



**Sensors Type 705
H₂S Sensor and Transmitter for
Electrochemical Cells UI Certified**

HELPING TO MAKE A SAFER WORLD

Ensure that you read and understand these operating instructions BEFORE installing or operating any part of the equipment.

Please pay particular attention to the Safety Warnings.



WARNINGS

1. To maintain safety standards, regular maintenance, calibration and operation of this equipment by qualified personnel is essential. Read and understand this manual completely before operating or servicing. If any further details are required which do not appear in this manual contact Zellweger Analytics Limited or their agent.
2. The Code of Practice regarding 'Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres' must be complied with at all times. Refer to the appropriate local or national regulations relative to the installation site.

Elsewhere the appropriate local or national regulations should be used.

3. Operators must be fully aware of the action to be taken if the gas concentration exceeds an alarm level.

CAUTION

To maintain safety standards, regular maintenance, calibration and operation of the equipment by qualified personnel is essential.

HELPING TO MAKE A SAFER WORLD

IMPORTANT NOTICES

1. Zellweger Analytics Limited can take no responsibility for installation and/or use of its equipment if this is not done in accordance with the appropriate issue and/or amendment of the manual.
2. The user of this manual should ensure that it is appropriate in all details to the exact equipment to be installed and/or operated. If in doubt, the user should contact Zellweger Analytics Limited for advice.
3. If further details are required which do not appear in this manual, contact Zellweger Analytics Limited or one of their agents.

HELP US TO HELP YOU

Every effort has been made to ensure the accuracy in the contents of our documents, however, Zellweger Analytics Limited can assume no responsibility for any errors or omissions in our documents or their consequences.

Zellweger Analytics Limited would greatly appreciate being informed of any errors or omissions that may be found in the contents of any of our documents and to this end we include the form opposite for you to photocopy, complete and return to us so that we may take the appropriate action.

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1. INTRODUCTION

1.1 GENERAL

The 705 ECC Sensor (Figure 1) is a hydrogen sulphide toxic gas detector certified for installation in a hazardous area. This version uses an electrochemical sensor, in conjunction with an electronic circuit to form a 2-wire 4 - 20mA transmitter.

The sensor comprises an aluminium housing containing an electrochemical cell with a sintered stainless steel disc forming the face of the sensor. The housing has a 47mm AF body with a 3/4 NPT mounting thread at one end and an M36 accessory thread on the other end. A plastic Filter Housing screws on to the accessory thread that holds the Hydrophobic Barrier in position, if accessories are not fitted. There are a number of accessories available for the 705 Sensor which utilise the M36 accessory thread. Refer to Section 8 for alternative systems to which the 705 Sensor can be connected.

Note: New Sensors are despatched with a protection disc in place of the Hydrophobic Barrier. This disc should not be removed until the sensor is installed or commissioned.

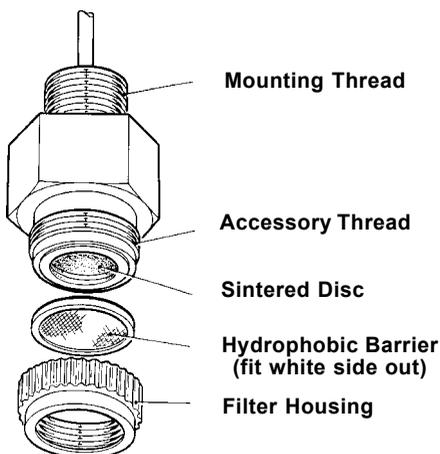


Figure 1 Type 705 Sensor and Filter Housing

1. INTRODUCTION

1.2 PRINCIPLE OF OPERATION

The sensor contains an Electrochemical Cell which generates an electrical current in proportion to gas concentration within the cell. Since the current output from the cell is in microamps, this is amplified and processed by the electronics in the terminal enclosure. The resulting signal, in the range 4 - 20mA and representing 0 - 50ppm H₂S, can then be wired to equipment in the safe area to provide alarm and concentration indications.

1.3 ACCESSORIES

1.3.1 General

The following accessories are available for use with the sensors:

- a. Collecting Cone (Figure 2).
- b. Weather Protection Housing (Figure 3).
- c. Sample Flow Housing (Figure 4).
- d. Hydrophobic Barrier.
- e. Gassing Point Assembly (Figure 5).

