

# CROWCON

# Instructions

Part No C01625

## Cirrus

### Fixed Point

### Infrared

### Flammable Gas

### Detector

#### 1. INTRODUCTION

##### 1.1 Product overview

**CIRRUS** is a dual wavelength, fixed point, infrared gas detector for the detection of C1 to C8 hydrocarbons in the range 0-100% LEL. It is designed for continuous operation in the harshest of environments where speed of response and accuracy are essential. Cirrus is powered by 24 V dc and provides a 4-20 mA signal (sink or source) proportional to the gas concentration. The unit is certified flameproof and may be fitted in zone 1 or 2 hazardous environments. For a list of gases which can be detected using Cirrus please contact Crowcon.

##### 1.2 Product description

Cirrus comprises two main parts, the docking station and IR detector. Diagram 1 shows the overall general arrangement of Cirrus. All housings are manufactured from 316 stainless steel and when assembled form an explosion proof detector for use in zone 1 or 2 hazardous environments. Cirrus is certified EEx d IIC T6 and UL Class 1, Zones 1 & 2, EEx d IIC T6.

All field cables are terminated at the docking station which can be supplied independently of the main detector. When supplied separately the docking station is fitted with a temporary dust cover. This cover is uncertified, so the docking station can only be installed in a hazardous area and cabled to, ready for fitting of the detector during commissioning, if a hot-work permit applies. This ensures that cabling can be carried out in advance of commissioning so reducing the risk of damage to the detector. As standard the docking station is supplied with one female M20 entry (alternative entries are available upon request). Terminals for up to 2.5 mm<sup>2</sup> cable are provided for all connections. Diagram 2 shows the docking station general arrangement. Provision is made for the attachment of identification tags as required.

The IR detector includes the electrical compartment, optical chamber and weatherproof cover (optional). Cirrus is calibrated at the factory to detect the target gas specified when ordering. A self-test option is available which includes a pre-calibrated filter built into the detector. This filter is automatically switched into the path of the infrared beam to check whether or not the detector is working correctly.

The test is invoked automatically by the processor and is totally transparent to the user. If the detector fails this test, a fault signal is raised. The specification sheet provided with each detector should be consulted to determine the unit's specific functionality.

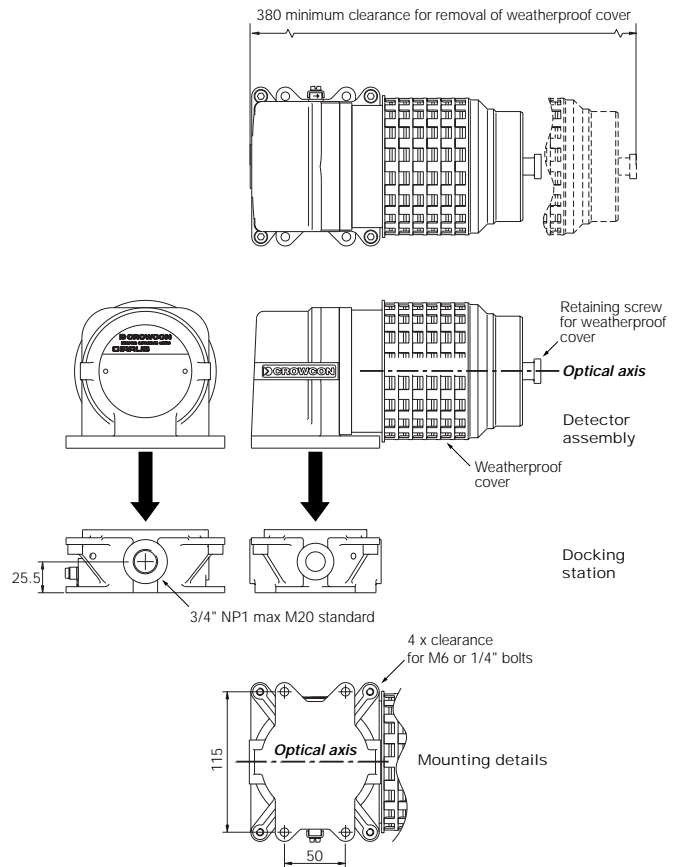


Diagram 1: Cirrus general arrangement

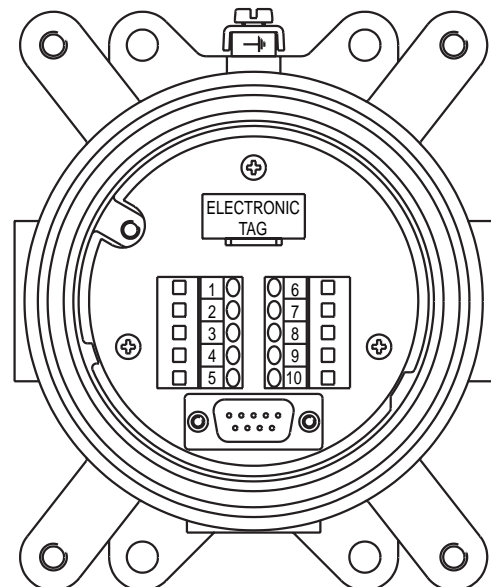


Diagram 2: Docking station general arrangement

## 2. INSTALLATION

### WARNING

Cirrus is designed for use in Zone 1 and 2 hazardous areas, and is certified to EEx d IIC T6 and UL Class 1, Zones 1 & 2, 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

