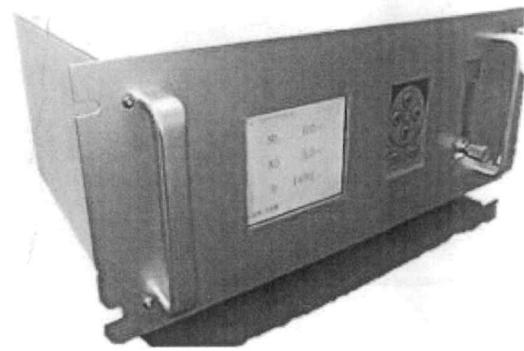


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**Gasboard3000PLUS**  
**NDIR Flue Gas Analyzer**

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## **User Manual**



**Hubei Cubic-Ruiyi Instrument Co.,Ltd**

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## 1. FOREWORD

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### 1.1 Overview

Before using the analyzer and its accessories, please familiarize yourself with its operation by reading this manual. If you have any questions, please do not hesitate to contact with us for assistance.

### 1.2 Unpacking Instructions

- Inspect the shipping boxes for any sign of damage. Damaged shipping boxes increase the risk to find damaged material too.
- Remove the accessories as power cable and rack mounting lugs from the shipping box.
- Carefully remove the analyzer from its shipping box together with its protections.
- Remove the protections and place the material on a flat surface in a clean and dry location.
- Inspect the material for any sign of damage.

Note: Keep the shipping box and the protective packaging for eventual future shipping needs.

### 1.3 Reporting Damage

If there are any apparent damages to the outside of the instrument due to shipping or handling, file a damage claim and notify the forwarder immediately. The shipping container or packing materials should be retained for inspection by the forwarder.

### 1.4 Before Using the Analyzer

The use of the Gasboard 3000Plus analyzer requires a full understanding of the analyzer operation. Use the analyzer only as specified in this manual, otherwise its good operation and initial performances may be impaired.

Authorized service representatives and original parts must only be employed in carrying out repairs to the analyzer in order to maintain the validity of the warranty. Modification of components, use of non-original parts, or use of incomplete or used parts will also invalidate the warranty.

- Make sure there is no obstruction at the sample inlet before you operate the analyzer.
- The sample gas must be free from particles (< 1µm), oil traces and its moisture content.
- Use only original parts that have been specifically designed for your GASBOARD-3000 analyzer. The use of other parts than original ones may modify the performances of your analyzer.
- We also recommend to configure the auto-zero function in order to make the zero drift negligible. Please refer to the specific sections of this manual.
- Do not expose the analyzer to electrical shock and/or severe continuous mechanical shock.

- Do not attempt to disassemble, adjust, or service the analyzer unless instructions for that procedure are contained in the manual and/or that part is listed as a replacement part.
- Do not allow liquids to condense or use high power sprays on the instrument.
- The warranty will be voided if customer personnel or third parties damage the analyzer during repair attempts. Non-authorized repair/service attempts void this warranty.

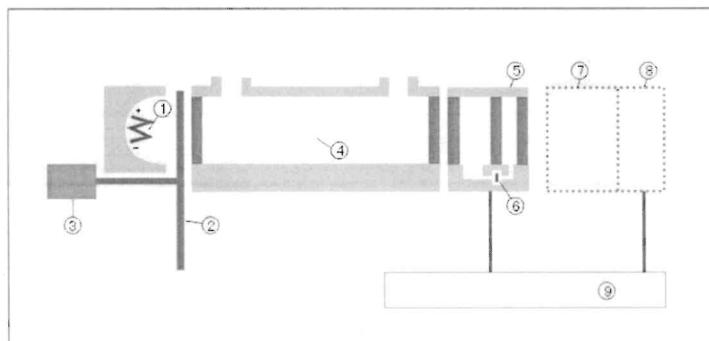
### Important

\*The sample gas must be free from particles (< 1μm), oil traces and its moisture content, if not, Cubic-Ruiyi Instrument can provide portable or on line gas conditioning system.

\* For any repair/service can not execute by non-authorized and/or non-qualified people.

## 1.5 Technical Principle

Online NDIR infrared flue gas analyzer Gasboard 3000Plus can detect the concentration of gas components such as CO, CO<sub>2</sub>, NO, SO<sub>2</sub>, NO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, O<sub>2</sub>. In particular, CO, CO<sub>2</sub>, NO, SO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, NO<sub>2</sub>, O<sub>2</sub> measurement is on the basis of micro-flow infrared technology, while measurement of NO<sub>2</sub> is basis of NDUV sensor, O<sub>2</sub> is on the basis of ECD sensor. This instrument is applicable in boiler flue gas measuring before or after desulfurization and denitration.



①-- Infrared light source ②-- Chopper ③—Chopper motor ④—Measurement cell ⑤-- Detector ⑥—Micro-flow sensor ⑦,⑧—The 2<sup>nd</sup> measurement cell and detector ⑨-- Signal processing and output system

The working principle is illustrated above. Infrared light goes through the chopper and then measurement cell. As molecules like SO<sub>2</sub>, NO, CO, CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O which are composed of heterogeneous atoms are absorptive to infrared light, so if the measurement cell has such gases, partial infrared light will be absorbed, those infrared light not absorbed go into the detector. The detector consists of front gas chamber, rear chamber, micro-flow sensor, and the front and rear gas chambers are filled with gas component to be measured. Under the influence of infrared light, the gas in the front and rear chamber will expand. Due to expansion differences, it will cause tiny flow between the front and rear gas chamber. After micro-flow sensors detect the flow, it will produce an AC voltage signal, gas concentration will be obtained after signal processed.

## Safety Information for Analyzer Utilization

	<ul style="list-style-type: none"><li>GASBOARD 3000Plus Analyzer is not designed for use in hazardous area. Never use the analyzer in an EX environment with potential gas explosion risks. Human safety could be seriously endangered by flame, fire and/or deflagration.</li></ul>
	<ul style="list-style-type: none"><li>GASBOARD 3000Plus Analyzer must be installed on a flat surface (if used as bench-type analyzer) or integrated in a gas analysis cabinet. Avoid locations where the analyzer can be exposed to vibrations, shocks or intense electromagnetic fields as this can have a negative effect on the performances of the analyzer.</li><li>Do not expose the analyzer to strong artificial light or sun radiations, wind, moisture or rain.</li><li>Prevent dust and moisture to enter the analyzer otherwise its good operation will be impaired.</li></ul>

## Gas Connections and Sample Gas Conditions

	<ul style="list-style-type: none"><li>Before switching ON the analyzer always check the gas inlet and outlet tubing are correctly connected to the respective ports of the analyzer.</li><li>Sample gas pressure must be within the specification range in order to avoid gas leak due to excessive pressure or wrong operation of the gas analyzer. A leakage of toxic or explosive gas can lead to serious accident.</li></ul>
	<ul style="list-style-type: none"><li>Sampling gas path should be based on the specific circumstances and make gas conditioning device or system, otherwise it will cause the instrument does not work properly.</li><li>Do not use the piping, pressure reducing valve or other sampling devices with grease which may block the gas path or cause a fire.</li></ul>

