USER MANUAL

TCD ANALYZER
CATARC MP-P

2018.05.28	1	All	Modification into CDL
DATE	**Version**	**PAGE**	**Modification**

Date	Written by pascal.fouchard	Date	Validated by Vincent.le-castrec
2018.05.28	PL	2018.05.28	VLC

SUMMARY

I. GENERALITY

I. 1 PREFACE

Instrument model:
This instruction manual concerns gas analyser model CATARC (MP-400P).

Serial number:
Analyser serial number is mentioned on the rear panel of the unit.

Power supply:
Analyser should be powered with alternative current, voltage is indicated in this instruction manual and on the rear panel of the instrument.

Taking into account instructions:
Instructions of manual must be read entirely before instrument using.

Instructions respect:
All instructions of use must be followed in order to reach the best performances of the analyser.

Analyser location:
Analyser should be located and should operate on stable support.

Important notice to users:
After entirely instructions reading, keep manual in a safe and known place in order to be able to find it very easily.

I.2 WARRANTY CONDITIONS

This Instrument is warranted two year from the test passed date.

The warranty includes free of charge replacement of defective parts (except consumable parts) and cost of labour for service in our factory. All equipment requiring repair or replacement under this warranty shall be returned to us at our factory. Such returned equipment shall be examined by us and if it is found to be defective as a result of defective materials or workmanship, it shall be repaired or replaced as foresaid.
If one reparation on site is required by the customer, travelling and living expenses are customer dependent.
This warranty shall not apply to any equipment (or part thereof) which has been tampered with or altered after living our control, which has been repaired by anyone except us, or which has been subject to misuse, neglect, abuse, or improper use. Misuse or abuse of the equipment, or any part thereof, shall be construed to include, but shall not be limited to, damage by negligence, accident fire, or force of the elements.
This warranty does not apply to used or second hand equipment, nor extend to anyone than the original purchaser from us.

The warranty doesn't cover the following:
- damages to the instruments occurred during the transport
- damages to the instruments due to negligence or wrong use
- wearable parts (batteries, motors, filters)

The technical service on the instruments is intended in our Service Department .

Email: customer.service@tecora.com

Warning: when you receive the instrument and the accessories from the packaging and verify their integrity, otherwise contact Tecora or your distributor immediately.

The instruments are tested in our laboratories at Fontenay sous Bois France 211 rue La Fontaine, 94120 Fontenay sous Bois, and a test certificate is released.

I.3. PACKAGE CONTROL

Pull out the analyser from the original package and examine it in order to detect any kind of external damage that can occur during shipment. In case of damage, missing part or suspect situation, please contact TECORA company or its agent.

## I.4. INSTALLATION AND USE CONDITIONS

The Catarc MP-P Analyzer is a portable instrument suitable for indoor and outdoor ambient samplings.

Nevertheless, the protection rate isn't enough to allow outdoor operations with rain presence.

Avoid installing the unit in an area where there are strong vibrations or strong electromagnetic fields.

All electrical wiring will be done with shielded cable.
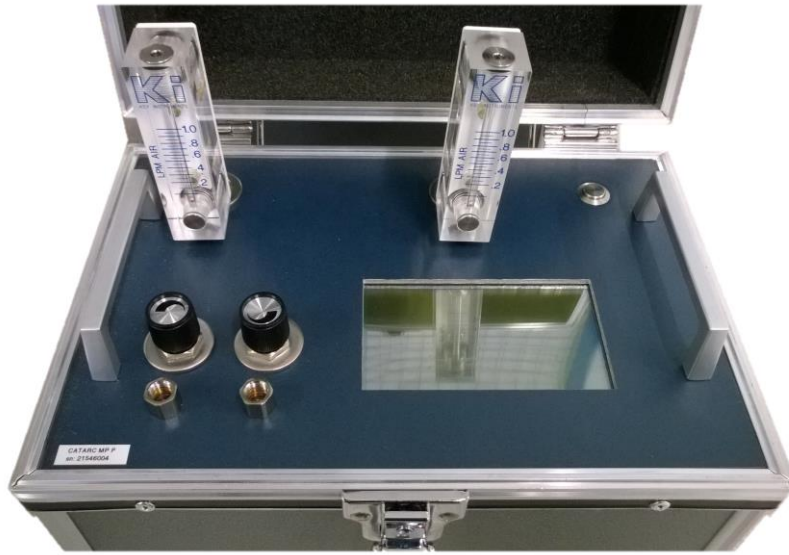
I.5 WASTE DISPOSAL

Packaging: all the packaging materials are to be considered as non-toxic and non-hazardous special waste and as such must be disposed of in accordance with current legislation.