There are no rules which dictate the siting and location of detectors, however, considerable guidance is available from BS6959:1988 - 'British Standard Code of Practice for the Selection, Installation, Use and Maintenance of Apparatus for the Detection and Measurement of Combustible Gases'. Similar international codes of practice may be used where applicable. In addition certain regulatory bodies publish specifications giving minimum gas detection requirements for specific applications.

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

- To detect gases which are lighter than air (eg. methane), detectors should be mounted at high level.
- To detect heavier than air gases (eg. butane) detectors should be mounted at low level.
- Consider the possible damage caused by natural events eg. rain or flooding.
- 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. Butane is normally heavier than air, but if 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 location of sensors should be recorded. Crowcon would be pleased to assist in the selection and siting of gas detectors.

### 2.2 Mounting

Diagram 1 shows the mounting arrangement of Cirrus. The docking station may be installed early in the construction phase of the plant and the detector connected during commissioning of the system. This minimises the risk of damage or contamination of Cirrus due to construction work.

Cirrus is mounted at the designated site with the optical axis of the detector horizontal ( $\pm 15^\circ$ ). The weatherproof cover has been designed to allow maximum gas flow into the optical chamber so providing the best speed of response while ensuring a high degree of dust and water ingress protection whilst horizontal. If Cirrus is used with the optional flow adaptor, non horizontal mounting is possible as long as the air/gas flow is not highly humidified.

### 2.3 Cabling Requirements

Cabling to Cirrus 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.

Cirrus requires a DC supply in the range 12-32 volts at 4 Watts. Care should be taken to ensure the minimum DC supply of 12 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 6 volts. Cirrus can demand up to 370 mA and so the maximum loop resistance allowed is 16 Ohms. A 1.5 mm<sup>2</sup> cable will typically allow cable runs up to 660 m. Table 1 below shows maximum cable distances given typical cable parameters. The acceptable cross sectional area of cable used is 0.5 to 2.5 mm<sup>2</sup>.

C.S.A. (mm <sup>2</sup> )	Resistance (Ohms per km)		Max. distance (m)
	Cable	Loop	
1.0	18.1	36.2	440
1.5	12.1	24.2	660
2.5	7.4	14.8	1080

Table 1: Maximum cable distances for typical cables

Table 1 is provided for guidance only, actual cable parameters for each application should be used to calculate maximum cable distances.

### 2.4 Electrical Connection for 4-20 mA Usage

Cirrus has two possible electrical configurations; Current source 4-20 mA and Current sink 4-20 mA.

As standard, Cirrus is supplied configured as a current source unless specified otherwise when ordering. For details of how to change this configuration in the field, contact Crowcon.

Refer to diagram 2 for terminal layout and diagram 3 for electrical connections. Terminals are designated as follows:

1. 24 V dc (nominal)
2. 0 V
3. 4-20 mA signal

Terminals 4 to 10 are reserved for digital communications and must not be used to terminate spare cores.

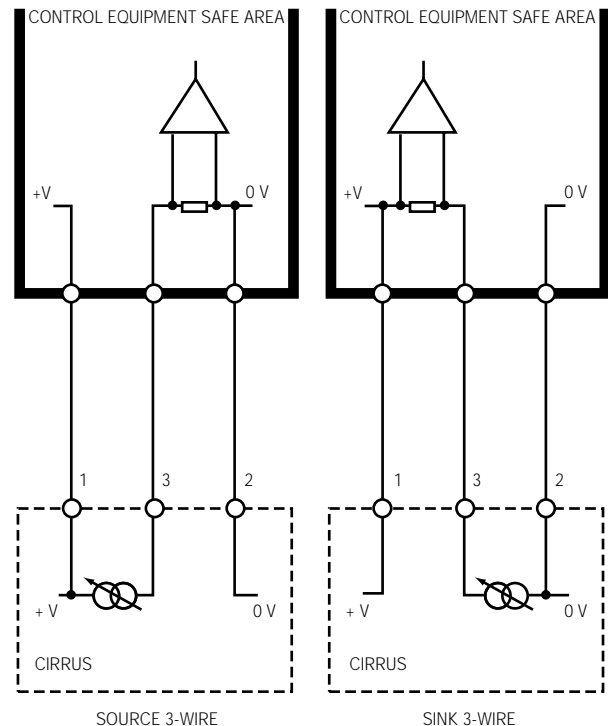


Diagram 3: Electrical connections for 4-20 mA usage

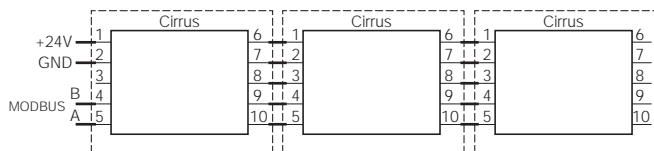
**Note:** The junction box and cable armour must be earthed at either the detector or control panel to limit the effects of radio frequency interference. It is good practice to provide the earth connection at the safe area only, so as to avoid earth loops.

