CROWCON
Gas Detection You Can Trust

Part No C01456

TCgard

(formerly EXD90/TC)

Flameproof Thermal Conductivity Type Gas Detector

Installation, operating and maintenance instructions, M07180

CE 1180

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CROWCON
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instructions

1. INTRODUCTION

1.1 Product overview

TCgard is a flameproof thermal conductivity type gas detector suitable for use in Zone 1 or 2 hazardous areas. It is designed to monitor binary gas mixtures (such as hydrogen in nitrogen) at % volume levels. The detector relies on there being substantial difference in the thermal conductivity of the gases in the mixture being monitored. For a list of the gas mixtures which can be monitored using TCgard please contact Crowcon. TCgard is powered by 24 V dc (nominally) and provides a 4-20 mA signal (sink or source) proportional to gas concentration.

1.2 Product description

TCgard comprises three main parts; a sensor housing, amplifier and junction box. The complete detector, (with junction box cover removed to show amplifier and wiring detail) is shown in Diagram 1.

Please note: 96HD sensor and amplifier unit (junction box) have been certified seperately. 96HD: Sira02ATEX1283X and Amplifier unit (junction box): Baseefa03ATEX0074.

The 96HD sensor housing is a modular stainless steel assembly which dismantles to allow plug-in thermal conductivity sensors to be replaced easily. The assembly is certified EEx d IIC T6 and screws into the junction box. An exploded view of the 96HD sensor housing is shown in Diagram 2.

The amplifier is mounted in the junction box. All electrical connections to the detector are made via the terminal block on the amplifier. The amplifier provides power to the sensor and converts the gas reading into a 4-20 mA signal for connection to a control panel.

The junction box is manufactured from galvanised cast iron and is certified EEx d IIC T6. The junction box is supplied with 1 x M20 cable entry for customer use. Alternative cable entries are available on request. Adaptors for NPTF entries are also available (see Section 4, Spare Parts and Accessories).