1.3.2 Collecting Cone

The detection of a lighter than air gas is enhanced by the use of a Collecting Cone. The cone fits onto the sensor accessory thread in place of the Filter Housing and retains the Hydrophobic Barrier.

A nozzle on the cone permits gassing of the sensor with the cone in position. The test gas is applied either direct to the nozzle or via a permanently connected pipeline when the sensor is in an inaccessible location.

1. INTRODUCTION

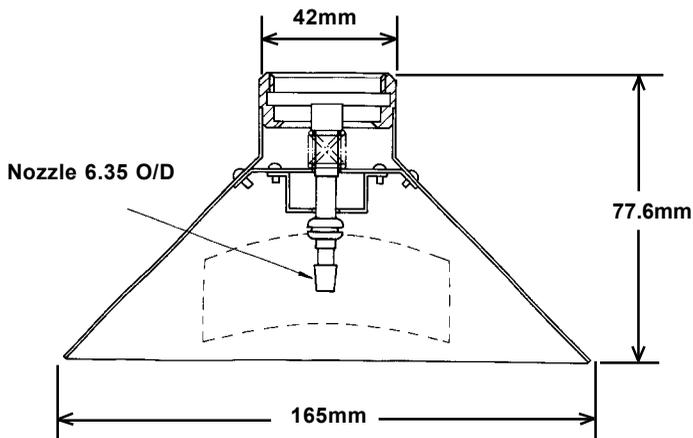


Figure 2 Collecting Cone

1.3.3 Weather Protection Housing

The Weather Protection Housing, fitted to a sensor installed in an exposed location, affords protection from driving rain from vertical to 30° below horizontal. When mounted close to the ground, protection is afforded from heavy rain rebounding off the ground. It also reduces contamination from industrial waste and enables the application of test gas in high wind speeds without significant error.

The housing is fitted to the sensor accessory thread in place of the Filter Housing and retains the Hydrophobic Barrier.

Incorporated in the housing is a nozzle to facilitate gassing of the sensor with the Weather Protection Housing in position, either by direct application to the nozzle or via a permanently connected pipeline. The nozzle is free to rotate within the housing to allow removal from the sensor without disconnecting a permanently connected pipeline, when changing the Hydrophobic Barrier and cleaning the sensor.

1. INTRODUCTION

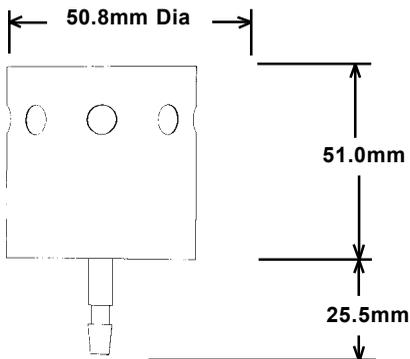


Figure 3 Weather Protection Housing

1.3.4 Sample Flow Housing

A Sample Flow Housing provides a facility to allow sampling of a closed system by means of two pipelines. The flow housing is fitted to the sensor accessory thread by a locking ring that enables the housing to be removed without disconnecting the pipeline. The Hydrophobic Barrier is retained by the housing and interfaces with a gasket bonded to the housing.

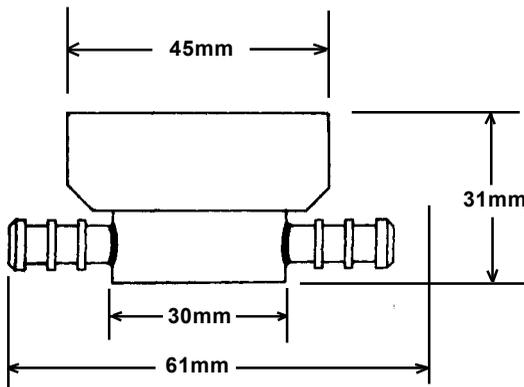


Figure 4 Sample Flow Housing

1. INTRODUCTION

1.3.5 Gassing Point Assembly

The Gassing Point Assembly can be fixed in a convenient position and permanently connected by suitable tubing to an inaccessible sensor, thus simplifying the application of test gas when checking sensor calibration. A DIN Rail Mounting Assembly (00785-A-0069) is available to enable five gassing point assemblies to be mounted side by side.