Equipment
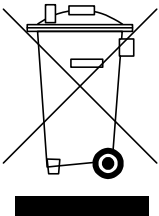
The crossed-out wheeled bin means that in European Union the product is to be considered AEE (electrical and electronic equipment) and must be taken to separate collection at the product end-of life.
This applies to your device but also to any enhancements marked with this symbol.
Do not dispose this product as unsorted municipal waste.

II. DESCRIPTION PART GAS

II.1 INTRODUCTION

The gas analyser model CATARC MP-P has been designed for simple and accurate measurements on dry and clean gas. The instrument uses thermal conductivity principle for gas content measurements in binary blending or equivalent of binary blending (example: air). It contains a catharometric detector with microthermistor designed and built by TECORA for a good stability.

II.2 MEASUREMENT PRINCIPLE

The gas analyser model CATARC MP-P could be used in a blending where the component to measure has got a far different thermal conductivity of other gas of the blending.

As you know, thermal conductivity is not a specific data of a gas (several gases can have the same thermal conductivity). Actually, the instrument measures the difference between two thermal conductivities. So it is absolutely necessary to check that both gas of the blending have different thermal conductivities in order that the unit provides the best performances it can.
The main element of the analyser consists in the detection cell. It includes two thermistors mounted in opposition in a Wheatstone bridge.

- One thermistor is installed in the 'sample gas' circuit
- The other one is installed in the 'reference gas' circuit

The reference gas is usually the main gas of the blending.

The content of gas to measure is given by the difference of balance between both thermistors.

So main operations to perform are:

- ■ balance of the bridge (zero setting)
- ■ calibration of the bridge with calibration gas (span setting)

THERMAL CONDUCTIVITY DATA

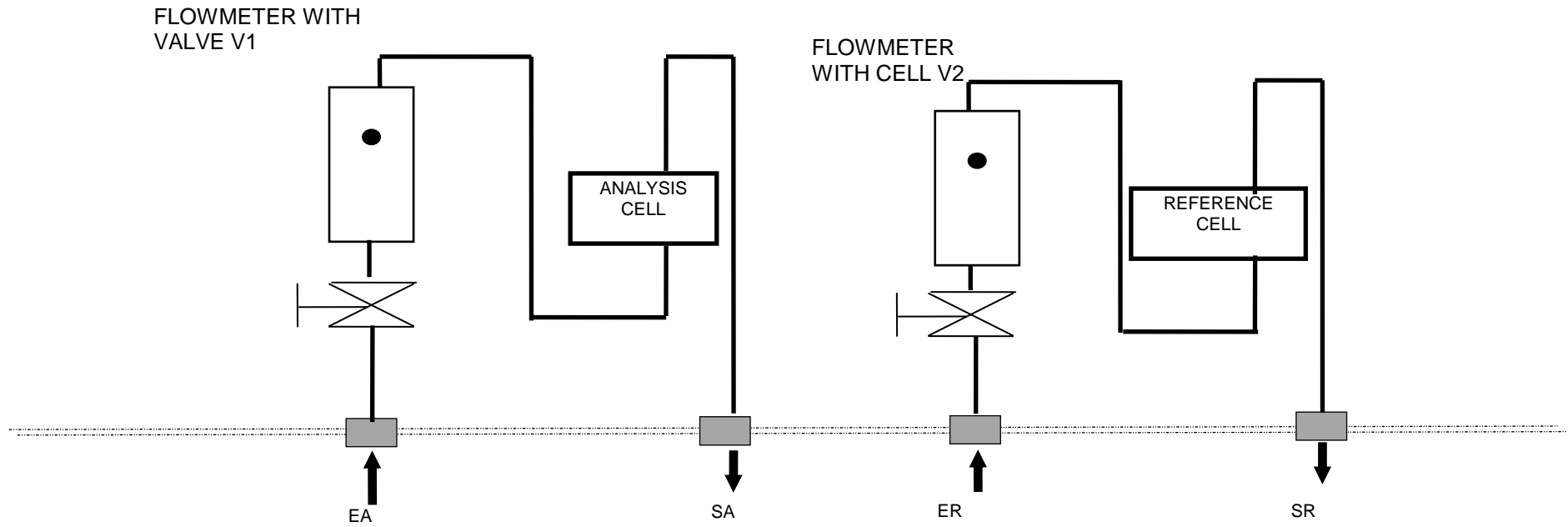The range of the instrument is depending on the application. It has to be check with our specialist engineers.
We give just under the thermal conductivities of main gases.

