



GLACIÄR X5

Advanced Gas Detection Transmitter



USER MANUAL



GLACIÄR X5 Manual v6

INTRODUCTION

The GLACIÄR X5 gas detector transmitter is a standalone detector approved for zone 1, 2, 21 or 22 ATEX environments.

X5 is approved to both European, UK ATEX and international IECEx standards.

The transmitter features a non-intrusive calibration, one or two independent detectors, 2 analogue outputs, relays and a wide range of sensor options.

The transmitter features our non-intrusive calibration method using our magnetic “wand” to perform one-man calibrations while in an ATEX zoned area.

The X5 updates itself when detectors are fitted for gas type, range, measurement type and alarm levels. No need to spend time setting the unit up, X5 does this for you. In addition detectors utilise our industry leading long-life sensor technology. With sensor options for a wide variety of gases including toxic gases, 5-year Ammonia sensors, 5-year IR sensors and our patented, long life poison resistant Pellistor sensors for flammable gases.

ABOUT THIS MANUAL

This manual is intended for use by competent installation and or service engineers. This manual relates to software versions V1.019 and later. The manual can also be used by end users to familiarise themselves with day to day operation, screen indications etc. Competence can be demonstrated in a number of ways but in this instance would be taken to mean manufacturer training and training as to installation into ATEX zoned areas, EN 60079-14 refers.

Note that gas detection systems require regular calibration to ensure correct operation. Calibration periods are affected by the environment into which the detector is fitted. We recommend 6 monthly calibration periods at which point calibration stability and the calibration period can be reviewed. Extremes of temperature, vibration, humidity and the frequency of exposure to hazardous or corrosive gases and vapours can all work to reduce calibration periods.

Failure to observe the requirements published in the manuals and in local and international standards may compromise the installed system. In particular:

EN 60079-14	Explosive atmospheres -	Electrical installations design, selection and erection
EN 60079-17	Explosive atmospheres -	Electrical installations inspection and maintenance
EN 60079-19	Explosive atmospheres -	Equipment repair, overhaul and reclamation
EN 60079-29-2	Explosive Atmospheres -	Selection, Installation, use and maintenance of detectors for flammable gases

WARNINGS AND PERFORMANCE STATEMENTS



This Transmitter can be located in a classified Ex area zone 1,2, 21,22, devices installed in an Ex area can be connected to this unit but shall be protected with one of the types of protection listed in IEC 60079-0 corresponding to their own category. We recommend users read the procedures described in IEC 60079-29-2 for reference.

Equipment to be installed into ATEX zoned areas must be installed by competent persons trained to do so.

Service of the X5 and its connected detectors must be undertaken by competent persons training to undertake the necessary procedures.

This product must be earthed in accordance with local safety regulations. Cabling must be screened.

Refer to the equipment ratings published in this manual. Exceeding specifications can result in damage to the transmitter.

Should the control panel be used in conjunction with portable generating equipment, care should be taken to ensure that the electrical supply is within the tolerance band described above.

The transmitter may be stored at temperatures between -25°C and 60°C . If stored at low temperatures and then brought into a warmer environment, care should be taken to ensure that condensation does not form or enter critical electrical components, for example the power supply. Allow 24 hours to stabilise extremes of temperature.

The transmitter is designed to operate within specification for ambient temperature between -20°C and 55°C , relative humidity up to 90% (non-condensing). Sensor specifications may differ.

Do not use a transmitter for protection applications that has not been fitted with a calibrated detector. If calibration seals are missing from the control panel or have been tampered with or broken, then the control panel must be re-calibrated and sealed by a trained engineer.

Substances and interfering gases can cause adverse effects on the performance or electrical safety of the gas detection systems. Care should be taken to limit exposure to these substances, for example corrosive atmospheres, for further advice and information contact head office.

The response time of the entire system is determined by the time of response of all the parts of the equipment within the gas detection system.

The relationship between the output signal and the gas concentration is linear, the control panel interprets the signal and the gas level is displayed on the HMI display. SAMON holds evidence of this linear performance which is available upon request.

Whilst detectors heads TOC-102-xxx Series are shipped calibrated this does not obviate the unit being checked on site for zero and calibration as part of the commissioning process.

WARNINGS AND PERFORMANCE STATEMENTS

CALIBRATION AND CHECK INTERVALS

Calibration and checking intervals are a function of the environment into which the instrument is installed. An instrument installed into an air conditioned and stable environment will have a longer calibration interval than one installed in more changeable conditions.

Where there is sufficient experience of an application regarding the reliability and accuracy of the measuring principle and equipment; the calibration and check intervals can be fixed based on experience. SAMON are available to help advised based on our wealth of application knowledge.

If sufficient experience is not available then:

- After commissioning the instrument perform four functional checks at weekly intervals.
- If no adjustments (re-zero or calibration) is necessary then perform another 3 checks at monthly intervals.
- If no adjustments are necessary then move to 6 monthly checks/calibration periods.

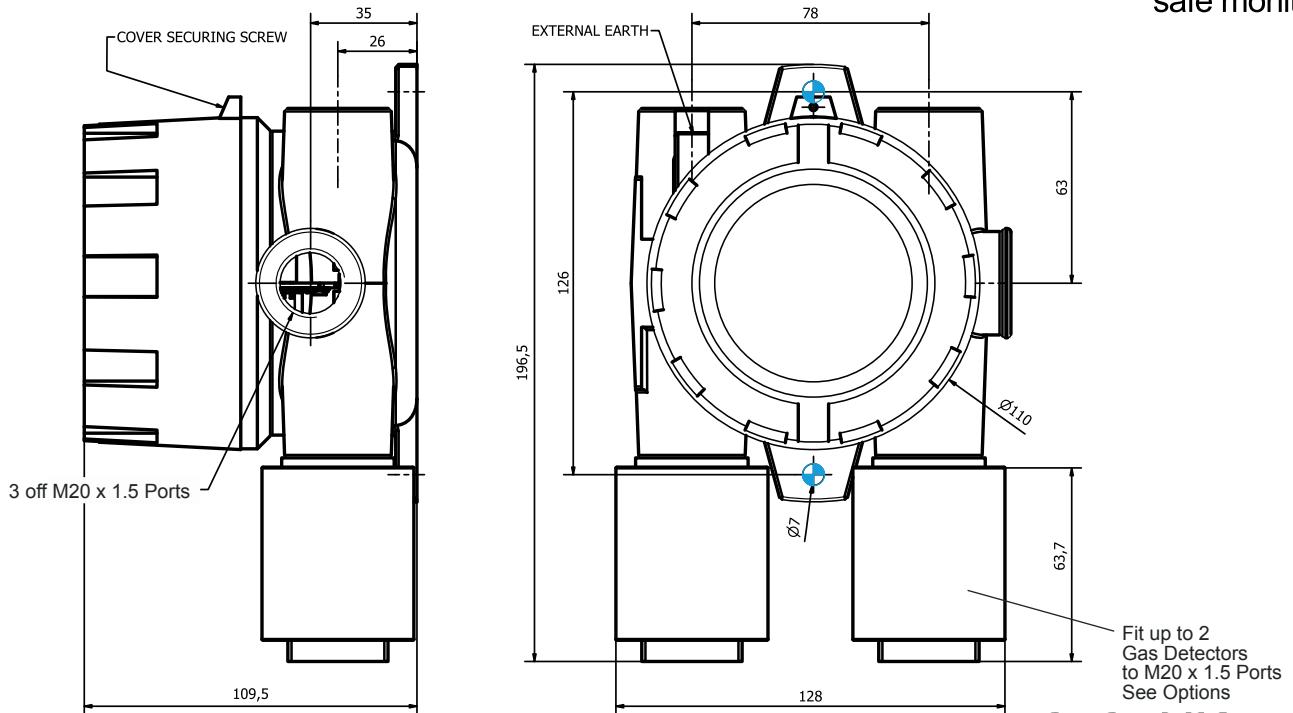
If adjustments prove necessary during testing then shorter test periods need to be chosen to prove the calibration stability in the particular application.

Under no circumstances should checks or calibration periods exceed 12 months.

RECOMMENDED STANDARD CHECK INTERVALS

Visual	User	1 Month
Functional/Bump Test	User	2 Months
Calibration	External Body	6 Months

SPECIFICATIONS



Power	18 to 30V DC
Electrical Outputs	2 off independent 4-20mA outputs auto ranged to suit fitted detector(s) 1 Single Pole Fault Relay 2 SPCO Alarm Relays Latching as standard Relays 4A at 24V DC Non Inductive Aux Power Connection 0.5A Max
JB Housing Material	Junction Box, Copper Free Aluminium Alloy Epoxy Coated Option for 316 Stainless Steel and Marine Paint Finishes
Sensor Housing Material	Sensor, Stainless Steel 316 S16
Explosion Protection	Junction Box, EEx d IIC T6 I I2 D G
Housing Dimensions (mm)	See Drawing
Cable Entry	5 x M20 x 1.5 See Drawing
Temperature	-20°C to +55°C
Humidity	20-90% RH Non-Condensing
Pressure	800-1200mBar
Air Flow	Max 6m/s, Air flows should not be directly to the sensor face
Sealing	IP66 (IP ratings do not imply that the equipment will detect gas during and after exposure to those conditions.)
Mounting	Wall Mount
Weight	1.1 Kg (Plus Fitted Detectors)



JB3/3500-0001

II 2G Ex db IIC T6/T5 Gb
II 2D Ex tb IIIC T85°C/ T100°C Db
Ta = -20°C to +40°C/+55°C
IECEx EXV 16.0002X
ExVeritas 16 ATEX 0140X
ExVeritas 21 UKEX0913X
FTZÚ 23 ATEX 0095
IECEx FTZU 24.0005
IP66
M20 x 1.5 Entries 12-32V DC
IEC/EN 60079-29-1



3500-XXXX Series Detector

II 2G Ex db IIC T6 Gb
II 2D Ex tb IIIC T85°C Db
Ta = -20°C to +40°C
II 2G Ex db IIC T5 Gb
II 2D Ex tb IIIC T100°C Db
Ta = -20°C to +55°C
Rating 12-32VDC 2W
IECEx EXV16.0003X
ExVeritas 16ATEX0141X
ExVeritas 21 UKEX0914X
FTZÚ 23 ATEX 0095
IECEx FTZU 24.0005
IEC/EN 60079-29-1

SPECIFICATIONS

APPLICABLE STANDARDS

EN 60079-29-1:2016+A1:2022+A11:2022	Explosive atmospheres - Gas detectors. Performance requirements of detectors for flammable gases.
EN 50270:2015+AC:2016	Electromagnetic compatibility. Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen.
EN 50271:2018	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/IEC 60079-0:2018	Explosive Atmospheres - Part 0: Equipment General Requirements.
EN/IEC 60079-1:2014-06	Explosive Atmospheres - Part 1: Equipment Protection by Flameproof enclosures 'd'.
EN/IEC 60079-31:2014	Explosive Atmospheres - Part 31: Equipment Dust Ignition Protection by Enclosure 't'.

APPLICABLE GAS TYPES

EN 60079-29-1 is a performance standard for flammable gases. The X5 fitted with a pellistor has been tested against this standard for the following gas types:

Hydrogen H ₂	Range 0-100% LEL	Typical Response Time T ₉₀ <60s
Methane CH ₄	Range 0-100% LEL	Typical Response Time T ₉₀ <60s
Propane C ₃ H ₈	Range 0-100% LEL	Typical Response Time T ₉₀ <60s

The following table shows flammable gases and their relative response to Methane as a calibration gas for which the pellistor flammable gas detector can also be used.

The addition of splash guards part number 3500-0090 does not extend the response time indicated. Gas collector cones may also be used and also do not affect response time.

PELLISTOR POISONS

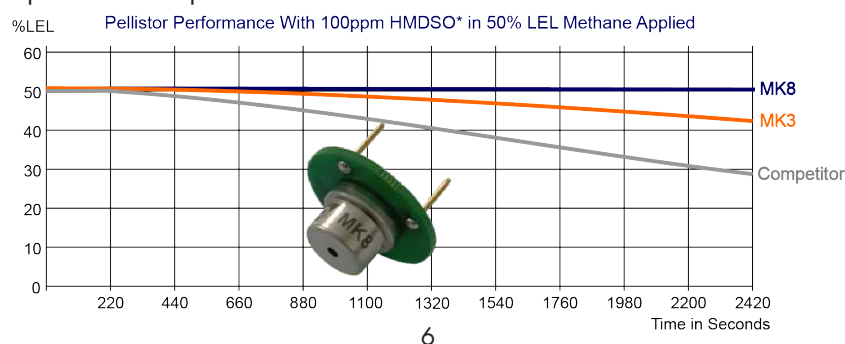
Certain substances are known to have a detrimental effect on Pellistor sensors. There are two mechanisms by which this can occur:

Poisoning: Some compounds will decompose on the catalyst and form a solid barrier over the catalyst surface. This action is cumulative and prolonged exposure will result in an irreversible decrease in sensitivity. Typical poisons are organic lead and silicon compounds.

Inhibition: Certain other compounds, especially H₂S and halogenated hydrocarbons, are absorbed or form compounds that are absorbed by the catalyst. This absorption is so strong that reaction sites in the catalyst can become blocked and normal reactions are inhibited. The resultant loss of sensitivity is temporary and in most cases a sensor will recover after a period of operation in clean air.

Most compounds fall into one of these two categories, although some will exhibit both mechanisms to greater or lesser extent. In applications where either poisoning or inhibition are likely to be present, a pellistor sensor should be protected from exposure to any compounds to which they do not specifically exhibit resistance.

Note that pellistors are extremely resistant to such poisons and inhibitors. A unique feature of the pellistor sensor is its ability to recover most of their response after exposure to silicones.



FLAMMABLE GAS RESPONSE TABLE



Below is a table FOR pellistor responses to various flammable gases. The table assumes the sensor is measuring on the 0-100% LEL scale and assumes that the response to methane = 100%.

Note that the LEL data can be different in different countries. In Europe, the LEL's used are defined in the IEC standard IEC80079-20-1, whilst in the USA and various other areas, LELs are generally taken from the US Bureau of Mines Bulletin Document 627.

Technically, both are correct; the reason for the differences being that the measurements made for IEC80079-20-1 are with the gas in motion, whilst the US Bureau of Mines Bulletin Document 627 assumes the gas is not moving. For convenience, relative responses are given according to BOTH standards below.

Accuracy in all cases Better Than +/-3% of Measured Range.

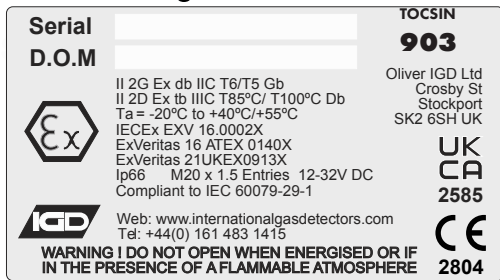
Gas	Formula	LEL Europe (IEC80079-20-1)	Relative response (%)	LEL USA (USBoM 627)	Relative response (%)
Methane	CH₄	4.4	100	5	100
Acetone	(CH ₃) ₂ CO	2.5	22	2.6	20
Ethanol	C ₂ H ₅ OH	3.1	27	3.3	26
Ethyl acetate	C ₂ H ₅ COOCH ₃	2	22	2.2	21
Ethylene	C ₂ H ₄	2.3	56	2.7	58
Hydrogen	H ₂	4	97	4	85
Iso-propanol	CH ₃ CH(OH)CH ₃	2	19	2.2	18
Methanol	CH ₃ OH	6	46	6.7	46
n-Butane	C ₄ H ₁₀	1.4	47	1.8	53
n-Heptane	C ₇ H ₁₆	0.85	40	1.05	43
n-Hexane	C ₆ H ₁₄	1	42	1.2	44
n-Pentane	C ₅ H ₁₂	1.1	41	1.4	46
Propane	C ₃ H ₈	1.7	54	2.1	59
Toluene	C ₆ H ₅ CH ₃	1	24	1.2	25
Propylene	CH ₃ -CH=CH ₂	2	74	2.4	78
Cyclo-hexane	C ₆ H ₁₂	1	44	1.3	50
Cyclo-pentane	C ₅ H ₁₀	1.4	63	1.5	59
Iso-butane	C ₄ H ₁₀	1.3	46	1.8	56
Iso-octane	C ₈ H ₁₈	0.7	36	not given	32
n-octane	CH ₃ (CH ₂) ₆ CH ₃	0.8	40	0.95	42
Styrene	C ₆ H ₅ CH=CH ₂	1	14	1.1	14
Xylene	C ₆ H ₄ (CH ₃) ₂	1	26	1.1	25
Carbon monoxide	CO	10.9	42	12.5	42
Ammonia	NH ₃	15	68	15	60

Note for correct operation Pellistors require a minimum of 11% Oxygen. Below this level incomplete combustion of the target gas on the surface of the pellistor will occur.

Above 23% Oxygen, readings from Pellistor based sensors will over read from their true level, resulting in alarm points being breached earlier than would otherwise be the case.

Where Oxygen levels may be subject to variation due to location, process or environment, consideration should be given to fitting an Oxygen sensor. The X5's unique dual sensor platform lends itself to this type of operation.

MARKINGS



Example of labelling X5

The housing must be grounded to a minimum 20A ground.

If the JB3 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 JB3 without the cover correctly screwed in place.

JB3

INSTALLATION INSTRUCTIONS

The following information is provided to enable safe installation and operation of the Model JB3 Junction Box.

The junction box can be fitted with either two or three wire flammable gas sensor.

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 JB3 and its sensor is to be used. The following is intended as a guide.

Cables need to be circular and compact and must be screened. Cable conductor sizes must be correctly sized for current carrying capacity.

