

# TOCSIN 903 SINGLE CHANNEL GAS DETECTOR USER INSTRUCTIONS



NEW WITH OPTIONAL

**HART**

COMMUNICATION FOUNDATION

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## TOCSIN 903 SINGLE CHANNEL HAZARDOUS GAS MONITOR

The Tocsin 903 can be used either as a stand alone 4-20mA transmitter module or integrated into a larger system.

The software platform for the Tocsin 903 can be upgraded as new enhancements are added making the 902 system the only hazardous area gas detector you will ever need  
Digital processing technology enhances an already proven range of hazardous area gas detectors making the Tocsin 903 series perform to new levels of excellence.

SPECIFICATION		FEATURES
Power Supply	24VDC, 12W	Software Controlled
Temperature	0 - 55°C	Software upgradable via serial port
Humidity	5 - 95% RH Non Condensing	Software fault detection and recovery
Accuracy	+/- 0.5% of FSD	Digital transducer Filter (to remove noise)
Resolution	1% of FSD	Alarms Include spike / noise rejection algorithm
Outputs	4-20mA (Max. 700 Ohms) 1 second update.	Under voltage detection and recovery
Inputs	Pellistor, 4-20mA	One Man Calibration
Display	4 digit RED LED, 14mm height	Full Pellistor fault detection - Compensator/Detector short/open.
Response Time	T90 = 10s	No Manual Potentiometers - All calibrations and set-up stored digitally
Size	Approx 130mm Dia x 110mm Approx see diagram	Set-up and Calibrations password protected
Weight	1.5 Kg	Programmable Pellistor operating current
		Programmable transducer range
		Diagnostic Information
		Fully controllable via serial port - Gas values, Diagnostics, Calibrations, Set-up
		Configurable alarms - Rising / Falling / Latching / Non-Latching
		Simple one button operation

### Default Supply Set Up

The alarm outputs will normally be set to activate at 20 and 50 % of the measured gas range. Standard alarm configuration is alarm on rising alarm and for alarms to latch.

**MARKINGS  
AND  
APPLICABLE  
STANDARDS**

**TOCSIN 903 INSTALLATION  
INSTRUCTIONS**

**INSTRUMENT HOUSING**

**Ex** II 2 DG

Ex d II C T6

Epsilon07ATEX2287x

**GAS DETECTORS**

**EEx d IIC T6**

**CE** 0518

**Ex** II 2 DG

Sira 02ATEX1271X

or

Sira 02ATEX1270X

ATEX 94/9/EC  
EN 50014  
EN 50018  
EN 50281-1-1

The following information is provided to enable safe installation and operation of the Tocsin 903 controller.

This control unit can be fitted with either a three wire flammable gas sensor based on pellistor or Infra Red technology or two or three wire 4-20mA toxic gas sensors based on electrochemical technology.

It is vitally important for correct and safe operation that appropriate cable types and sizes are used and all earth bonding points observed. It is also important to observe all instructions for entry terminations. Failure to follow these instructions may result in a system which may be dangerous or fail to operate correctly.

It is imperative to use cabling which suits the environment in which the T903 and its sensor is to be used. The following is intended as a guide.

Fit 1.5mm SQ cable and for pellistor sensors do not exceed 50M between the sensor and the T903. For 4-20mA sensors do not exceed 200M.

**Use**

Pirelli LSX type cable for office/light commercial un-zoned installations

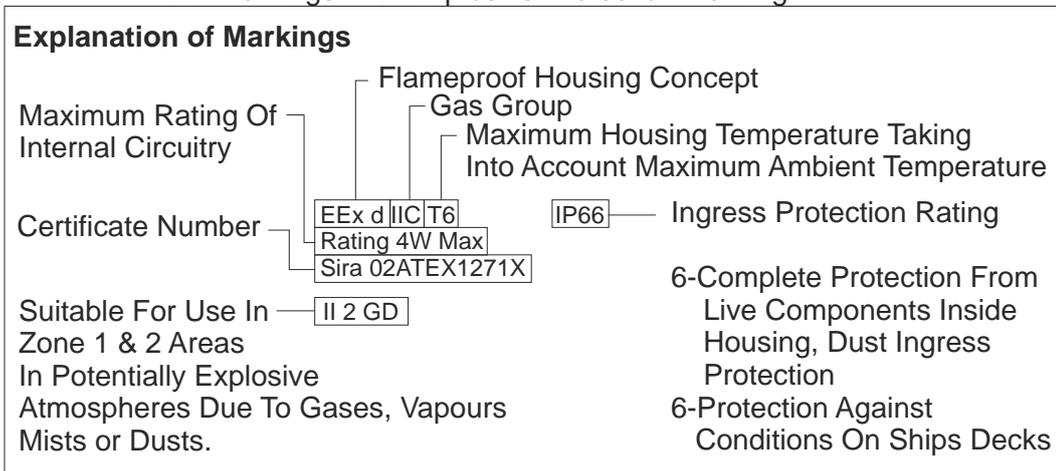
Steel Wire Armoured or CY cable for medium/heavy industrial un-zoned installations

Mineral Insulated Pyro cable for all hazardous area zoned installations.

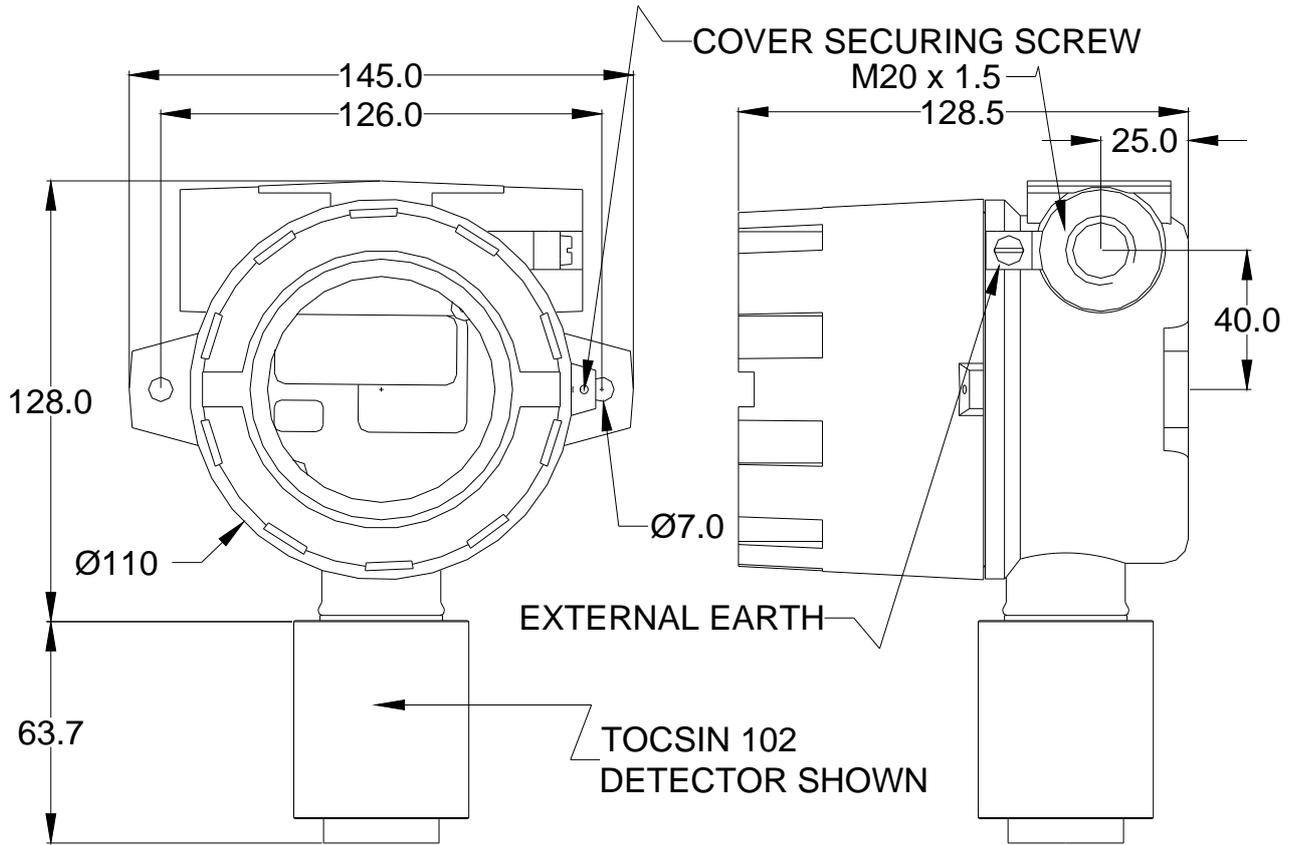
Note in all cases the T903 must be supplied via a suitable fuse or circuit breaker for isolation during service if required.

The housing must be grounded to a minimum 20A ground. If the Tocsin 903 is to be used in a zoned hazardous area ensure the certification marks on the side of the main housing match the zones certification requirements. In such cases do not operate the Tocsin 903 without the cover correctly screwed in place.

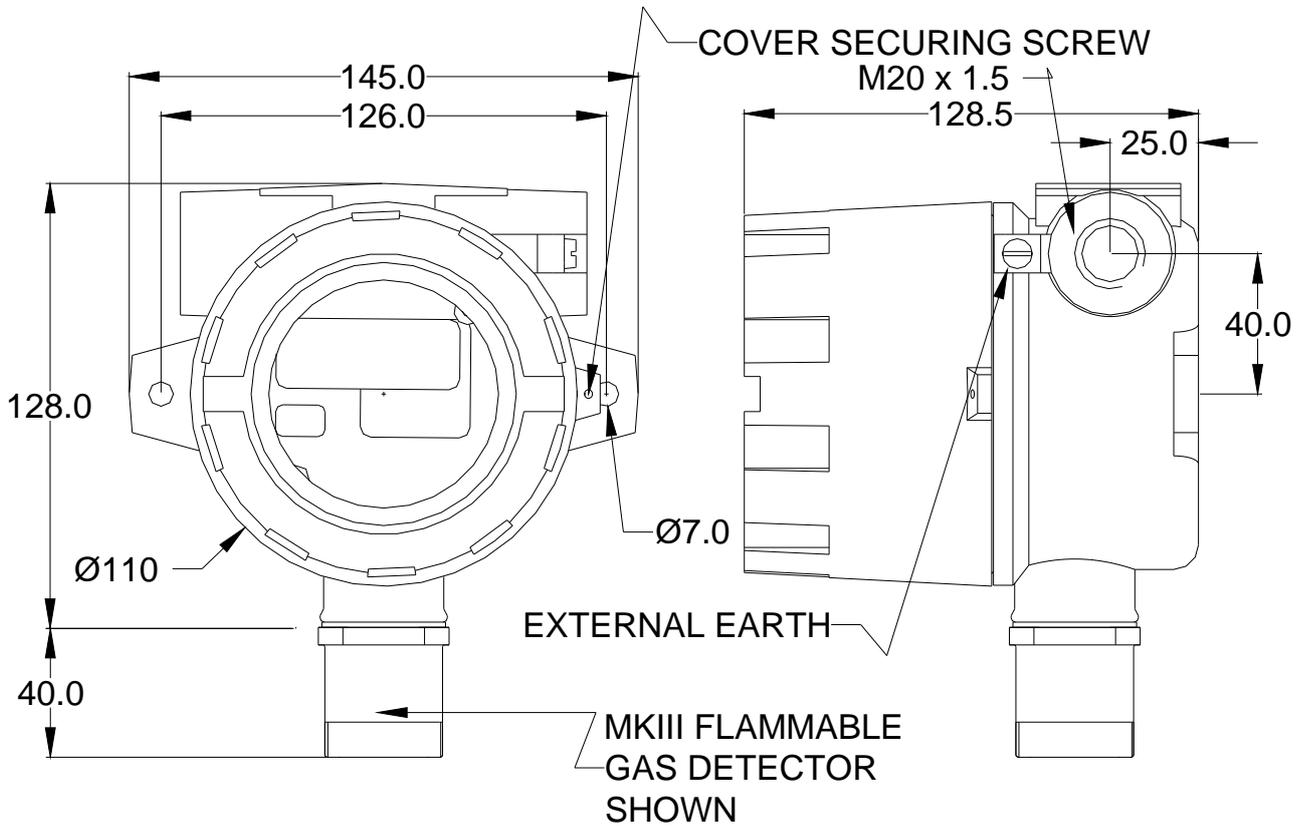
**ATEX Markings With Explosive Protection Marking**



