Flammable Gas Detectors
Pellistor (Catalytic) Type MK8

Product Data Manual

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International Gas Detectors

MK8 FLAMMABLE GAS DETECTORS MANUAL V10

For:
Tocsin 903, Tocsin 102
and
JB3, Tocsin 102

Model JB3 Part Number: TOC-750X-MK8

Model Tocsin 903 Part Number: TOC-750XD-MK8

To be read in conjunction with:

2-Wire Installers Guide

and relevant controller manual:

TOC-635
TOC-650
TOC-750

internationalgasdetectors.com
+44 (0)161 483 1415
sales@internationalgasdetectors.com
/international-gas-detectors-ltd

Triton House
Crosby Street
Stockport
SK2 6SH

This guide is intended for the use of system specifiers, surveyors, designers and installers. The intention of this guide is to provide information for the correct installation of IGD's MK8 flammable gas detectors. This guide indicates correct cabling practice, types of cabling which can be used and options available. This guide is not intended as a design or specification guide, these are available separately.

Note that System control panels, detector nodes, battery backup modules and power boosters are all supplied with their own manuals. Their general specifications and performances are available both in their individual manuals and published data sheets. This data is not reproduced in this guide.

Failure to follow this guide could compromise operation so please follow the enclosed information carefully.

Systems should be designed and installed by competent persons. A competent person being defined by the UK Health and Safety Executive as:

A competent person is someone who has sufficient training and experience or knowledge and other qualities that allow them to assist you properly. The level of competence required will depend on the complexity of the situation and the particular help you need.

IGD's gas detection systems are capable of installation by electrical installation engineers. Design of a system is not covered in this guide and should be undertaken by a competent person. The design should include:

The Nature of the Gas Hazard and Appropriate Placement of Detectors
Clear Indication to workers That a Gas Hazard Exists and the Action They Must Take
Interaction Between the Gas Detection System and Other Systems
The Necessary Safe Operating Procedures That Must be in Place

IGD can provide help to design systems where help is required and can also provide training for surveyors, specifiers, designers and installers.

All Gas Detectors shipped from IGD are pre-calibrated. It is not always necessary to re-calibrate a newly installed system on site but it is recommended that commissioning is undertaken. Commissioning should be undertaken by persons trained to do so. Commissioning should ensure that the system performs and interfaces correctly to all connected devices, host systems and operates to the required cause and effect.

IGD are available to answer question using our on-line ticketing system available through our website.

NOTE that ATEX equipment has specific requirements for cable protection and glanding to housings. These requirements are detailed in manuals for such equipment available through our website.

ATEX Zone 1 & 2 rated gas detectors from IGD are available in two formats as indicated below.

Option 1 Enclosure without display PN TOC-750X-MK8

Option 2 Enclosure with display PN TOC-750XD-MK8

Both types are fitted with IGD's Tocsin 102 Series detector housing which in turn can be fitted with any of the following detector types:

Flammable Gas Detectors, Pellistor Type

Flammable Gas Detectors, Infra Red Type

Refrigerant Gas Detectors, Infra Red Type

Refrigerant Gas Detectors, Semiconductor Type

CO2 Gas Detectors, Infra Red Type

Toxic and Oxygen Gas Detectors Electrochemical Type

VOC Gas Detectors Photoionisation Types (PID)

This manual relates to Flammable Gas Detectors based on IGD's MK8 pellistor (catalytic) technology. ATEX marking and EXD approvals are general across all types as indicated on the following pages.

ATEX Markings

Labelling for 903 Versions

Material:
CPM-200 3M Silver / Grey
Polyester -40 to +150 Deg C
69mm x 38 mm

Equipment Name

Adhesive label applied to top surface of housing

Labelling for JB3 Versions

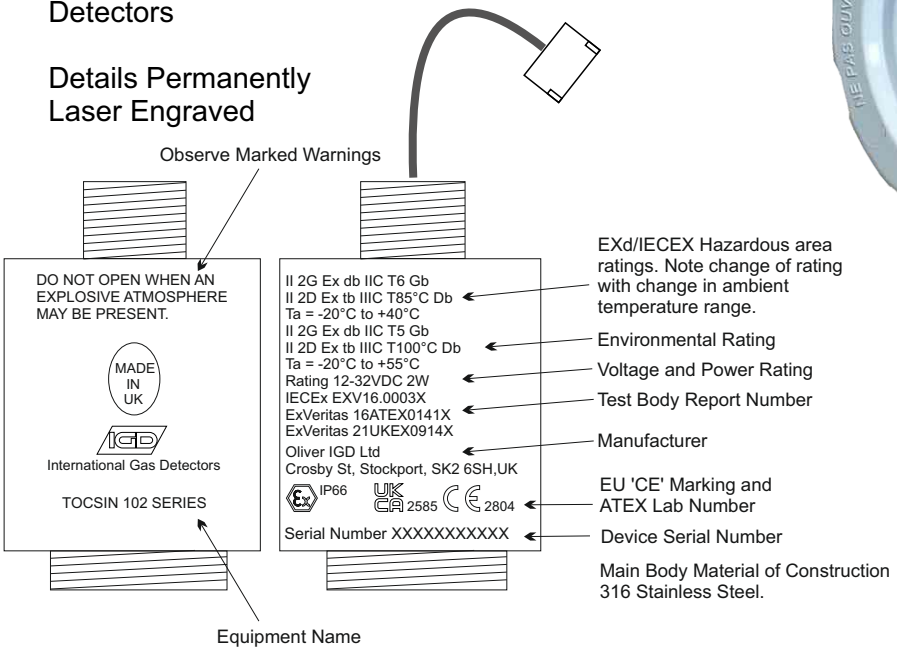
Permanent Print Direct to Front Face as Indicated

78mm Dia

Equipment Name

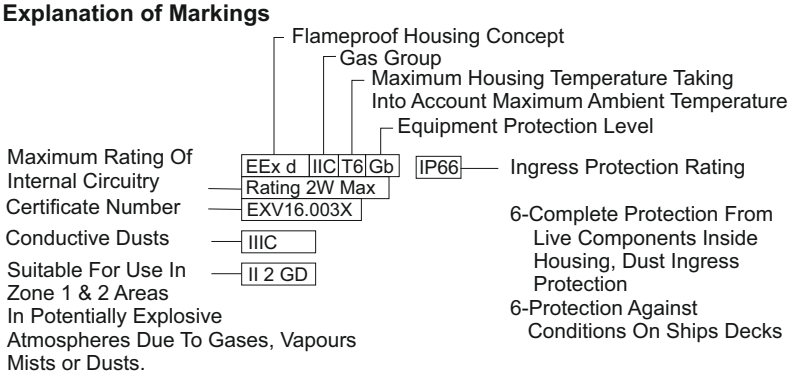
Labelling for 102 Series Detectors

Details Permanently Laser Engraved



The housings must be grounded to a minimum 20A ground.
If the JB3/903 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 JB3/903 without the cover correctly screwed in place.

