Gas detection control system CM80-ID

Operator Manual

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By OGGIONI s.a.s.
Via Lavoratori Autobianchi, 1 Desio (MB) Italia

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OGGIONI S.a.s. Via Lavoratori Autobianchi, 1 - 20832 DESIO (MB) Italy
Tel. +39 0362 629135 Fax.+39 0362 622531 e-mail: info@oggionisas.com
Technical support techsupport@oggionisas.com web: www.oggionisas.com

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OGGIONI S.a.s. will not be responsible for any damage or problem caused by improper changes into CM-80 functionalities.

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1. GENERAL DESCRIPTION

CM80-ID control unit has been developed following the EN 61508 functional security standard and the EN 50402 gas detection specific standard.

CM80-ID is a programmable control system designed to reach the SIL1 (HFT=0) Safety Integrity Level .

The system is modular and expandable, in fact the CM80-ID unit, in addition to managing the enose® series gas detectors by using two RS-485 serial bus, can acquire signals in current loop 0-20mA or digital inputs galvanic isolated, directly from the field or through remote concentrators (REM 485).
All the status related to the input signals can be freely associated to relay outputs logic following a totally programmable “cause & effect” matrix.

The central unit works as a MASTER, taking decisions according to the defined “cause & effect” matrix and monitoring the Safety Integrity Level.

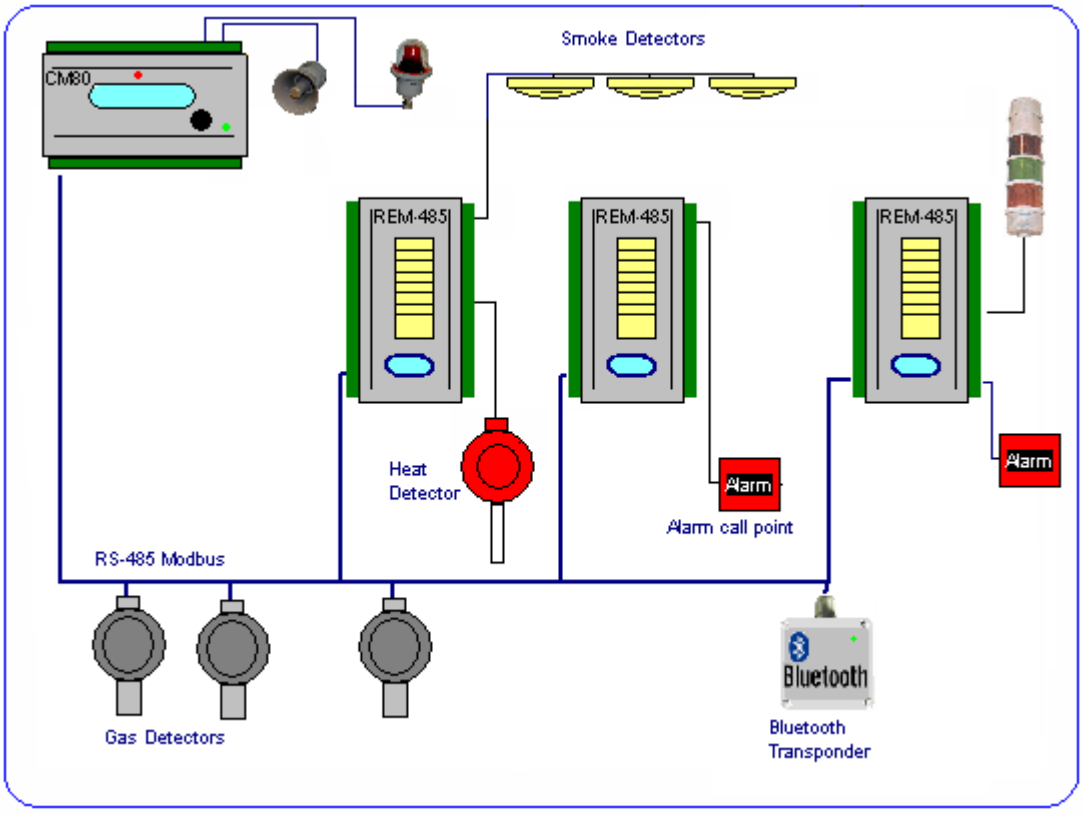


Figure 1. General pattern

In the central unit two BUS RS-485 are available, they can both be used either with the field concentrators and/or the enose® transmitters.
It is possible to connect a maximum of 6 REM concentrators and a maximum of 48 enose® GAS detectors. All single components of this system are compatible with the Safety Integrity Level SIL1.

1.1 Main features of the System

Here below are the main technical characteristics of CM80-ID control unit:

- Two RS-485 Modbus RTU serial lines, used to connect the devices in the field
- Two optical fibre 62.5/125um (3,5dB/Km.) Drivers (optional)
- Addressing possibility for max 48 enose® Gas detectors
- N. 6 relay outputs (4 programmable: from number 2 to number 5) :

System status assignments on CM80-ID

Status	Relay Output	Mode	Status	Condition
Unset/Maintenance	1 *	Reflex	N.D.	Enabled
Warn	2	Reflex	N.D.	Enabled
Alarm	3	Latch	N.D.	Enabled
Overrange	4	Latch	N.D.	Enabled
Fault	5	Reflex	N.E.	Enabled
Power failure	5	Reflex	N.E.	Enabled
Communication fault	5	Reflex	N.E.	Enabled
Siren	6 *	Reflex	N.D.	Enabled

(*)Non programmable. N.E.:Normally Energized, N.D.:Normally De-energized

- Possibility to address max 6 REM-485 remote Concentrators.

For a total of:
42 Programmable Relay Outputs
49 Threshold inputs in current loop 0-20mA
14 Digital Inputs Opto-isolated

Internal power supply battery charger 24 Vcc 20W.

Different configurations available:
For DIN rail mounting
In a box for wall mounting
In 19” Rack

1.2 Software features

- The program code and the parameters configuration are protected against non authorized alterations.
The operator will not have the possibility to modify the software functions.
- The parameters assignment in the configuration software is automatically verified for its validity. Invalid entries will be rejected.
- Only authorized personnel can modify the configuration using a high-level password
- The program codes updating is under the manufacturer control. The download of a new software version will be possible only with Oggioni s.a.s. authorization.
- The user is able to identify the installed program code version (Firmware). The Firmware version installed on CM80-ID unit and on the REM concentrators is showed on LCD Display during system start-up time.

2. OPERATION MODE

CM80-ID is a system designed to detect gas following the EN 50402 standard. Then the operating mode will reflect the requirements of the standard.

The measurement method will be the standard one, ie the input signals of the detectors in the field must fall within the range set.
Within this range, the system is able to identify Five operating conditions:

NORMAL CONDITION
The device is in normal condition, there are no fault and no alarms.

ALARM CONDITION
This is the measurement condition of the system, when at least one alarm threshold in at least one channel has been exceeded.
The event will be memorized in the event log with the details of the concerned threshold.
Depending on the settings, the outputs will activate and automatically return in normal mode when the alarm condition will be terminated or they will remain latched and it will be necessary to reset them manually when the setting is a LATCH type.
If latched, the reset is done by an action of ACKNOWLEDGEMENT and RESET to be done by password from authorized personnel.

FAULT CONDITION
- One or more transmitters detect signals outside the measuring range (Under range or Over range).
- The self-diagnosis procedures of one or more system devices reported abnormal conditions.
- The detector is in fault condition because of an incorrect calibration procedure.
- Interruption of the serial line communication or lack of power to the detector.

The event is memorized in the event log with the concerned fault device details.

CALIBRATION CONDITION
The CM80-ID central unit can automatically recognize if a Gas Detector is in calibration mode (see Par. 12.2).

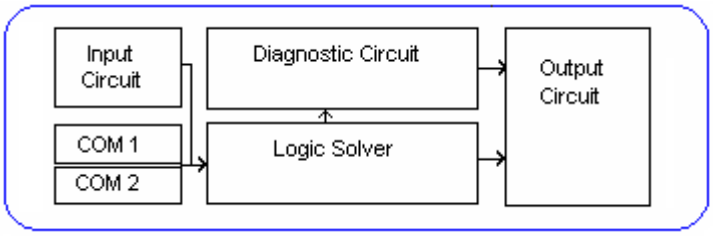
MAINTENANCE CONDITION
If authorized, the operator can intentionally exclude a system part for maintenance, calibration, parameters configuration, functional tests, etc.
In this case one or more devices, enabled and connected to the serial loop, can be disabled or taken to test mode to avoid alarms.

Depending from the programming, the outputs associated with these operating states will activate and will return automatically in a normal mode when the trigger condition will be terminated, or (if latched) they will remain memorized and a manual reset will be necessary by an authorized operator for AKNOWLWDGEMENT and RESET through a password.

3. HARDWARE ARCHITECTURE

3.1 CM80-ID Motherboard

The board architecture is based on a double programmable logic, a first one based on a RISC microprocessor for the serial communication functions on the loop and operator interface and a second one realized by a Logic Gate Arrays, for the watch-dog and diagnostic functions.
The board also includes 2 digital opto-isolated inputs, 8 analogue inputs with current threshold 0-20mA and 7 relay outputs with SPDT contacts. The outputs are used to signal the main system status and can be programmed according to the signals arriving from the field.



3.2 CM80-ID Technical Characteristics

- LCD Backlit Display 2x20 character
- System status LED indications
- 2 configurable RS485 Modbus RTU serial lines,
- 2 Optical fibre communication Drivers

Each CM80-ID unit has a local REM module defined as module 0 that has the following I/O:

3.3 Outputs

- 4 freely programmable relays
- 1 relay (relay 1) corresponding to MAINTENANCE mode (UNSET)
- 1 relay (relay 6) for SIREN output corresponding to both WARN & ALARM modes

3.4 Digital Inputs

- 2 Opto-isolated Digital Inputs 0-10; 0-24 Vdc. For higher voltages, it is recommended to use a current limiting resistor at 20 mA
- 8 analogue inputs, one of which (Ain1) internally used to monitor the battery voltage and other 7 set as inputs with a current threshold 0-20 mA,
  - Io < 3,6 mA Open Loop Fault
  - Io > 12 mA Alarm
  - Io > 21,6 mA Short Circuit Fault

3.5 LED Indications

6 red LED corresponding to the relays status
2 green LED corresponding to the digital inputs status
1 green LED corresponding to the presence of a Back-Up battery
1 green LED corresponding to the presence of power supply
2 blue LED corresponding to the Tx and Rx signals of the COM lines.
2 yellow LED to report abnormal signals on the COM ports.

