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SMART LOGGER
OPERATION AND MAINTENANCE
MANUAL

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Figure 1: Smart Logger and Smart Blocks

Figure 2: Smart Logger Features and Nomenclature

Figure 3: Attachment of Sampling Probe

1.0 Presentation

The SMART LOGGER is a portable gas detector. It employs interchangeable SMART BLOCK sensor modules, which can be chosen to detect oxygen (O₂) or a toxic gas (O₃, CO, H₂S, CL₂, SO₂, NO, NO₂, NH₃, HCL, HCN, CLO₂, H₂, CH₂OCH₂, ...). At any time, the SMART BLOCK can be changed and the instrument thus modified to correspond to the nature of the risk to be detected. The instrument and an array of SMART BLOCKS are shown in Figure 1, and the nomenclature and features of the instrument are given in Figure 2.

The instrument triggers a repetitive audible and visual alarm as soon as there is:

- An increase or decrease of oxygen, with the oxygen SMART BLOCK installed:
- Threshold overstepped, with a toxic SMART BLOCK installed:
 - + Instantaneous: Authorized instantaneous maximizing value
 - + STEL: Short term exposure limit (average on a period of 15 minutes)
 - + TWA: Term weight average (average on a period of 8 hours)

TWA, STEL and instantaneous thresholds are preset in the factory. The table below gives the ranges, resolutions, and alarm set points for the various sensors.

The instrument triggers a steady audible and visual alarm as soon as there is:

- An anomaly (electronic fault, SMART BLOCK fault)
- An insufficient power supply (discharged primary cell or rechargeable battery)

Sensor	Units	Range	Resolution	Inst	TWA	STEL
CO	ppm	0-1000	1	35	35	400
H ₂ S	ppm	0-100	1	10	10	15
SO ₂	ppm	0-30	1	2.0	2.0	5.0
H ₂	ppm	0-2000	0.1	200	2000	2000
NO	ppm	0-300	1	25	25	100
NO ₂	ppm	0-30	1	1.0	1.0	1.0
Cl ₂	ppm	0-10	0.1	0.5	0.5	1.0
HCl	ppm	0-30	0.1	5.0	5.0	5.0
HCN	ppm	0-10	0.1	4.7	4.7	4.7
NH ₃	ppm	0-100	1	25	25	35
O ₂ DEF	% by vol	0-30	0.1	19.5	--	--
O ₂ ABN	% by vol	0-30	0.1	23.5	--	--
O ₃	ppm	0-3	0.1	0.1	0.1	0.3
CIO ₂	ppm	0-3	0.1	0.1	0.1	0.3
ETO	ppm	0-30	1	1	1	5

An audible and visual "confidence beep" every 30 seconds indicates that the instrument is on and working.

In a very noisy place, an earphone can be connected to the instrument.

The SMART LOGGER is certified for use in a flammable atmosphere according to European rating, Ex EE ia IIC T4. This is equivalent to Class I, Div. 1, Groups A, B, C, and D in the NEC.

2.0 Start-Up

2.1 Power Supply

The power supply is either a 9v standard or alkaline primary cell type 6F22, or a rechargeable battery. The instrument is supplied from the factory with the NCMH battery and a charger. The instrument is certified for a use in a flammable atmosphere only when it is equipped with a specified primary cell or battery.

Since the SMART BLOCK draws a small amount of bias current when the instrument is off, it is advisable to charge the instrument when it is not used, even for a relatively short period of time. An instrument with a rechargeable battery, when off, depletes a fully charged battery in approximately 7 days. If the rechargeable battery is deep discharged repeatedly, the energy capacity of the battery is reduced. An instrument with an alkaline battery, when off, depletes a new battery in approximately 30 days.

2.2 Installation of the Battery

The battery is shipped as a separate item. To install it, unscrew the rear cover mounting screw to access to the battery compartment. The cell is connected to the circuit with a spring loaded connector. Charge the battery after installing it; see below.