Explanation of Markings



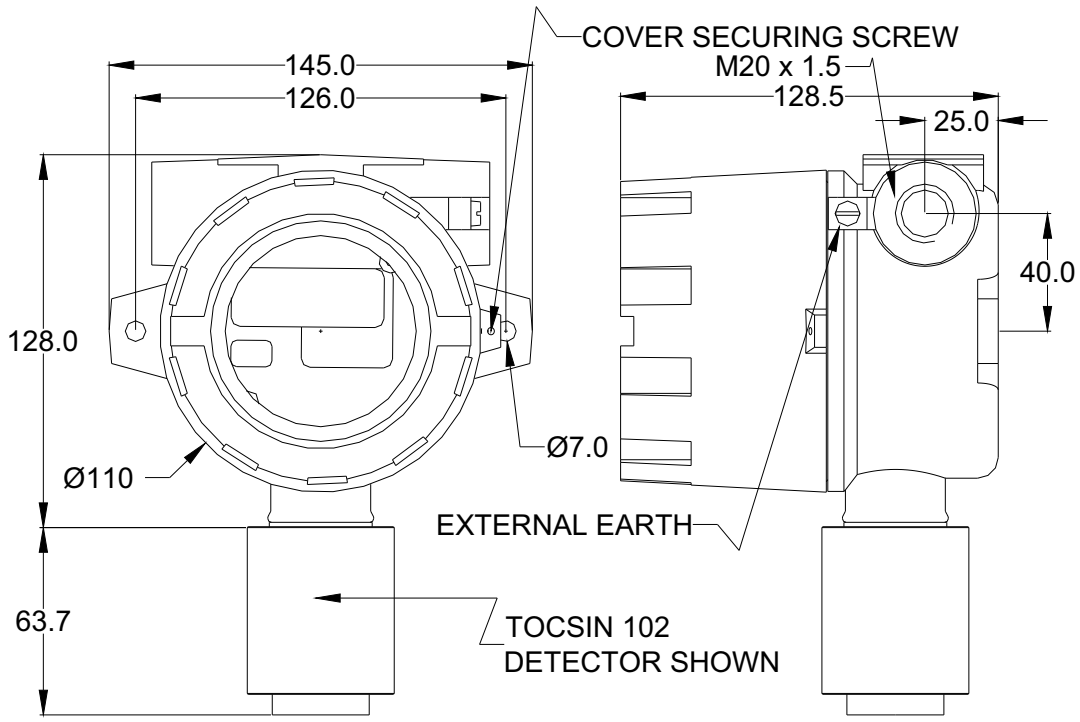
CERTIFICATION & SPECIFICATIONS

JB3/903

II 2G Ex db IIC T6/T5 Gb
II 2D Ex tb IIIC T85ºC/ T100ºC Db
Ta = -20ºC to +40ºC/+55ºC
IECEx EXV 16.0002X
ExVeritas 16 ATEX 0140X
ExVeritas 21UKEX0913X
IP66 M20 x 1.5 Entries 12-32V DC
Compliant to IEC 60079-29-1

With 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



Power	12 to 32V DC without Relay Option Typically 4W
Electrical Outputs	2 Wire Sentinel+™ Addressable I/O Digital Communication Linear over Detector Range.
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, Ex d IIC T6 I I2 D G
Explosion Protection Sensor	Ex d IIC T6 I I2 D G
Housing Dimensions (mm)	110 Diameter x 127 High Plus Detector Option
Cable Entry	2 x M20 x 1.5 Cable Entries 1 x M20 x 1.5 Detector Entry

Storage Temperature	-20 Deg Celsius to +55 Deg C
Storage Humidity	20-90% RH Non-Condensing
Shelf Life	5 Years
Sealing	IP66*
Mounting	Wall Mount
Weight	1.5Kg
Measured Range	0-100% LEL (see gas list)
T90 Time	<60 seconds
T50 Time	<20 seconds
Pressure	80 to 120kPa
Humidity	0 to 90% RH non condensing
Temperature T5 Temperature T6	-20 to +55 Deg C -20 to +40 Deg C
Warm up Time	Set by controller, 15 minutes

* IP ratings do not imply that the equipment will detect gas during and after exposure to these conditions. Calibration and maintenance may be required more frequently and should be assessed based upon exposure.

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 IGD gland. The aluminuim 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 IGD part # 5922701, 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 entires MUST be fitted with a suiatbly certified Ex d stopping plug. We recommend using IGD part # 5880501.

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

Both internal and external earth studs are provided, and can be used as the installation requires. 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 internal earth stud be used to:
  - ☐ Connect any unused cores
  - ☐ Connect any earth core internal to the cable
- The external earth stud be used to bond the enclosure to the any steel-work, on which the gas detector is mounted.

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 such as IGD part # 5128701.

Special condition for safe use (X):

The enclosures can have a non-conductive coating applied and may generate an ignition-capable level of electrostatic charges under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.

The flameproof joints employed in the equipment are not intended to be repaired

Equipment not intended to be installed in areas where corrosive vapour or gas may be present.

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Innovative Gas Detection since 1917

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 N/A**	**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 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

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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 N/A**	**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

