

# TOC-20 SERIES

Carbon Dioxide or Refrigerant Gas Monitor



## Installation and Operation Manual Version 2

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### Who should read this manual.

This manual is intended for use by trained installers of gas detection systems who are technically competent and have all necessary tools to undertake installation and maintenance on this type of equipment.

Failure to install and maintain the equipment properly can render the detector ineffective.

You should not undertake any of the procedures in this manual if you do not have access to the correct equipment, have not undertaken training on this or similar equipment or are not technically qualified to install this equipment.

Calibration gases and test equipment is available from Sensors.

# EC Declaration of Conformity

Issuers name and address:

Oliver IGD Limited of  
4a Pepper Rd  
Stockport, SK7 5BW  
United Kingdom



Declares that the product listed as:

## TOC-20

Co<sub>2</sub>, CFC or HCFC Gas Detector

Are in conformity with the provisions of the following European Directive(s) when installed, operated, serviced and maintained in accordance with the installation and operating instructions contained in the product documentation.

**2004/108/EC**      **EMC Directive**  
**2006/95/EC**      **Low Voltage Equipment Directive**

And that the standards and/or technical specifications referenced below have been applied or considered.

EN 61779-1:2000	Electrical apparatus for the detection and measurement of flammable gases, general requirements and test methods.
EN 50271:2001	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. <i>Excluding requirements for SIL</i>
Technical File Reference	T20-TF9

Notified Body For ATEX and/or QAN:

Sira Test & Certification Ltd  
Hazardous Area Centre,  
Rake Lane  
Eccleston,  
Chester,  
CH4 9JN.  
United Kingdom

Oliver IGD Limited operate an independently assessed ISO9001:2008 Quality Assurance System and ATEX QAN.

Quality Assurance Certificate Number

**023827**

Quality Assurance Notification Number

**SIRA 02ATEX M174**

Testing Agency:

TUV - SUD  
Octagon House  
Concorde Way  
PO 15 5RL Fareham



Issued on: At Oliver IGD Limited, Stockport, SK7 5BW , United Kingdom

Signature:  Declaration of Conformity in accordance with EN ISO/IEC 17050-1:2004

Name: Andrew J Collier M.I.O.D

Position: Managing Director      Date: 12.January 2014      Declaration Ref: TOC-20-DEC-1

## Standard Specifications

<b>Power</b>	18-28V DC (230V AC Adaptor Supplied)
<b>Construction</b>	ABS
<b>Outputs</b>	3 off 4-20mA Linear Outputs for CO <sub>2</sub> , Temperature and Humidity Modbus RTU Interface 2 off SPCO Relays Rated 4A Non Inductive 85dB Alarm Sounder

<b>Operating Environment</b>	-5 to 55 Deg C
Temperature	5-95% RH Non-Condensing
Humidity	IP54 (Excluding Sensor)
Sealing	

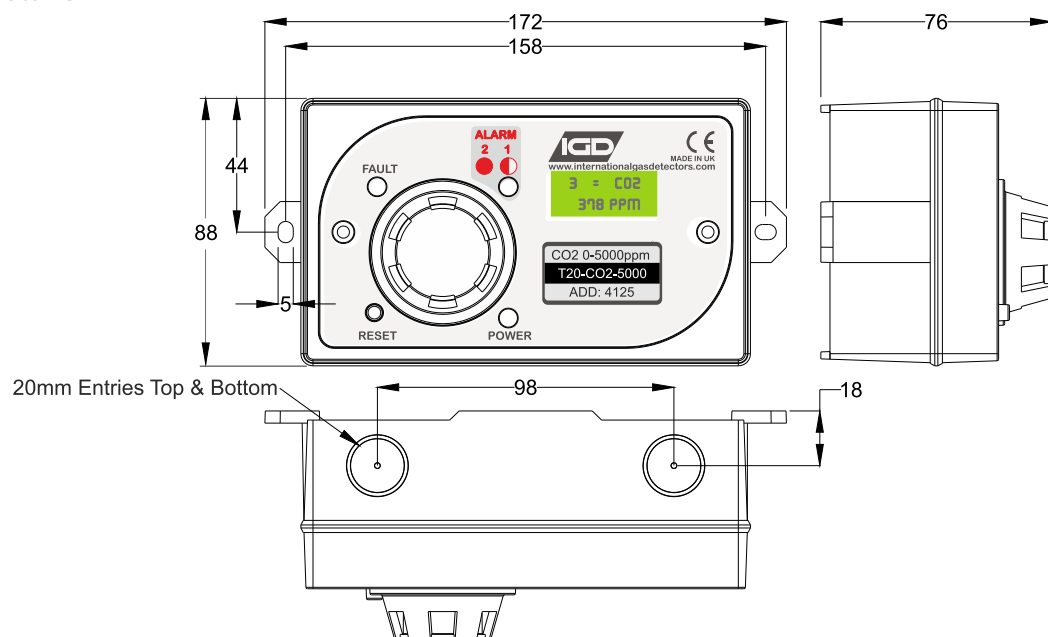
<b>Measuring Ranges</b>	CO <sub>2</sub> 0-5000ppm, Resolution 1ppm, Accuracy +/-5% of Range Temperature -5 to +55 °C, Resolution 1°C, Accuracy +/-4 °C Humidity 0-100% RH, Resolution 1%RH, Accuracy +/-4%RH CFC/HCFC 0-1000ppm, Resolution 10ppm, Accuracy +/- 5% of Range
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<b>Initial Stabilisation</b>	Typically up to 48 Hours on first installation <b>Note for installers: Do not make adjustments to zero or calibration settings until the unit has fully stabilised.</b>
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<b>Package Size</b>	180mm X 100mm X 75mm (See Dimension Drawing)
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<b>Weight</b>	375g
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## Physical Details

