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OPERATING INSTRUCTIONS FOR

LGA4000Z Extractive

Extractive Laser Gas Analyzer

P/N :
MLGA4000Z-EXTRACTIVE
9/21/2016

DANGER
Toxic gases and or flammable liquids may be present in this monitoring system.
Personal protective equipment may be required when servicing this instrument.
Hazardous voltages exist on certain components internally which may persist for a time even after the power is turned off and disconnected.
Only authorized personnel should conduct maintenance and/or servicing. Before conducting any maintenance or servicing, consult with authorized supervisor/manager.

DECLARATION OF CONFORMITY

APPLICATION OF COUNCIL DIRECTIVE	**: Directive 2014/34/EU Directive 2014/30/EU**
STANDARDS TO WHICH CONFORMITY IS DECLARED	**: IEC 60825-1, IEC 62321-1:2013, IEC 62321-2:2013, IEC 62321-3-1:2013, IEC 62321-4:2013, IEC62321-5:2013, IEC 62321-6:2015, IEC 61010-1:2010, IEC 60825-1:2014, EN 61326-1:2013, IEC 61000-4-2:2008, IEC 61000-4-3:2010, IEC 61000-4-4:2010, IEC 61000-4-5:2005, IEC 61000-4-6:2008, IEC 61000-4-8:2009, IEC 60079-0:2011, IEC 60079-1:2014, IEC 60079-28:2015, IEC 60079-31:2013, IEC 80079-34:2011**
MANUFACTURER'S NAME	**: TELEDYNE ANALYTICAL INSTRUMENTS**
MANUFACTURER'S ADDRESS	**: 16830 Chestnut Street City of Industry, CA 91748 U.S.A.**
TYPE OF EQUIPMENT	**: Laser Gas Analyzer**
EQUIPMENT CLASS	**: Laboratory, Measurement & Process Control**
MODEL NUMBER	**: LGA4000Z**

I, THE UNDERSIGNED, HEREBY DECLARE THAT THE EQUIPMENT SPECIFIED ABOVE CONFORMS TO THE ABOVE STANDARD(S)

SIGNATURE: Alegria

FULL NAME: Angel Alegria

POSITION: New Products Manager

Date: 7/14/20

PLACE: City of Industry, California

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Warranty

This equipment is sold subject to the mutual agreement that it is warranted by us free from defects of material and of construction, and that our liability shall be limited to replacing or repairing at our factory (without charge, except for transportation), or at customer plant at our option, any material or construction in which defects become apparent within one year from the date of shipment, except in cases where quotations or acknowledgements provide for a shorter period. Components manufactured by others bear the warranty of their manufacturer. This warranty does not cover defects caused by wear, accident, misuse, neglect or repairs other than those performed by Teledyne or an authorized service center. We assume no liability for direct or indirect damages of any kind and the purchaser by the acceptance of the equipment will assume all liability for any damage which may result from its use or misuse.

We reserve the right to employ any suitable material in the manufacture of our apparatus, and to make any alterations in the dimensions, shape or weight of any parts, in so far as such alterations do not adversely affect our warranty.

Important Notice

This instrument provides measurement readings to its user, and serves as a tool by which valuable data can be gathered. The information provided by the instrument may assist the user in eliminating potential hazards caused by his process; however, it is essential that all personnel involved in the use of the instrument or its interface, with the process being measured, be properly trained in the process itself, as well as all instrumentation related to it.

The safety of personnel is ultimately the responsibility of those who control process conditions. While this instrument may be able to provide early warning of imminent danger, it has no control over process conditions, and it can be misused. In particular, any alarm or control systems installed must be tested and understood, both as to how they operate and as to how they can be defeated. Any safeguards required such as locks, labels, or redundancy, must be provided by the user or specifically requested of Teledyne at the time the order is placed.

Therefore, the purchaser must be aware of the hazardous process conditions. The purchaser is responsible for the training of personnel, for providing hazard warning methods and instrumentation per the appropriate standards, and for ensuring that hazard warning devices and instrumentation are maintained and operated properly.

Teledyne Analytical Instruments, the manufacturer of this instrument, cannot accept responsibility for conditions beyond its knowledge and control. No statement expressed or implied by this document or any information disseminated by the manufacturer or its agents, is to be construed as a warranty of adequate safety control under the user's process conditions.

Specific Model Information

It is not recommended that this instrument be used for analysis on any other gas or gas mixture than that specified at the time of purchase. Thermal conductivity analyzers are calibrated at the factory for a specific application using a known gas mixture that is representative of the customers' process. Using this instrument to analyze any other gas mixture may result in serious error. Consult the factory for additional information for gas analysis not specified at the time of purchase.

Instrument Serial Number: _____

Instrument Range: _____

Calibrated for: _____

Background Gas: _____

Zero Gas: _____

Span Gas: _____

Safety Messages

Your safety and the safety of others is very important. We have provided many important safety messages in this manual. Please read these messages carefully.

A safety message alerts you to potential hazards that could hurt you or others. Each safety message is associated with a safety alert symbol. These symbols are found in the manual and inside the instrument. The definition of these symbols is described below:

GENERAL WARNING/CAUTION: Refer to the instructions for details on the specific danger. These cautions warn of specific procedures which if not followed could cause bodily Injury and/or damage the instrument.

CAUTION: HOT SURFACE WARNING: This warning is specific to heated components within the instrument. Failure to heed the warning could result in serious burns to skin and underlying tissue.

WARNING: ELECTRICAL SHOCK HAZARD: Dangerous voltages appear within this instrument. This warning is specific to an electrical hazard existing at or nearby the component or procedure under discussion. Failure to heed this warning could result in injury and/or death from electrocution.

Technician Symbol: All operations marked with this symbol are to be performed by qualified maintenance personnel only.

No Symbol

NOTE: Additional information and comments regarding a specific component or procedure are highlighted in the form of a note.

CAUTION: **THE ANALYZER SHOULD ONLY BE USED FOR THE PURPOSE AND IN THE MANNER DESCRIBED IN THIS MANUAL.**

IF YOU USE THE ANALYZER IN A MANNER OTHER THAN THAT FOR WHICH IT WAS INTENDED, UNPREDICTABLE BEHAVIOR COULD RESULT POSSIBLY ACCOMPANIED WITH HAZARDOUS CONSEQUENCES.

This manual provides information designed to guide you through the installation, calibration operation and maintenance of your new analyzer. Please read this manual and keep it available.

Occasionally, some instruments are customized for a particular application or features and/or options added per customer requests. Please check the front of this manual for any additional information in the form of an Addendum which discusses specific information, procedures, cautions and warnings that may be peculiar to your instrument.

Manuals do get lost. Additional manuals can be obtained from Teledyne at the address given in the Appendix. Some of our manuals are available in electronic form via the internet. Please visit our website at: www.teledyne-ai.com.

Table of Contents

List of Figures

List of Tables

This is a general purpose instrument designed for use in a non-hazardous area. It is the customer's responsibility to ensure safety especially when combustible gases are being analyzed since the potential of gas leaks always exist.

The customer should ensure that the principles of operation of this equipment is well understood by the user. Misuse of this product in any manner, tampering with its components, or unauthorized substitution of any component may adversely affect the safety of this instrument.

Since the use of this instrument is beyond the control of Teledyne Analytical Instruments, no responsibility by Teledyne Analytical Instruments, its affiliates, and agents for damage or injury from misuse or neglect of this equipment is implied or assumed.

Introduction

1.1 Overview

The LGA4000Z Extractive laser gas analyzer employs a Tunable Diode Laser Absorption Spectroscopy (TDLAS) technique for analyzing the gas concentration in a background gas. In this technique, a laser diode emits a beam of light through the process gas. Depending on the interaction between the laser intensity and the target gas concentration, the analyzer performs a single-line molecular absorption spectroscopic analysis on the specific gas then subtracts any interference (background gas, dust, etc.) resulting in a real-time online analysis of the concentration of the target gas.

TDLAS uses the tunable laser's narrow band and wavelength ability to change with the current. By precisely modulating the current of tunable laser, it can scan a specific absorption peak of a target gas without absorption from background interference. Using the second harmonic and line-width, the concentration of the target gas is determined without interference from background components.

To increase the sensitivity the laser parameters are tuned to the proper absorption line. Figure 1-1 shows a functional block diagram of the process.

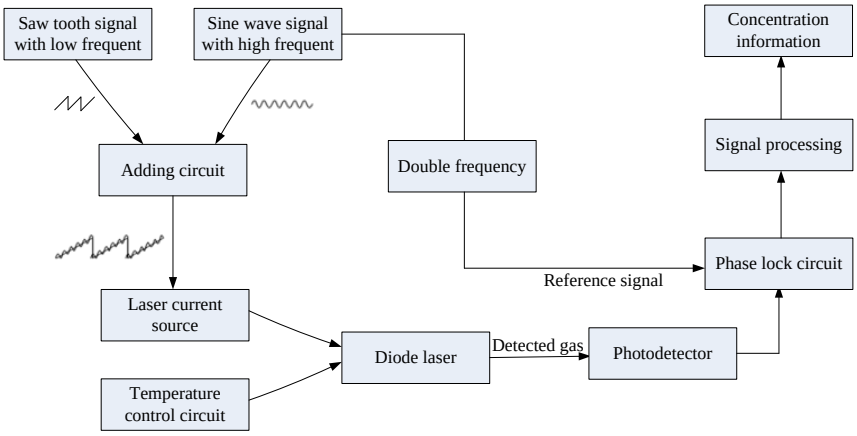


Figure 1-1: TDLAS Block Diagram

1.2 Features

LGA4000Z Extractive Laser Gas Analyzer can be installed as an in situ component in a sample system. The analyzer features an organic LED (OLED) screen, which has the advantage of low power consumption, a wide angle of view, and enhanced low temperature operation (down to -40°C). Moreover, it employs a highly sensitive Hall Effect interactive keypad that responds accurately and quickly to the operation of the supplied magnetic pen.

The LGA4000Z Extractive has the following features:

1. No background gas interference
2. It employs a narrow spectrum emission (spectral width< 0.0001nm) from the tunable laser diode which is about 10^{-6} of the infrared spectrum width. This is always much less than the spectral width of detected gas's absorption line. The laser frequency modulation range is adjusted to contain the single-line molecular absorption line from the detected gas, thus it successfully eliminates any cross interference from the background gas. The single-line molecular absorption spectroscopy from the laser is shown in Figure 2-2.

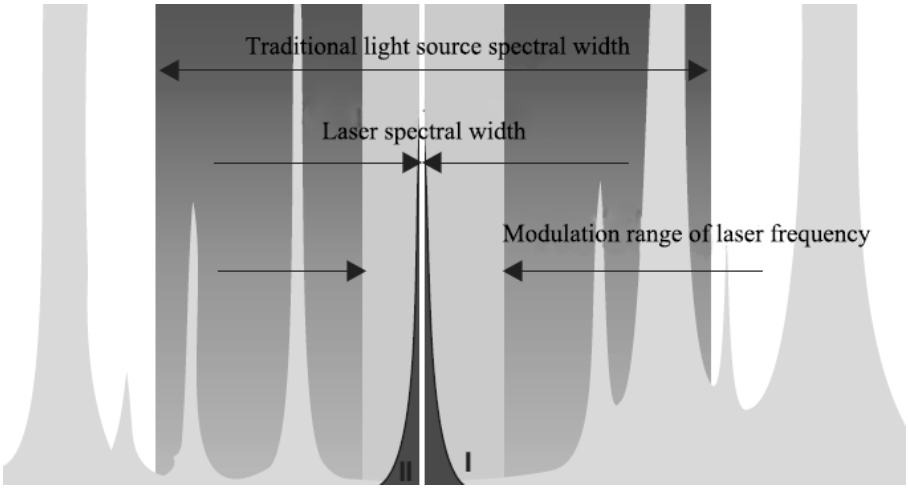


Figure 1-2: Tunable Laser Single-Line Molecular Absorption Spectroscopy

3. **No influence from dust or windows contamination.**
   The wavelength band of emission from the tunable laser used in this instrument allows the analyzer to scan across not only the absorption profile, but also regions outside of the main absorption band. The wavelength of the diode laser is scanned using a modulating current. Thus the transmittance (T1) from the gas, dust and window can be measured as the laser scans across the absorption profile. After scanning outside the absorption profile, the transmittance (T2) associated with dust and/or window contamination can be measured. Thus, the transmittance due to the gas of interest Tg (Tg= T1/T2) can be accurately determined. In essences, TDLAS removes the effects from dust and window contamination by using a laser wavelength scanning technique.

4. **Automatic temperature and pressure compensation (optional feature as needed)**
   Pressure and temperature variation in the measured gas causes a variation in line strength and line width. Thus, without temperature and pressure compensation, there will be a noticeable inaccuracy in the measurement. The LGA4000Z Extractive has built-in temperature and pressure correction with analog inputs for temperature and pressure when needed. TDLAS analyzes the single absorption lines in the target gas, and then makes corrections for temperature and pressure variation based on the 4-20 mA temperature and pressure input. It performs automatic correction according to the actual temperature and pressure measurement of the source gas and outputs an accurate on-line gas analysis.

5. **Low drift, less frequent calibration**
   The LGA4000Z Extractive Laser Gas Analyzer has virtually no drift and excellent stability. Span drift has been determined to be ≤±1% FS over 6 months. Also, the time between calibration cycles is very long, reducing the overall cost of calibration.

