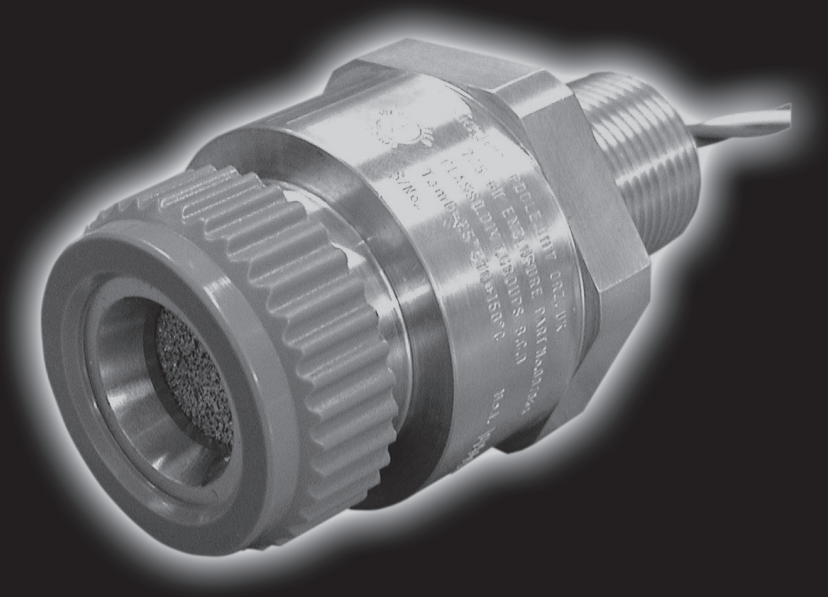
Operating Instructions

Honeywell



Sieger Type 705
CO Sensor and Transmitter for Electrochemical Cells
UL Certified 00705A1731

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 the equipment. If 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 Ltd 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 a form for you to photocopy, complete and return to us so that we may take the appropriate action.

CONTENTS

1. INTRODUCTION

1.1 GENERAL

The Type 705 Carbon Monoxide Sensor is a toxic gas detector certified for installation in a hazardous area. This version uses an Electrochemical (ECC) Sensor, in conjunction with an electronic circuit to form a three 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 and holds a Hydrophobic Barrier in position when 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.

1.2 PRINCIPLE OF OPERATION

The sensor contains an Electrochemical Cell. Electrochemical Cells are dynamic devices which generate a current in proportion to gas concentration within the cell. As the current output from the cell is in microamps, it is amplified and processed by the electronics in the terminal enclosure. The resulting signal in the range 4 - 20mA (representing 0 - 500ppm CO) can then be connected to equipment in the safe area to provide alarm and concentration indications.

1. INTRODUCTION

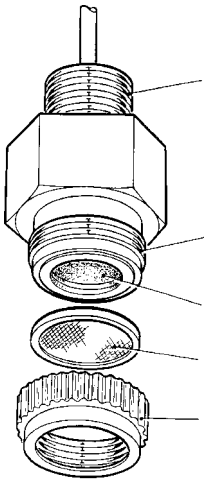


Figure 1 Type 705 Sensor and Filter Housing

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.

1. INTRODUCTION

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 fitted in an inaccessible location.

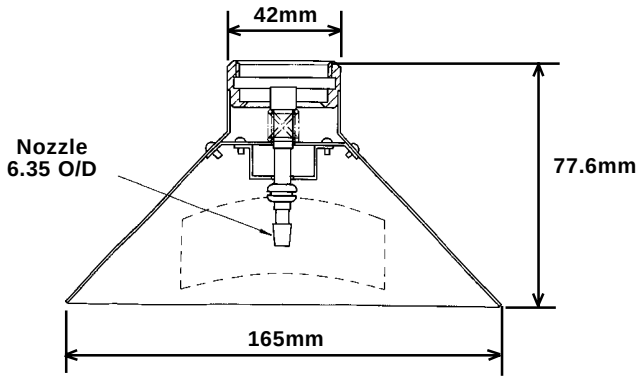


Figure 2 Collecting Cone

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 the vertical to 30° below the 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 a 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 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

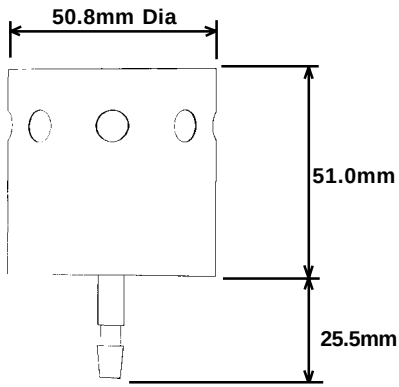


Figure 3 Weather Protection Housing

1.3.4 Sample Flow Housing

A Sample Flow Housing provides a means to sample gas from a closed system, via two pipelines. The flow housing is fitted to the sensor accessory thread by a locking ring, enabling removal of the housing without disconnecting the pipeline. The Hydrophobic Barrier is retained by the housing and interfaces with a gasket bonded to the housing.