GAS	THERMAL CONDUCTIVITY $Wm^{-1} K^{-1}$	GAS	THERMAL CONDUCTIVITY $Wm^{-1} K^{-1}$
Acetylene	53.72	Ethylene	52.07
Air	64.22	Fluorine	66.12
Ammonia	61.58	Helium	368.63
Argon	44.22	Hydrogen	458.72
Bromine	11.57	Hydrogen bromide	21.49
n-Butane	40.91	Hydrogen chloride	35.12
i-Butane	41.74	Hydrogen cyanide	30.99
Carbon dioxide	41.74	Hydrogen sulphide	36.78
Carbon disulphide	19.84	Krypton	23.56
Carbon monoxide	61.99	Methane	85.54
Chlorine	21.90	Neon	118.19
Deuterium	343.01	Nitric oxide	64.06
Ethane	54.55	Nitrogen	64.06
Ethanol	36.78	Nitrous oxide	43.31
Ethylamine	39.67	Oxygen	65.91

II.3 GAS CIRCUIT

The analyser has a 1/8" NPT female inlet and outlet in the open air. The gas flow must be equal from 0.2 to 0.8 L/min. The recommended flow is 0.5 L/min. The gas pressure must be contained between 0.9 and 1.1 bars (absolute). In case of a higher pressure, use a pressure regulator at the inlet of the instrument. In case of a lower pressure, use a pump. It must be placed above the instrument. Like that, the gas will be pushed in the analyser (cf. scheme).

![Tecora - a division of CDL]

GAS CONNECTION (sensor integrated in the analyser)

FLOWMETER WITH
VALVE V1

FLOWMETER
WITH CELL V2

ANALYSIS
CELL

REFERENCE
CELL

EA

SA

ER

SR

E = Inlet
S = Outlet

Gas fittings on the rear panel of
the unit

Inlet / Outlet to be
connected by flexible
pipes

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III. ELECTRONIC DESCRIPTION

III.1. INTRODUCTION

The analyser integrates a touch screen that allows to quickly see the totality of the essential parameters: gas content, temperature regulation, alarms status…
The analyser incorporates an internal function for data memorization (350 data)
A parallel output allows connecting the device to a printer (output on listing). The RS232 output permits to connect a PC for the acquisition of the measurements under "terminal" in WINDOWS.
The calibration of the analyser can be done with manual sequence.

III.2. PASSWORD

The modification of the parameters seen in the menu is protected with a password.

Protection A: press during 6 seconds on indication "." (Dot) on the right of the zero. The indication "–" on the left of the zero will be changed on "◄". The protection is inactive in this page.

III.3. TOUCH SENSITIVE DISPLAY

The user has to press on the good item to select it. It is recommended not to use any pen or hard point for this operation. The touch sensitive display could be damaged.

III.4. PRINCIPAL DISPLAY

At the power on, the analyser displays:

- the program version
- the device model
- the time
- the TECORA phone number
- the TECORA fax number

At the first start, the working language can be selected : FR or EN.

The device switches over to the principal screen of data « routine screen »
The « routine screen » gives indications about:
- the measurement
- alarm status
- operating phase of the device in coherence with its general parameters (made in our manufactory for some tasks, or set by the user for available functions in several menu pages and accessible by "MENU" touch in the bottom right corner of the screen)

It contains:
- the time
- measured gas content
- threshold alarm and flow
- informations in relation with thermostatic sensor and calibration.

On the power on, the device has to stabilize the sensor temperature before doing optimal measurements.

It runs with a heating phase, indicated on the screen by a message « heating » on the top of the screen.

In a first time, the difference of temperature between the real temperature of the sensor and the instruction (fixed in our manufactory at +45°C) is big.