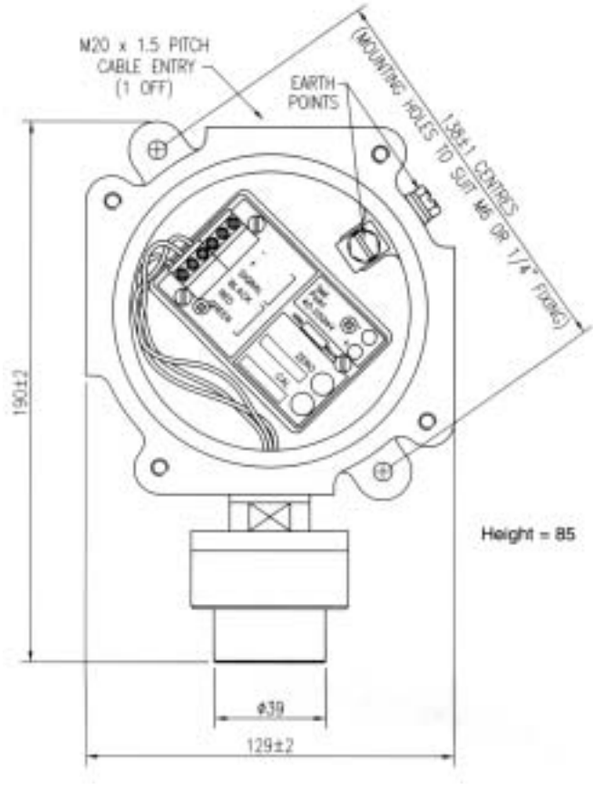

Diagram 1: *TCgard assembly*

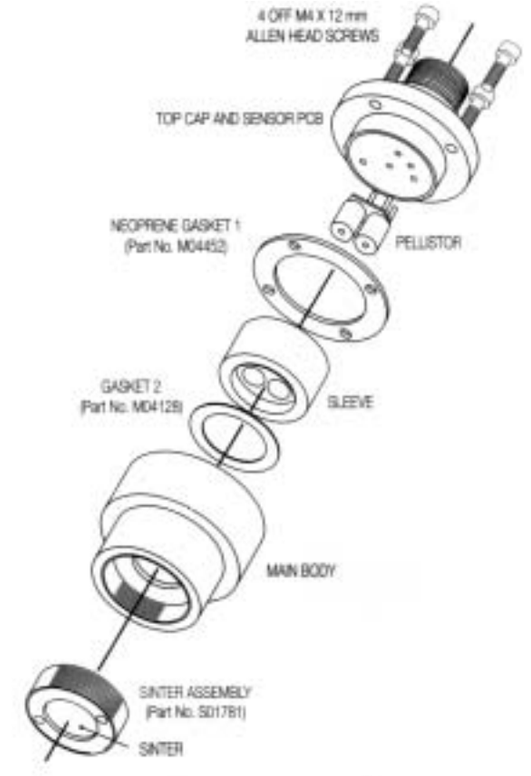

Diagram 2: *96HD sensor housing*

2. INSTALLATION

WARNING

TCgard is designed for use in Zone 1 and 2 hazardous areas and is certified EEx d IIC T6. Installation must be in accordance with the recognised standards of the appropriate authority in the country concerned. For further information please contact Crowcon. Prior to carrying out any installation work ensure local regulations and site procedures are followed.

2.1 Location

The detector should be mounted where the gas is most likely to be present. The following points should be noted when locating gas detectors:

- To detect gases which are lighter than air (eg. hydrogen in nitrogen), detectors should be mounted at high level and Crowcon recommend the use of a Collector Cone (**Part No. C01051)**.
- To detect heavier than air gases (eg. propane in nitrogen) detectors should be mounted at low level.
- Consider the possible damage caused by natural events eg. rain or flooding. For detectors mounted outdoors Crowcon recommend the use of a weatherproof cap (**Part No. C01442)**.
- Consider ease of access for functional testing and servicing.
- Consider how the escaping gas may behave due to natural or forced air currents. Mount detectors in ventilation ducts if appropriate.
- Consider the process conditions. For instance, when gases which are normally heavier than air are released from a process line which is at an elevated temperature and/or pressure, the gas may rise rather than fall.

The placement of sensors should be determined following advice of experts having specialist knowledge of gas dispersion, the plant processing equipment as well as safety and engineering issues.

The agreement reached on the locations of sensors should be recorded. Crowcon would be pleased to assist in the selection and siting of gas detectors.

2.2 Mounting

The mounting detail of TCgard is given in Diagram 1. TCgard should be installed at the designated location with the detector pointing down. This ensures that dust or water will not collect on the sinter and stop gas entering the detector. A Swivel Mounting Bracket is available from Crowcon to assist in the mounting of the detector (**Part No. C01340**).

2.3 Cabling requirement

Cabling to TCgard must be in accordance with the recognised standards of the appropriate authority in the country concerned and meet the electrical requirements of the detector. Crowcon recommend the use of steel wire armoured (SWA) cable and suitable explosion proof glands must be used. Alternative cabling techniques, such as steel conduit, may be acceptable provided appropriate standards are met.

TCgard requires a DC supply of 10-30 volts at up to 350 mA. Care should be taken to ensure the minimum DC supply of 10 volts is observed at the detector taking into account the voltage drop due to cable resistance.

For example, a nominal dc supply at the control panel of 24 volts has a guaranteed minimum supply of 18 volts. The maximum voltage drop allowed is therefore 8 volts. TCgard can demand up to 350 mA and so the maximum loop resistance allowed is 22 Ohms. A 1.5 mm^2 cable will typically allow cable runs up to 900 m. Table 1 shows maximum cable distances given typical cable parameters. The table is provided for guidance only, actual cable parameters for each application should be used to calculate maximum cable distances.

The acceptable cross sectional area of cable used is 0.5 to 2.5 mm^2 .