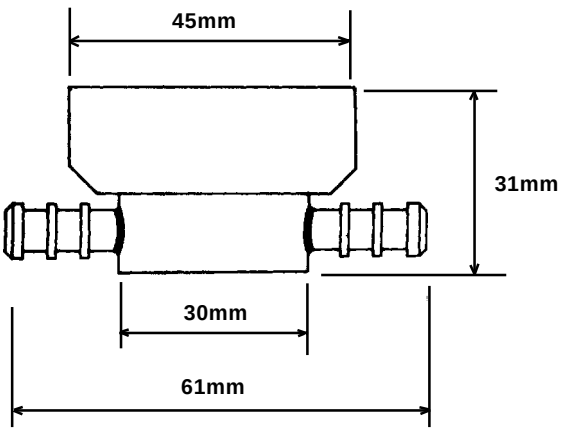


Figure 4 Sample Flow Housing

1. INTRODUCTION

1.3.5 Gassing Point Assembly

This assembly can be fixed at a convenient position and permanently connected by suitable tubing to an inaccessible sensor, thus simplifying the application of a test gas when checking the sensor calibration. A DIN rail mounting assembly (00785-A-0069) is available to enable five Gassing

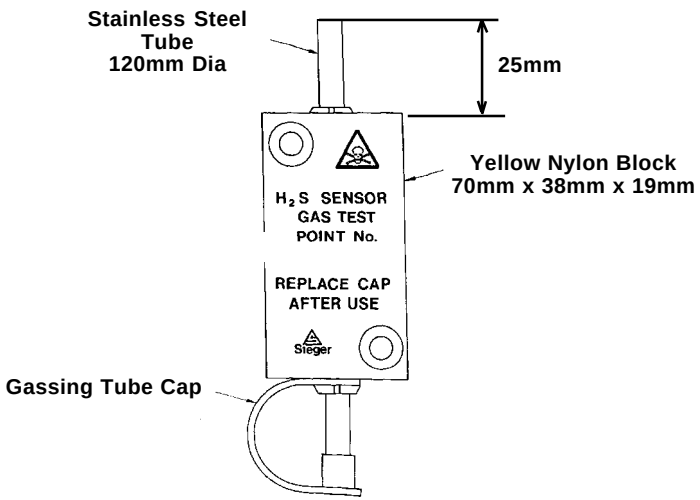


Figure 5 Gassing Point Assembly

Point Assemblies to be mounted side by side.

1.3.6 Hydrophobic Barrier

The Hydrophobic Barrier consists of a layer of stainless steel mesh with a rubber rim, with a Hydrophobic Barrier of PTFE bonded onto its 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 Limited 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, for example 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.

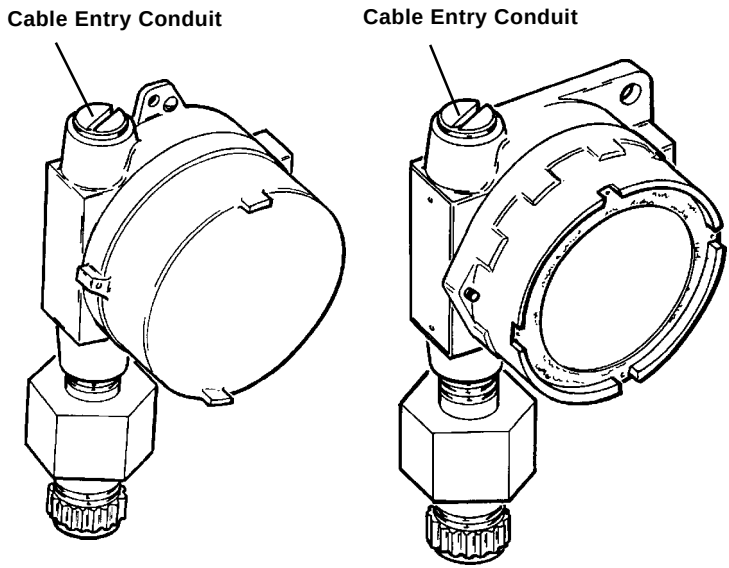
2.2 SENSOR ORIENTATION

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



Killark Box with 705 Sensor

Adalet X1HFC3L Terminal Housing

Figure 6 Terminal Housings

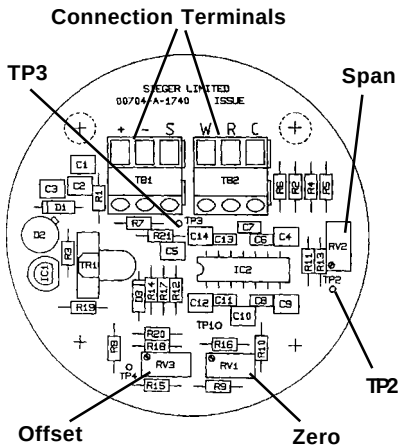
2.4 CABLE CONNECTIONS

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 are provided on the pcb in the terminal enclosure to enable connections from the sensor and to equipment in the safe area to be made. For wiring details see Figure 7.