The message "heating" is activated. The temperature indication of the sensor is displayed on the range from 0 to +60°C.

When the temperature is near +45°C; the temperature of the sensor displays a window which indicates the temperature difference in a band of temperature about +/- 5%.

From this moment, the heating line is replaced by the message "SENSOR READY IN … MINUTES" with the count of the last time.

This temporisation allows to assure a good homogeneity of temperature at the level of the sensor for better measurements.

At the end of the count, the messages concerning the start up phase disappear.

The device is on analysis routine and general function, in conformity with the last setting realized.

Nota: in case of brief shutdown (< 1'), the analyser restarts if the sensor temperature doesn't drift. In the opposite, the routine is reactivated (when it restarts, the screen displays a page of several characters during its initialization phase).

IV. SETTINGS

From this routine screen, enter to the first page of the menu by the key "MENU" on the bottom right.

IV.1. FIRST PAGE OF SETTING

The first page allows to set:
- the threshold alarm A1
- the threshold alarm A2
- the flow alarm
- the range for the function of analogic outputs (dilated range)
- the command of optional external pump
- serial port parameters
- printer port parameters
- access to calibration menu
- edition of current configuration

IV.1.1. SETTING OF A1 AND A2 THRESHOLD ALARM

Working sense HIGH or LOW, by successive press on the corresponding zone, then VALID to confirm.
HIGH means alarm situation if the measure is higher than the instructions.
Threshold, in %, adjustable from 0.0 to 100.0%. After pressing on corresponding zone, take hold of by numeric keypad, then VALID to confirm.
Working mode NORM, MEMO, INAC, and then successive press on the corresponding zone, then VALID to confirm.

Mode NORM: the alarm is a fugitive type. She goes over to alarm position or come back to out alarm situation according to the current conditions.
Mode MEMO: the alarm is a memorized type. She goes over to alarm position and keep this position until its receipt which is done by the same key in this page of menu by pressing on ACQ then VALID.
Mode INAC: the alarm is inactive.

Nota: the routine screen indicates the chosen alarm mode by the following display :
A1 NORM   A1 at the right of the measurement,
A1 MEMO   A1 on white background at the right of the measurement,
A1 INAC   A1 not displayed.

• The alarm status is indicated by a flashing white square near the concerned alarm when it is activated.
•HYST (hysteresis) common to A1 and A2, adjustable from 0.00 to 9.99% of the programmed threshold.

IV.1.2. FLOW ALARM

This alarm can be set like A1 and A2. It is activated by an external contact held open during 15 seconds minimum.

IV.1.3. ANALOGUE OUTPUTS SETTING 0/10 V AND 4/20 mA IN DILATED RANGE (option)

In front of I/V OUT, the first digit fits to the bottom of the range and the second to the top of the range. In order to modify, press on the concerning zone, take hold off by numeric keypad then VALID. A minimum gap of 2% is required.
The device will refuse any incoherent programmation.

IV.1.4. COM SETTING

The user should send the measurements stamped with the hour and date on COM1 (RS232) for communication to a PC under Terminal for example and to the printer.
Set the desired interval by pressing on the concerning zone, from 0 to 99 (Do the same for time unit, hour, minute and second) then press on VALID to confirm.

IV.1.5. EDIT CONFIG CHOISE.

It allows to print the general configuration of the analyser. Press on the concerning zone then VALID. This edition is sent to the PC.