CUSTOMER SEALING AND EARTHING RESPONSABILITIES

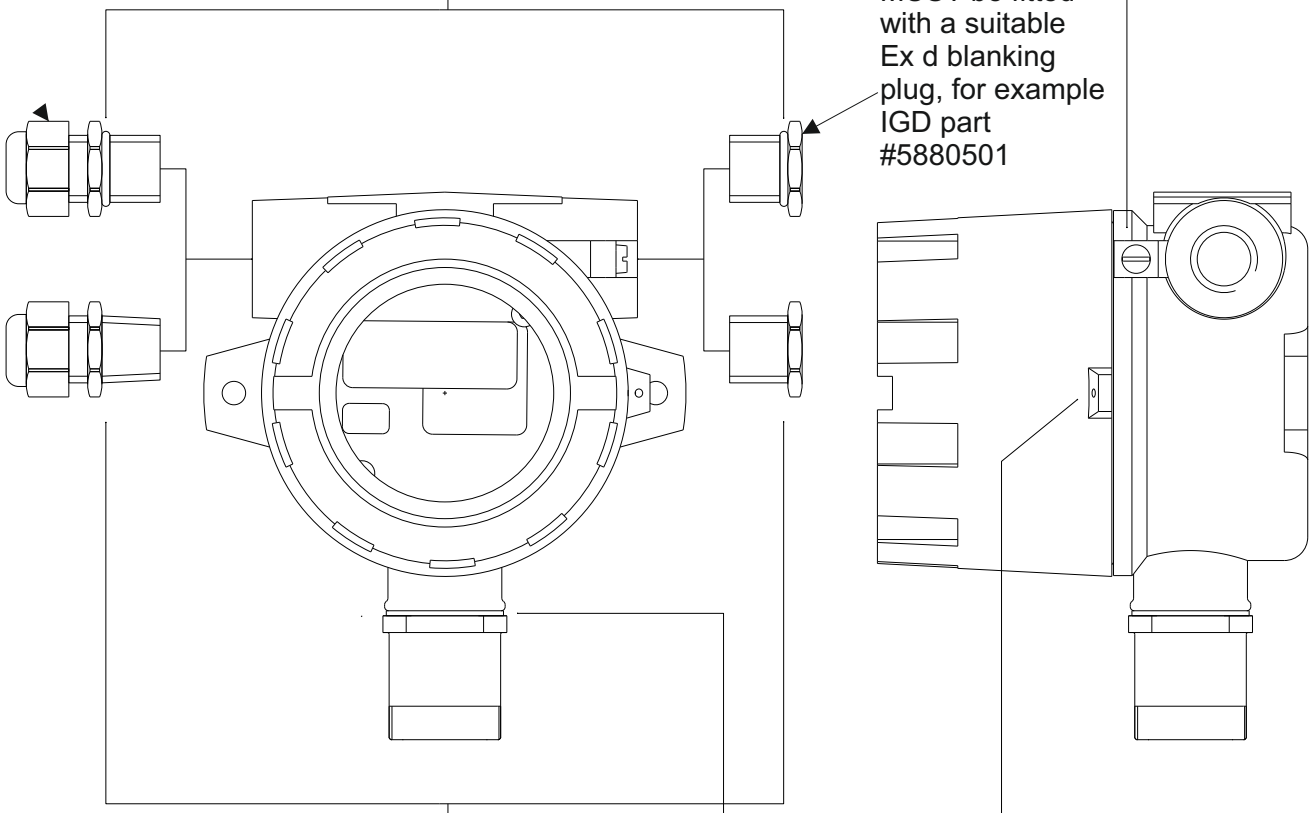
The JB3 is designed for use in Zone 1 and Zone 2 hazardous areas and is ATEX & IECEx certified. To maintain compliance it is imperative the installer of the equipment observes the following installation guidelines. Failure to do so could compromise the protection concept of the equipment.

Parallel glands and blanking plugs should have O Ring seals or sealing washers to maintain IP66 rating use Atex rated glands and blanking plugs

EXTERNAL EARTH TERMINAL

Universal Gland #5922701

ALL UNUSED cable entries MUST be fitted with a suitable Ex d blanking plug, for example IGD part #5880501



Taper glands and blanking plugs should use suitable grease to maintain IP66 rating, typical IGD part # 5128701.

Use suitably rated glands, for example IGD part # 5922701, and suitably rated blanking plugs, for example IGD part # 5880501.

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

On final assembly the cover screw must be locked in place.
Use 2mm Allen Key

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

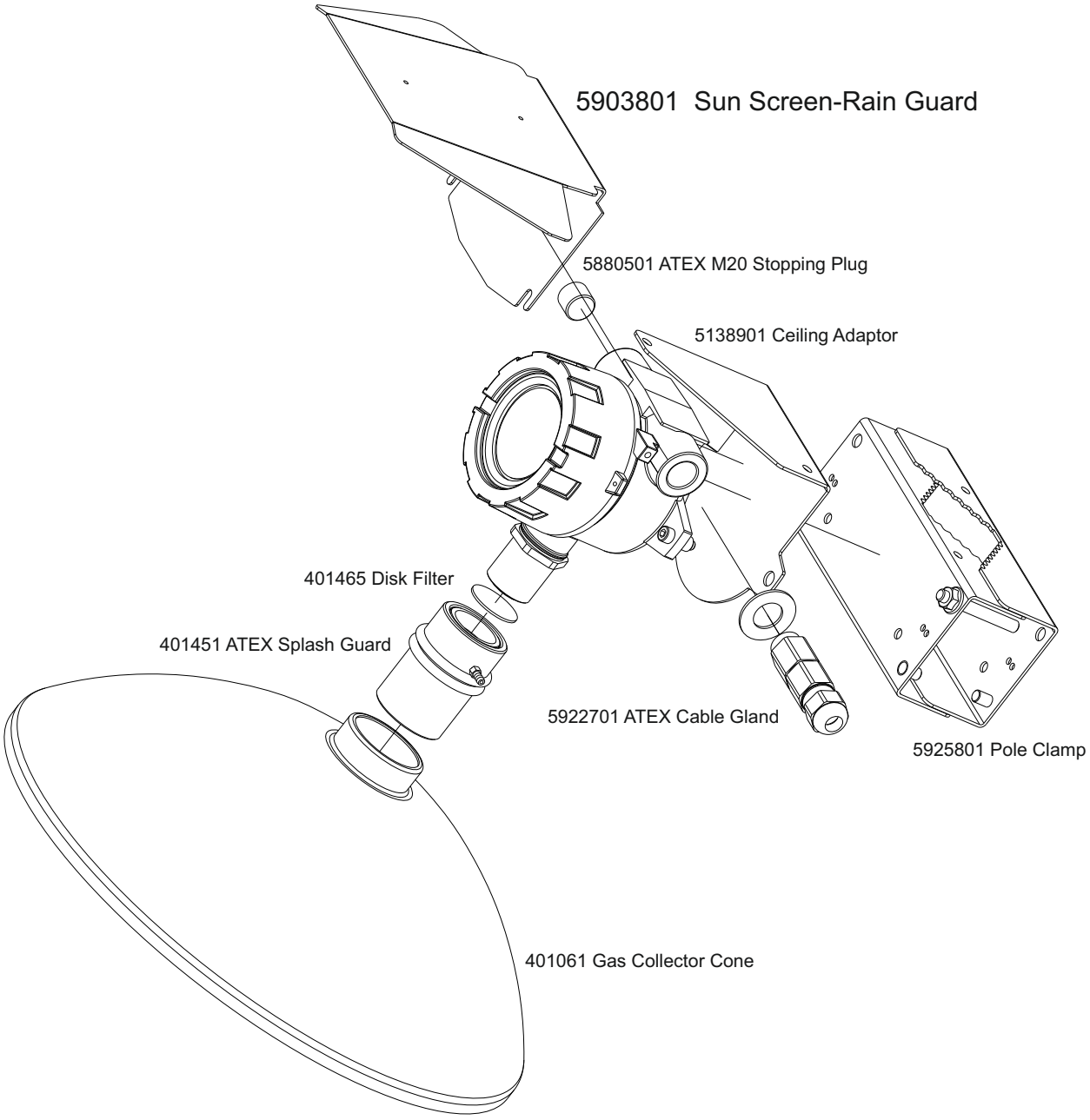
Two detectors may be ‘close coupled’ together using our potted feedthrough bushing. For example IGD part # 5903501