## Notice for Electrical Connections

	<ul style="list-style-type: none"><li>Please use the power supply that complies with the power ratings of the analyzer, to avoid fire and/or abnormal operation.</li></ul>
	<ul style="list-style-type: none"><li>Ensure the power supply is switched OFF when connecting the gas analyzer to the process to avoid any accident by electric discharge.</li></ul>
	<ul style="list-style-type: none"><li>Ground connection of the analyzer must be carried out according to the local and/or international regulations to prevent from any damage of injuries.</li></ul>
	<ul style="list-style-type: none"><li>Ensure the power supply is switched OFF before connecting a data transmission line to the serial RS232 port.</li></ul>
	<ul style="list-style-type: none"><li>Insulation of all electrical connections and cables must be controlled before switching ON the analyzer to avoid any dangerous and accidental electrical discharge.</li></ul>
	<ul style="list-style-type: none"><li>Never use the analyzer in an EX environment with potential gas explosion risks.</li></ul>

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## Safety Information

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Safety marks are identified as follows:

Safety Mark	Brief Description	Additional Instruction
	Dangerous	May cause serious human injuries.
	Caution	May cause moderate human injuries or may destroy the analyzer.
	Electric Shock	May cause human injuries and/or may damage the analyzer.
	Forbidden	Not allowed in normal operation.

## Notice for Analyzer Application

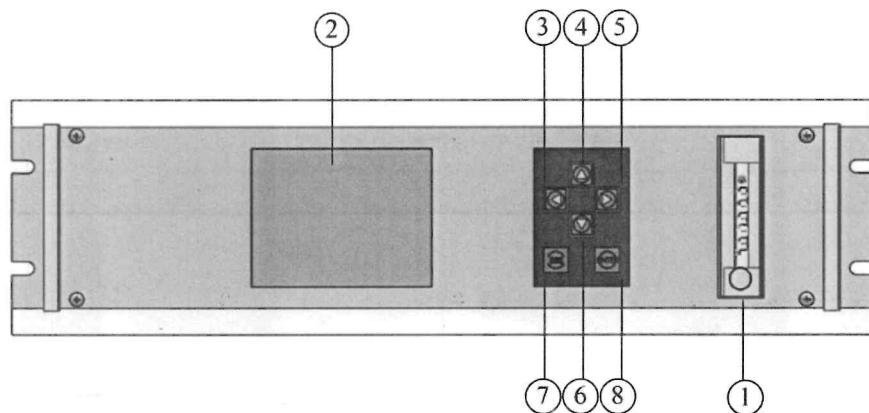
	<ul style="list-style-type: none"><li>Test the gas analyzer response exclusively on target gases with certified gas canisters from known concentration. Span gas concentration need to be within 90% to 100% of the designed full scale range, otherwise the accuracy and linearity of the analyzer can be affected. Use pure nitrogen N2 5.0 quality for zero calibration.</li></ul>
	<ul style="list-style-type: none"><li>Never let the moisture enter the analyzer to avoid electric discharge and risk of short circuit.</li><li>Always prevent dust and oil traces for entering the analyzer to avoid damages to the measuring cells.</li><li>Never switch OFF &amp; ON successively the analyzer power supply without reasons, otherwise the analyzer lifetime might be shortened, or the analyzer might be damaged.</li></ul>
	<ul style="list-style-type: none"><li>Do not touch the input and output terminal site by metal and fingers etc.. Otherwise, it may result in electric shock.</li><li>Smoking nearby to the analyzer is not allowed and could lead to serious fire hazards</li><li>Do not allow moisture intrusion analyzer. Otherwise, it may result in electric shock or analyzer internal fire.</li></ul>

## Notice for Maintenance

	<ul style="list-style-type: none"><li>Always shut off the power supply before servicing the analyzer to prevent from electric shocks.</li></ul>
	<ul style="list-style-type: none"><li>In order to operate correctly, the analyzer must be maintained timely, at least once a year. Please consult your authorized reseller.</li><li>Always switch off the power supply, protect and store carefully the analyzer if it will not be used for a long period of time.</li></ul>

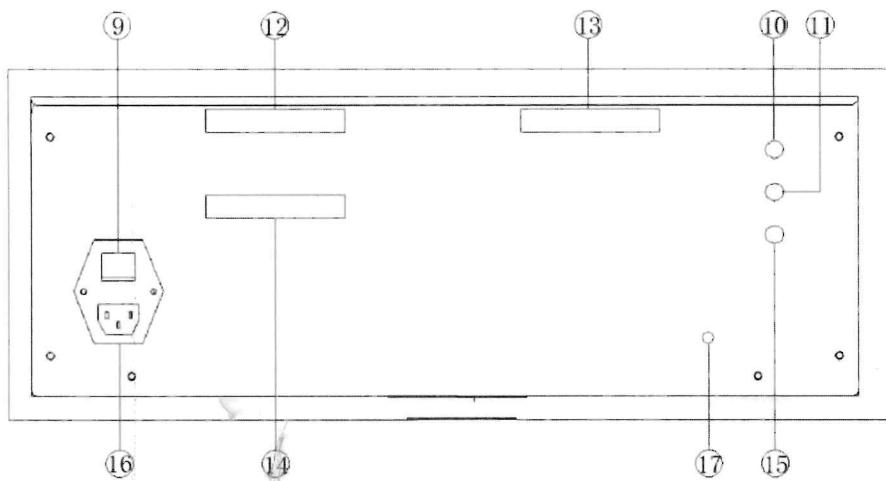
## 2. GASBOARD 3000PLUS NDIR FLUE GAS ANALYZER

### 2.1 Front Panel



- |                 |                |
|-----------------|----------------|
| 1 ---Flow meter | 2 --- LCD      |
| 3 --- Left Key  | 4 --- Up Key   |
| 5 --- Right Key | 6 --- Down Key |
| 7 --- ESC       | 8 --- Enter    |

### 2.2 Rear Panel



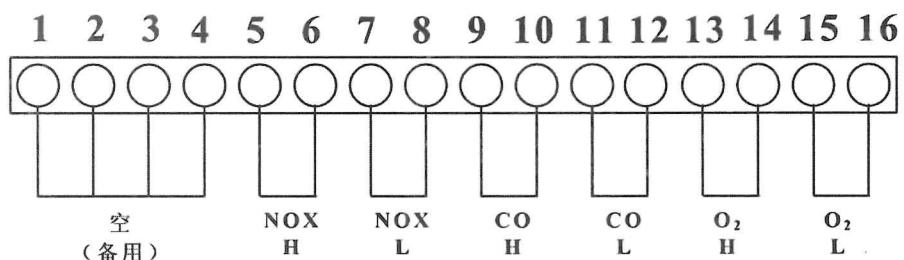
- |                                |  |
|--------------------------------|--|
| 9 ---Power ON/OFF              | 10 --- Sample gas inlet                |
| 11 --- Sample gas outlet       | 12 --- Alarm relay contact terminals 1 |
| 13 --- RS232 and DB9 interface | 14 --- Alarm relay contact terminals 2 |
| 15 --- Zero port               | 16 --- Power socket                    |
|                                | 17 --- GND                             |