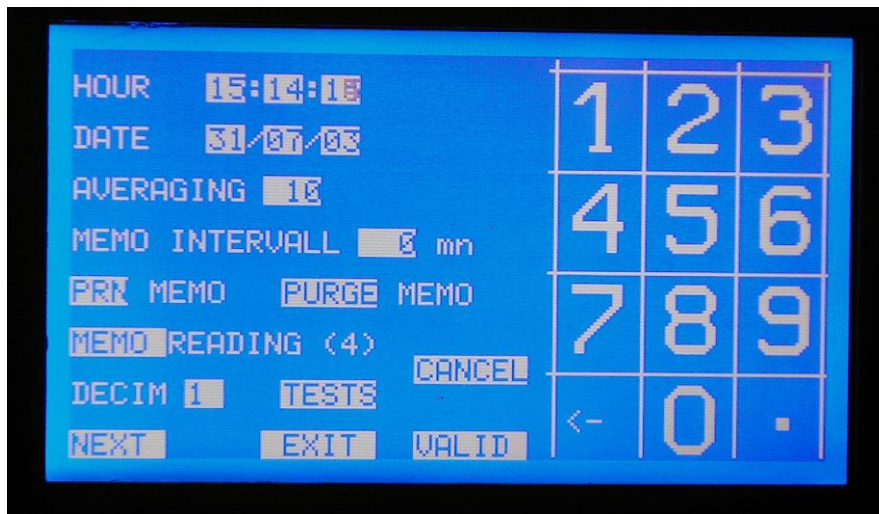### IV.1.6. CALIBRATION CHOICE

It allows to access to sub menus concerning the calibration. (see calibration paragraph).

Nota : The CANCEL key allows to cancel the current capture and to keep an old data.
The EXIT key displays the routine screen.
The NEXT key allows to access to the second page of settings.

IV.2. SECOND PAGE OF SETTING

IV.2.1. TIME AND DATE SETTING

Press on the concerning zone, enter the value with the numeric keypad, then press on VALID to confirm.

IV.2.2. MEMO INTERVALL

The device is equipped with a memory which allows the storage of the 350 last measurements. MEMO INTERVALL makes possible to choose the storage frequency, defined in intervals expressed in minutes, adjustable from 0 to 720 minutes (12 hours). For a programming of "0", the memorization is inactive. To set the interval, press on the concerning zone, enter the value on the numeric keypad, then press on VALID to confirm.

IV.2.3. PRINTING MEMO

To print the contents of the memory, press on the concerning zone, then VALID to begin the printing.

IV.2.4. PURGE MEMO

This command allows to empty the content of the memory.

N.B: the number of measurements stored is indicated between parenthesis at the right of the reading MEMO.

IV.2.5. MEMO READING

It allows to display the contents of the memory with the navigation using the keys ▲ and ▼.

IV.2.6. DECIM

It allows to select the display of the measurement with 1 or 2 decimal number, by successive pressing on the concerning zone.

IV.2.7. TESTS

It is a menu which allows the access to the visualization of the state of following interfaces:
- Digital Inputs / Outputs TOR (All or Nothing).
- Analogue inputs/outputs.
- Internal sensors.

These data are interesting in case of problem on the device.
However, almost of them aren't in user domain except the above data.

IV.2.7.1. LOGIC INPUT / OUTPUT

NOT VALID MEASUREMENT (3 and 11 of SUB D) "NVM"

This output is activated as soon as the user isn't in the routine screen, or the analyser is in preheating phasis, or the user is in the phasis FROZEN OUT (see previous section). This information allows to emit caution on the quality of the signals in progress available on ANALOGIC outputs, on screen and on PC.

ANALYSER DEFAULT (4 and 12 of SUB D) "DEF"

This output is activated in case of internal default of the analyser:
- Temperature of regulation out of limit.
- Signal of sensor out of limit.
- Flow default if it is activated.
- Internal power supply default.
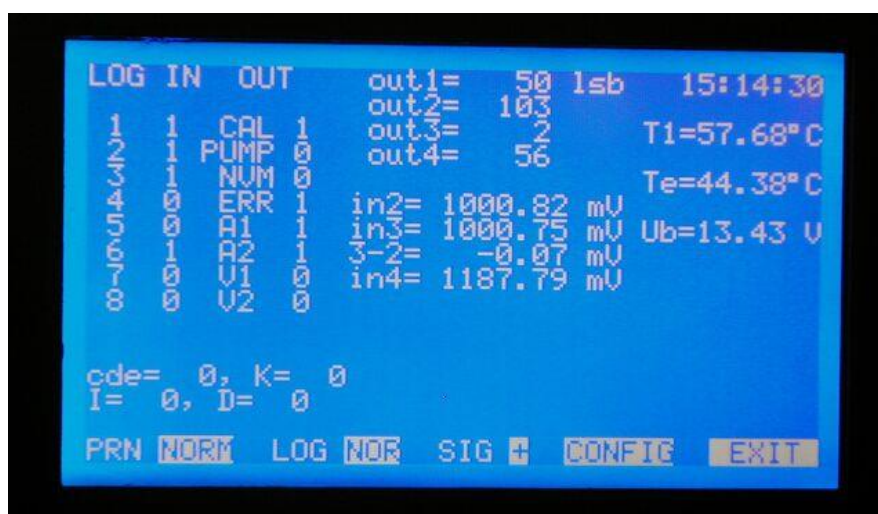
It is possible to run the outputs in positive security or passive security. This setting is applied to the alarm outputs A1 and A2 and to the outputs CALIBRATION STATUS, ANALYSER DEFAULT and NOT VALID MEASUREMENTS.

