



ANALOX

looking after the air **YOU** breathe®

ANALOX 3D - Carbon Monoxide Detector

User Manual

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ANALOX 3D

1. GENERAL DESCRIPTION

- 1.1 The Instrument is designed to measure and indicate the concentration of Carbon Monoxide (CO) in the gas sample presented to its input port. The range of measurement can be specified by the user, but the present design is configured for 0 to 50ppm with a resolution of approximately 0.3ppm.
- 1.2 The Instrument is powered from an external supply having a voltage range from 9v to 26v. Current consumption is approximately 30 milliamps.
- 1.3 The Alarm circuit incorporates a low voltage relay which has 'volt-free' contacts, permitting connection of remote warning devices. The relay is configured in the 'Fail-Safe' mode - ie. it is energised in the Non-Alarm state and releases in any alarm condition or in the event of a power failure.
- 1.4 The Instrument is housed in an ABS box measuring 160mm x 80mm x 85mm - the entire electronics being built in the lid of the box, to permit easy installation and servicing.
- 1.5 CO concentration is measured using an Electro-Chemical sensor followed by high grade amplification. The resultant electrical signal is then passed to a Microprocessor, which carries out the following functions:
 - a. Linearisation of the signal using Calibration constants.
 - b. Conversion of the signal into a form, suitable for the Instrument Display.
 - c. Monitoring for an Alarm condition with reference to a preset level.
 - d. Provide facilities for Audible and Visual Gas Alarms.
 - e. Provide Simple means of user Calibration.
 - f. Provide Authorised Personnel access to change the Alarm Setpoint.

OPERATION

2.1 SWITCHING ON

When the Instrument is first switched on, it carries out a self test procedure and during this operation, the Display will show the word ' tEst ' . This procedure takes about 5 seconds. This is followed by a 20 Second period to allow the electro-chemical sensor to stabilise, during which, the Display is Clamped to read 000.0 . After this time, the Instrument is ready to monitor the input gas.

2.1.1 Carbon Monoxide concentration in the input sample is indicated on the 4 Digit LCD display.

2.2 GAS ALARM

2.2.1 As long as the measured CO concentration remains Below the pre-set alarm level, the relay will be Energised and the Normally Open Contact will be connected to the Common Contact. The Alarm LED and Audible alarm will be inactive.

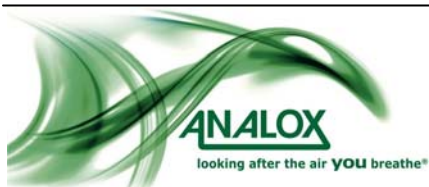
2.2.2 If the CO concentration exceeds the pre-set alarm level, then the following actions will take place:

- a. The Relay will De-energise resulting in the Common Contact connecting to the Normally Closed Contact and breaking the connection to the Normally Open Contact.
- b. The Alarm LED will be turned On.
- c. The Audible Alarm will be activated.

2.2.3 These conditions will prevail until the measured CO concentration drops 1 ppm below the alarm setpoint. The difference between the points at which the alarm triggers and clears is called Hysteresis and is used to stop the Instrument going rapidly in and out of alarm, when measurements are being taken at or very near the setpoint.

2.2.4 The Alarm Setpoint value depends on Local Health and Safety regulations and varies depending on Country of use. The Instruments are normally pre-set at the factory to 10ppm but Authorised Personnel may be instructed on the procedure for changing this setting.

(See Appendix A to this document.)



2.3 CALIBRATION

- 2.3.1 This is a fairly simple procedure which requires a source of clean, CO free air or Nitrogen, and a mixture of CO / Air of concentration around 50ppm CO. IT SHOULD BE CARRIED OUT WITH CARE, SINCE THE ACCURACY OF THE SUBSEQUENT READINGS IS ONLY AS GOOD AS THE ACCURACY OF THE LAST CALIBRATION.
- 2.3.2 The procedure uses the Four Membrane keys on the front panel, just to the left of the display, marked 'MODE' , 'UP' , 'DOWN' and 'ENTER' . The keys carry out simple functions allowing the 'Zero' and 'Span' calibration points to be entered.
- 2.3.3 The information entered during this procedure is stored in Non-Volatile Memory which means that it is not lost when the Instrument is switched off or when the battery is being replaced.
- 2.3.4 The basic Key functions are:
- 'MODE' Key - is used to Initiate the calibration process. It also acts as an Abort key, if say the Calibration process is entered accidentally or the user realises that a wrong value has been entered and he wishes to cancel the operation.
 - 'UP' Key - is used to Increment the displayed value, during the Span Calibration process. 1 is added to the displayed value, each time the key is pressed and released.
 - 'DOWN' Key - is used to Decrement the displayed value, during the Span Calibration process. 1 is subtracted from the displayed value, each time the key is pressed and released.
 - 'ENTER' Key - is used to confirm the end of each step in the Calibration procedure. When pressed and released it automatically advances the calibration process to the next level.
- 2.3.5 During the first two stages of the calibration procedure, a 3 digit number will appear on the display. These numbers DO NOT actually mean anything to the user; they are only used to indicate a Steady input condition.
- 2.3.6 **Setting Zero** - Connect a source of Clean Air or Nitrogen to the Calibration or Gas Inlet and adjust the flow rate to between 30 and 60 Litres/Hour. Press and release the 'MODE' Key Once. The Display will show three short horizontal bars (≡) in the Left hand digit position followed by three numbers. As the 'Zero' gas flows, the numbers on the display will change. Wait until the reading is steady (the right hand digit may flicker \pm 1 Digit) and then press the 'ENTER' Key. The Display will change to show ' Cxxx' where xxx are the three digits which were displayed before the 'ENTER' key was pressed.