C.S.A. (mm^2)	Resistance (Ohms per km)		Max. Distance (km)
	Cable	Loop	
1.0	18.1	36.2	2.2
1.5	12.1	24.2	3.3
2.5	7.4	14.8	5.4

Table 1: Maximum cable distances for typical cables

2.4 Electrical connections

All connections are made via the 6 way terminal block mounted on the amplifier in the junction box. The 3 wires from the 96HD sensor housing are colour coded and should be terminated in the corresponding colour coded terminal. The remaining terminals marked '+','-' and 'Signal' are connected to the control equipment. TCgard is factory set as a 4-20 mA source device unless specified otherwise when ordering. This is set via an internal switch in the amplifier and may be changed to 'Sink' on site if necessary. Diagram 3 summarises the electrical connections.

Note: The junction box and cable armour must be earthed at the detector or control panel to limit the effect of radio frequency interference, and to maintain electrical safety.

2. INSTALLATION (continued)

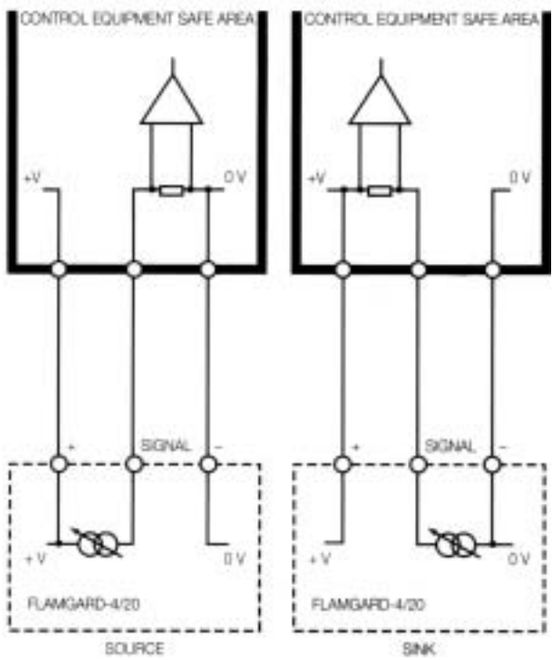

Diagram 3: *Electrical connections*

3. OPERATION

WARNING

Prior to carrying out any work ensure local regulations and site procedures are followed. Never attempt to open the detector or junction box when flammable gas is present. Ensure the associated control panel is inhibited so as to prevent false alarms.

3.1 Commissioning procedure

a. Open the junction box of the detector by removing the 4 x M6 Allen head screws.
b. Check that all electrical connections have been made and are correct as per Diagram 3.
c. Apply power to the detector and ensure the minimum supply voltage of 10 V dc is available at the detector across terminal '+' and '-'.
d. Leave the detector to stabilise for 1-2 hours.
e. Connect a digital volt meter (DVM) to the test points on the amplifier in the junction box. Note: The test points read 40 mV = 4 mA = zero up to 200 mV = 20 mA = 100% FSD. There is a current clamp of 24 mA on the 4-20 mA output.
f. Check the amplifier label for details of the background gas. This is normally air, but may be argon, nitrogen or carbon dioxide.
g. Check the zero by passing a sample of background gas over the detector at a flow rate of 100 ml/min. Adjust the 'ZERO' pot on the amplifier until the DVM reads 40 mV.
h. Apply calibration gas to the detector at a flow rate of 100 ml/min. Contact Crowcon for the supply of calibration gas.
i. Allow the gas reading to stabilise and adjust the 'CAL' pot until the DVM reads the appropriate reading (120 mV = 50% of scale if used).
j. If the control equipment display requires adjustment consult the operating manual for the equipment.
k. Close the junction box of the detector ensuring the 4 x M6 Allen head screws are securely fastened.
l. The detector is now operational.

3.2 Routine maintenance

The operational life of the sensor depends on the application for which it is being used. Crowcon expect that such a device will work satisfactorily for up to 5 years in ideal conditions. Site practices dictate the frequency with which detectors are tested. We recommend that detectors be gas tested at least every 6 months and re-calibrated as necessary. To re-calibrate a detector follow steps 3.1 (a.), (e.) to (l.) above.