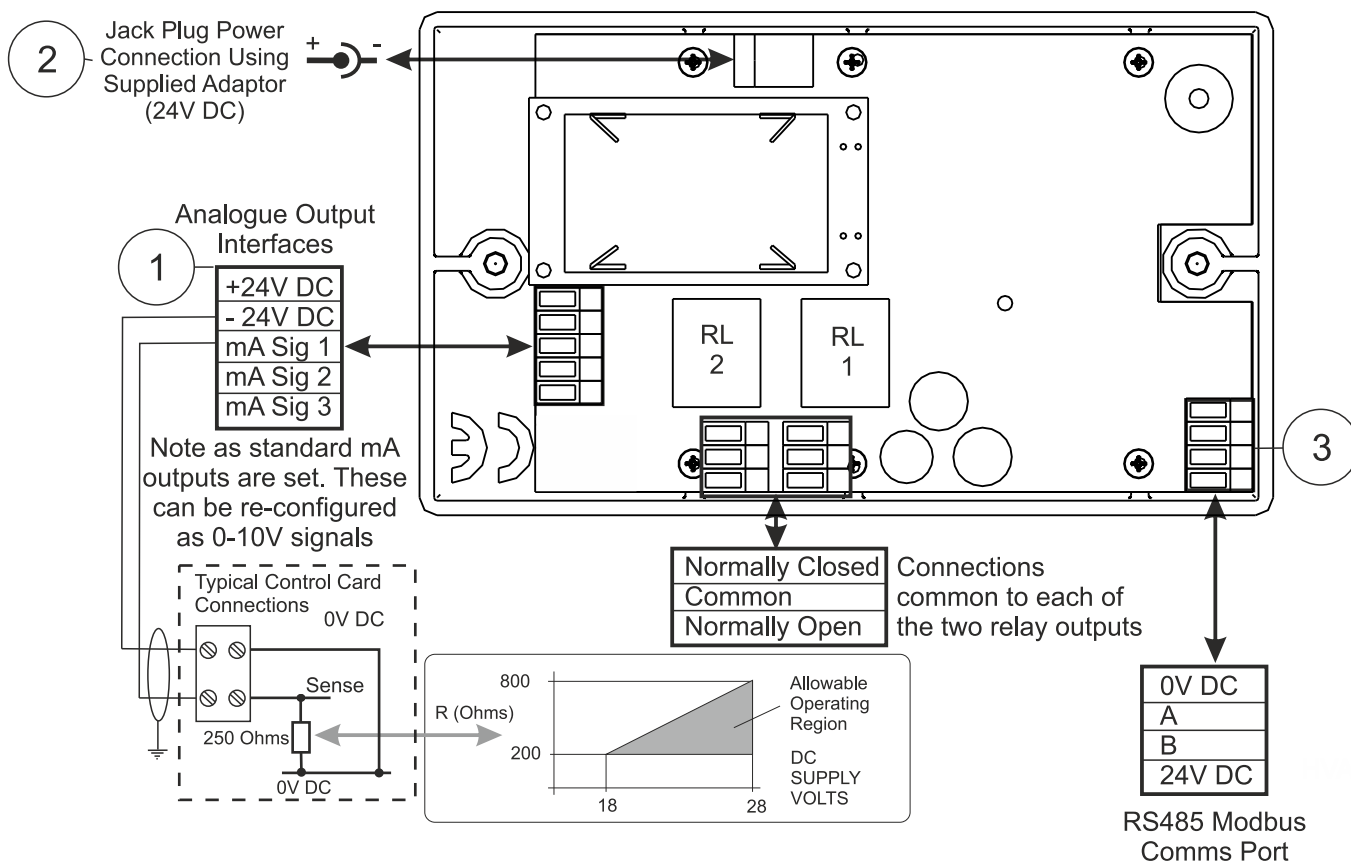


**NOTE**

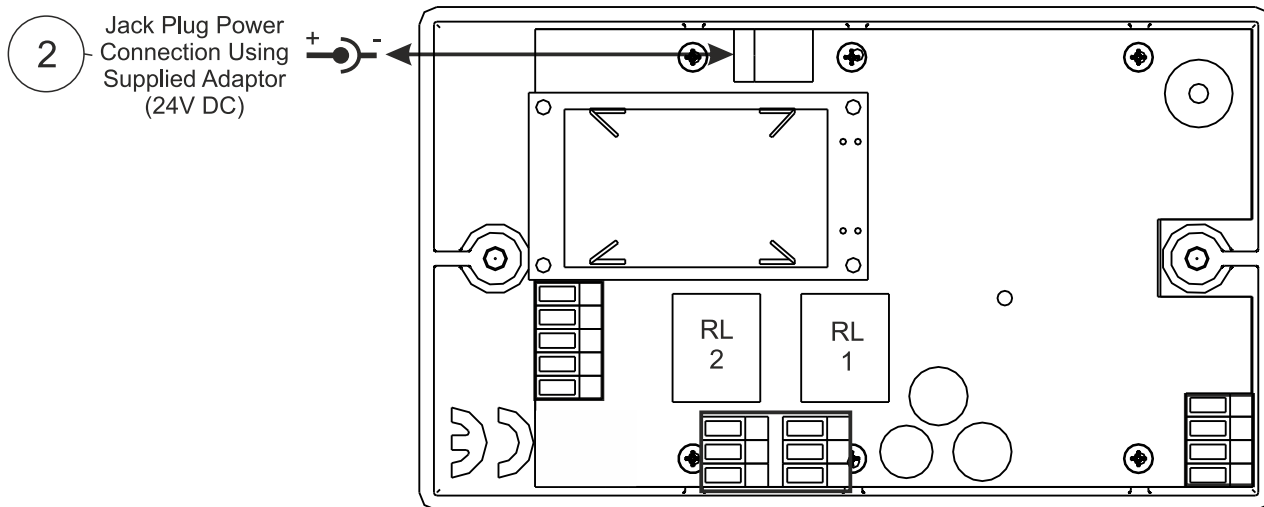
TOC-20 can be supplied with a bulkhead mounting PSU allowing permanent connection to a 230V AC mains power source. Mains power should be fed via a fused spur.

The following information shows the main electrical connection points labelled as points and interfaces. These points are referred to in the manual supplied. When installing ensure you have the full manual available. This page is also supplied inside the TOC-20 enclosure as a quick reference for site engineers. If you do not have the full manual a copy is available on the Sensors website at [www.internationalgasdetectors.com](http://www.internationalgasdetectors.com)

**INTERFACES**



**Power Options Figure 2**

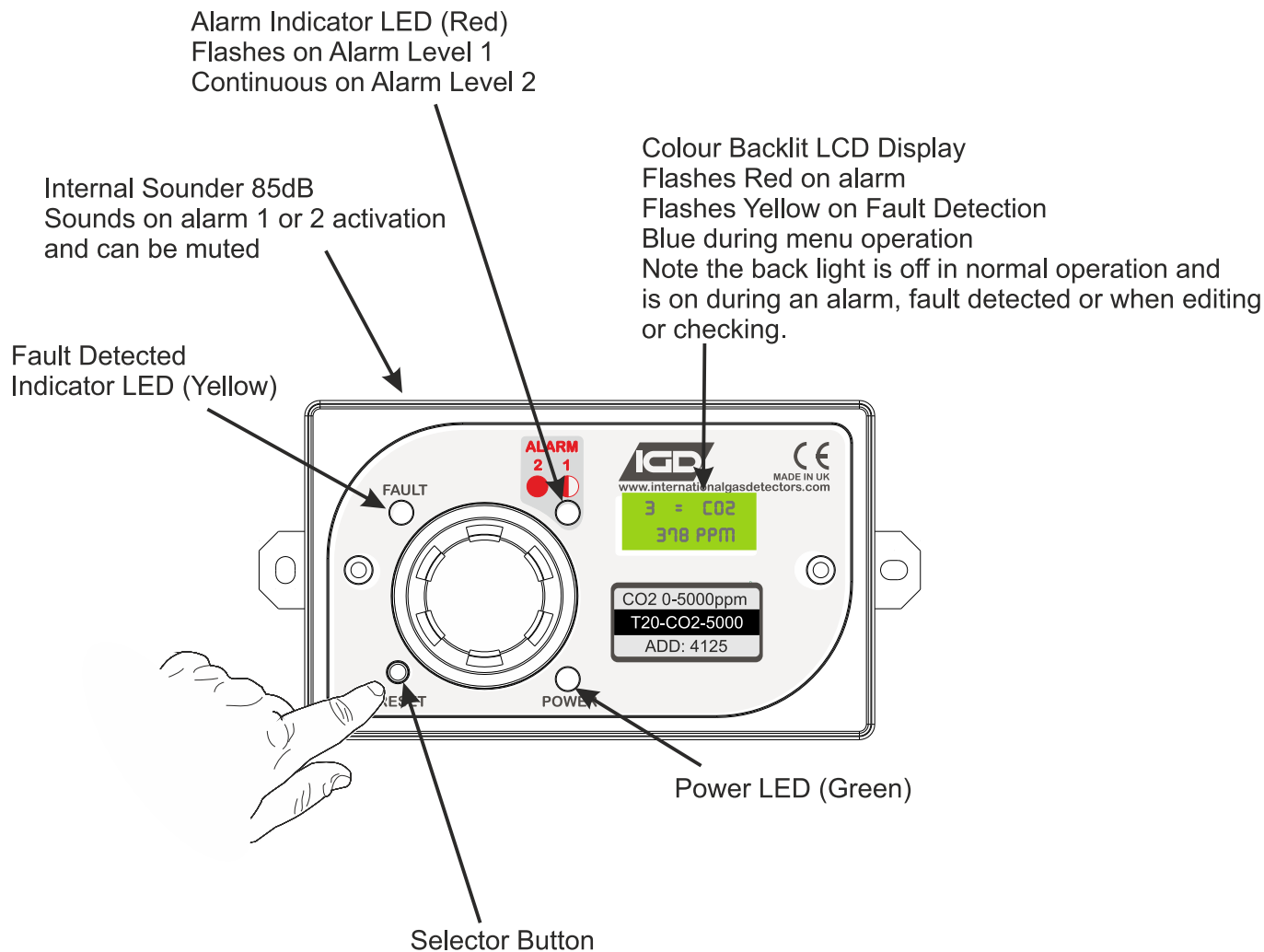


Notes

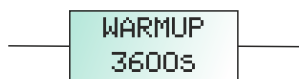


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### Controller Overview



Typical display during warm up



On initial power up the backlight will perform the following cycle:

Backlight cycles: green-yellow-red

The display then shows:

Software Version  
Software checksum and date  
Connected sensor info

Finally a countdown starts to enable connected sensors to stabilise prior to normal operation.

From initial power up the TOC-20 will take 1 hour to stabilise. Additionally for a new installation it can take up to 48 hours for detectors to fully stabilise to new conditions.



