

VESDA ECO

Test Gas Guide

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Document Conventions

The following typographic conventions are used in this document.

Convention	Description
Bold	Used to denote: emphasis Used for names of menus, menu options, toolbar buttons
<i>Italics</i>	Used to denote: references to other parts of this document or other documents. Used for the result of an action

The following icons are used in this document.

Icon	Description
	Caution: This icon is used to indicate that there is a danger to equipment. The danger could be loss of data, physical damage, or permanent corruption of configuration details.
	Warning: This icon is used to indicate that there is a danger of electric shock. This may lead to death or permanent injury.
	Warning: This icon is used to indicate that there is a danger of inhaling dangerous substances. This may lead to death or permanent injury.

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1 Warning

Before using any test / calibration gas; reference should be made to supplier Material Safety Data Sheets (MSDS) for all safety recommendations.

Always ensure there is sufficient ventilation to prevent ingestion of potentially harmful levels of test gas or the build-up of potentially hazardous concentrations.

Ensure that ceiling spaces and voids are adequately ventilated when using gases that are lighter than air.

Ensure low lying areas (inspection pits, floor voids, basements etc.) are adequately ventilated when using gases that are heavier than air.

ALWAYS ADHERE TO LOCAL HEALTH AND SAFETY REGULATIONS WHEN HANDLING HAZARDOUS GASES.

2 Scope

Gas detectors must be calibrated before use, this is done by the manufacturer and is valid for six months. It is very important to perform another calibration especially if more than six months pass from the time the detector leaves the manufacturer till it is first used, also depending on gas type and environment, calibration may be required more frequently.

This document provides an overview of suitable test/calibration equipment required to conduct routine response checks or calibration of VESDA ECO gas detectors along with contact details of potential test gas suppliers.

3 Overview



VESDA ECO adds gas detection capability to existing or new installations of VESDA Aspirating Smoke Detection (ASD) systems that typically utilize 25mm or 3/4" BSP air-sampling pipe networks.

The VESDA ECO can detect a range of flammable gases, toxic gases and oxygen deficiency.

Each VESDA ECO detector houses a replaceable sensor cartridge which can contain one or two gas sensors.

VESDA ECO uses the same well proven core sensing technologies that have been successfully used by the gas detection industry for many years. (see Table 1)

VESDA ECO currently employs three core sensing principles: Catalytic bead (often referred to as Pellistors) for the detection of flammable gases. Electrochemical cells for the detection of toxic gases and for oxygen deficiency. Infrared for the detection of carbon dioxide.



The majority of gas sensors have a finite life (see Table 1). Sensor life is dependent on the type of sensing principle, any internal chemistry and the environmental conditions it is exposed to.

This makes it difficult to precisely predict the end of life for any gas sensor. With the exception of the oxygen deficiency detector and the infra red detecting principle used for carbon dioxide; these sensing technologies are not failsafe. That is to say; they do not provide any indication when the operating life has expired.

Routine (typically 6 monthly) exposure to test/calibration gas is recommended for all gas types to verify gas sensor response and re-validate the accuracy of gas concentration readings.

The test/calibration process requires the use of a zero gas and a span gas. Zero gas (e.g. clean air for flammable gas detectors, Nitrogen for toxic gas and Oxygen deficiency detectors), plus span gas e.g. a known concentration; (typically 50% of full scale); of the target gas to be detected.

4 Sensor life

The life of a toxic gas electrochemical cell is related to the working life of its internal chemistry and is typically 24 months.

Oxygen fuel cells consume their internal chemistry during normal operation, their life can be measured in ppm hours based on an ambient of 20.9 % v/v and have a typical life in excess of 18 months.

Ammonia cells have a life of 18-24 months, this assumes they are operating in an environment free of any background concentration of Ammonia.

The life of flammable gas sensors that use catalytic beads can be many years; typically greater than three years. Their life is directly related to the amount of catalytic poisons they are exposed to.