## 2.3 Alarm output

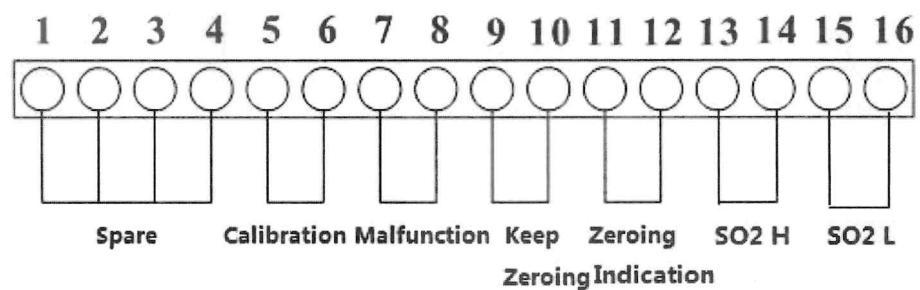
L ----- Low concentration alarm

H -----High concentration alarm

DIO1:

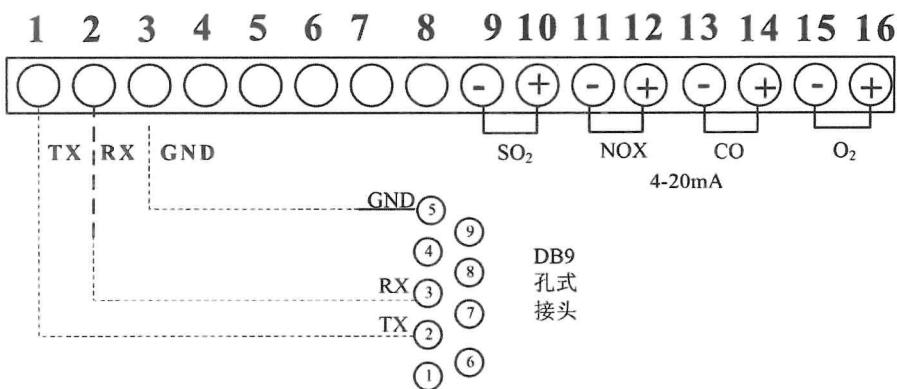


DIO2:



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## 2.4 RS232 and DB9 interface connection as below:



Please disconnect the instrument from power supply when connect the RS232 cable to the instrument, in order to avoid the instrument damaged.

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## 3.INSTALLATION

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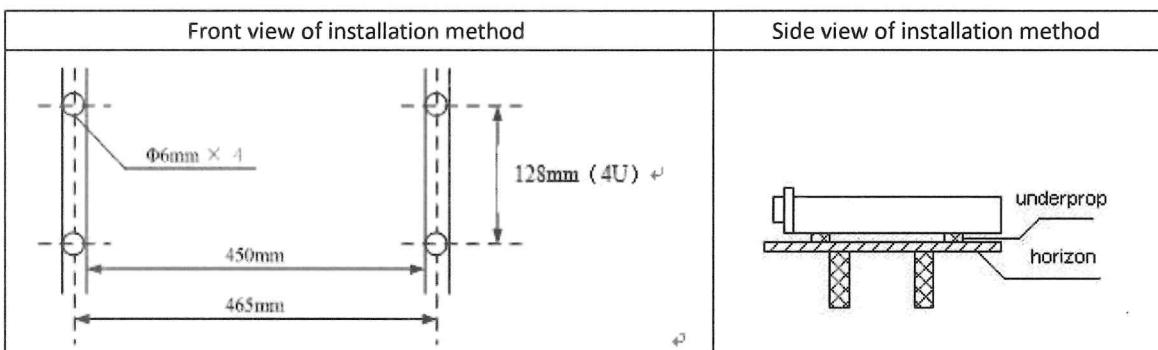
### 3.1 Instrument installation



**Danger: the analyzer is not designed for use in areas with explosion risk.  
Do not install the analyzer in a hazardous zone with presence of explosive gas.**

1. The analyzer is delivered in a 19"-4U rack enclosure and can be used as Bench type for desk installation or for integration in an instrumentation cabinet.
2. The analyzer enclosure is not rated for outdoor use.
3. The gas venting must be done outside of the building directly in the atmosphere.
4. Please avoid strong vibrating or magnetic disturbing.
5. Please select an environment with fresh air.
6. If used as desk type analyzer, please put the analyzer on a robust and plane support.
7. Power supply: 220V ± 44 VAC: 50Hz±1Hz.
8. Operating temperature: 0 to 50°C max.
9. Operating moisture: 5 to 85% RH, no condensation is allowed.
10. Dimension: rack 19"-4U: width × length × height = 480mm × 450mm × 160mm.

### 1) Installation of 19 inch machine cabinet



- 1) Support frame must be steady enough to stand the analyzer. Keep away from hard light and strong wind.
- 2) Keep away from moist place, environmental temperature should be within 0~50°C.
- 3) Protect instrument inside from dust and water. Otherwise, it may result in malfunction.
- 4) If vibration can not be avoided, you should take the shockproof rubber between analyzer and support frame.

### 3.2 Gas Route Installation

Generally industry gas contains dust, liquid water, vapor and possible tar as well, so sample gas need meet the follow condition.

### 3.3 Sample Gas Condition

- 1) Sample gas enters into analyzer have to use dust filter (the filter accuracy 0.1μm).
- 2) Assure the gas temperature that entry facility is within 0-50°C. And use condenser to lower the temperature if high.
- 3) In some sample gas includes tar, the removing action is necessary.
- 4) Sample gas psig should be lower than 50kPa, flow rate should be ranging from 0.7-1.2 L/min, and keep stable. High pressure may lead to abnormality, and cause damage if serious.

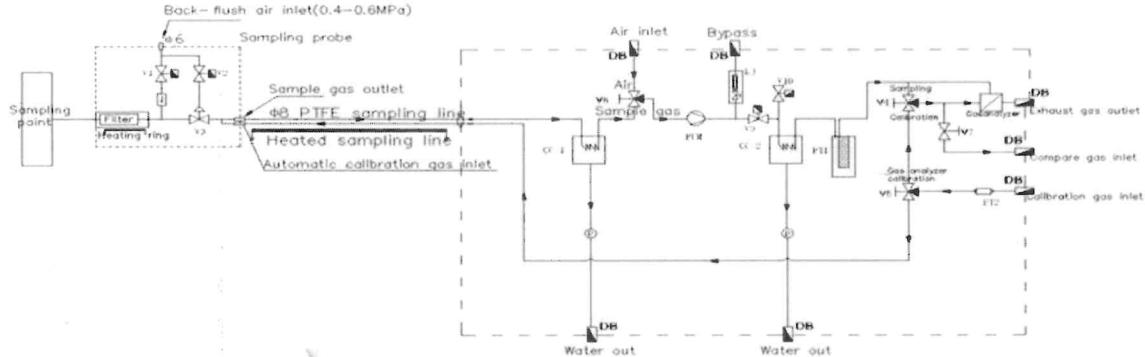
### 3.4 Selection of Sampling Equipment

- 1) You'd better to reduce the length of gas pipe in order to improve response time of measurement. Please use the clean sampling pipe. Don't use the pipe with lipin or other contamination.
- 2) The dimension of gas in port and gas out port is φ6 x 4mm (inner diameter x external diameter).