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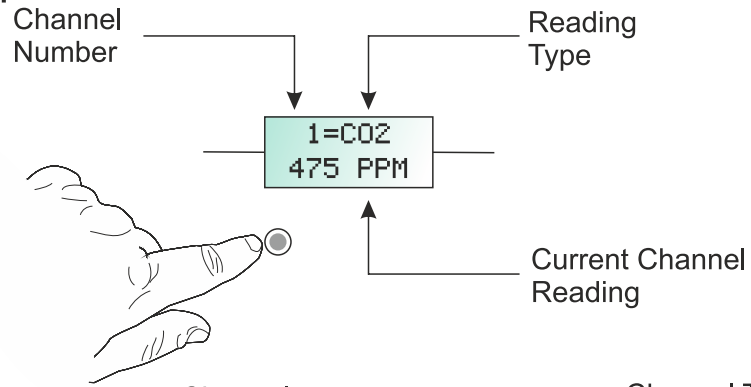
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**User Actions....Day to Day Operation**

Once fully installed the TOC-20 controller will continuously monitor the CO2 level, Temperature and humidity continuously comparing current values with any set alarm thresholds. The display will cycle to display each reading in turn. Normally the backlight will be green to indicate correct operation below set thresholds

**To access the display click the button**

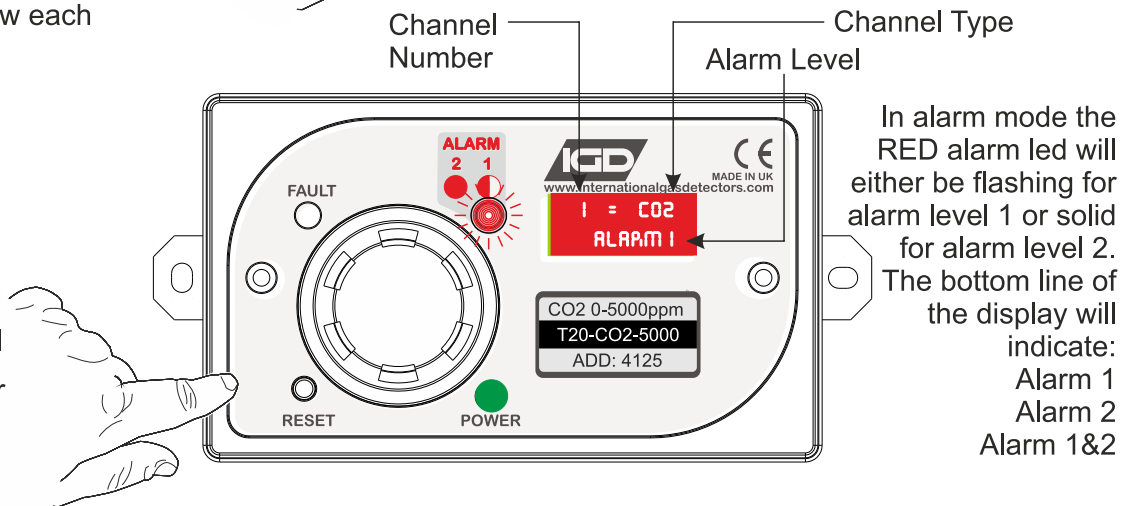
Note that each channel will be displayed in turn as indicated by pressing the button. The background colour changes to blue to indicate manual channel selection. After 60s if the button is not pressed the display reverts to a green background and the display will revert to show each reading in turn.



**In Alarm Condition**

The back light will flash red and the display will indicate which alarm level and which channel is in alarm. The sounder will also activate.

Pressing the button will silence the sounder. If the gas is still breaching the alarm threshold it will not be possible to reset the alarm

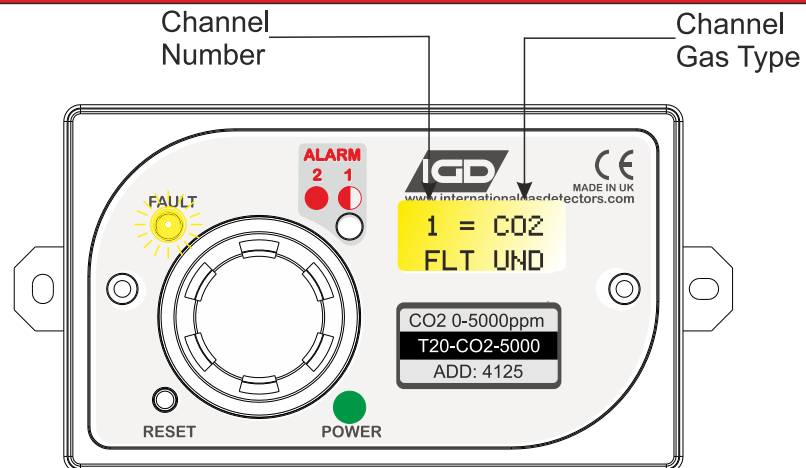


**In the event of alarm or fault, CALL FOR SERVICE.**  
 The owner operator is not usually a gas engineer or competent person as defined by Health and Safety guidelines. If there is any doubt call your service company and get it checked.

**In Fault Condition**

In FAULT mode the Yellow fault led will be on. The bottom line of the display will indicate as follows:

- FLT COM communication error to sensors
- FLT SEN Sensor Error
- FLT OVR Sensor Over Range
- FLT UND Sensor Under Range



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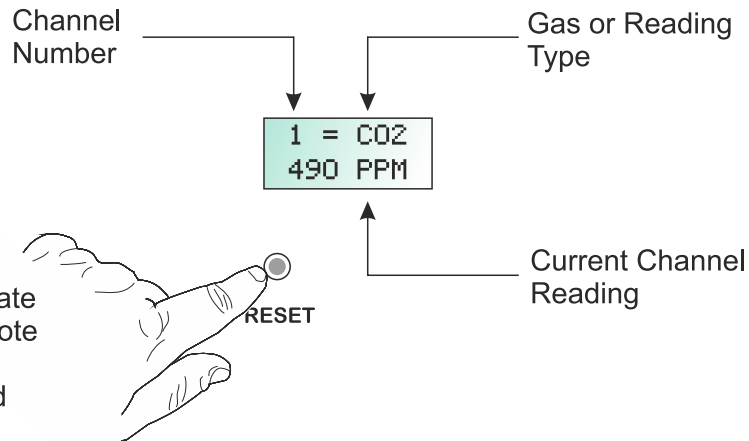
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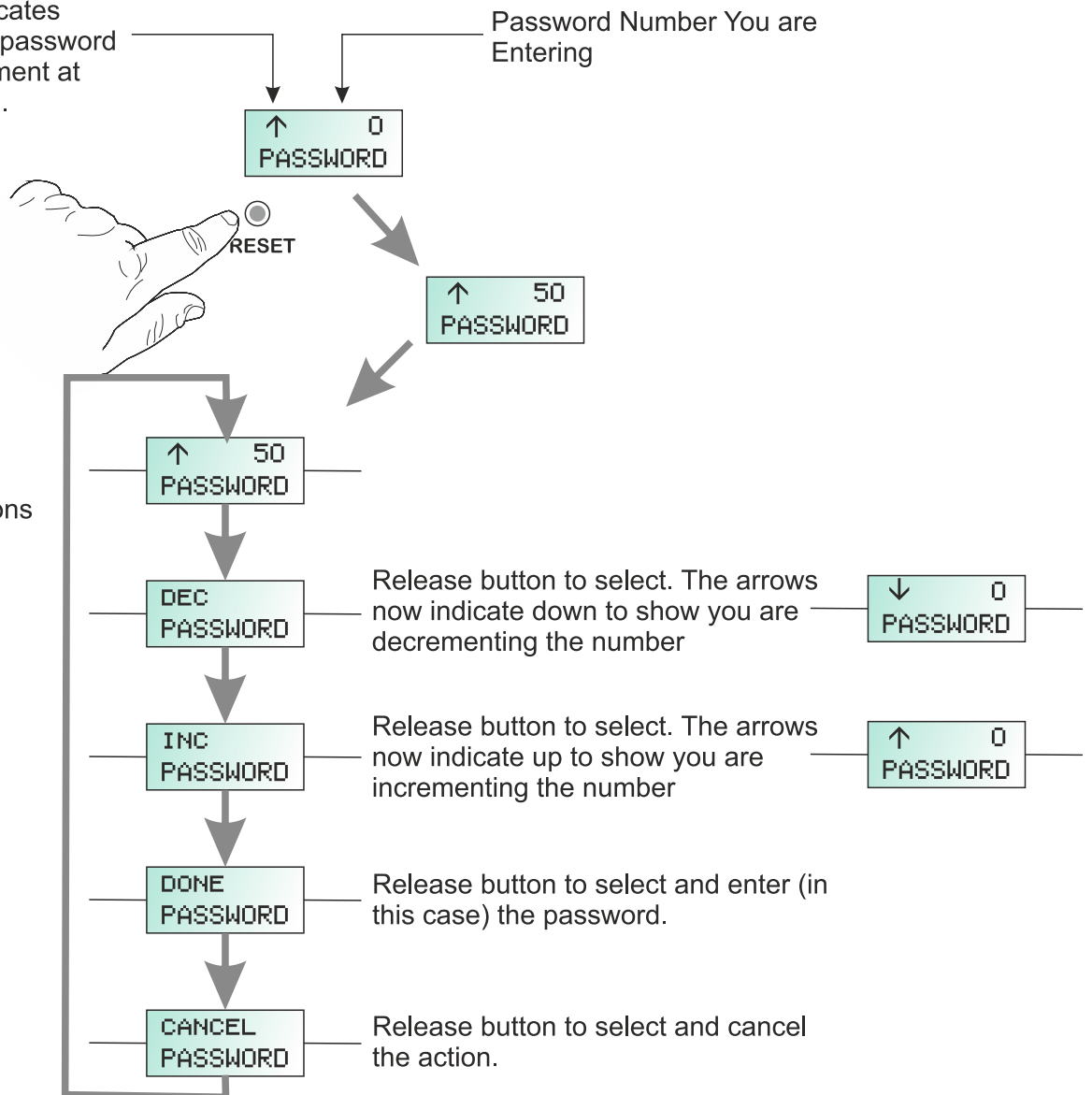
To access the display press the button for 1-2 seconds



The back turns blue to indicate manual channel selection. Note that each channel will be displayed in turn as indicated

**Data entry and menu selection using the password entry as an example.**  
 To access the menu system press the button until the message "Release button and enter password" message is displayed.