Catalytic poisons include silicon or sulphur based compounds e.g. silicon based: furniture polish, electrical contact releasing sprays and lubricants, like WD40.

VESDA ECO uses catalytic beads with integral filters to ensure the longest possible operating life.

Infrared sensing elements should also operate for several years, typically greater than five and possibly ten.

Gas name	Chemical Formula	Detection Range	Detection principle	Typical sensor life
Alcohols	NA	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Ammonia	NH ₃	0-100 ppm	Electrochemical cell	18 to 24 months *
Ammonia	NH ₃	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Carbon Dioxide	CO ₂	0-5% v/v	Infrared	> 5 years
Carbon Monoxide	CO	0-500 ppm	Electrochemical cell	18 to 24 months
Chlorine	Cl ₂	0-20 ppm	Electrochemical cell	18 to 24 months
Gasoline Vapours	NA	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Hydrogen	H ₂	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Hydrogen	H ₂	0-2000 ppm	Electrochemical cell	18 to 24 months
Hydrogen Sulphide	H ₂ S	0-100 ppm	Electrochemical cell	18 to 24 months
Methane	CH ₄	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Nitrogen Dioxide	NO ₂	0-10 ppm	Electrochemical cell	18 to 24 months
Oxygen	O ₂	0-25% v/v	Electrochemical fuel cell	18 to 24 months
Pentane	C ₅ H ₁₂	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Propane	C ₃ H ₈	0-100% LFL	Catalytic bead / Pellistor	3 to 5 years
Sulphur Dioxide	SO ₂	0-10 ppm	Electrochemical cell	18 to 24 months

Table 1: Gas type – sensing technology – typical sensor life

Note: Those marked with an * assumes operation in atmospheres free of any background concentration of the target gas.

4.1 Routine Testing/Calibration

To perform routine testing and calibration of VESDA ECO gas detectors you will need the following:

- A Microsoft Windows enabled laptop or PC
- Xtralis VSC configuration software. (Free download from the Xtralis partner website after registration)
- Cylinder of zero gas (clean air or Nitrogen)
- Cylinder of span / calibration gas (see Table 2)
- Flow regulator capable of delivering a flow rate of 0.5 litres / minute (1.0 l/m for Cl₂) using
- 6mm (1/4") outside diameter; 4mm (~1/8") inside diameter pipe for connecting the gas to the ECO calibration port
- Product manual calibration procedure.



Examples of calibration kit and flow regulator



Will vary based on supplier

The recommended test gas concentrations for each sensor type/measurement range are given in Table 2.

Gas Name	Chemical formula	Measurement Range	Factory Default Setting		Temperature Limit		Humidity Limit		Recommended Test Gas Concentration
			Pre Alarm	Alarm	Low	High	Low	High	
Alcohols (IPA)	—	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	42 %LFL in Air†
Ammonia	NH ₃	0-100 ppm	6 ppm	9 ppm	-20°C	+40°C	15 %RH	90 %RH	50 ppm
Ammonia	NH ₃	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	36 %LFL in Air††
Carbon Dioxide	CO ₂	0-5% v/v	0.5% v/v	1.5% v/v	-10°C	+50°C	10 %RH	90 %RH	2.0% v/v
Carbon Monoxide	CO	0-500 ppm	7 ppm	50 ppm	-20°C	+50°C	15 %RH	90 %RH	100 ppm
Chlorine	Cl ₂	0-20 ppm	0.1 ppm	0.3 ppm	-20°C	+40°C	10 %RH	90 %RH	5 ppm* (See note)
Gasoline	—	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	46 %LFL in Air†
Hydrogen	H ₂	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	50 %LFL in Air
Hydrogen	H ₂	0-2000 ppm	500 ppm	1000 ppm	-20°C	+50°C	15 %RH	90 %RH	1000 ppm
Hydrogen Sulphide	H ₂ S	0-100 ppm	1 ppm	2 ppm	-20°C	+50°C	15 %RH	90 %RH	20 ppm
Methane / Natural Gas	CH ₄	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	50 %LFL in Air
Nitrogen Dioxide	NO ₂	0-10 ppm	0.3 ppm	0.5 ppm	-20°C	+50°C	15 %RH	90 %RH	5 ppm
Oxygen Deficiency	O ₂	0-25% v/v	20 % v/v	19.5% v/v	-20°C	+55°C	5 %RH	95 %RH	20.9% v/v
Oxygen Deficiency & Enrichment	O ₂	0-25% v/v	19.5% v/v	22.5% v/v	-20 C	+55°C	5 %RH	95 %RH	20.9% v/v
Pentane	C ₅ H ₁₂	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	50 %LFL in Air
Propane	C ₃ H ₈	0-100% LFL	7 %LFL	12 %LFL	-20°C	+50°C	5 %RH	90 %RH	42 %LFL in Air†
Sulphur Dioxide	SO ₂	0-10 ppm	0.3 ppm	0.5 ppm	-20°C	+50°C	15 %RH	90 %RH	5 ppm