2.3 Smart Block Acclimation

The battery has not been installed, so the SMART BLOCK does not draw a bias current during shipment. After installing the battery, the SMART BLOCK must become acclimated before use. The time required to acclimate a SMART BLOCK depends upon the type of SMART BLOCK, and ranges from a few minutes for a CO or H₂S SMART BLOCK to a day for an HCl SMART BLOCK. The SMART BLOCK is being acclimated while the instrument is off. When the instrument is turned on and not auto zeroed, an acclimated SMART BLOCK gives a stable reading near zero to within $\pm 10\%$ of the upper range of the instrument. Do not auto zero an instrument until the cell is acclimated; see below.

2.4 Changing

Plug the charger into a 110VAC wall socket. With the instrument off, plug the charger connector into the CHARGE/PRINT connector on the top of the SMART LOGGER; charge the battery for 12-14 hours. When the instrument is turned on and then the charger is disconnected, the auto zero feature is automatically activated. If auto zero is not desired, leave the instrument off when disconnecting the charger. The instrument must be in a clean atmosphere when auto zero is activated.

2.5 Installation of Change of a Smart Block

Accomplish this operation carefully in a safe atmosphere.

- Turn the instrument off. Remove the cover, and extract the SMART BLOCK.
- Plug in the new SMART BLOCK. The connector is keyed. Replace the cover.
- Allow the SMART BLOCK to acclimate; do not auto zero until it is.

2.6 Earphone

An earphone may be adapted for use with the CHARGE/PRINT mini-DIN plug. The earphone chosen must be commensurate with intrinsic safety requirements. See Section VI, below, for maximum allowable inductance and capacitance.

2.7 Remote Sampling

The measurement of toxic gas concentrations, before entry into a confined space or in places where the access is difficult, can be done with a remote sampling probe.

- In the ring groove provided for this purpose, install the pneumatic remote sampling system as indicated in Figure 2.

3.0 Use

The operating temperature of the instrument is from 0° to 40° C.

Some gases are heavier than air, some have the same density, and some are lighter. In a closed space, hold the instrument, or place the input of the sampling probe:

Prevent the instrument from coming in contact with any liquid, otherwise the SMART BLOCK may be damaged.

- Level with the ground for heavy gases: H₂S, SO₂, NO₂, CL₂, HCL, CLO₂, O₃, CH₂OCH₂.

- 1 meter above the ground for the detection of oxygen, CO, NO, HCN.

- High, in the case of light gases such as: H₂, NH₃.

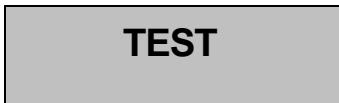
3.1 Turn-On

Every 30 seconds, an audible and visual confidence signal indicates the normal operation of the instrument.

Standard turn-on:

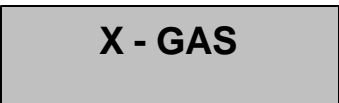
- Press the ON/OFF switch for a moment.

The display indicates:



TEST

Then after 10 seconds:



X - GAS



X - UNIT

You can read alternately:

+ The measurement (X) and the gas symbol (GAS)

+ The measurement (X) and the measurement unit, ppm or %

3.2 Turn-On with Auto Zero:

This procedure permits the automatic zero adjustment of the toxic SMART BLOCK, or setting the sensitivity of the oxygen SMART BLOCK to 20.9 % in clean air.

The auto zero turn-on is accomplished by:

- Locate the instrument in an area free from toxic gas with a normal oxygen concentration.
- Press the OPTION switch and keep it pressed.
- Turn instrument on by pressing the ON/OFF switch.
- Release both switches.

The display indicates:

AUTO SET

TEST

The instrument executes internal tests of battery, SMART BLOCK, electronics, etc. Then it displays:

WAIT FOR

STAB

Alternated with:

X - GAS

X - UNIT

X is the measurement of the chosen gas, units are in ppm or in %. Wait stabilization of this measurement. The display continues to alternate, so you can read alternately:

- The measurement (X) and the gas symbol (GAS)
- The measurement (X) and the measurement unit, ppm or %

When the display is stable, press the OPTION switch to confirm.