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2.3.7 **Setting Span** - Connect a source of Air/CO having a concentration of around 50ppm CO and adjust the flow rate to between 30 and 60 Litres/Hour. Observe the display and ensure that the numeric value is increasing. Wait until the reading is steady - this should occur at about 200 with a 50ppm Air/CO mixture. When the reading is steady, press and release the 'ENTER' key. The Display will then change to show 'E050'.

NOTE: If a reading of between 180 and 240 cannot be achieved then the sensor is probably exhausted. The Calibration procedure should be aborted by pressing the 'MODE' key and the Sensor should be replaced. (See Section 3. Page 4)

2.3.8 **Setting the Gas Concentration** - When the Display is showing 'E050' , pressing and releasing the 'UP' Key will add 1 to the displayed value and pressing the 'DOWN' Key will subtract 1 from the displayed value. Use the 'UP' and 'DOWN' keys to change the displayed reading to match the actual concentration of the Air/CO mixture being used. When the Air/CO concentration reading is correct, press the 'ENTER' key and the process is complete.

2.3.9 Note that there are built-in Upper and Lower limits for the Air/CO gas concentration. These are set at 60 ppm and 25 ppm respectively. Values outside these limits, cannot be entered during the process in 2.3.8

2.3.10 The data collected during the Calibration process, is not actually transferred to the Non-Volatile memory until the final operation of the 'ENTER' key, in step 2.3.8. The procedure may be Aborted at any time up to this point, simply by pressing the 'MODE' key. The data entered during the previous calibration will then be used to linearise the measurement.

2.3.11 Pressing the keys in combinations other than as described above, will have no effect on the Instrument's operation. During the operation of the Keys the actual effect of the key only takes place when it is Released.

3. MAINTENANCE

- 3.1.1 **Sensor Replacement** - The Electrochemical Sensor has a life, in air, of about 18 months. However, this will be shortened if it is constantly subjected to Carbon Monoxide, particularly high concentrations.

SAFETY WARNING

THE SENSOR CONTAINS CORROSIVE ELECTROLYTE, AND MUST NOT BE OPENED, OR THE SEALED MEMBRANES REMOVED. EYE AND HAND PROTECTION MUST BE WORN IF THE SENSOR IS LEAKING. WIPE AND FLUSH ANY ELECTROLYTE SPILT ON SURFACES. ELECTROLYTE CAN BE FATAL IF SWALLOWED.

- 3.1.2 Switch off the Instrument and remove the battery and DC supply connector. Undo the four corner screws in the front panel (they are captive in the front panel) and carefully withdraw the panel from the housing body. Disconnect the wiring loom from the front panel by releasing the small retaining clips on the 2 x White plastic connectors and remove the front panel. Locate the Sensor Cell - this is a 32mm diameter component at the end of the printed circuit board. It is a plug-in device having 4 small pins. Carefully ease the sensor out of its 4 sockets.
- 3.1.3 Replacement sensors are supplied in a Gas tight package, which should NOT be opened until they are to be fitted in an Instrument. Examine the New sensor and note that there is a thin spring shorting clip fitted to three of the gold pins. Remove this spring clip and carefully fit the New sensor in to the 4 PCB sockets, ensuring that it is secure. Check that the 'O'ring seal is correctly located on the front of the sensor and that there is no foreign matter on the face of the seal. At this point, it is a good policy to make a note of the sensor serial number and enter the date of replacement in a record book, so that the next replacement may be anticipated.
- 3.1.4 Refit the White plastic connectors on the front panel and refit the front panel to the housing body checking that the orientation is correct ie that the sensor will mate with the gas flow adaptor in the housing body. Secure the 4 corner screws and re-fit the battery and power supply connector.
- 3.1.5 Switch on the Instrument and allow the new sensor to settle for about 30 minutes, then carry out a full calibration procedure, as described in section 2 above.
- 3.1.6 There are no other User-Serviceable parts in the Instrument. If the Instrument fails to perform as expected, then contact your Distributor for assistance.