### 3.5 Function of Sampling Pipe

- 1) Sample gas, zero gas, span gas enter into instrument, through dust filter, flow rate calculator, gas sensor and exhaust sample gas.
- 2) Outlet of sample gas should be connected to outdoor air or sampling circuit vessels to assure safe discharge.

### 3.6 Pre-treatment of Gas Pipeline and Reference Solutions



The list of core parts as following:

1. Pre-treatment device adopts compressor condenser with peristaltic pump, when the sample gas enter into the analysis cabinet, it will be quickly condensed, and drain condensate by peristaltic pump.
2. Germany KNF series sampling pump fast sampling.
3. High precision filter (filter accuracy of 0.1um) to ensure sample gas meet instrument requires.
4. Other accessories are used heat-resistant, corrosion-resistant special stainless steel, PTFE and other materials.

**\*This is just reference for the customer. We have several kinds of pre-treatment solution for the different in site conditions.**

## 4. PREPARATION

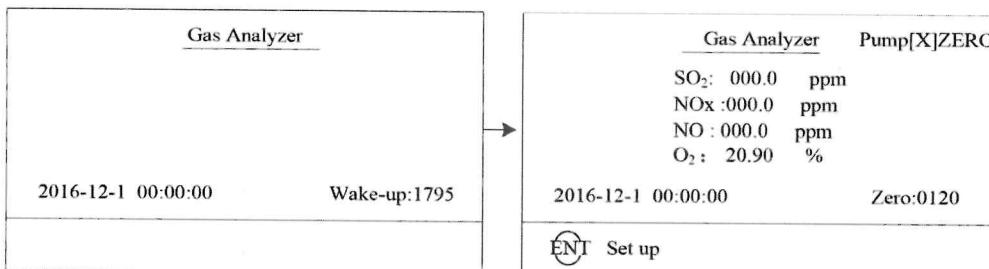
### 4.1 Preparation

Before using the analyzer for measuring the target gases, please check first the following points:

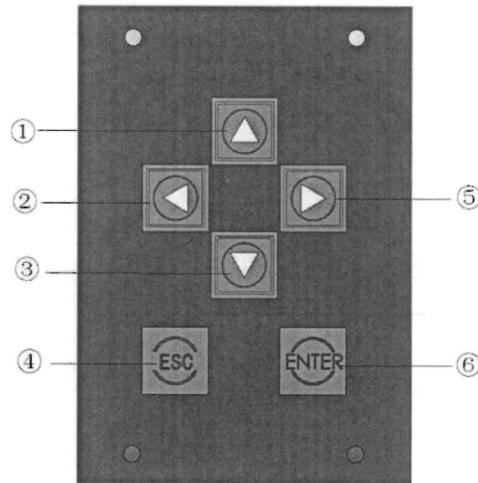
- The sampling gas shall be free of dust, moisture, oil traces and tar.
- The gas flow at the inlet port of the gas analyzer shall be adjusted between 0.7-1.2L/min.
- Connect a venting pipe at the gas outlet port of the analyzer in order to vent the gas directly in the outside atmosphere or working area.
- Power on the instrument and wait until it is stable (15 to 30 minutes).

### 4.2 Warm-up

- 1) Analyzers equipped with NDIR detectors need to perform a complete warm-up before reaching their optimal performances. The warm-up period is fixed in factory to 1800 seconds, the last 150S analyzer will start to auto zeroing.
- 2) After finish zeroing, the zero and/or span drift are not within the analyzer specifications, please perform a zero and/or span calibration and power on 2 hours. From this point the gas sample can be measured accurately by the analyzer.



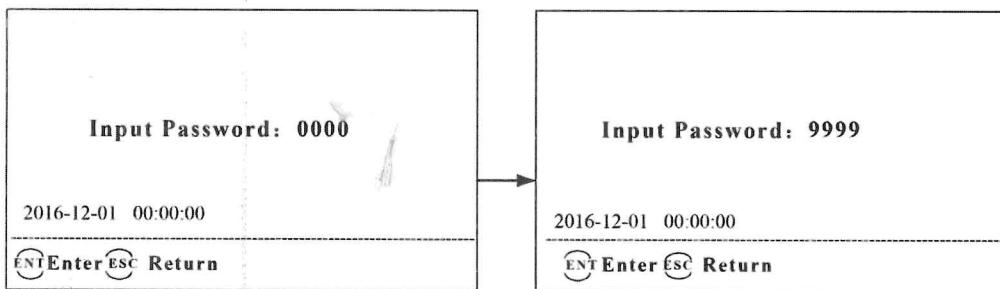
## 5. OPERATION



Button	Name	Function
① ▲	Up button	Move to UP or increase the value
② ◀	Left button	Move to left
③ ▼	Down button	Move to down or reduce the value
④ ESC	Cancel	Cancel current operation
⑤ ►	Right button	Move to right
⑥ ENT	ENT button	Confirm current operation

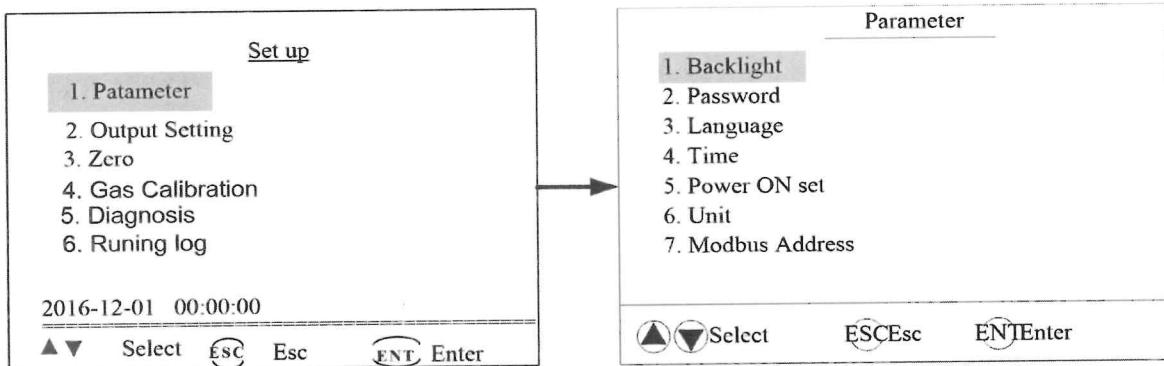
### 5.1 Operation

In measure mode, press ENT to go to the Input password screen. Input the factory password 9999.



## 5.2 Set Up Menu

Press ENT to enter the Set Up menu.

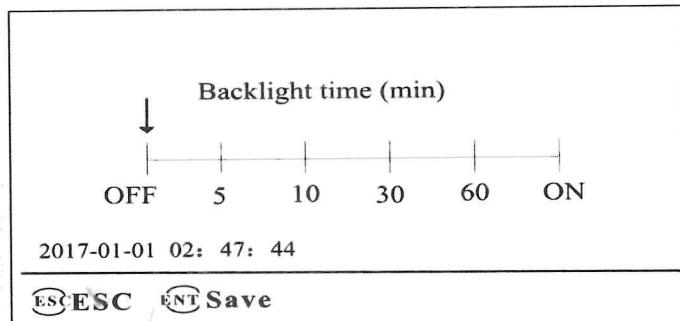


With the **▲** or **▼** button, select the sub-menu of the Set up menu of the analyzer you want to enter.  
From the Set up menu, move the cursor on 1. Parameter and press ENT to enter into the Parameter menu.