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

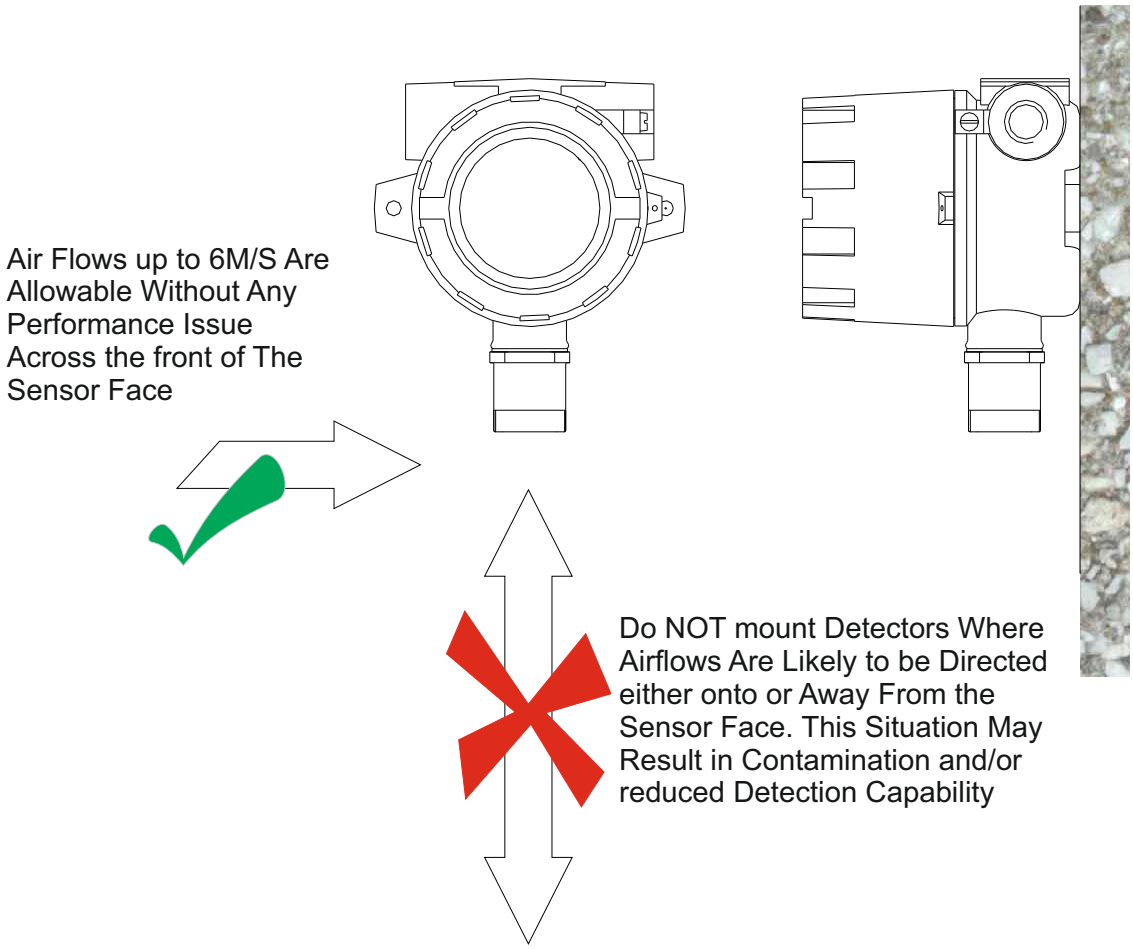
WARNING

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

5922701	M20 Universal EX d Cable Gland
5880501	M20 Stopping Plug
5128701	Conductive Assembly Paste
5138901	Ceiling Adaptor
5903801	Sun Screen/Rain Guard
5925801	Pole Clamp
401451	102 Series Detector Splash Guard
401465	Optional Disk Filter



Detectors in Airflows Mounting Positions Atex (BS EN 60079-29-1)



A Pellistor consists of a very fine coil of platinum wire, embedded within a ceramic pellet. On the surface of the pellet is a layer of a high surface area noble metal, which, when hot, acts as a catalyst to promote exothermic oxidation of flammable gases. In operation, the pellet and so the catalyst layer is heated by passing a current through the underlying coil. In the presence of a flammable gas or vapour, the hot catalyst allows oxidation to occur in a similar chemical reaction to combustion. Just as in combustion, the reaction releases heat, which causes the temperature of the catalyst together with its underlying pellet and coil to rise. This rise in temperature results in a change in the electrical resistance of the coil, and it is this change in electrical resistance which constitutes the signal from the sensor. Pellistors are always manufactured in pairs, the active catalysed element being supplied with an electrically matched element which contains no catalyst and is treated to ensure no flammable gas will oxidise on its surface. This "compensator" element is used as a reference resistance to which the sensor's signal is compared, to remove the effects of environmental factors other than the presence of a flammable gas. The advantage of using this technique when detecting flammable gases for safety purposes is that it measures flammability directly.

In the event of exposure to gas beyond the measuring range. Allow to stabilise in clean air or use instrument air at 0.5L/Min for 4 hours. If reading is greater then 5% LEL after this period replace otherwise re-zero and calibrate

Pellistor Poisons

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

Poisoning

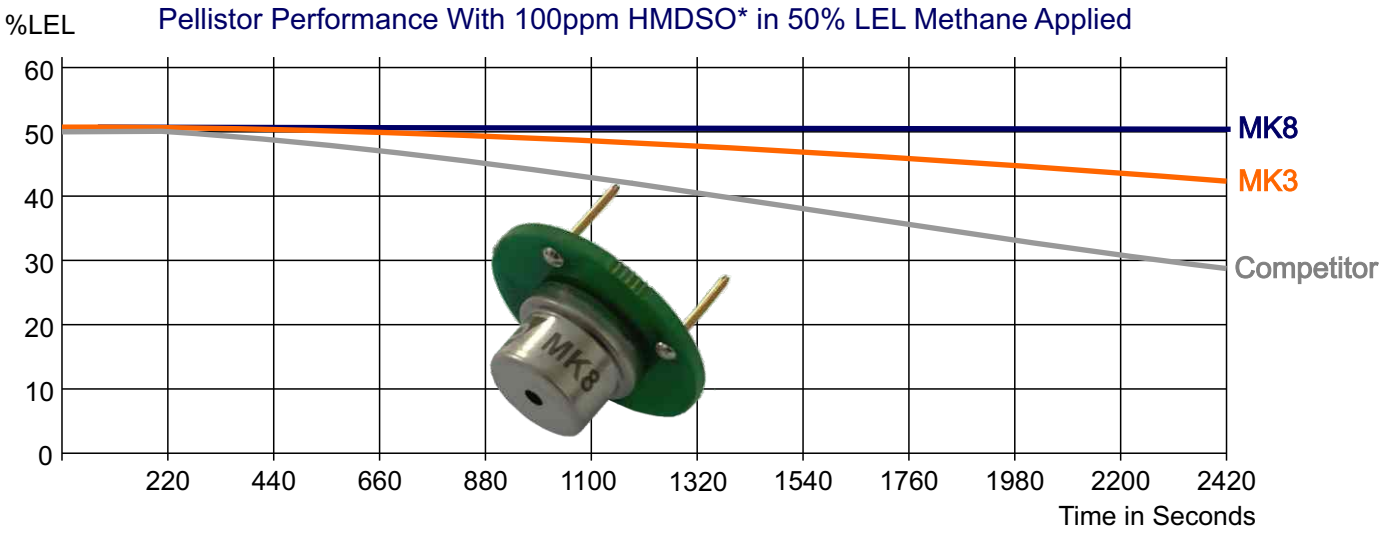
Some compounds will decompose on the catalyst and form a solid barrier over the catalyst surface. This action is cumulative and prolonged exposure will result in an irreversible decrease in sensitivity. Typical poisons are organic lead and silicon compounds.