6. **Protection**
   The LGA4000Z Extractive Laser Gas Analyzer is constructed with IP66 level of ingress protection against dirt, dust, oil, water, etc. and is designed for operation in Exd IIC T6 Gb rated areas.

1.3 Typical Applications

The LGA4000Z Extractive Laser Gas Analyzer is a high resolution, versatile tool for online analysis and monitoring of a gas flow process. The LGA4000Z Extractive is suitable for a wide range of industrial applications including petrochemical and steel industries where critical monitoring of process gases is vital. Depending on the gas specie or species of interest, the instrument is capable of measuring from the parts per million (ppm) to 100% range of concentration. The analyzer can be fitted with an optional pressure control module for positive pressure control in instruments manufactured for explosion proof applications.

1.4 Operator Interface

The operator interface consists of an OLED high contrast screen with a four-key keypad. The keys are operated using the included magnetic pen.

Various screens are presented to guide the user through the operation of the instrument as well as display status information and data display.

Operational Theory

2.1 Introduction

The LGA4000Z Extractive has five main components as shown in Figure 2-1:

1. Transmitter Control Unit
2. Transmitter Probe
3. Receiver Control Unit
4. Receiver Probe
5. Sample Cell

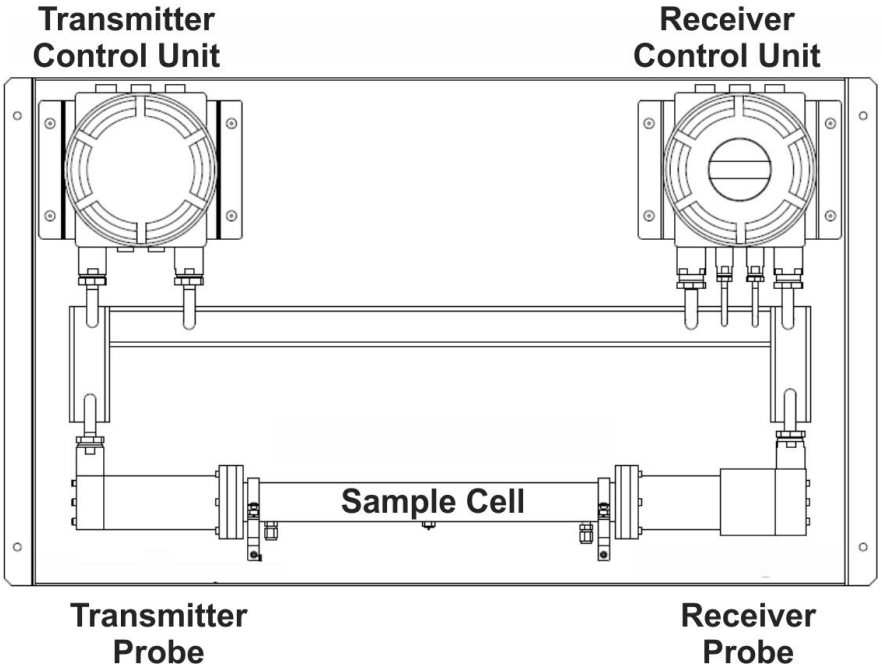


Figure 2-1: LGA4000Z Extractive Main Components

The Transmitter Probe houses the semiconductor laser and optical components. The Transmitter Control Unit drives the semiconductor laser to emit a beam of light, in kHz frequency of electrical modulation, which passes through the Sample Cell containing the gas to be measured. The Receiver Probe, synchronized to laser emitting modulation, collects the radiation and produces an absorption spectrum based on the intensity as a function of wavelength. The raw data is passed to the Receiver Control Unit where they undergo signal processing and analysis of the spectral data. The Receiver Control Unit displays the measurement results on its front panel screen. The front panel is also where the user makes parameter setting changes to the unit and receives status, alarm, and other operational information.

In addition to displaying the measured results, the Receiver Control Unit also generates a 4-20 mA output signal that is proportional to the concentration of the measured species across the analysis range.

The LGA4000Z Extractive Laser Gas Analyzer uses an extractive sampling installation whereby the process gas for analysis is directed through the sample cell entering through a port close to the Transmitter Probe and exiting at the Receiver Probe end. The sample cell length will vary depending on the application and the target gas. The analyzer requires clean sample gas to avoid contaminating the optical windows on the probes.

2.2 Transmitter Probe

The Transmitter Probe consists of the semiconductor laser and its optical components. Depending on the application and the gas to be measured, the diode laser is adjusted to emit at a particular wavelength, at one of absorption peaks for the compound under test. Figure 2-2 shows the Transmitter Probe.

Figure 2-2: LGA4000Z Extractive Transmitter Probe

2.3 Transmitter Control Unit

The Transmitter Control Unit consists of the main board and temperature control board, which are used to drive the semiconductor laser. The Transmitter Control Unit is shown in figure 2-3.

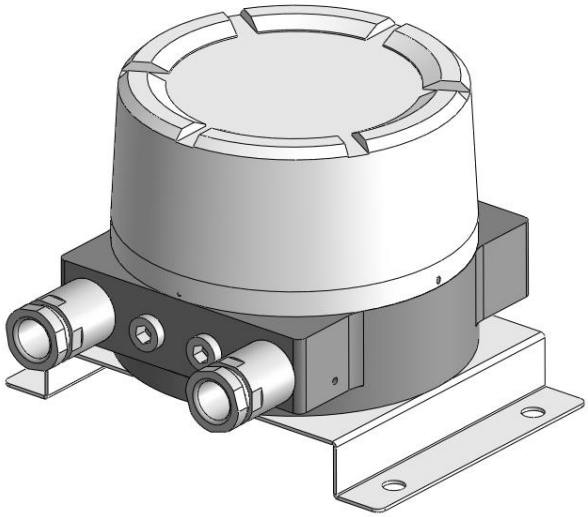


Figure 2-3 LGA4000Z Extractive Transmitter Control Unit

2.4 Receiver Probe

The Receiver Probe contains the photoelectric sensor, lens, sensor board and other optical components. The lens focuses the laser onto the photoelectric sensor and translates the optical signal into an electrical signal. The Receiver Probe is shown in Figure 2-4.

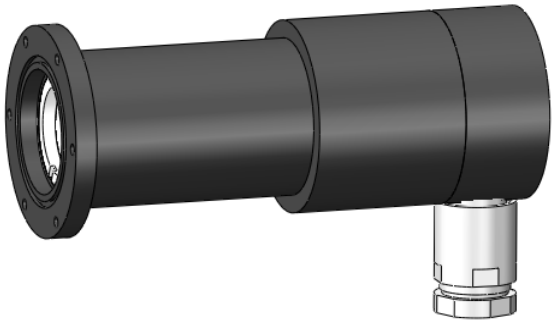


Figure 2-4 LGA4000Z Extractive Receiver Probe

2.5 Receiver Control Unit

The Receiver Control Unit consists of the mainboard, protection board, display panel and OLED screen. After processing the electrical signals from the receiving module, the Receiver Control Unit acquires the second harmonic signal, translates this signal into concentration, and then displays the gas concentration on the OLED screen.

The OLED screen is the user interface of the analyzer and receives input from the user via the keypad using a magnetic pen. The Receiver Control Unit is shown in figure 2-5.

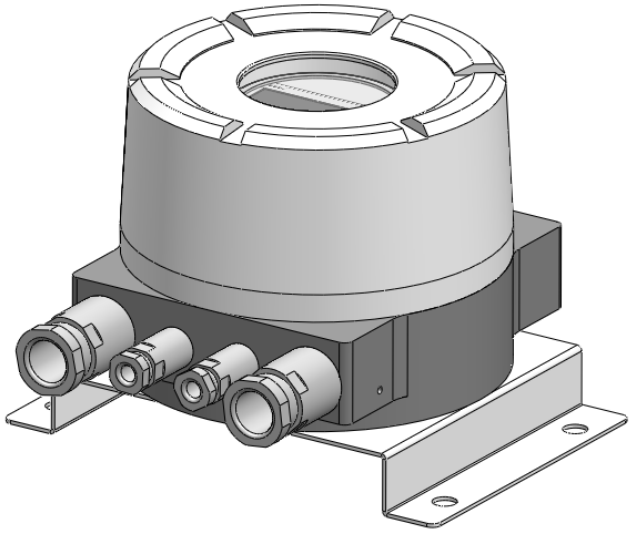


Figure 2-5 LGA4000Z Extractive Receiver Control Unit

2.6 Laser Spectral Scanning Technology

The LGA4000Z Extractive employs a laser spectral scanning technology that periodically scans the sample gas with a modulated frequency range larger than the gas absorption spectral line-width. Within one scan period, there are two distinctive areas as shown in Figure 2.6. Area I is unaffected by the gas absorption and gives T_d, whereas area II is affected and gives T_{gd}. The transmittance of the gas under test (T_g) is then calculated accurately by $T_g = T_{gd} / T_d$. The

interference from dust and optical window contamination is, therefore, automatically screened out.

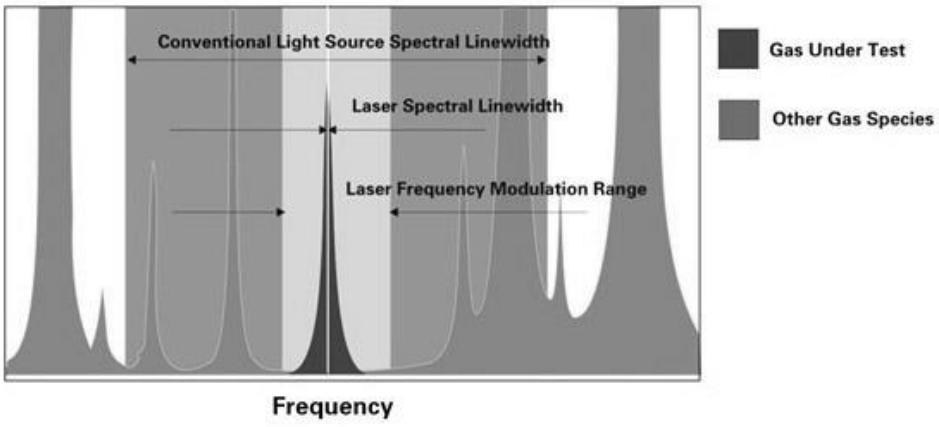


Figure 2-6: Single Line Spectroscopy Principle

2.7 Automatic Compensation For Spectral Line Broadening

When gas temperature and pressure under measurement undergo changes, the width and height of measured gas absorption spectral line change and this affects the accuracy of the measurement. To compensate for this, the LGA4000Z Extractive incorporates a 4-20mA process temperature and pressure input and uses a proprietary algorithm to ensure measurement accuracy. This is an optional feature installed when necessary and requires T/P sensors.

Installation

Installation of the LGA4000Z Extractive Laser Gas Analyzer includes:

- Unpacking
- Mounting
- Gas connections
- Electrical connections
- Calibration

3.1 Unpacking the Instrument

The analyzer is shipped with all the materials you need to install and prepare the system for operation. Carefully unpack the unit and inspect it for damage. Immediately report any damage to the shipping agent.

3.2 Mounting

The Model LGA4000Z Extractive is a panel mounted instrument intended for indoor use only. It requires a 24 VDC power source for operation.

The components are mounted on a carbon steel backplate. See Figure 3-1 and the Outline Diagram included at the rear of this manual for exact dimensions. All dimensions are in millimeters. Keep in mind that the Sample Cell length is application dependant.

The analyzer requires a clean sample gas. TAI suggests using a sample filter be installed in the sample in line to remove dirt and debris. Depending on the application, it may also be necessary to include sample cooling.

To reduce lag time, the instrument should be installed close to the sample take off point. Gas path should not be excessive, and air resistance should be reduced as much as possible. The selected

installation site must be clean, non-corrosive, vibration free, and free from strong electromagnetic interference. In addition, the selected site should not be too close to high temperature objects which could affect the operational temperature of the unit or the sample gas. Also make sure there is adequate room to make the sample system connections.

Depending on the application, special conditions may apply to the exhaust line. Observe all local and regional regulations regarding exhaust emissions.

The analyzer is designed for use in ATEX classified Exd IIC T6 Gb environments with IP66 ingress protection.