2. INSTALLATION



Circuit Board Assembly Showing Adjustment Controls

RFI Shield Plate

Figure 7 Connections

2.5 FITTING SENSORS

WARNINGS

1. Before installing sensors, isolate the power supply by disconnecting or removing the associated control module from the installation.

2. All electrochemical cells contain acid or a caustic solution. Avoid its contact with skin, eyes and clothing. In case of contact flush 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. When replacing a sensor refer to CAUTION 1 in Section 4 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 Terminal Housing and fit the sensor to the housing. To comply with 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 the 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, proceed as follows:

(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, proceed as follows:

(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 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, proceed as follows:

(1) Remove the Filter Housing and gasket from the sensor.

(2) Ensure that the Sample Flow Housing is fitted with 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 the gasket and Hydrophobic Barrier and gassing the sensor when testing the system.

CAUTIONS

1. The ECC cell contains a small quantity of acid. When disposing of a sensor, it is necessary to comply with the current waste disposal regulations, either local or national **ECC TYPE SENSORS SHOULD NEVER BE DISPOSED OF BY PLACING IN A FIRE.**
2. Exposure to gas 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

The 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 the power supply from the sensor by withdrawing the associated Control Module from the installation.

b. Do not remove the 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 carbon monoxide using the procedures detailed in Section 6.

5.2` CROSS INTERFERENCE FROM OTHER GASES

Some gases, other than carbon monoxide, can produce an output current. Those which may be encountered and typical examples of their effect (if any) at 20ºC are as follows:

Gas	Concentration	Indication in ppm H_2S
Carbon Dioxide	5%	Less than 1
Chlorine	20ppm	Less than ±2
Ethylene	500ppm	Less than 425
Hydrogen	1000ppm	Less than 100
Hydrogen Sulphide	10ppm	Less than 38
Methane	5%v/v	Less than 5
Sulphur Dioxide	10ppm	Less than 5

5.3 SENSOR LIFE

The expected life of the detector assembly is greater than 2 years. The guaranteed life is 12 months in use plus 6 months storage, subject to storage at a stable temperature between -10ºC to +20ºC. This guarantee will not apply to extended use in harsh environments.

5. CALIBRATION

5.4 CALIBRATION PROCEDURE

Notes: 1. Ensure that the sensor is not pressurised during calibration by blockage of the exhaust (outlet of the Flow Housing).

2. This procedure will produce an upscale output signal which may activate alarms if fitted. Refer to the Warnings in Section 2 Installation before proceeding.

(1) Allow a minimum warm-up period of 1 hour after applying power before carrying out this procedure.

(2) Insert the Digital Multimeter (DMM), set to read current, in series with the 4 - 20mA line.

(3) Ensure that the sensor is in a gas-free atmosphere then, if necessary, adjust the ZERO control for 4mA on the DMM.

(4) Gas the sensor as instructed in Section 6 'Gassing the Sensor'. After 3 minutes, set the SPAN control to obtain a 20mA indication on the DMM for 50ppm CO.

(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 pcb. (see Figure 7).

b. Adjust the ZERO control to obtain a reading of 0.000V ± 1mV on the DMM.

c. Disconnect the DMM.

d. Adjust the OFFSET control to obtain an output (at the 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 the DMM indicates 4mA. If not, adjust the ZERO control for 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 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

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

CAUTION

Upward pressure on the gassing nozzle of Weather Protection Housings, 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 gas to the sensor for a minimum period of 3 minutes.

(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, always quote the complete part number. Where a part number is not listed or known, state 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-1761	Killark HKB-BC Box (Including Sensor and Electronics)	

* These two items may be sourced locally.