Steel Wire Armoured cable to BS6724, BS5467, EN 50288-7 are examples that can be used other types may be suitable. Refer to current revisions of the ATEX 60079- standards for full installation requirements in particular: 60079-14

Note in all cases the JB3 Housing must be earthed and used in conjunction with correctly zoned cable glands and sealing for safe operation in a hazardous area.

Explanation of ATEX/IECEX Markings

Equipment Category (Surface)
ATEX Zone (1)
Gas
Protection Concept (Flameproof)
Gas Group (Hydrogen, Acetylene etc)
Temperature Class (85°C)
Equipment Protection Level

II 2 G Ex db IIC T6 Gb

Dust
Dust Protection Concept (by enclosure)
Dust Group (Conductive)

II 2 D Ex tb IIIC T85°C Db

Ta = -20°C to +40°C — ATEX Temp Range

IECEX EXV16.0003X
ExVeritas 16ATEX0141X
ExVeritas 21UKEX0914X

Notified Body
&
Certificate No

Example of external junction box labelling JB3



MARKINGS FOR PERFORMANCE APPROVALS 60079-29-1



Approvals related to the product protection concept under ATEX and IECEx for EXd relates to certification obtained from ExVeritas for:

GLACIÄR X5 transmitter
Junction Box with Window
Junxtion Box no window

These certificates and related product approval markings are indicated on the enclosed labels
Markings are explained in section JB3.

Markings for the detector head are indicated in section under Specifications.

Where reference is made to performance standard IEC/EN 60079-29-1. This references the protection concept approvals from ExVeritas and relates to the listed approval from FTZU under the following certificates:

IECEX FTZU 24.0005
IEC/EN 60079-29-1



102 Series Detector

II 2G Ex db IIC T6 Gb
II 2D Ex tb IIIC T85°C Db
Ta = -20°C to +40°C
II 2G Ex db IIC T5 Gb
II 2D Ex tb IIIC T100°C Db
Ta = -20°C to +55°C
Rating 12-32VDC 2W
IECEX EXV16.0003X
ExVeritas 16ATEX0141X
ExVeritas 21UKEX0914X
FTZU 23 ATEX 0095
IECEX FTZU 24.0005
IEC/EN 60079-29-1

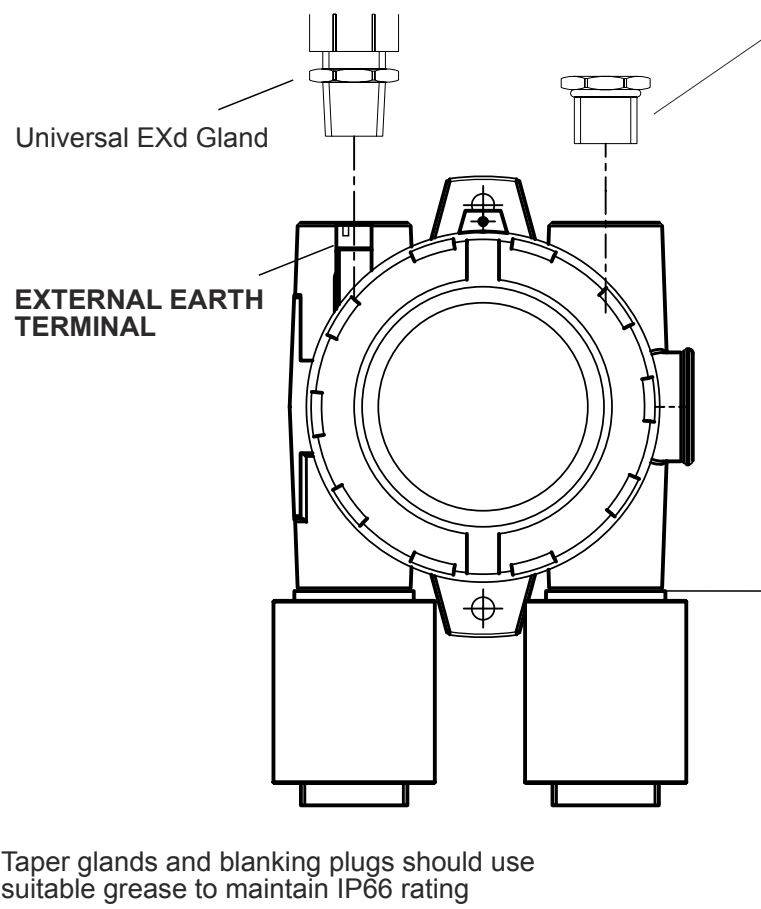
CUSTOMER SEALING AND EARTHING REQUIREMENTS

The JB3 is designed for use in Zone 1 and Zone 2 hazardous areas and is ATEX & IECEx 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.

Regarding IP ratings Parallel glands and blanking plugs should have O Ring seals or sealing washers to maintain IP66 rating use Atex rated glands and blanking plugs. Loctite 577 can be used as a thread sealant as an additional aid. If using thread sealant additional measures may need to be taken to ensure all parts earth together effectively.

ALL UNUSED cable entries MUST be fitted with a suitable Ex d blanking plug

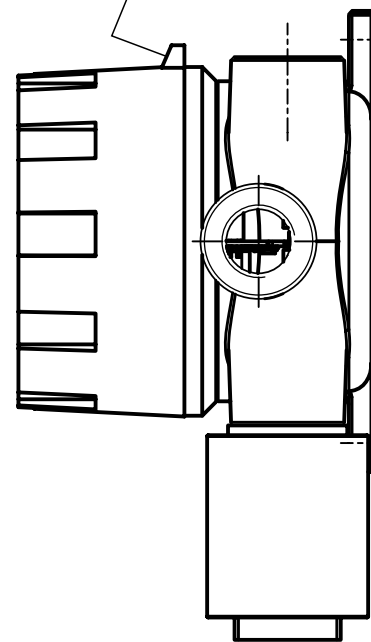
On final assembly the cover screw must be locked in place. Use 1.5 mm Allen Key



Use suitably rated glands

Gas detectors are supplied with sealing washers. These must be fitted to meet approval requirements

Also see notes on page 5 & 6 of this manual.



EXTERNAL EARTH	STRANDED CABLE USE	4.0mmSQ CSA	SOLID CORE CABLE USE	6.0mmSQ CSA
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WARNING

Glands and cables must be of suitable type to match the zone of application of the equipment, see later notes in this manual

CONSIDERATIONS FOR ATEX INSTALLATIONS



The following notes on equipment selection and installation are taken from applicable standards. They are not intended to replace adequate knowledge and skill on the part of those using them. Also any and all applicable local regulations should be considered when deciding on installation methods and materials.

Selection of cables

In accordance with EN 60079-14, cables connected to Ex d enclosures should satisfy one of the following:

- Have ALL the following characteristics:
 - Sheathed with thermoplastic, thermosetting or elastomeric material
 - Any bedding or sheathing must be extruded
 - Any fillers must be non-hygroscopic (meaning resistant to the absorption of moisture)

or;

- Mineral insulated & metal sheathed

or;

- Special cables, for example flat cables with appropriate glands

It is worth noting that many PVC sheathed and insulated cables do not satisfy these requirements.

Also if an armoured cable is used, then the gland should be of a type that clamps the armour, and provides a compression seal on the inner sheath.

For these purposes armoured can refer to armoured OR braided (SWA or SY), and should be clamped accordingly.

If using a fine braided cable with strands of less than 0.15mm, where the braid covers at least 70% of the surface of the cable, then compression sealing only on the outer sheath, is permitted. In such instances the braid should be brought into the enclosure, and handled accordingly.

Fire Proof cable, such as FP200 can be used with the recommended gland. The aluminium tape which forms the outer metal jacket can be clamped in the armour clamping ring.

Selection of cable glands

In accordance with EN 60079-14, cable glands used with Ex d enclosures should satisfy one of the following:

- Certified barrier glands

or;

- Cables and glands meeting ALL of the following:

- Certified Ex d glands
- Connected cable length is at least 3m
- Cable having ALL the following characteristics:
 - Sheathed with thermoplastic, thermosetting or elastomeric material
 - Any bedding or sheathing must be extruded
 - Any fillers must be non-hygroscopic (meaning resistant to the absorption of moisture)

or;

- Certified Ex d bushing and Ex e junction box

or;

- Mineral insulated cable and suitable, certified glands

or;

- Other certified barrier device

It should be noted that the use of tapes, heat shrink or other devices to enlarge the diameter of the cables sheath to make the gland compression seal grip the cable, is explicitly forbidden.

To satisfy the above requirements we recommend using our ATEX cable gland, with at least 3m of cable left before the next gland, and a cable which complies with the above requirements.

Unused cable entries

It is critical to the safety integrity of the system that all unused cable entries MUST be fitted with a suitably certified Ex d stopping plug.

CONSIDERATIONS FOR ATEX INSTALLATIONS

Un-used cores of a multi-core cable

Any un-used cores in a multi-core cable must be either terminated to earth, or effectively isolated from other cores and terminations. We recommend terminating to the internal earth stud.

Maintenance

Whilst the maintenance of installations is the responsibility of the site operator, EN 60079-17 gives guidance on what should be checked and when. Included at the back of this manual is a chart based on that found in section 6 of EN 60079-17, for a Periodic Close Inspection. This chart is intended to be used by qualified personnel in conjunction with the EN 60079-17.

Commissioning

When commissioning a system for use in a zoned area, EN 60079-17:2014 4.3 mandates that, it shall be given an initial inspection. Included at the back of this manual is a chart based on that found in section 6 of EN 60079-17, for an Initial Detailed Inspection. This chart is intended to be used by qualified personnel in conjunction with the EN 60079-17.

Qualification of personnel

Personnel involved in installation and commissioning of equipment in Zoned areas should be suitably qualified. The qualifications required are detailed in various parts of the EN 60079 standard. Qualification can be purely internal or can involve a third party. It is the responsibility of each individual organisation to decide upon the most appropriate way to implement these requirements.

As well as the mandatory qualifications in the standard personnel must of received adequate training in the gas detection equipment. To comply with EN 60079 such training must be documented.

Installation, commissioning, maintenance and operation by unqualified personnel could lead to serious equipment malfunction and/or unsafe operation.

Installation location

It is important that the detector is mounted in accordance with EN 60079-14, clause 14.2 which states that flameproof joints must be a minimum distance away from solid obstacles, (eg structural steelwork) which is not part of the equipment.

Note that if the detector is mounted to a flat surface then the joints where the cables and detectors go into the housing are closer than the minimum, but this has been taken account of during testing and hence does not need to be considered.

For a IIA installation the minimum distance is 10mm, for a IIB it is 30mm and for IIC it is 40mm.

Earthing

An external earth studs is provided. The external earth point provides a means for connecting the enclosure, which is considered to be an 'exposed conductive part', to the bonding system. There is no specific requirement in 60079 to run a separate earth bond to this stud, but we recommend that one is connected. This is inline with best practice and many local requirements, for example equipment going offshore from Aberdeen. The minimum size conductor for such bonds is 4mm² as per EN60079-14 clause 6.4.1.

To summarise, as a minimum we recommend that:

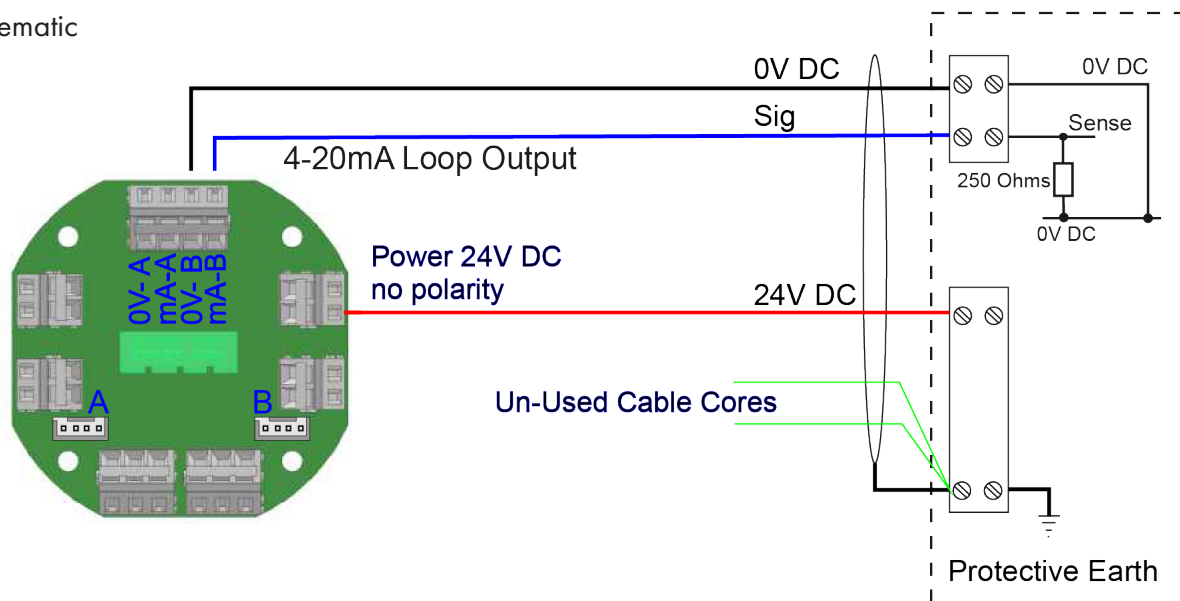
- The external earth stud be used to bond the enclosure to the any steel-work, on which the gas detector is mounted or cable containment.
- Cable screens and un-used cable cores should be grounded at the control panel.

Greases and assembly compounds

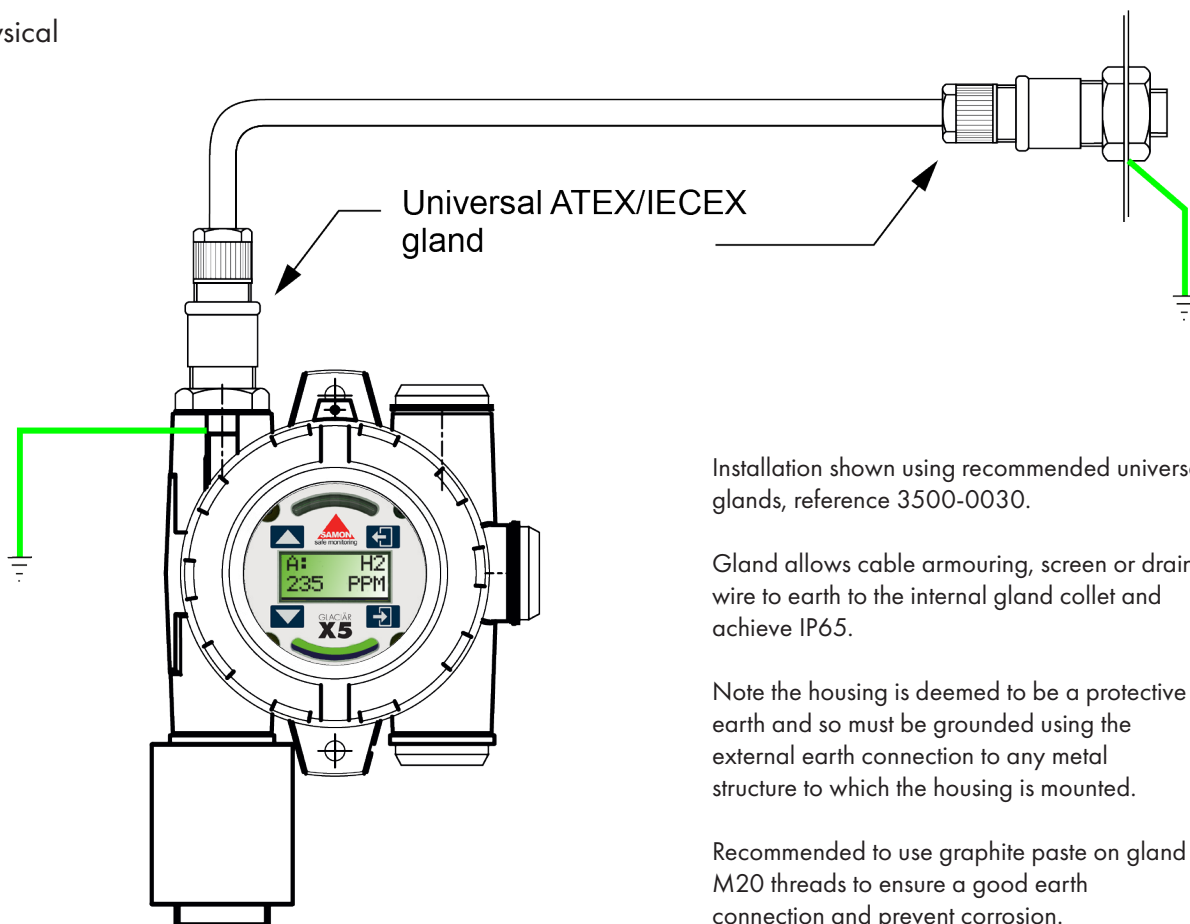
EN 60079-14 allows for the use of grease when assembling flameproof joints, such as threaded cable glands, but stipulates that it must be, non-setting, non-metallic and non-combustible, and, in the case of cable entries, also that earth continuity must be maintained. We recommend conductive carbon grease.