The positive security is called NOR. The passive security is called INV.

Press on indication NOR or INV situated on the right of LOG (on the bottom of the screen), by choosing by successive pressings. The status LOG OUT reverses immediately (Log pressing during 5 seconds).

IV.2.7.3. VIZUALISATION OF THE CONFIGURATION

It is possible to see the complete configuration of the analyser. Press on CONFIG (on the bottom of the screen). The configuration displays automatically. The indication NUM corresponds to the serial number of the analyser. The other indications show the effective setting of the analyser.
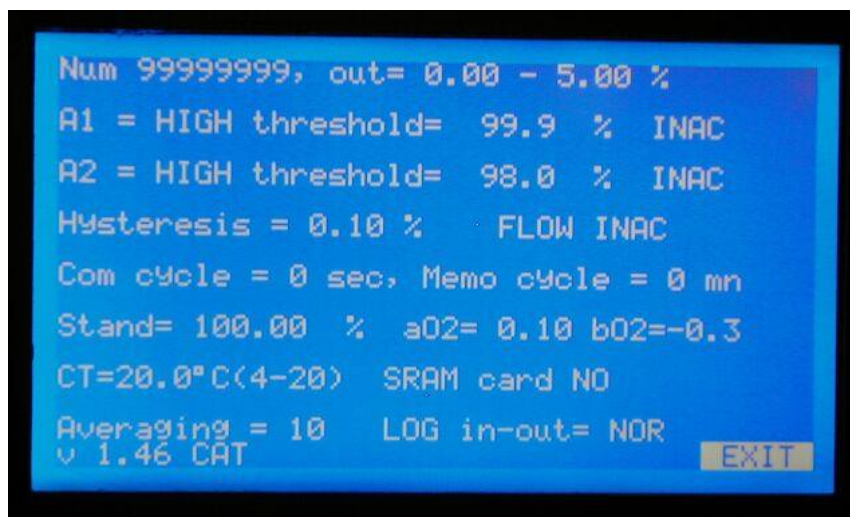
V. ELECTRICAL CONNECTIONS

The electric wirings are at the back panel of the analyser. The following connectors are present:
- Power supply   IEC plug
- RS232 serial interface, COM1   SUB-D, 9 pins, male

The standard power supply of the device is 230 V/50-60 Hz. See the label of the device in case of doubt on the power voltage.

INTERFACE RS232 (COM1)

It allows the wiring to a PC for the recovery of data under TERMINALS software.
The data are present on the current configuration (timing programmed on COM)
RS232 Format: 9600 bauds
                           Datum bit: 8 without parity
                           one stop bit.

Wiring of SUB-D, 9 pins, male: T X pin3, R X pin2, GND pin5

VI. CALIBRATION

The calibration of the device is manual and is done only from the main screen.

Press on "MENU" then "CALIBRATION".
Press on "VALID" to confirm the choice, and then press EXIT

This is a sequence of manual instruction of calibration gas to the analyser. This sequence is controlled by a manual action on touch screen.

VI.1. CALIBRATION GAS - HIGH VALUE GAS

It is the gas for the top of the range. It is recommended to use the mixing of gas near the wanted value if it remains in a constant range. For measurement of oxygen purity, it is recommended to use pure oxygen (100%).
Don't forget that you have to respect the pressure and the recommended flow.
From the routine screen, press on "MENU", then on CALIBRATION, and pass on "MANU" mode.
Press on the indication located near HIGH GAS. The symbol ►--- appears near it.
Enter the new value of the gas.

Note: If it is absurd (ex: 123%), the device refuse the new value and keep the old one.

Press on "VALID" to confirm the choice then press on "EXIT" to return to the principal display with this new setting.

The analyser asks if the operator want to calibrate with the HIGH GAS. In case of refusal (high gas not available or control make recently), press on REJECT.