MOUNTING DETAILS AND DIMENSIONS FOR COMBINED TOCSIN 903 AND TOCSIN 102 DETECTOR

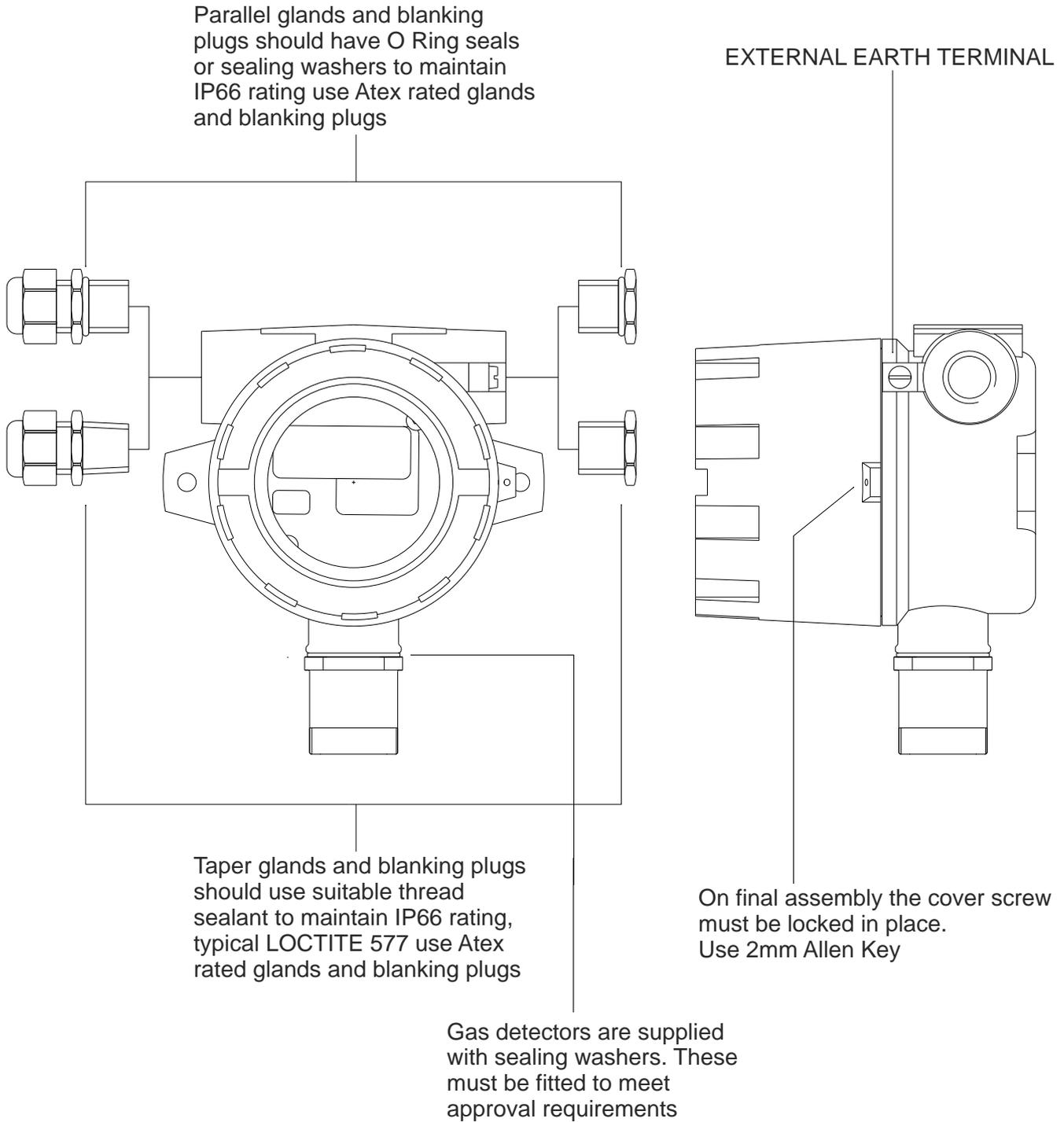


MOUNTING DETAILS AND DIMENSIONS FOR COMBINED TOCSIN 903 AND MKIII DETECTOR



## CUSTOMER SEALING AND EARTHING RESPONSABILITIES

The Tocsin 903 is designed for use in Zone 1 and Zone 2 hazardous areas and is ATEX certified. To maintain compliance it is imperative the installer of the equipment observes the following installation guidelines. Failure to do so could compromise the protection concept of the equipment.



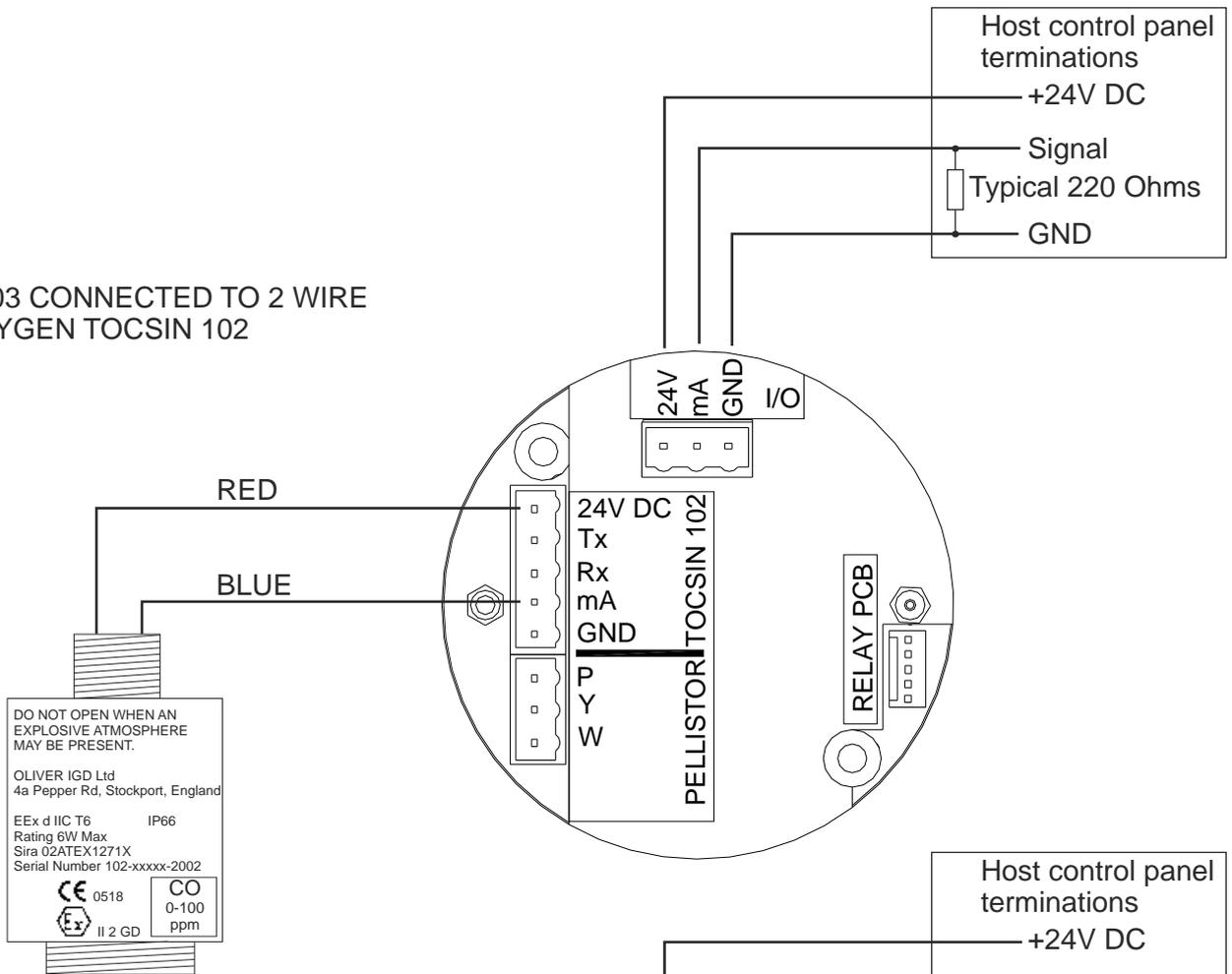
EXTERNAL EARTH	STRANDED CABLE USE	4.0mmSQ CSA	SOLID CORE CABLE USE	6.0mmSQ CSA
INTERNAL EARTH	STRANDED CABLE USE	1.5mmSQ CSA	SOLID CORE CABLE USE	2.5mmSQ CSA

### WARNING

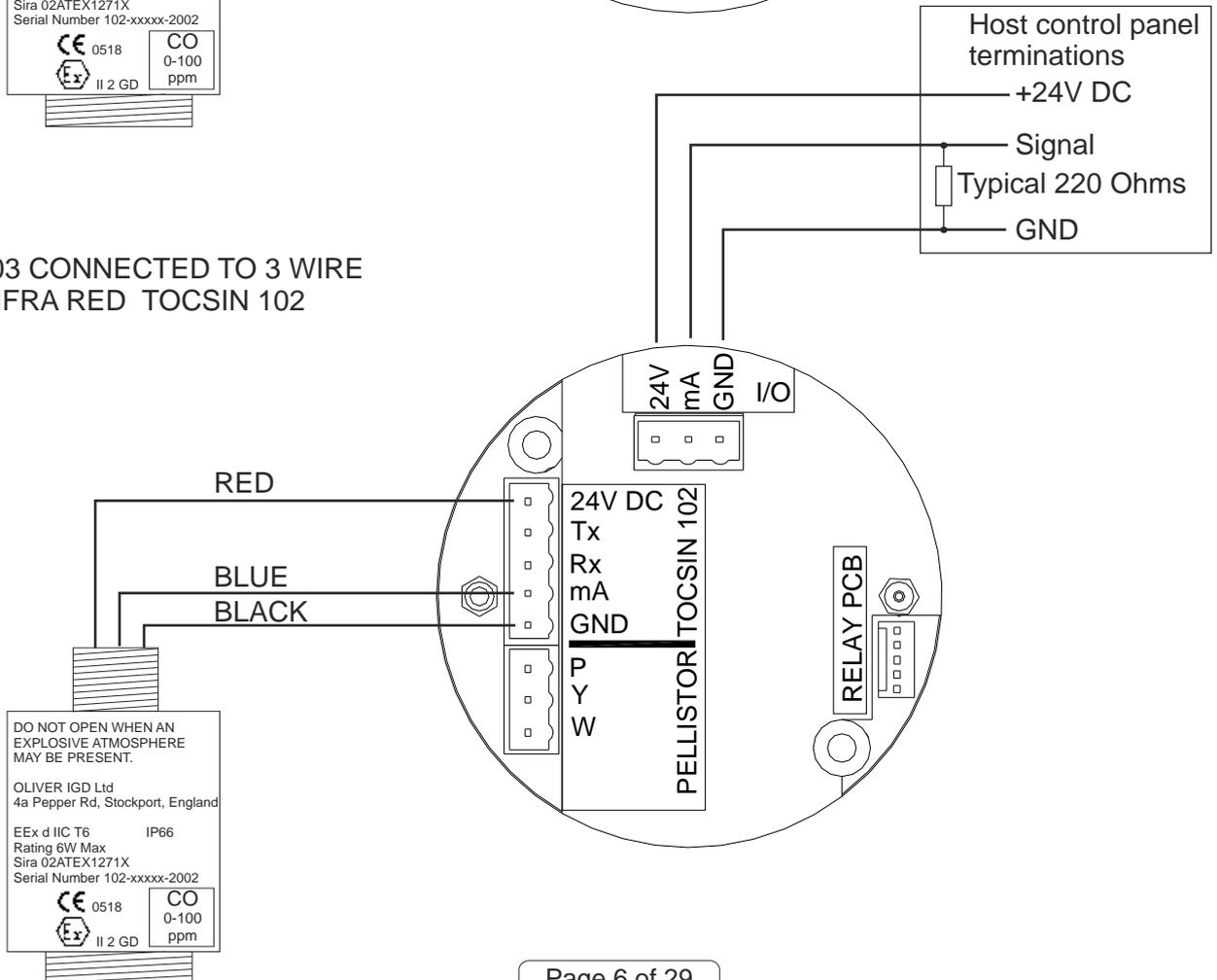
**Glands and cable must be of a suitable type to match the zone of application of the equipment**