The up arrow indicates that the indicated password number will increment at each button press.



Keep the button pressed and the following menu options appear.



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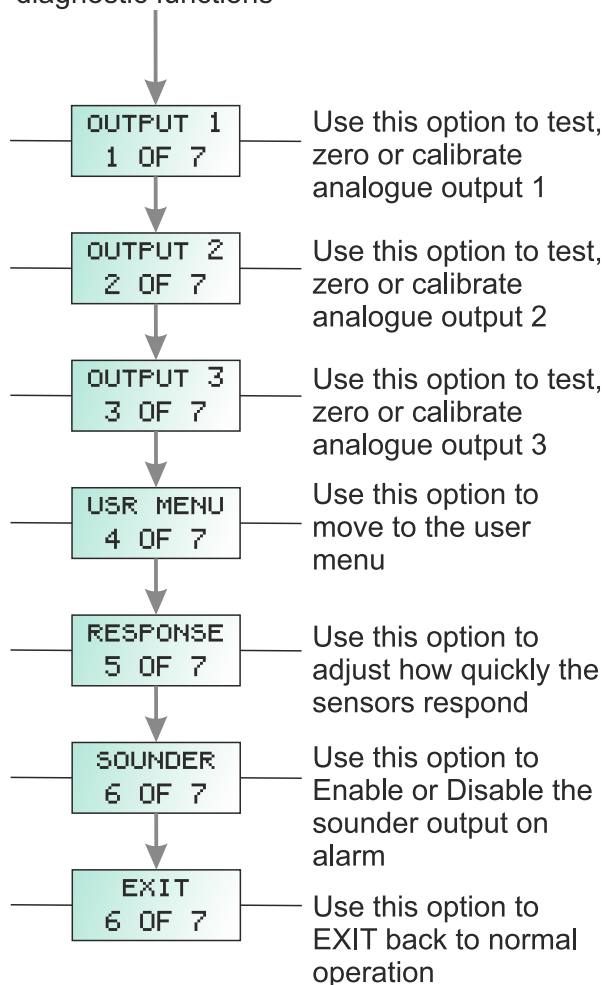
# TOC 20 Menu Overview



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## Engineer Menu Options

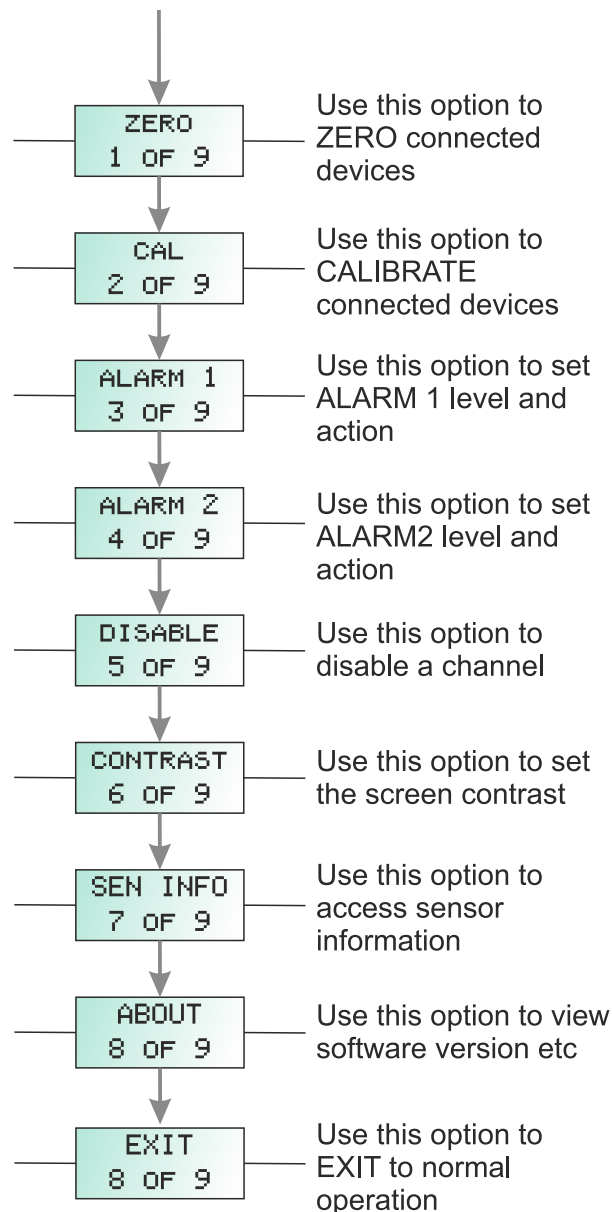
Provides access for control panel set up and diagnostic functions



100

## User Menu Options

Provides access for maintenance functions



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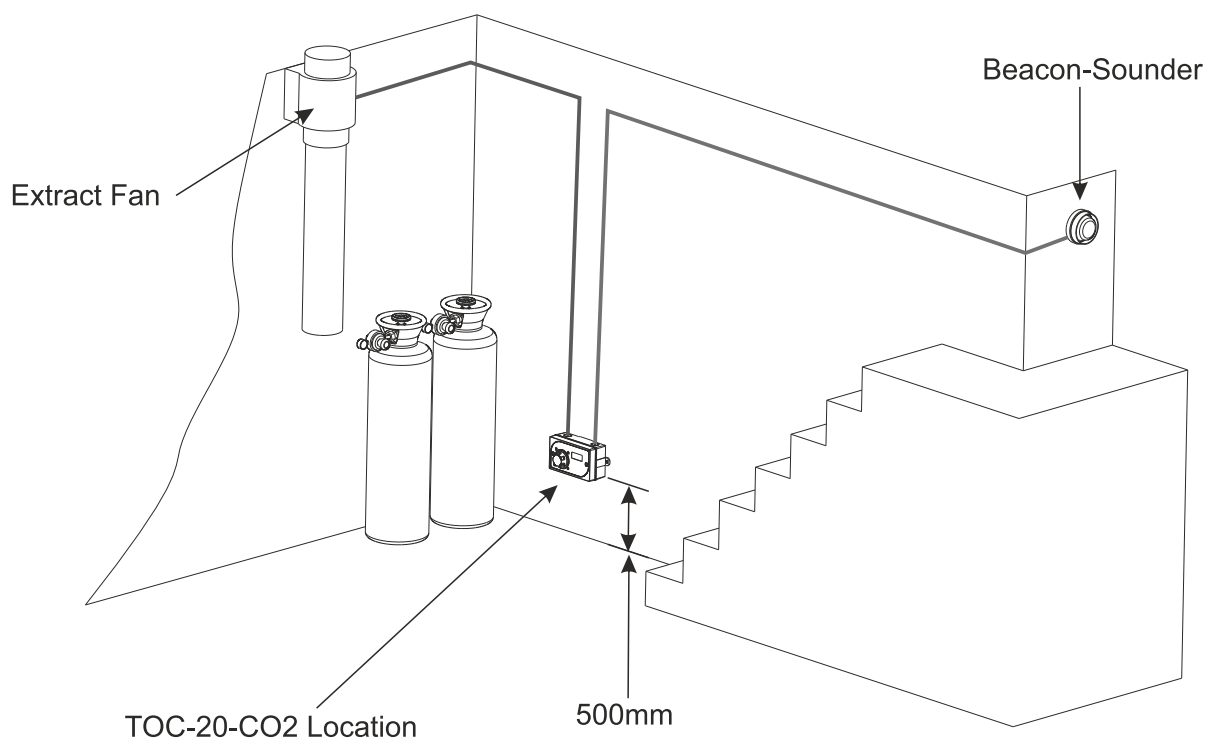
## Putting Into Service

### Correct Positioning of the TOC-20

TOC-20-CO<sub>2</sub> can be used in a number of applications. The correct positioning of the unit is important to maximise performance of the unit in a given application. Typical applications could be:

#### Confined space monitoring (CO<sub>2</sub> Versions).

Typically in this application CO<sub>2</sub> is present as a compressed gas in a confined space such as a Laboratory Gas Bottle store, Bar/Pub Cellar, Micro Brewery etc. In this application the TOC-20 should be close to potential leak sources such as valves or manifolds and 500mm from floor level. In these applications the stored compressed gas is at a high concentration (100% CO<sub>2</sub> in the case of Bar or Pub Cellars). Any leaks will quickly accumulate at floor level. Placing the detector at 500mm from floor level as indicated will maximise detection of the hazard.