CORRECT EARTHING

Schematic



Physical



ATEX INSTALLATION CHECKLIST

Initial detailed inspection check-list to EN 60079-17:2014 Part 6. Table 1 Ex d & Ex tD			
System name			
Inspection date		Doc template #	
Equipment type		Ex d gas detector	Detector serial #
Site name			
Check that:			Y, N or NA
Comments			
A	General		
1	Equipment is appropriate to the ELP/Zone requirements of the location		
2	Equipment group is correct		
3	Equipment temperature class is correct		
4	Equipment maximum surface temperature is correct		
5	Degree of protection (IP grade) of equipment is appropriate for the level of protection/group/conductivity		
6	Equipment circuit identification is correct		
7	Equipment circuit identification is available		
8	Enclosure glass parts and glass -to-metal sealing gaskets and/or compounds are satisfactory		
9	There is no damage or unauthorised modifications		
11	Bolts, cable entry devices (direct or indirect) and blanking elements are of the correct type and are complete and tight. Physical check		
12	Threaded covers on enclosures are of the correct type, are tight and secured. Physical check		
13	Joint surfaces are clean and undamaged and gaskets, if any, are satisfactory and correctly positioned		
14	Conditions of gaskets is satisfactory		
15	There is no evidence of ingress of water or dust in the enclosure in accordance with the IP rating		
17	Electrical connections are tight		
25	Breathing and draining devices are satisfactory		
26	Items 26 – 31 refer to motors and lighting so hence are not relevant and have been omitted		
B	Installation – General		
1	Type of cable is appropriate		
2	There is no obvious damage to cables		
3	Sealing of ducts, pipes and/or conduits is satisfactory		
4	Stopping boxes and cable boxes are correctly fitted		
5	Integrity of conduit system and interface with mixed system maintained		
6	Earthing connections, including any supplementary earthing bonding connections are satisfactory (for example connections are tight and conductors are of sufficient cross-section). Physical check.		
7	Fault loop impedance (TN systems) or earthing resistance (IT systems) is satisfactory		
8	Automatic electrical protective devices are set correctly (auto reset not possible)		
9	Automatic electrical protective devices operate within permitted limits		
10	Specific conditions of use (if applicable) are complied with		
11	Cables not in use are correctly terminated		
12	Obstructions next to flameproof joints are in accordance with IEC 60079-14:2014 14.2. See explanatory note on Page 6 of the 903 manual		
14	Items 14-23 refer to heating systems and motors, hence they have been omitted		
C	Environment		
1	Equipment is adequately protected against corrosion, weather, vibration and other adverse factors		
2	No undue accumulation of dust and dirt		
3	Electrical insulation is clean and dry		

Signature

Print name

ATEX INSTALLATION CHECKLIST



Periodic close inspection check-list to EN 60079-17:2014 Part 6. Table 1 Ex d & Ex tD			
System name			
Inspection date		Doc template #	
Equipment type		Ex d gas detector	Detector serial #
Site name			
Check that:			Y,N or NA
Comments			
A	General		
1	Equipment is appropriate to the ELP/Zone requirements of the location		
2	Equipment group is correct		
3	Equipment temperature class is correct		
4	Equipment maximum surface temperature is correct		
5	Degree of protection (IP grade) of equipment is appropriate for the level of protection/group/conductivity		
7	Equipment circuit identification is available		
8	Enclosure glass parts and glass -to-metal sealing gaskets and/or compounds are satisfactory		
10	There is no evidence of unauthorised modifications		
11	Bolts, cable entry devices (direct or indirect) and blanking elements are of the correct type and are complete and tight. Physical check		
12	Threaded covers on enclosures are of the correct type, are tight and secured. Physical check		
25	Breathing and draining devices are satisfactory		
26	Items 26 – 31 refer to motors and lighting so hence are not relevant and have been omitted		
B	Installation – General		
2	There is no obvious damage to cables		
3	Sealing of ducts, pipes and/or conduits is satisfactory		
6	Earthing connections, including any supplementary earthing bonding connections are satisfactory (for example connections are tight and conductors are satisfactory (for example connections are tight and conductors are of sufficient cross-section). Visual check.		
12	Obstructions next to flameproof joints are in accordance with IEC 60079-14:2014 14.2. See explanatory note on Page 6 of the 903 manual		
14	Items 14-23 refer to heating systems and motors, hence they have been omitted		
C	Environment		
1	Equipment is adequately protected against corrosion, weather, vibration and other adverse factors		
2	No undue accumulation of dust and dirt		
3	Electrical insulation is clean and dry		

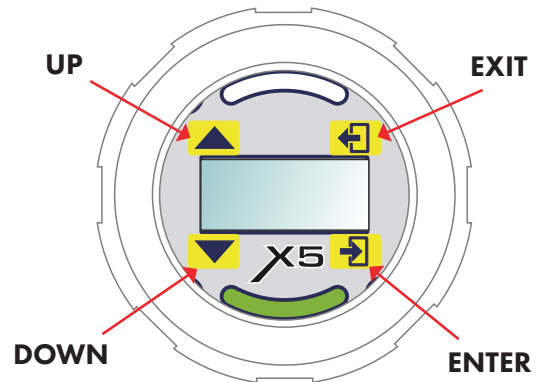
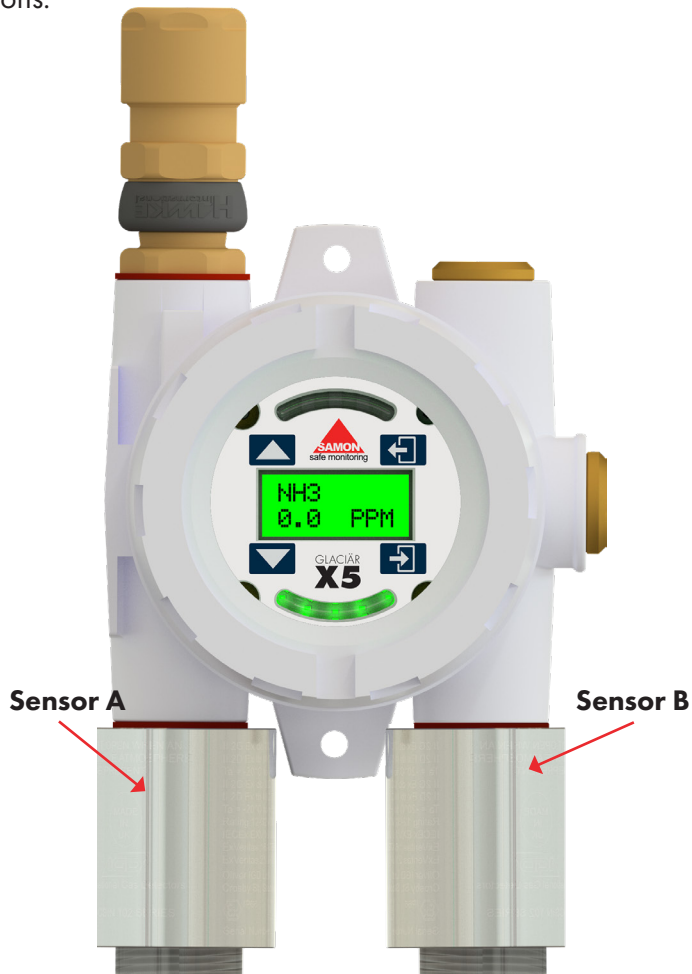
Signature

Print name

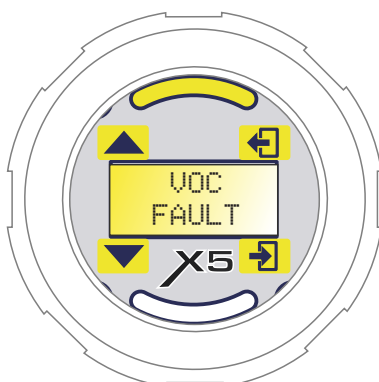
OVERVIEW

X5 has 5 20mm x 1.5 threaded entries. Two of these can be used to mount 102 series gas detectors. Which port is used for each detector has an impact on how it is displayed on screen (sensor A or B). Menus can be accessed using the magnetic wand provided. The following pages show the internal base PCB and terminal functions.

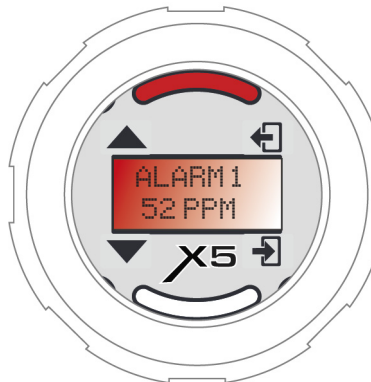
Buttons that can be accessed using the supplied Magnetic wand.



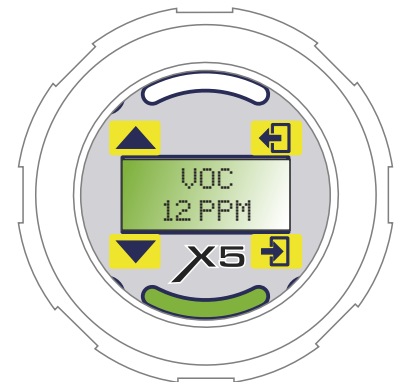
Typical Operational Displays



Detector in Fault



Detector in Alarm

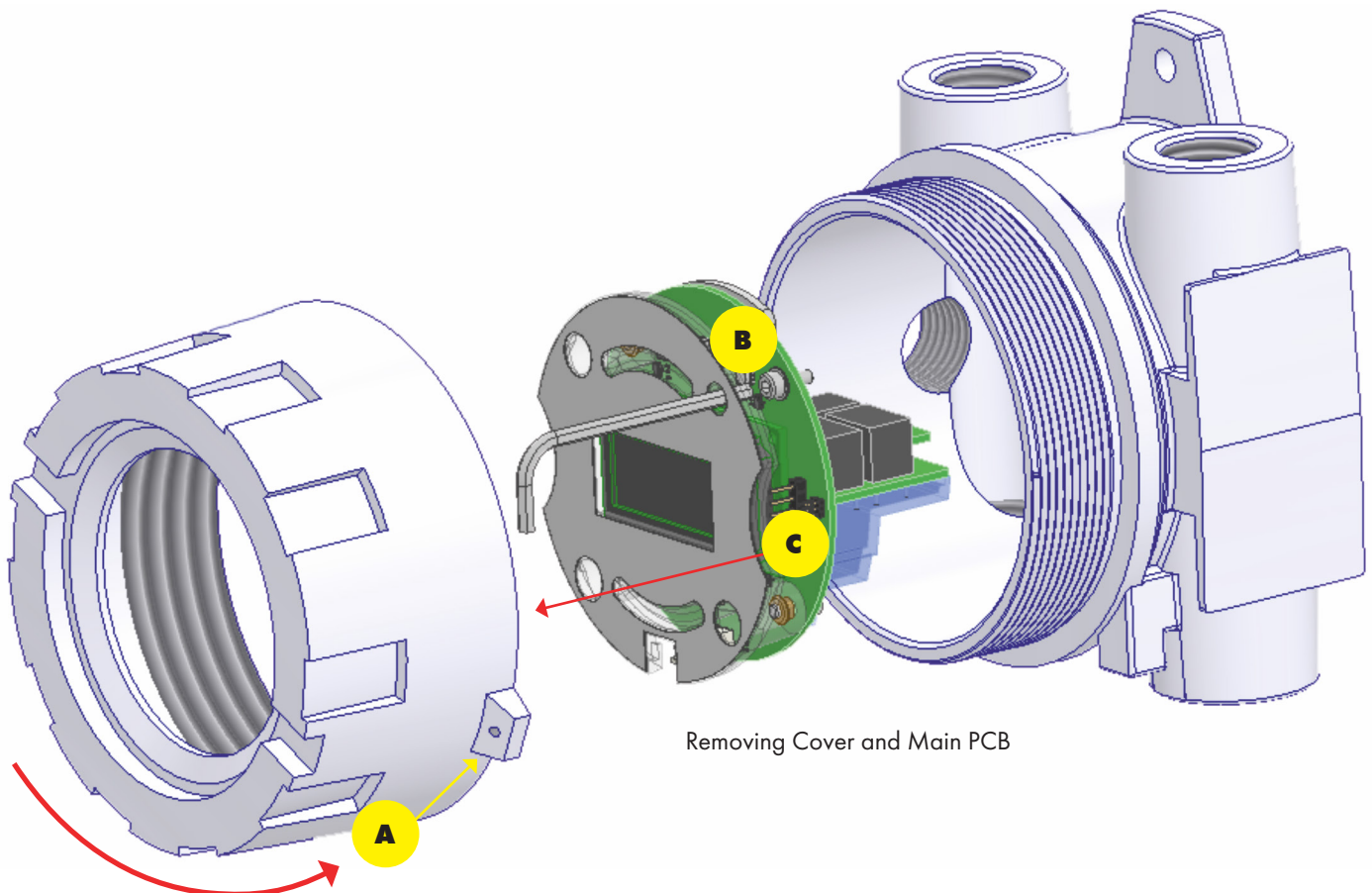


Normal Display

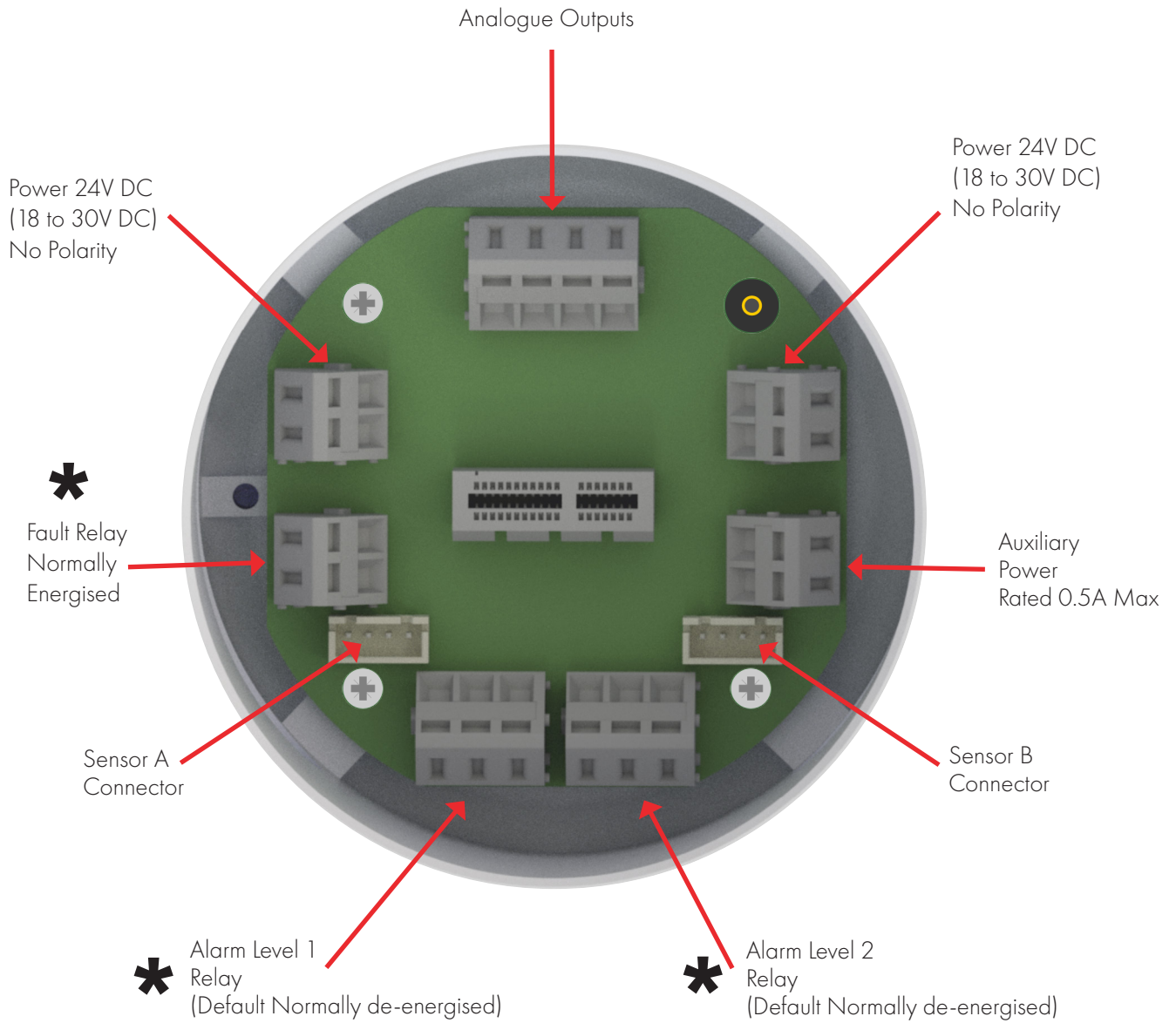
BASE PCB CONNECTIONS

On first delivery it will be necessary to connect a sensor or sensors to the X5 and check the X5 correctly registers and installs them.

- a)** Unscrew the X5 cover noting that it may be necessary to loosen the locking screw.
- b)** With the lid unscrewed, unscrew the PCB retention screw using the Allen key provided.
- c)** Using the finger points unplug the main PCB assembly
- d)** If only one sensor is to be fitted then use Port A on the housing.
- e)** When screwing the sensor onto the X5 make sure the sensor cable does not snag or 'corkscrew'.
- f)** Plug the sensor into the corresponding port on the base PCB (A or B)
- g)** Power can be applied to either power port and is not polarity specific, do not apply power without first refitting the main PCB assembly, to do so may cause damage to the PCB.



BASE PCB CONNECTIONS



View on Base PCB with Main PCB removed

***** Note relays are rated for 12/24V DC Operation at up to 4A

CONNECTORS

X5 uses screwless spring loaded terminals for greater connection reliability. Strip the wire to the correct length. Use a 3mm flat bladed screw driver to 'open' the terminal gate. Insert the cable and remove the screw driver to 'close' the terminal gate.