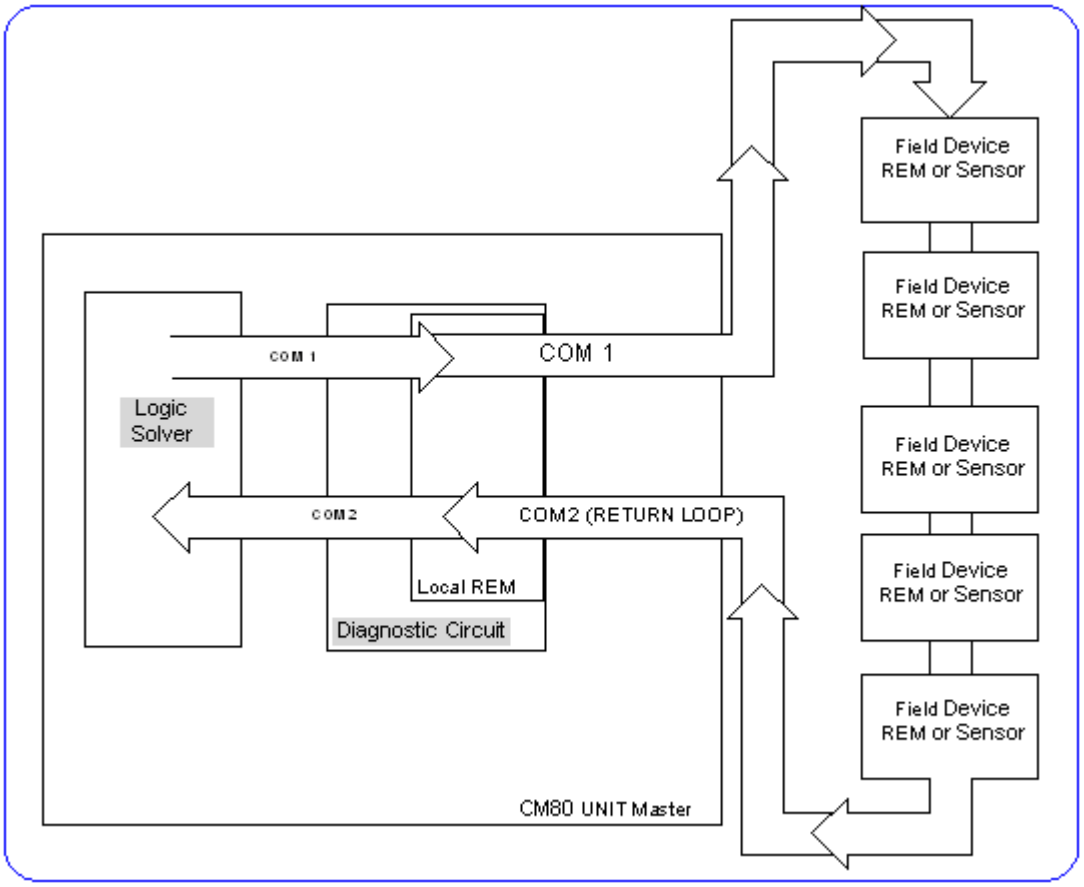
3.6 SERIAL PORTS

Two serial lines managed by an internal controller are available.

The controller programmable logic ensures the possibility to have different configurations for the serial lines.
The serial lines can be configured in closed loop or on two independent open lines.

3.6.1 CLOSED loop configuration

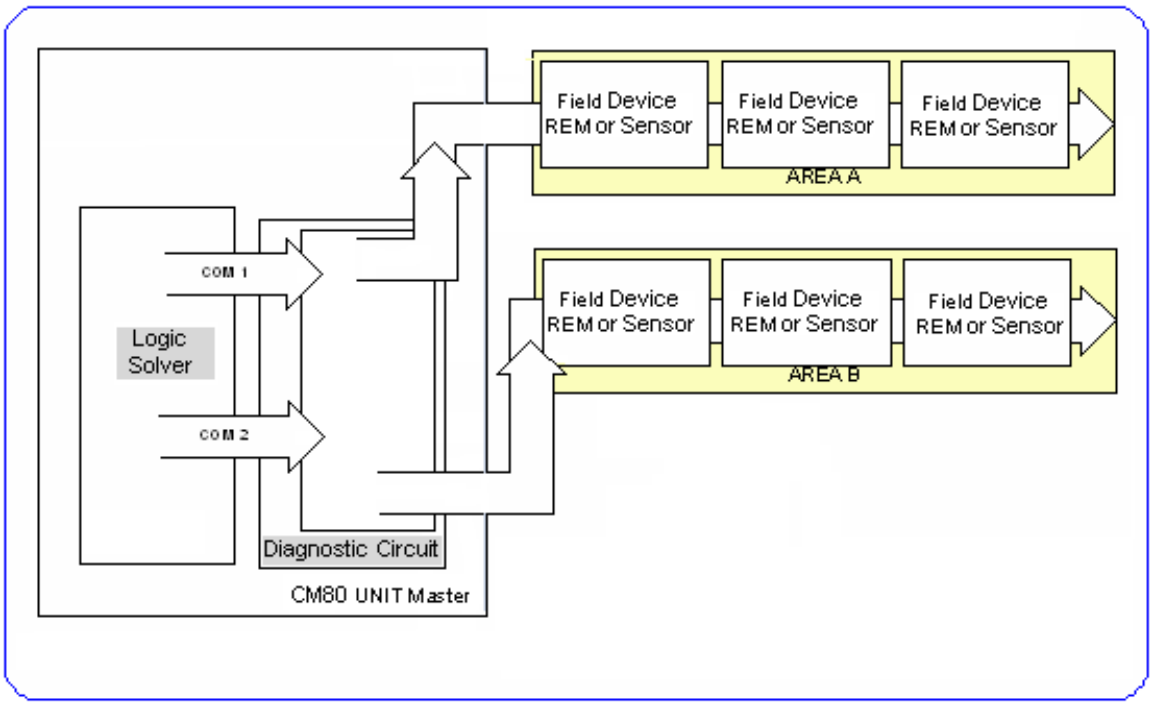
COM1 being on one side of the loop and COM2 on the other side.
In this case, the system reliability is higher, in fact a mechanical interruption of the loop will not disconnect any device from the controller.
All the devices will be accessible from both sides of the loop, through COM1 or COM2



3.6.2 *OPEN loop Configuration*

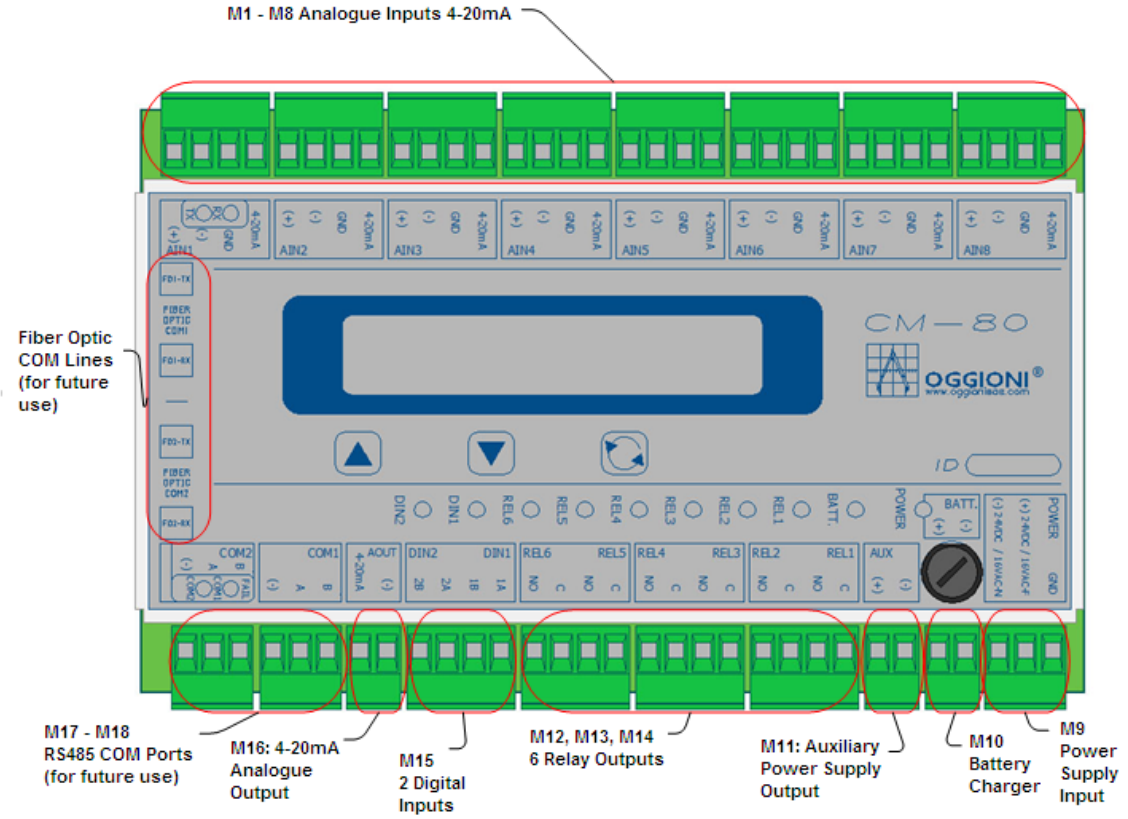
With this configuration the second serial lines is an independent loop.
In this case if the loop is cut off by a mechanical interruption, all devices connected to the damaged part of the serial line will not be accessible any more.

Using this configuration, the system is virtually divided in two different areas A and B to which are assigned respectively the COM1 and COM2 ports.



4. ELECTRICAL CONNECTIONS

Connections are made via screw terminals accepting the following wire sections:
#22 AWG ÷ #14 AWG (0.5 ÷ 2.5 mm^2).
Before powering up the device, ensure that all electrical connections have been completed and are correct.



4.1 System Power

The CM80-ID control units are equipped with a 20W internal power supply, battery charger, with the possibility to connect a 24V /3 A/h backup battery.
Before proceeding with installation verify that the current consumption of the system devices (sensors, concentrators, actuators, etc.) doesn't exceed the maximum load that the service power supply can sustain.
In case REM-485 remote concentrators are used, it will be possible to distribute the power load using the inner power supplies of these devices, in fact each concentrator has an internal battery charger with maximum power 20W.
As an alternative it will be necessary to have an external power supply with an adequate power, in this case it is recommended to verify that the device has an appropriate EMC filter according to current guidelines.