The display indicates:

AUTO SET

DONE

TEST

The auto zero is done. The instrument executes a new internal test.

After 10 seconds, the instrument displays alternately:

- The measurement (O) and the symbol of gas, for instance, CO.
- The measurement (O) and the measurement unit, ppm or %.

0 - GAS

0 - UNIT

3.3 Display Backlighting

- Press and maintain the OPTION switch. Note that frequent use of the backlight reduces the life of the battery.

3.4 Switching Off

- Press and maintain the ON/OFF switch. Then the display indicates the countdown.

OFF 2

OFF 1

- Then the instrument switches OFF, the display is blank, and the confidence beep ceases.

When the instrument is off, values are kept in memory even if the instrument is not used for a long time. The lithium primary cell located inside the instrument allows a memorization from 3 to 5 years.

3.5 Alarms

Steady audible and visual alarm:

Display	Cause	Remedy
BATTERY	Low battery equipment cannot be used anymore	Not a resettable alarm: Recharge or charge the used battery
OVER RANGE	Measuring range exceeded	Resettable alarm: Push OPTION switch. Leave the area.
ALARM Alternated with the O ₂ measurement	O ₂ concentration has risen or decreased beyond alarm levels	Resettable alarm: Push OPTION switch. Leave the area.
TWL AL or STEL AL	TWA or STEL alarm level have been exceeded	Resettable alarm: Push OPTION switch.
ALARM Alternated with gas measurement	The instantaneous alarm level has been exceeded	Resettable alarm: Push OPTION switch. The alarm light stays on; the audio alarm is OFF
BATTERY Alternated with gas measurement	Battery life is ending; 15 minutes of use remaining	Resettable alarm: Push OPTION switch. The alarm light stays on; the audio alarm is OFF

As soon as an instantaneous alarm threshold is breached, the instrument displays the maximum value of the concentration encountered during the episode, or the minimum value for oxygen deficiency. As long as the alarm is not reset with the OPTION switch, the instrument keeps this value displayed.

3.6 Connection to a Printer

The SMART LOGGER keeps the following data in memory:

- Events, such as alarms, resets, faults, etc.
- Measurements for a duration of 120 working hours. This duration may be reduced by a proliferation of memorized events.

So you can output statistical charts on a printer, connection is made with the CHARGE/PRINT mini-DIN plug located on top of the instrument by means of the printer cable.

The printer must be of the serial type compatible with an IBM-PC.

- Plug in the connecting cable between the SMART LOGGER and the printer
- Turn the printer on, configure it, position "on line." See Section VI.
- Turn the SMART LOGGER on with the ON/OFF switch
- Press the OPTION switch, which starts the printing process

The display indicates:

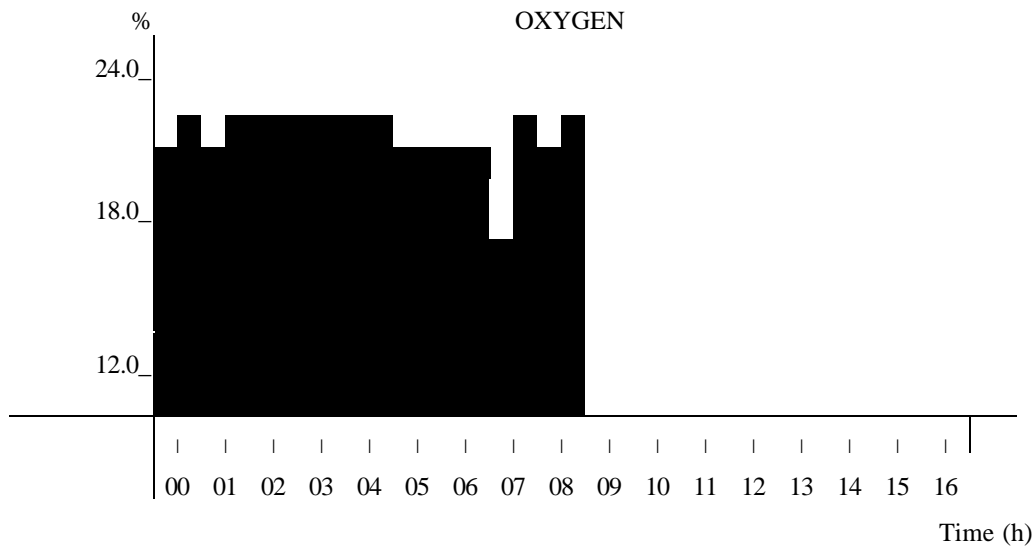


If the instrument working duration has been less than 15 minutes, only the events are printed in chart form. For a duration of 16 minutes or more, the events are followed by a histogram representing the measurements, as shown below.

Type	:TX12	Version	GB 1.1	No.	:94-04-00843
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Range	:	0-30.3 %	O2	Type of gas	:	Oxygen
				High Alarm	:	23.5 % O2
				Low Alarm	:	19.5 % O2

HISTOGRAM : From 09/18/93 at 12:17AM



The histogram displays a line every quarter of an hour, representing the average value of gas concentration during that time. The time scale indicates the hours since turn on. With the SMARTCOM software and a software data basis type (LOTUS, EXCEL), it is possible to obtain a curve minute by minute.

ATTENTION: When the instrument is ON, and the connecting cable between the SMART LOGGER and the printer is removed, all data is cleared from the memory, and the display indicates:



M CLEAR

The SMART LOGGER then returns at the normal mode.

To avoid erasing the data stored in the instrument memory, turn OFF the SMART LOGGER before removing the printer cable.

Note that the printout process reduces the life of the battery. It is advisable to recharge the battery before and after the printing process.

3.7 Connection to a PC

The SMART LOGGER can be connected to a IBM compatible computer with the use of the SMARTCOM software. The connection is done with the CHARGE/PRINT mini-DIN plug located on top of the instrument by using the computer cable.

The SMARTCOM software offers different menus allowing an optimal use of the SMART LOGGER:

- Calibration menu: allows an automatic execution of the calibration processes.
- Historical menu: analysis and storage of the events in the files.
- Maintenance menu: modification of the instantaneous alarm thresholds.
- Fault menu: analysis of the faults and the solutions.
- Print menu: edits the instrument control sheet.

4.0 Maintenance

4.1 Servicing

Auto Zero:

This process is explained in Section III, USE, on page 3, and should be executed regularly and particularly after the change and acclimation of a SMART BLOCK. This process must be done in a clean atmosphere; otherwise, the SMART BLOCK sensitivity is likely to be erroneous. When the charger is disconnected while the instrument is on, Auto Zero is automatically activated.

4.2 Calibration Verification

The only way to verify the gas detection capability is calibration verification executed with a standard gas. This operation should be done every 3 or 6 months, and when the instrument has been exposed to exceptionally high gas concentrations during use, and if the instrument has been stocked for a long period of time.

4.3 Calibration

Actual calibration is best executed with the SMARTCOM software; the calibration menu permits an automatic adjustment of the zero and the sensitivity of the SMART BLOCK. Follow the indications given by the SMARTCOM help screens.

Note that the SMARTCOM software provides useful update information, such as the dates of calibration and the SMART BLOCK wear rates. It also allows the editing of control sheets. We advise that users who do not possess the SMARTCOM software send SMART BLOCKS to authorized repair depots for recalibration.

It is possible to execute calibration by adjustment of the potentiometer located on the side of the SMART BLOCK, as described below. This process is reserved for the users without access to the software and with time constraints which require immediate use of the instrument. Since the potentiometer adjustment changes the calibration settings but does not update the information in memory in the SMART BLOCK, both features and accuracy may be affected. Such a SMART BLOCK should be returned to an authorized repair depot for recalibration with the software as soon as practical.