APPENDIX A

IT IS VERY IMPORTANT THAT THE FOLLOWING ROUTINES ARE ONLY CARRIED OUT BY AUTHORISED PERSONNEL.

THEY DIRECTLY AFFECT THE ACCURACY OF THE INSTRUMENT IN A WAY WHICH WILL NOT BE OBVIOUS TO THE USER.

IF EITHER ROUTINE IS IMPLEMENTED, THEN THE OPERATION SHOULD BE RECORDED FOR FUTURE REFERENCE.

RESETTING THE ALARM POINT

Since the Safe working limits for Toxic Gas Concentrations are laid down by Health and Safety organisations and the alarm setpoints are related to these limits, it is recommended that access to the procedure for changing the setpoint, is limited to Authorised Personnel.

It is recognised that different Countries use different limits and this instrument can have its setpoint adjusted to any level between 5 and 15 ppm CO in Air, to a resolution of 1 ppm.

PROCEDURE

Switch off the Instrument and whilst holding down the 'UP' Key, switch on again. Release the 'UP' Key. The Display will show 'A010' where 010 is the default value, in ppm, of the Gas Alarm Setpoint. Use the 'UP' or 'DOWN' key to increase or decrease the setpoint, within the limits of 5 - 15 ppm. When the desired value is displayed, press the 'ENTER' key. The Instrument will then return to its normal Power-On and test routine.

Note that the new setpoint is recorded in Non-Volatile Memory, when the 'ENTER' key is pressed and will be used during all subsequent operations, until it is changed again.

ENTERING CALIBRATION DEFAULT VALUES

If for any reason the Instrument has become mal-adjusted due to incorrect operating procedure or other reason and Calibration gas is not available to allow a correct Re-calibration procedure to be carried out, a set of 'Default' calibration parameters can be inserted into the Instrument memory. This will allow the Instrument to at least operate correctly but with possible reduced accuracy, since the values entered will be the theoretically ideal values and not the real values as seen during a Calibration procedure.

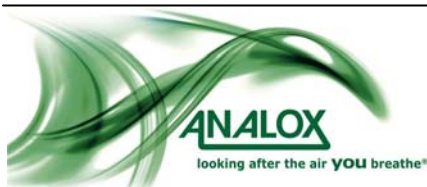
PROCEDURE

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Switch off the Instrument and whilst holding down the 'ENTER' Key, switch on again. Release the 'ENTER' Key.

The Display will show 'dFLt. Press the 'ENTER' Key again and the Default values will be transferred and the Instrument begin its normal start-up procedure.

NOTE: **THE DEFAULT VALUES WILL REMAIN IN USE UNTIL THE NEXT**
FULL **CALIBRATION ROUTINE IS CARRIED OUT.**



WARRANTY INFORMATION

We provide the following Warranties for the Analox 3D:

- A 1 year sensor warranty.
- A 1 year electronics warranty.

In both cases the Warranty period runs from the date of our Invoice.

We warrant that the equipment will be free from defects in workmanship and materials.

The Warranty does not extend to and we will not be liable for defects caused by the effects of normal wear and tear, erosion, corrosion, fire, explosion, misuse, use in any context or application for which the equipment is not designed or recommended, or unauthorised modification.

Following a valid Warranty claim in accordance with the above, the equipment, upon return to us, would be repaired or replaced without cost or charge but in our discretion we may elect instead to provide to you which ever is the lesser of the cost of replacement or a refund of net purchase price paid as per our Invoice on initial purchase from us.

We shall have no liability for losses, damages, costs or delays whatsoever. We shall have no liability for any incidental or consequential losses or damages. All express or implied warranties as to satisfactory or merchantable quality, fitness for a particular or general purpose or otherwise are excluded and no such Warranties are made or provided, save as set out in this Clause 7.

In order to effectively notify a Warranty claim, the claim with all relevant information and documentation should be sent in writing to:

Analox Sensor Technology Limited
15 Ellerbeck Court
Stokesley Business Park
Stokesley
North Yorkshire
TS9 5PT

Or by e-mail to : info@analox.net
Or by Fax to : +44 1642 713900

We reserve the right to require from you proof of dispatch to us of the notification of Warranty claim by any of the above alternative means.

The equipment should not be sent to us without our prior written authority. All shipping and Insurance costs of returned equipment are to be born by you and at your risk. All returned items must be properly and sufficiently packed.