In this example the TOC-20 is monitoring CO<sub>2</sub> in a Bar Cellar where CO<sub>2</sub> cylinders are stored. The TOC-20 is mounted 500mm from floor level where any leakage from the cylinders will tend to settle as CO<sub>2</sub> is generally heavier than air. In this example the TOC-20 is wired to run a ventilation fan in event of leak detection and set off a warning alarm at the entry door. TOC-20 has a built in sounder so anyone working in the cellar will be alerted. With the alarms set to be auto-reset this means that as soon as the ventilation fan has done its job and the room concentration of CO<sub>2</sub> falls to a safe level the alarm and fan will turn off. The system arrangement is safe and unambiguous.

## Hazard Monitoring in the Working Environment

This category covers for example laboratories where CO<sub>2</sub> is used and distributed as a compressed gas. In these applications the TOC-20-CO<sub>2</sub> is being used for early hazardous leak detection and so detectors are placed close to potential leak sources at normal operator head height. Care should be taken to ensure the detector will not be subject to the operators breath in normal use as it will detector the CO<sub>2</sub> exhaled by people in the vicinity. For this reason ensure in normal working operation the TOC-20 is located to be at a minimum 1M distance from any operators/staff.

## Room Ventilation Monitoring

In this application the TOC-20 is being used to monitor room air quality to provide just the right amount of ventilation and/or air conditioning to match the level of room occupancy. In these applications it is important that the TOC-20's are located to give a good average of the room CO<sub>2</sub>, Temperature and Humidity. Mount the TOC-20 typically at standing head height, typically 1.8M from floor level and away from areas of normal office 'traffic'. If the TOC-20 is found to be too responsive then this can be changed by selecting either the Medium or Slow response settings in the engineer menu (Menu Item 'RESPONSE').

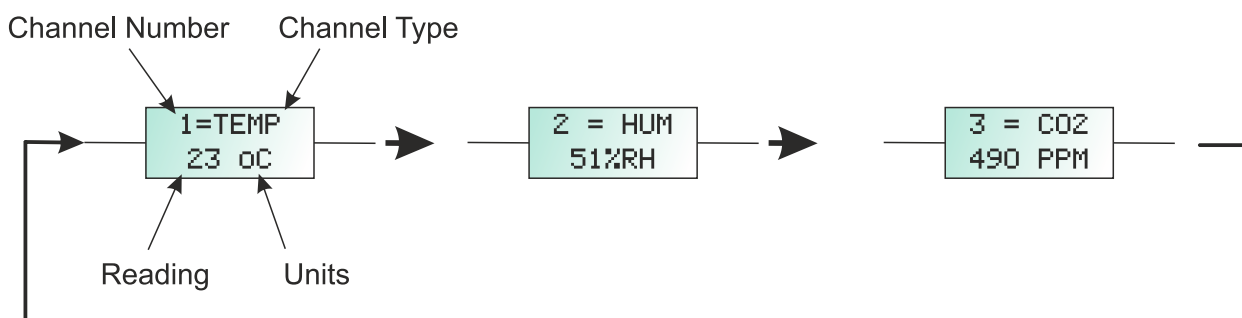
## Monitoring CFC/HCFC Plant Using T20-HFC or CFC Models

In this application the TOC-20 is being used to monitor for possible leaks from fixed refrigeration or air conditioning plant. Good detector placement is key to ensuring correct operation. Most CFC's and HCFC's are heavier than air so it would be normal practice to place detectors below valve stations, manifolds and coils. Note that detectors cannot be placed in cold stores and should be away from areas of air movement such as ventilation fans. Avoid moisture and condensation onto units, enclosures are IP rated but the sensor is not, condensation and moisture ingress to the sensor can cause damage. IGD are available to advise on specific installations provided details are available. Inclusion for the detection at an early design stage is always advisable.

With the TOC-20 correctly located and powered the system will perform a self check then proceed through its stabilisation period. This is 1 hour, during this period the sensors are stabilising to their environment, during this period the alarm relay outputs are inactive and the analogue outputs will indicate zero. At the end of the stabilisation period the system will go into normal operation.

**Normal Operation**

In normal operation mode the TOC-20 displays each channel and its reading in turn. In normal mode the back light will be green. Pressing the button will change the backlight to blue, indicating manual mode. each button press then indicates the next channel reading. After 60 seconds without a button press the system reverts to normal operation.



**Supplied Set Up**

The TOC-20-CO2 will be supplied with the following default set up.

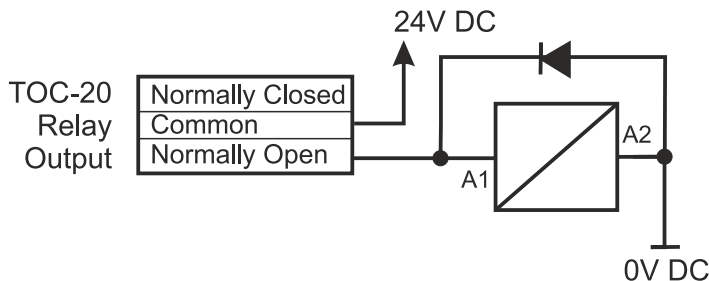
	Channel 1 Temperature -5 to +55°C	Channel 2 Humidity 0-100% RH	Channel 3 CO2 0-5000ppm
Alarm 1 Level	Not set	Not set	3500 ppm
Alarm 1 Relay	Not set	Not set	Relay 1
Sounder	Off	Off	On
Alarm 2 Level	Not set	Not set	4500 ppm
Alarm 2 Relay	Not set	Not set	Relay 2
Sounder	Off	Off	On
Analogue Output	1	2	3



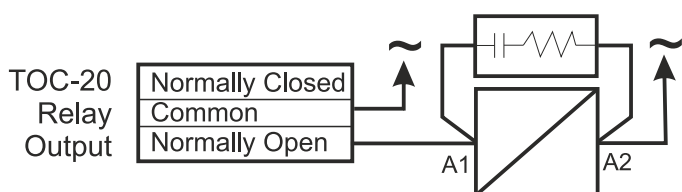
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### Relay Connection

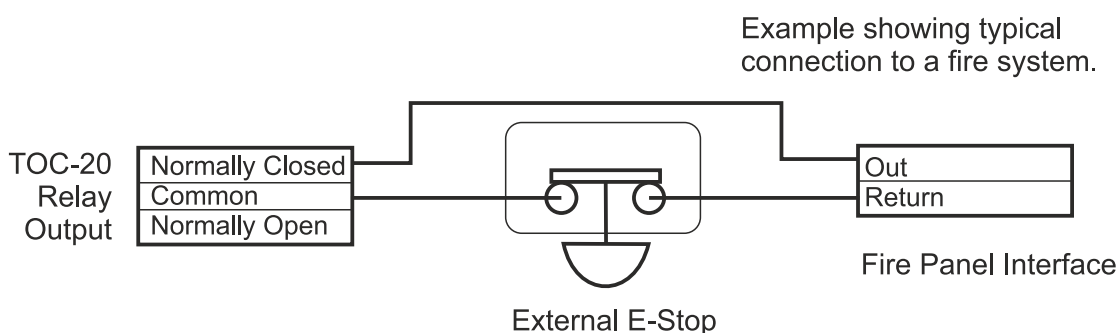
As standard the TOC-20 system is equipped with two relay outputs. The function of these two relay outputs can be user configured and is discussed in a later section. The relays are rated to operate 4A non inductive loads. Typical wiring arrangements are indicated below and show typical methods to protect the relays during installation.



Example fit protection diodes when switching external DC loads.