## TOCSIN 903 TERMINATION DETAILS

### TOCSIN 903 CONNECTED TO 2 WIRE TOXIC/OXYGEN TOCSIN 102

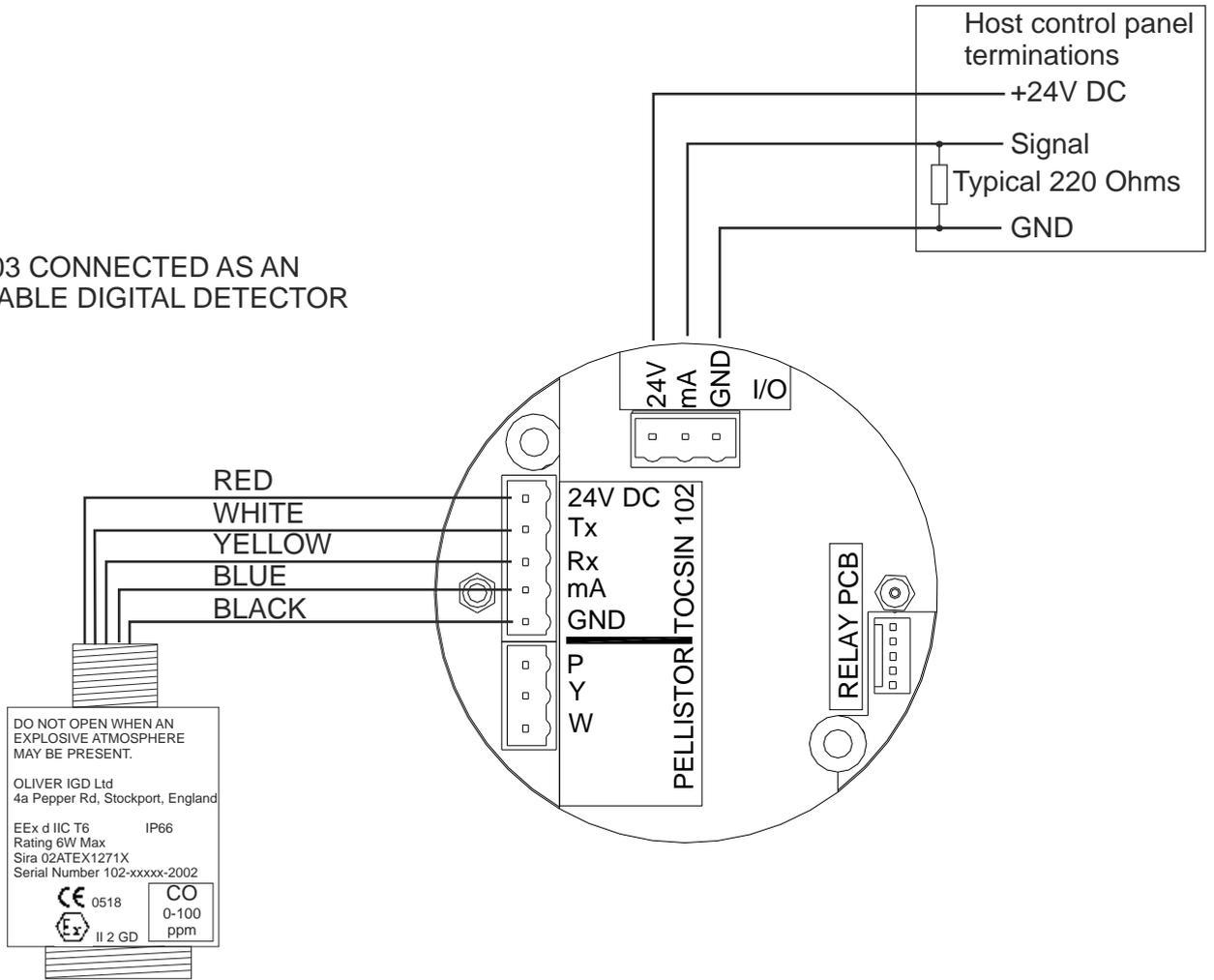


### TOCSIN 903 CONNECTED TO 3 WIRE CO2/HC INFRA RED TOCSIN 102



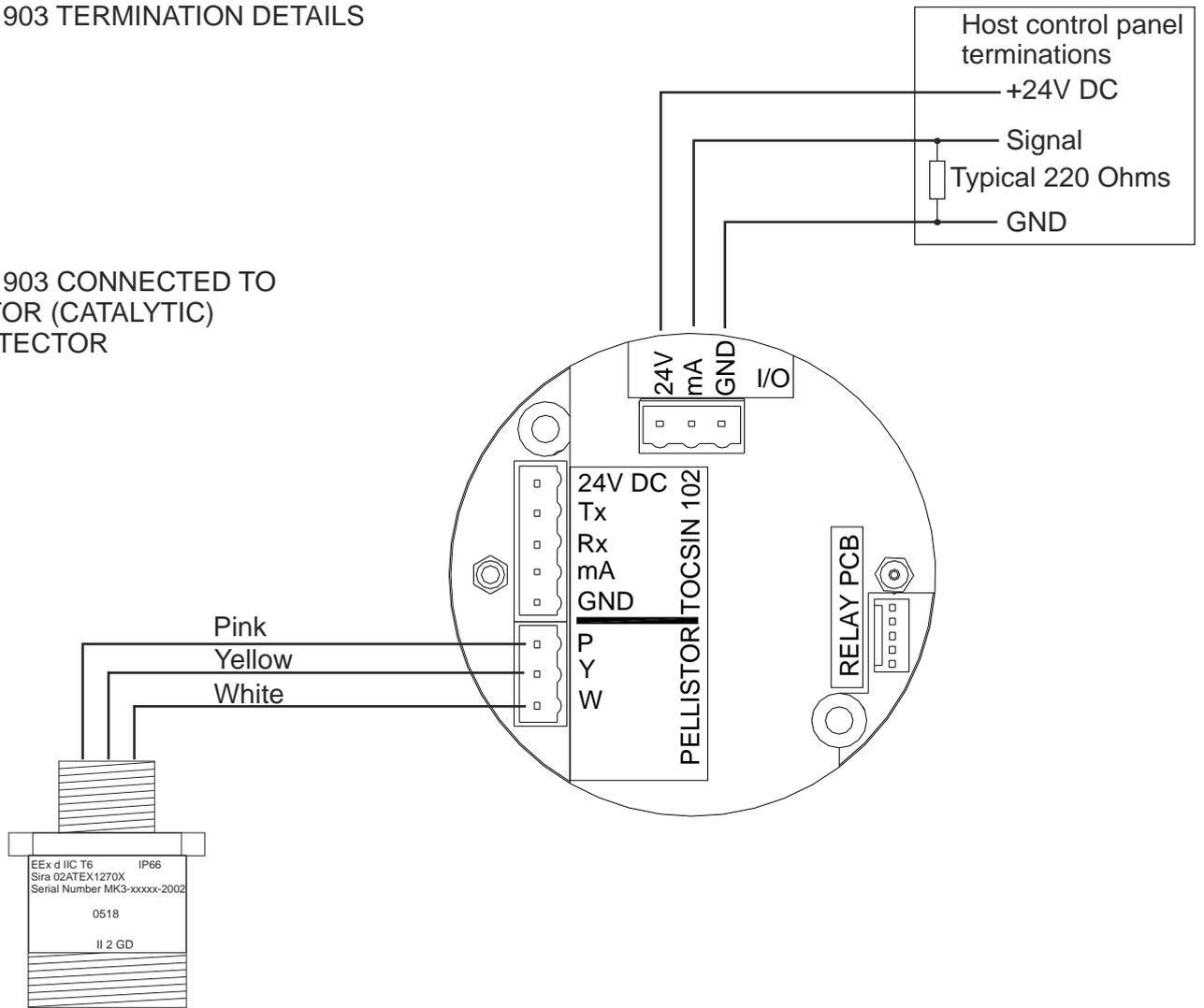
## TOCSIN 903 TERMINATION DETAILS

TOCSIN 903 CONNECTED AS AN ADDRESSABLE DIGITAL DETECTOR



TOCSIN 903 TERMINATION DETAILS

TOCSIN 903 CONNECTED TO PELLISTOR (CATALYTIC) GAS DETECTOR



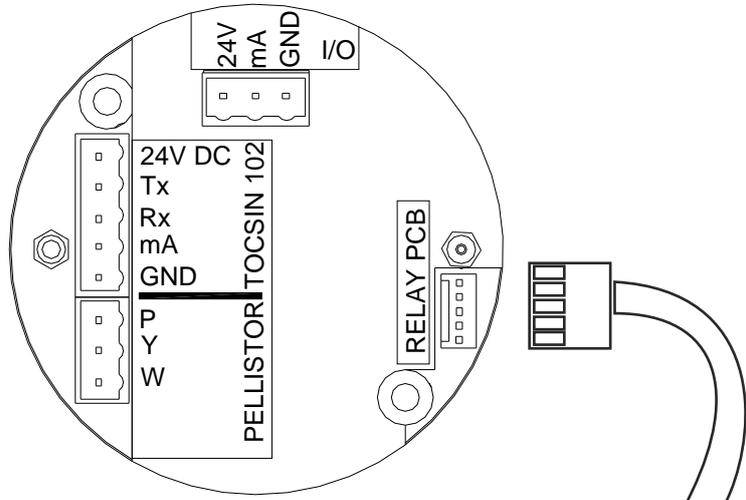
MK3 and Type B Pellistors

RELAY OUTPUT MODULE (OPTIONAL)

The Tocsin 903 can be fitted with an optional relay output board to provide 2 alarm levels and one fault relay output.