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, MK8's should be protected from exposure to any compounds to which they do not specifically exhibit resistance.

Note that MK8 pellistors are extremely resistant to such poisons and inhibitors. A unique feature of the MK8 is its ability to recover most of their response after exposure to silicones.



Below is a table FOR MK8 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.

Gas	Formula	LEL Europe (IEC80079-20-1)	Relative response (%)	LEL (USA) (USBoM 627)	Relative response (%)
Methane	**CH_4**	**4.4**	**100**	**5**	**100**
Acetone	$(CH_3)_2CO$	2.5	22	2.6	20
Ethanol	C_2H_5OH	3.1	27	3.3	26
Ethyl acetate	$C_2H_5COOCH_3$	2	22	2.2	21
Ethylene	C_2H_4	2.3	56	2.7	58
Hydrogen	H_2	4	97	4	85
Iso-propanol	$CH_3CH(OH)CH_3$	2	19	2.2	18
Methanol	CH_3OH	6	46	6.7	46
n-Butane	C_4H_{10}	1.4	47	1.8	53
n-Heptane	C_7H_{16}	0.85	40	1.05	43
n-Hexane	C_6H_{14}	1	42	1.2	44
n-Pentane	C_5H_{12}	1.1	41	1.4	46
Propane	C_3H_8	1.7	54	2.1	59
Toluene	$C_6H_5CH_3$	1	24	1.2	25
Propylene	$CH_3\text{-}CH{=}CH_2$	2	74	2.4	78
Cyclo-hexane	C_6H_{12}	1	44	1.3	50
Cyclo-pentane	C_5H_{10}	1.4	63	1.5	59
Iso-butane	C_4H_{10}	1.3	46	1.8	56
Iso-octane	C_8H_{18}	0.7	36	not given	32
n-octane	$CH_3(CH_2)_6CH_3$	0.8	40	0.95	42
Styrene	$C_6H_5CH{=}CH_2$	1	14	1.1	14
Xylene	$C_6H_4(CH_3)_2$	1	26	1.1	25
Carbon monoxide	CO	10.9	42	12.5	42
Ammonia	NH_3	15	68	15	60

Using one calibration gas type to calibrate for another

In some cases it may be necessary to use a non Methane calibration gas to calibrate for a different target gas.

Example the engineer has a 50% LEL Pentane calibration gas bottle and needs to perform a Butane calibration.

$$\text{LEL to use} = \text{Cal Bottle LEL} \times \left(\frac{\text{Cal Gas Response to CH4}}{\text{Target Gas Response to CH4}} \right)$$

So in this example for the MK8 Pellistor:

Cal Bottle = 50% LEL Pentane

From the table

Relative Response to CH4 for Pentane = 41
Relative Response to CH4 for Butane = 47

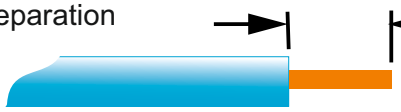
$$50 \times \left(\frac{41}{47} \right) = 43$$

So in this example when using 50% LEL Pentane to calibrate a pellistor for correct response to Butane use a bottle value of 43 %LEL

Notes

IGD's 2-Wire gas detection systems operate using screened cabling of appropriate cross sectional area. There are no specific requirements and our typical advised cable types are indicated below. Cable screens, either foil and drain wire, braid or armouring must be continuous between devices and grounded for effective operation. Ancillary devices such as stop buttons, beacons, sounders etc should commoned to the earth blocks provided as indicated below.

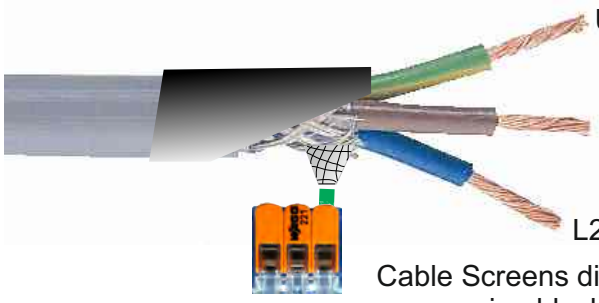
Recommended Cable Preparation



Strip Conductors 7mm Ensure No Stray Strands

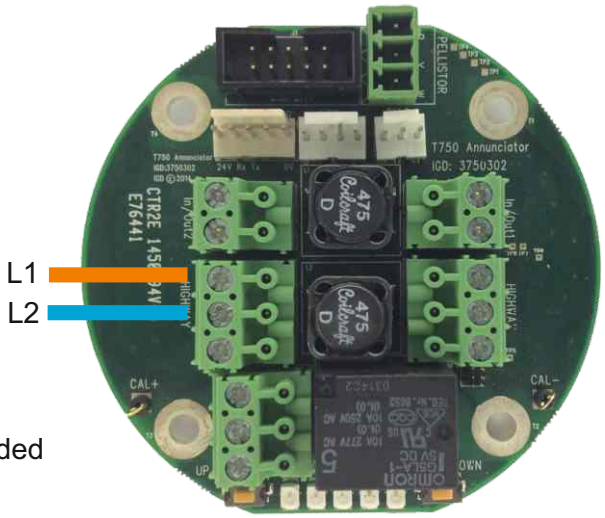
CY Style Cable

CY Type cable has a braided screen which should be trimmed back to ensure no trimmed conductor ends up on sensitive PCB components, tracks or terminals where it may short. The screens of the incoming cables should be terminated to the floating terminal block provided to ensure screen continuity. Trim back any unused conductors and ensure the braid is insulated with heat shrink or insulation tape and/or sleeve.