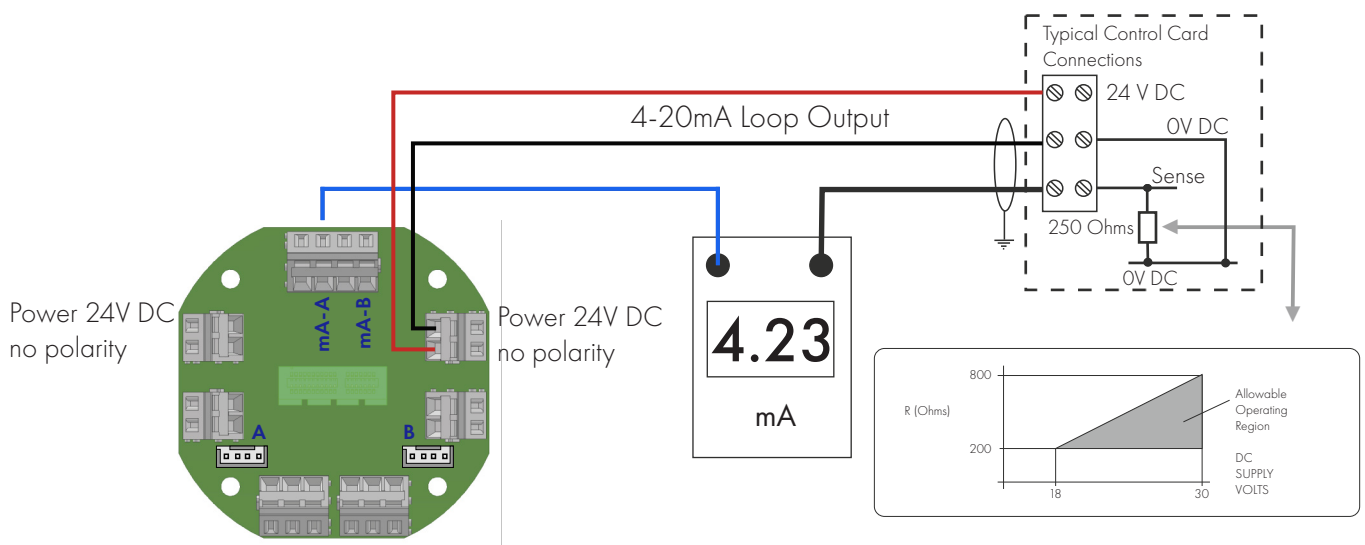
Cable strip length 5mm

Ideally terminate direct to solid core or stranded copper cable

If anti "splaying" is required then use and correctly fit tin plated copper ferrules

POWER AND ANALOGUE OUTPUT CONNECTIONS

The following diagram shows typical connection for a 24V DC power X5 with its analogue 4-20mA output connected to a host system. The ammeter is shown in circuit if required for test purposes. Cables must be screened types. See selection types.



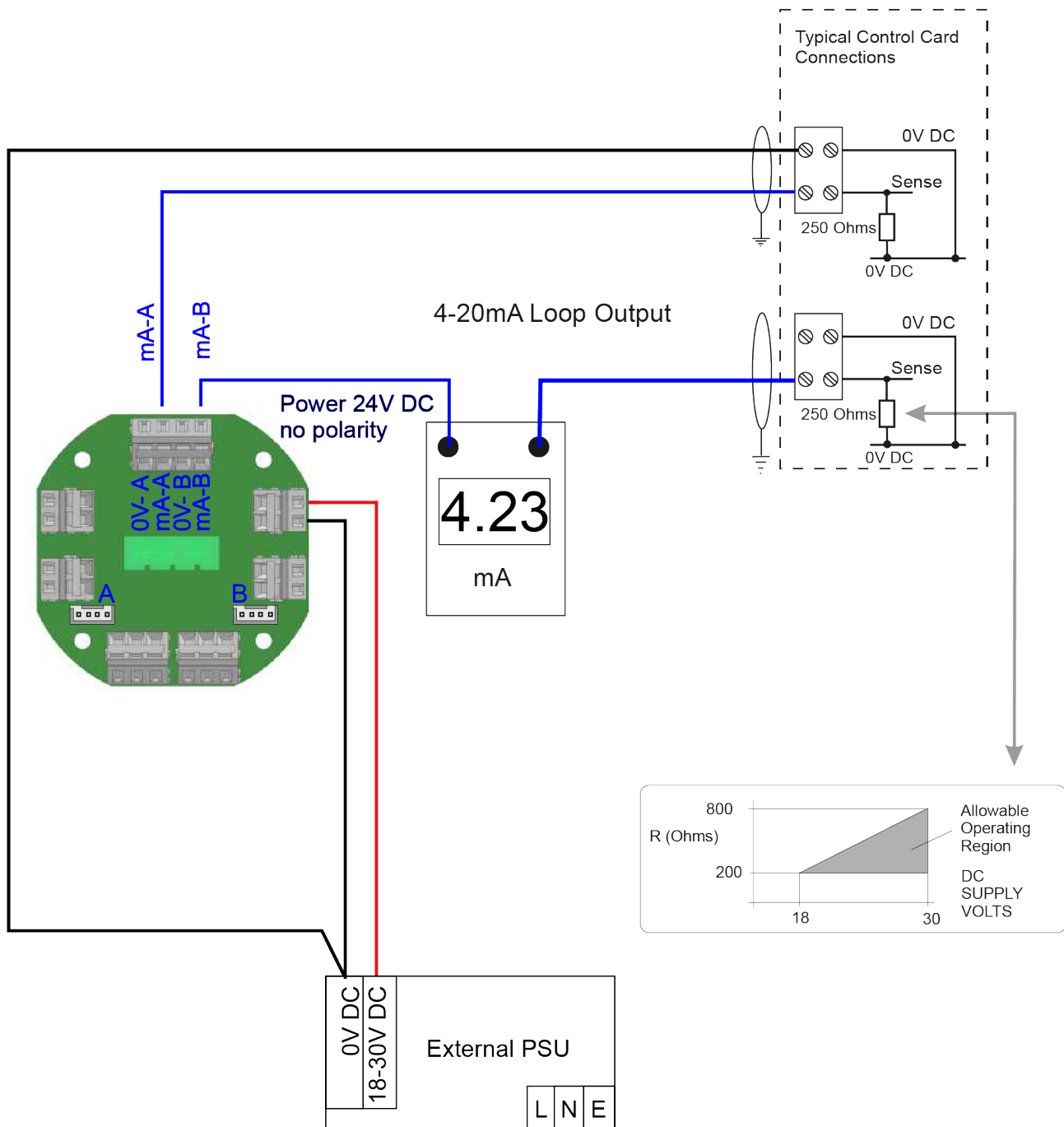
X5 Base PCB shown wired for one 4-20mA output (channel A)

Note Power can be applied to either of the two available power connectors.

POWER AND ANALOGUE OUTPUT CONNECTIONS

The following diagram shows typical connection for a 24V DC power X5 with both its analogue 4-20mA output connected to a host system. The ammeter is shown in circuit if required for test purposes. Cables must be screened types. See selection types.

In this instance the X5 is powered from an external PSU separate to the monitoring system.



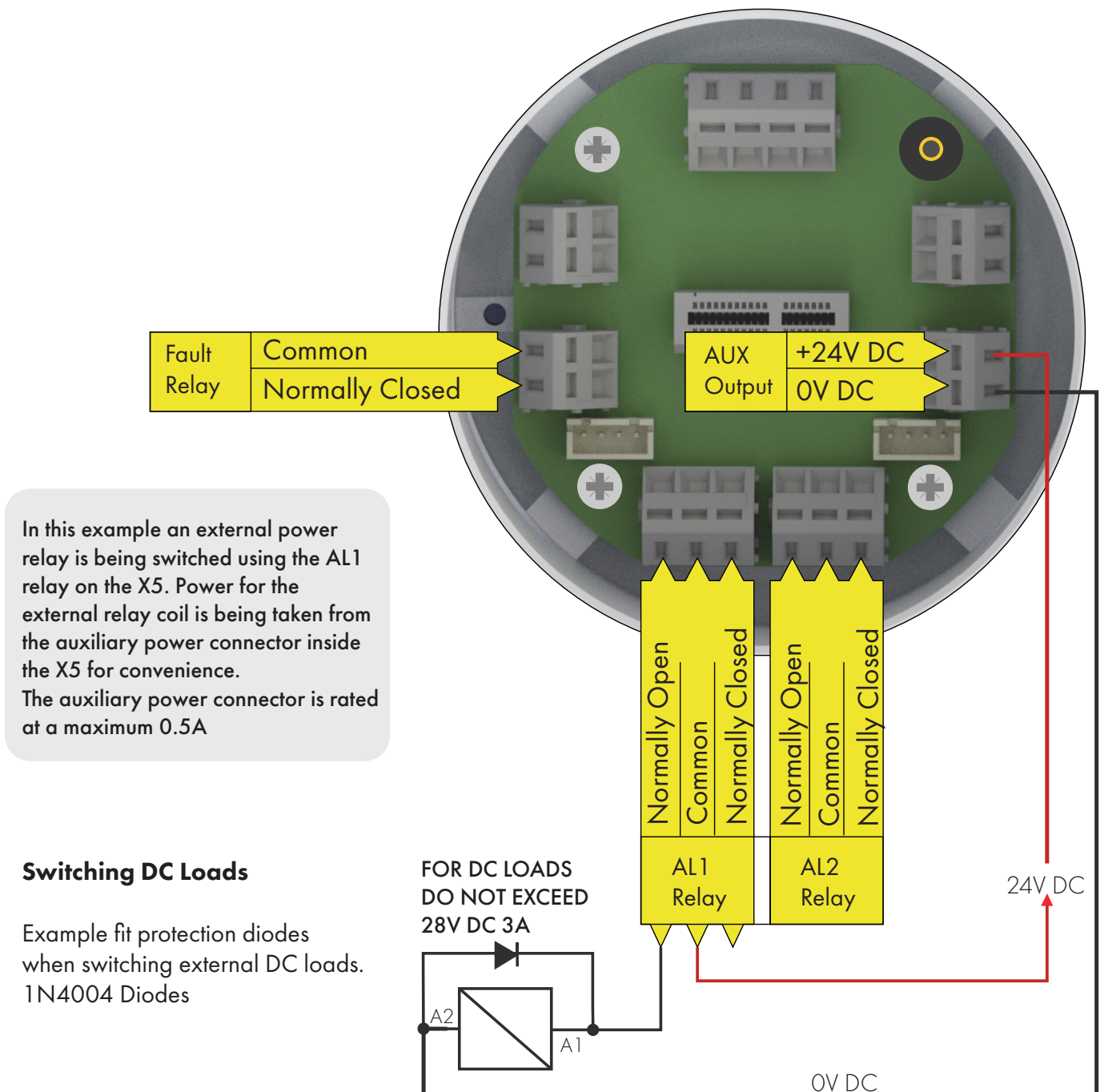
RELAYS

X5 has 3 relays on-board.

Fault Relay: This is normally energised in operation providing a closed connection that opens (de-energises) if a fault condition is detected.

AL1 & AL2 Relays: By default these are normally de-energised and energise on breaching an alarm level. Note that alarm levels are automatically set based on the range and gas type of the detector(s) fitted. The menu system can be used to alter the defaults and alarm action.

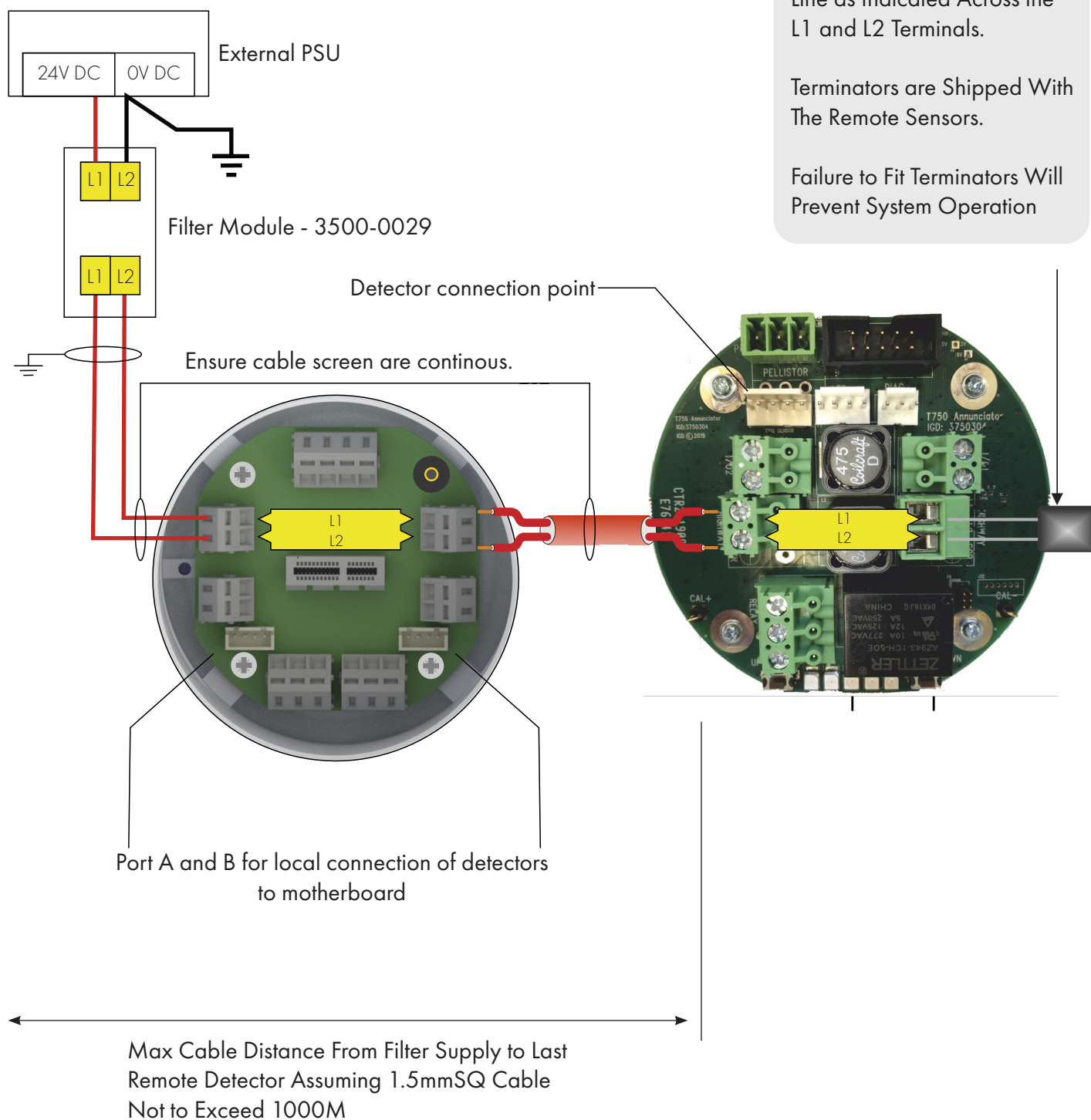
Do not exceed the relay ratings or this may result in damage to the X5.



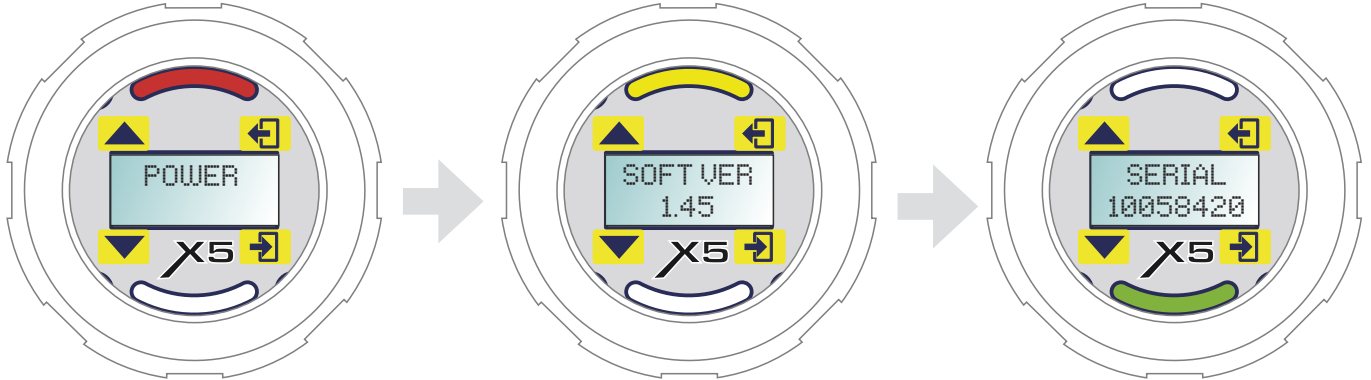
[illegible]

X5 Series Junction box with Transmitter display and locally connected 3500-XXXX series gas detector.

REMOTE CONNECTION OF ONE OR BOTH DETECTORS



ON START UP



On power up the display back light will show blue with the status indicators cycling red, yellow, green. The display shows the software version and serial number.

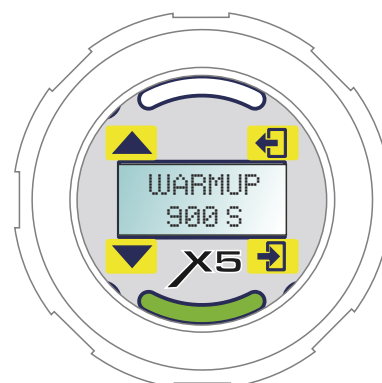
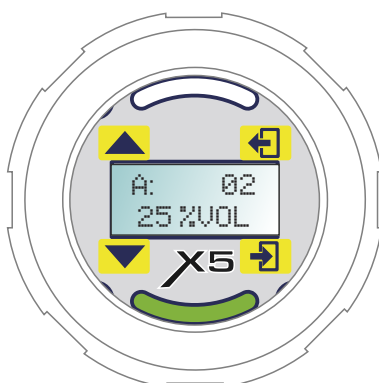


The status indicator stays green if the gas detectors are connected otherwise a channel fault is indicated for the affected channel. The display shows the number of channels and then their type and range.