All relays are 7A resistive SPCO

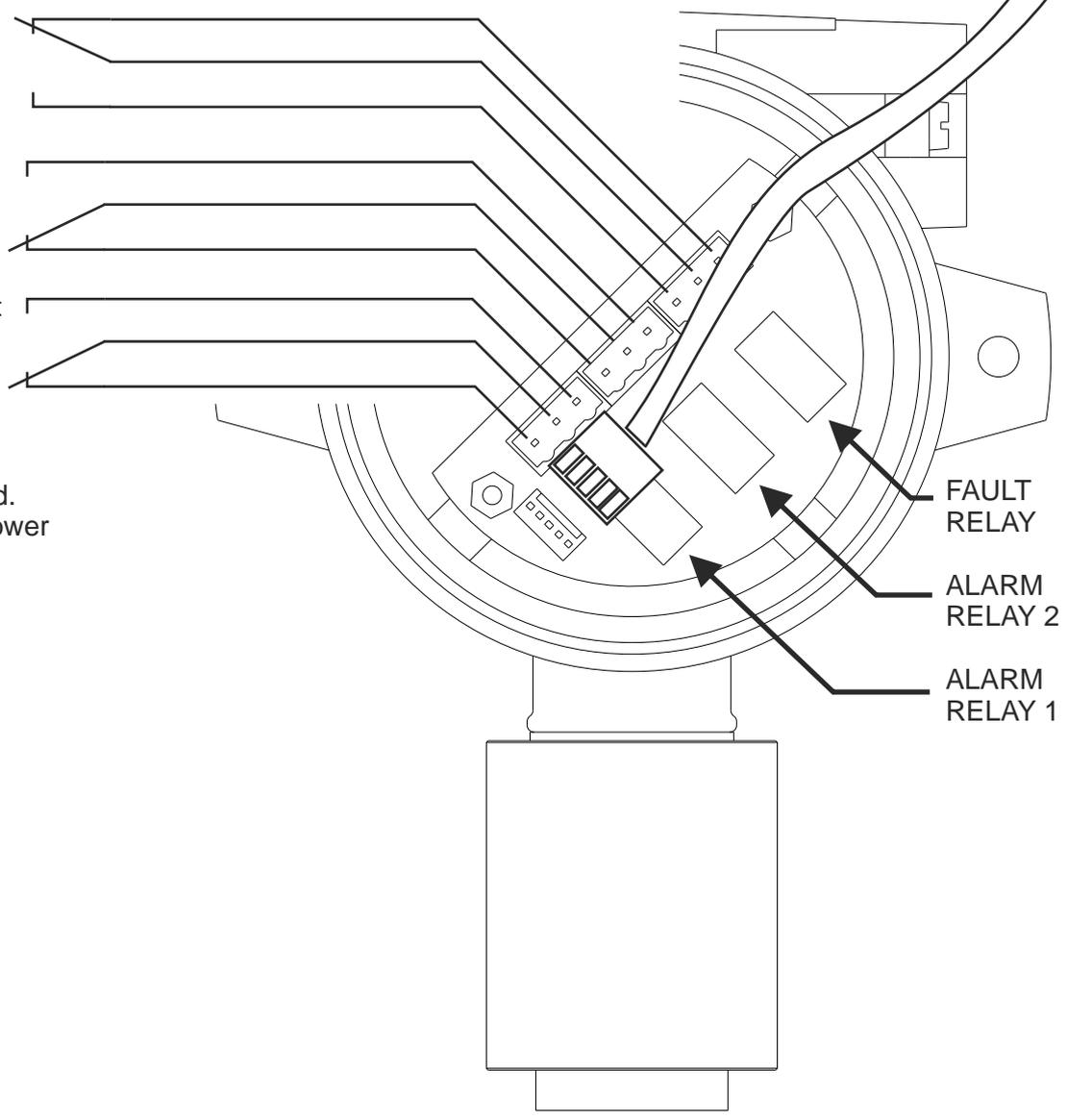
Alarm levels can be programmed from the 903 operating software.



INTERFACE CABLE

Relay arrangement shown in normal operation mode

The Fault/System Healthy Relay is Normally Energised. This also allows Power Failure Detection.

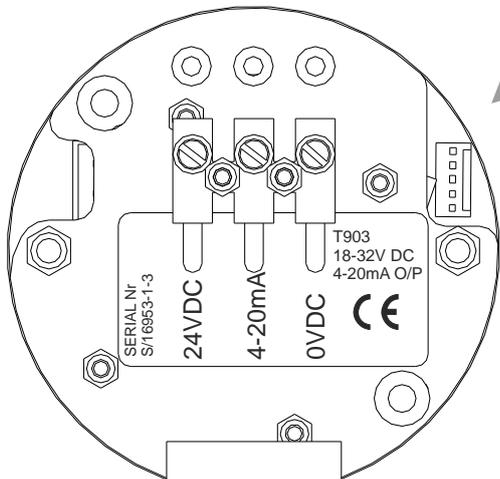
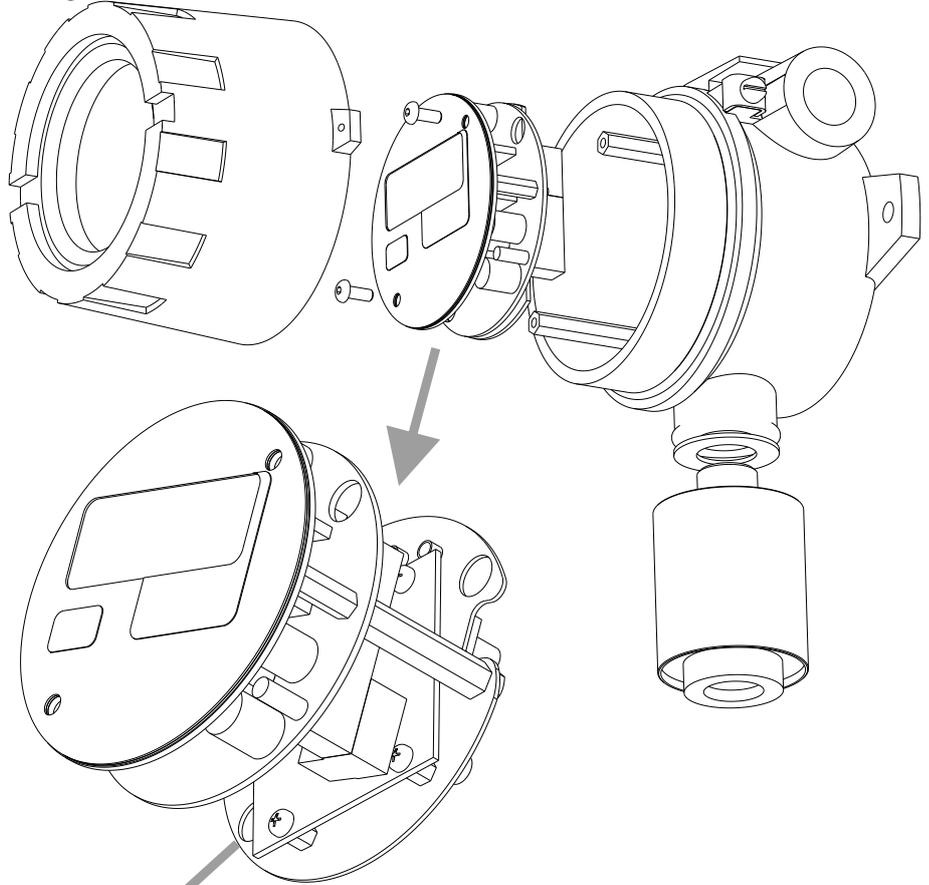


## HART COMMUNICATION MODULE (OPTIONAL)

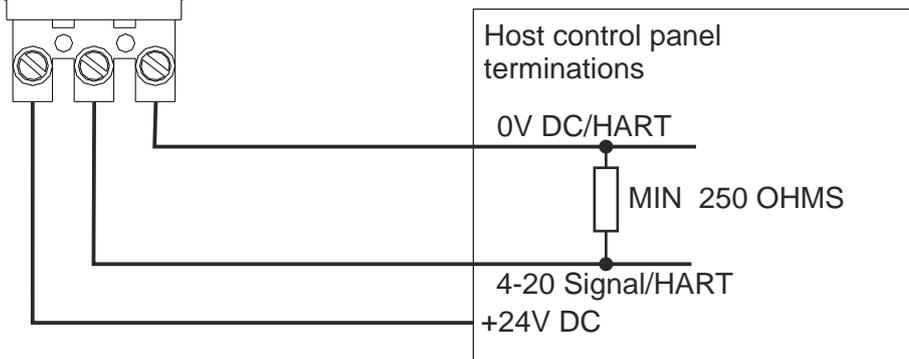
The Tocsin 903 can be fitted with an optional HART interface module using standard HART commands.

Available Functions are:

- Zero Detector
- Calibrate Detector
- Gas Reading
- Fault Indication
- Alarm Indication



Carefully withdraw the Tocsin 903 control module assembly. Terminations are accessed to the rear of the module as indicated. Note that terminations appear as a standard 4-20mA module. The Hart communications are superimposed on the signal line being extracted at either end using custom Hart interface units. The 4-20mA process output functions as normal with or without Hart communications running. The following page indicates typical Hart communications options using an Emerson Hart 375 communicator or similar.



## HART COMMUNICATION MODULE (OPTIONAL)

The following relates to information available over the Hart communications link and in particular when using a Hart field communicator similar to the Emerson model 375.

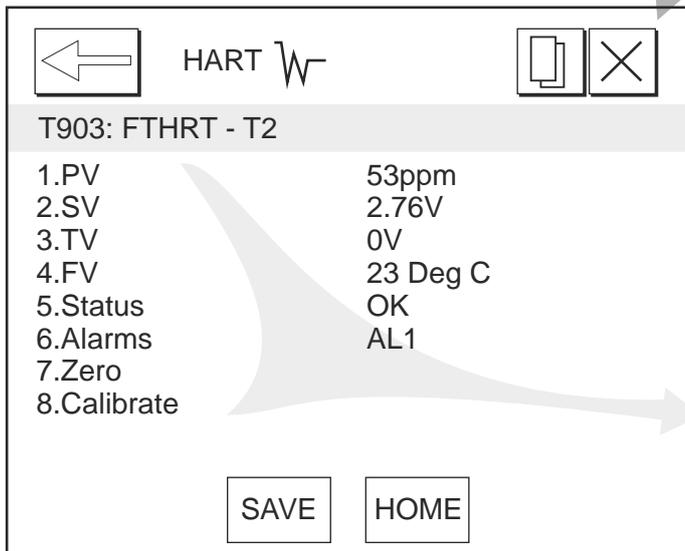
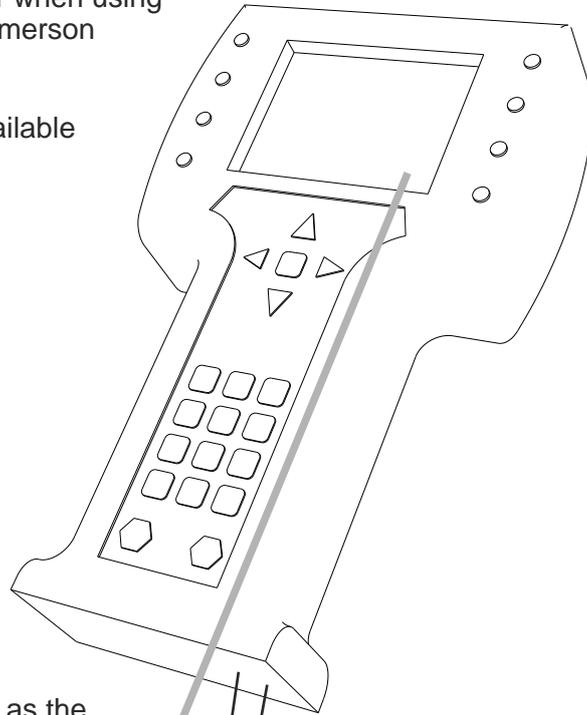
The following process parameters are available using the Hart Interface