### 5.2.1 Backlight

From the Parameter menu, move the cursor on 1. Backlight and press ENT to enter this configuration menu.  
The backlight time can be selected continuously according to the "ENT" key: ON (open) - OFF (close) - 5min - 10min to 30min - 60min. Press ENT to confirm the change and to return to the Parameter menu.

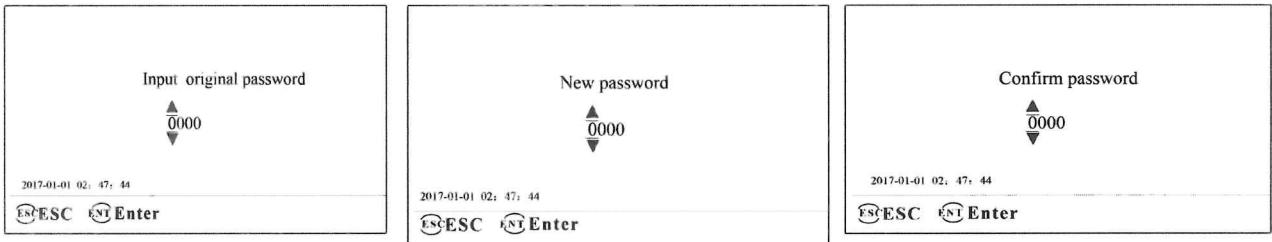
In this program step you can select the duration of the backlight activation; if no key is pressed, the screen backlight will be automatically switched off after the set time.



### 5.2.2 Password

From the System Setting menu, move the cursor on 2. Password and press ENT to enter this configuration menu. In this program step you can change the default factory password (9999) and insert your own password.

1. Input first the factory default current password (9999) and press ENT to confirm.
2. If the current password is correctly introduced, you will be asked to input a new password.
3. You are now asked to confirm your new password again. If the first new password is the same than the second new password, the password change is accepted.

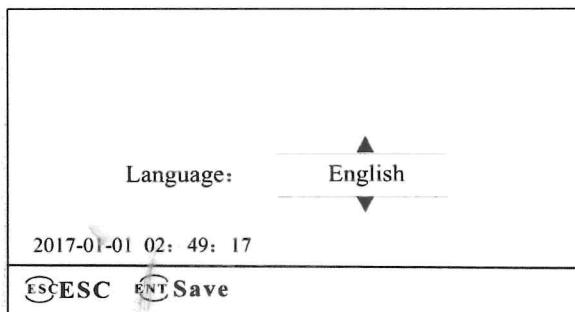


### 5.2.3 Language

From the Parameter menu, move the cursor on 3. Language and press ENT to enter this configuration menu. In the standard specification, we have the English and Portuguese to select.

This function allows you to select the language of the configuration interface between English (the default language) and another language between French, Portuguese or Polish. The second language of the software interface needs to be fixed when ordering the analyzer. Other languages are available on request.

Move the cursor on the selected language using the ▲ or ▼ buttons, then press ENT to confirm your choice.



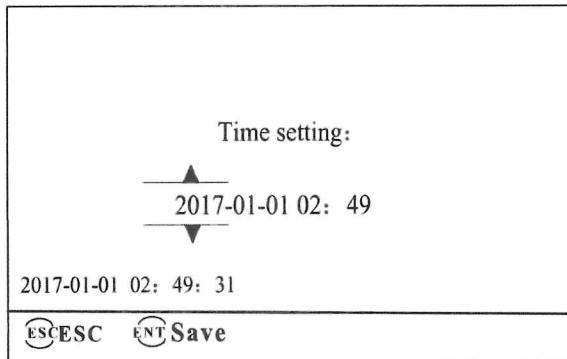
### 5.2.4 Time

From the Parameter menu, move the cursor on 4. Time and press ENT to enter this configuration menu.

In this program step you can adjust the date and the time. This setting is important when using the GAS 3000 real time data download software.

Press ENT again; input now the actual date and time using the ▲ or ▼ buttons for scrolling from 0 to 9 or 9 to 0 and the ◀ or ▶ buttons for moving from one digit to another one to the left or to the right.

Press ENT again to confirm your date and time settings, then press ESC to return to the Set up menu.



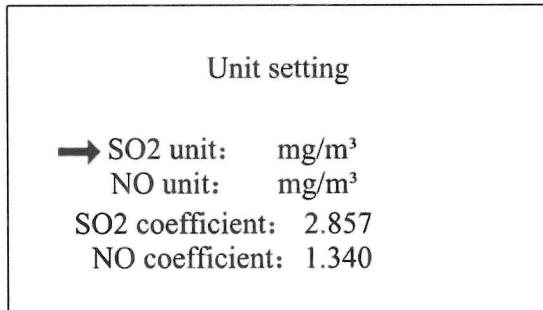
### 5.2.5 Power On Setting

When the instrument restarts due to an accident, if re-energizing within 10-20 seconds, the power-on hold function will skip warm up, in the 150s air zero process, the 4-20mA value display the actually concentration value.

1. Power ON (time): It shows the instrument reboots times, the latest time is displayed in the bottom line. In this menu, press the OK button, you can delete all the records.
2. Power HOLD: Factory setting is ON, input the measurement gas average, during the instrument in the warm-up process, the 4-20mA output value can be keep the average output value.

### 5.2.6 Unit Setting

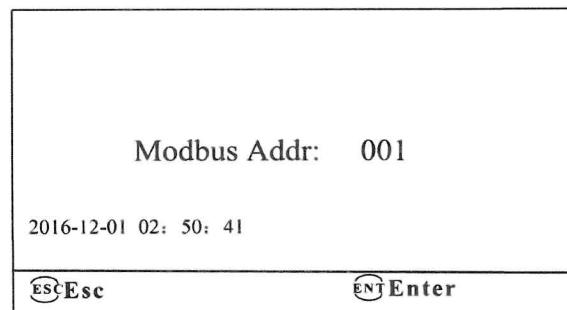
From the Parameter menu, move the cursor on 7. Unit and press ENT to enter this configuration menu.



It has ppm and mg/m<sup>3</sup> unit to select and change, you will change it according to your own requirements.

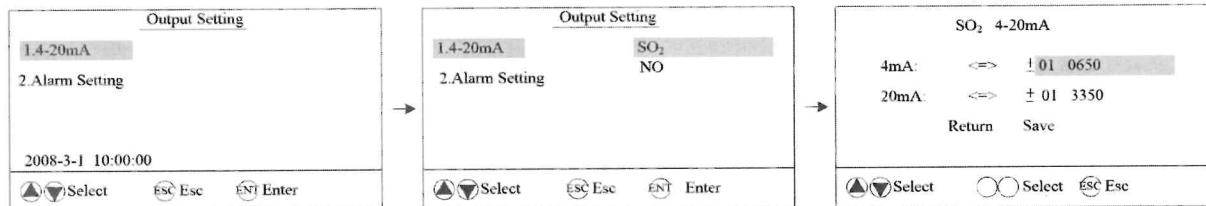
### 5.2.7 Modbus address Setting

This option sets the modbus communication protocol slave address in RS232/RS485 communication mode. The setting range is 0-255.



