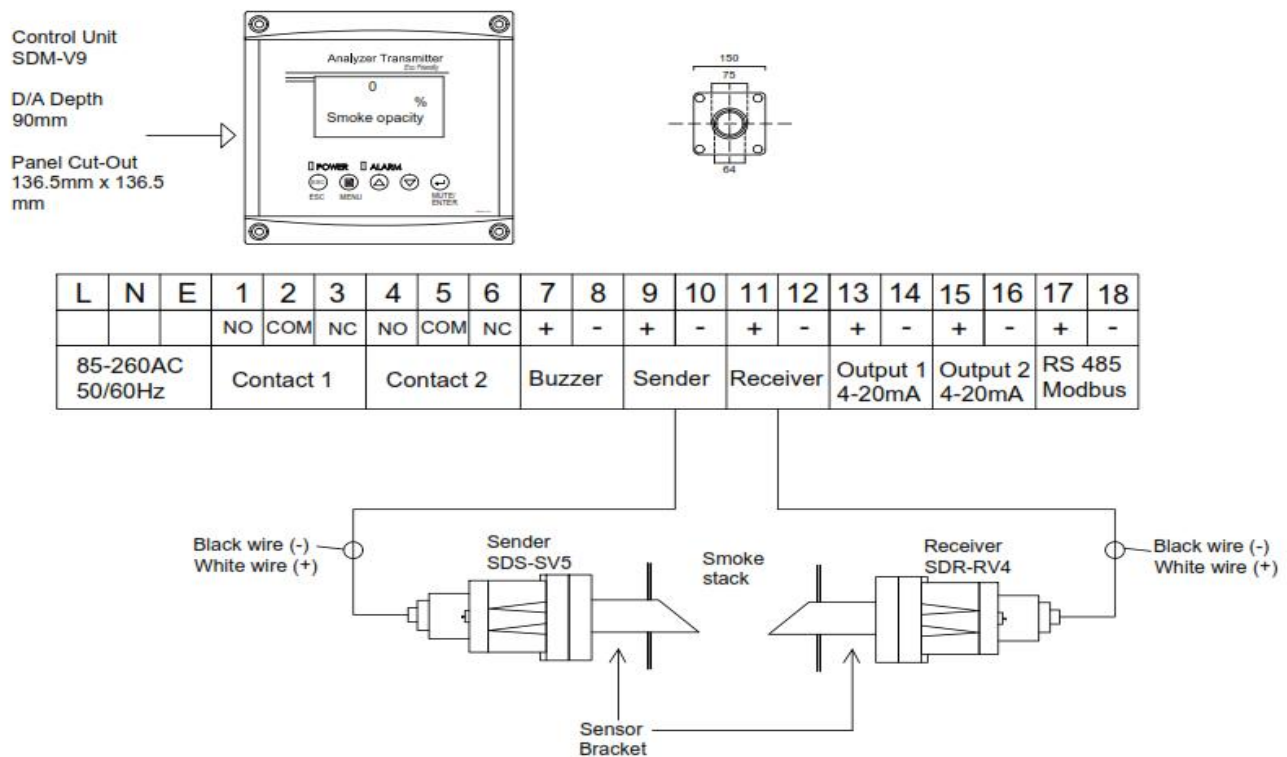
1. Be sure to all the wires is turn off before proceeding with the installation. High voltage will present on the input power wires.
2. All SDM-V9 are designed to operate 85-260 VAC power source.
3. The terminal block for the power connection is label “L”, “N”, “E” on the rear panel of the transmitter. Terminal is label “L” for Line wire, “N” for Neutral wire and another is “E” for Earth wire.



NO = Normally Open

NC = Normally Close

Output 1/ Output 2 = 4-20mA



## DESCRIPTION

**CONTROL UNIT** - Mild steel epoxy enclosure c/w power supply, setting up controls, horn muting switch, normal, alarm and LCD indicators, output relay contacts and remote meter output.