- PV
- SV
- TV
- FV
- Status
- Alarms

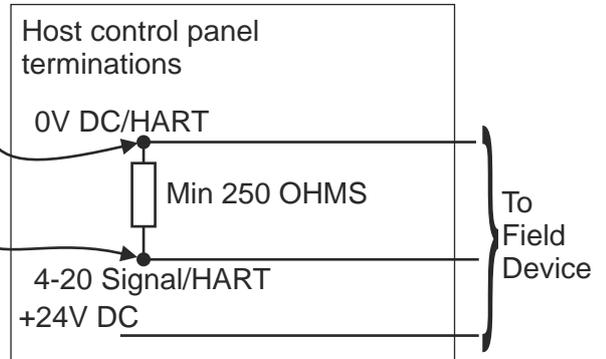
In addition using the 'T903' DD (Device Description) the following two commands are available:

- Zero
- Calibrate

Typically using a field communicator such as the Emerson 375 a screen display using the T903 will look as follows:



- |             |  |
|-------------|--|
| 1.PV        | Sensor Concentration   |
| 2.SV        | Sensor Voltage   |
| 3.TV        | Pellistor Active Volts   |
| 4.FV        | Sensor Temperature (not active for pellistor detectors)            |
| 5.Status    | Sensor Status: Under Range, Over Range, Sensor Fault, Comms Fault. |
| 6.Alarms    | Alarm 1 activated, Alarm 2 Activated                               |
| 7.Zero      | Sensor zero routine follow hand controller prompts                 |
| 8.Calibrate | Sensor calibration routine follow hand controller prompts          |



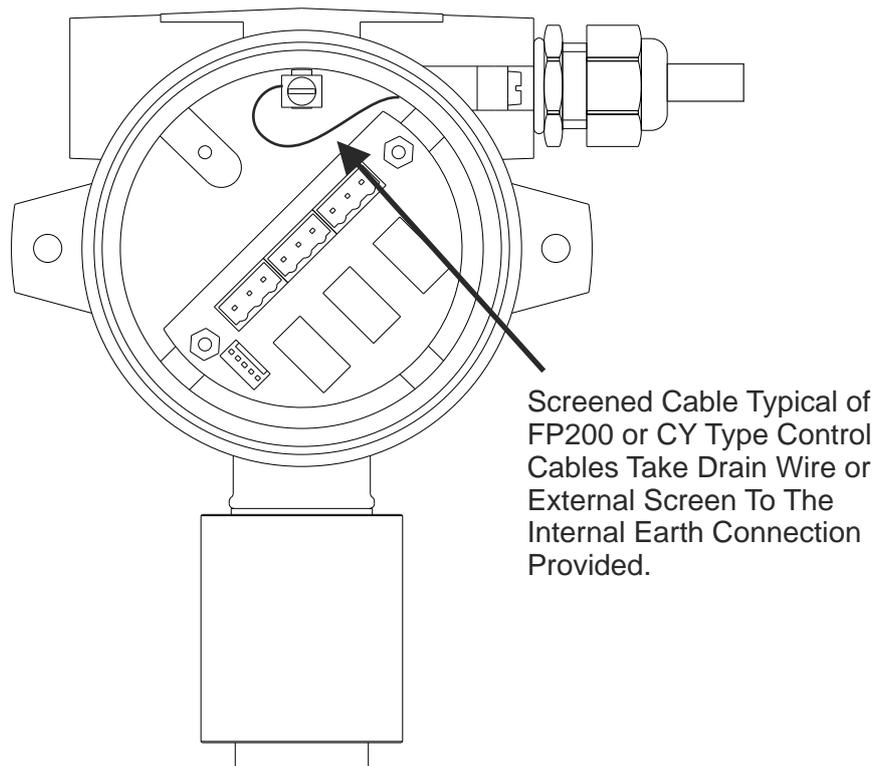
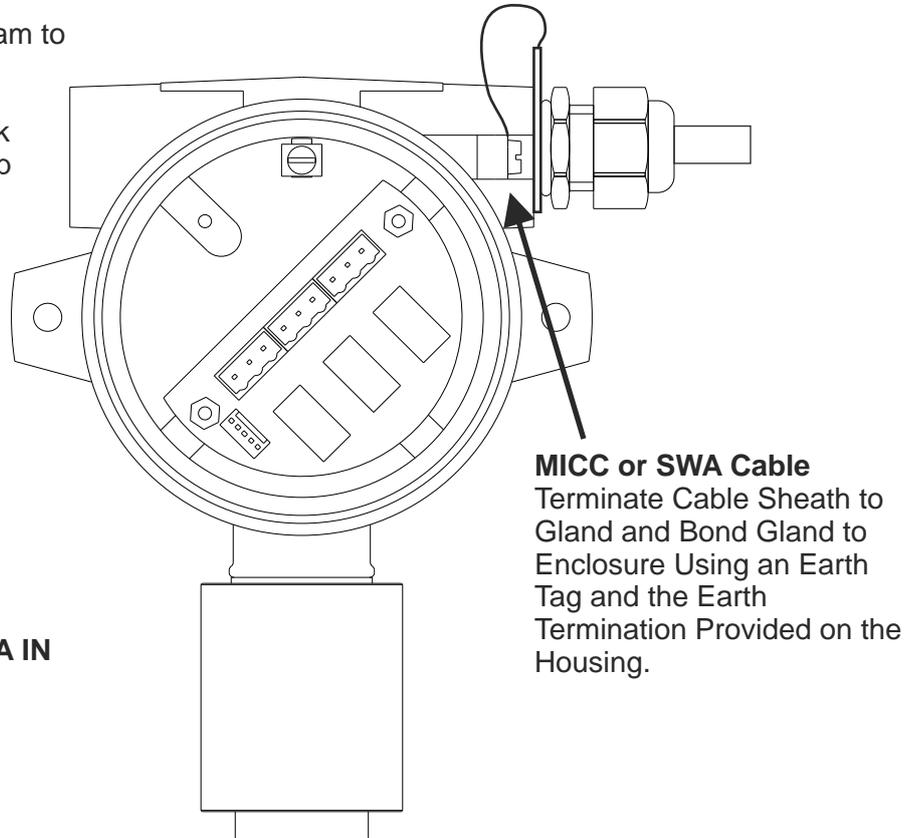
## Earth Bonding and Cable Screening

The 903 must be correctly earth bonded for reliable and safe operation.

Please follow the enclosed diagram to ensure correct installation.

This is intended to reduce the risk from electric shock, static build up and signal noise.

**IN ALL CASES CABLES AND GLANDS MUST BE APPROPRIATE FOR THE AREA IN WHICH THE 903 IS MOUNTED.**

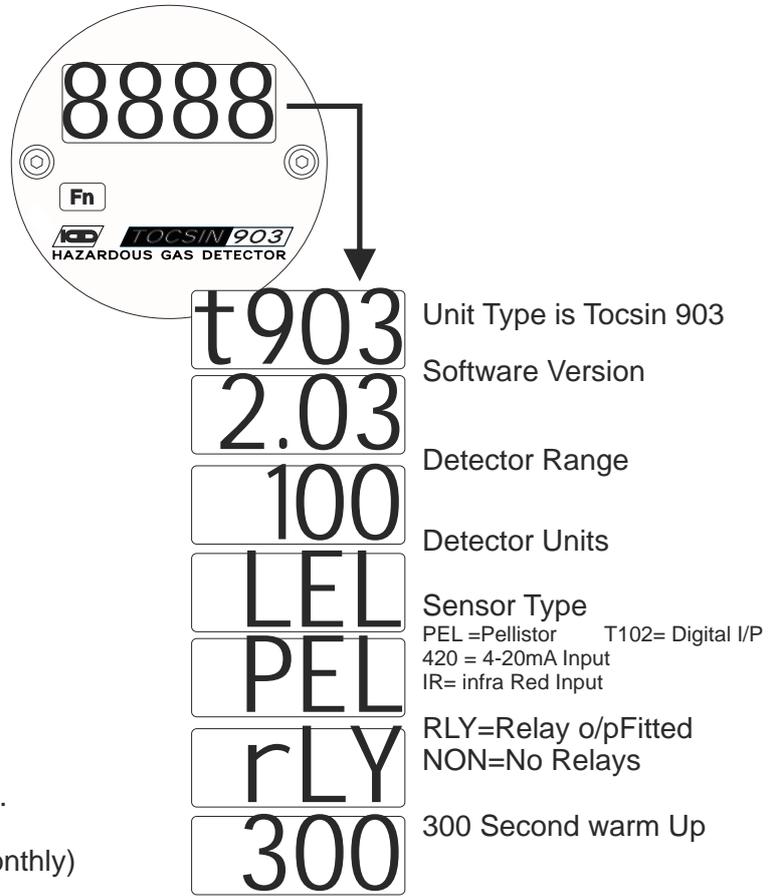


## Section 1 Basic Operation.

Before attempting to operate the Tocsin 903 single channel gas detector ensure that the installation and calibration instructions have been followed to install the system.

### Powering on the system.

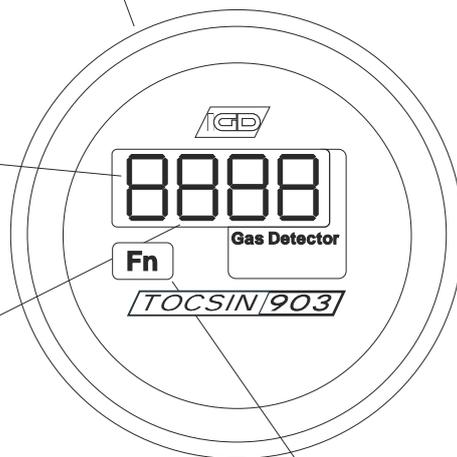
After ensuring correct installation of the Tocsin 903 the unit can be switched on. When first switched on the Tocsin 903 will perform a display test, indicate T903 then its software version, range, units, sensor type, relay output action, address and then commence a 300 second count down timer. This allows the sensor to stabilise before operation. During this time the analyser alarm outputs are off and the 4-20mA output is fixed at 4mA. At the end of the count down the unit will indicate a continuously updating gas concentration.



A calibration label will be fitted to the side of the unit. This label will indicate when the system is next due for calibration. Regular calibration (usually 6 monthly) is vital for correct system operation.

The Tocsin 903 in normal monitoring mode.

The Tocsin 903 is fitted with a 4 digit 7 segment high brightness LED display for easy recognition in poor lighting conditions.



The gas being monitored by the Tocsin 903 will be indicated here along with its units of measure. For instance the unit shown here is measuring for a flammable gas measured in percent of the gases Lower Explosive Limit. Other possibilities could be toxic gases measured in Parts Per Million or Oxygen Measured in Percent volume concentration.

The Function button is used to cancel alarms or to access the internal software functions and system set up.

## Section 1 Basic Operation.

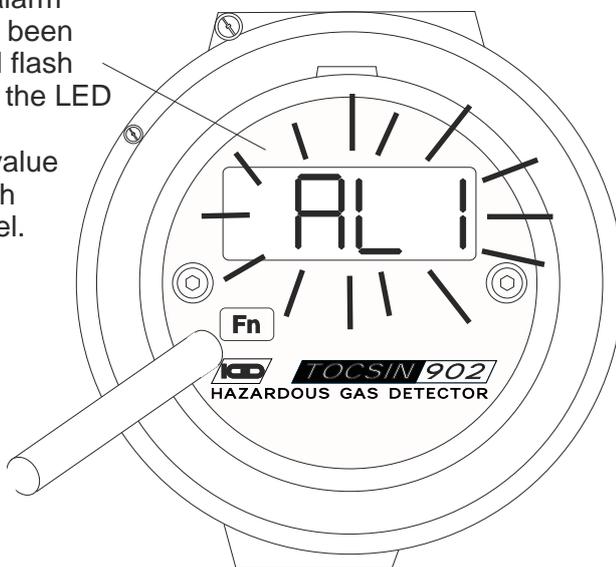
What to do if the alarm activates.