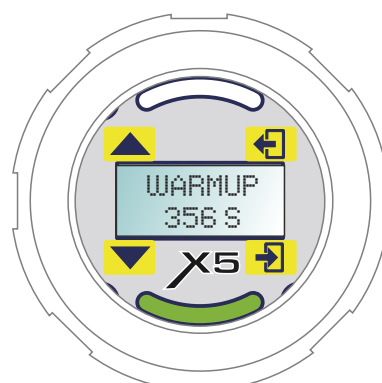
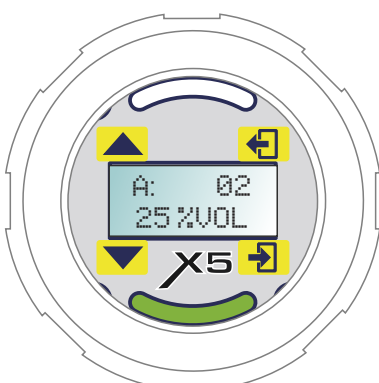


Standard warm up and stabilisation period 600 s

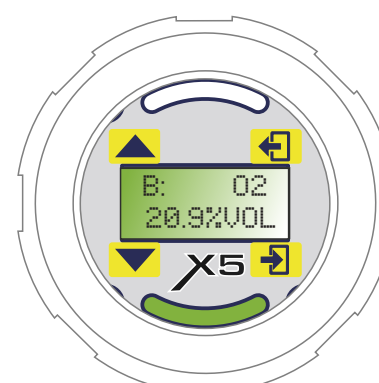
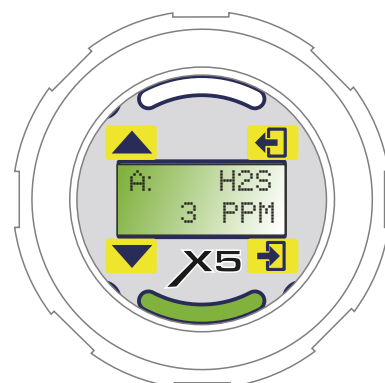
ON START UP



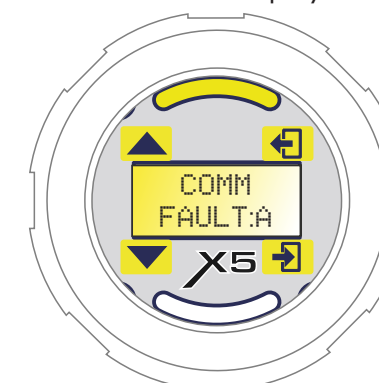
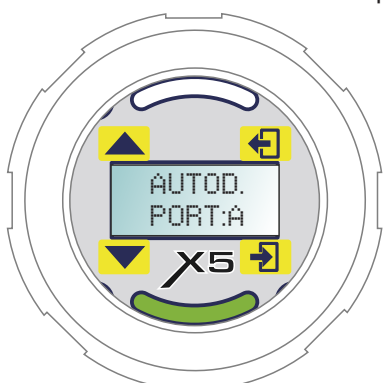
During warm up information is displayed to show the setup of the X5. If two channels are fitted information is displayed sequentially.



If addressable mode is active then the base address for the unit is also displayed sequentially. The display then indicates the warm up time, this is variable depending on the detector type. After the warm up time the display sequentially shows each detector and its readings.

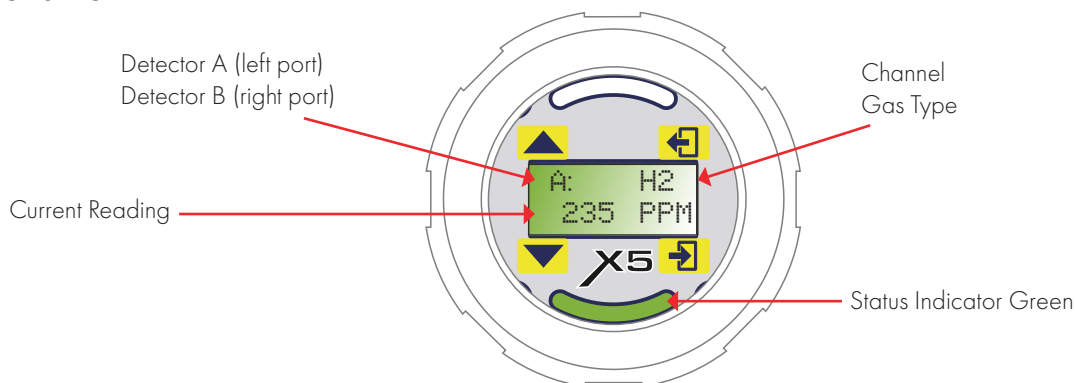


Note if the X5 is powered with no sensor connected (or second port enabled with no detector connected) then the controller will attempt to communicate to the port in question (either A, B or both) for 60 seconds. If no detector is connected then after that period, Comms Fault will be displayed.

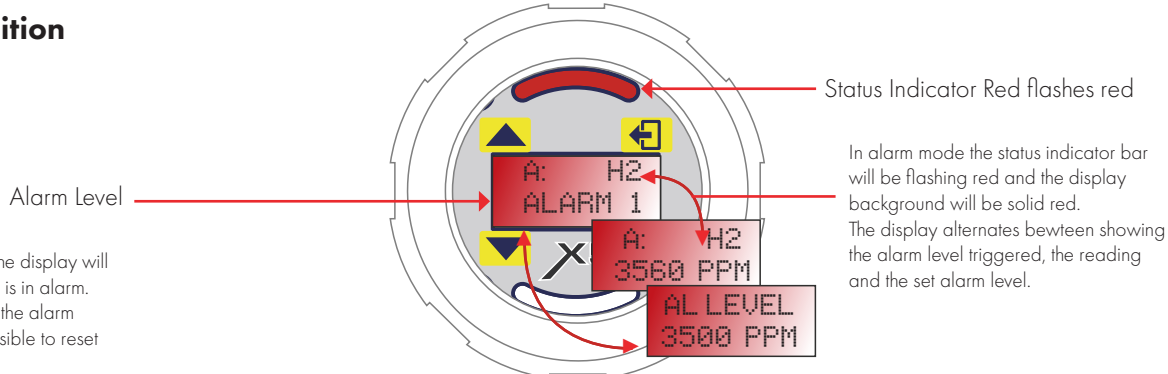


DAY TO DAY OPERATION

In Normal Condition



In Alarm Condition



The back light is red and the display will indicate which alarm level is in alarm. If the gas is still breaching the alarm threshold it will not be possible to reset the alarm.

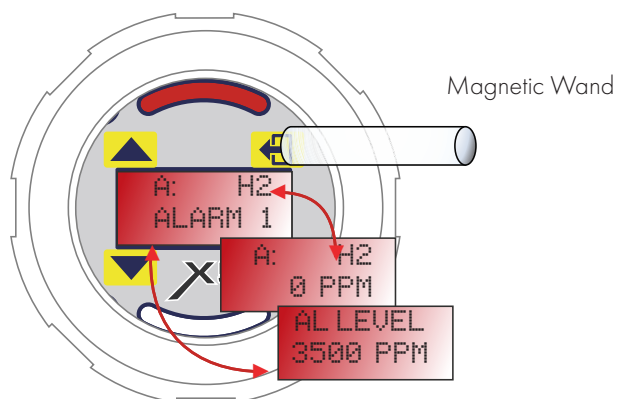
Resetting a Latching Alarm

If the alarm type is set as latching the alarm condition remains set until the X5 is manually reset.

Check that the displayed level is below the set Alarm level.

If it is the alarm can be reset.

To reset the alarm, hold the magnetic wand over the EXIT icon for at least 5 seconds. The display will show RESET for a few seconds and then if the gas level condition allows the display will revert to a 'green' normal display.

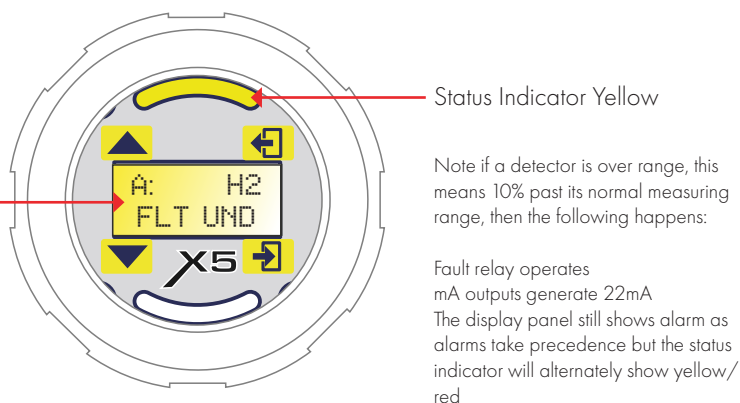


In Fault Condition

In FAULT mode the backlight is Yellow.

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. Note alternates red as technically still in alarm.
FLT UND	Sensor Under Range
SELFTEST	Voltage too low (not 4-20mA mode)



Note if a detector is over range, this means 10% past its normal measuring range, then the following happens:

Fault relay operates
mA outputs generate 22mA
The display panel still shows alarm as alarms take precedence but the status indicator will alternately show yellow/red

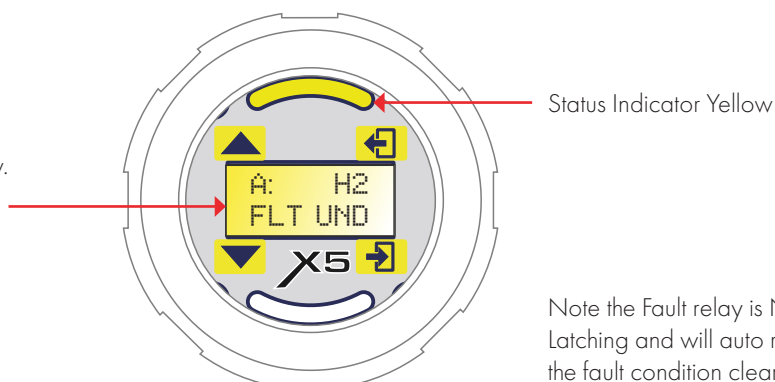
FAULT CONDITIONS & FAULT FINDING

In general if the system detects a fault then the display will indicate the fault type. The following describes typical fault states and the suggested actions to take.

In Fault Condition

In FAULT mode the backlight is Yellow.
The bottom line of the display will indicate as follows:

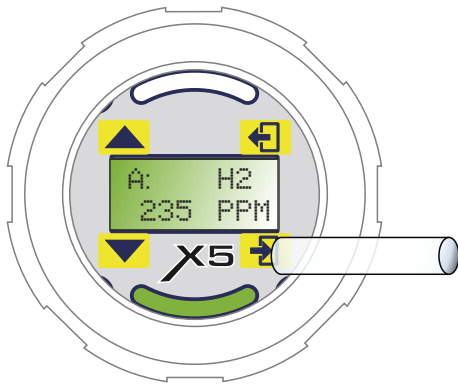
There is a 5 second delay time where the system continues checking before a fault condition is triggered.



Note the Fault relay is Non-Latching and will auto reset once the fault condition clears

	Fault Relay (Normally Energised)	mA Output A	mA Output B	Action
A: H2 FLT UND	Off	2mA		Re-zero & Calibrate Sensor.
B: H2 FLT UND	Off		2mA	
A: H2 FLT OVR	Off	22mA		Follow Sight Operating Procedure to Clear Levels. When Clear Check And Re-Calibrate Sensor.
B: H2 FLT OVR	Off		22mA	
A: H2 FLT COM	Off	2mA		Check Cable Between Detector Head And Sensor is Plugged in and Undamaged. Use the RESET Command to Force a Reset and Sensor Detection.
B: H2 FLT COM	Off		2mA	
A: H2 CAL DUE	Off	22mA		Indication After Sensor Over Range. Follow Sight Operating Procedure to Clear Levels. When Clear Check And Re-Calibrate Sensor.
B: H2 CAL DUE	Off		22mA	
A: ZERO FAIL	Off	2mA		Ensure a zero gas is correctly Flowing and Re-Zero. If Sensor Repeatedly Fails This indicates Instability, Replace Sensor.
B: ZERO FAIL	Off		2mA	
A: CAL FAIL	Off	2mA		Ensure a Calibration gas is correctly Flowing and Re-Cal. If Sensor Repeatedly Fails This indicates Instability, Replace Sensor.
B: CAL FAIL	Off		2mA	
A: H2 FLT SEN	Off	2mA		Indication shows in Normal Operation After a Failed Zero or Calibration. Re-Zero or Calibrate. If still Fails Replace Sensor.
B: H2 FLT SEN	Off		2mA	

MENU SYSTEM



To enter the menu system hold the magnetic wand over the ENTER symbol for at least 5 seconds.

Data Entry

Data entry operates in the same manner for passwords, calibration data etc. At any moment you are editing one of the digits on screen. Use the up and down buttons to increase or decrease the current number. When complete, use the entry and exit symbols to navigate to the next number to edit.

Use the magnetic wand to navigate as follows to enter the password.

Increment current number

Decrement current number

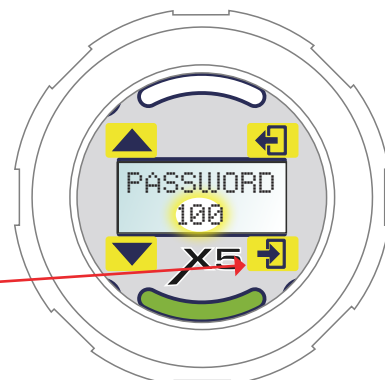
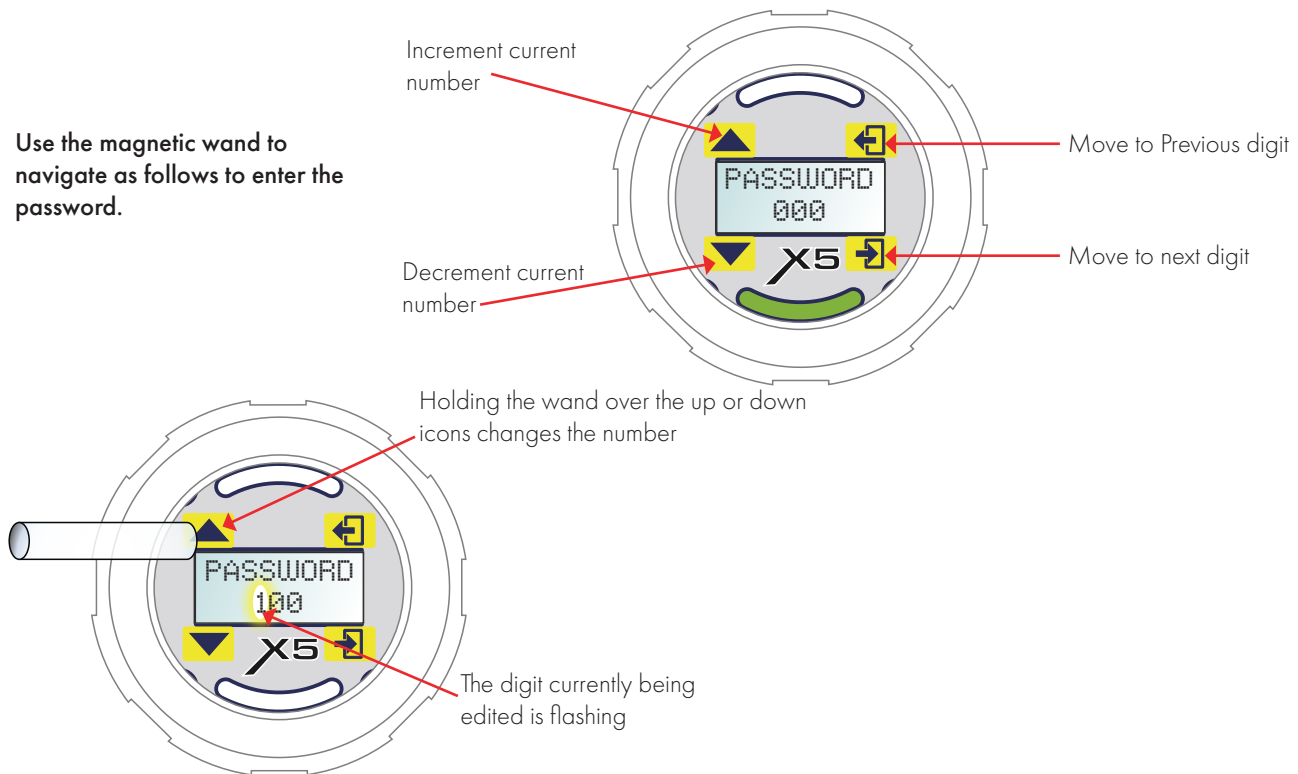
Move to Previous digit

Move to next digit

Holding the wand over the up or down icons changes the number

The digit currently being edited is flashing

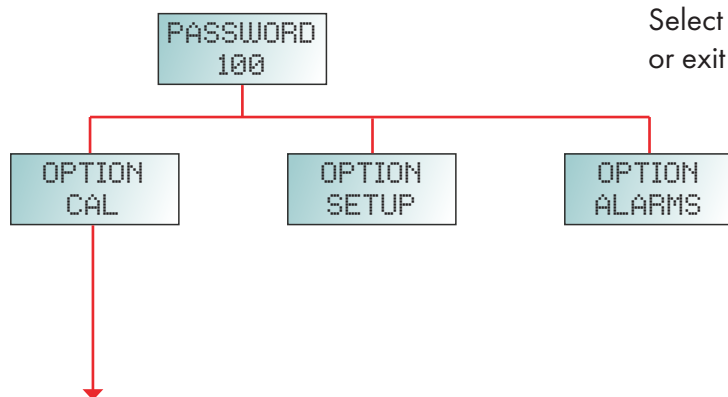
When the edited value is correct, use the enter button. Move to the furthest right digit and hold the wand over the button until all digits are flashing. When you remove the wand the value is entered.