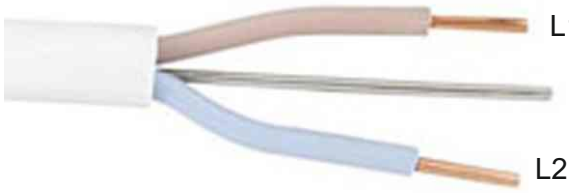
Cable Screens direct to commoning blocks provided

Internal Interface PCB



FP Style Cable (Preferred Option)

FP style cable is fitted with a foil screen and drain wire. Generally this is easier to terminate than CY type cable. Trim back any unused cores and foil screen. Ensure the drain wire is insulated with suitable size sleeving and terminates to the cable screen terminal



SWA Style Cable

SWA style cables are usually only recommended for used with ATEX EXD housings where the universal cable glands ground the cable armour to the housing. This provides both an effective EMC screen and mechanical protection. Ensure unused conductors are trimmed back and isolated. If terminating to plastic enclosures fit 'pan handles' and terminate on the outside of the enclosure to ensure screen continuity

Note: AWG vs mm^2 Cable Sizes

$2.5mm^2$	13 AWG
$1.5mm^2$	15 AWG

Gas detectors usually fall into two groups for placement

1. Plant Protection. Typically flammable gas detectors fall into this category. Aside from asphyxiation flammable gases are typically not directly toxic and so detectors are placed strategically where the gas is expected to accumulate based on its relative density to air (lighter or heavier)

2. Life Safety Systems. Here the concern is that a toxic or asphyxiant gas is directly hazardous to personnel and so the gas detection is placed based on the normal operating zone for the people present

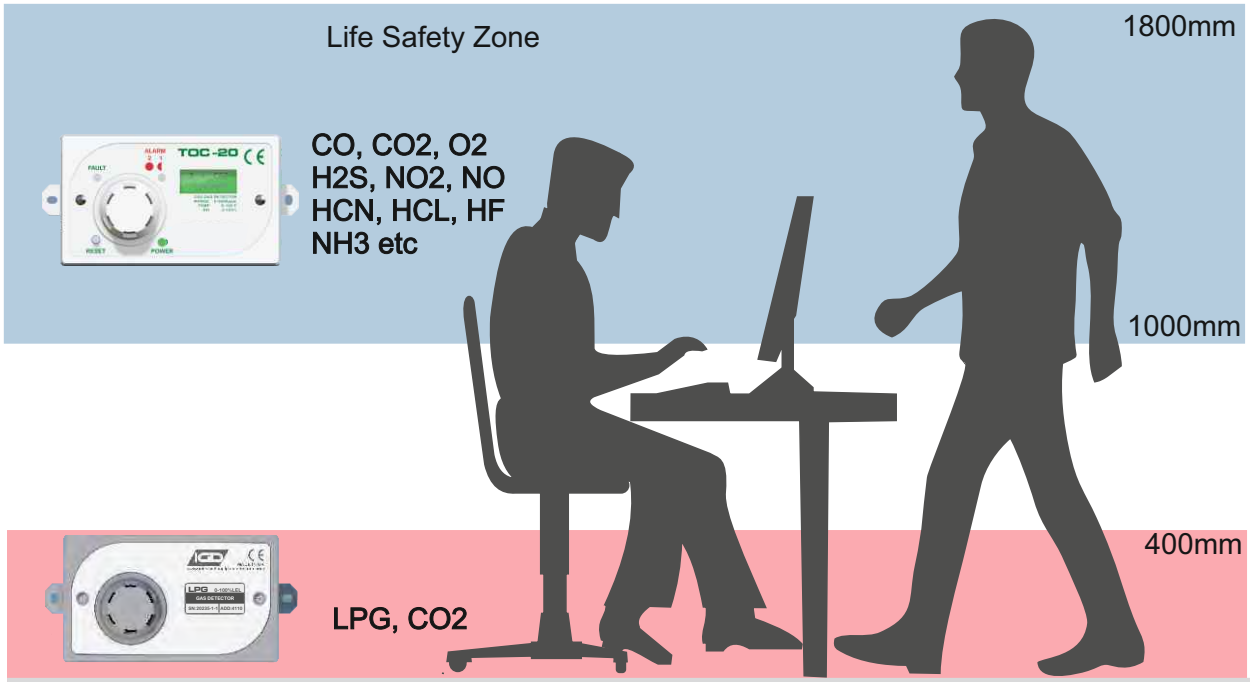
Note that in many cases both life safety and plant protection sensors may be appropriate on a site. For example a plant using liquid helium may have plant protection sensors at high level to ventilate roof spaces in the event of leaks. However in the event of ventilation failure Helium could accumulate down towards the zone where personnel operate. In this case a second set of life safety sensors would be appropriate.

Each site should be surveyed and assessed on its own merits. This document presents general guidance only.