The Tocsin 903 is fitted with a number of interfaces which may be connected to other systems in the location that the gas detector is being used. For instance the Tocsin 903 could be set up to cut off the mains gas supply to a boiler in the event of a gas leak or it could be set up to activate alarms external to the unit in the event of a toxic gas leak.

Whatever interfaces are connected the following will happen as a minimum.

### 1.1 If an alarm set point is exceeded.

The highest alarm level that has been exceeded will flash on and off on the LED display. The Current gas value alternates with the alarm level.



The Tocsin 903 is fitted with a function button which is activated using a magnetic pointer provided with the system. By following the instructions in this manual the menu system can be accessed to set alarm levels change ranges or sensor type.

Use the magnetic 'pointer' once to mute the alarm. (The 'SIL', silence function)  
 In this instance note that the outputs stay in the alarm state as does the display.  
 Select 'RES' or RESET function to reset the alarm.  
 Note if the hazard is still present the alarms will be re-activated.

Note that the system may be configured to act as a simple 4-20mA device in which case indicated alarm levels will be disabled.

## Section 2 Editing and Display Options.

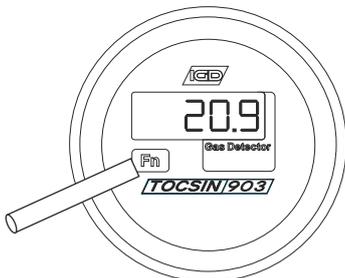
As supplied and installed the Tocsin 903 will be programmed for the following:

- Detector Range
- Detector Units
- Sensor Type
- Relay Action

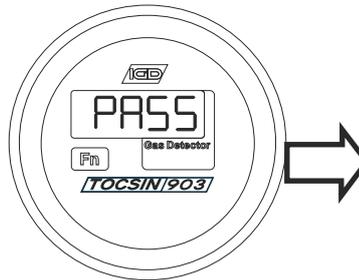
It will not normally be necessary for a user to need to change any of these parameters. To attempt to change any of the parameters without the necessary specialist knowledge and training could compromise the performance of the gas detector. The operator does have access to zero the unit and check or change the alarm levels. This feature is password protected. Passwords are entered as follows:

### 2.1 Entering the USER password

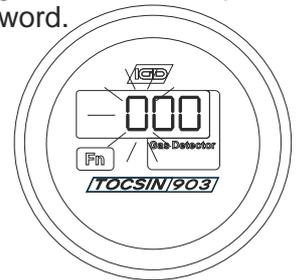
With the display indicating 903 hold the magnetic pointer over the Fn area..



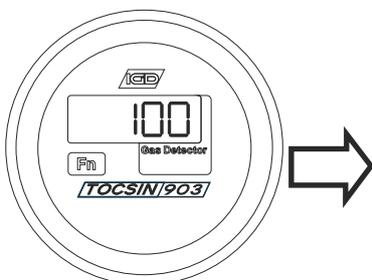
The display will indicate PASS remove the pointer when this is displayed.



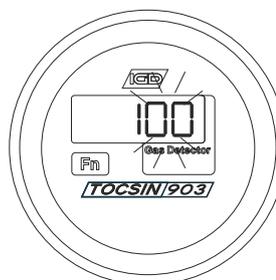
The display will now indicate all zero's. The first zero will be flashing. The T903 is expecting a password.



Bring the magnetic pointer over the Fn area and the digit will increment. Increment the display to read '1'



Hold the magnetic pointer over the Fn area. Each digit in turn will flash.



When all digits are flashing remove the pointer. The display will now alter to indicate the USER menu (see next section)

## USER MENU

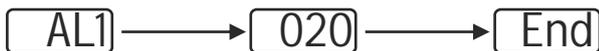
After entering the pass code for the user menu the display will sequence through the menu as:

- AL1            Select to set Alarm Level 1
- AL2            Select to set Alarm Level 2
- AL1t           Select to set AL1 Alarm Action, either Rising, Rising Latching, Falling or Falling Latching
- AL2t           Select to set AL2 Alarm Action, either Rising, Rising Latching, Falling or Falling Latching
- ZERo           Select to set Zero the detector
- CAL            Select to set Calibrate the Detector
- End            Select to Return to Normal Operation

Use the magnet to select the desired action.

### AL1 Set Alarm Level 1 Command

Use this option to set or change alarm Level 1.  
Select AL1 from the menu using the magnet

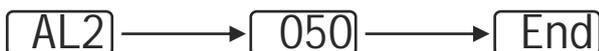


Select AL1 and the current alarm level is displayed. Use the data entry sequence to alter if required (see previous).

Once data is entered select END to return to the main menu.

### AL2 Set Alarm Level 1 Command

Use this option to set or change alarm Level 1.  
Select AL1 from the menu using the magnet

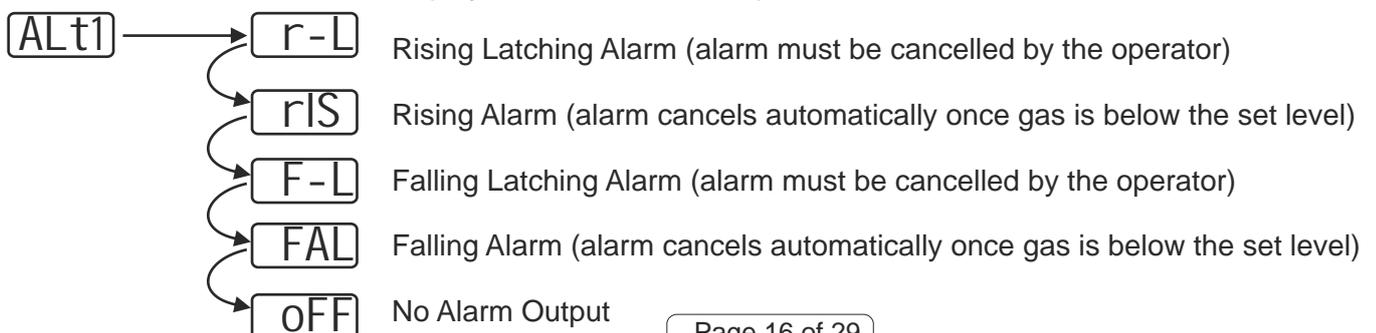


Select AL2 and the current alarm level is displayed. Use the data entry sequence to alter if required (see previous).

### ALt1 Alarm Level 1 Type Command

Use this option to set or change alarm Level 1 Type. Select ALT1 from the menu using the magnet. With the desired Alarm Type displayed hold the magnet in place until the display flashes to set.

Select ALT1 to alter the alarm action. The currently selected type is displayed when this menu option is selected.

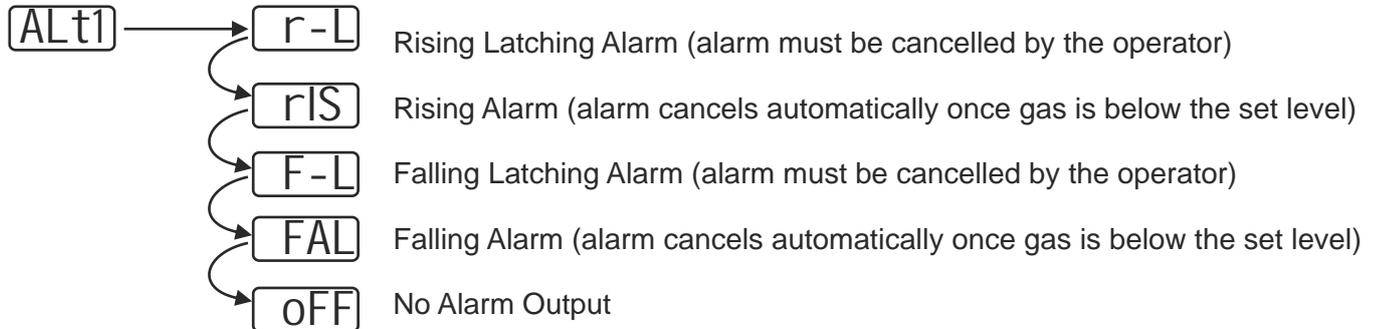


USER MENU CONTINUED

**ALt2** Alarm Level 2 Type Command

Use this option to set or change alarm Level 2 Type. Select ALT2 from the menu using the magnet. With the desired Alarm Type displayed hold the magnet in place until the display flashes to set.

Select ALT2 to alter the alarm action. The currently selected type is displayed when this menu option is selected.



**Zero and Calibration.**

In common with most measuring devices gas detection equipment requires regular calibration if it is to operate correctly. Gas detectors are usually calibrated using either a synthetic air mixture or Nitrogen depending on the detector to obtain a zero point and a known gas concentration to obtain a calibration point. Usually bottled calibration gas is used to calibrate the detectors. In some cases this is either not practical or simply not desirable due to the nature of the gas. In such cases electrochemical gas generators can be used or ampules of solution mixed on the spot in a known volume. In some cases, Chlorine detectors being a good example an amount of atmospheric moisture (Rh) is required for the detector to function correctly. In such cases bottled gas is of no use and a gas generator must be employed.

The frequency of calibration is governed mainly by two factors, the type of detector and the environment it is located in. Calibration records should be kept for gas detection equipment and should indicate in particular the state of calibration of the detector both before and after calibration. Examination of such records over time can then be used to determine if a detector in a given environment is capable of maintaining calibration for the chosen period. If not then consideration should be given to either reducing the interval between calibrations or choosing an alternative detection technology.

**Equipment fo Calibration and Methodology**

A gas detector calibration kit will normally include:-

Zero Gas Bottle or Air Pump/Scrubber

Calibration Gas or Gas Generator

Calibration Gas Adaptor (possible this is a permanent fitment in hard to reach locations)

Gas flow Regulators

Introduction Tubing (again possibly permanent fitment in hard to reach locations)

Calibration Stickers (to indicate date of calibration, next due date and certificate number)

**Method**

In principle the sequence of events to ZERO and CALIBRATE are as follows:-

1. Inhibit the control panel during calibration so the act of introducing gas does not set off the alarm. This will vary from system to system.
2. Fit the calibration gas adaptor to the sensor if this is not a permanent fitment.
3. Flow zero gas for the recommended period for the detector and note the reading. Note that many gas detectors will zero clamp the reading. This pre-calibration record will indicate if there has been any zero drift since the last calibration and can be used to assess if the calibration period is correct for the detector.
4. Flow Calibration gas for the recommended period for the detector and note the reading. This pre-calibration record will indicate if there has been any calibration drift since the last calibration and can be used to assess if the calibration period is correct for the detector.
5. Re-introduce zero gas for the recommended period for the detector and follow the instructions on the following pages to zero the detector
6. Re-introduce calibration gas for the recommended period for the detector and follow the instructions on the following pages to calibrate the detector.
7. Observe and record the detector reading whilst flowing calibration gas.
8. Update the calibration status stickers on the detector

Example of Required Calibration equipment



Detector to be Calibrated

Fixed Flow Regulator

Gas Adaptor  
P/N 401101  
Shown.