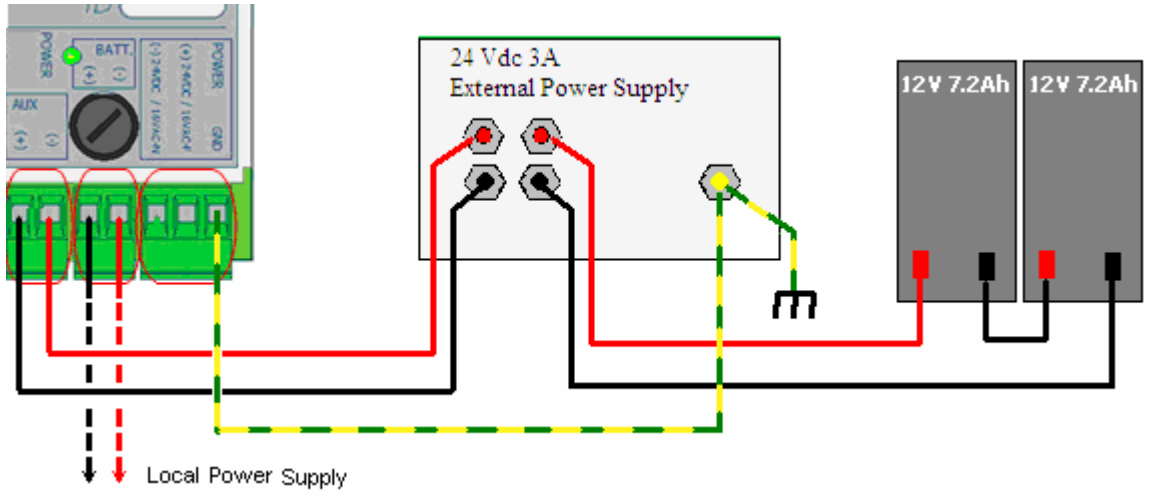
4.1.1 Overload control

If the 24V power supply collapses due to an excessive current demand, the protection circuit operates automatically limiting the output voltage.
Below the threshold of about 19.2V power is interrupted and the system must be reset manually.

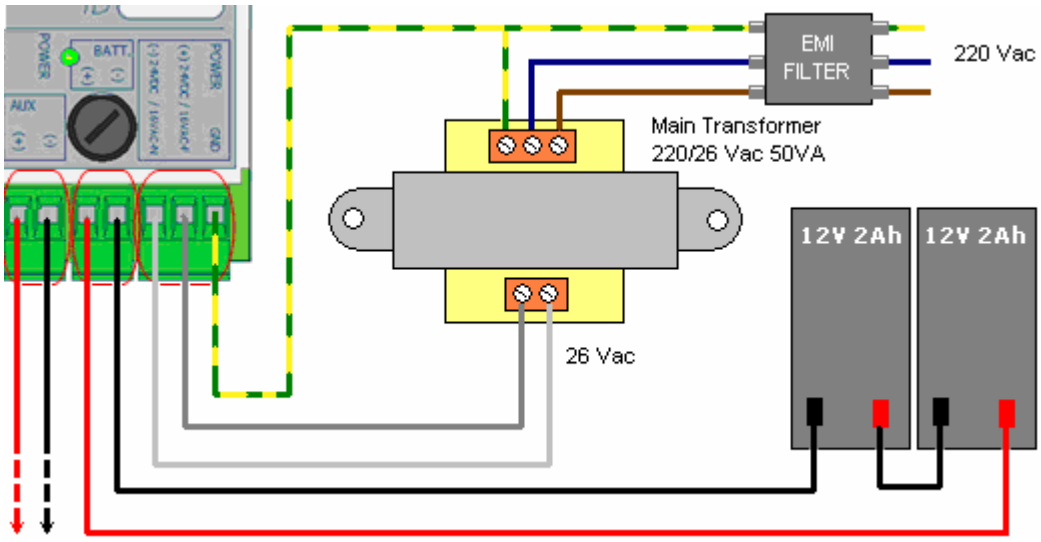
4.1.2 System Supply Sizing

Device	Consuption
Enose RAS or DUST type With catalytic sensor	1,2 W
Enose RAS or DUST type With HQ catalytic sensor	2 W
Enose RAS or DUST type With IR sensor	1,9 W
Enose RAS or DUST type With electrochemical cell	1,3 W
REM remote concentrator	4 W
Bluetooth™ Repeater	1 W

The CM80-ID central unit may be powered by an alternate voltage 26 Vac (25Vac...28 Vac) 100VA or by an external auxiliary power supply of 24 Vdc (24 ... 32 Vdc) with a power adequate to the system needs.
In both configurations the power supply input must be connected to M9 terminal.



Power supply from external auxiliary power supply, maximum output current 6A.
In case this configuration is chosen, use terminal M10 as output for the system power supply.



Power supply from internal power supply, maximum output current 1.8A.
In case this configuration is chosen, use terminal M10 to connect the battery pack.

4.2 Terminal Block Assignments

Terminal M1-M8	Pin	Description
4-20 mA	1	Proportional 4-20mA current Input
GND	2	Ground
(-)	3	Common Negative
(+)	4	+24Vdc detector power supply

Terminal M9	Pin	Description Power Supply Input
GND	1	Ground
(+) / F	2	Phase 26 Vac or + 24 Vdc
(-) / N	3	Neutral 26 Vac or - 24 Vdc

Terminal M10	Pin	Description Exit battery charger
Batt (-)	1	Negative backup battery 24V 3A/h
Batt (+)	2	Positive backup battery 24V 3A/h

Terminal M11	Pin	Description Service power supply output
Aux (-)	1	Negative Aux. power supply 1,8A max.
Aux (+)	2	+24Vdc Aux. Power supply 1,8A max.

Terminal M12-M14	Pin	Description Relays Output
C	1	Common
N.O.	2	Contact N.O. 3A 30Vdc/110Vac
C	3	Common
N.O	4	Contact N.O. 3A 30Vdc/110Vac

Terminal M15	Pin	Description Digital Inputs
1A	1	Input Channel 1
1B	2	Input Channel 1
2A	3	Input Channel 2
2B	4	Input Channel 2

Terminal M17-M18	Pin	Description Com1, Com2 serial RS 485
B	1	(B) standard EIA RS 485
A	2	(A) standard EIA RS 485
(-)	3	Common negative

- The **M16** terminal 4-20mA analogue output is not implemented in this version.

5. INSTALLATION

Before proceeding with installation please follow some simple practical rules:

- Identify the most suitable position for the control unit installation and the requirements for the cabling system.

WARNING: the identified area to install the control unit and the REM concentrators must be out of the hazardous areas (with explosion danger), there must not be presence of gas or corrosive substances and the operating temperature and humidity environment limits must be respected.

- Check that the voltages and currents of power supply requirements are appropriate
- Depending on the central unit configuration that you are using, install the CM80-ID control unit (if open frame) or the 19" rack and their accessories, if any, in the target framework.
  Make the connections of the power supply, paying particular attention to the ground circuit.
  DO NOT POWER the control unit during this phase.

- In case of a system with distributed sensors and/or concentrators, proceed with the installation of all devices in the field and complete the connections with the CM80-ID central unit.
  Carefully check connections of the serial communication line to make sure that nothing has been reversed on the signals.
  As already mentioned, the serial loop follows the RS-485 standard, therefore it will be impossible to create star-type configurations, all devices must be connected linearly and it must be installed an "end of line" resistor on the last component of the loop.

WARNING : if the sensors are installed in classified hazardous areas with explosion danger, carefully follow the instructions provided by the current standards for this type of plant.

- Connect the actuators or the alarm devices to the respective output terminals.

At the end of all the installation and wiring operations and before to power up the installation carefully check that all the electrical connections have been done correctly.

The CM80-ID central unit and all the connected devices must be installed in accordance with the indications given by the EN60079-14 standard.

5.1 Guidelines for a proper installation

To comply with EMC standards EN 50270 (Electromagnetic Compatibility), you should observe some simple points during the installation.

In General:
The chosen area where to install the central unit must not be interested with hard electromagnetic interferences.

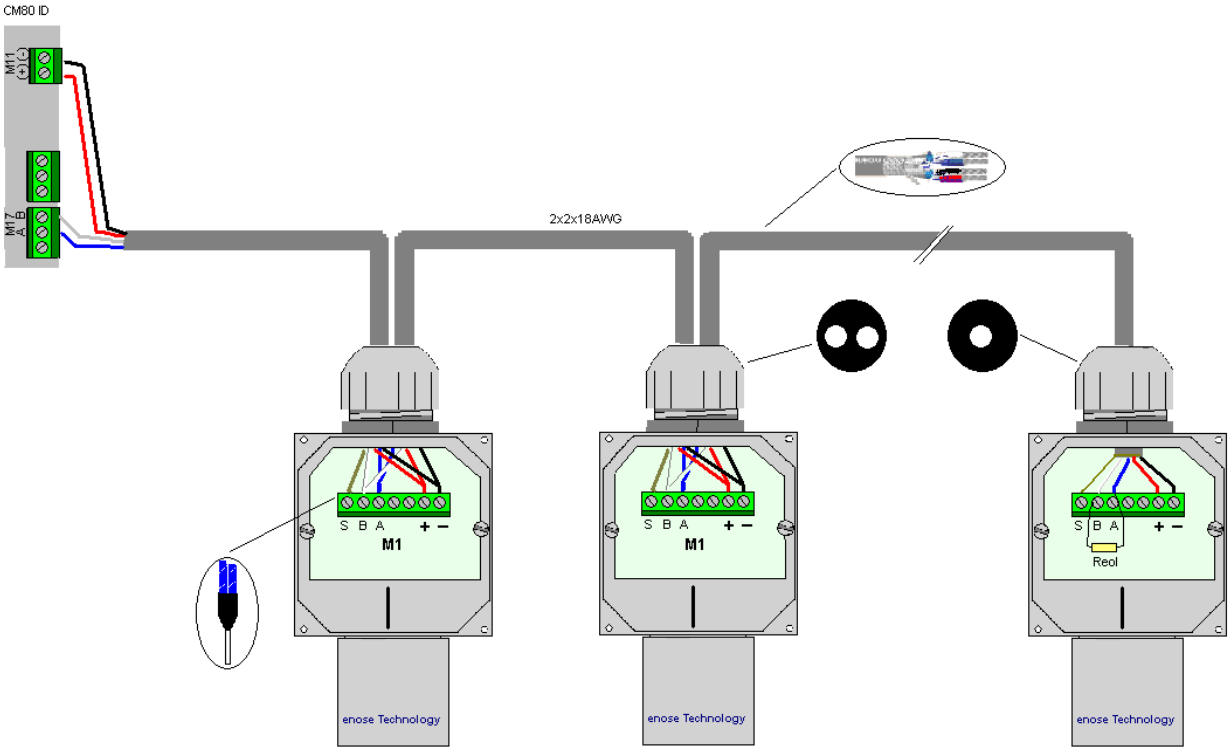
The power supply input must have a line filter type FN 660 (Schaffner) or equivalent.
If a supplementary power supply is used (external 24 Vdc) it has to be protected by a line filter type FN 2060 (Schaffner) or equivalent.