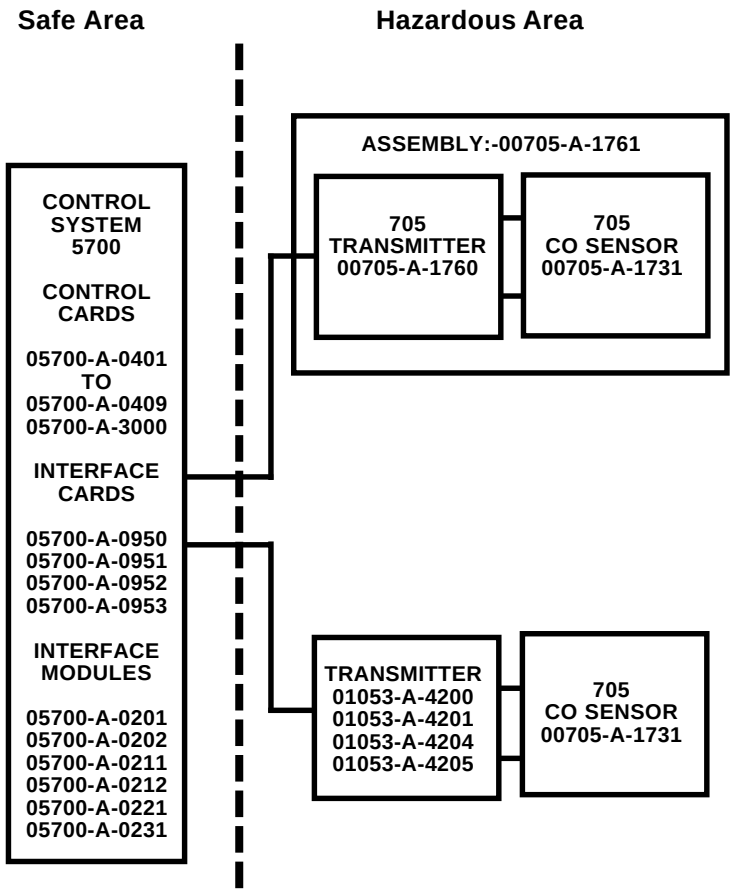
7.2 MAINTENANCE SPARES

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

Part No.	Description
00705-A-1731	Sensor Assembly CO (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

8. TYPE 705 SENSOR ALTERNATIVE SYSTEMS

TOXIC SYSTEMS



9. SPECIFICATION

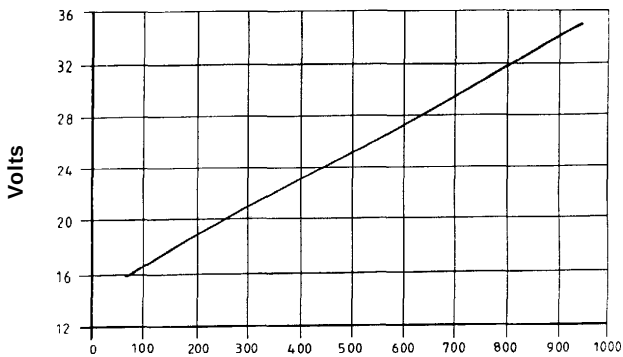
CERTIFICATION APPROVALS

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

POWER REQUIRED

16 - 35V dc. (24V nominal).

LINE RESISTANCE/LOAD RESISTANCE



Line Resistance and Load Resistance Total

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

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

$T_3$20 less than 10s.
$T_3$50 less than 15s.
$T_3$90 less than 35s.

9. SPECIFICATION

OPERATING RANGE

0 to 500ppm CO, Overrange 0 to 1000.

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 - 500ppm CO.

CONTROLS

ZERO and SPAN potentiometers are accessible through the label plate.

AMBIENT TEMPERATURE RANGE

Operating: -10°C to +45°C.

Will operate at lower temperatures with reduced specification.

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

Accuracy:

6 months pure air (-10ºC to+45ºC):

Typical baseline change ±15ppm CO.

6 months 500ppm CO exclusive of baseline (-10ºC to +45ºC):

Typical span change less tha -150 to less than ±50ppm CO.

9. SPECIFICATION

Storage (recommended):

-0º to +20ºC.

For prolonged storage it is recommended that the sensor is stored in a sealed container.

HUMIDITY RANGE

Range 0 to 90% RH non-condensing.

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

SENSOR

Dimensions: 78mm x 55mm (47.2mm across flats).

Weight: 270g

TERMINAL HOUSINGS

Killark HKB-BC:

Dimensions: 155mm x 135mm x 100mm.

Weight: 1.13kg.

Adalet X1HFC3L:

Dimensions: 115mm x 130mm x 88mm.

Weight: 1.2kg.

COLLECTING CONE

Dimensions: 87mm x 165mm dia.

Weight: 175g.

9. SPECIFICATION

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.

Accepting cable up to 2.5mm^2.

Thank you for reading this data sheet.

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

UK Office
Keison Products,
P.O. Box 2124, Chelmsford, Essex, CM1 3UP, England.
Tel: +44 (0)330 088 0560
Fax: +44 (0)1245 808399
Email: sales@keison.co.uk