MENU SELECTION

Enter Password 100 to access the menu system.
Use the up/down icons to navigate between the two menu options  

Select the enter icon to select the option 
or exit icon to return to normal operation 



Calibration Menu

CAL
MENU

Use the up and down icons to navigate up and down menus  
Use the enter icon to select a menu option 
Use the exit icon to return to a previous stage 

ZERO
SENSOR

Select option to zero a sensor, see later section on calibration.

CAL
SENSOR

Select option to calibrate a sensor, see later section on calibration.

ZERO
mA

Select option to zero a mA output reading for a sensor.

CAL
mA

Select option to calibrate a mA output reading for a sensor.

FORCE
READING

Select option to force a gas detection level. Note that this operates exactly as if a gas level has been detected forcing the reading for as long as required. Alarm relays, transmitted data and mA outputs will act normally in response.

FORCE
FAULT

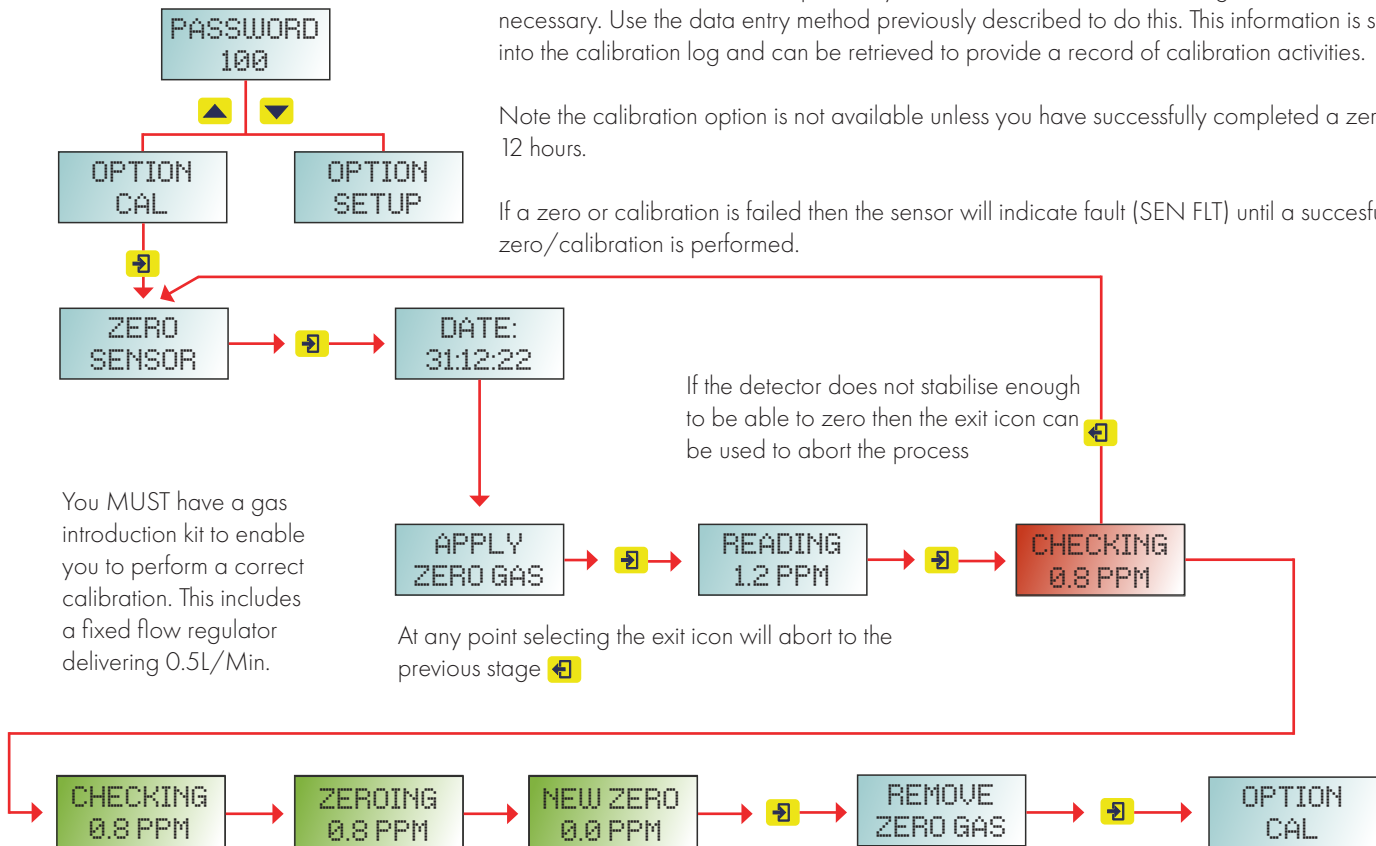
Select option to force an under range fault.

CALIBRATION..... THE ZERO ROUTINE

At the start of the cal and zero process you are asked to check and change the date if necessary. Use the data entry method previously described to do this. This information is saved into the calibration log and can be retrieved to provide a record of calibration activities.

Note the calibration option is not available unless you have successfully completed a zero within 12 hours.

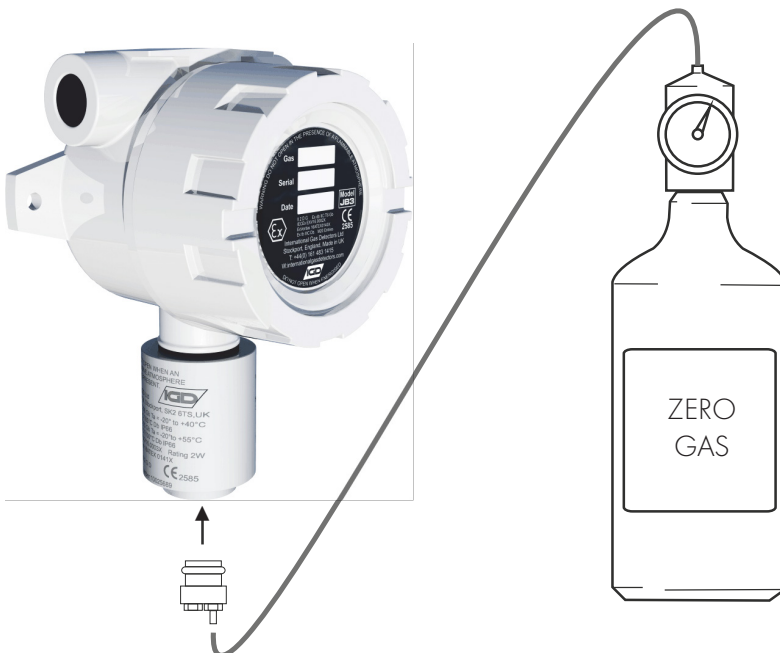
If a zero or calibration is failed then the sensor will indicate fault (SEN FLT) until a successful zero/calibration is performed.



The process allows the engineer to observe the state of the existing zero, perform a zero and then observe the results. Ensure readings are back to normal levels before exiting the menu system. Whilst in the menu system alarms are inhibited. Ensure readings are back to normal levels when observing at the 'NEW ZERO' stage before progressing. Note that during zero and calibration the X5 controls the time period that calibration gas flows based on reading stability. Pre Zero must be stable within 1% of range for at least 5 consecutive readings (5 seconds). Post Zero must be stable to $\pm 3\%$ range of zero reading within 15 seconds of zero operation.

Pre Cal: stable within 1% of range for at least 5 consecutive readings (5 seconds) and concentration reading is above 10% of range. Post Cal must be stable within 3% of range of the entered bottle value for at least 5 consecutive readings (5 seconds).

Failure to meet these conditions will result in zero or calibration failure



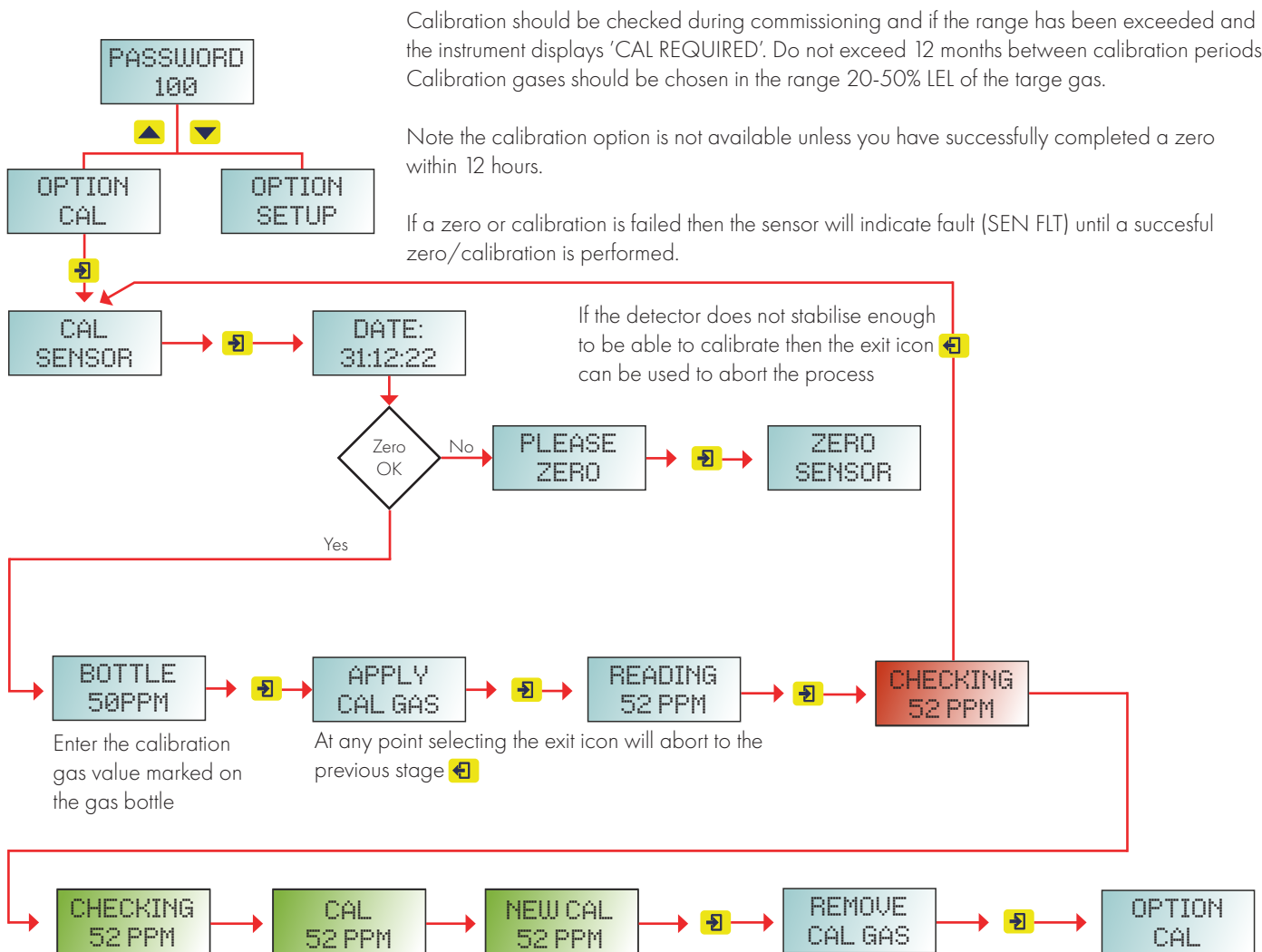
Gas calibration kits are available for purchase. They include fixed gas flow regulators to deliver test gases at the correct flow rate and calibration caps. It is imperative to have the correct flow rate and to use the correct calibration cap.

The calibration cap is tested during approval to ensure it presents gas in the same manner that the detector would normally see gas and does not adversely affect readings.

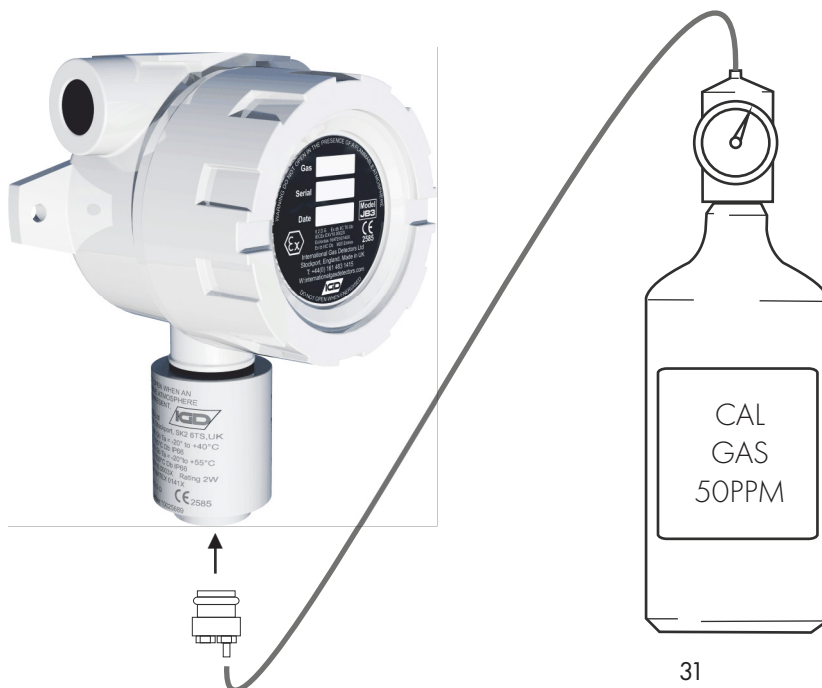
Failure to use these can result in a poor calibration which will effect performance.

Test gases are 'dry', i.e zero humidity.

CALIBRATION



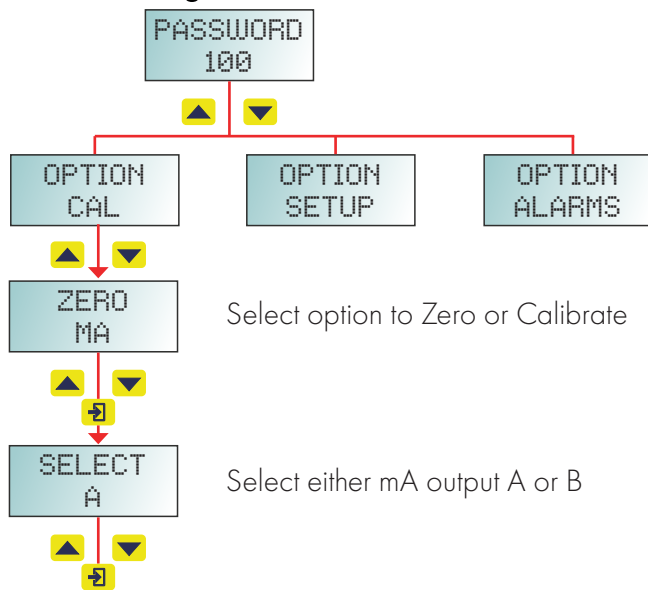
The process allows the engineer to observe the state of the existing calibration, perform a calibration and then observe the results. Ensure readings are back to normal levels before exiting the menu system. Whilst in the menu system alarms are inhibited. Ensure readings are back to normal levels when observing at the 'NEW CAL' stage before progressing.



Response time of the detector can be tested using a stopwatch to check the time for the detector to reach 90% of the applied calibration gas value from first application of the calibration gas.

1. First zero and calibrate the detector.
2. Flow zero gas ensuring a stable zero.
3. Fit the calibration gas bottle and time response to 90% of the bottle value.

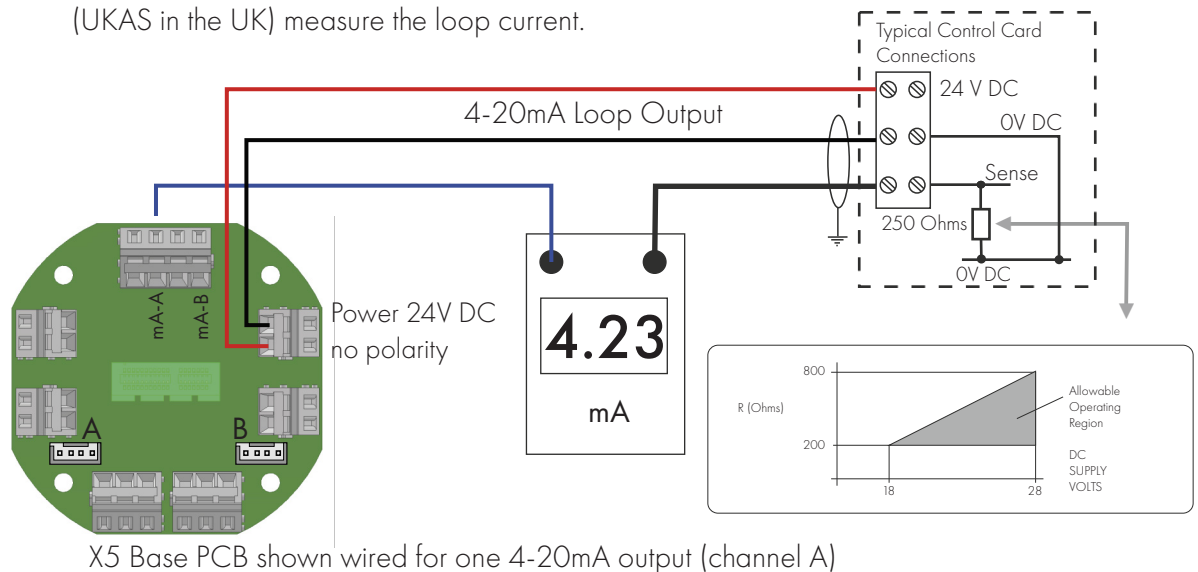
For flammable gases response time requirement to meet 60079-29-1 is less than 60 seconds and a T50 time in under 20 seconds.