For the connection of the devices shielded cables with a minimum coverage of 80% must be used.
The shields must be connected only by the control unit side in the ground point, through a good electrical connection with minimum resistance.

The serial communication cables must be adequately protected and must be kept separate from the primary power supply or power ones (d > 30 cm).
Also there must not be any potential difference between the shield and the ground.

For enose® Gas Transmitters or remote modules connection it is recommended to use the data transmission cables EIA RS-485/422 2x2x18/7 type TELDOR 9FA9D2Z or equivalent.

An “end of line” resistor (Reol=120R) must be placed on the last device connected to the serial loop, while on the control unit point the resistance itself is already internally connected.

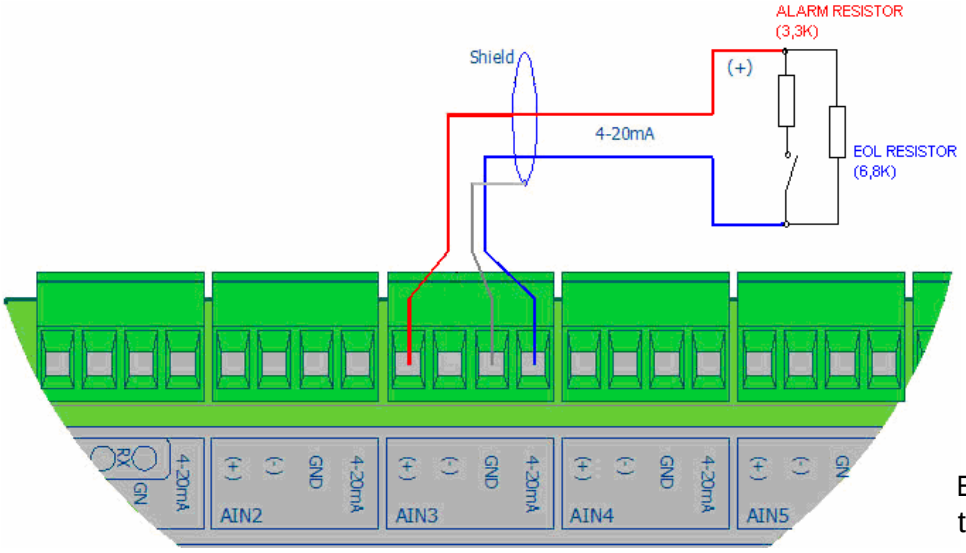


5.2 Power loop threshold inputs

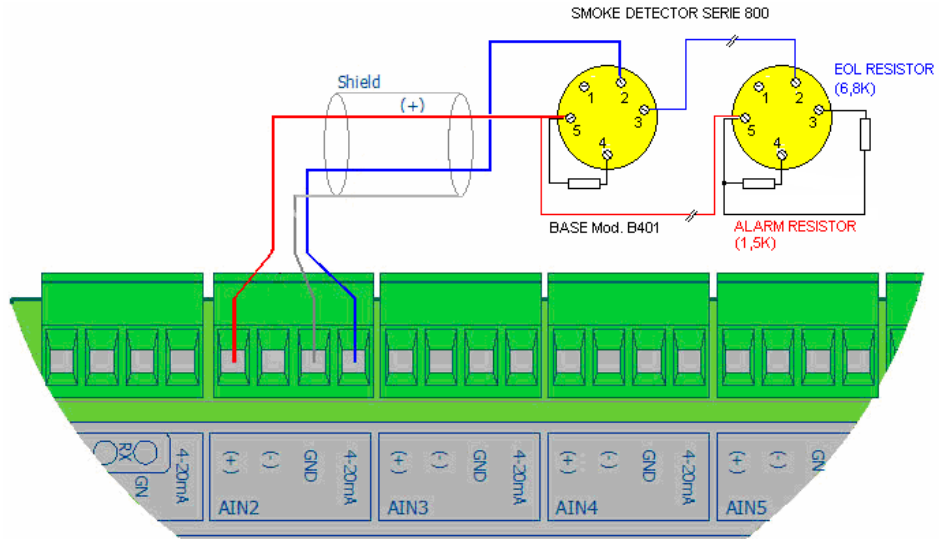
The M1 and M8 terminals are designed to connect the devices with 0-20mA threshold current loop, a service power supply is also available on the terminals for any sensor as for example Thermal, Smoke or Flame sensors, , manual alarm buttons etc.
These inputs can be used to realize lamps tests or to monitor the relay contact status. In all these cases it is to be considered that the activation of one of these inputs corresponds to an alarm status and generates the activation of the output or outputs concerned to this status.
It is recommended to use a 80% shielded cable to connect these devices.

For these kind of inputs the thresholds are:

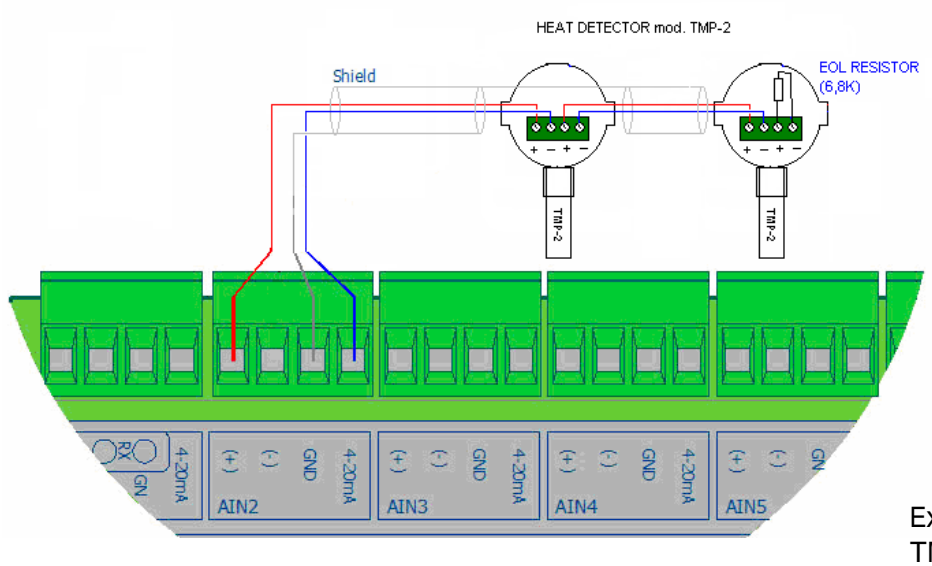
Io < 3,6 mA Open loop fault
Io > 12 mA Alarm
Io > 21,6 mA Short circuit fault



Example of connection with the alarm push button.



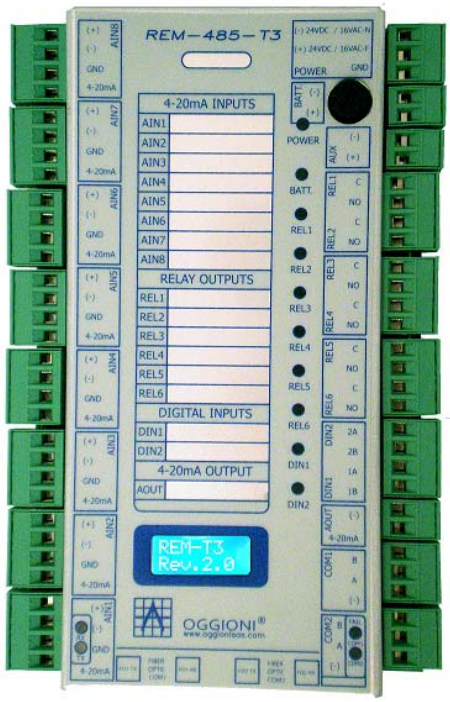
Example of connection with Honeywell smoke detectors



Example of connection with TMP-2 Heat detectors

5.3 *REM-485 T3 Remote Concentrators*

The REM-485 modules are remote concentrators that can be connected to BUS RS-485.
The general features are similar to the inner module of the CM80-ID central unit:



5.3.1 REM modules technical features

-1 LCD Display 8x2 diagnostic characters for the states display
-7 analogue current threshold inputs type 0-20mA
-6 relays outputs, (or open collector)
-2 opto isolated digital inputs
-2 Standard serial Ports RS-485 Modbus RTU
-2 Optical fibre serial ports 62.5/125um 3,5dB/Km. (optional)

Using the REM-485 modules it is possible to connect directly the 0-20mA power consumption devices.
The REM-485 modules directly supply power to the sensors and can manage the charge of a back up battery due to a 20W power-charged internal battery.
For limitations on the power system, the considerations previously made remains valid.
Also the electrical connection are absolutely similar to those mentioned for the CM80-ID central unit.

5.3.2 LED Indicators

- 1 Green LED corresponding to power supply;
- 1 Green LED corresponding to Battery presence;
- 6 Red LED corresponding to the 6 outputs;
- 2 Blue LED signalling active communications on the RS-485 loops;
- 2 Yellow LED signalling a fault respectively on the two RS-485 serial lines.

5.4 REM Modules configuration

The REM modules can be configured directly from the CM80-ID central unit, the language selection is automatic and depends on the central unit program.

Same as the CM80-ID central unit, the relays 1 and 6 are not programmable.
Relay 1 is associated to the system fault, this output is normally activated. Every module fault condition, including communication errors or lack, cause the fall of this output.
Relay 6, same as for CM80-ID, is associated to the general ALARM condition.

5.5 REM Modules diagnostic messages

The input and the module operating status are displayed on the service display through a series of diagnostic messages:

When power up the display shows the message with module model and installed software version.