3.3 Sensor replacement/servicing of detectors

TCgard uses the 96HD sensor housing which allows the user to replace the sensors, gaskets and sinter if necessary. An exploded view of the sensor housing is shown in diagram 2 for reference. The following procedure may be followed when servicing a TCgard detector.

WARNING

This work should be carried out by Crowcon or an approved service centre unless suitable training has been received.

a. Switch off and isolate power to the detector requiring attention.
b. Open the junction box by unscrewing the 4 x M6 Allen head screws.
c. Disconnect the 3 sensor wires from the terminal block.
d. Unscrew the complete sensor housing from the junction box.
e. Open the 96HD sensor housing by removing the four Allen head screws from the Top Cap with a 3mm Allen Key.
f. Remove the sensor from the Top Cap PCB.
g. Fit the replacement sensor checking the part number is correct. This part number is labelled on the main body of the detector. Observe pin alignment with PCB.
h. Inspect the gaskets and replace if necessary.
i. The sinter assembly will only need to be replaced if it has become blocked by dust or oil. This causes the response time of the detector to be slow and may affect sensitivity. To remove the sinter a removal tool (Part No. M01614) is required. Loctite No 243 must be used on sinter assembly threads to maintain certification.
j. Re-assemble the 96HD housing taking time to ensure that the four Allen head screws are securely fixed into position.
k. Fit the 96HD sensor housing to the junction box ensuring that the colour coded wires are terminated correctly.
l. Remove the amplifier fixing screws and rear lid.
m. Connect a DVM to TP2 on the amplifier PCB.
n. Switch on power and adjust VR3 until DVM reads 0 mV.
o. Re-assemble the amplifier.
p. Follow the Commissioning Procedure given in 3.1 above.

If a spare 96HD sensor housing complete with new sensor is available, ignore steps (e.) to (j.) and return the old 96HD to Crowcon or an approved service centre for repair.

4. SPARE PARTS AND ACCESSORIES

Description	Part Number
M20 to 1/2" NPTF adaptor	M02125
M20 to 3/4" NPTF adaptor	M02281
Flow adapter 96HD	C01688
Collector cone	C01051
96HD weatherproof cap	C01442
Swivel mounting bracket	C01340
96HD sensor housing complete with sensor	S01754
96HD replacement sensor	S01638
Sinter removal tool	M01614
Loctite No. 243	
Sinter assembly	S01781
Gasket 1	M04452
Gasket 2	M04128
Calibration gas	Contact Crowcon

5. SPECIFICATION

Dimensions	190 x 129 x 85 mm (7.3 x 5 x 3.4 inches)
Weight	4.0 kg (8.8 lbs)
Operating voltage	10-30 V dc
Current consumption	35 mA @ 10 V, 22 mA @ 24 V (power)
Operating temperature	10-55°C (40-75°F)
Humidity	0-99% RH, non-condensing
Cable loop resistance	220 Ohms @ 22 V +ve terminal (power) 600 Ohms @ 22 V signal terminal (4-20 mA) Common 0 V
Degree of protection	IP66 (when fitted with Weatherproof Cap)
Explosive protection	Flameproof
Approval code	Ex II 2 G EEx d IIC T6
Safety certification no.	Amplifier unit (Junction Box): Baseefa03ATEX0074 96HD: Sira02ATEX1283X
Standards	EN50014, EN50018
Zones	Certified for use in Zone 1 or Zone 2 areas. (see area classifications section)
Gas groups	IIA, IIB, IIC
EMC	EN50270
Detector output	4-20 mA source or sink selected by internal switch

NOTES

Area Classifications:-

Zone 0: An area classified, as Zone 0 will have ignitable concentrations of flammable gases, vapours or liquids present continuously or for long periods of time under normal operating conditions.

Zone 1: An area classified, as Zone 1 is likely to have ignitable concentrations of flammable gases, vapours or liquids present under normal operating conditions.

Zone 2: An area classified, as Zone 2 is not likely to have ignitable concentrations of flammable gases, vapours or liquids present under normal operating conditions.