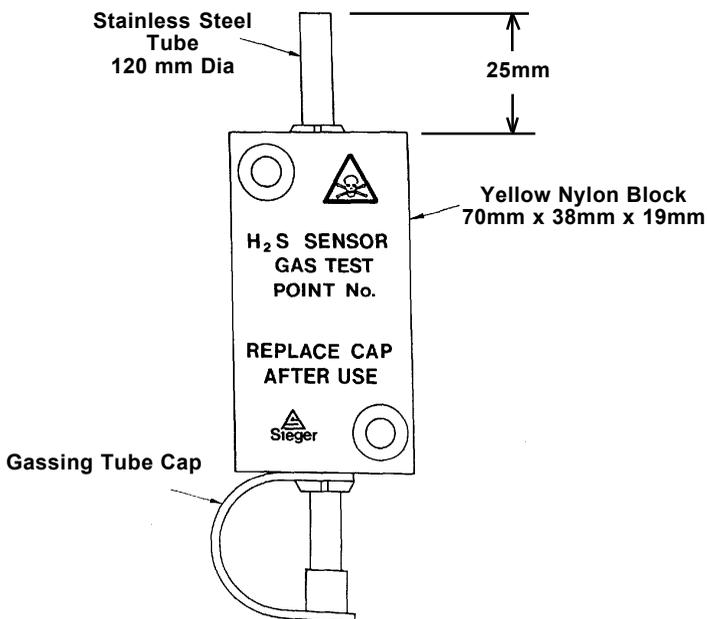


Figure 5 Gassing Point Assembly

1.3.6 Hydrophobic Barrier

The Hydrophobic Barrier consists of a layer of stainless steel mesh with a rubber rim. A hydrophobic barrier of PTFE is bonded to the stainless steel surface.

This MUST be fitted with the white surface facing outwards.

2. INSTALLATION



WARNING

The Code of Practice regarding 'Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres' must be complied with at all times. Refer to the appropriate local or national regulations relative to the installation site.

CAUTIONS

1. Replacement of components by other than Zellweger Analytics authorised engineers will invalidate the instrument warranty and certification.
2. The Type 705 Sensor must never be used in conditions when the flameproof integrity of the sensor and associated terminal housing is impaired.
3. The sintered disc on the sensor assembly must be kept free from contaminants. ie. Oil and dirt.

2.1 UNPACKING

On receipt the equipment must be carefully unpacked,, observing any instructions printed on the packaging, and the contents checked for deficiencies and transit damage.

2.2 SENSOR ORIENTATION

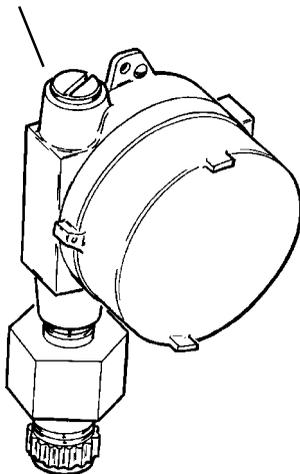
The sensor must be installed with the Sensor facing downwards. In exposed locations a Weather Protection Housing should be fitted.

2.3 TERMINAL HOUSINGS

A Terminal Housing (Figure 6) provides a mounting base for the sensor and contains the associated electronic circuit. The installation wiring enters the Terminal Housing via conduit.

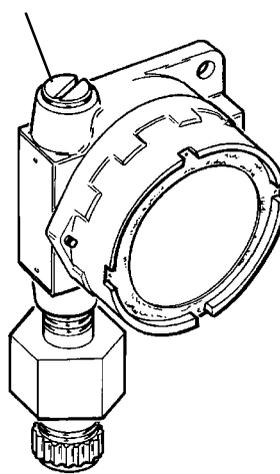
2. INSTALLATION

Cable Entry Conduit



**Killark Box with
705 Sensor**

Cable Entry Conduit



**Adalet X1HFC3L
Terminal Housing**

Figure 6 Terminal Housings

2.4 CABLE CONNECTIONS

The sensor is connected by three wires to the terminals on the pcb:

Connections		Colour Code
Counter	C	Brown
Working	W	Blue
Reference	R	White

Two 3-way terminals blocks on the pcb in the terminal enclosure enable the sensor to be connected to equipment in the safe area. For wiring details see Figure 7.