Condition of the 0-20mA threshold inputs and the digital ones are shown in a sequence order.

When all the 0-20mA inputs are in normal conditions the message “In Status” is shown and on the second line there are 8 dashes for the 8 available inputs.
The horizontal dash “–“ indicates the OFF condition and the vertical one “|” the ON condition.
In a short circuit input condition or open circuit the display will show the concerned message and on the second line there will be one or more vertical dashes to indicate which of the inputs in is this condition.

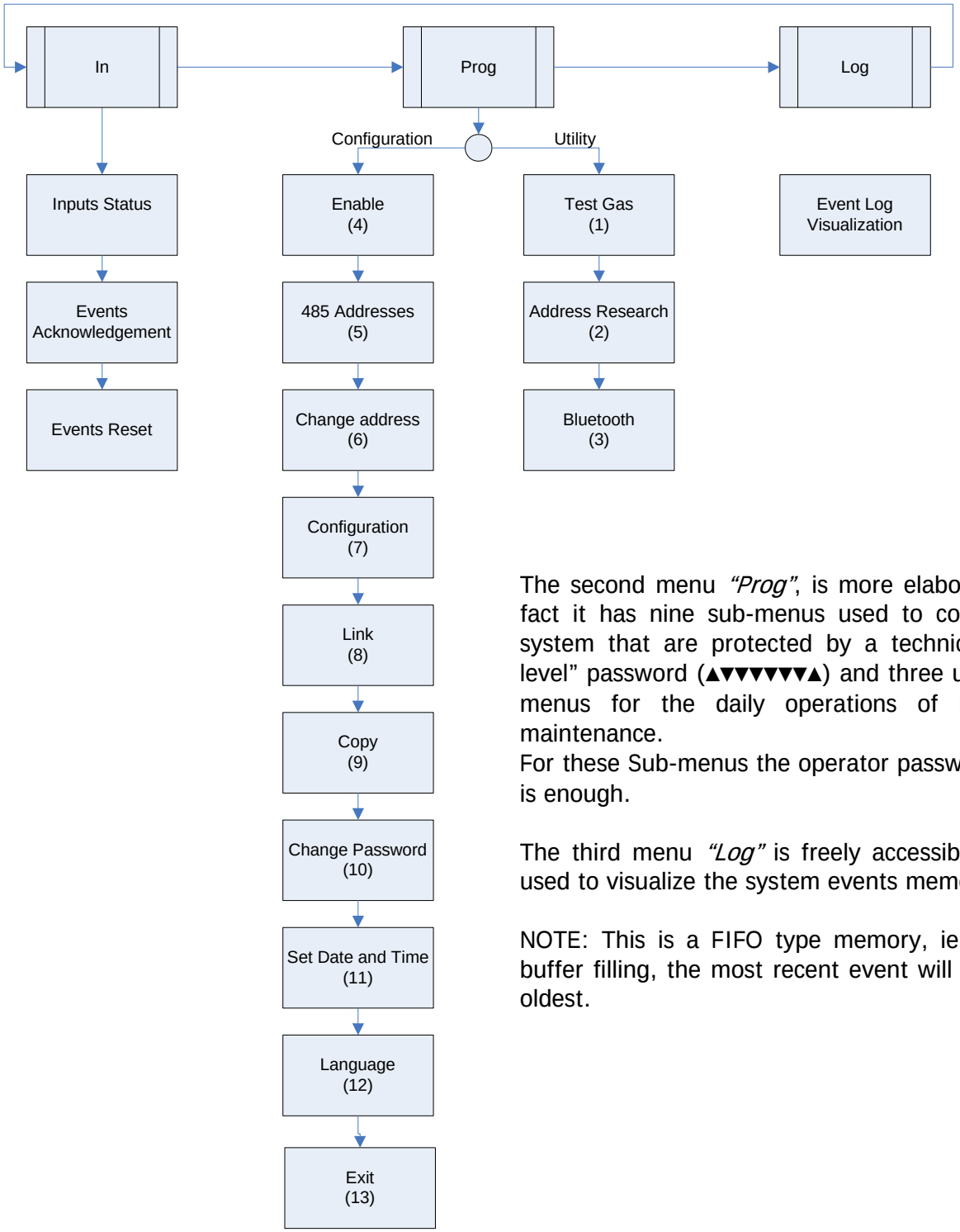
Similarly concerning the digital inputs the only difference being in the second line where the horizontal dash “–“ is for OFF condition and the vertical one “|” is the ON condition.

When the module is normally operating and connected to the serial loop the status message will display the On Line condition and the Modbus address of the module itself.

Otherwise, the display reads Off Line.
This means that the module interrogation has not been enabled from the central unit yet, or that there are communication problems on the RS-485 loop.

6. SOFTWARE STRUCTURE

The CM80-ID central unit management software is divided in three main menus: *In - Prog- Log.*
The first menu *"In"* is used to visualize the inputs status, the system status and for the acknowledgement and reset actions to reset alarms.
These actions are protected by operator password (▲▲▼▼)



The second menu *"Prog"*, is more elaborate and in fact it has nine sub-menus used to configure the system that are protected by a technical "second level" password (▲▼▼▼▼▼▲) and three utilities sub-menus for the daily operations of running or maintenance.
For these Sub-menus the operator password (▲▲▼▼) is enough.

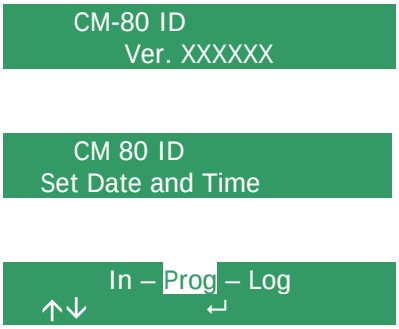
The third menu *"Log"* is freely accessible and it is used to visualize the system events memory.

NOTE: This is a FIFO type memory, ie in case of buffer filling, the most recent event will replace the oldest.

7. CM-80-ID CONTROL PANEL PROGRAMMING

7.1 System General Parameters Configuration

At power up, the display shows the presentation page with the control unit model and the installed software version.
After few seconds the 90 seconds warm up time will start.
Having finished to install the hardware parts of the system, it is possible to start the configuration procedure of the different units, and to realize the “cause & effect” matrix for the generation of alarm, warning, failure or emergency signals.

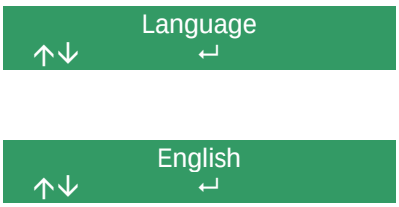


The first request is DATE and TIME.

Entering “Enter” you enter the page to scroll and chose the menus.

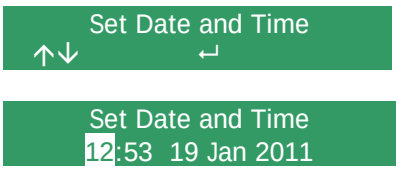
Use the arrows digits ▲ ▼ to chose the programming option and confirm with “Enter”.
Remember: for this operation the technical level Password (▲▼▼▼▼▼▼▲) is required.

7.2 Submenu (12) Language



When necessary it is better to program the Language first.
To do this scroll with the arrows ▲ ▼ the sub-menus and confirm with “Enter” the option Language.
Scroll with the arrows ▲ ▼ all the available languages and confirm with “Enter” you choice. Entering “Enter” you also go back to the programming main menu.

7.3 Submenu (11) Set Date and Time

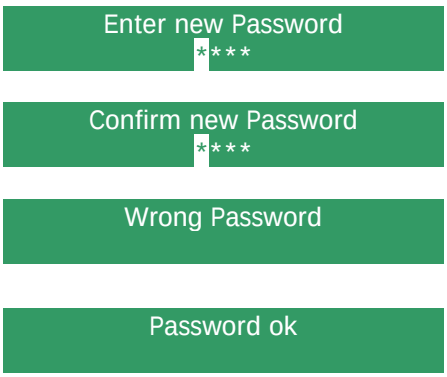


Using again the arrows ▲ ▼ you can scroll the Sub-menus to get to the date and time programming:
The date and time format is:
time: HH:MM date: DD MMM YYYY, with three letters to indicate the month.

The cursor will go on the Time. With the arrow ▲ ▼ set the time in 24h format.
Entering “Enter” the cursor will go on the next field, to set the minutes use the same procedure. Proceed the same way up to the Year field, confirming which you save the data and exit the Sub-menu. Having completed the first part of the initial configuration, you can jump to the definition of the system structure.
For complex installations it is recommended to plan the assignment of the devices addresses for each area of the plant and the “cause & effect” Links, using the attached tables(xx xx).

7.4 Sub-menu (10) Change Password

By this sub-menu you can change the operator password.



In the first screen the new password is required.

In the second it is required to confirm the new password:
If it doesn't correspond the message "*Wrong Password"* will appear, otherwise it will be accepted with the message "*Password OK"*.

We remind that the operator default password is (▲▲▼▼).

In case you forgot the new password and you cannot enter the Sub-menu to change it, there is only the possibility to force a system reset and restart with default parameters.

ATTENTION!!: this operation will cancel all the previous settings.

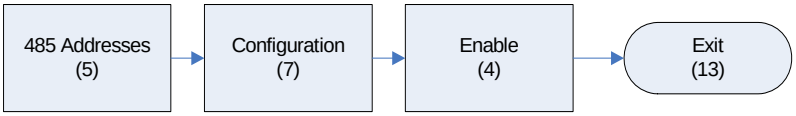
8. CONFIGURATION OF DEVICES CONNECTED TO SERIAL LINE RS-485

As already described it is possible to connect on the serial line up to 48 enose® Gas Detectors and up to 6 REM modules.
The serial communication with these units follows the Modbus Protocol and in phase of configuration, it is possible to assign an address from 1 to 127.

NOTE: all devices are supplied with the default address 127, so before connecting them to the network they have to be configured with their own single definitive addresses.

It is recommended not to confuse the detectors device number (from 1 to 48) and the modules number (from 0 to 6) with the Modbus address.
The first one is just a progressive number to identify the device itself, while the second is the "unique identifier" that the central unit uses to communicate with the remote peripheral devices.
It is suggested to use fixed rules to assign the addresses for example associate addresses for 11÷99 for the sensors and from 100÷127 for the modules.
This way the first number can be used to indicate the area where the devices are installed, ex. AT11, AT12, AT13 can be read as sensors no. 1, 2, 3 installed in area 1; and of course AT21, AT22 sensors 1 and 2 installed in area 2 etc.
This simple trick will avoid confusion during the programming and will simplify the plant structure understanding.