**SENDER UNIT** - Weatherproof cast aluminium housing c/w Light Emitting Diode source and optical system.

**RECEIVER UNIT** - Weatherproof cast aluminium housing c/w Light sensor.

**COMPLETE SET** comprises of: **(complete set model: SDMS-LK-V9)**





- Controller Unit, Model: SDM-LK-V9 - 01 unit
- Sender Unit, Model: SDS-LK-SV5 - 01 unit
- Receiver Unit, Model: SDR-LK-RV4 - 01 unit

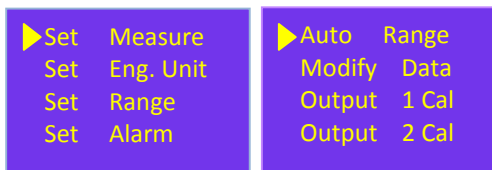
## PART NO: SPARE AND ACCESSORIES

BZ-NE-24V-WIRE Buzzer Unit  
 S-LK-SDM-SP20 Receiver Seal Kit  
 S-LK-SDM-SP21 Sender Seal Kit  
 S-LK-SDM-SB Sensor Bracket  
 RC-LK-IR71002-00 Recorder Unit  
 FAN-HPB-81S Auto Clean Blower Unit, Model:81





## 14. Setup

### 14.1 Enter Main Menu Mode

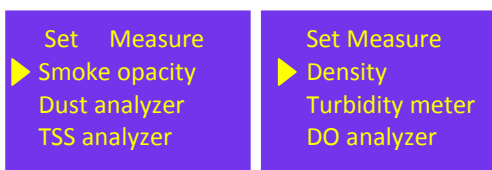
Press  key. Press  or  key to navigate **Menu Mode**. Then, press  key for the desired option.









### 14.2 Parameter Setup

1. Press  or  to select parameter type. Then, press  key.
2. Select **Smoke opacity**, then, press  key.
3. Other parameters are shown as below:

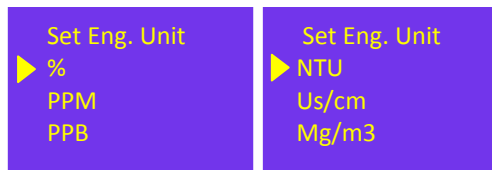
Smoke opacity	Density
Dust analyzer	Turbidity meter
TSS analyzer	DO analyzer










### 14.3 Set Engineering Unit

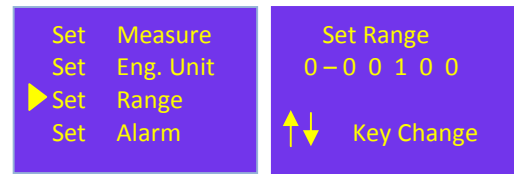
1. Press  key, press  key to select **Set Eng. Unit**. Then, press  key.
2. Press  or  key to select **%** unit, then press  key.
3. Other units are shown as below:

%	NTU
PPM	us/cm
PPB	mg/m3










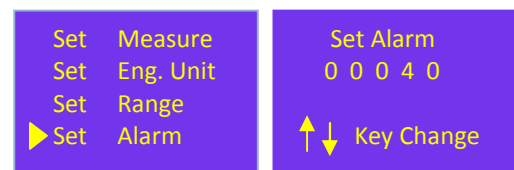
### 14.4 Set Range

1. Press  key, then press  key to select **Set Range**. Then, press  key.
2. Press  key for moving cursor among digits, and then press  or  key to set to 100%. Then, press  key.







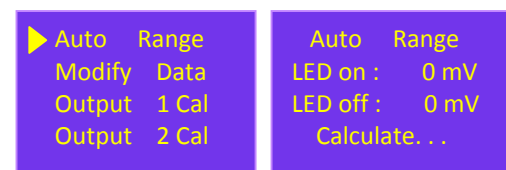
### 14.5 Set Alarm

1. Press  key, then press  key to select **Set Alarm**. Then, press  key.
2. Press  key, then press  or  key to set to 40%, press  key.





### 14.6 Auto Range

1. Press  key, then press  key to select **Auto Range**. Then, press  key.
2. Press  key for running calibration process.
3. The calibration process needs to take about 50 sec to complete.
4. Take the **LED ON's** value subtracts the **LED Off's** value that shown on display must be greater than **100mV**. Else, there is problem from sensor or transmitter.