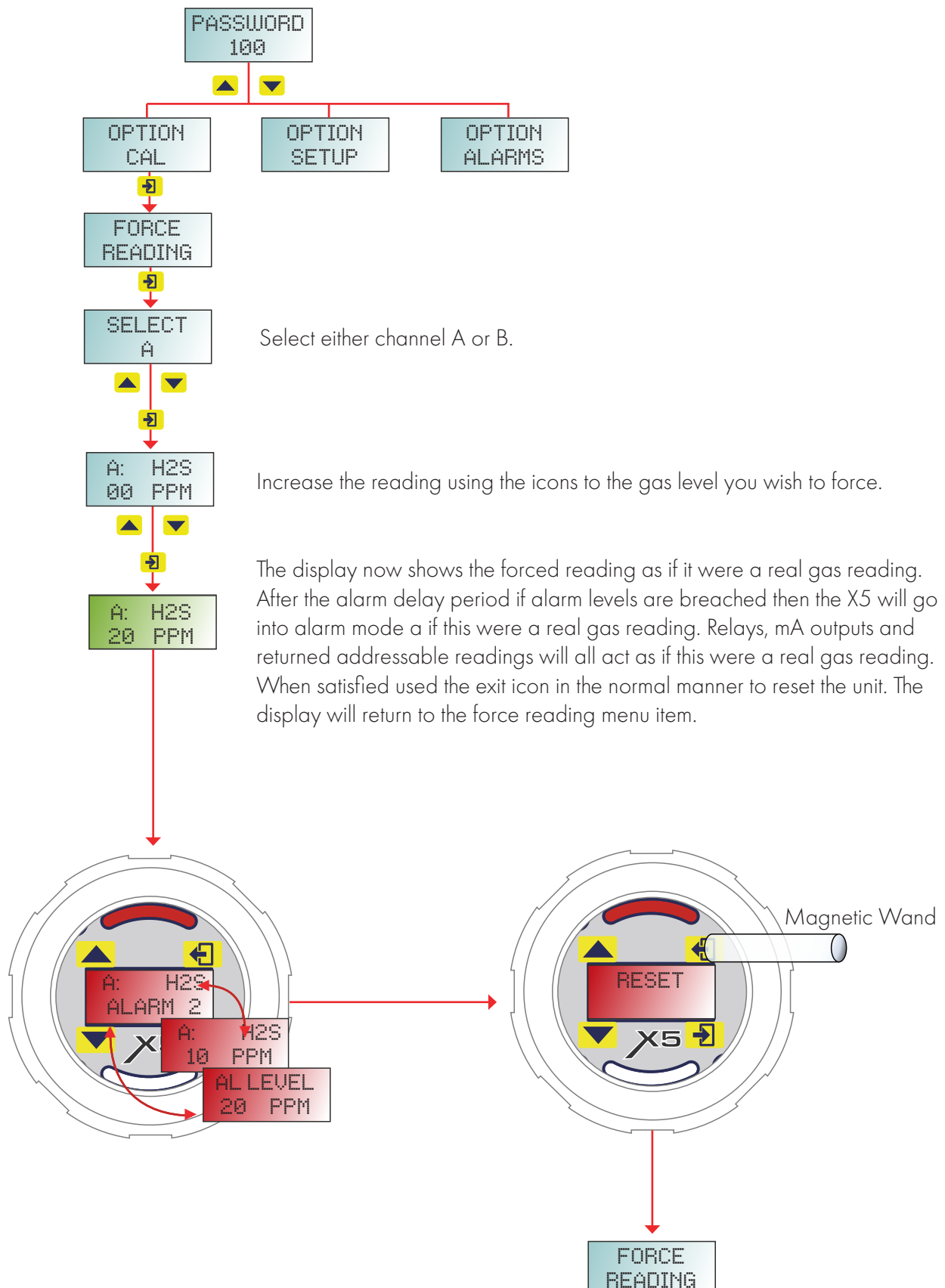
Select option to Zero or Calibrate

Select either mA output A or B

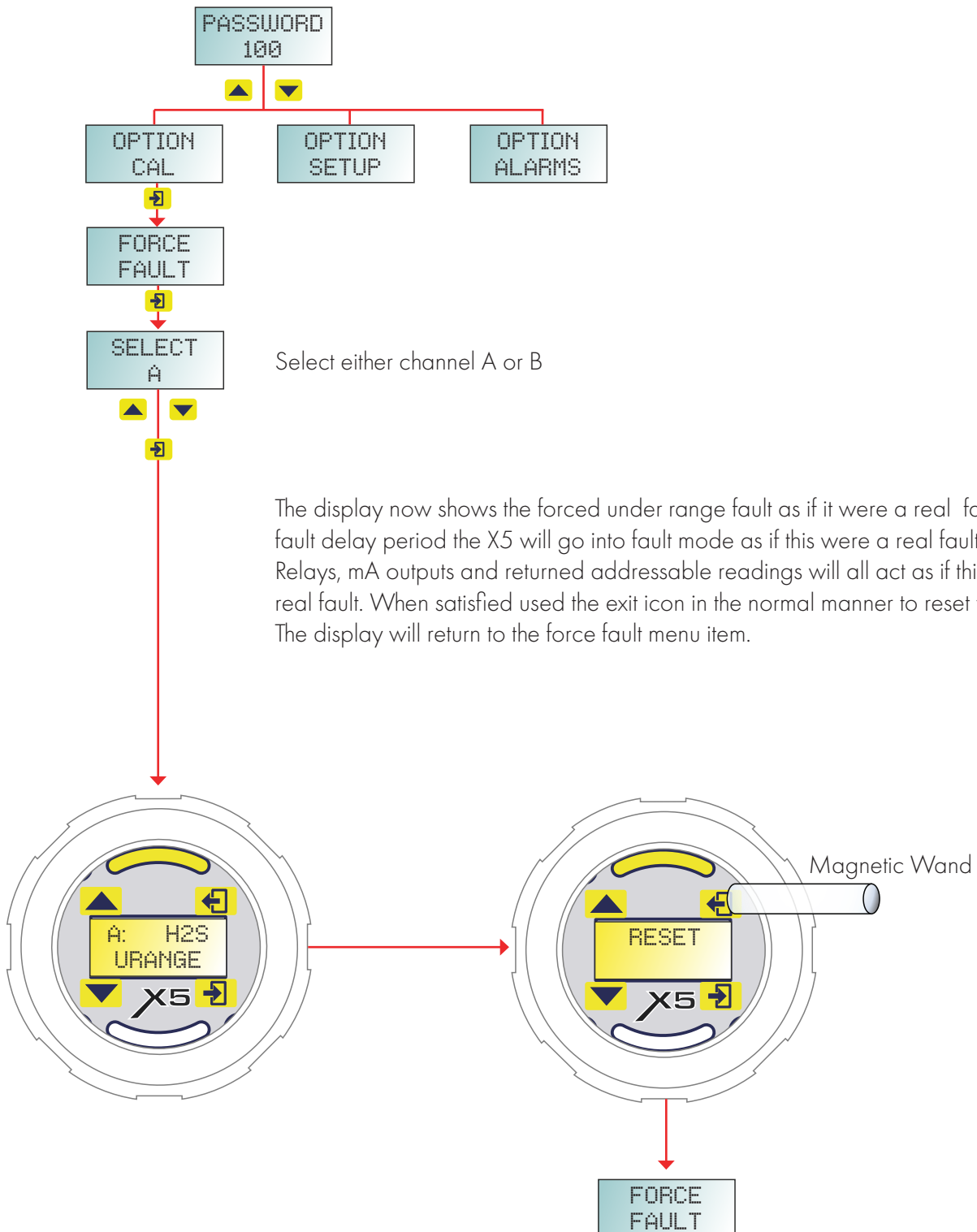
Using a calibrated ammeter traceable to a national standard (UKAS in the UK) measure the loop current.



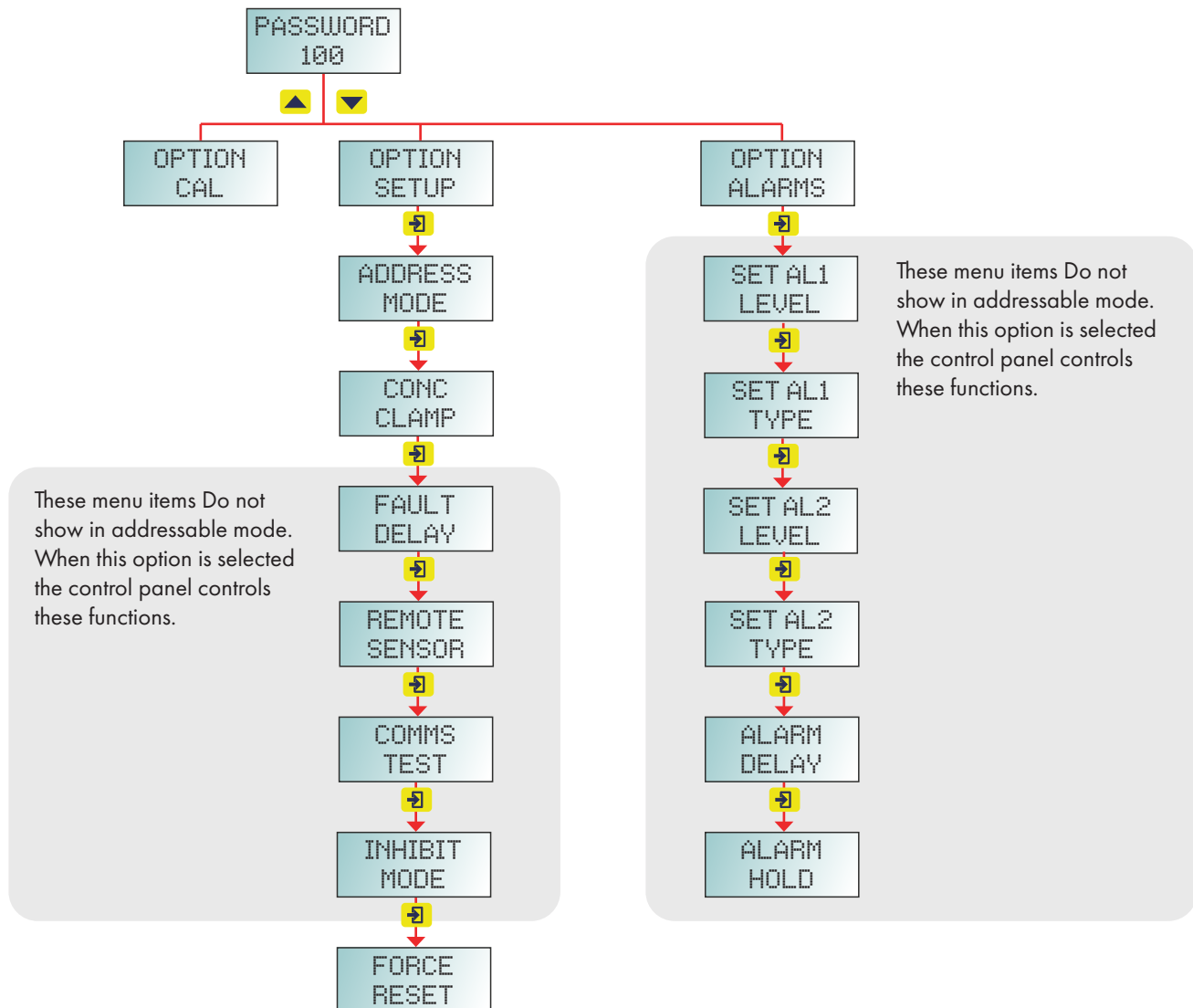
The mA zero or cal option both work in the same manner. Select Option Zero or Option Cal from the menu. For option zero the X5 will generate 4mA based on its last zero. With a mA meter connected as indicated in the enclosed diagram use the icon buttons to enter meter reading as displayed. When entered the screen shows 'check' and displays the newly corrected mA output value. You then have the option to abort and go through the process again or continue and return to the 'option' menu selection. The calibration option is exactly the same routine but in this case the X5 will generate 20mA based on its last valid zero.



FORCE FAULT



SETUP MENU..... ENGINEER FUNCTIONS



SETUP MENU..... ENGINEER ALARMS

OPTION
ALARMS



Use the up and down icons to navigate up and down menus ▲ ▼

Use the enter icon to select a menu option ↵

Use the exit icon to return to a previous stage ↶

Note if address mode is on then alarm levels and relay actions are controlled from the host controller and the following menu options will not be displayed

SEL AL1
LEVEL

Use these menu options to set the required alarm levels and the alarm actions either:

SET AL1
TYPE

Alarm on Rising Level, Falling Level, Latching or Non Latching.

SET AL2
LEVEL

Note by default levels will be set based on the gas type and range.

SET AL2
TYPE

The X5 has to have a valid alarm level set for the first stage alarm.

Alarm level 2 is optional. Setting alarm level 2 to zero will disable the alarm.

Relay 1 activates on breach of alarm level 1, relay 2 activates on breach of alarm level 2.

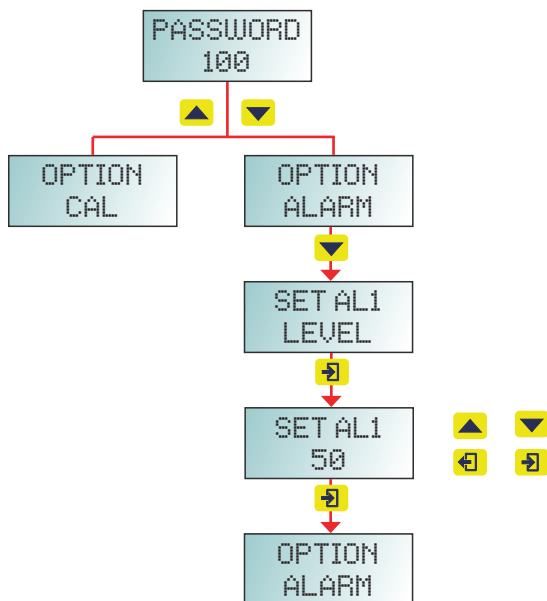
ALARM
DELAY

The alarm delay value sets, in seconds a delay before alarm between 3 to 99 seconds. Default value is 10 seconds.

ALARM
HOLD

Alarm hold allows you to enter a value from 0 to 255 seconds. With the value at zero the relay hold function is disabled. With any other setting this value is used to keep an alarm relay active for the set period after a latched or unlatched reset of the alarm.

SET ALARM LEVEL 1 OR 2

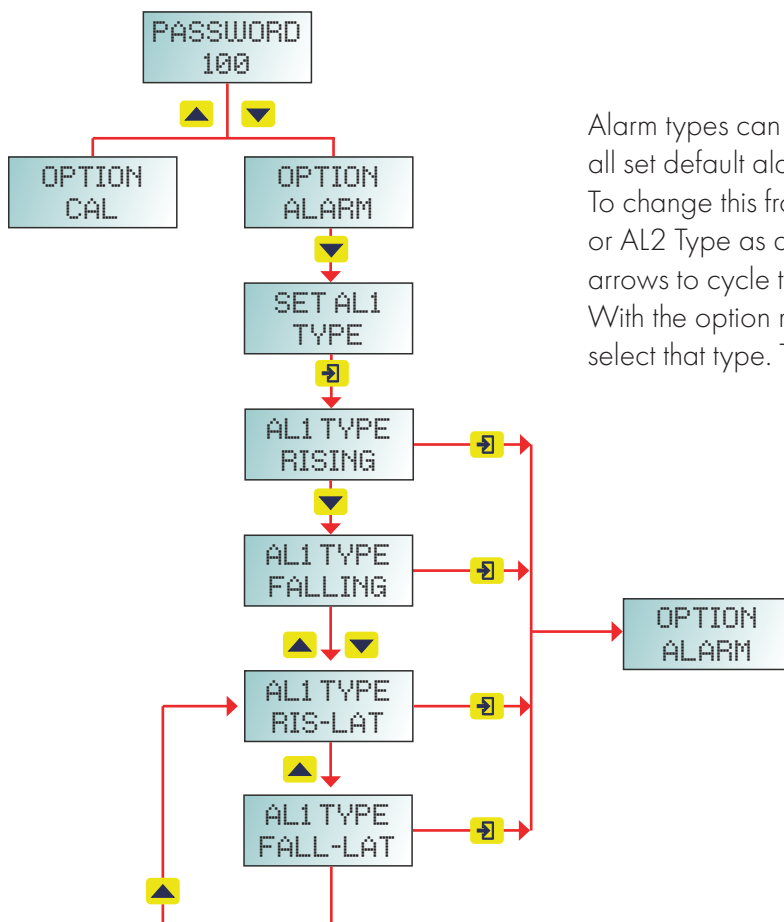


Alarm levels can be adjusted from the default pre-sets. In the option menu select either set AL1 or set AL2 as desired.

The existing alarm level is displayed, note that units are not shown. You will not be able to set an alarm level outside of the detector range. Use the data entry method to set the new alarm level and enter. The display returns to the option setup menu.

Note that if two detectors are fitted in stand alone mode then the alarm relays operate on either set of detector alarm levels. AL1 levels operate relay 1 and AL2 levels operate relay 2.