Consider ceiling divisions, follow rules for smoke detectors

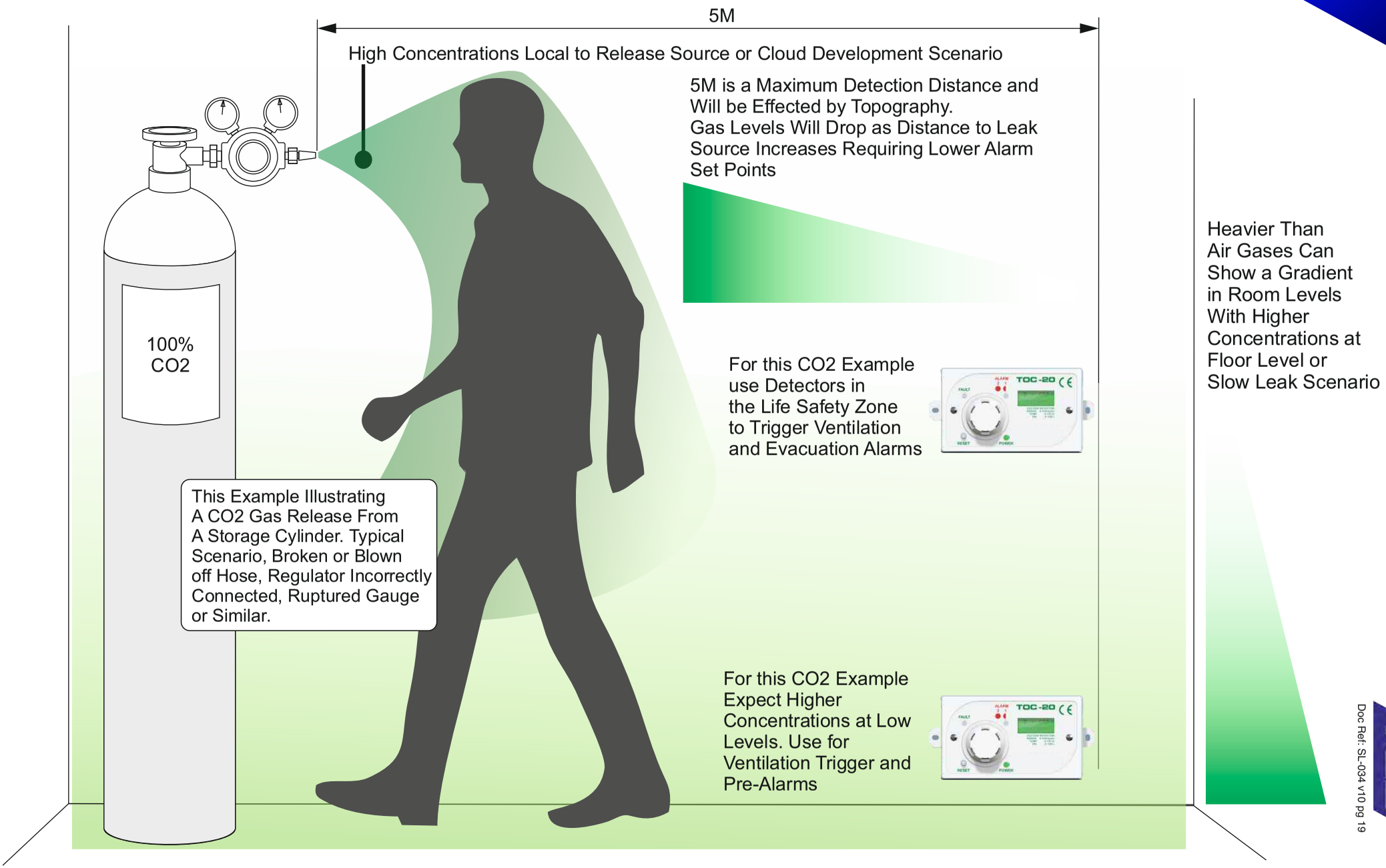
Lighter than air gases, detectors placed at highest ceiling points
Consider fitting collector cones at lower level for gas bottle stores boiler plant and gas meters (see separate application note).

Methane, Helium, Hydrogen, Ammonia etc



Consider fitting splash/dust guards to protect low level sensors

Consider sensors in under floor areas/voids/drains where heavier than air gases are present


5M
High Concentrations Local to Release Source or Cloud Development Scenario
5M is a Maximum Detection Distance and Will be Effected by Topography.
Gas Levels Will Drop as Distance to Leak Source Increases Requiring Lower Alarm Set Points
100% CO2
This Example Illustrating A CO2 Gas Release From A Storage Cylinder. Typical Scenario, Broken or Blown off Hose, Regulator Incorrectly Connected, Ruptured Gauge or Similar.
For this CO2 Example use Detectors in the Life Safety Zone to Trigger Ventilation and Evacuation Alarms
TOC-20
For this CO2 Example Expect Higher Concentrations at Low Levels. Use for Ventilation Trigger and Pre-Alarms
TOC-20
Heavier Than Air Gases Can Show a Gradient in Room Levels With Higher Concentrations at Floor Level or Slow Leak Scenario

CALIBRATION

Mk8 flammable gas detectors are addressable devices compatible with the following control panels:

TOC-635 Series
TOC-650 Series
TOC-750 Series

Gas detectors require regular calibration. As with all such devices calibration periods are a function of the environment into which the detector is installed. A detector installed onto an offshore oil platform where it sees large temperature swings, vibration, salt spray etc will require a different calibration regime to the same detector installed into a closely controlled environment clean room. As a minimum calibration should be undertaken every 12 months with gas response checks (bump tests) every 6 months. Detectors MUST be bump tested to confirm correct operation if the measured range has been exceeded.

Only competent persons should undertake calibration. A competent person being defined by the UK Health and Safety Executive as:

A competent person is someone who has sufficient training and experience or knowledge and other qualities that allow them to assist you properly. The level of competence required will depend on the complexity of the situation and the particular help you need.

Installation, operation and calibration is detailed in the control panel product manual. User should reference IEC 60079-29-1 and its related standards.

To undertake calibration you will need as a minimum:

Either instrument grade air or Nitrogen
A suitable calibration gas
Correct calibration gas adaptor (#401101A)
Correct regulator to suit the gas bottles capable of delivering a fixed flow of 0.5L/Min

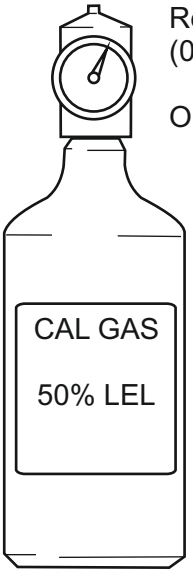
Calibration gas kits are available from IGD.

Calibration gases are ‘dry’ (zero humidity)

Gases must be flowed for a minimum of 60 seconds

Cal Gas Adaptor
Ensure it is correctly fitted

Hose delivers cal gas to the detector. Note a test gas applicator is usually required. In some cases weather protection guards or the detector itself may include a gas applicator port.



Regulator to deliver a fixed flowrate (0.5-1 L/min)

Oliver IGD P/N 5022001

Calibration gas.
Note: the concentration marked on the label. Ensure it is of the correct type for the detector being calibrated. The concentration should typically be 50 to 90% of the detector range.
Calibration gas should have a humidity between 0-90%RH
Refer to EN 600179-20-1 for gas concentration guidance.

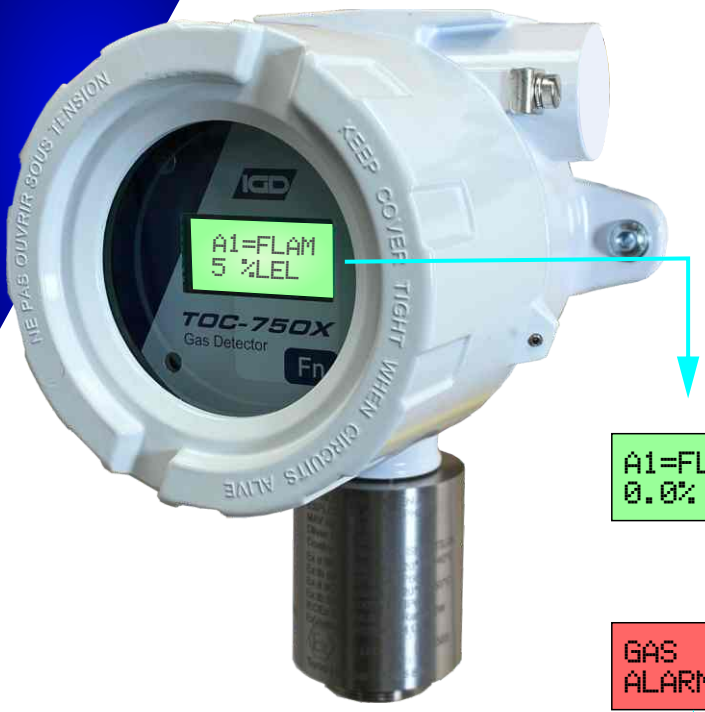
Response time of the detector can be tested using a stopwatch to check the time for the detector to reach 90% of the applied calibration gas value from first application of the calibration gas.