### 5.3 Output Setting

From the Set up menu, move the cursor on 2. Output and press ENT to enter into the output setting menu.



Output setting includes the setting of the 4-20mA analog output(s) and the warning alarm level setting.

From the output menu, move the cursor on 1. 4-20mA and press ENT to enter into the analogue outputs setting menu.

#### 5.3.1 4-20mA Output Setting

This function allows you to adjust the linear 4-20mA output signal for one specific or for all active measuring channels. Move the cursor on 4-20mA and press ENT, the active measuring channels appear on the display. Select the channel you want to adjust the analogue output signal with the UP or DOWN keypad. With the ▲ or ▼ button, select the measuring channel you want to set the 4-20mA output.

The given example is for a SO<sub>2</sub> analyzer but the procedure would be the same with a multi-components analyzers.

##### Adjustment of the 20mA value :

- use a multimeter in DA mA current measuring mode, connect the black probe of the multimeter to the pin n° 11 of the AIO/RS-232 rear connector and connect the red probe of the multimeter to the respective 4-20mA output signal pin of the AIO/RS-232 rear connector of the channel you have selected, in our example it will be the SO<sub>2</sub> channel.
- move the cursor on  $\leftrightarrow$  of the 20mA adjustment, and adjust the 20mA value (full scale value) of the output current by pressing the  $\blacktriangleleft$  or  $\triangleright$  buttons in order to bring the reading of the multimeter to precisely 20mA. In normal mode each time you press the  $\blacktriangleleft$  button you will decrease the value of the output current by 0,1mA and each time you press the  $\triangleright$  button you will increase the value of the output current by 0,1mA. If the gap between the reading of the multimeter and the 4mA value is too big, you can change the increment value which is in normal state @ ±01 by bringing the cursor with the  $\nabla$  button on ±01, then incrementing to ±20 or ±80 with the  $\blacktriangleleft$  or  $\triangleright$  buttons. Then move the cursor back on  $\leftrightarrow$  of the 4mA adjustment, and adjust the 20mA value of the output current by pressing the  $\blacktriangleleft$  or  $\triangleright$  buttons in order to bring the reading of the multimeter to precisely 20mA.
- When the adjustment is done, move the cursor on Save and press ENT to save it. If you want to escape the 4-20mA set mode without changes, configuration mode, move the cursor on Cancel and press ENT.

#### 5.3.2 Warning Alarm Setting

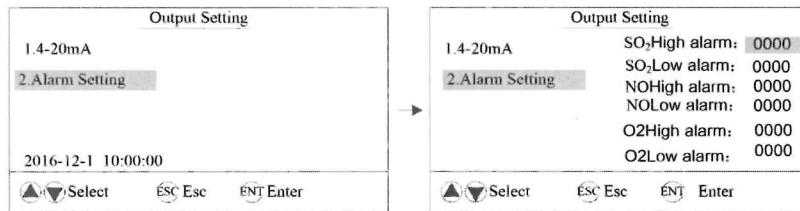
From the output menu, move the cursor on 2. Alarm setting and press ENT to enter into the alarm level

setting menu.

With this function you can set the high alarm and low alarm limits of each measuring channel.

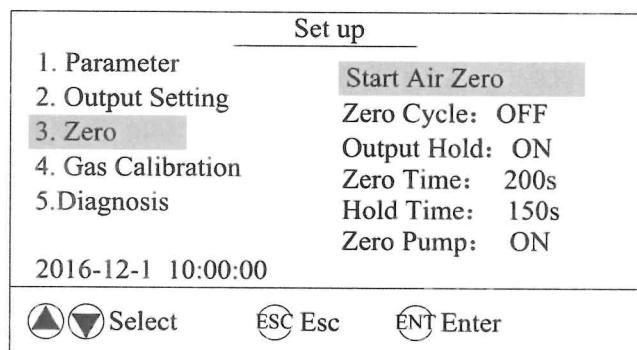
Press ENT to set the high alarm limit; input now the high concentration level for which you want the high alarm relay to be activated using the ▲ or ▼ buttons for scrolling from 0 to 9 or 9 to 0 and the ◀ or ► buttons for moving from one digit to another one to the left or to the right.

Press ENT again to confirm the setting and move the cursor with the ▼ button on the low alarm limit to input the low concentration level for which you want the low alarm relay to be activated. Press ENT to save your configuration, then ESC to return to the Set up menu.



#### 5.4 Zero

From the Set up menu, move the cursor on 3. Zero and press ENT to enter into the auto-zero setting menu.



This function allows you to manually start a zeroing cycle of all detectors or to configure the auto-zero cycle of the analyzer. Move the cursor on the action you want to perform and press ENT.

##### Air Zero

We recommend using fresh ambient air, eventually through an external charcoal filter. If clean compressed air, synthetic air or Nitrogen from gas bottles is used, please control that the gas pressure is between 2-3KPa (20 to 30 mbar) and the gas flow between 0.7 to 1.2L/min. When zeroing an analyzer with an oxygen measuring channel with galvanic fuel cell, the zero value will automatically be set to 20,90% O<sub>2</sub>, and other gases value will be "00.00" after 150S.

**Attention: Don't switch off the power source during zeroing the analyzer.**

##### Zero Cycle

With this function you can configure the delay after which you want the analyzer to perform an auto-zero cycle.

By pressing successively the ENT button you can select a fixed time interval between 2 automatic zeroing cycles: 30 minutes, 1h, 2h, 4h, 8h, 12h, 24h and 48h or OFF, this last meaning that the automatic zeroing cycle will never been activated.

##### Output Hold

ON: The concentration value that remains displayed during zeroing is the value one second before zeroing.

OFF: The concentration value displayed during zeroing is the true measurement gas value.

**Our factory setting of this function is on.**

##### Zero Time

In this status, user need to inject zero gas (usually air) to the gas chamber, this function's valid adjustable time can be set 30-999 seconds.

##### Hold Time

In this status, gas chamber's gas switch to the normal measurement gas (such as SO<sub>2</sub>, NO), hold time is over then instrument has completed auto-air zero. This function's valid adjustable time can be set 0-999 seconds.

## Zero Pump

Our factory setting of this function is on.

If you choose the off status, then the zero pump and solenoid valve will be closed during instrument warm-up.

## 5.5 Calibration

From the Set up menu, move the cursor on 4. Calibration and press ENT to enter into the calibration menu.