Adaptor options as:

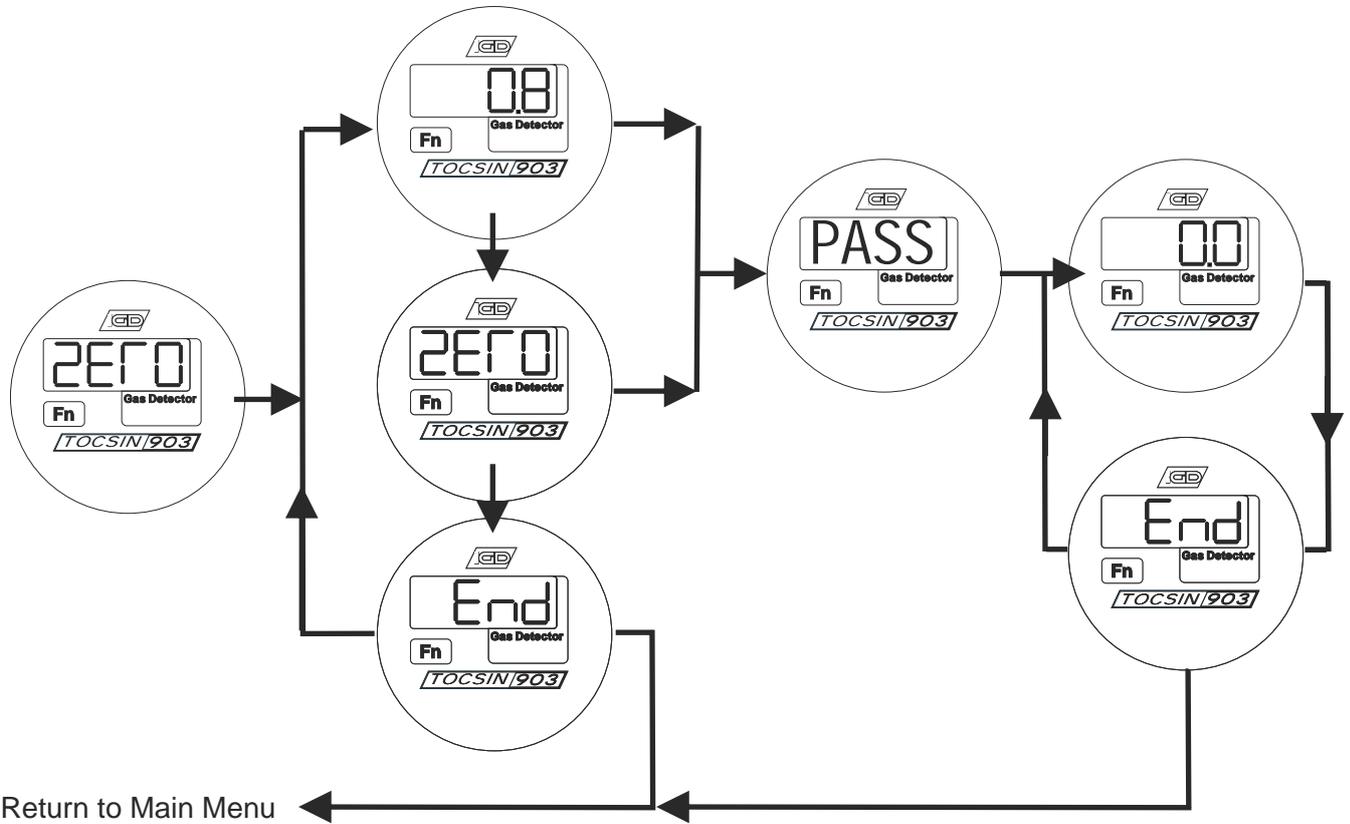
MKIII & Tocsin 102 use 401101A  
Tocsin 103 Series use 401101B  
MKV and VI use 401101C

Calibration Gas Bottle:

When using note the following:  
Do not use past the expiry date indicated  
Do not use below the recommended minimum fill pressure  
Always check the concentration is that required  
Check the bottle accuracy (ideally no worse than +/-3% absolute  
Check and observe any COSH instructions for safe handling

## USER MENU CONTINUED

### DETECTOR ZERO FUNCTION



Select ZERO from the menu and the first sequence of options is displayed as

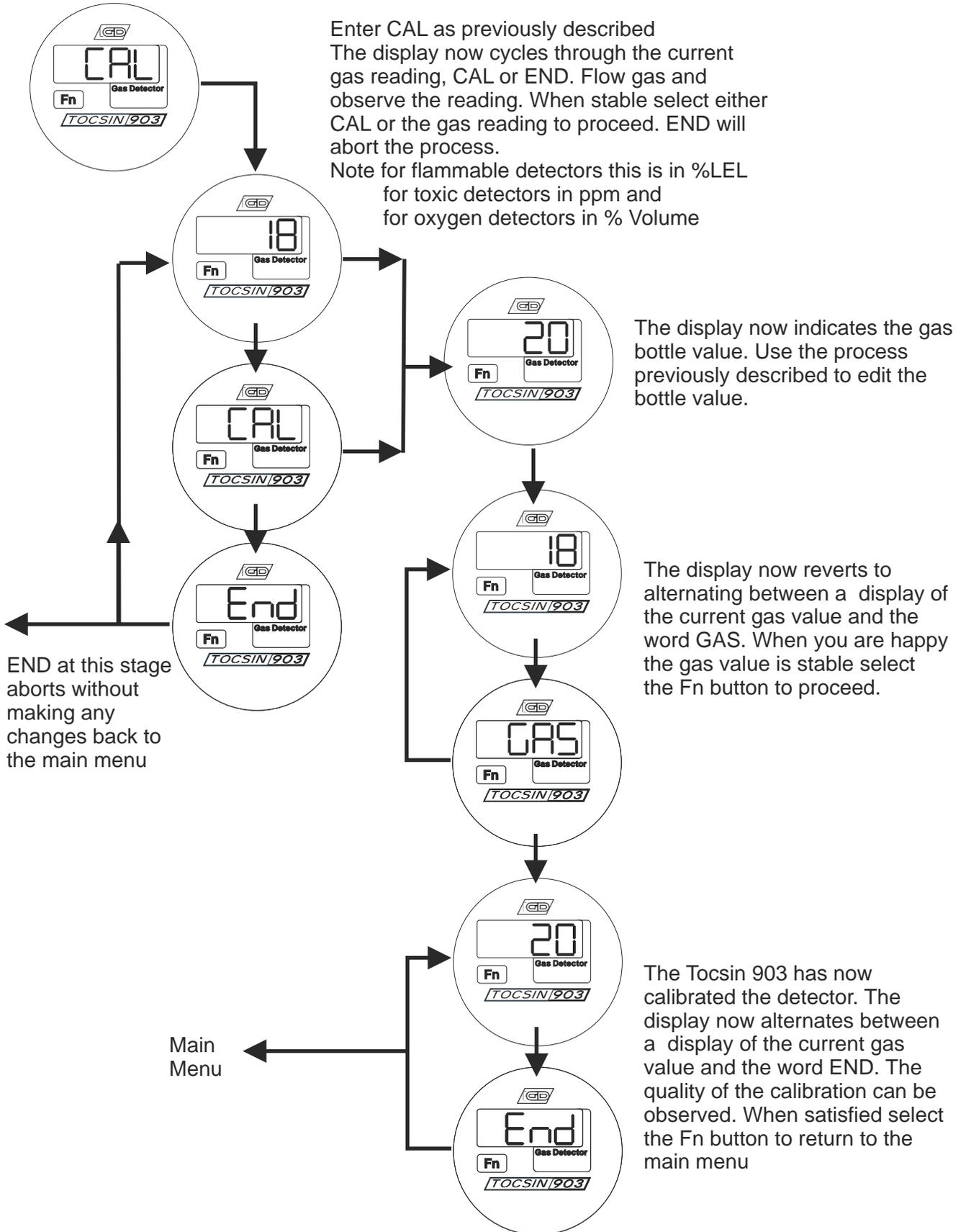
Current Reading,  
Option to Zero,  
Option to END without performing a zero.

Select either the reading or Zero and the Tocsin 903 will perform a zero. At the end of the process the display will show either PASS or FAIL. The display then shows the 'zeroed' reading and the 'End' option. Select either of these options to return to the main menu.

Note when performing a zero a suitable zero gas must already have been applied to the detector using the correct gas adaptor for the detector.

## USER MENU CONTINUED

### Selecting to Calibrate The Tocsin 903



## Section 3 General Information

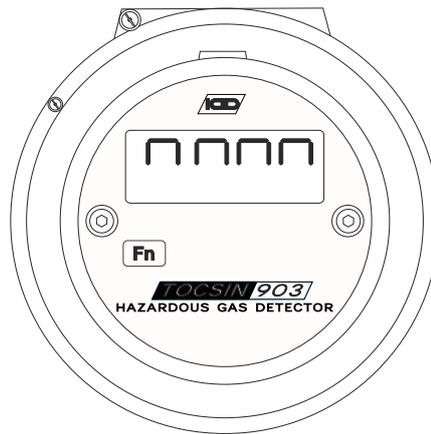
### Fault Conditions.

The Tocsin 903 controller can detect and report faults which may develop with the sensor. .

### Section 3.1 Over or Under Range Indication.

If the gas being sensed exceeds the range of the sensor fitted to the Tocsin 903 by more than 5% of the sensors range then this is indicated by the display indicated below.

When the gas concentration is back in range the Tocsin 903 reverts to normal operation

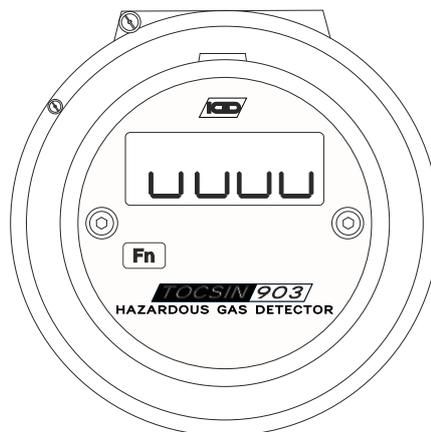


This indicates gas over range.

If the Tocsin 903 is being used as a 4-20mA transmitter then the output will drop below 4mA to indicate a fault condition.

In some circumstances for example if the temperature conditions exceed the rating of the sensor or if the calibration period has been exceeded the sensor may drop below the range of the Tocsin 903. Should the sensor signal drop below the zero point by more than 5% of the sensors range this is indicated by the display shown below.

When the gas concentration is back in range the Tocsin 903 reverts to normal operation.



This indicates gas under range.

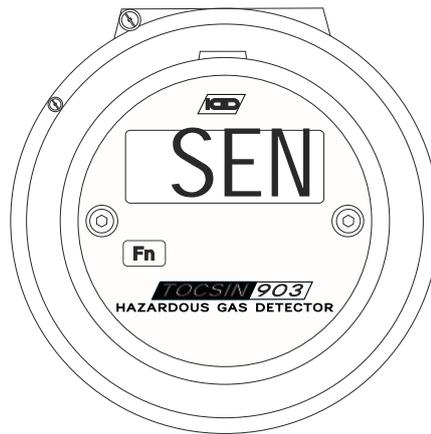
If the Tocsin 903 is being used as a 4-20mA transmitter then the output will drop below 4mA to indicate a fault condition.

In both cases the fault must be continuously present for more than 5 seconds.

## Fault Conditions Continued.....

## Section 3.2 Sensor Fault.

If the controller detects that the analogue control loop between the detector and controller is either open circuit or short circuit then the following display is indicated. when corrected the display will revert to normal operation



This indicates an analogue sensor fault, either open or short.

For digital detectors should communication between the Tocsin 903 and the detector be lost then the following error message is displayed. Normal operation is resumed once the error is corrected.



This indicates a communication error between the T903 and detector.

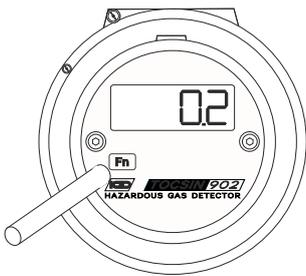
In both cases the fault must be continuously present for more than 5 seconds.

## Password Protected Menus

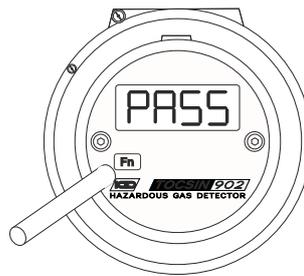
The Tocsin 903 stores its calibration and set up information in battery backed memory. To access these functions it is necessary to enter a password as previously described. These password protected functions should only be carried out by trained staff otherwise problems can arise due to poor calibration or zeroing. Similarly if detector set up functions are incorrectly set then poor performance could result.