2. INSTALLATION

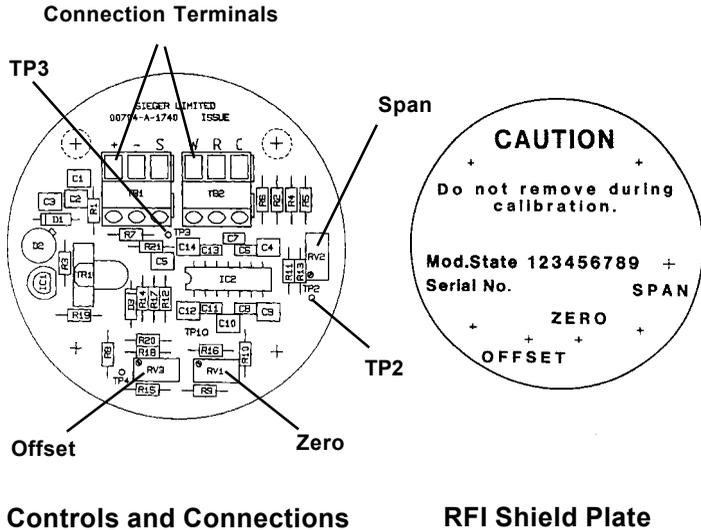


Figure 7 Circuit Board Assembly Connections

2.5 FITTING SENSORS



WARNINGS

1. Before installing the sensors, isolate the power supply by disconnecting or removing the associated control module from the installation.
2. All electrochemical cells contain acid or caustic solution; avoid contact with the skin, eyes and clothing. In case of contact flush the area with water for at least fifteen minutes.

CAUTION

The sintered disc on the sensor assembly must be kept free from contaminants, for example oil and dirt.

2. INSTALLATION

When fitting a sensor to a metal thread, it is recommended that the mounting thread should be coated with an approved anti-seize compound, such as a light petroleum grease.

Refer to Section 8 for alternative systems to which the sensor can be connected. If replacing a sensor refer to CAUTION 1 in the Maintenance section.

To fit the 705 Sensor proceed as follows:

- (1) Remove the protection disc and fit the accessories as required. (Refer to Section 3).
- (2) Isolate the power supply and wait for five minutes.
- (3) Remove the Terminal Housing lid.
- (4) Pass the cable into the Terminal Housing and fit the sensor to housing. To comply with the certification requirements, a minimum of five threads must be engaged.
- (5) Connect the sensor cable to the terminal block.
- (6) After mounting the Terminal Housing in the required location, connect the associated Control Module wiring to the terminal block (see label).
- (7) Fit the shield plate to the standoff pillars. Replace and secure the Terminal Housing lid.
- (8) If not already replaced by accessories, unscrew the Filter Housing, remove the protection disc and replace Filter Housing and gasket.

Note: The Hydrophobic Barrier is retained in position by the Filter Housing, or one of the accessories.
- (9) Reconnect to the Control Module.

3. FITTING ACCESSORIES

3.1 COLLECTING CONE (00780-A-0032)

To fit the Collecting Cone Assembly to a sensor, carry out the following:

- (1) Remove the Filter Housing and gasket from the sensor.
- (2) Fit the Hydrophobic Barrier, ensuring that the white surface faces away from the sinter.
- (3) Screw the Collecting Cone assembly onto the sensor accessory thread and tighten firmly by hand.

3.2 WEATHER PROTECTION HOUSING (00780-A-2076)

To fit a Weather Protection Housing to a sensor carry out the following:

- (1) Remove the Filter Housing and gasket from the sensor.
- (2) Fit the Hydrophobic Barrier, ensuring that the white surface faces away from the sinter.
- (3) Screw the Weather Protection Housing on to sensor accessory thread and tighten firmly by hand.

3.3 SAMPLE FLOW HOUSING (00780-A-0035)

To fit a Sample Flow Housing to the sensor, carry out the following:

- (1) Remove the Filter Housing and gasket from the sensor.
- (2) Ensure that the Sample Flow Housing is fitted with its gasket (00780-C-0017).
- (3) Apply a thin coating of anti-seize compound, such as a light petroleum grease, to the sensor accessory thread.