To start the devices connected to the system configuration it is recommended to follow the following order:



8.1 Sub-menu (5) 485 Addresses

To start: from the *Prog* menu, using the ▲▼ digits select the Sub-menu (3); *485 Addresses*

With this menu you can set the RS 485 addresses of every connected device.
Confirm with "Enter" at the end of every setting.

WARNING: Entering (0) you exit the menu
If you want to set a sensor address, use the arrow▲ to select the sensor from 1 to 48 then press the "Enter" key.
Afterwords with the arrows ▲▼ set the address for the selected sensor. In the example we associated the sensor no. 1 to the address 11. Pressing the "Enter" key you confirm the selection.
The letter "d" after the number identifying the device, indicates this device has not been enabled yet (*see Par. 8.6 – ENABLE*).

Pressing the “Enter” key you confirm the selection and with the keys ▲▼ you repeat the procedure up to the last sensor to be configured.

The central unit check the address and indicates it as not valid if this address is already being used for another device.

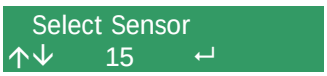
NOTE : in the screen “Insert Address” suddenly pressing the ▼ key the central unit suggests the address previously set + 1. (no need to check if the same address is already being used by another device; this notice will be visualized after having pressed the “Enter” key).

WARNING; if you press any other key this function will not be available any more.

If you want to start the setting of the REM modules, from the initial menu it is suitable to use the arrow ▼ . This way you will immediately see the concentrators setting screen and still using the arrows ▲ ▼ you can repeat the addresses assignment procedure for all the installed modules.
Please remind that to exit this menu you have to go back to the sensor addresses setting, chose the virtual address (0) and confirm with “Enter”.
If by mistake you try to use an already assigned address, the display will show : *ID: not available*

We will see later how it is possible to perform a scan on the serial loop to determine if the addresses have already been assigned.

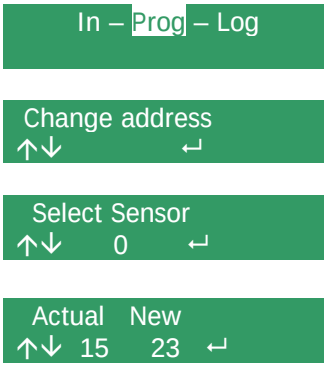
8.2 Exclusion of a device



In this menu it is possible to exclude a device from a serial loop interrogation cycle.
To do this it is enough to select the device to be excluded and assign it the (0) address.
This is a definitive action, so to insert again the device in the interrogation cycle you have to re-assign the old address or give it a new available address.
WARNING: All active events related to the excluded device are reset.

8.3 Sub-menu (6) Change Address

To modify an assigned address you can use the Sub-menu (6) *Change Address:*



Starting from the Prog menu using the arrows▲ ▼ select the sub-menu (6) and you'll see the screen for the addresses change, confirm your choice with "Enter".

Chose the device as in the previous addresses assignment menu, once chosen the display will show the current address memorized in the CM80-ID control unit, and the field where to insert the new address, as usual confirm with "Enter".

To change the address to a sensor that is already in the central unit interrogation cycle, you must at first disable it and only at the end of the procedure you can enable it again.
This procedure causes a gas sensor system reset, so the central unit could display a communication diagnostic error message, but when the gas detector start-up procedure will end, the interrogation cycle will be working again with the new assigned address.

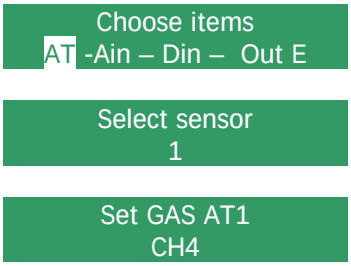
8.4 Submenu (7) Configuration

When all the addresses have been assigned to all the system detectors and modules (when installed), the operator can start their configuration using the submenu (7) *Configuration.*
With this sub-menu you can chose to configure detectors, analogue inputs, digital inputs or relays:

AT = Detectors
Ain = Analogue Inputs
Din = Digital Inputs
Out = Relays
E = Exit

Confirm the selection with "Enter".

8.4.1 Sensors configuration (AT)



From the "chose device" sub-menu select AT and confirm with "Enter".
Always using the arrow ▲ ▼ select the sensor from 1 to 48 that you want to configure.
After the sensor selection (ex. No.1) you can start setting the substance (gas) to detect, ex CH4.
Using the arrow ▲ ▼ scroll the list of available substances and confirm your selection with "Enter"
.

Available gas:

CH4	Methane	LPG	Liquefied Petroleum Gas	PRO	Propane	BUT	Butane
H2	Hydrogen	CO	Carbon Monoxide	PEN	Pentane	NH3	Ammonia
GAS	Generic	HCN	Hydrogen Cyanide	H2S	Hydrogen Sulphide	O2+	Oxygen in excess
CL2	Chlorine	HCL	Hydrochloric Acid	CO2	Carbon Dioxide	O2-	Oxygen in decrease

In case the desired gas is not in the list, chose the option GAS (Generic)

Once the gas is set, with “Enter” you go to unit measurement choice, for ex. %LEL. (Low Explosive Level percentage) or ppm (Part Per Million).
Always using the arrow ▲ ▼ scroll the table with the units measurement and confirm your selection with “Enter”
Units of measurement available:

%LEL: %Low Explosion Level %v/v: % Volume Ppm: Parts per million

Once the UM is set, you have to set the Full Scale, using the same procedure, with the arrow ▲ ▼ scroll the table with the Full Scale values and confirm your selection with “Enter”

F.S. value available:

For **%LEL**: 2,00 – 5,00 – 10,0 – 20,0 – 25,0 – 30,0 – 40,0 – 50,0 – 100,0.
For **%v/v**: 2,00 – 5,00 – 10,0 – 20,0 – 25,0 – 30,0 – 40,0 – 50,0 – 100,0.
For **ppm**: 2,00 – 5,00 – 10,0 – 20,0 – 25,0 – 30,0 – 40,0 – 50,0 – 100,0 100 – 300 – 400 – 500 – 1000 – 5000 – 10000 – 20000.

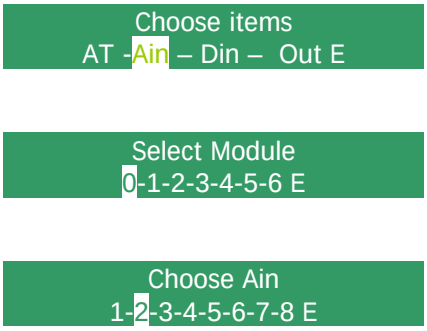
The next step is to set the WARN and ALARM thresholds.
The default WARN threshold is 25% of Full Scale and the ALARM one is set at 50%.
Using the arrow ▲ ▼ you can increase or decrease the proposed values and memorize them by pressing “Enter”

N.B. The displayed value increase depends on the full scale chosen, high f.s. values imply bigger steps of increase from a point to the following one.

8.4.2 Analogic Input Configuration (Ain)

This are inputs are current threshold type, useful for the connection of emergency buttons, thermal sensors, etc. In this case the thresholds are prefixed.

I < 3,6 mA Open Loop Fault
I > 12 mA Alarm or closed contact
I > 21,6 mA Short Circuit Fault

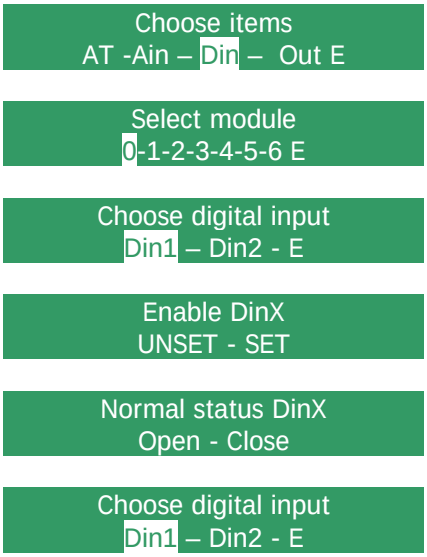


In this case the configuration for this kind of inputs is just enabling or not each single input or in case you want to connect a contact, you can chose if normally open or normally closed.
From the sub-menu "select devices" select *Ain* and confirm with "Enter".
As usual with the arrow ▲ ▼ select the module relative to the analogue channel you want to configure and confirm with "Enter".

Using this procedure select the channel to configure from 2 to 6.
Channel 1 is not available because it is dedicated to the battery level monitoring.

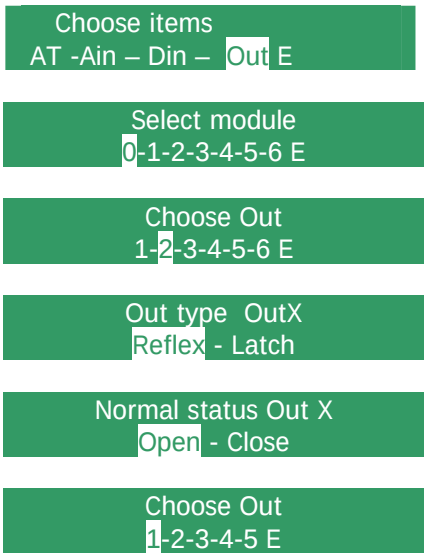
8.4.3 Digital Inputs configuration (Din)

These are ON-OFF inputs; being galvanic isolated they are specially indicated to acquire signals from the limit switches, level indicators, etc.



To configure these inputs you have to start from the Sub-menu "Select devices" selecting *Din* and as usual confirm with "Enter"
The procedure is absolutely the same as per *Ain.*
On the left side you can see the sequence of the configuration screens for the two digital inputs.
Of course you have to repeat the same procedure for all the enabled inputs of the connected modules.
To exit the sub-menu select *"E"* and confirm with "Enter".
Warning: these inputs are to be considered as process inputs, that you can use to realize link with the relay outputs.
As all the other kind of inputs they are stored in the event Log, but they do not generate any particular system status.