Follow the procedure described below to gain access to the system calibration and set up functions.

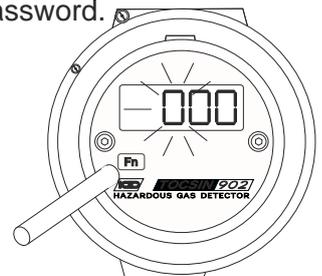
With the display indicating 0.2 hold the magnetic pointer over the Fn area..



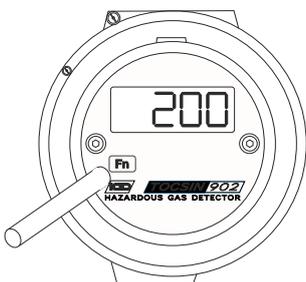
The display will indicate PASS remove the pointer when this is displayed.



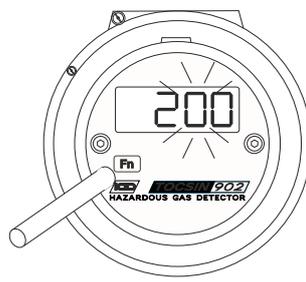
The display will now indicate all zero's. The first zero will be flashing. The T903 is expecting a password.



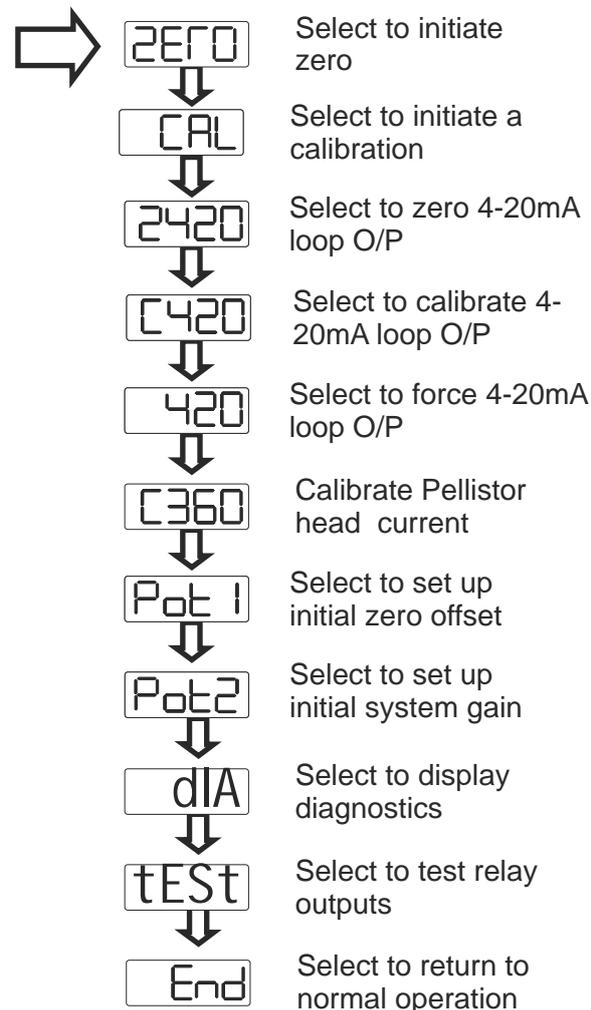
Bring the magnetic pointer over the Fn area and the digit will increment. Alter the display to read as required



Hold the magnetic pointer over the Fn area. Each digit in turn will flash.



When all digits are flashing remove the pointer. The display will now cycle through the available options



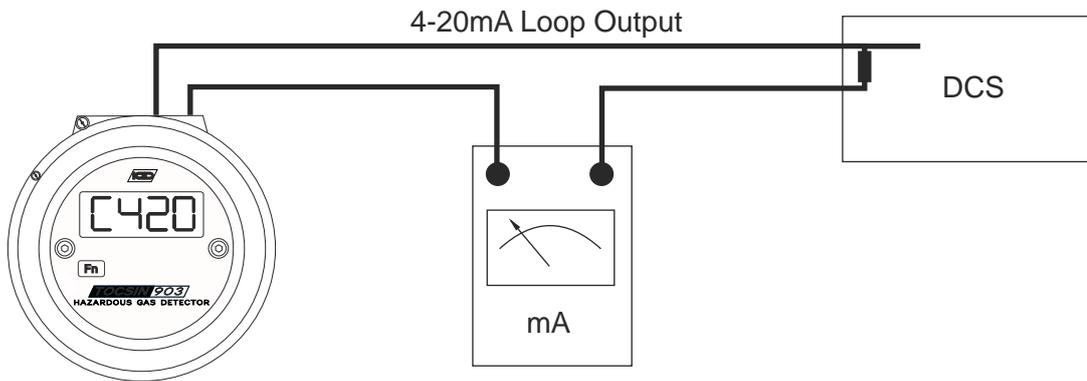
**NOTE:**

These menus are shown for information only and should only be accessed by a trained Oliver IGD appointed engineer. Altering any of the following settings can result in inadvertent damage or unexpected operation of the unit.

**C420** Select to calibrate 4-20mA loop O/P

The 'C420' function is used to calibrate the 4-20mA loop output by the following method.  
NOTE ZERO FIRST THEN CALIBRATE.

- 1 Using a calibrated ammeter preferably traceable to a national standard measure the loop current.



- 2 Select the '420' option and set the current loop output to 18mA. Observe and record the meter reading. If it matches the set output current no further action needs to be taken the current output is already set up and calibrated.
- 3 If the ammeter reading differs from that set using the '420' function then calibrate the loop by using the 'C420' function. Whilst the '420' function is still outputting a fixed value select the 'C420' function. Adjust the on screen value up/down until the reading matches the ammeter reading. Use the '420' function again to check that the ammeter and Tocsin 902 are concurrent. Note that it may be necessary to repeat this process a few times if there was a large initial difference.

**2420** Select to zero 4-20mA loop O/P

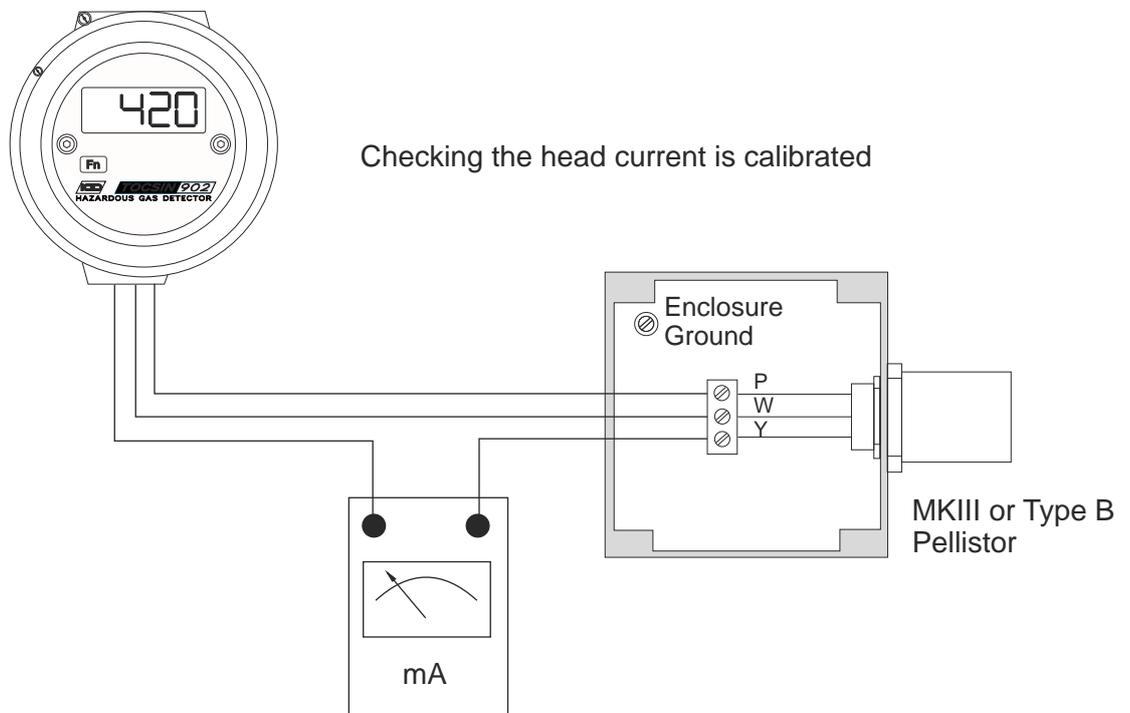
Follow the same basic procedure described for calibration but this time use it to zero the 4-20mA loop output.

**420** Select to force 4-20mA loop O/P

The '420' function allows the user to output a set current for diagnostic purposes on the 4-20mA loop output. The output once set will remain for a short period until the system times out and returns to normal operation or a new value is input. Maximum output value is 25mA.

**C360** Select to calibrate the pellistor drive current

This function can be used to eliminate any read errors between the set drive current for a pellistor head and the current measured using an external ammeter. For example if the Tocsin 903 indicates it is outputting 360mA to the measuring head but an external ammeter indicates 350mA then select C360 and increment the displayed value until 360mA (+/-5mA) is indicated on the ammeter.



**Pot 1** Select to set up  
initial system zero

The 'POT 1' function sets up an initial zero setting using an electronic 'potentiometer'. Once set at the factory this should not need to be re-set during the operational life of the Tocsin 903. Note this option is only present when a pellistor type is selected.

**Pot2** Select to set up  
initial system Gain

The 'POT 2' function sets up an initial gain setting using an electronic 'potentiometer'. Once set at the factory this should not need to be re-set during the operational life of the Tocsin 903. Note this option is only present when a pellistor type is selected.

**tSt** Select to test relay output function

This option will energise all the output relays for a short period. Note this feature is only operational on models fitted with relay outputs.

**dIA** Select to display system diagnostics sequentially as:  
Concentration, Volts, Zero Volts, Cal Volts, Bottle Value  
Each button press shows the next parameter.  
Select END when displayed to return to the main menu.

**End** Select to return the Tocsin 902 to normal  
operational mode.

**PRODUCTION SET UP MENU**

Enter Code 300 to gain access to the engineer set up menus for the Tocsin 903. This menu system should only be used by trained engineers as it is possible to alter the basic operation of the unit with this menu. Menu options are as follows:

**SEn**

Select to alter the sensor input type

Options are: PEL for pellistor input, T102 for toxic 102 series detectors, IR for infra red detectors, 4-20 for standard 4-20mA input devices.

**Uni t**

Select to alter the units for the 903

Options are: LEL, PPM, VOL note the units option is important when the Tocsin 903 is used in addressable mode. If not set correctly then the displayed units will be incorrect on the host control panel.

**SPAn**

Select to alter the Range for the 903

This option allows the user to alter the range on the 903 display and is used when scaling the 4-20mA input. Again if set incorrectly the units display and transmitted data will be incorrect. Note that if the range is altered from the factory set range then the alarm levels will be reset to defaults. These defaults will be 20 and 50% of the set range and can be altered to any desired value within the set range after the range has been set.

**Add**

Select to alter the address for the 903

Use this option to set the unit address when used in addressable mode.

**SEr**

Select to alter the serial number of the 903

Use this option to set a serial number if required for the 903

**POrT**

Select to alter the output port function of the 903

Use this option to set the output port either to run a relay card or addressable RS485

**End**

Select to return to normal operation

All these menu items operate in the same manner. Enter code 300 in password mode and each menu item is displayed in turn. Select a menu item and by using the magnet each menu item can be displayed in turn. When the required item is displayed hold the magnet over the function button until the display flashes. The option is now selected into memory.

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