3. FITTING ACCESSORIES

- (4) Fit the Hydrophobic Barrier, ensuring that the white surface faces away from the sinter. Screw the Sample Flow Housing on to the sensor and tighten with a 40mm A/F spanner.
- (5) Set the sample flow rate to 1.5 ± 0.1 litres per minute, unless otherwise directed in System installation instructions.

4. MAINTENANCE

4.1 GENERAL

Maintenance consists of cleaning the sensor and accessories, replacing gasket and the Hydrophobic Barrier and gassing the sensor when testing the system.



CAUTIONS

1. The ECC cell contains a small quantity of acid. It is therefore necessary to comply with the current waste disposal regulations, either local or national, when disposing of a sensor.

ECC TYPE SENSORS SHOULD NEVER BE DISPOSED OF BY PLACING IN A FIRE.

2. Exposure to concentrations above the design range may result in the sensor needing re-calibrating or checking.
3. Dismantling of a sensor or a sensor installation by other than authorised engineers invalidates certification.

In the event of exposure to contaminant or prolonged exposure to high concentration of gas, the sensor should be operated for 24 hours in a clean environment and then recalibrated.

Note: If the sensor is found to be faulty, or cannot be calibrated, the complete sensor must be discarded and replaced.

4.2 CLEANING

Sensor and accessories may be cleaned using an industrial grade of methanol. Whenever cleaning takes place, a new Hydrophobic Barrier must be fitted and the following precautions must be observed:



- a. Isolate power supply from the sensor by withdrawing the associated Control Module from the installation.
- b. Do not remove sensor from the installation.

5. CALIBRATION

5.1 GENERAL

When testing and calibrating a gas detection system, the sensors must be gassed in accordance with the practice recommended for the particular installation. The sensor should be calibrated with hydrogen sulphide using the procedures detailed in Section 6.

5.2 CROSS INTERFERENCE FROM OTHER GASES

Some gases other than hydrogen sulphide can produce an output current. Those which may be encountered and typical examples of their effect (if any) at 20°C are as follows:

Gas	Concentration	Indication in ppm H ₂ S
Carbon Dioxide	25%	0
Carbon Monoxide	100ppm	0
Ethylene	500ppm	0
Hydrogen	100ppm	0
Methane	5%	1
Sulfur Dioxide	100ppm	0

5.3 SENSOR LIFE



The expected life of the detector assembly is greater than two years. The guaranteed life is 12 months in use, plus six months storage, subject to storage at a stable temperature of between -10 to +20°C. This guarantee will not apply to extended use in harsh environments.

5. CALIBRATION

5.4 CALIBRATION PROCEDURE

Note: This procedure will produce an upscale output signal which may activate alarms if fitted. Refer to the Warnings in Installation section of the manual before proceeding.

- (1) Allow a minimum warm-up period of 1 hour after applying power before carrying out this procedure.
- (2) Insert a Digital Multimeter (DMM), set to read current, in series with the 4 - 20mA line.
- (3) Ensure the sensor is in a gas-free atmosphere then, if necessary, adjust the ZERO control for a reading of 4mA on the DMM.
- (4) Gas the sensor as instructed in Section 6 'Gassing the Sensor'. After 5 minutes, adjust the SPAN control for a reading of 20mA on the DMM for 50ppm H₂S.
- (5) If procedures (3) and (4) cannot be achieved, adjust the Offset control as follows:
 - a. Connect the DMM, (set to read mV), between TP2 and TP3 on the pcb (see Figure 7).
 - b. Adjust the ZERO control to obtain $0.000V \pm 1mV$ on the DMM.
 - c. Disconnect the DMM.
 - d. Adjust the OFFSET control to obtain an output (at terminals) of 4mA.
 - e. Repeat steps (3) and (4), remove the gas adaptor and allow sufficient time for the test gas to escape.
- (6) Turn off the test gas and check that the DMM indicates 4mA. If not, adjust the ZERO control to give a DMM reading of 4mA.