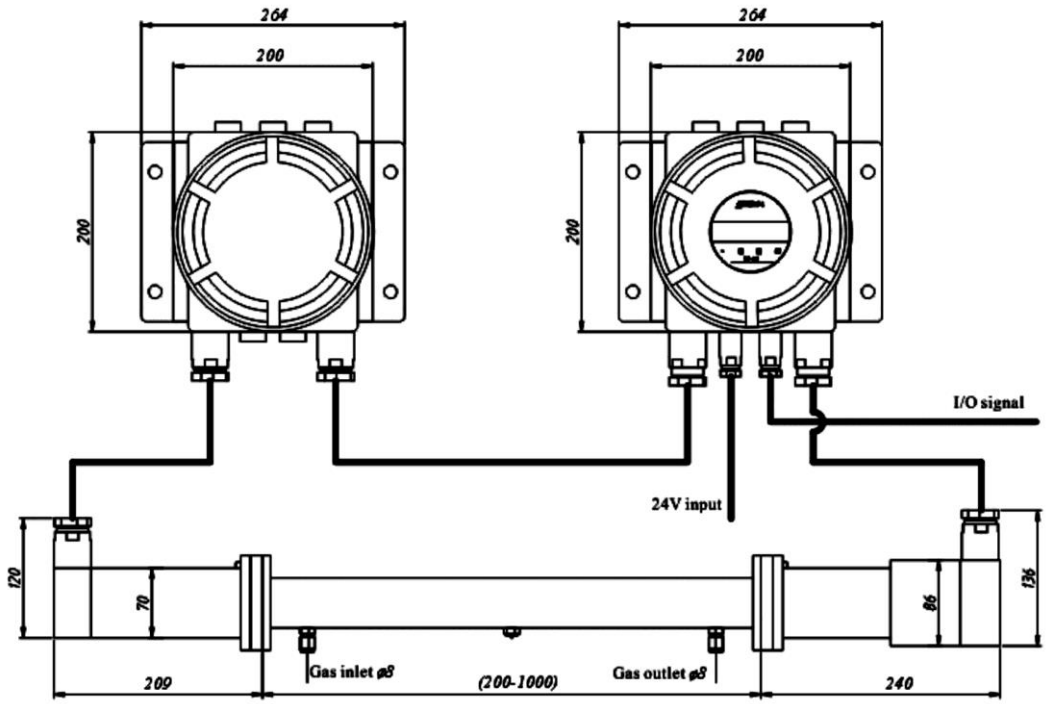


Figure 3-1: General Dimensions (mm) of the LGA4000Z Extractive

3.3 Gas Connections

CAUTION: THE STANDARD INSTRUMENT IS NOT DESIGNED TO HANDLE HAZARDOUS GASES. OPTIONS ARE AVAILABLE FOR USE WITH HAZARDOUS GASES.

CONTACT TAI CUSTOMER SERVICE FOR ADDITIONAL INFORMATION.

Gas connections are made to the 8mm gas fittings installed on the Sample Cell as shown in Figure 3-2. TAI recommends installing a particle filter on the inlet side to avoid possible deposition on the transmitter windows. The gas path should be as short as possible and pressure and flow regulated to 15-20 psig and 2-5 slpm.

Table 3.1 Lists the recommended pressure and temperature for sample (and calibration), and purge gas.

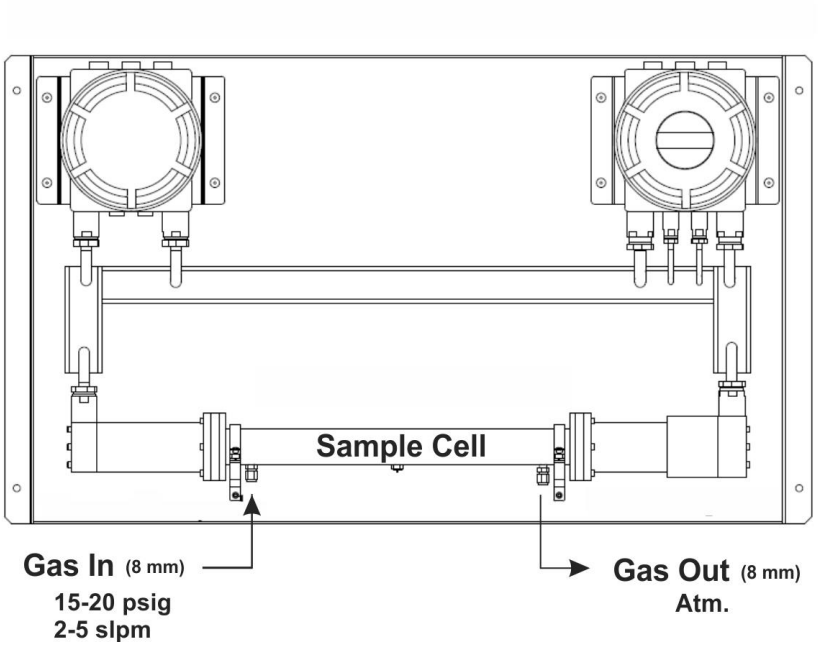


Figure 3-2: Gas Connections

Table 3-1: Recommended Specifications for Sample/Purge Gas

Items		Unit	Recommended level or range	Maximum level allowed
Sample gas	Pressure	bar	0.8~1.2	1.2
	Flow rate	L/min	0.5~5	5
	Temperature	°C	RT~200	200
Purge gas	Pressure	Pa	0~1000	1000
	Flow rate	L/min	0~5	5
Ambient temperature		°C	-20~60	60

3.4 Electrical Connections

The LGA4000Z Extractive Laser Gas Analyzer requires 24VDC power to operate. The instrument supports multiple input and output signal interfaces: relay alarm outputs (3), 4-20mA concentration outputs (2), pressure/temperature signal inputs, and RS485/RS232 protocol.

The connections are made to the three terminal strips inside the Transmitter Control Unit as shown in Figure 3-3. Power and signal feedthroughs are shown on Figure 3-4.

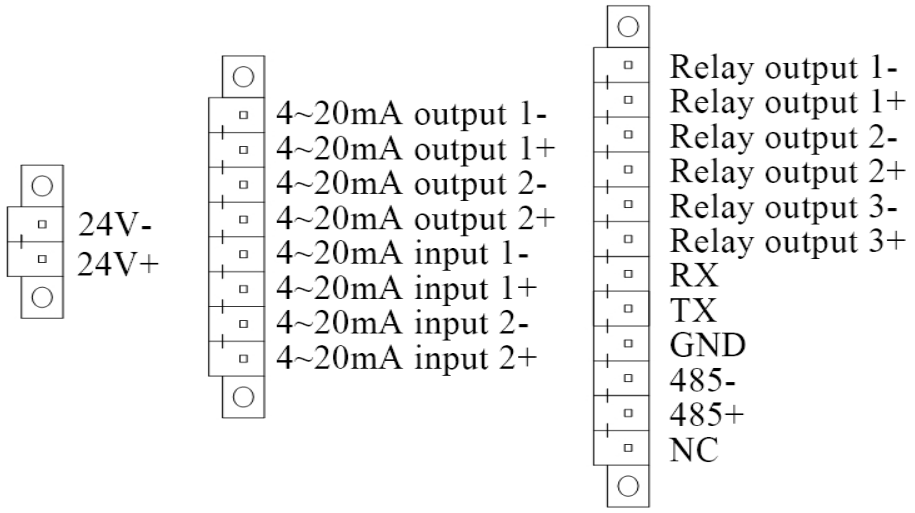


Figure 3-3: LGA4000Z Extractive Signal Interface Diagram

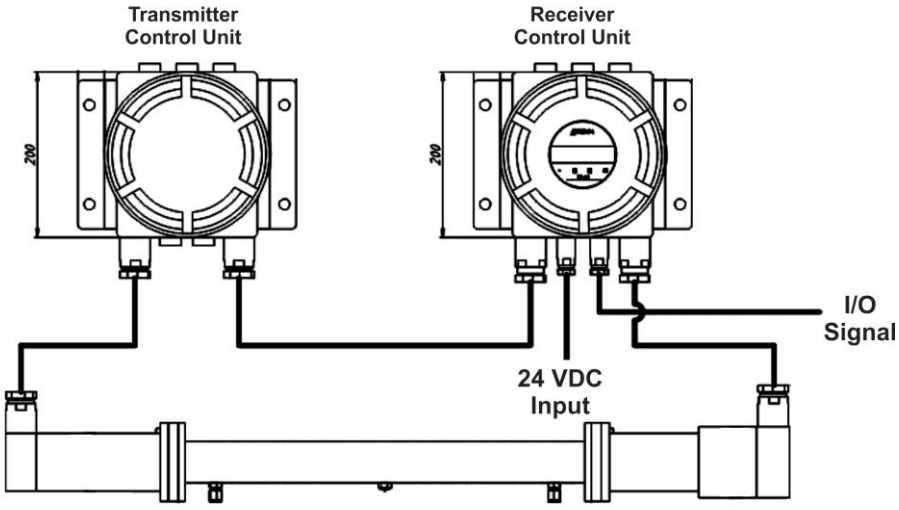
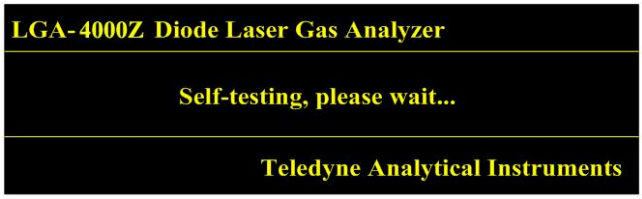


Figure 3-4: Power and Signal Connections

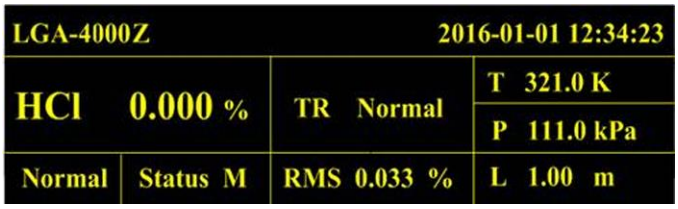
3.5 Powering Up

Before turning on the power supply, make sure the gas source, power supply, and wiring are correct.

As soon as power is applied, the unit will power up. After an initial internal self-test routine (approximately 2 minutes), the OLED screen will automatically display the Measurement Screen which is the default or home screen during operation.



If a problem has been detected during power up, the Alarm screen will display with a code indicating the specific fault encountered. Refer to Section 5 Alarms for information regarding the alarm codes.



Operation

The executable embedded program performs signal processing and data analysis, manages system I/Os including keypad input operations and display, and runs system self-test, calibration, and alarms. It also establishes data communication with a PC through an RS485/RS232 serial communication port.

4.1 Front Panel

The operator interface panel for the LGA4000Z Extractive is located on the Receiver Control Unit and consists of the OLED display and a magnetic 4-key panel that is operated using the magnetic pen. The OLED screen displays system information as described in the following sections. The keypad is used to carry out all user operations such as setting alarm parameters, setting environment temperature and pressure, setting the optical path length, doing system calibration, etc. The interface panel is showed in Figure 4.1.

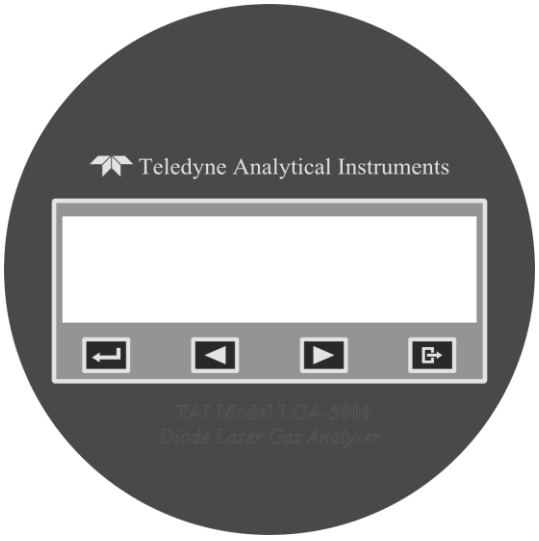


Figure 4-1: LGA4000Z Extractive Interface Panel

The keypad is comprised of 4 keys:

ENTER (↵): Used to enter a menu or confirm data input. Every digit input must be confirmed by using this key.

LEFT (◄): Move up or move left

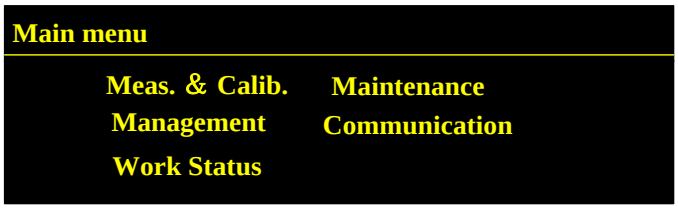
RIGHT (►): Move down or move right

ESC: Used to exit a sub menu and go back up the menu, or to cancel the input data.

The LGA4000Z Extractive uses a magnetic pen for activating the keys on the keypad. A brief touch with the magnetic pen on the key will activate the function assigned to that key.

4.2 Modes of Operation

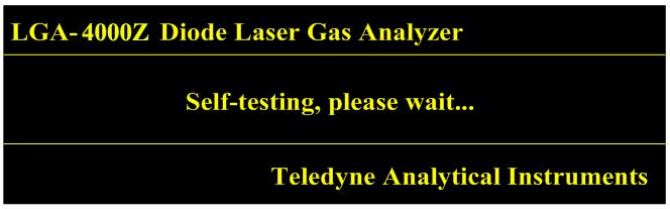
In addition to the power up sequence which includes the self-testing routines, the LGA4000Z Extractive has five primary modes of operation available from the main menu. An alarm mode is also present which is an information only screen and only appears during an alarm condition.



- Measurement & Calibration
- System Management
- Alarm
- Work Status
- Maintenance
- Communications

4.2.1 Self-Test

When the power on is turned on, the instrument enters into a brief (2 min) self-testing routine, to verify the working condition of each function. The first screen that appears displays the company name and instrument.



If self-testing succeeds, the instrument enters the Measurement Mode and displays the measurement screen as shown in Figure 4-2. If a problem is encountered, the Alarm Mode is activated and an alarm screen is displayed as shown in Figure 4-3.