Table 2: Gas Types, Measurement ranges and recommended test gas concentrations

Notes: (*) requires a gas flow at 1 litre per minute

(†) Cross-calibrated using 50% LFL Pentane (C₅H₁₂) in Air

(††) Cross-calibrated using 50% LFL Methane (CH₄) in Air

4.2 Detector Preparation before Calibration

Proper calibration of the ECO gas detector requires that there is no air flowing through the ECO detector during the entire calibration procedure. The most effective means of achieving this is to install a shut-off valve in front of the ECO detector (Figure 1) and closing the valve prior to beginning the calibration process. Ensure that inside diameter of valve does not restrict the inside diameter of the ASD sample pipe.

Note: The flow readings are averaged over a five (5) minute period therefore it will take approximately 5 minutes before the displayed air flow drops to zero (0), even though the actual flow is zero (0).

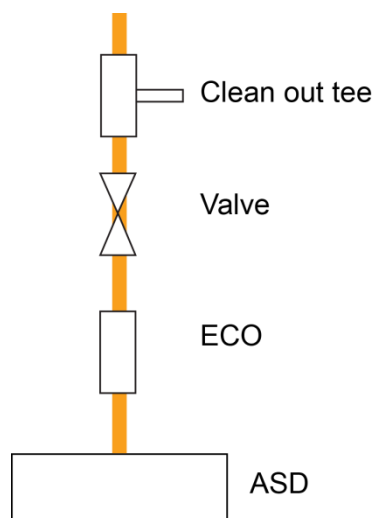


Figure 1

4.3 Zero Calibration

Zero calibration of flammable gas sensors requires the use of clean air, e.g. ambient air without the presence of combustible gases, this can be referred to as "zero gas". Zero calibration of toxic gas sensors can be performed using zero gas or 100% v/v Nitrogen which is also referred to as "zero gas".

Zero calibration of Oxygen and Carbon Dioxide sensors also requires the use of an inert gas such as 100% v/v Nitrogen.

4.4 Span Calibration

Span calibration is the setting of a detector to read the same concentration as supplied in a test/calibration gas cylinder.

Span gas concentrations are typically 50% of scale, but can be any concentration between 10% and 90% of scale.

4.5 Oxygen Detectors

Span calibration of Oxygen detectors can be performed using ambient air provided it can be confirmed that no interference gases are present.

4.6 Calibration Procedure

Refer to the VESDA ECO product guide for full details of the calibration procedure.

4.7 Documenting Calibration with Calibration Report

ECO is able to generate a Calibration Report that documents the calibration process. This report is accessed by connecting to the detector with VSC and then selecting calibration reports from the View tab of the tool bar. Downloading a calibration report before and after a calibration enables you to track the sensor's drift over time and determine if the time between calibrations can or should be changed.

4.8 Toxic Gas Detectors

When calibrating toxic gas detectors, gas cylinders containing a known concentration of the target gas (typically 50% of the measuring range) should be used.