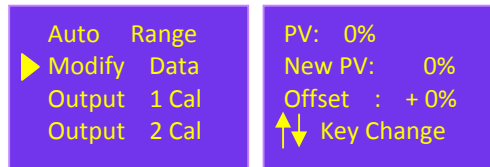






### 14.7 Modify Data

1. Press  key, then press  key to select

**Modify Data**. Then, press  key.

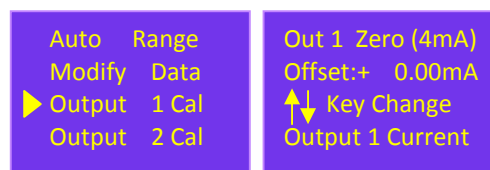



2. Press  or  key to set offset value  
when PV reading is different from actual result.

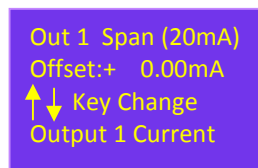
### 14.8 Output Calibration




1. Press  key, then press  key to select the

**Output 1 Cal or Output 2 Cal**.



2. Press  to change from **Out1 Zero (4mA)** to **Out 1 Span (20mA)** on **Output 1 Cal** and change from **Out2 Zero (4mA)** to **Out 2 Span (20mA)** on **Output 2 Cal**.



3. Press  or  key to set offset value.
4. Press  key to return to measurement page.

## 15. Maintenance

### ✿ Sender and Receiver

It's essential that the lenses be maintained in a clean condition. The frequency with these should be cleaned depends upon the location of the units as described earlier, and deposit occurs whilst the firing plant is in operation.

The inlet side of an induced draught fan is extremely satisfactory in that the intake of clean air from atmosphere (filtered if necessary) will maintain the lenses in clean condition during firing it may be found, however, that when combustion ceases and dampers are closed to conserve heat, a built-up of pressure may occur which will cause a deposit of soot on the lenses.

It may be necessary to clean the lenses after soot blowing or ash blowing. In all such instances the need for cleaning will be evidenced by a rise in the instrument reading other than would be encountered with normal combustion.

If this occurs, a routine procedure for cleaning the lenses at these times should be adopted, and in any case the lenses should be cleaned at regular intervals of say once per week to ensure that the smoke density reading are accurate.

After the lenses are cleaned, the sensor units must be securely closed or the balance of airflow will be upset and atmospheric dust will be deposited on the lenses.

### ✿ Controller

It's advisable to check the zero; full-scale deflection and alarm set point from time to time to ensure the instrument is remaining accurate. The zero should, of course, only be checked when the stack is clear and the lenses are perfectly clean.

If any change is found necessary, the setting up procedures detailed in the commissioning instruction should be followed.

## 16. Faults

The equipment is designed so that wherever possible, components failure will cause the alarm circuit to operate. Faulty operation is most probably caused by an expendable component and if the fault is not clear by changing the LED lamp in the sender and/or the relay in 10,000 hours. Short of physical damage, the life of the photo-diode is unlimited.

In World there are the appointed agent that can only provided the service, such as regular servicing of the equipment, which includes a comprehensive check of the instrument using test reading to detect deterioration of components and thus reducing the possibility of breakdown. Full detail will be supplied on the request.

## 17. Term of Used

Sender - The unit housing the LED.

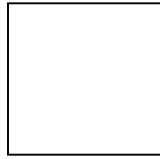
Receiver - The unit housing the LDR

The sender and receiver are preferred to collectively as the optical units and will normally be mounted on the chimneystack or flues leading to the stack.

Total light path - The distance between sensor units.

Scanning distance - The length of light path in flue gases.

The right is reserve to amend, without notice, details given in this publication.

**BB.S. 2742M BRITISH STANDARD MINIATURE SMOKE CHART**

0 (0% of density)



1 (20% of density)



2 (40% of density)



3 (60% of density)



4 (80% of density)



5 (100% of density)