SET ALARM DELAY

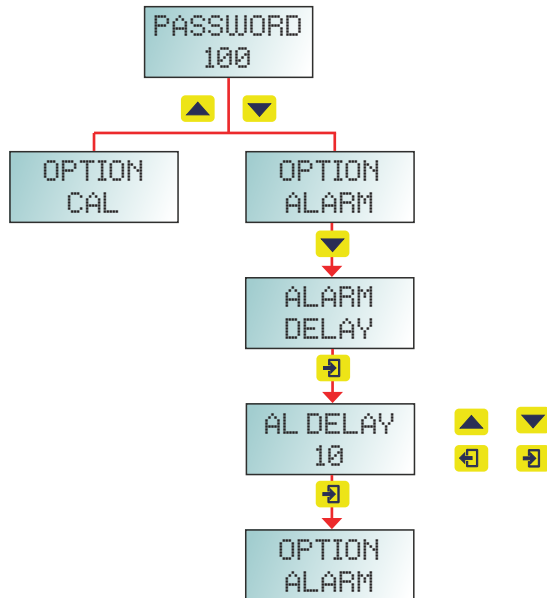


Alarm types can be altered from the system default. By default all set default alarm levels will be latching alarms.

To change this from the option menu select either set AL1 Type or AL2 Type as desired. You can then use the up and down arrows to cycle through the options as indicated.

With the option required displayed select the enter icon to select that type. The options menu is then displayed.

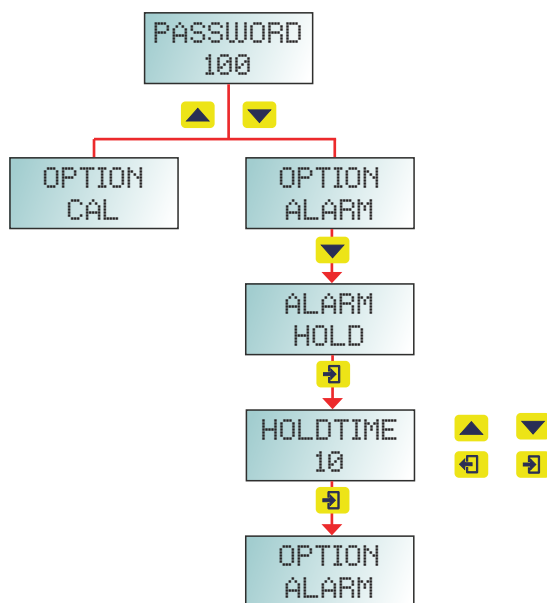
SET ALARM DELAY



The X5 allows you to set an alarm delay of up to 99 seconds. The default value is 10 seconds.

This value is the length of time a gas level must be above the set alarm level before the alarm operates. The setting is typically used to allow the X5 to ignore short duration gas releases which could cause nuisance alarms or during automatic ventilation control. Long delays should be avoided for safety critical applications. During approval the alarm delay is set at 10s careful consideration should be made before altering this default.

SET ALARM HOLD



The X5 allows you to set a hold time for alarm relays of up to 255 seconds. In operation when an alarm level resets, either automatically or on user action, the unit then stays in alarm until the hold time period expires.

Typically this setting is used in ventilation control to keep vent fans running. For example if non latching alarms are set then these will reset once levels are 10% below the set alarm level. If the alarm level is set at 50, then with the delay set to zero (default) the alarm would reset at 45. If the X5 is controlling the event fan it could be desirable that the fan runs for longer to clear down the level.

By setting the delay to 100, the fan would then run for another 100 seconds beyond where the normal reset would be.

FORCE RESET

Force reset does two things

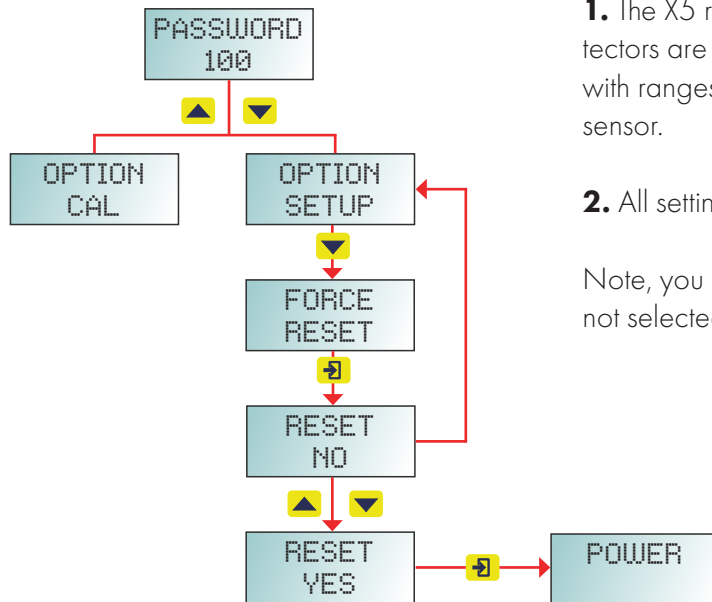
1. The X5 restarts and checks its inputs to see what gas detectors are fitted. Once detected, the channels are added with ranges, units, gas types and alarm levels loaded from the sensor.

2. All settings on the X5 are retuned to default condition.

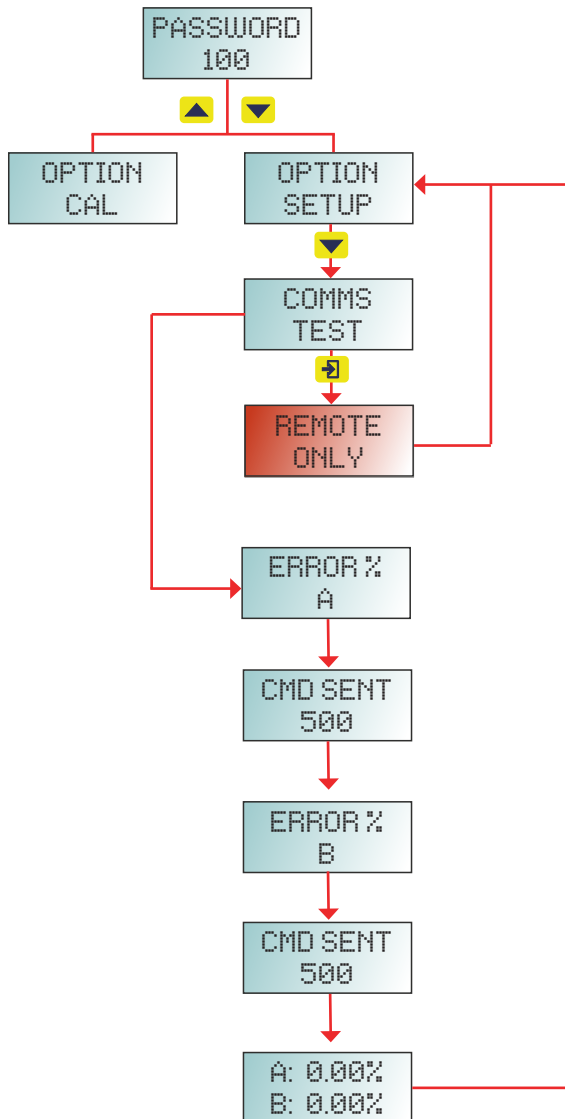
Note, you are asked "Reset Yes/No" to ensure this option is not selected accidentally

On reset, the unit goes back through its power up cycle, setup, stored settings etc and warmup cycle.

Note this also resets the unit to stand alone operation. If an addressable option is required this will have to be set up following the menu options.



COMMUNICATION TEST



The comm's or communications test is used to test the quality of serial communication when detectors are connected remotely from the X5.

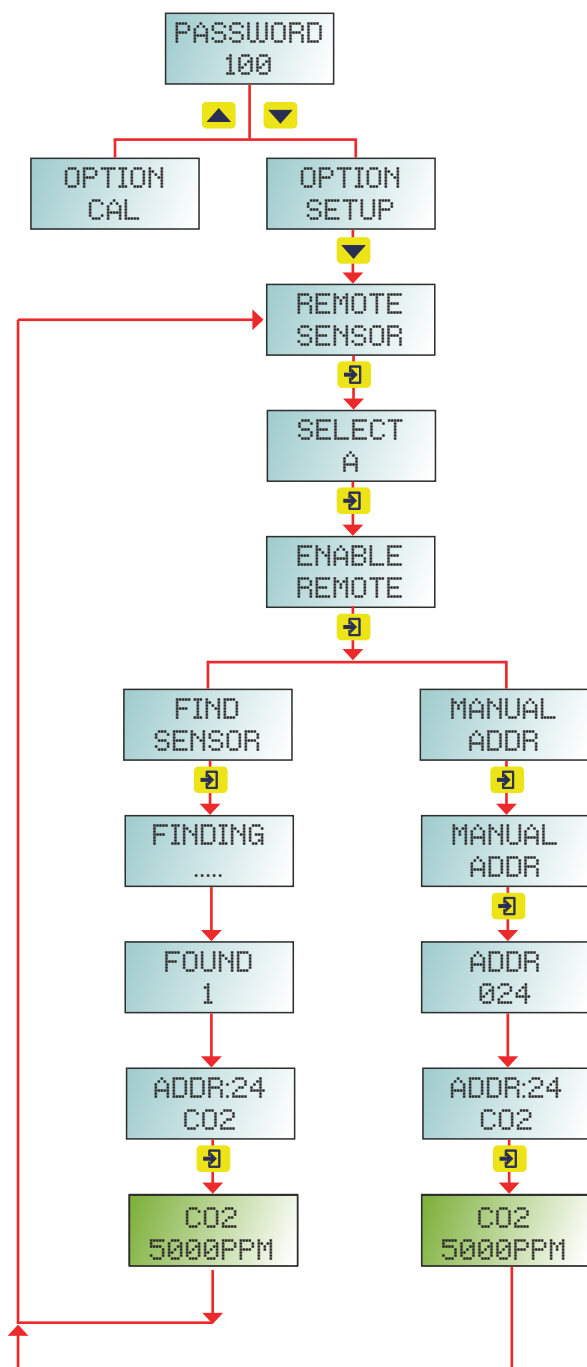
If this option is run with detector(s) in direct connection mode then the error message "REMOTE ONLY" will be displayed.

If one or both detectors are connected in remote mode (see REMOTE SENSOR option): Then the X5 will proceed to test the detectors that have been configured for remote operation.

500 data packets are transmitted to and from each remotely connected detector. Once the test is complete the percentage error rate is displayed.

For a good installation the expected error rate should be less than 0.5%.

REMOTE SENSOR



Detectors can either be directly connected to the X5 via the X5 motherboard or can be remotely connected on a 2-Wire addressable highway. (See section Remotely Connecting Sensors).

By default the X5 will have detectors directly connected to the X5 motherboard.

Remotely connected sensors need to have a filter module fitted at the supply side of the 24V DC supply. (See section Remotely Connecting Sensors).

Select remote sensor.

select sensor port A or B to remote.

Select Enable or Disable
(note the display shows current setting)

Select to either automatically FIND the sensor or to manually enter the address. It's recommended letting the X5 automatically FIND the sensor.



Either enter the address or let the system FIND the sensor.

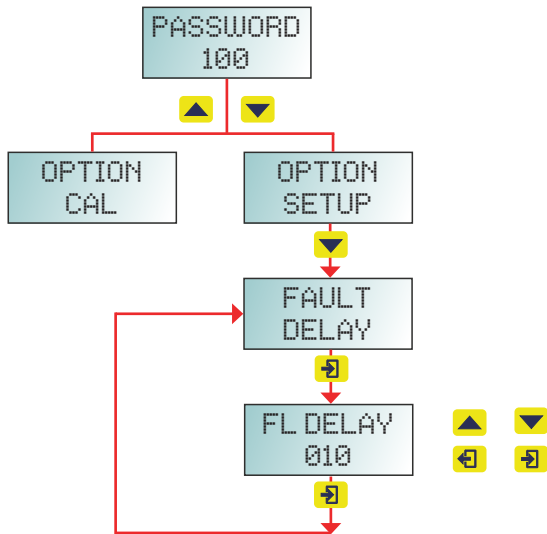
The address and gas type will be displayed.

To confirm communication the gas type and range is displayed with a green background.

The sensor is now added as a remote sensor.

NOTE: remote sensors MUST have a terminator fitted for correct operation.

FAULT DELAY

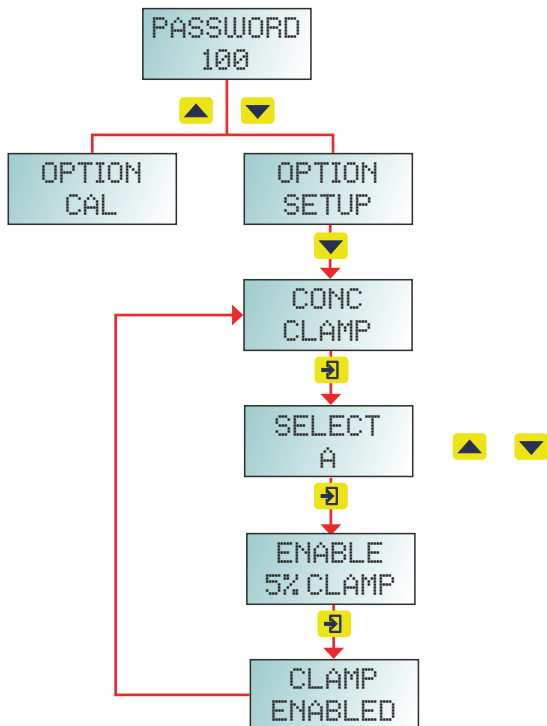


Use this menu item to set the delay period in seconds before the fault relay/indication activates.

This setting allows you to make the system more or less responsive to system faults, particularly comm's errors.

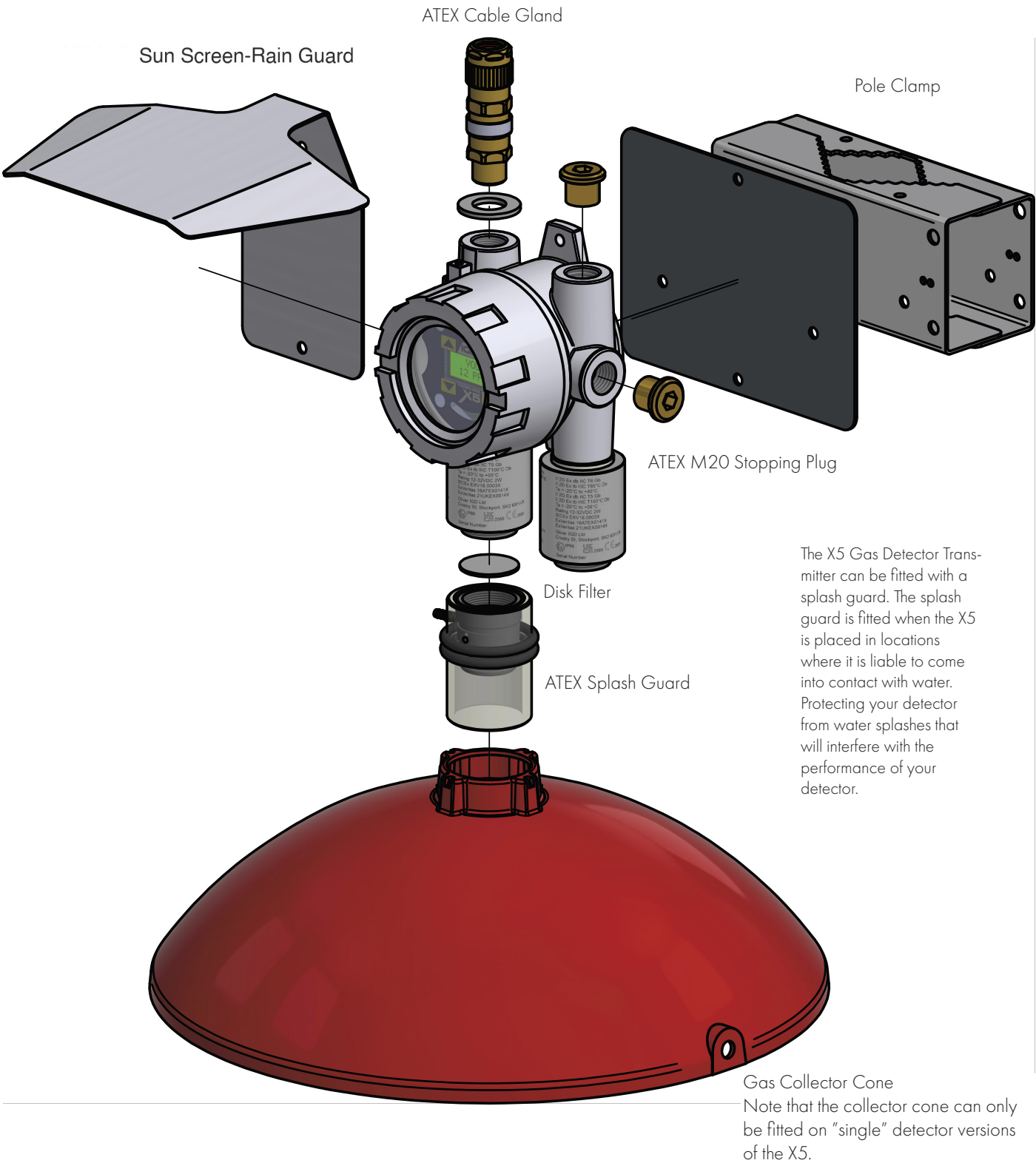
As with alarm relays, the delay set means that the fault must be present for longer than the set period for the fault to be displayed.

CONCENTRATION CLAMP



The concentration clamp setting is either on or off for either port A or B.

When selected any reading below 5% of the detectors range will be displayed as zero.





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Manufactured by:
IGD - International Gas Detectors
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Part of Safe Monitoring Group

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