Example fit protection suppressors when switching external AC loads typical device Farnell Ref 1438460 (0.22uF 47R X1)

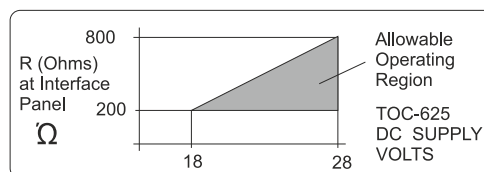
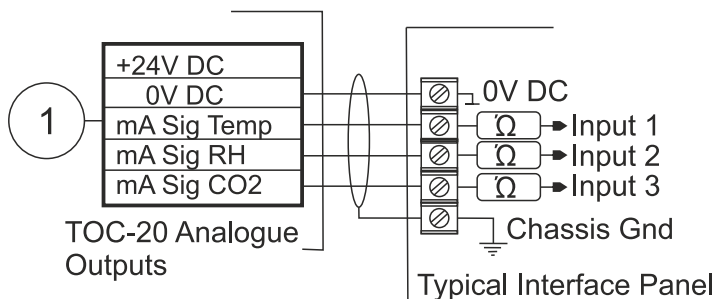


Example showing typical connection to a fire system.

### Analogue Outputs (mA)

As standard the TOC-20 is equipped with three analogue outputs. By default these are configured as 4-20mA current outputs. By request these can be set to 0-10V DC outputs during production. This is a factory only setting. The following diagrams indicate the connections

mA Analogue Output Interfaces



Note this diagram shows the use of screened cabling when interfacing signal cables. Signal cables should be segregated from power and control cables for best results.



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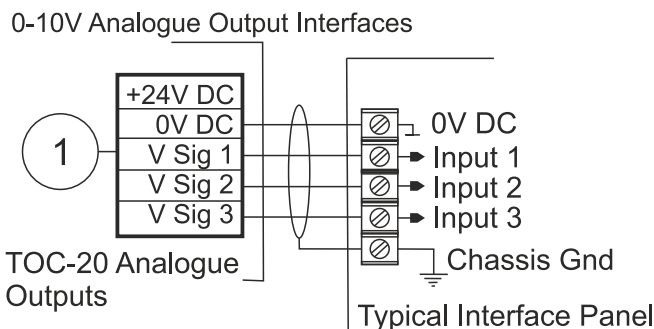
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### Analogue Outputs (Voltage)

If requested at the time of ordering the TOC-20 can be supplied with its analogue outputs re-configured as 0-10V DC. The following diagrams indicate the connections



Note this diagram shows the use of screened cabling when interfacing signal cables. Signal cables should be segregated from power and control cables for best results.



The operating system has a simulation mode for the analogue output channels. This allows the commissioning engineer to force a signal output to prove correct interfacing at the host system.

From Normal Operation press the function button until the display alters to show 'release button.

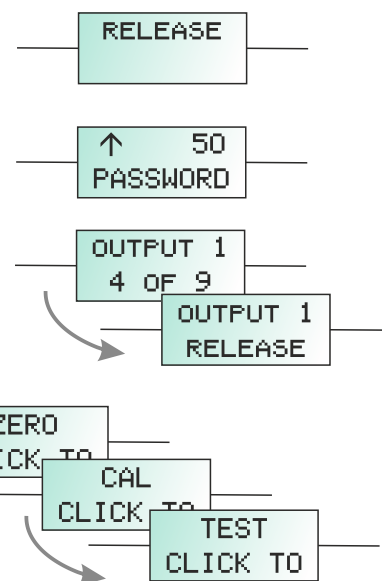
The system now requests a password. Enter 50 to enter the Engineer Menu.

Press the function button until the required option, OUTPUT 1, 2 or 3 is displayed. Now hold down the button until prompted to release.

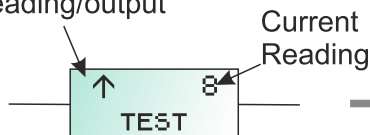
In this example output 1 will be tested.

Press the button until TEST is indicated and hold until prompted to release.

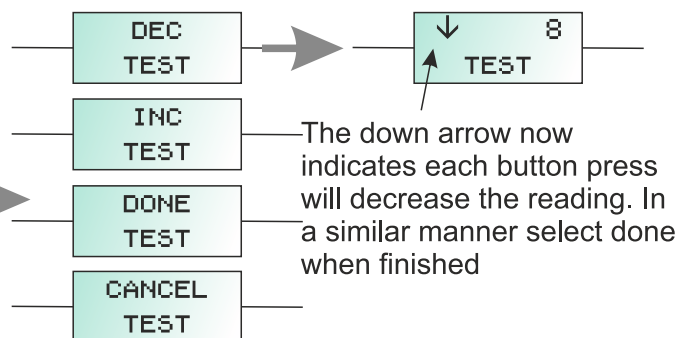
The display now shows a mV or mA output reading which can be increased or decreased as desired during testing as follows (mA output shown)..



Indicates each button click will increase the reading/output



To decrease the reading press and hold the button. The display cycles through the following options



The down arrow now indicates each button press will decrease the reading. In a similar manner select done when finished

Release the button when the desired option is displayed



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## Putting into Service Test Schedule

In conclusion by following the steps discussed your checklist for putting into service should be:

- 1 Ensure Location of the TOC-20 is optimum for the application. If the bulkhead PSU option is being used then ensure this is fed from a fused spur.
- 2 Ensure terminations via glands provide a positive seal.  
Leave all interfaces unplugged and check installation cabling terminations
- 3 Check the required alarm setup has been entered. Amend the default alarm set up if required  
Power up the TOC-20. Allow the system to stabilise and that the normal green display is indicated at the end of the stabilisation period with no faults indicated.
- 4 If the relay outputs are being used check the cabling then plug in and test using the TST RLY function the relay action.
- 5 If the analogue outputs are being used check the cabling to connector 1 , plug in and test using the OUTPUT 1, 2 or 3 functions.
- 6 After stabilisation is complete the display should indicate the room temperature and humidity if these options are active. For CO2 versions the CO2 reading will typically read 350 to 800ppm depending on room occupancy. The atmosphere has a normal background level of around 350ppm so the TOC-20 will never read less than this. For CFC/HCFC versions the display should indicate zero with no leaks present.
- 7 The normal response for the sensors is 90 seconds to 90% of final reading. This is the FAST response setting. In some applications, such as densely populated call centres this may be too fast. If a slower response is required to reduce peak readings then choose either the Medium or Slow settings in the engineer menu RESPONSE option.
- 8 The TOC-20 should now be operating correctly

In the event that the controller needs amendment to set up follow the instructions in the following sections.

Changing alarm levels

Assigning relay outputs

Zero and Calibration Function (analogue outputs)

Calibration of the sensors is not covered in this manual and should only be undertaken by a trained engineer with the appropriate equipment and software.

**NOTE: Detectors will require a period of time to stabilise to the environment into which they are installed. It is quite normal for this to take up to 48 Hours.**

**Do not use Aerosol or other cleaning agents with the detector, these can upset readings.**



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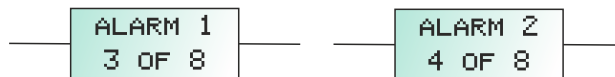
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Email: [sales@internationalgasdetectors.co.uk](mailto:sales@internationalgasdetectors.co.uk)  
Website: [www.internationalgasdetectors.co.uk](http://www.internationalgasdetectors.co.uk)