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.

Response time requirement to meet 60079-29-1 is less than 60 seconds and a T50 time in under 20 seconds



Note there is no audible output on the TOC-750XD display version of the detector or the TOC-750X.

For both types the internal relay or I/O ports can be used to trigger local beacon sounders. If fitted these must carry a suitable approval for the zone of operation and be compatible electrically and match approval requirements.

For example and EXD IIC T6 rated beacon sounder could be directly connected either using the internal relay of I/O ports so long as its does not exceed 100mA@24V DC. Otherwise a separate supply is required. Please refer to the Installers Guide for more details.

A1=FLAM 0.0% LEL	Normal Operation Top Line of the Display Indicated Gas Type Bottom Line of the Display shows the Reading
GAS ALARM	Alarm Mode Display Changes to Red and Indicates Gas Alarm. Note Alarm Levels Are Set on and Indicated by the Connected Control Panel
OVER RANGE	Alarm Mode Beyond the Measured Range Display Alternates Between ‘Gas Alarm’ on a Red Background to Over Range on a Yellow/Amber Background. Mode Active When Above 110% of Range
UNDER RANGE	Under the Measured Range Display Alternates Between ‘Gas Alarm’ on a Red Background to Over Range on a Yellow/Amber Background
FAULT	Detector Fault Mode Display changes to Yellow/Amber Background and Indicates Fault. The fault Type and Details Can be Further Explored on the Connected Controller. In Short fault types: > Over Range > Under Range > Communication Error > Detector Fault

Communicated Values

Gas values indicated on the display are communicated digitally to the controller using IGD’s proprietary Sentinel+ © communications protocol.

Each detector on the system has its own unique address (see controller manual). Using Sentinel+© protocol the controller requests the detectors status and gas reading sequentially from each address on the system. The update cycle for all connected detectors is approx 1 second.

SENSOR REPLACEMENT

Gas detectors can give excellent service over many years. The expected life of a gas detector will be dependant on many factors.

Over exposure to gas
Continuous exposure to gas
Environmental factors (thermal shock, vibration and similar)
Sensor aging

Over time the response of a sensor will change so whilst it may still zero and calibrate the following may change:

Response times become slower
Response to gas diminishes meaning the sensor will become noisier
Drift may increase between calibrations

For these reasons sensor elements should be replaced as part of a preventative maintenance plan. IGD recommend replacement of MK8 sensors at around 4 years in service.

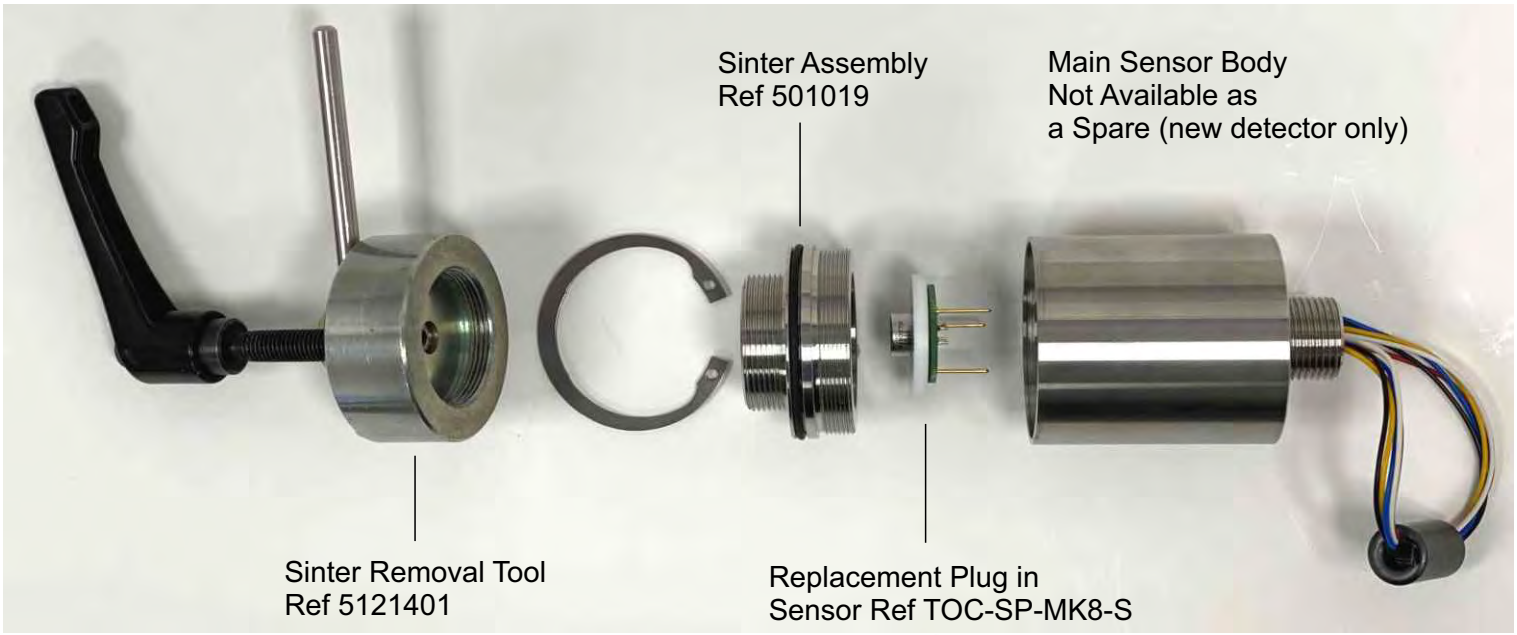
The internal sensor can be plug replaced and is available as PN TOC-SP-MK8-S

It is recommended to replace the protective sinter assembly at the same time ref 501019. This requires service tool ref 5121401.

Replacement should only be undertaken by suitably competent persons trained in the process.

Housings MUST NOT be opened in the hazardous area without first removing power.

Note that sensors will be susceptible to contaminants and should be handled in a clean area. Use nitrile or similar gloves to ensure sensors are not contaminated with dirt or hand creams when fitting. The sensor only plugs in one way and the assembly will require re-calibration after fitting. Allow 30 minutes for a sensor to fully stabilise before attempting calibration.



Replacement Pellistor Module
PN TOC-SP-MK8
Re-calibration Required After Fitting