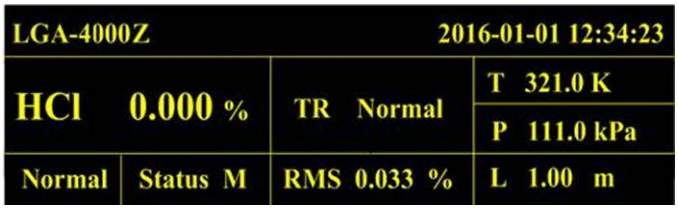


Figure 4-2: Main Measurement Display

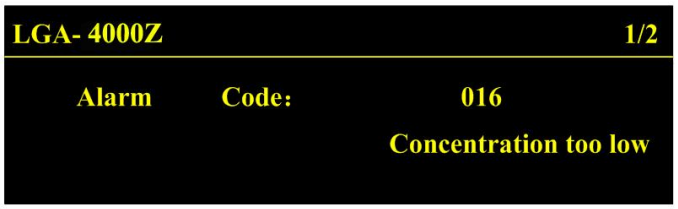


Figure 4-3: Alarm Screen

4.2.2 Measurement Mode and Screen Display

The measurement screen displays eight items shown and described below.

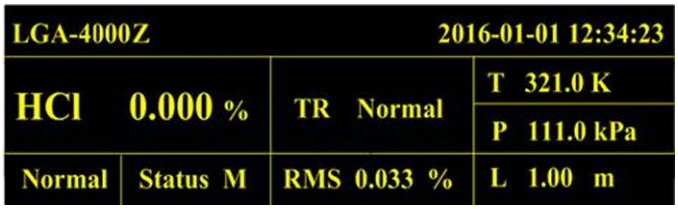
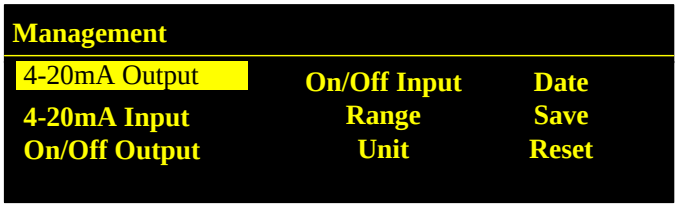


Table 4-1: Items Appearing on Measurement Screen

Item	Function
Gas concentration	The average concentration of measured gas.
Transmittance (TR)	Ratio of light intensity measured by receiver unit to the light intensity emitted from transmitter unit.
Normal/Alarm	Working mode.
Status	Measurement or calibration.
RMS	Root Mean Square
Temperature (T)	The temperature of the gas.
Pressure (P)	The pressure of gas.
Length (L)	Path length (distance the laser beam pass through the gas).

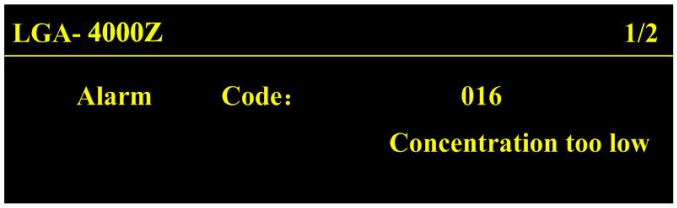
4.2.3 System Management Mode

In this mode the user can set the various parameters that affect the operation of the unit such as: alarm setpoints, input/output parameters, analysis range, etc. The System Management functions will be described in Section 4.6.



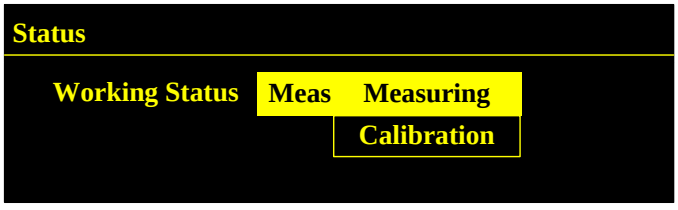
4.2.4 Alarm Mode

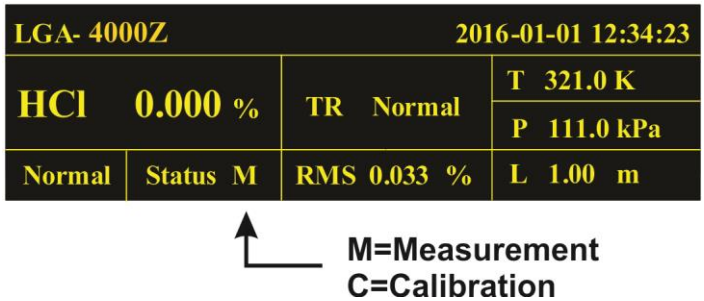
If the self-test routine encounters a problem or if the concentration of the measured gas exceeds (or falls below) a user defined setpoint, the instrument enters the Alarm Mode. The various alarm codes are described in Section 5 Alarms.



4.2.5 Status Mode

This mode allows the user to select whether the instrument is to be used for normal measurement or is to be calibrated.

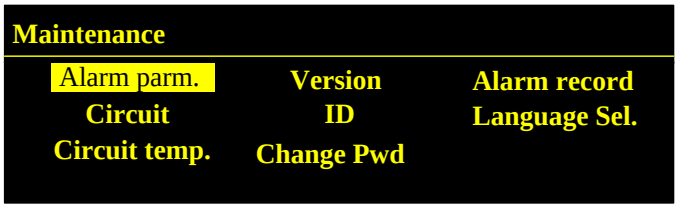




Depending on the selection either an ‘M’ (measurement) or ‘C’ will appear in the status field of the Measurement Screen.

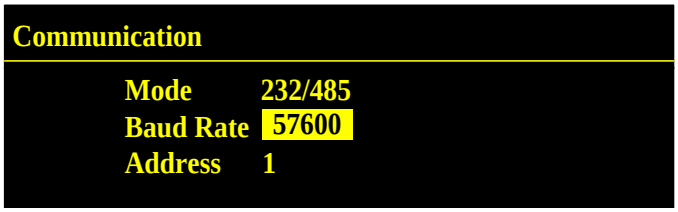
4.2.6 Maintenance Mode

In this mode the user can make changes to the alarm settings, change the password, select the language for display, and view circuit details, alarm record, and the version ID. See Section 4.8 for specific procedures.



4.2.7 Communication Mode

In this mode the user can specify the type of digital communication port used (RS232/RS485) and set specific parameters for communication with a remote computer.



4.3 Menu Hierarchy

The various functions and displays for the LGA4000Z Extractive are grouped into the five modes as described above and accessed through the Main Menu. You can display the Main Menu at any time by tapping ESC on the key pad with the magnetic pen. Depending on the active screen, you may have to press ESC several times to escape up to the Main Menu.

Figure 4-4 lists the functions available in each operational mode. These functions and displays will be described in subsequent sections.

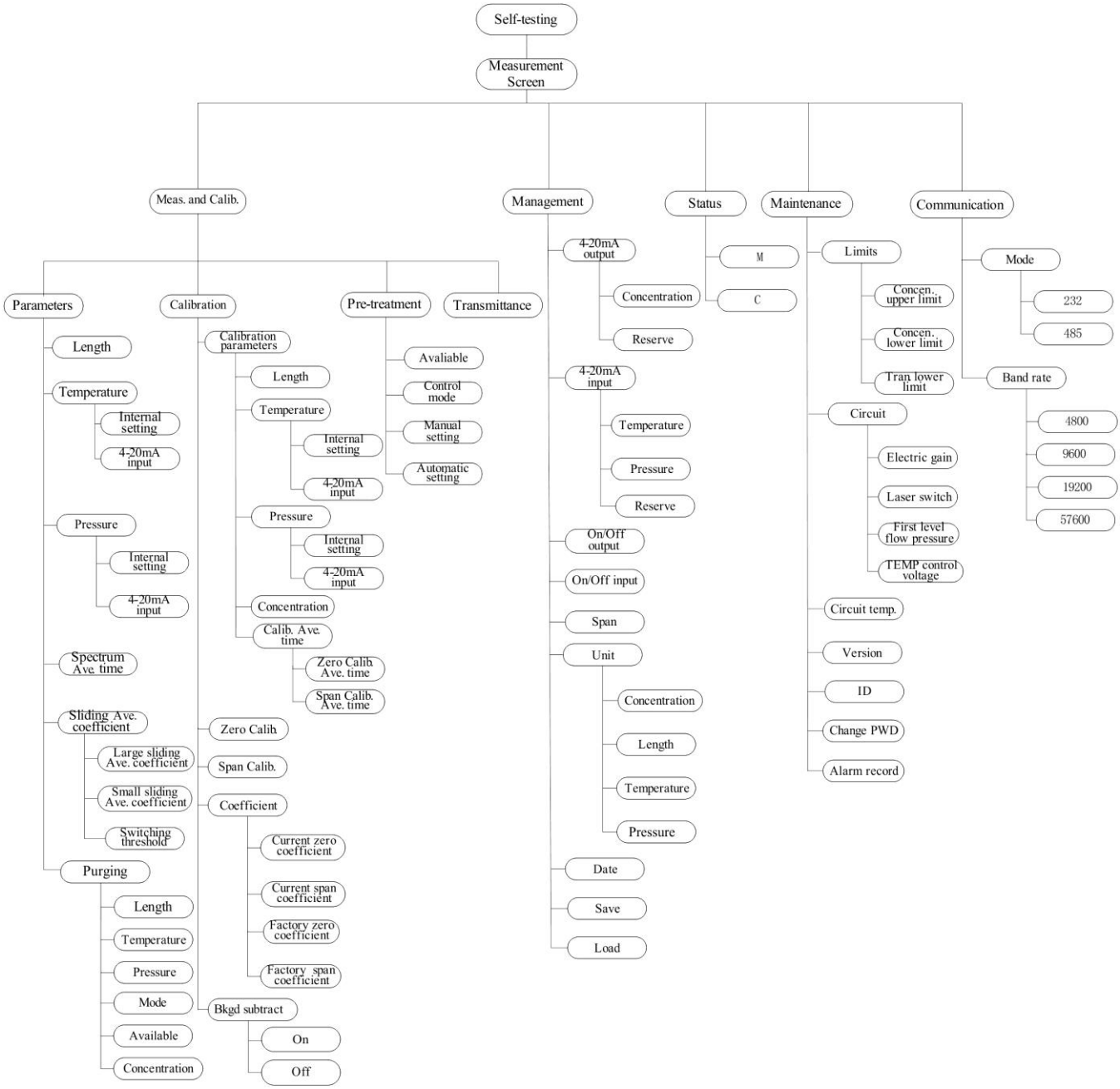


Figure 4-4: Function Hierarchy

4.4 Password

After entering into the main screen you will be asked to enter a password before you can access any other function. The default password is set at the factory to "1122". See Section 4.8.5 for information on how to change the password.

To enter the password, use the pen and tap ENTER. A numerical keyboard will appear where you can use the ◄/► keys to enter the password. Remember to touch ENTER after each digit. After the last digit, tap ENTER again to enter the password.

4.5 Measurement and Calibration Menu

After entering the correct password in the Main Menu screen, use the◄/► keys to move the highlight to Meas & Calib. and then tap ENTER. The measurement and calibration menu will appear.

The available functions on this screen include Measurement Parameters, Calibration, Pre-treatment, and Transmittance

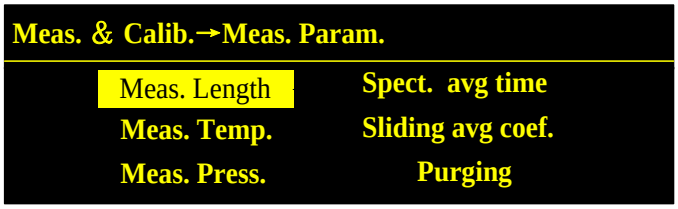
4.5.1 Measurement Parameters

You can use the functions in this menu to set path length, temperature, pressure, spectrum average time and sliding average time. A sixth function (purging) is only used for the oxygen version of the LGA4000Z Extractive.

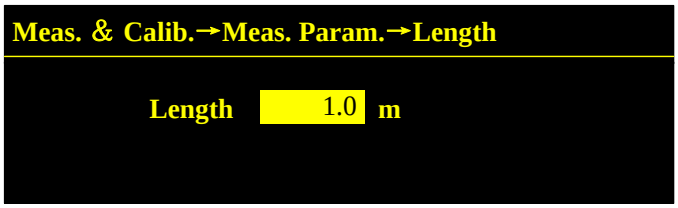
4.5.1.1 MEAS. LENGTH (PATH LENGTH)

This function is used to set the path length of the laser light.

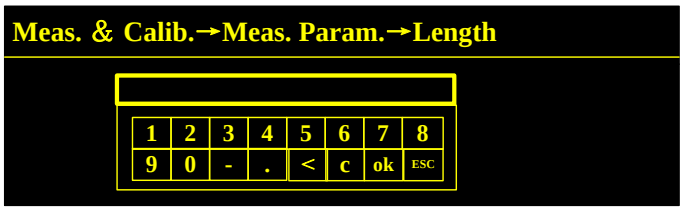
Use the ◄/► arrow keys to move the highlight to Meas. Param. and then touch ENTER to bring up the following screen:



With the highlight on Meas. Length, touch ENTER again and the Length screen will appear.



Touch ENTER again and a numerical input keyboard will appear where you can input the proper value. Touch OK and then ENTER to save or ESC to cancel.