6. GASSING THE SENSOR

6.1 EQUIPMENT REQUIRED

To test and calibrate the gas detection system, the following items are required:

- a. A suitable Calibration Gas Test Kit and a bottle of the appropriate test gas.
- b. Where the sensor accessories are not fitted, a Sample Flow Housing will be required for accurate sensor calibration.

Note: Purpose built gassing equipment is available on request from Zellweger Analytics Limited.

6.2 CALIBRATION GASSING PROCEDURE



CAUTIONS

1. The calibration of H₂S sensors requires extreme care and accurate gas mixtures. Electrochemical sensors are better left factory calibrated and only an approximate calibration check made.
2. If applying H₂S test gas via a gassing nozzle, such as on the Weather Protection Housing, the control system may indicate up to 20% high. This is normal and the system does not need recalibrating.
3. Should recalibration of a H₂S sensor be required, a Sample Flow Housing should be used to ensure accuracy.

To calibrate a H₂S sensor, proceed as follows:

- (1) Connect a suitable calibration gas test kit to the sensor gassing nozzle or to the permanently connected pipeline, if fitted.

6. GASSING THE SENSOR

CAUTION

On Weather Protection Housings, upward pressure on the gassing nozzle forces the nozzle against the hydrophobic barrier. Do not rotate the nozzle when fitting the pipeline as this may cause damage.

- (2) Open the valve of the calibration gas test kit and set the flow rate to 1.5 ± 0.1 litres per minute.
- (3) Apply the test gas for a minimum period of 5 minutes to electrochemical sensors.
- (4) Set up the Control System as instructed in the Control System manual.
- (5) On completion, shut off the test gas and disconnect the calibration gas test kit.

7. REPLACEMENT PARTS

Note: When ordering replacements parts, always quote the complete part number. Where a part number is not listed or known, state the type, material, cable entry size and other relevant details.

7.1 TERMINAL HOUSINGS

Part No.	Description	Cable Entry Thread
00704-A-1756	*Killark HKB-BC Box Bulkhead Mounting	¾ NPT (2 entries)
00704-C-1738	RFI Shield Plate for Killark Box	
00704-A-1755	*Adalet X1HFC3L Box Bulkhead Mounting	¾NPT (2 entries)
00704-C-1739	RFI Shield Plate for Adalet Box	
00705-A-1762	Killark HKB-BC Box (including sensor and electronics)	

* These two items may be sourced locally.

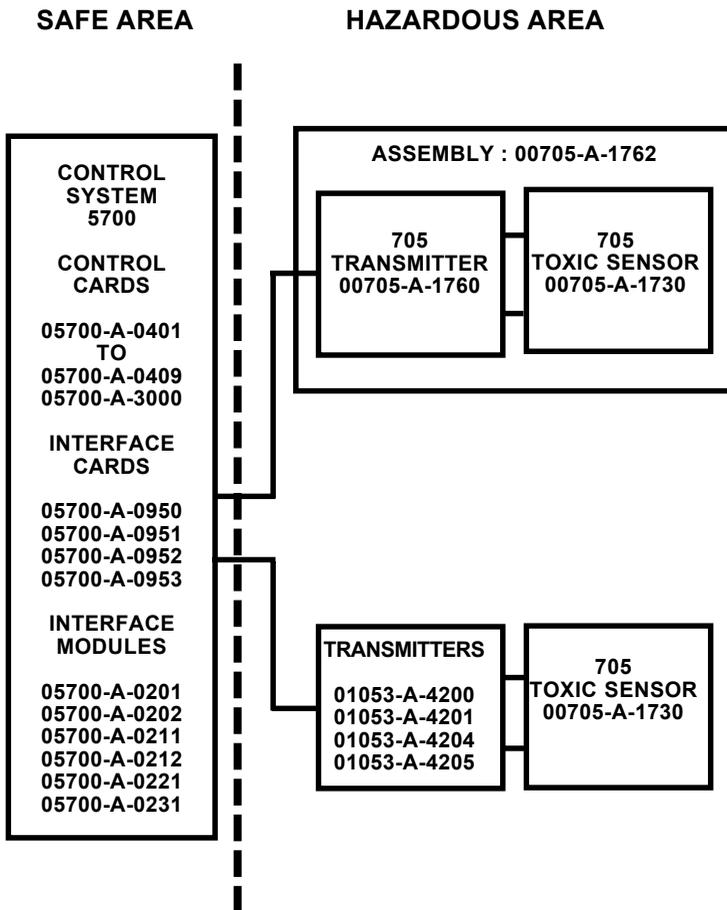
7.2 MAINTENANCE SPARES

Note: When ordering replacements, always quote the complete part number.