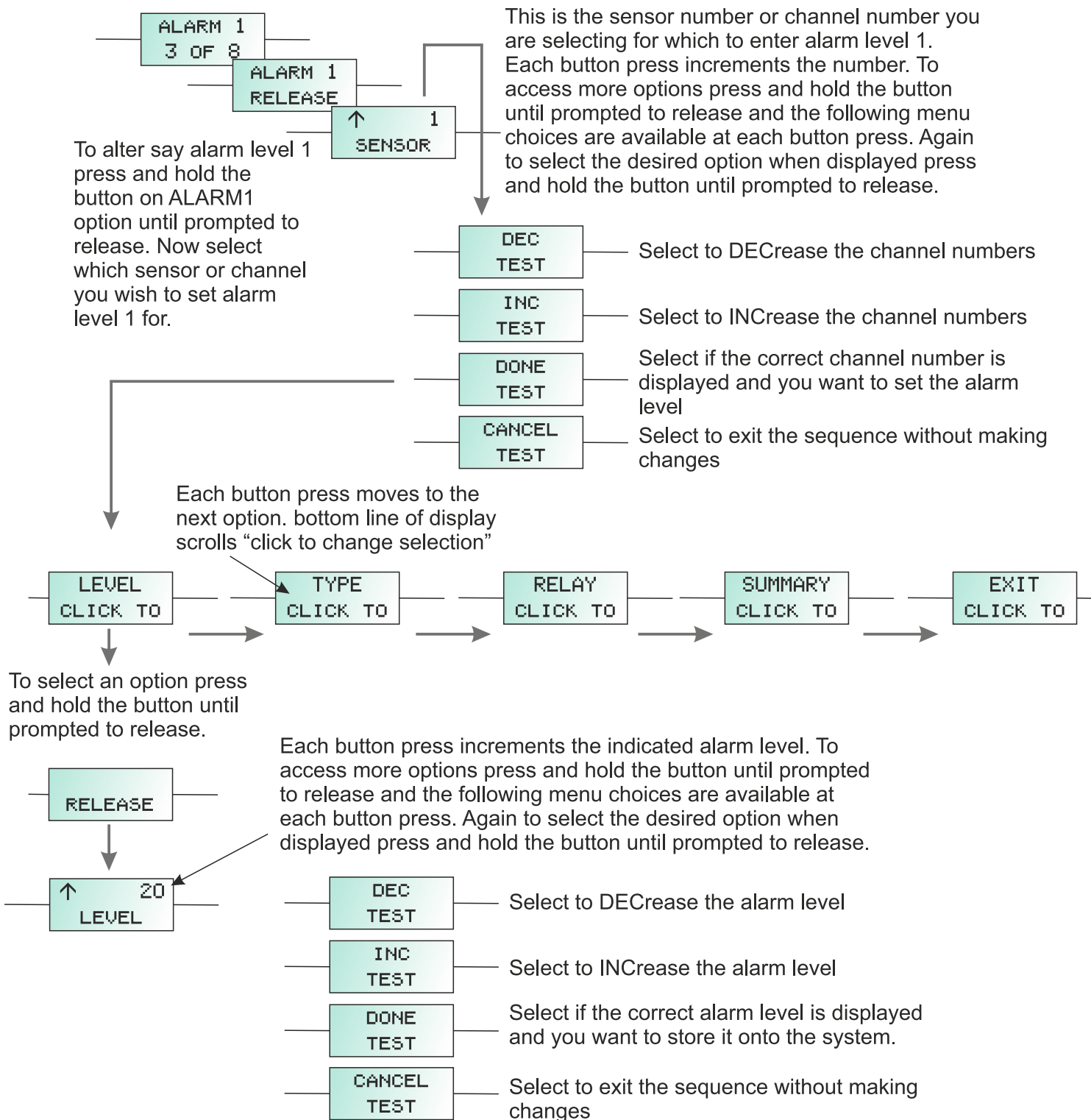
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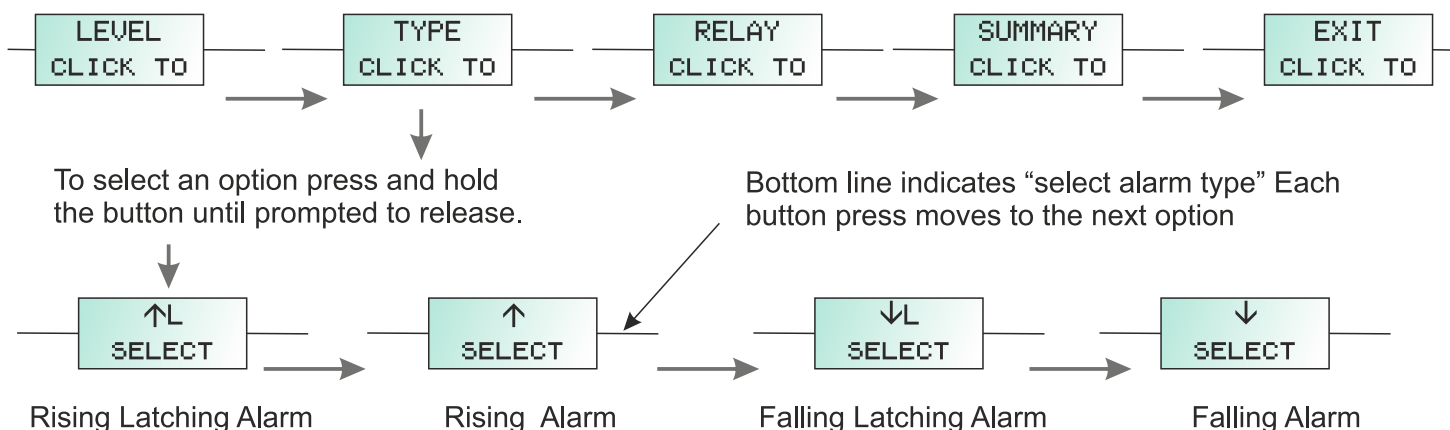
### Alarm Level Set Up



As previously described enter password mode and enter password 100 to enter the user menu. Press the button until either menu 3 or 4 is displayed and hold the button until prompted to release. The set up sequence for the alarm level selected is as follows:



Once the alarm level has been set you then need to set the Alarm TYPE and decide which relay activates once the set alarm level is breached. The following sequence continues from the previous page and describes the set up sequences



To select an option press and hold the button until prompted to release.

Bottom line indicates "select alarm type" Each button press moves to the next option

**Rising Latching Alarm**  
Latching alarms remain set until the button is pressed to reset the alarm. The gas level must be below the alarm level threshold for the reset to operate. This type of alarm is typically used in safety applications. Where alarm is required in response to rising gas levels

**Rising Alarm**  
Rising alarms will automatically reset once the gas level falls below the alarm threshold. This type of alarm is typically used in control applications where action is required in response to rising gas levels.  
Press and hold until prompted to release to select this option.

**Falling Latching Alarm**  
Latching alarms remain set until the button is pressed to reset the alarm. For a falling alarm the gas level must be above the alarm level threshold for the reset to operate. This type of alarm is typically used in safety applications for Oxygen deficiency monitoring where you are monitoring for a falling Oxygen level.  
Press and hold until prompted to release to select this option.

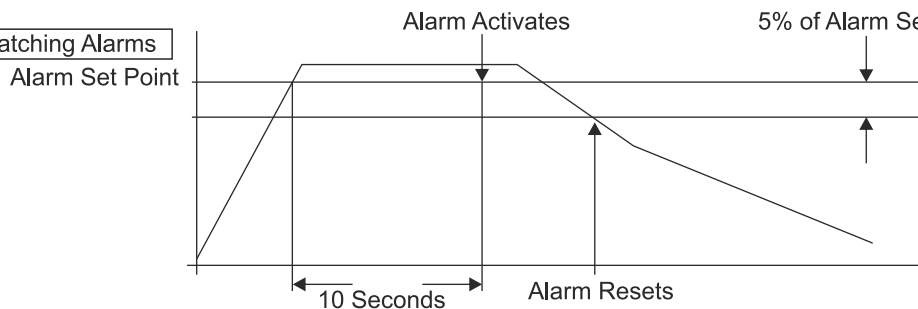
**Falling Alarm**  
Falling alarms will automatically reset once the gas level rises above the alarm threshold. This type of alarm is typically used in control applications where action is required in response to falling gas level (typical in Oxygen deficiency applications).  
Press and hold until prompted to release to select this option.

Press and hold until prompted to release to select this option.

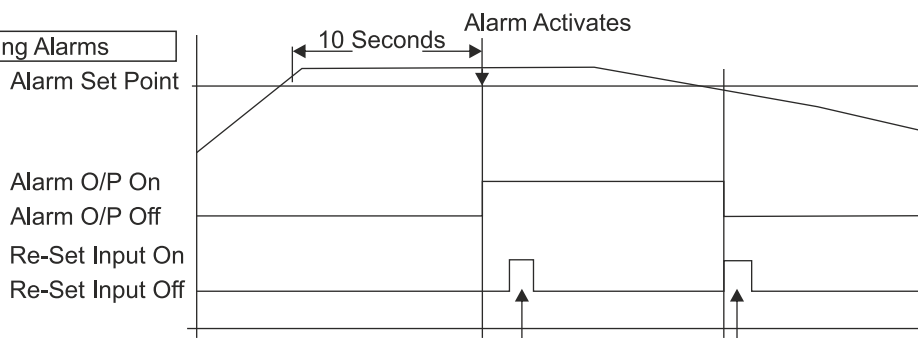
Press and hold until prompted to release to select this option.

Press and hold until prompted to release to select this option.

Rising and Falling Non Latching Alarms



Rising and Falling Latching Alarms

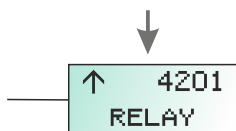


Indicates pressing the front panel 'jog wheel' to cancel the alarm

Once the alarm TYPE has been set you then need to set the RELAY output, that is deciding which relay activates once the set alarm level is breached. The following sequence continues from the previous page and describes the set up sequence



To select an option press and hold the button until prompted to release.