8.4.4 Output Configuration (Out)



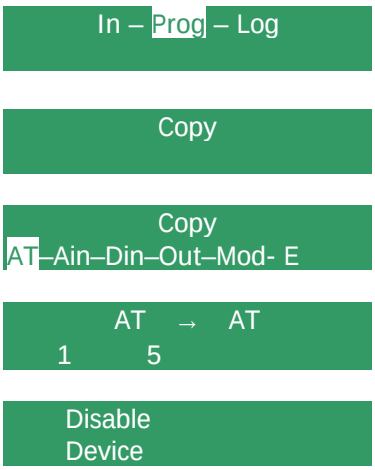
From the sub menu "select devices" select *Out* and confirm with "Enter".
Then select the module and after select the output you want to configure.
You will note that the outputs from 1 to 6 are not selectable, because they are already assigned to built-in functions.
The output 1 for the module 0, the one inside the control unit, is set as UNSET, this is the only output that is activated when a device is disabled.
The output 6 for all the modules is dedicated to the SIREN output and it is activated by a warn or alarm event, while the output 1 for the remote modules (1÷6) is assigned to the situation of communication lost with the central unit.

The available options for the relays outputs are related to the operation mode and to the relays status in a normal operating condition

The operating mode can be *Reflex* (the output follows the event status) or *Latch* (the output associated to an event is memorized), while the output contact status can be *OPEN* (normally non energized relay) or *CLOSE* (normally energized relay).
To select, as usual use the arrows ▲ ▼ and confirm with "Enter"
To exit select "E" on the second line left and confirm with "Enter"

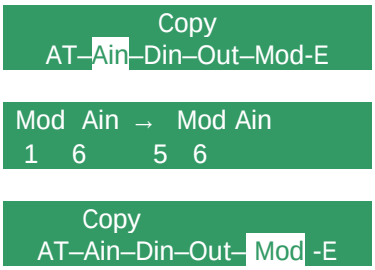
8.5 Sub-menu (9) COPY

Often different devices need the same configuration, in this case to speed up the setting it is possible to use the Sub-menu *COPY*.



From the menu Prog using the arrow ▲ ▼ select the sub-menu *COPY.*
Entering this menu you can copy the setting of every device already configured.
Select the data source device, ex. an AT sensor, confirm with "Enter".
Using the arrows ▲ ▼ select the destination sensor where you want to copy the settings, when the setting of two addresses is the same will force the exit.
To accept the copy the device must be disabled. If it is not disabled, when selected and you try to confirm a copy with "Enter" the display will show the diagnostic screen.

With any key you can exit the menu and enter the menu “Enable” in order to disable the device.
To end the Copy procedure select the virtual address 0 and confirm with “Enter” to go back to the home screen:

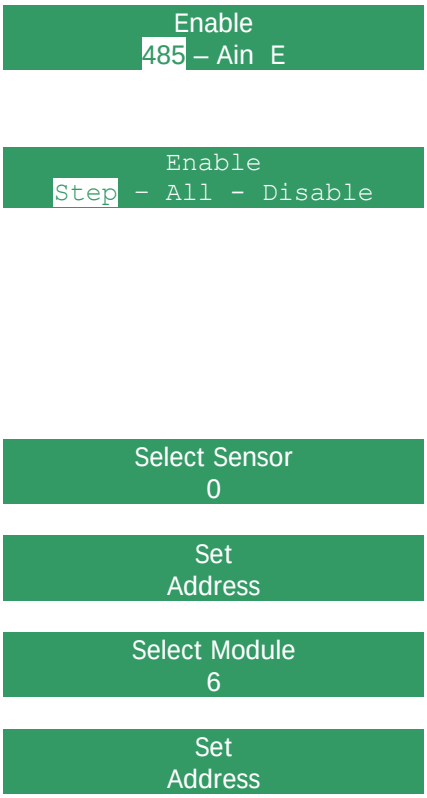


To copy the input or output configurations, use the same procedure.
Special case for the built-in input or output that cannot be copied.
Selecting *Mod* it is possible to entirely copy all the configurations from the source module to the destination one.

To end the copy procedure select the virtual address 0 and confirm with “Enter” to go back to the home screen, then selecting *E* you exit the sub-menu.

8.6 Submenu (4) ENABLE

Use this menu to enable or disable the interrogation of a sensor that has a Modbus address already assigned or of an analogue input (Ain).
This procedure can be applied to already configured devices only.



Choose if you want to enable a device connected in the RS-485 serial loop or an Analogue Input (Ain).
In the example is showed to enable a detector in the serial loop. (Selection “485”)
The central unit suggests 3 choices:
All = enables all the devices connected on the serial loop
Disable = Disables all the devices connected on the serial loop
Step = Let the operator enable step by step the devices one by one

The key 0 is to exit the menu, with the arrow ▲ you can select the sensors from 1 to 48. If you want to start selecting the REM modules, from the home menu you have to use the arrow ▼ and you will see the screen to set the concentrators from 1 to 6 and still using the arrows ▲ ▼ you repeat the selection procedure.

If a device hasn’t a modbus address yet, the display will show *Set address.*

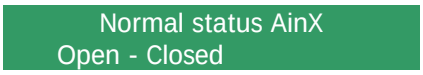
See menu "485 Address" (sec.8.1 page 23)

If the address has already been assigned to the device, the display will show the enable screen:

Confirming "*SET*" the device communication will be activated.

Select *"UNSET"* to disable a device from the interrogation cycle.
This procedure is useful when you need to do the maintenance or you need to enlarge the system and you don't want to disable all the system.
The disabling action will reset the device active events.

Exactly in the same way you can enable or disable an Analogue Input (Ain).



Once the channel is chosen the display will show UNSET-SET to enable or disable the input and also the choice OPEN-CLOSED for the kind of contact eventually connected.
The choice and confirm procedure is always the same until the end, selecting "Enter" you'll go back to the initial screen *Ain*.
Of course the operator must repeat the procedure for all the module's channels.

At this point all the connected devices have an address, a configuration and the are enabled to the serial communication.
You just have to make the cause-effect Links to activate the outputs according to the different the system or the devices status. You have to use the submenu (8) LINKS to do this.

8.7 Submenu (8) LINK

Link
Exit

Link
Warn → Out

Link
Al → Out

Link
Ovr → Out

Link
Fault → Out

Link
Din → Out

Link
Al Ain → Out

Link
Fault Ain → Out

Link
No com → Out

Link
PWF → Out

Link
Warn → Out

Warn-AT N Mod Out
1 1 0 3

Warn-AT N Mod Out
1 2 1 3

From the first screen with the arrow ▲ ▼ you can visualize all the possible status that can be associated to the outputs:
As already mentioned some of the outputs are built-in (see *par.3.3 pag.8)*, for all the other outputs it is possible to decide the link status-output.
For every device or input status and/or condition it is possible to generate up to three links, in other words for every status it is possible to enable up to three different relays.

The mechanism for the selection of the different options is always the same, with the arrows ▲ ▼ select the choices and confirm with *"Enter".*
The selection (0) for the sensors is the exit from the submenu
To make a link please proceed as follows:
Select the condition ex. Warn, confirm with "Enter" and go to the screen source device or source input selection and then set the link to the output of the concerned module.
While selecting, the display will show the already assigned links or the default ones.

The example on the side shows two links for warn condition of the sensor AT-1;
The first link is for output 3 of the central unit (module 0) while the second one is used to enable the same output but in the remote module 1.
Setting the link of output status, the configuration procedure is finished.

Status Table

Sensors (AT)	Status
	Warn
	Alarm
	Fault
	Ovr

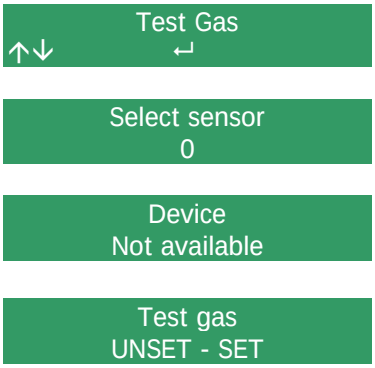
REM Modules	Status
Input Ain	Alarm
	Fault CC o CA
Input Din	Online Offline
General Fault	PWF Power Supply Fault
	No Com Fault RS-485

9. SYSTEM UTILITY

Always starting from the menu *"Prog"* there are some other utility sub-menus to make tests and maintenance: Gas Test, Search Addresses, and Bluetooth.
These submenus are protected by the operator password (▲▲▼▼).

9.1 Sub-menu (1) Test Gas

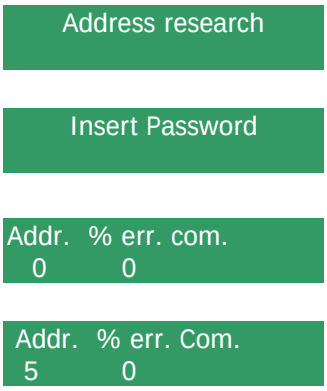
This is the submenu to verify the sensors, it is possible to excite the gas sensor with a reference mixture and verify the answer without activate any alarm



Select the sensor to be verified from 1 to 48 with the arrow ▲▼ (the selection 0 is the Exit).
If the selected sensor doesn't correspond to any enabled address there will be the diagnostic message:
Device non available
Otherwise the screen will show: Gas Test
Selecting *ON* the 40 minutes test period for selected sensor starts, while with *OFF* the procedure ends and the sensor goes back to normal operating status.

9.2 Sub-menu (2) Address research

This menu is very helpful when a device has to be added to the serial loop and you don't know the addresses already in use or at the end of the addresses assignment procedure you want to make a functional check of the serial lines.



Starting from *Prog* using the arrows ▲ ▼ select the sub-menu (11) *Address* res*earch* and confirm with "Enter"
Considering this function stops the normal system functioning, it is requested to insert the technical Password: (▲▼▼▼▼▼▲).
Each time you press the arrow ▲▼ the system starts to search the addresses starting from 1 up to 127. Every time it recognizes an address on the loop, the scan stops and you can verify on the screen the communication fault percentage caused from the detected faults because of lost data packets or not correctly received.

The parameter of the detected error rate on the transmission packets is a useful indicator of the quality of the serial communication line.
When it is 100% on all the devices it means that the line is interrupted or there are faults in the wiring.
When you find 100% on one device it could mean that the device is out of order.
Any percentage between 0 and 100% means that there are electromagnetic noises on the serial line or the line itself could be too long > 800 m. therefore there is a strong attenuation of the transmitted signal.