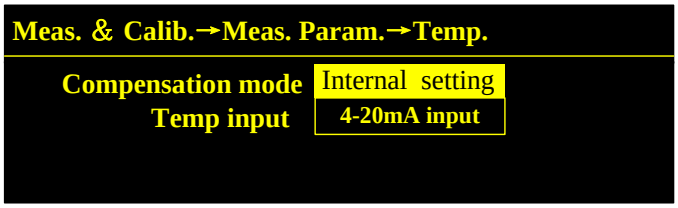
4.5.1.2 MEAS. TEMP.

The temperature value used for temperature compensation in the analysis can be either from a 4-20 mA input or, if the temperature fluctuation is known to be small, by a fixed value set by the operator in the Calibration Parameters screen. See Section 4.5.2.

This function allows the user to select whether the compensation is by an analog input or the fixed internal setting value.

Note: If temperature compensation is to be by analog input, please configure the 4-20 mA input parameters in the Management/4-20mA Input screen first. See Section 4.6.2.

Use the ◄/► arrow keys to move the cursor to Meas. Temp. and then touch ENTER to bring up the following screen:

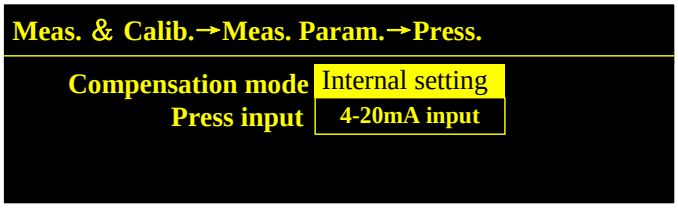


Use the ◄/► keys to position the highlight over the proper selection and then touch ENTER.

4.5.1.3 Meas. Press. (Pressure compensation or fixed input)

Similar to the Measure Temperature screen, the pressure value used for pressure compensation can be either from an analog 4-20 mA input or a fixed value set during calibration. Use the same procedure as for temperature compensation for selecting the pressure compensation.

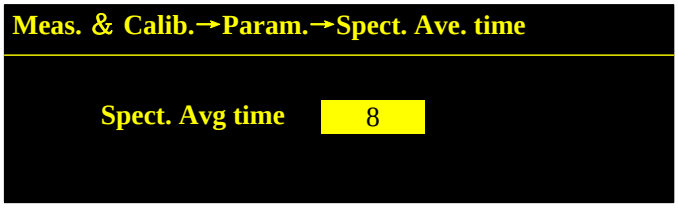
Note: If pressure compensation is to be by analog input, please configure the 4-20 input parameters in the Management/4-20 mA Input screen first. See Section 4.6.2.



4.5.1.3 SPECT. AVG TIME

Spectrum average time is the average sampling time spent analyzing the second harmonic. The possible values are 1-16.

Use the ◄/► arrow keys to select Spect. Avg Time from the Meas. Parameters menu and then touch ENTER. The following screen appears:



Touching ENTER again will bring up the numeric keyboard where you can use the ◄/► keys to enter the proper value. When finished, touch OK and then ENTER to save or ESC to cancel.

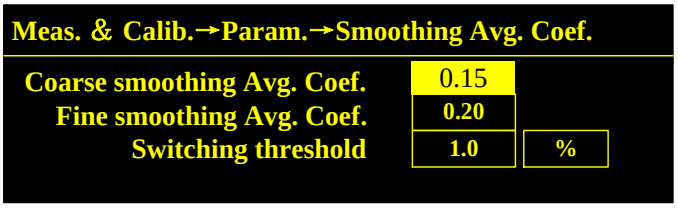
4.5.1.4 SMOOTHING AVG COEF.

Smoothing average coefficients (filtering coefficients) are divided into coarse smoothing average coefficient and fine smoothing average coefficient. These are on a scale of 0.1-1. When the measured value is greater than the switching threshold, the system will use the coarse smoothing average coefficient; otherwise, it will use the fine smoothing average coefficient. The formula and screen are shown below.

$$Conc = \alpha * C_{curr} + (1 - \alpha)C_{aver}$$

Table 4-2 Sliding Average Parameters

Parameter	Meaning
Conc	Concentration after smoothing.
C_{curr}	Present concentration
C_{aver}	Average concentration previously calculated
α	Smoothing average time



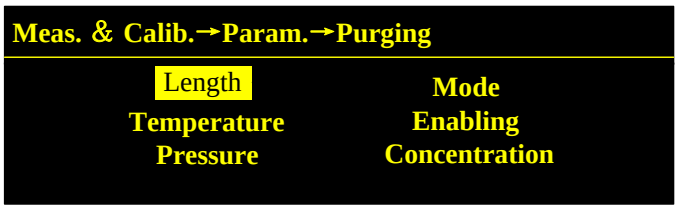
Use the ◄/► keys to select the parameter you want to change and tap ENTER. The numerical keyboard will appear allowing you to enter the desired value. Remember to tap ENTER after each digit is entered. When the value is correct, touch OK and then ENTER to save the value or ESC to cancel and return to the Smoothing Coefficient parameter selection screen.

4.5.1.5 PURGING

The purging function is only used in units configured to analyze oxygen concentration. It is typically a nitrogen flow that is used to remove oxygen from electronics sections including emitter, receiver, control boxes and portions of the optical path outside of the sample cell. It does not purge the sample cell. It is designed to remove optical interference from ambient air in those sections.

The function allows the user to set various purging parameters such as purge length, purge temperature, purge pressure, purge method, purge status and purge concentration settings, should purge gas itself contain certain known and constant amount of compound of interest.

Use the ◄/► keys to select the Purging function and then tap ENTER. The following screen will appear:

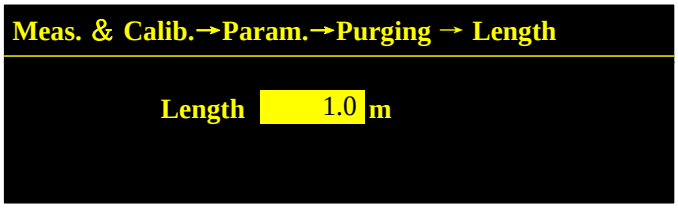


Using the ◄/► keys, navigate to the parameter of interest and tap ENTER.

Purge Length

Purge length means the length that the gas purges through the path. It can be set or changed from this screen.

With the highlight on Length, tap ENTER. The following screen will appear:



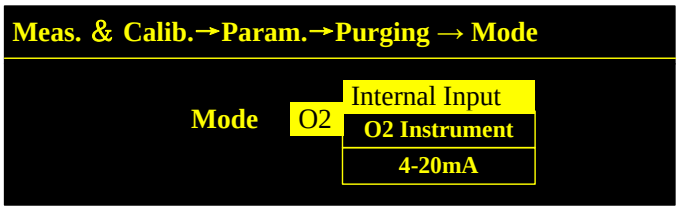
Tap ENTER to bring up the numeric keyboard and then use the ◄/► keys to input the purge length. Tap OK when the correct value is entered and then tap ENTER to save.

Purge Temperature and Purge Pressure

Purge Temperature and Purge Pressure parameters are set in the same way as Purge Length and analogous screens.

Purge Mode

The Purge Mode screen defines how the purge information is input to the analyzer. It can be via a manual input, directly from an Oxygen Analyzer, or by a 4-20mA input. Use the ◄/► keys to navigate to Mode and tap ENTER. The following screen is displayed:

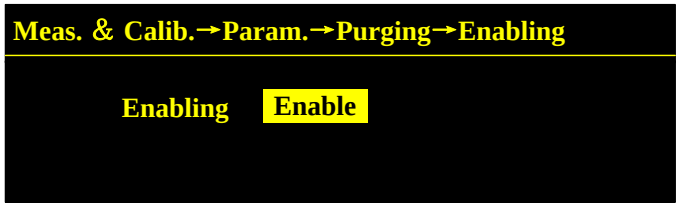


Use the ◄/► keys to highlight the desired option and tap ENTER. If Internal Input is selected, go to Concentration to set the purge concentration.

Purge Enabling

This option allows the user to turn purging on or off. Use the ◄/► keys to navigate to Enabling and tap ENTER. The following screen is displayed:

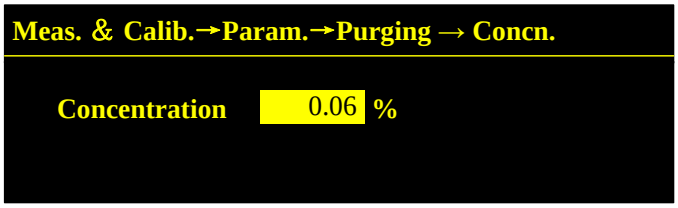
.



At the highlight, use the ◄/► keys to make the desired selection: Enable or Disable, and then tap ENTER.

Concentration

Use this screen to inform the analyzer the oxygen concentration of the purge gas. This is used in conjunction with the Internal Input mode for purging. Use the ◄/► keys to navigate to Concentration and tap ENTER. The following screen is displayed:



With the concentration field highlighted, tap ENTER to invoke the numerical keyboard. Use the ◄/► keys to enter each digit of the value tapping ENTER after each digit. Touch OK and then ENTER to save or ESC to cancel.

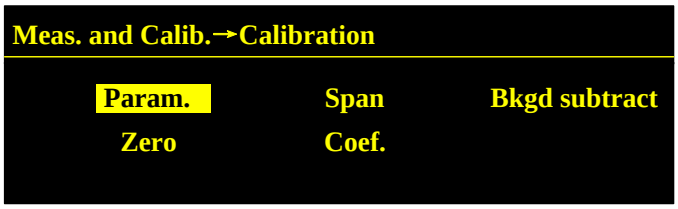
Purging parameters settings are only needed for laser oxygen analyzer.

4.5.2 Calibration Setting

The Calibration Setting menu and submenus allow the user to set the parameters to be used in zero and span calibration. Before calibrating, make sure the appropriate calibration gas is connected to the input port and the outlet is directed to a suitable exhaust vent. See Figure 3-2.

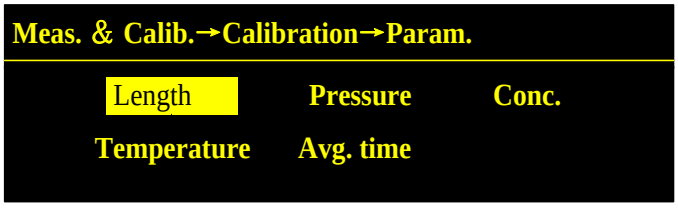
From the Meas. & Calib. main menu, use the ◄/► keys to move the highlight to Calibration and tap ENTER.

The following screen will appear:



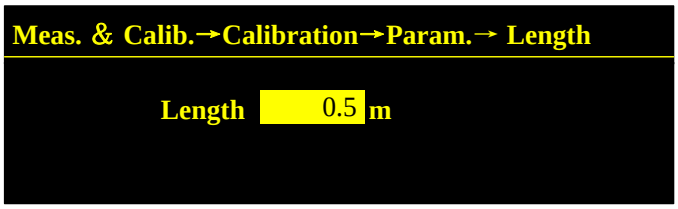
4.5.2.1 CALIBRATION PARAMETERS

You can use this function to set length, temperature, pressure, spectrum average time and concentration. The procedures are identical to those described in the Measurement Parameter Section 4.5.1.



Before calibrating, you will need to set calibration length, temperature and pressure. See section 4.5.1 and its subsections.

4.5.2.1.1 LENGTH



4.5.2.1.2 CALIBRATION GAS TEMPERATURE

As in the measurement parameters, the temperature value is used for temperature compensation in the calibration gas and can be from either a 4-20 mA input or, if the temperature fluctuation is known to be small, by a fixed value.

This function allows the user to select whether the compensation is by an analog input or the fixed internal setting value.

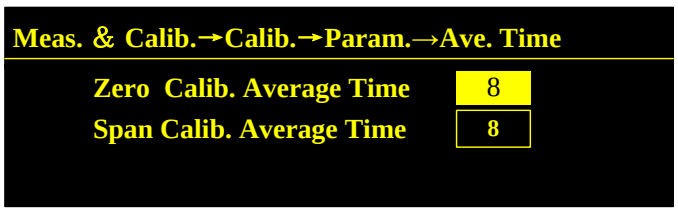
Note: If temperature compensation is to be by analog input, please configure the 4-20 input parameters in the Management/4-20mA Input screen first. See Section 4.6.2

4.5.2.1.3 CALIBRATION GAS PRESSURE

Pressure compensation in the calibration gas can also be input directly or by a 4-20 mA input. If via 4-20mA input, the input parameters must be established first as per Section 4.6.2.

4.5.2.1.4 CALIBRATION AVERAGE TIME

Calibration average time is the spectrum average time used in calibration. The range is 1-16 and the input screen is shown below.

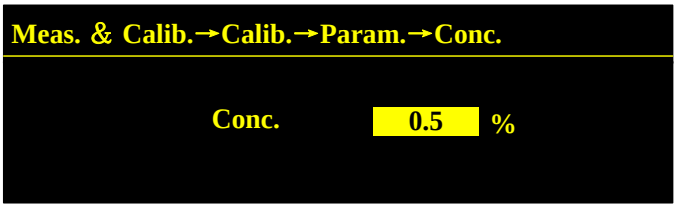


With the highlight on the value field, tap ENTER and the numerical keyboard will appear. Use the ◄/► keys to enter the zero calibration average time. Remember to touch ENTER after each digit. After the correct value has been entered, tap ENTER again and then OK to exit the screen and save the value.

Repeat the above procedure to enter the span calibration average time.