- execute an auto zero turn-on in a clean area
- open the SMART BLOCK cover
- place the standard gas nozzle in contact with the SMART BLOCK
- regulate the output at 1 liter per minute
- wait for stabilization of the display
- adjust the potentiometer to make the displayed value correspond with the known concentration of the gas.

4.4 Maintenance

- The instrument can become electrostatically charged, so clean only with a damp cloth.
- Recharge the battery regularly or change the primary cell out of a classified area.
- The lithium primary cell must be changed every 3 or 5 years; as follows:

For users having SMARTCOM software, the operation should be executed by authorized personnel, as follows:

- Unscrew the sensor cover screw.
- Remove the lithium primary cell which is located under the display and put a new one.
- Reprogram the date and time with SMARTCOM software.

For users who do not possess SMARTCOM software, return the instrument to your supplier or an authorized repair depot.

5.0 Features

Symptoms	Cause	Solutions
Screen is blank	Used primary cell or discharged battery	Charge the primary cell or recharge the battery
No confidence beep	Out of order	Return the equipment for maintenance
<div style="border: 1px solid black; background-color: #cccccc; padding: 2px; text-align: center; width: fit-content; margin: 0 auto;">FAULT</div> Displays. Steady audible and visual alarms no resettable	No SMART BLOCK or bad contact Defective SMART BLOCK	Turn off the instrument, then replace the SMART BLOCK Change the SMART BLOCK
<div style="border: 1px solid black; background-color: #cccccc; padding: 2px; text-align: center; width: fit-content; margin: 0 auto;">BATTERY</div> Displays permanently or alternately with the measurement. Steady or unsteady audible and visual alarm	Primary cell or rechargeable battery life is ending	Change the primary cell or recharge the battery
<div style="border: 1px solid black; background-color: #cccccc; padding: 2px; text-align: center; width: fit-content; margin: 0 auto;">USED CELL</div> Displays	Bad calibration SMART BLOCK life exhausted	Turn off the instrument Recalibrate the SMART BLOCK Change the SMART BLOCK
<div style="border: 1px solid black; background-color: #cccccc; padding: 2px; text-align: center; width: fit-content; margin: 0 auto;">OVERANGE</div> Displays. Steady audible and visual alarm	Over measurement range	Leave the area
<div style="border: 1px solid black; background-color: #cccccc; padding: 2px; text-align: center; width: fit-content; margin: 0 auto;">NO CAL</div> Displays	Auto zero adjustment not performed	Reinitiate auto zero or change SMART BLOCK
<div style="border: 1px solid black; background-color: #cccccc; padding: 2px; text-align: center; width: fit-content; margin: 0 auto;">NOT POSS</div> Displays	Impossible to auto zero	Stay in a safe atmosphere Reinitiate the auto zero Check the temperature 0 - 45°C
<div style="border: 1px solid black; background-color: #cccccc; padding: 2px; text-align: center; width: fit-content; margin: 0 auto;">C FAULT</div> or <div style="border: 1px solid black; background-color: #cccccc; padding: 2px; text-align: center; width: fit-content; margin: 0 auto;">C FAULT</div> At turn on	Loss of time setting Loss of memory	Change the lithium cell Change the lithium cell
Measurements are negative	Zero not adjusted	Perform auto zero
Impossible to printout	Bad connection	Check installation