Each button press increments the indicated relay to activate. Note that relays 1 and 2 are physically on the control panel. If you increment past 2 then the panel assumes the relay is addressable and jumps to start from 4201. In this case enter the address of the addressable relay to activate. To access more options press and hold the button until prompted to release and the following menu choices are available at each button press. Again to select the desired option when displayed press and hold the button until prompted to release.

- Select to DECREASE the relay number
- Select to INCREASE the relay number
- Select if the correct relay number is displayed and you want to store it onto the system.
- Select to exit the sequence without making changes

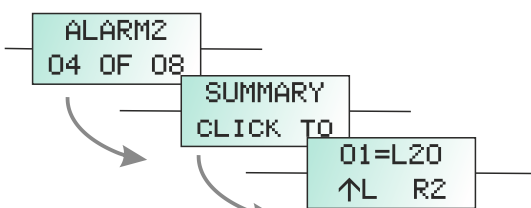
Selecting SUMMARY from this group of menu options allows you to see what has already been set up



To select an option press and hold the button until prompted to release.



In this example a two channel system has two alarm level 1's set up. When you enter the option alarm level one settings for the channel are displayed. Click the button to return to the previous menu options. To view alarm level 2 settings go back and select ALARM2 option. Note you only view the summary one channel at a time.

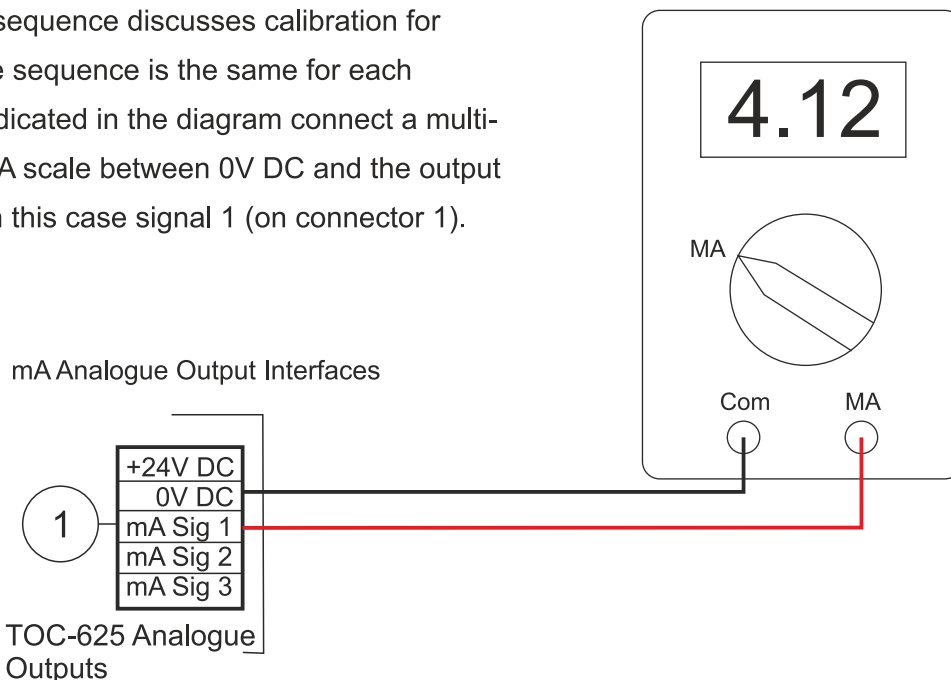


## CALIBRATIONS

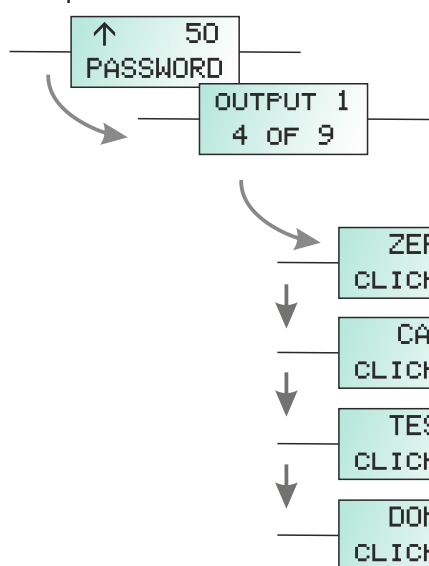
### 4-20mA Output Calibration and Test

The TOC-20 is equipped with three 4-20mA analogue outputs. By default these are configured so that output 1 relates to input channel 1, output 2 is input channel 2 and output 3 is input channel 3. The TOC-20 is shipped with these channels pre-calibrated. It should not normally be necessary to calibrate these channels. The system has functions to allow zero, calibration and test of these channels as follows:

The following sequence discusses calibration for channel 1. The sequence is the same for each channel. As indicated in the diagram connect a multi-meter on its mA scale between 0V DC and the output to be tested, in this case signal 1 (on connector 1).



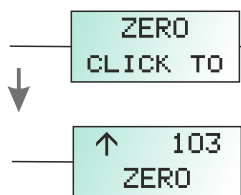
As previously described enter password mode and enter password 50 to enter the engineer menu. Press the button until either menu 3, 4 or 5 is displayed depending on the required output channel and hold the button until prompted to release. The following sequence shows output 1 being calibrated as an example.:



Each click of the button now cycles you through the available menu options as follows. As with previous menu's press and hold the button to select the displayed option:

- ZERO  
CLICK TO — Select this option to zero the channel
- CAL  
CLICK TO — Select this option to calibrate the channel
- TEST  
CLICK TO — Select this option to test the channel, this option forces the output to whatever mA output is required.
- DONE  
CLICK TO — Select this option to return to the previous menu

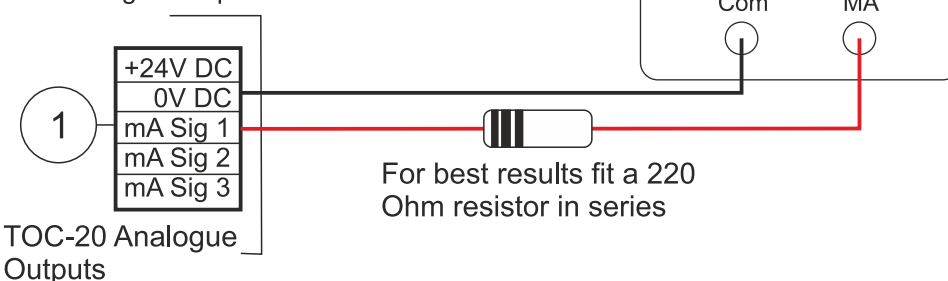
### 4-20mA Output Zero Function



From the menu previously described select the zero option.

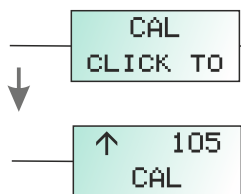
The display now shows the current 'setting' for the channel zero, in this case 103. Increasing this setting will increase the indicated 4mA setting and vice versa. Increase or decrease the setting until the meter reads 4mA +/- 0.1mA then from the sub menu select DONE (press and hold for sub menu as previously described).

mA Analogue Output Interfaces



For best results fit a 220 Ohm resistor in series

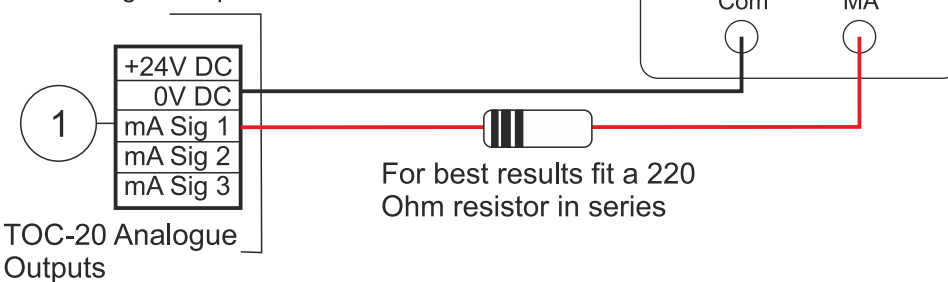
### 4-20mA Cal Zero Function



From the menu previously described select the CAL option.

The display now shows the current 'setting' for the channel Calibration, in this case 105. Increasing this setting will increase the indicated 20mA setting and vice versa. Increase or decrease the setting until the meter reads 20mA +/- 0.1mA then from the sub menu select DONE (press and hold for sub menu as previously described).

mA Analogue Output Interfaces



For best results fit a 220 Ohm resistor in series