Zero Calibration						
GAS	Test	Ref	Temp	Value	Input	Unit
SO <sub>2</sub>	18193	0	1879	480	0000	ppm
NO	13076	0	1211	468	****	ppm
O <sub>2</sub>	3040	0	0	20.75	***.*	%
	Next			Save		
2016-12-1 10:00:00						
ESC	Retrun	▲▼	Select	ENT	Enter	

Span Calibration						
GAS	Test	Ref	Temp	Value	Input	Unit
SO <sub>2</sub>	18193	0	1879	600	1000	ppm
NO	13076	0	1211	500	****	ppm
O <sub>2</sub>	0368	0	0	20.75	***.*	%
	Return			Save		
2016-12-1 10:00:00						
ESC	Retrun	▲▼	Select	ENT	Enter	

### 5.5.1 About Gas Calibration

- In order to ensure the highest precision of the instrument :
  - Gas calibration must be done only after completion of the 30 minutes warming-up time and power on gas analyzer above 2 hours.
  - Zero and span gas calibration should be done at least each 3 months or as soon as the measured value is out of manufacturer drift specifications.
- User gas calibration includes zero and span calibration. For high calibration accuracy you shall successively complete both zero and span calibrations for a same measuring channel.
- Use by preference pure nitrogen 6.0 quality (N<sub>2</sub>) for the zero calibration and 90 to 100% of the measuring range for the span calibration of each detector. Please check the configured measuring ranges of your analyzer in the nameplate. Span gas should never be less than 90% of the full measuring range.
- Several measuring channels may be calibrated together by using span gas cylinder with adequate gas mixture.
- Control that the gas pressure is between 2-3KPa (20 to 30 mbar) and the gas flow between 0.7 to 1.2L/min.

Note: Dual range description

- On the measurement interface, different icons are displayed for low range and high range.

For example, low range of SO<sub>2</sub> is displayed as SO<sub>2L</sub>, high range of SO<sub>2</sub> is showed as SO<sub>2H</sub>.

Note: Manufacturer has set the low range and high range, user cannot change them. When the measurement value is greater than 1.2 times low range value, it will automatically switch to the high range; when the measurement value is less than 1.1 times low range value, it will automatically switch to the low range.

### 5.5.2 Zero Calibration

Press ENT to enter the Zero Calibration menu. The display shows the window with the zero calibration of all gases that are measured by the analyzer. (For example with SO<sub>2</sub> calibration).

We explain how to proceed to the calibration of a measuring channel. Please apply the same procedure for all detectors from your analyzer.

- 1) Move the cursor on the SO<sub>2</sub> channel by using the ▲ or ▼ buttons. Press ENT. The first digit is highlighted. Input now the value 0000 (corresponding to zero) using the ▲ and ▼ buttons to scroll the numbers from 0 to 9 and the ◀ and ► buttons for moving the cursor to another digit. Press ENT. Move the cursor on SAVE using the ▼ button.
- 2) Inject now pure nitrogen quality (N2) into the gas analyzer.
- 3) Control the gas pressure (20 to 30 mbar) and the gas flow (0.7 to 1.2L/min) are OK.
- 4) Wait till the indication Unstable becomes Stable, then press ENT to save the zero calibration. The display shows now the SPAN calibration screen.

### 5.5.3 Span Calibration (Includes low range and high range)

1. Firstly do the span calibration with low range of SO<sub>2</sub>: 0-200ppm.
- 1) Input the value indicated on the gas cylinder using the ▲ and ▼ buttons to scroll the numbers from 0 to 9 and the ◀ and ► buttons for moving cursor to another digit. Press ENT. Move the cursor on SAVE using the ▼ button.

Inject the SO<sub>2</sub> gas into the gas analyzer.

- 2) Control the gas pressure (20 to 30 mbar) and the gas flow (0.7 to 1.2L/min) are OK.
- 3 ) Wait till the indication Unstable becomes Stable, then press ENT to save the zero calibration.
- 4 ) The program automatically returns to the Set up menu screen.

2. Seconly, do the span calibration with low range of SO<sub>2</sub>: 0-500ppm.

- 1) Enter calibration interface again, skip zero calibration enter span calibration interface directly.
- 2) Do the same operation as low range calibration.

To perform the zero and span calibration of the other measuring channel, re-enter the Gas calibration menu and follow the same procedure for each other measuring channel as explained here above.

#### Attention

1. Calibration includes zero and span calibration. Dual calibration only work for SO<sub>2</sub> and NO.
2. Pls use certified calibration gases with a concentration that equals 90% to 100% of the respective measuring range.
3. During doing SO<sub>2</sub> span calibration, pls input the corresponding value on the calibration cylinder, for example, if calibration cylinder shows SO<sub>2</sub>: 0-510ppm, you need to input "510" value. And keep \* status for another components.

## Zero Pump

Our factory setting of this function is on.

If you choose the off status, then the zero pump and solenoid valve will be closed during instrument warm-up.

## 5.5 Calibration

From the Set up menu, move the cursor on 4. Calibration and press ENT to enter into the calibration menu.

Zero Calibration						
GAS	Test	Ref	Temp	Value	Input	Unit
SO <sub>2</sub>	18193	0	1879	480	0000	ppm
NO	13076	0	1211	468	****	ppm
O <sub>2</sub>	3040	0	0	20.75	***.*	%
	Next			Save		
2016-12-1 10:00:00						
ESC	Retrun	▲▼	Select	ENT	Enter	

Span Calibration						
GAS	Test	Ref	Temp	Value	Input	Unit
SO <sub>2</sub>	18193	0	1879	600	1000	ppm
NO	13076	0	1211	500	****	ppm
O <sub>2</sub>	0368	0	0	20.75	***.*	%
	Return			Save		
2016-12-1 10:00:00						
ESC	Retrun	▲▼	Select	ENT	Enter	

### 5.5.1 About Gas Calibration

- In order to ensure the highest precision of the instrument :
  - Gas calibration must be done only after completion of the 30 minutes warming-up time and power on gas analyzer above 2 hours.
  - Zero and span gas calibration should be done at least each 3 months or as soon as the measured value is out of manufacturer drift specifications.
- User gas calibration includes zero and span calibration. For high calibration accuracy you shall successively complete both zero and span calibrations for a same measuring channel.
- Use by preference pure nitrogen 6.0 quality (N<sub>2</sub>) for the zero calibration and 90 to 100% of the measuring range for the span calibration of each detector. Please check the configured measuring ranges of your analyzer in the nameplate. Span gas should never be less than 90% of the full measuring range.
- Several measuring channels may be calibrated together by using span gas cylinder with adequate gas mixture.
- Control that the gas pressure is between 2-3KPa (20 to 30 mbar) and the gas flow between 0.7 to 1.2L/min.

Note: Dual range description

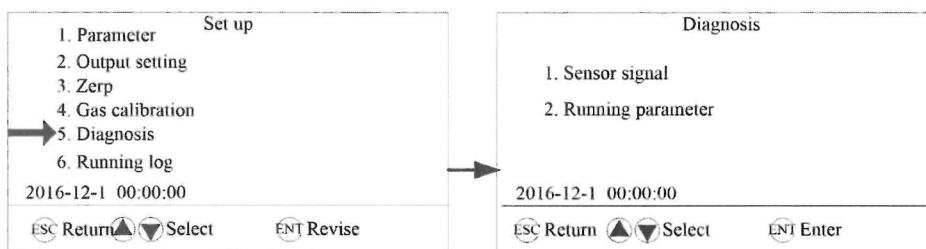
- On the measurement interface, different icons are displayed for low range and high range.

For example, low range of SO<sub>2</sub> is displayed as SO<sub>2L</sub>, high range of SO<sub>2</sub> is showed as SO<sub>2H</sub>.