4.5.2.1.5 CONC.

Prior to performing a span calibration, the known value of the span gas concentration must be entered. To do this, enter the Meas. & Calib./Calib./Param. Menu as described in Section 4.5.2. Then use the ◄/► keys to move the highlight to Conc. and tap ENTER.

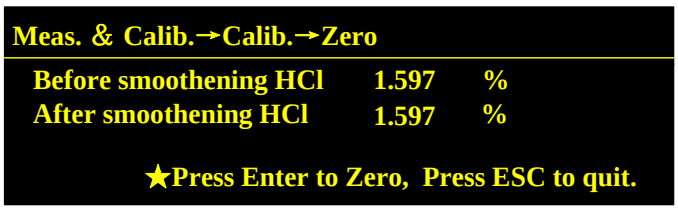


Here you can enter the calibration concentration. With the highlight on the value field, tap ENTER and a numerical keyboard will appear. Use the ◄/► keys to enter the span gas concentration. Remember to touch ENTER after each digit. After the last digit, tap ENTER again and then OK to enter the correct value.

4.5.2.2 CALIBRATION

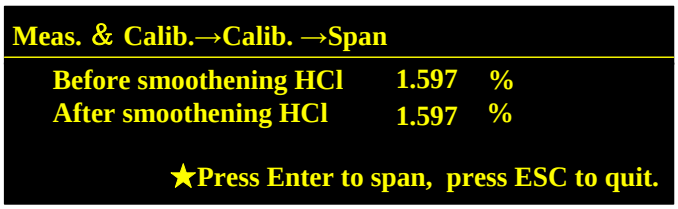
When calibrating the instrument always perform a zero calibration first followed by span calibration. The calibration parameters must be set properly prior to calibration.

Enter the Calibration function from the Meas. & Calib. Menu. The following screen appears:



When preparing to do a zero calibration, allow the zero gas (high purity nitrogen 99.99% or better) to purge the sample cell for a few minutes. After the concentration has stabilized at or near zero, use the magnetic pen to tap ENTER to begin the zero calibration or ESC to cancel.

Repeat the procedure for the span calibration. Make sure the reading has stabilized before you tap ENTER to begin the calibration.

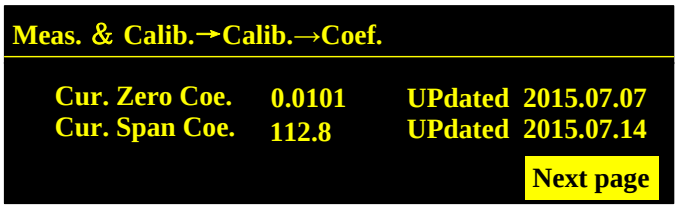


4.5.3 Calibration Coefficients

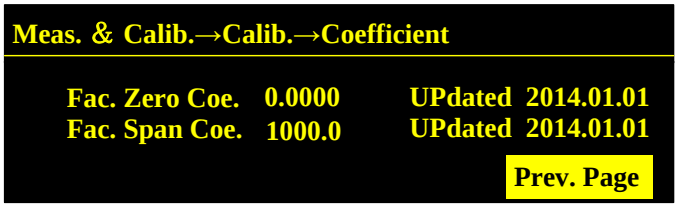
Both the user set calibration coefficients and the factory set calibration coefficients are saved. You can view these values as well as the last update date from the Coef. Screen accessible from the Calibration Menu.

To do this, enter the Meas. & Calib./Calib. Menu as described above. Then use the ◄/► keys to move the highlight to Coef. and tap ENTER.

The first of two screen will appear. The first screen displays the current calibration coefficients and the date they were last updated.



To view the factory set calibration coefficients, tap ENTER. The following screen will appear:



The calibration coefficients can be reset back to the factory default values from the Management Main Menu using the Restore function. See Section 4.6.8.

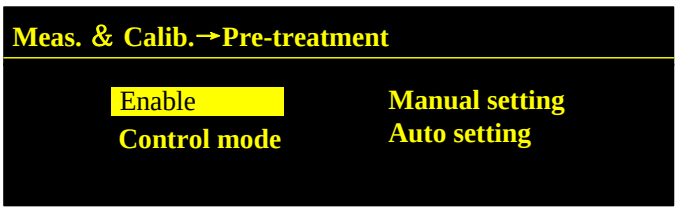
4.5.4 Pre-treatment

The Pre-Treatment function is a group of four sub functions that allows the user to enable and control a blowback probe cleaning cycle. It can be:

- Enabled or disabled
- Manual or automatic

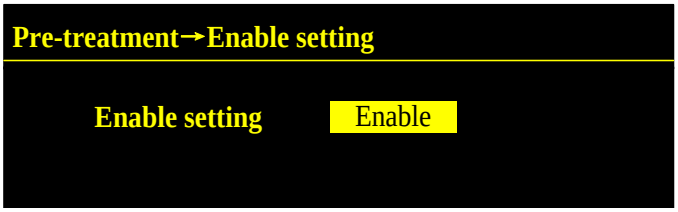
To activate this function, enter the Meas. & Calib main menu and then with the ◄/► keys move the highlight to Pre-Treatment and tap ENTER.

When selected, the following screen appears:



4.5.4.1 ENABLE/DISABLE

This screen allows the user to turn on or off the blowback pre-treatment feature. Use the ◄/► keys plus ENTER to enter the Enable Setting screen.



Use the ◄/► keys and then ENTER to toggle between Enable or Disable.

When enabled, two relays control the solenoid valves (relay 1) and electric ball valve (relay 2). Refer to Figure 4-5. When disabled, these relays can be set to Alarm, Fault, or Transmittance Alarm.

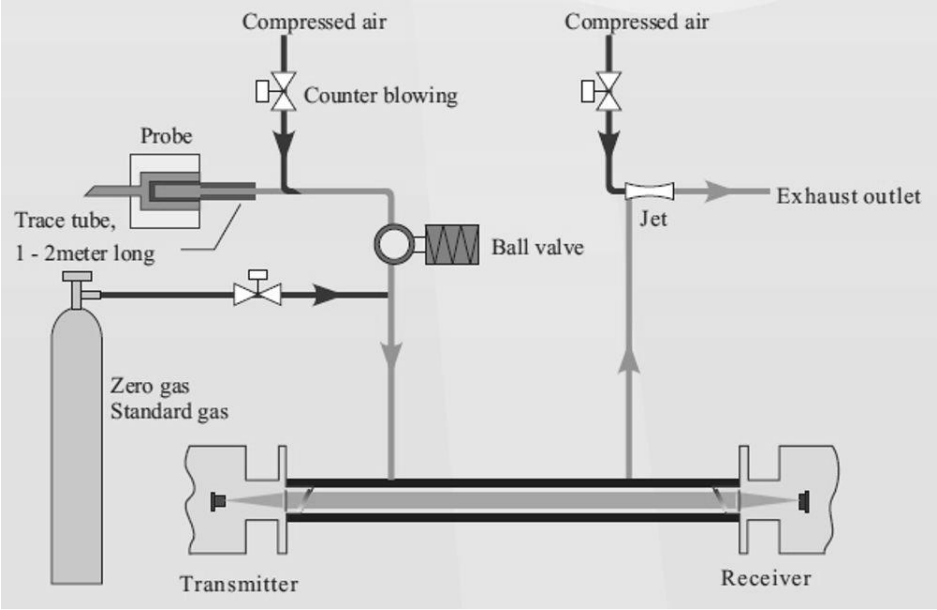
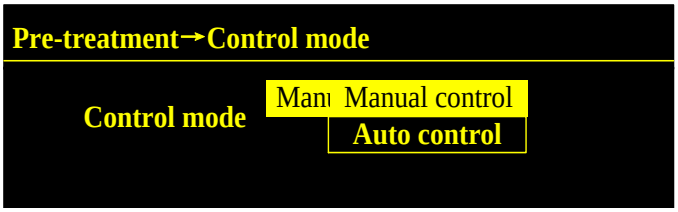


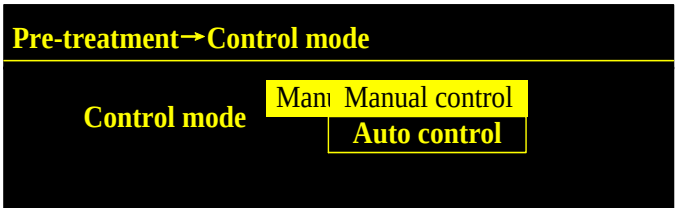
Figure 4-5: Blowback System Flow Diagram

4.5.4.2 CONTROL MODE

The Control Mode menu sets whether the blowback feature is controlled automatically or manually. Use the ◄/► keys plus ENTER to display the Control Mode screen.

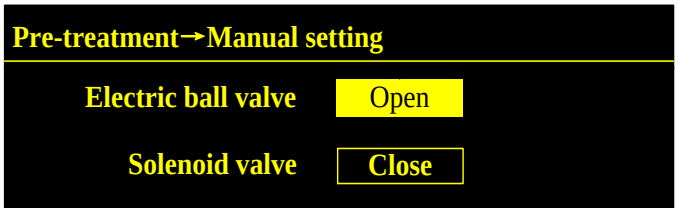


Use the ◄/► keys plus ENTER to toggle between Manual Control or Automatic Control.



4.5.4.3 MANUAL SETTING

With Manual Control chosen, the opening and closing of the solenoid valves and electric ball valve is handled within the following screen:

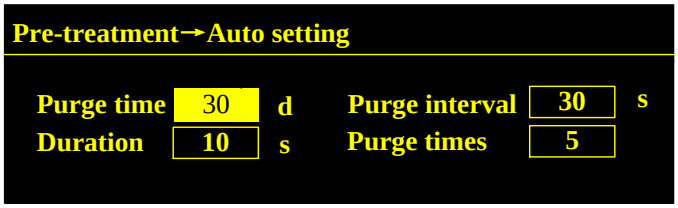


Use the ◄/► keys plus ENTER to toggle between Open and Close for each valve.

4.5.4.4 AUTO SETTING

If Automatic Control is chosen, after setting the purge time, duration, purge interval and number of purge sequences, the system will automatically invoke a blowback sequence according to the set paramaters.

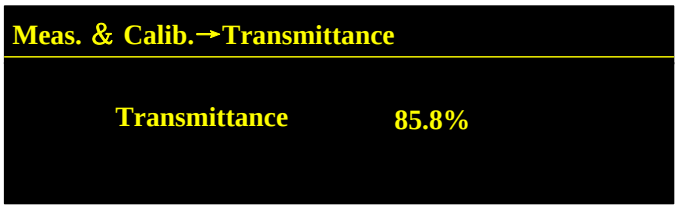
The Auto Control settings screen is shown below.



With the highlight on the value field, tap ENTER and the numerical keyboard will appear. Use the ◄/► keys to enter the desired value. Remember to touch ENTER after each digit. After the correct value has been entered, tap ENTER again and then OK to exit the screen and save the value. Repeat for each value field in the Auto Control Setting screen.

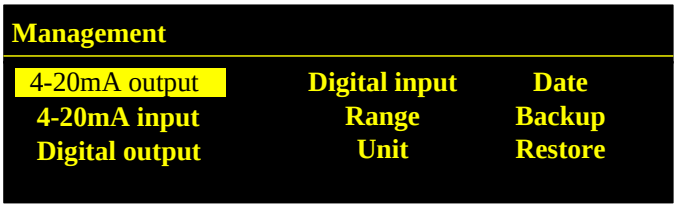
4.5.5 Transmittance

The Transmittance function is a read only display of the current value of transmittance.



4.6 System Management

The System Management functions are used to configure the analog and digital input/output features of the analyzer. It also includes backup and restore functions. The System Management main screen is shown below:

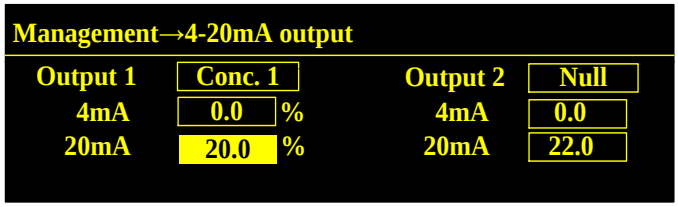


4.6.1 4-20 mA Output

This function allows the user to set the concentration associated with the analog 4-20 mA output. There are two 4-20 mA outputs either of which can be set to Conc. (concentration), TR (Transmittance) or Null (not used).

Note: When setting the concentration associated with the 4-20 mA ouput, make sure that the 4 mA concentration is less than the 20 mA setting, otherwise, an error will occur.

Use the ◄/► keys plus ENTER to display the 4-20mA Output screen.



Use the ◄/► keys plus ENTER to select the desired output field (Output 1 or Output 2). Use the ◄/► keys plus ENTER to toggle between Conc. and Null.

To set the concentration associated with the 4 mA and/or 20 mA output, highlight the field and tap ENTER. The numerical keyboard will appear. Use the ◄/► keys to enter the desired value.

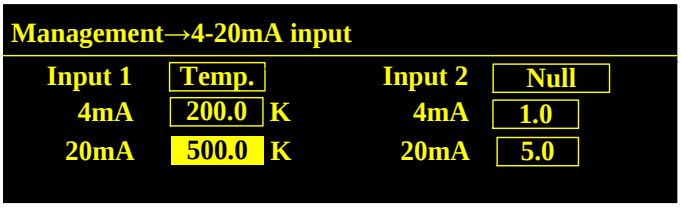
Note: The concentration value must be in units of %, ppm, mg/m^3, or g/m^3 whichever has been set in the Management/Unit screen. See Section 4.6.5.