A particular case can be when two devices on the loop show 50% of errors. This is typical when by mistake the two devices have the same address.
To scroll to the following addresses to continue the scan press one of the arrows ▲▼.
To stop the scan at any time select “Enter”

Addr.	% err.com.
0	0

At the end of the scan cycle you go back to the initial screen, Selecting “Enter” you go back to the menu *Prog.*

9.3 Sub-menu (3) Bluetooth

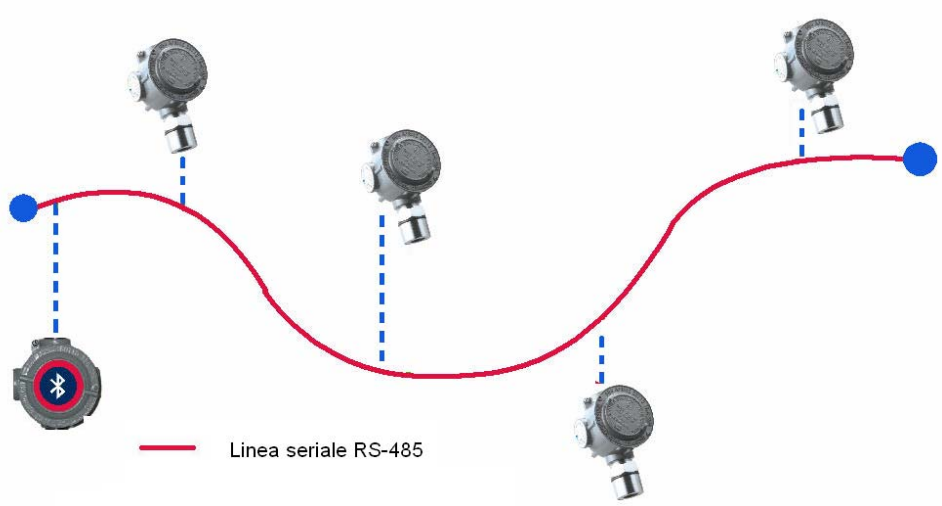
This command stops the communication with the control unit and the communication is handled from remote.

Bluetooth
Insert Password
Bluetooth Yes No

Requested Password is Operator Password:(▲▲▼▼). Pressing No you exit the procedure, pressing Yes the system communication handling goes to the Bluetooth device that will operate as a Master.
To enable the communication with the control unit, enter the Bluetooth menu again, digit the password, and select No. Anyway this function is automatically disabled after 20 minutes.

The installation of this device, OPTIONAL, can be particularly useful for Gas enose® Detectors because it allows the display of all the functional parameters related to the sensor status, the execution and check of the calibration procedures, the settings, etc. simply using a laptop or portable devices supporting Windows Mobile rev.7.0 or higher version.

For further information please refer to the document operator manual BT-485 Part No 101200



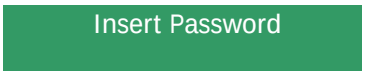
10. MENU "IN"

This menu allows to make normal operations required during the operational phase of the system. Visualize the inputs status, sensors reading, acknowledgement and reset of the events.

Any event has priority over the rest of information.
The operator has to execute the acknowledgement (ACK) and the *Reset* of all the events using the "Enter" key.

10.1 Events Acknowledgement

When the system is operating in normal condition the display shows the logo, time and date.
When an event occurs, the display shows the information about the event itself.



Pressing "Enter" and selecting "In" it is possible to visualize the condition generating the event.
To acknowledge it and of course to silent eventual alarms you have to press again the "Enter" key and insert the user's password (▲▲▼▼).

A (*) followed by a text explaining the kind of event will be shown on the display to confirm the ACK.

After having entered the password a 2 minutes time of non operations will put you out of time.

If more than one event is active every time you press the "Enter" key the screen will automatically scroll to the following event.

10.2 Events Reset

If the event happens on a LATCH output, the display right side inscription will blink and it will be blinking also after the star (*) appears on the screen, waiting for manual reset.
Only after a second press of the "Enter" key the LATCH output will be reset.

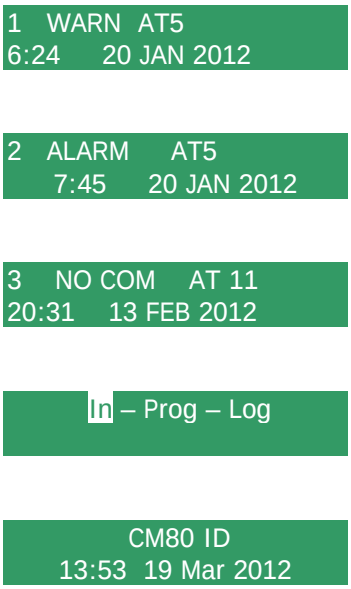
Note: The reset is not accepted by the system when the event is still active.
When all the active events will be confirmed, the system goes automatically back to the normal condition.

11. "LOG" MENU

In normal conditions pressing "Enter" the display will show the menu selection.
Selecting *Log* with the arrow ▲ and confirming with "Enter" the display will show the events list

The event log is a FIFO circular one, so the oldest events are automatically overwritten by the newest ones.

If there are no recorded events the display will simply show *No Log.*
Otherwise you will be able to scroll on the display the recorded events using the arrow keys (▲▼).



The data format is as follows:

n° event; Kind of event; Input, Time; Date.

To exit the "*Log*" menu it's enough to press the "Enter" key to go back to the menu selection page, after few seconds the system will automatically show the normal condition home page.

12. SPECIAL STATUS

12.1 System Reset

During the start up period, pressing one arrow key and “enter” simultaneously for 6 seconds you will enter the initialization menu that is under a level 1 technical password.
Entering the level 1 password (▲▼▼▼▼▼▲) you will see the following screen:

Selecting *NO* you exit the procedure, selecting *YES*
The central data memory is initialized.

WARNING: all the programming and event log recording data will be cancelled

Default parameters:
Gas Detectors (AT1-48)

Substance	Scale	Alarms	Modbus address	Condition
GAS	100% LEL	25% 50%	0	Disabled

System status assignments on module (0)

Status	Relay Output	Mode	Status	Condition
Unset/Maintenance	1 *	Reflex	N.D.	Enabled
Warn	2	Reflex	N.D.	Enabled
Alarm	3	Latch	N.D.	Enabled
Overrange	4	Latch	N.D.	Enabled
Fault	5	Reflex	N.E.	Enabled
Power failure	5	Reflex	N.E.	Enabled
Communication fault	5	Reflex	N.E.	Enabled
Siren	6 *	Reflex	N.D.	Enabled

(*)Non programmable N.E.Normally Energized N.D.Normally De-energized

System status assignments on modules (1-6)

Status	Relay Output	Mode	Status	Condition
COM line fault	1 *	Reflex	N.D.	Disabled
Free	2	Reflex	N.D.	Disabled
Free	3	Reflex	N.D.	Disabled
Free	4	Reflex	N.D.	Disabled
Free	5	Reflex	N.D.	Disabled
Siren	6 *	Reflex	N.D.	Disabled

(*)Non programmable N.E.Normally Energized N.D.Normally De-energized

Digital Inputs (Din 1-2)

Status	Relay Output
Din 1 ON	2 - mod.0
Din 2 ON	3 - mod.0

Language	User’s Password
EN	▲ ▼▼▲

Current Inputs 0-20mA (Ain)

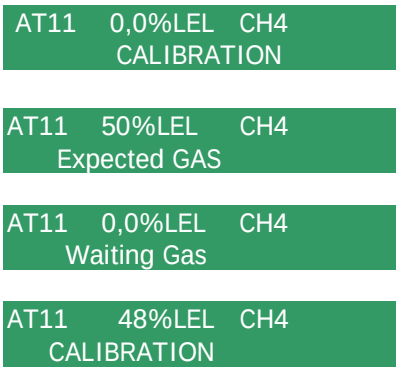
Status	Relay Output
Ain 1 ON	3 - mod.0
Ain 2 ON	3 - mod.0
Ain 3 ON	3 - mod.0
Ain 4 ON	3 - mod.0
Ain 5 ON	3 - mod.0
Ain 6 ON	3 - mod.0
Ain 7 ON	3 - mod.0
Ain 8 ON	3 - mod.0

Nota : Ain 1 is not available

12.2 Calibration

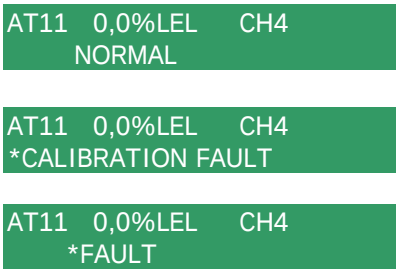
Detailed information about the automatic procedure of the enose® Gas Detectors are available in each specific Gas Detector User's Manual.

The CM80-ID central unit can automatically recognize if a Gas Detector is in calibration mode, in this case the display will show the following screen:



From this moment the control unit will follow all calibration procedure steps, showing automatically all the phases on the display.
First of all it will show the expected gas value for the detector to be calibrated, then it will show a warning screen of calibration Test Gas.
In this moment the operator has to apply the span gas to the gas detector and the display starts to visualize the read concentration.

If the procedure is successful the display will show the detector's normal condition message.



Otherwise it will show the diagnostic calibration fault message.

This is a system fault condition, so it will be recorded in the Event Log and it requires the ACK and RESET action with "Enter" by the operator.

Pressing the "Enter" key to acknowledge (ACK) the event the sensor is reset and after the start up period it is possible to repeat the calibration procedure.

If the problem persists, it could be that the sensor is exhausted, in this case contact manufacturer.

IMPORTANT: during the calibration procedure the alarms ARE NOT generated in the same way as for the *Gas Test* procedure.
At the end of the procedure the Links to the output associated to the sensor in calibration are automatically reset.

13. REFERENCE STANDARDS

EN 50073	Guide for selection, installation, use and maintenance of apparatus for the detection and measurement of combustible gases or oxygen
EN 50270	Electromagnetic Compatibility. Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen.
EN 50054	Electrical apparatus for the detection and measurement of combustible gases – General requirements and test methods
EN 50402	Electrical apparatus for the detection and measurement of combustible or toxic gases or oxigen– Requirements of functional safety of fixed gas detection systems.
EN 50104	Electrical apparatus for the detection and measurement of oxygen; Performance requirements for operating and test method.
EN 50271	Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen – Requirements and tests for apparatus using software and/or digital technologies.
EN 50057	Electrical apparatus for the detection and measurement of combustible gases – Performance requirements for Group II apparatus indicating up to 100% lower explosive limit.

NOTES

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For more information please contact:

Oggioni S.a.s. Tel. + 39 0362 995062
DESIO (MB) Fax. +39 0362 622531
Italy www.oggionisas.com
info@oggionisas.com

The brochure includes general specifications which are subject to change without prior notice.