Part No.	Description
00705-A-1730	Sensor Assembly H ₂ S (ECC)
00780-A-0032	Collecting Cone
00780-A-0035	Sample Flow Housing
00780-C-0048	Gasket (Flow Housing)
00780-A-2076	Weather Protection Housing (Plastic)
00910-A-0084	Hydrophobic Barrier
00780-C-0038	Filter Housing
00780-C-0048	Gasket for use with Filter Housing, when a filter is not fitted

8. TYPE 705 SENSOR ALTERNATIVE SYSTEMS

TOXIC SYSTEMS



9. SPECIFICATION

CERTIFICATION APPROVALS



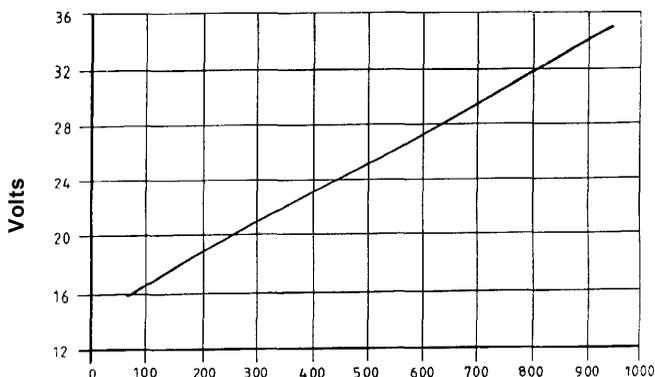
Certified for Class 1, Division 1, Groups B, C and D

POWER REQUIRED

16 - 35V d.c (24V nominal).

LINE RESISTANCE/LOAD RESISTANCE

The graph shows the maximum resistance allowed (cable + load), for various values of supply voltage, between the power supply and the 705 Sensor.



Line Resistance and Load Resistance Total

Note: For supply voltages above 24V, a minimum total resistance of 100 ohms is recommended.

POWER CONSUMPTION

Less than 1W.

RESPONSE TIME AT 20°C

T₃20 less than 10s.

T₃50 less than 20s.

T₃90 less than 60s.

9. SPECIFICATION

ADALET X1HFC3L

Dimensions: 115mm x 130mm x 88mm.

Weight: 1.2kg.

OPERATING RANGE

0 to 50ppm H₂S

ANALOGUE OUTPUT

4 - 20mA two wire. The 'sensing resistor' can be either connected between the fuse supply and the sensor (sinking current) or connected between the sensor and 0V (sourcing current). 4 - 20mA represents 0 - 50ppm H₂S.

CONTROLS

Zero and span potentiometers accessible through label plate.

AMBIENT TEMPERATURE RANGE

Operating: -40°C to +55°C.



Operation at temperatures above +50°C or below -20°C for prolonged periods can reduce operating life of the cell.

Accuracy: Baseline change (-10°C to +45°C) less than ±3ppm H₂S.

Span change (-10°C to +45°C) ±10 ppm H₂S.

Storage: -0°C to +25°C (recommended).

9. SPECIFICATION

HUMIDITY



Range: 0 to 90% RH non-condensing.

Prolonged operation below 20% RH can reduce operating life of the cell.

OVERALL DIMENSIONS AND WEIGHTS

Sensor:

Dimensions: 8mm x 55mm (47.2mm across flats).

Weight: 270g.

Killark HKB-BC Terminal Housing

Dimensions: 155mm x 135mm x 100mm.

Weight: 1.13kg.

Collecting Cone:

Dimensions: 87mm x 165mm dia.

Weight: 175g.

Weather Protection Housing :

Dimensions: 76.5mm x 50.8mm dia.

Weight: 52.4g

Sample Flow Housing:

Dimensions: 61mm x 45mm x 31mm.

Weight: 110g

TERMINALS

Screw clamped and accepting cable up to 2.5mm².



Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.



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Please note - Product designs and specifications are subject to change without notice. The user is responsible for determining the suitability of this product.