Remember to touch ENTER after each digit. After the correct value has been entered, tap ENTER again and then OK to exit the screen and save the value. Repeat for each value field in the 4-20 mA Output screen.

4.6.2 4-20 mA Input

The LGA4000Z Extractive uses two separate 4-20 mA inputs for manually entering temperature and pressure into the analyzer.

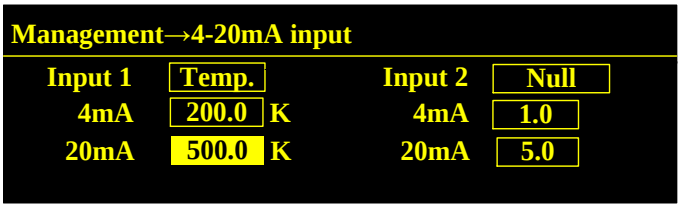
Use the ◄/► keys plus ENTER to display the 4-20mA Input screen.



Use the ◄/► keys plus ENTER to select the desired input field (Input 1 or Input 2). Use the ◄/► keys plus ENTER to toggle between Temp., Press., or Null.

To set the value associated with the 4 mA and/or 20 mA input, highlight the field and tap ENTER. The numerical keyboard will appear. Use the ◄/► keys to enter the desired value.

The units used must the same units as set in the Management/Unit screen. See Section 4.6.5.



Remember to touch ENTER after each digit. After the correct value has been entered, tap ENTER again and then OK to exit the screen and save the value. Repeat for each value field in the 4-20 mA Input screen.

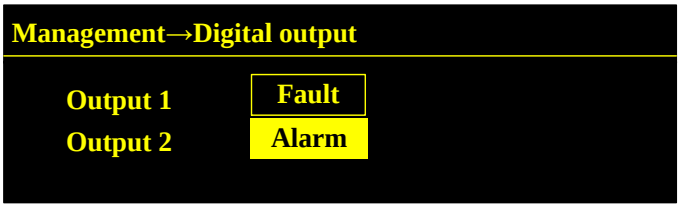
4.6.3 Digital Output

There are two configurable digital outputs in the LGA4000Z Extractive and they can be set for Alarm, Fault, or Null. These are used by the following functions:

- Concentration
- Zero Calibration
- Span Calibration
- Transmittance

In the Alarm mode, a corresponding relay will change state with an onscreen indication of Alarm. In the Fault mode, only an onscreen Fault Alarm will display.

From the System Management screen, use the ◄/► keys plus ENTER to display the Digital Output screen.

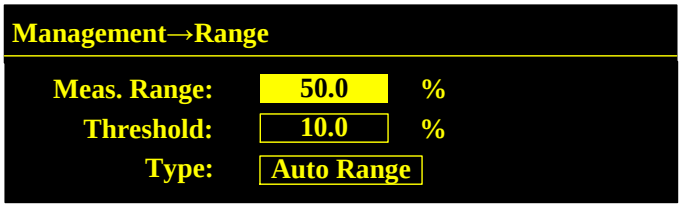


Use the ◄/► keys to toggle each output between Alarm, Fault, or Null and then tap ENTER.

4.6.4 Range

The instrument range can be set by the user from this screen. When the measured value is outside a permissible range, an alarm will occur.

From the System Management screen, use the ◄/► keys plus ENTER to display the Range screen.



To set the range highlight the Meas. Range field and tap ENTER. The numerical keyboard will appear. Use the ◄/► keys to enter the desired value.

The units used must the same units as set in the Management/Unit screen. See Section 4.6.5.

Repeat to set the Threshold value (value above which an alarm will occur).

Note: The current version of the LGA4000Z Extractive is a single range instrument and does not include the AutoRange feature. Please set the Type field to Manual Range.

4.6.5 Units

In this function, the user can set the units used and displayed for various functions and screens. The configurable units are:

- Concentration: ppm, %, mg/m^3, g/m^3.
- Length: m.
- Temperature: °C, K, °F.
- Pressure: bar, MPa, kPa.

To select or change units, navigate to the System Management screen, then use the ◄/► keys plus ENTER to display the Units screen.

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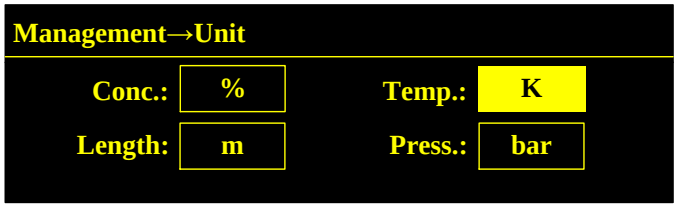
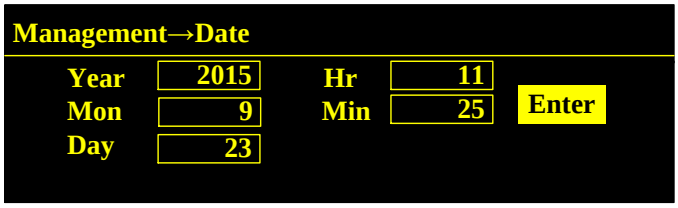


To set or change a unit, highlight the specific field and tap ENTER. The numerical keyboard will appear. Use the ◄/► keys to toggle between the available units. The chosen unit will be displayed on all screens that the field applies to. For instance, if % is chosen for the concentration unit, all calibration and measurement screens that display or require an input will show % as the current unit.

4.6.6 Date/Time

You can set the date and time from the Management/Date screen.

To view or change the current date and time, navigate to the System Management screen, then use the ◄/► keys plus ENTER to display the Date screen.

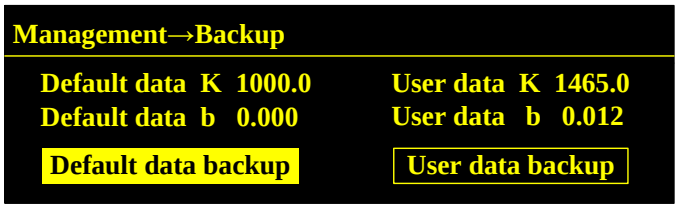


To set the date and/or time, highlight the specific field and tap ENTER. The numerical keyboard will appear. Use the ◄/► keys to enter the desired value.

Remember to touch ENTER after each digit. After the correct date or time has been entered, tap ENTER again and then OK to exit the screen and save the value. Repeat as required for each value field in the Date screen.

4.6.7 Backup

This function is used to back up specific settings and data used in the various functions of the analyzer. The Backup screen displays the default data and the current user defined data as shown in the screen below. The backup can be used to restore the parameters to either default condition or to the last saved user defined settings, should settings get lost accidently or a new calibration is found to be less desirable than an older one.



To backup either the default settings or the current user settings, use the ◄/► keys plus ENTER to highlight your choice and then tap ENTER. The current backup will be available to return the analyzer to the default or the saved user configuration.

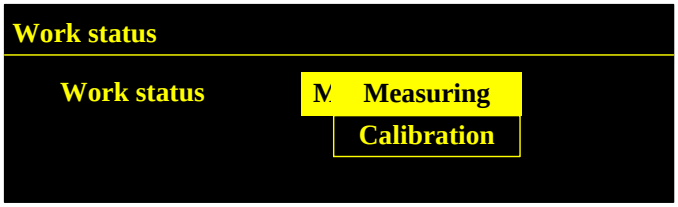
4.6.8 Restore

This function is used to restore the analyzer to its default configuration or the last saved user configuration. For instance if you are not satisfied with a calibration result and cannot achieve a better result for the moment, you can restore the zero and span calibration coefficients using this function.

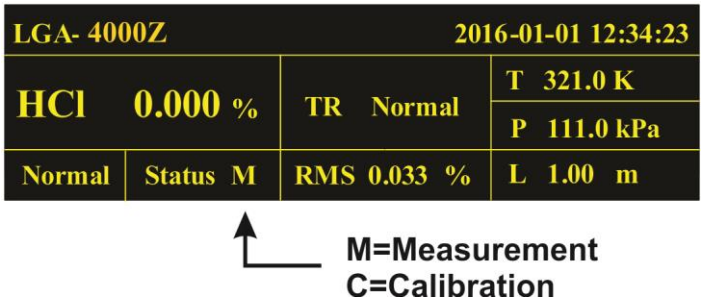
To restore either the default data or the previously saved user data, use the ◄/► keys plus ENTER to highlight your choice and then tap ENTER.

4.7 Work Status

Work status is used to set the analyzer for measurement or calibration.



When calibrating, use the ◄/► keys plus ENTER to select Calibration as the work status. A “C” will appear in the Status block of the main measurement screen. Select Measuring when the analyzer is to be performing analysis. “M” will appear in the Status block



4.8 Maintenance Menu

The Maintenance menu contains functions for setting and reading alarm parameters including alarm record, circuit parameters, version, ID and password maintenance.

Use the ◄/► keys plus ENTER from the Main Menu to select Maintenance. The following screen will appear:

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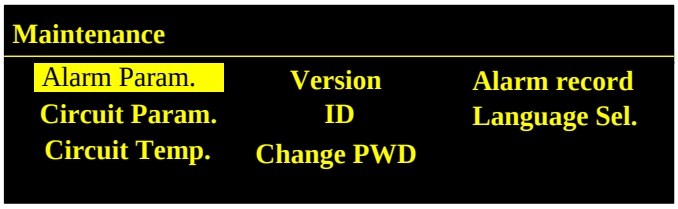
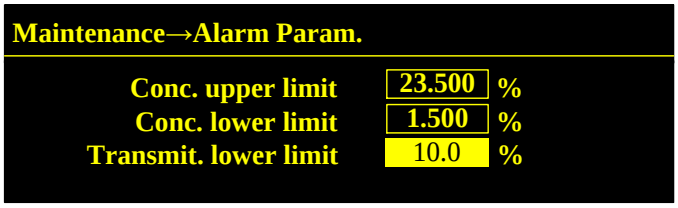


4.8.1 Alarm Parameters

In alarm parameters interface, you can enter the maximum and minimum concentration setpoints and the minimum transmittance. When the concentration is out of range, the concentration alarm will trigger. If the transmittance is below the value set in this function, a Transmittance alarm will occur. The alarms can cause relays to change state or to just indicate an alarm condition on the measurement screen depending on how the digital Outputs have been set. See Section 4.6.3 Digital Ouput.

Use the ◄/► keys plus ENTER to select Alarm Param. From the Maintenance menu. The following screen will appear:



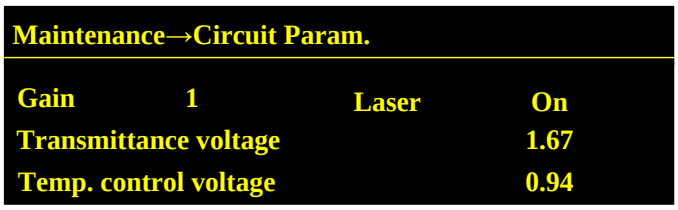
Use the ◄/► keys to move the highlight to the parameter you desire to change and then press ENTER. The numerical keyboard will appear. Use the ◄/► keys to enter the desired value. Note that the specific units used are configurable from the Units function. See Section 4.6.5.

Remember to touch ENTER after each digit. After the value has been entered, tap ENTER again and then OK to exit the screen and save the value. Repeat as required for each value field in the Alarm Parameters screen.

4.8.2 Circuit Parameters

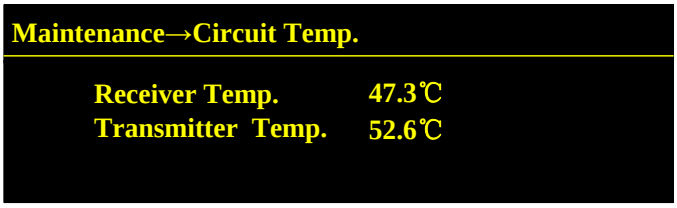
The circuit parameter screen is an information only screen with no user settable fields. It lists the gain, transmitter voltage, temperature controller voltage, and displays the ON/OFF status of the laser.

Use the ◄/► keys plus ENTER to select Circuit Param from the Maintenance menu.



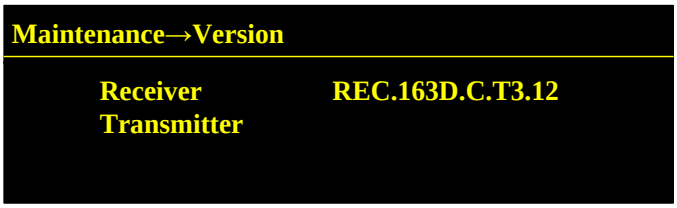
4.8.3 Circuit Temperature

The circuit Temperature screen is also an information only screen with no user settable fields. It displays the Receiver and Transmitter temperature in the units that have been set in the Units function. See Section 4.6.5 Units.



4.8.4 Version and ID

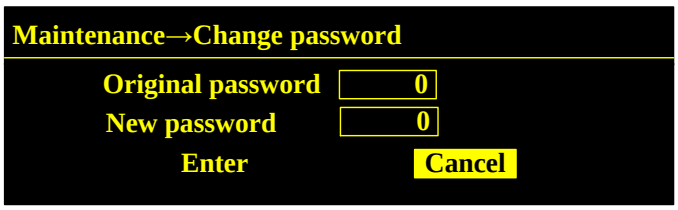
The Version and ID screens are information only screens that identify the Receiver, Transmitter, and unit ID.