4.9 Flammable Gas Detectors

When calibrating flammable gas detectors, gas cylinders containing a known concentration of the target gas (typically 50% of the measuring range) should be used. However some flammable gases are either not available or unsuitable for storage in pressurised containers.

Under these circumstances it is possible to calibrate for the target flammable gas using an alternative flammable gas with the use of a correction factor See table two for more information.

4.10 Test/calibration/test Gas Cylinders

Test / calibration gas cylinders are available in most countries. To ensure ease of handling and reduce costs Xtralis recommend the use of small disposable aluminium alloy or steel cylinders with a gas capacity ranging from 34 to around 110 litres.

A flow regulator will be required to deliver a flow rate of up to 0.5 litres a minute. It should be possible to calibrate in excess of 12 sensors from a 34 litre cylinder and 40 sensors from a 110 litre cylinder at a flow rate of 0.5 litres / minute.

Cylinders regulations vary between countries and regions, check which regulations apply to your country before ordering. Alternatively the recommended suppliers listed below will be able to help.

- American gas cylinders comply with US Dot standards
- European gas cylinders comply with : EN12205

Note: Smaller 12 / 20 litre; aerosol type; canisters are not recommended due to their small capacity and the inability to accurately regulate the flow.

To ensure the accuracy of the calibration gas mixture, suppliers quote a shelf life for the cylinders contents. At the end of this life the accuracy of the contents cannot be guaranteed. The typical shelf life for flammable calibration gas is 36 months and 12 months for most toxic mixes. Check with your supplier for exact details.

4.11 Calibration / Test Gas Suppliers

If you are unable to source calibration test kits in your country, Xtralis has partnered with 3 regional suppliers, see contact details and product part numbers below.

Each of these suppliers can supply test gases globally, most have regional distributors which can often supply these gases at a reduced price due to their ability to consolidate consignments and ordering in bulk.

Contact any of these suppliers direct to learn of your nearest distributor.

Costs may vary between suppliers. We recommend alternative quotes are obtained covering price and delivery times.

The following table of supplier part numbers is supplied for reference purposes only. Check supplier part numbers and descriptions with any potential supplier before ordering or when cylinders of different gas mixtures are required.