6.0 Technical Data

Manufacturer:	OLDHAM FRANCE S.A.
Function:	Single oxygen or toxic gas detector with interchangeable SMART BLOCK
Type:	SMART LOGGER
Case:	ABS, shock proof
Configuration:	Oxygen or one toxic gas, interchangeable sensors
Detectable gases:	Refer to table, Section I
Auto zero:	If requested at turn on, and when the charger is connected.
Measurement:	Continuous
Sensor:	Interchangeable SMART BLOCK
Display:	LCD (with backlight when initiated)
Sensor fault:	Continuous alarm
Battery fault:	Displayed, audible and visual alarm
Alarms:	Oxygen: 2 instantaneous thresholds Toxic: 1 instantaneous threshold 1 TWA threshold 1 STEL threshold Audible and visual alarm, concentration displayed on screen
Output:	(option) - On serial printer for events Speed: 9600 Bauds, 8 bits, parity pair, 1 stop bit, protocol XON/XOFF - On PC: maintenance and supervision software SMARTCOM, data bases, LOTUS, EXCEL
Earphone:	(option) Characteristics defined in the certification Inductance < 1.5 μ H Capacitance < 0.8 μ F
Power supply:	9V DC primary cell or rechargeable battery
Mounting:	In the pocket or on the belt with clip
Autonomy:	100 h with primary cell, 24 h with rechargeable battery
Weight:	210 g. Dimensions : 130 x 61 x 43 mm
Warranty:	12 months
Certification:	CENELEC Ex EEx ia IIC T4

Specification subject to change without notice.

7.0 Parts List

7.1 Instruments

Part No.	Gas Detected
02400-0100	Cl ₂
02400-0200	H ₂ S
02400-0300	HCN
02400-0400	HCl
02400-0500	SO ₂
02400-0800	O ₃
02400-0850	ClO ₂
02400-1100	O ₂
02400-1200	CO
02400-1500	H ₂
02400-1700	NO ₂
02400-1750	NO
02400-2400	NH ₃
02400-5200	ETO

7.2 Instrument Components

Part No.	Description
02220-002	Chassis
02501-0100	Smart Block, Cl ₂
02501-0200	Smart Block, H ₂ S
02501-0300	Smart Block, HCN
02501-0400	Smart Block, HCl
02501-0500	Smart Block, SO ₂
02501-0800	Smart Block, O ₃
02501-0850	Smart Block, ClO ₂
02501-1100	Smart Block, O ₂
02501-1200	Smart Block, CO
02501-1500	Smart Block, H ₂
02501-1700	Smart Block, NO ₂
02501-1750	Smart Block, NO
02501-2400	Smart Block, NH ₃
02501-5200	Smart Block, ETO

7.3 Calibration Verification Kits

Part No.	Gas
02201-0100	Chlorine, Cl ₂
02201-0200	Hydrogen sulfide, H ₂ S
02201-0300	Hydrogen cyanide, HCN
02201-0400	Hydrogen chloride, HCl
02201-0500	Sulfur dioxide, SO ₂
02201-0800	Ozone, O ₃
02201-1100	Oxygen, O ₂
02201-1200	Carbon monoxide, CO
02201-1500	Hydrogen, H ₂
02201-1700	Nitrogen dioxide, NO ₂
02201-1750	Nitric oxide, NO
02201-2400	Ammonia, NH ₃
02201-5200	Ethylene oxide, ETO

7.4 Accessories

Part No.	Description
67011-003	Battery, rechargeable, NCMH, 9V
67019-007	Memory back-up Battery
67051-036	Battery Charger
02200-004	Hand strap
02200-009	*Aspirator, with fiberglass probe
02200-010	*Aspirator, with 12' hose
02200-012	Adapter, calibration, for Cl ₂ , H ₂ S, NO ₂ , SO ₂ , HCN, HCL, NO and NH ₃
03700-014	Adapter, calibration, for CO, H ₂ , and O ₂
02200-002	Cover, aspirator
02200-008	Screwdriver
02400-012	Printer and Computer Cable

*Not recommended for use with reactive gases.

7.5 Replacement Gas Cylinders

Part No.	Description
03302-010	10 ppm HCl in N ₂
03303-010	10 ppm HCN in N ₂
03314-010	10 ppm H ₂ S in N ₂
03315-010	10 ppm SO ₂ in N ₂
03318-025	25 ppm NH ₃ in N ₂
03219-050	50 ppm CO in Air
03227-800	800 ppm H ₂ in Air
03331-005	5 ppm Cl ₂ in N ₂
03333-005	5 ppm NO ₂ in N ₂
03334-025	25 ppm NO in N ₂
03332-005	5 ppm ETO in N ₂
03296-195	19.5% by vol. O ₂ in N ₂