4.8.5 Change Password

A password is required to make any changes that affect the analyzer. The unit is shipped with a default password of "1122". You can reset the password to a four digit entry of your choice from this function.

To change the password you will need to enter the existing password and then the new password. Use the ◄/► keys plus ENTER to select Change Password from the Maintenance menu.



With the ◄/► keys, highlight the Original Password field and then tap ENTER. The numerical keyboard will appear. Use the ◄/► keys to

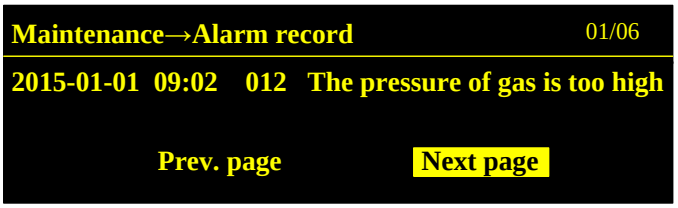
enter the original password one digit at a time. Remember to touch ENTER after each digit. After the original password has been entered, tap ENTER on the keyboard and then OK to exit the keyboard screen.

Repeat the above procedure for the new password. When finished, tap ENTER again to save the new password.

4.8.6 Alarm Record

The LGA4000Z Extractive can store the last six triggered alarms. The screen includes the analyzer ID (serial number), date and time of occurrence, alarm identification and a brief description of the alarm.

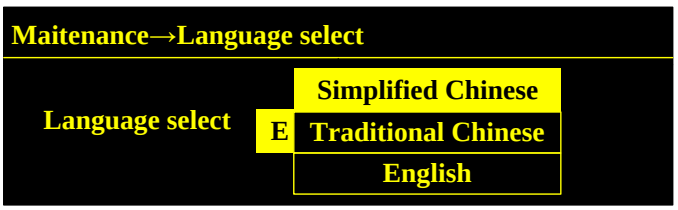
To review the alarm record, use the ◄/► keys plus ENTER to select Alarm Record from the Maintenance menu.



Use the ◄/► keys plus ENTER to navigate back and forth between pages. Tap ESC when finished to return to the Maintenance main menu.

4.8.7 Language

The LGA4000Z Extractive interface is available in the following languages: English, Simplified Chinese and Traditional Chinese. To change the language, use the ◄/► keys plus ENTER to select Language from the Maintenance menu.

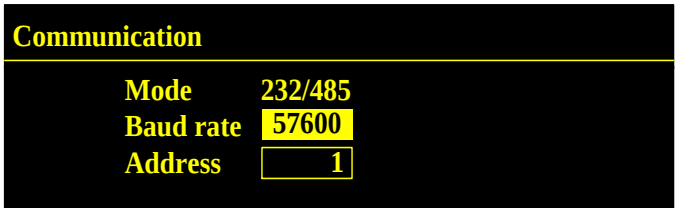


Then with the ◄/► keys, highlight the language of choice and tap ENTER.

4.9 Communication

Digital communication in the LGA4000Z Extractive is through an RS232/RS485 mode of transmission. The operator has the ability to select the baud rate and the address of the instrument.

To set the baud rate and address, from the Main Menu, use the ◄/► keys to highlight Communication and tap ENTER. The Communication screen will appear.



Use the ◄/► keys to navigate to the Baud Rate or Address screen and then tap ENTER. The numerical keyboard will appear. Use the ◄/► keys to enter the desired value.

Remember to touch ENTER after each digit. After the value has been entered, tap ENTER again and then OK to exit the screen and save the value. Repeat as required for each value field in the Communication screen.

Alarms

Whenever the unit encounters an alarm state, the alarm will be displayed on OLED screen along with a corresponding change in status of a relay output. The main alarm information is shown in table below. If an alarm condition cannot be solved using this table, please contact Teledyne Customer Service for additional help.

Table 5-1: Alarm Codes

Code	Definition	Possible Cause	Solution
005	Spectral line out of range	The wavelength is beyond the measurement range.	Contact Customer Service.
006	Purge concentration out of range	The concentration of detected gas in the purge gas is too high.	Check the concentration of detected gas in purge gas.
011	Gas pressure is too low	4-20mA input signal for pressure is less than 2mA.	Check the output current of pressure transmitter.
012	Gas pressure is too high	4-20mA input signal for pressure is above 22mA.	Check the output current of pressure transmitter.
013	Gas temperature is too low	4-20mA input signal for temperature is less than 2mA.	Check the output current of temperature transmitter.
014	Gas temperature is too high	4-20mA input signal for temperature is more than 22mA.	Check the output current of temperature transmitter.
015	Concentration is	The concentration of	Check if the

	too high	detected gas is above the maximum setpoint	setpoint is set too low.
016	Concentration is too low	The concentration of detected gas is below the minimum setpoint.	Check if the setpoint is set too high.
017	Gas concen-tration out of range	Gas concentration is out of range	Check the range setting is too low.
021	RTC error	RTC error in receiver	Contact Customer Service.
101	Transmitter temperature is too high	Transmitter temperature is above 85℃	Check whether the ambient temperature is above 70℃.
102	Transmitter temperature is too low	Transmitter temperature is lower than -40℃	Check whether the ambient temperature is below -50℃.
103	Receiver temperature is too high	Receiver temperature is above 85℃	Check whether the ambient temperature is above 70℃.
104	Receiver temperature is too low	Receiver temperature is below -40℃	Check whether the ambient temperature is below -50℃.
105	EEPROM communication abnormal	EEPROM malfunction	Contact Customer Service.
107	Laser temperature is too high	Laser temperature is above 50℃	Contact Customer Service.
108	Laser temperature is too low	Laser temperature is less than -10℃	Contact Customer Service.
109	The current of laser is high	The current of laser is above the maximum	Contact Customer Service.
110	The current of	The current of laser is	Contact Customer

	laser is too low	below the minimum	Service.
112	Internal communication abnormal	Internal communication signal interrupt	Contact Customer Service.
113	Transmission connecting abnormal	Fault in transmission connection	Contact Customer Service.
114	Internal signal error	Laser driving signal is abnormal	Contact Customer Service.
115	External signal error	External DA signal is abnormal	Contact Customer Service.
116	Temperature control abnormal	Temperature control malfunction	Contact Customer Service.
117	Temperature control abnormal	Temperature control feedback abnormal	Contact Customer Service.
118	Transmittance is too low	Gas pressure is too low, causing window contamination. The dust loading is too high in the measuring environment.	Check whether the window is coated or not.
119	Transmittance is too high	Transmittance signal is out of range	Contact Customer Service.
120	Measured signal is out of range	Measured signal is out of range.	Contact Customer Service.
121	DC signal abnormal	DC signal sampling abnormal.	Contact Customer Service.
122	Thermostat returns abnormal	Thermostat returns abnormal value	Contact Customer Service.

Contact Information:

Teledyne Analytical Instruments
16830 Chestnut Street
City of Industry, California 91748-1020, USA

Tel: 626-961-9221 or 626-934-1500
Fax: 626-961-2538 or 626-934-1651
Toll free: 888-789-8168
Email: ask_tai@teledyne.com

Maintenance and Calibration

6.1 Routine Maintenance

Aside from normal cleaning and checking for leaks at the gas connections, routine maintenance is limited to cleaning optical windows and recalibration.

6.2 Calibration

The LGA4000Z Extractive has been calibrated at the factory before delivery. There is no need to do a calibration prior to first use. However, with extended use of the instrument, the system parameters will drift and influence the accuracy of the measurement. Thus it is necessary to calibrate periodically (at least every 6 months).

The following procedure should be used to calibrate the LGA4000Z Extractive.

a. Replace the sample gas connection with a known zero gas at the Sample In port as shown in Figure 6-1. Use pure nitrogen as a zero gas.

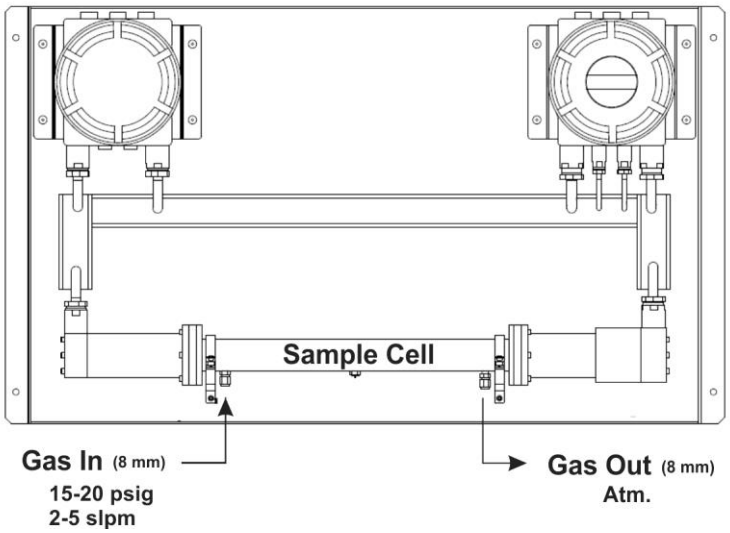
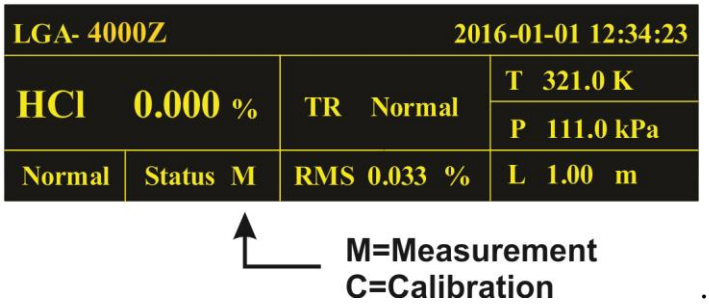


Figure 6-1: Sample/Calibration Gas Ports

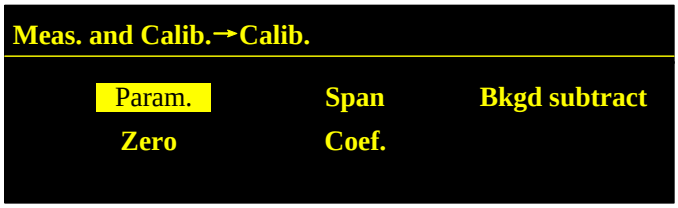
b. Power the unit on. If the self-test is successful and there are no alarms, go to the next step. Otherwise, refer to Table 5-1 for troubleshooting alarm and fault conditions.

c. Before flowing the zero gas, use the magnetic pen to input the password. Then, change the status from measurement to calibration in the Measurement screen.



d. Enter the Meas. & Calib./Calibration/Parameters menu (see Section 4.5.2) and check that the temperature, pressure, length and calibration concentrations have been set correctly.

e. Allow the zero gas (nitrogen purity is 99.99%) to flow into the sample cell. When the displayed concentration settles, enter into calibration setting interface to perform the zero calibration.

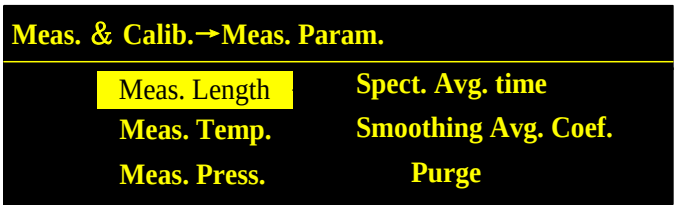


f. Replace the zero gas supply with the span gas supply at the Sample In port.

g. If the span settings are correct, allow the span gas to flow. When the reading is stable, enter into calibration setting interface to perform the span calibration.

h. After calibration has completed, go to the status field on the main measuring screen and return the Status to M (Measurement).

i. Review the temperature, pressure and length for the sample gas in the measurement parameters screen.



Contact Teledyne Customer Service with any issue or questions regarding the calibration process.

Appendix

A.1 Specifications

Analytical Performance

Linear Error:	≤ ±1% F.S.
Repetition:	≤ 1%
Span Drift:	≤ ±1%F.S. in 6 months
Maintenance Cycle:	≤ 2 times per year, clean optical window
Calibration Cycle:	≤ 2 times per year

Signal Interface

AO:	2×4-20mA output (isolated, max load 750Ω)
AI:	2×4-20mA input (TEMP. and PRESS. compensation)
Digital Output:	RS485/RS232/GPRS
Relay Output:	2 outputs (24V, 1A)

A.2 Recommended Spare Parts List

Qty.	P/N	Description
1	T1860	Transmitter module
1	DP30	Receiver module
1	P2123	Transmitter board
1	P2124	Receiver board
1	P2125	Temperature control board
1	P2126	Interface board
1	DP31	Display module,
1	T1853	Magnetic pen

Note: Orders for replacement parts should include the part number (if available) and the model and serial number of the instrument for which the parts are intended.

Orders should be sent to:

TELEDYNE Analytical Instruments

16830 Chestnut Street
City of Industry, CA 91749-1580

Phone (626) 934-1500, Fax (626) 961-2538

Web: www.teledyne-ai.com
or your local representative.

A.3 Reference Drawings

Refer to Addendum for reference drawing list. Drawings may be found at the back of the manual.