Region	Europe	Americas	Australasia & Asia Pacific	Middle East
Supplier	Air Products PLC (Formerly Cryoservices) Warndon Business Park, Worcester, WR4 9RH, UK Tel +44(0)1905 758 200 Fax: +44(0)1905 457824 Email: oneuse@airproducts.com www.airproducts.com	Gasco 320 Scarlet Boulevard, Oldsmar, Florida 34677 USA Toll free: 800-910-0051 Local: 813-343-5631 Fax: 866-755-8920 Email: info@gascogas.com www.gascogas.com	CAC Gas & Instrumentation Unit 10, Junction Estate 2 Duck Street, Auburn, NSW Australia 2144 Tel: +61 (0)2 9735 8833 Fax: +61 (0)2 9735 8899 Email: cac@promptel.com.au www.cacgas.com.au	Abdullah Hashim Industrial Gases & Equipments Co. Ltd. PO Box 717 Jubail 31951 Saudi Arabia Erfan Rathore Tel. +966 13 341 2345 Mob. +966 503 665623 Fax. +966 13 341 1622 Email: er@ju.ahg.com.sa info@ahg.com.sa http://www.ahg.com.sa
Gases and concentrations Cylinder capacity - gas litres	110 Litre Disposable Aluminium alloy cylinders Part Numbers	103 Litre Disposable Steel cylinders Part Numbers	34,103 or 112 Litre Disposable Cylinders DA: Disposable Aluminium DS: Disposable Steel Part Numbers	
Ammonia (50 ppm) in Nitrogen (see note 1)	312680	103L-13-50	34DA50NH3N	JUNG02PDP13
Carbon Dioxide 2.0% in Nitrogen	312701	103L-35-2	103DS2CO2N	JUNG02RDP07
Carbon Monoxide (100 ppm) in Nitrogen	312043	103L-49-100	103DS100CON	JUNG02PDP01
Chlorine 5 ppm in Nitrogen (see note 1)	312937	116L-252-5 (116 L Aluminium alloy)	34DA5CL2N	JUNG02PDP40
Hydrogen 50% LFL in air (2.0% v/v)	312025	103L-85-2	103DS50H2A	JUAI02RDP04
Hydrogen (1000 ppm) in air	312153	103L-92-1000	103DS1000H2A	JUAI02PDP23
Hydrogen Sulphide (20ppm) in Nitrogen (see note 1)	312158	103L-98-20	112DA20H2SN	JUNG02PDP15
Methane 50% LFL in air (2.5% v/v)	312030	103L-135A-2.5	Not applicable	JUAI02RDP01
Methane 50% LFL in air (2.2% v/v)	312049	Not applicable	103DS2.2CH4A	JUAI02PDP10
Nitrogen (100%)	197140	103L-114	103DSN	JUNG01RDP01
Nitrogen Dioxide (5 ppm) in Nitrogen (see note 1)	TBA	103L-111-5	34DA5NO2N	JUNG02PDP05
Oxygen (18%) in nitrogen	TBA	Not applicable	103DS18O2N	JUNG02RDP24
Oxygen (20.9%) in Nitrogen	312016	103L-1	103DS20.902N	JUNG02RDP02
Pentane 50% LFL in air (0.7% v/v)	312155	103L-154-0.7	103DS0.7VC5H12A	JUAI02RDP28
Pentane 50% LFL in air (0.55% v/v)	Not applicable	Not applicable	Not applicable	JUNAI2RDP45
Propane 50% LFL in air (1.1% v/v)	Not applicable	103L-176-1.1	103DS50PA	JUAI02RDP08
Propane 50% in air (0.85% v/v)	312046	Not applicable	Not applicable	JUAI02RDP50
Sulphur Dioxide (5 ppm) in Nitrogen (see note 1)	312734	103L-175-5	34DA5SO2N	JUNG02PDP24
LFL Values derived from	ISO 10156	NFPA 497	ISO 10156 2010	ISO 10156

Note 1: Considered to be a reactive gas. Use Teflon tubing to deliver gas from cylinder to detector otherwise a low gas reading may result due to interaction between the test gas and tubing.

Accessories				
Test Kit including: Qty 1: 103L gas cylinder 103DS3GASXT1N (100ppm CO/2.2% CH4/20.9% O2 in N2) Qty 1: 103L gas (103DSN 100% N2) Qty 1: FF-100-.5 regulator Qty 1: CC-01 carry case 3 M tubing (see note 1)	Not applicable	Not applicable	103DSXTKIT1	Not applicable
Two cylinder carrying case	198258	CC-58-AL	CC-01	Not applicable
Regulator - 0.5 l/min Chrome plated or Nickel plated Brass (For all non-relative gases)	186414	70-0.5 Includes 2 feet of tubing	FF-100-0.5	SP037/PR160-05 Chrome Plated Brass
Regulator - 0.5 l/min Stainless steel (For reactive gases: Ammonia, Hydrogen Sulphide, Nitrogen Dioxide, Sulphur Dioxide)	197943	70SS-0.5 Includes 2 feet of tubing	FF-100-SS-0.5	SP037/PR160-1 Chrome Plated Brass
Regulator - 1 l/min Stainless steel (For reactive gas: Chlorine)	197941	70SS-1.0 Includes 2 feet of tubing	FF-100-SS-1.0	SP037/PR160-1 Chrome Plated Brass
Dial a flow regulator 0-5 l/pm	197929	Not applicable	VAF-100-5 0.5 to 5.0 l/min	Not applicable
Tygon tubing 6.0mm OD 4.0mm ID	198261	Not applicable	AEM02011	Not applicable
Teflon tubing for Ammonia and Chlorine 6.5mm (3/16") OD, 4.3mm ID x 100cm	198784	Not applicable	AJD00012	Not applicable

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