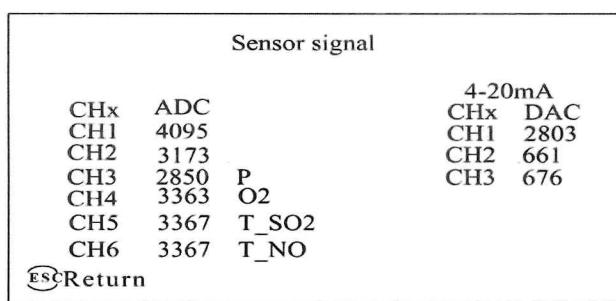
Note: Manufacturer has set the low range and high range, user cannot change them. When the measurement value is greater than 1.2 times low range value, it will automatically switch to the high range; when the measurement value is less than 1.1 times low range value, it will automatically switch to the low range.

## 5.6 Diagnosis

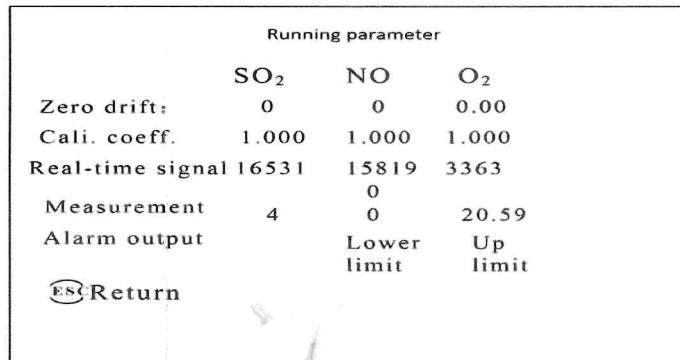
From the Set up menu, move the cursor on 5. Diagnoses and press ENT to enter into the calibration menu. We can check the sensor's signal to diagnoses the problems.



1. Press the ENT to enter into the sensor's signal interface, if the instrument has some problems, pls take this photos to us, we will diagnose the problem accordingly.



2. Running parameter: Check the zero drift, calibration coefficient, real-time signal.

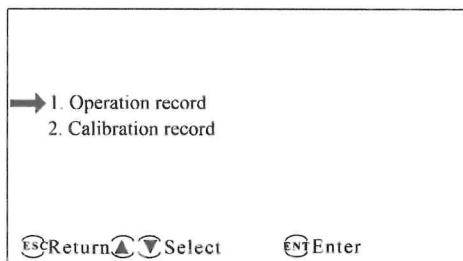


## 5.7 Running log

It has operation record and calibration record.

Con0: Real-time measurement value.

Con1: Calibration value.



Operation record				
Date	Time	User	Operation	
170103	10:00	Administrator	Log in	
170102	11:00	Administrator	ESC	
	08:00		Start up	

At the bottom are function keys: ESC, Return, ▲ Delete, ▲ Select, ▼ Select, and ▼ Enter. A status bar at the bottom right shows "Select 1/001".

NO	Calibration record					
Data	Time	AD	P	T	Con0	Con1
ZERO						
SPAN						
170104	04:16	8103	2759	2392	196.0	200.0

At the bottom are function keys: ESC, Return, ▲ Select, and ▼ Delete.

## 6. SPECIFICATIONS

### 6.1 Measurement Technical Parameters

Measure gas	Measure Method	Range	Precision	Repeatability Error
SO2	Micro-flow NDIR	0-2000ppm	±2%FS	≤1%
NO	Micro-flow NDIR	0-2000ppm	±2%FS	≤1%
CO	Micro-flow NDIR	0-2000ppm	±2%FS	≤1%
CO2	NDIR	0-25%	±2%FS	≤1%
O <sub>2</sub>	ECD	0-25%	±3%FS	≤1%

Note: component, precision, range and repeatability error can be changed according to customer requirements, specific to the actual product shall prevail

### 6.2 Other function technical parameters

Response Time (TD+T90)	≤60s
Warm-up Time	1800s
Output	RS232
analog output	(4~20) mA
Alarm Output	With alarm output function
Working Temperature	(0~50) °C
Relative Humidity	(5~85) %RH
Pressure	(86~108)kPa
Power Supply	AC 220V/50Hz

## 7. TROUBLE SHOOTING

Trouble description	Possible cause	Remedy
<b>Display troubles</b>		
No display after power ON.	No power.	Check the power cable of the analyzer is connected to the main.
	Power cable is damaged or the fuse is broken.	Replace the power cable and/or the fuse.
	Display is broken.	Display must be replaced; return your instrument to your dealer for repair.
After power ON there is a pallid white image (low contrast)	Ambient temperature affects the LCD display operation.	The contrast control is no longer guaranteed if the LCD temperature is outside the permissible tolerance. It may be difficult to read the display.
After power ON, there is no image or a white screen.	Ambient temperature inside the analyzer is too high and affects the LCD display operation.	Provide sufficient ventilation or air conditioning inside the cabinet. Control that the internal ventilation of the analyzer is operating correctly. If the fault still occurs, contact your dealer.
<b>Keyboard troubles</b>		
No action when pressing the keyboard interface buttons.	Cable connection is loosen.	Check the cable connection.
	Keyboard interface is broken.	Keyboard interface must be replaced; return your instrument to your dealer for repair.
<b>Measuring troubles</b>		
Slow response of the analyzer	The gas sampling path outside the analyzer is blocked or leaky.	Check the gas sampling line.

Trouble description	Possible cause	Remedy
Slow response of the analyzer.	Insufficient flow.	flow need to be adjusted between 0.7 to 1.2 l/min.
	Internal filter is blocked.	The filter needs to be replaced. Note: When replacing the filter, make sure that the arrow on the filter points in the gas flow direction.
	The gas sampling path inside the analyzer is leaky.	Please contact your dealer for repair.
Low or nearly no variation of the measured value.	Gas detector(s) are leaky or faulty.	Please contact your dealer for repair.
Oxygen value is too high.	Leakage (ambient air intake) in the gas sampling system.	Control any part of the gas sampling system for leakage (connectors, tubing, ...)

Unstable measures, high drift, bad repeatability.	Instrument is not warm enough.	Wait till the warming time of 30 minutes is fully complete before using the analyzer.
	Sampling is not stable.	Check the sampling system.
	Ambient temperature is lower < 5°C or > 45°C.	Work inside the operational temperature limits of the gas analyzer.
Does not fall to zero after testing.	Gas still present in the gas cell.	Use the pump to purge the measuring cell with ambient air.
	Zero drift is too high.	Make a zeroing cycle. Make a zero calibration
Wrong measure of the detector(s) to test gas.	Accuracy is ≥ 2% FS	Make a zero and span calibration of the detector(s).
Wrong measure of the oxygen sensor to test gas.	Accuracy is ≥ 3% FS.	Make a zero and span calibration of the oxygen Sensor.
		If the problem is still present, contact your dealer for oxygen sensor replacement.
Slow or no response of detector(s).	Faulty detector.	Contact your dealer for repair.
Slow or no response of oxygen.	End of life of O2 sensor.	Contact your dealer for oxygen sensor module replacement.

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## 8.Analyzer Maintenance

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1. Disconnect the power supply when maintaining the instrument to avoid electric shock.
2. After use, wipe the dust stains on the surface of the instrument.
3. The instrument should be stored in a clean, ventilated and dry environment.
4. Violent vibration should be prevented during transportation.

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## 9. Customer Consultation and Service

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