If the HIGH GAS is available, press on YES to start the calibration. A count of time begins and is displayed. Dots are moving in the indication zone near the HIGH GAS. The count lasts one hour max. Valid the calibration of HIGH GAS by pressing on VALID as soon as the measurement is stabilized (10 to 15' for a good stability). The device display COEF CALCUL and the value of the high gas is taken into account. If the high gas is wrong (leak, bottle mistake…), the device indicates NO CALIBRATION and the count continue. This allows to verify the high gas sent to the analyser or check the mounting and re-valid. By pressing on IGNORED, it does not take into account the value. The old value is kept. However, it is possible to force the memorization of the coefficients by pressing on FORCE (Not recommended because it supposes a risk of wrong coefficient setting). In the case of an important drift of calibration coefficients is observed, the device indicates COEF DRIFT, and purposes FORCE or IGNORED. The operator has to take a decision; if he decides to IGNORE, the old coefficients are conserved; if he decides to FORCE, these new coefficients are applied.

Note: If none action is done during a one hour period, the device leaves the calibration mode and the old values are kept.

VI.2. CALIBRATION GAS – LOW VALUE GAS

It is the gas for the zero gas or for the bottom of the range. It is recommended to use Nitrogen. Respect the pressure and recommended flow.

The analyser asks if the operator want to calibrate with the LOW GAS. In case of refusal (high gas not available or control make recently), press on REJECT.

If not, press on YES to start the calibration of the "zero". A count of time begins and is displayed. Dots are moving in the indication zone near the ZERO GAS. The count lasts one hour max. Valid the calibration of LOW GAS by pressing on VALID as soon as the measurement is stabilized (10 to 15' for a good stability). The value of the zero gas is taken in account. If the zero gas is wrong (leak, bottle mistake…), the device indicates NO CALIBRATION and the count continue. This allows to verify the zero gas sent to the analyser or check the mounting and re-valid. By pressing on IGNORED, it does not take into account the value. The old value is kept. However, it is possible to force the memorization of the coefficients by pressing on FORCE (Not recommended because it supposes a risk of wrong coefficient setting).

If none action is done during a one hour period, the device leaves the calibration mode and the old values are kept.

VI.3. COEFF A AND COEFF B

It is the gas for the zero gas or for the bottom of the range. It is recommended to use Nitrogen. Respect the pressure and recommended flow.

VI.4. COEF A AND COEF B

They are two coefficients calculated by the analyser during the calibration. They enter in the equation $Y = AX + B$. The user doesn't operate on it. However, it is possible to enter the

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coefficient manually or reinitialize. It is interesting in order to have the coefficients if they were lost because of a bad manipulation or when the user doesn't have enough calibration gas.

Press on "INIT", the symbol ► appears in front of the box.
Enter the protection code (4875). For each number, appears a star "*" on the bottom left. The values of coefficients A and B are underlined.

Press on the value of the coefficient to modify. The symbol ►--- appears near the indication.
Enter the new value (max value: 9.9999).
If the value is absurd (ex: 123), the analyser refuse the new value and keep the old one.

Press on "VALID" to confirm the choice then press on "EXIT" to return to the display of the routine screen with this new setting.

Note: By command INIT, the reinitialisation set A = 0.1000 and B = 00.00

VII. TECHNICAL SPECIFICATIONS

Measurement principle	Thermal conductivity
Measurement range	According to application – ex. 0 – 100% H_2 in N_2
Analogue output ranges	Adjustable between 0 and 100%
Repeatability	Better than ± 0.5% of full scale
Linearity	Better than ± 2.0% of full scale
Drift	< 0.1% abs. / week
Response time	T_{95} < 10sec.
Sensor	Temperature monitored at 45°C
Pressure	1 bar max.
Flow gas	0.5 L/min recommended
Output signals	4 – 20 mA, 0 -1 V, RS232, parallel port
Power supply	Rechargeable battery
Dimensions (L * H * P)	260 * 190 * 305 mm
Weight	7 kg

COMBUSTION / ÉMISSION DEPARTMENT

INDUSTRIAL CONTROL DEPARTMENT

HYGIENE HEALTH AND ENVIRONMENT DEPARTMENT

SERVICE AND LOGISTIC DEPARTMENT