### 2.5 Electrical Connection for Digital Communication

A digitally connected Cirrus has the following terminal designation.

Line in	Line out
1 24V dc (nominal)	6=1
2 0V	7=2
3 unused	8=3
4 Modbus RS485B	9=4
5 Modbus RS485A	10=5

please refer to Modbus multidrop system drawing.



**Diagram 4: Typical connection diagram for Cirrus used in a Modbus multi-drop system**

The digital communications facilities, present in all Cirrus detectors may be used by connection of a Modbus 485 master to terminals 4&5 in the Cirrus docking unit.

Full fault diagnosis and occasionally repair is possible over this common link. Re-zeroing/re calibrating is possible as is alteration of the configuration, (please refer to section 3.6) and viewing internal data in order to schedule maintenance etc.

### 2.6 Connection of the Detector to the Docking Station

Ensure that power to the detector is isolated at the control panel. Prior to installation of the detector check that all electrical connections to the docking station are correct.

The detector is connected to the docking station via a flying lead terminated in a 9 way D type connector. This connector is plugged into the docking station's female connector and secured using the two retaining screws supplied. The unit is fixed securely to the docking station with four M6 screws.

## 3. OPERATION

**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 that the associated control panel is inhibited so as to prevent false alarms.**

**Note:** Cirrus is factory calibrated to detect the required flammable gas and provide a 4-20 mA output proportional to 0-100% LEL of that gas. The control panel which is used to indicate the gas concentration should be pre-configured to accept 4-20 mA input prior to connection of Cirrus. Please contact the supplier of the control panel being used for assistance.

### 3.1 Initial Start Up

Prior to switching on Cirrus for the first time, inhibit any local control functions from the control panel to which Cirrus is connected.

Once field cabling is complete and connections have been checked, the 24 V dc supply may be switched on. After switch on, Cirrus performs a self check routine. Leave Cirrus to warm up for 10 to 15 minutes approximately.

After the warm up period Cirrus is fully operational and the output signal is proportional to the concentration of hydrocarbon gas or vapour present at the detector. As standard Cirrus provides a 4-20 mA signal proportional to 0-100 %LEL methane (for calibration purposes 5%VV = 100%LEL). Other calibrations are available and the specification for each instrument should be consulted to discern the correct operation. If the output reads other than 4-20 mA see Section 3.3 'Fault Diagnosis'.

### 3.2 Normal Operation

Operational state	LED indication	Detector output	Comment
Start up	Flashing green	2 mA	10-15 minutes
Normal	Green continuous	4.0-11.2 mA	-5-45% LEL
Normal	Red/green alternate	11.2-12.8 mA	45-55% LEL
Normal	Red continuous	12.8-20.8 mA	55-105% LEL
Detector fault	Amber continuous	0 mA	Unrecoverable fault
Dirty optics	Flashing amber	2 mA	Recoverable fault
Over range	Flashing red	>22 mA	

**Table 2: LED status indication**

Cirrus includes a tricolour LED visible through the quartz window of the detector with the Weatherproof Cover removed. The LED gives the user basic information concerning the state of the detector. This is basic information concerning the state of the detector. This is summarised in Table 2 below.

### 3.3 Fault Diagnosis

Cirrus is designed to provide user free operation and includes a number of diagnostic routines which are transparent to the user. Two types of fault condition may occur, one is 'dirty optics' indicated by a 2 mA signal and the other is an unrecoverable fault signalled by 0 mA.

Cirrus continuously checks that the optics are clean. Should the optics become blocked or obscured by more than 75% the 4-20 mA output is clamped to 2 mA signalling dirty optics. Although the optics should be cleaned as soon as possible, Cirrus will continue to report the presence of gas concentrations greater than 10% of full scale. However, when the optics are obscured by more than 90% the 4-20 mA output is clamped to 0mA signalling a beam block condition with no gas detection capability. This may be cleared by removing the Weatherproof Cover and cleaning the optics with an IPA impregnated lint free cloth. It is advisable to inhibit the control panel before cleaning the optics.

If the output is 0 mA then remove power from the detector, wait 15 seconds and reconnect the power. If after carrying out the self check routine (10-15 minutes) the output remains at 0 mA, it is worthwhile checking that the optics are clean, the supply voltage is correct and that the operating temperature is between -40°C and +80°C. If these are correct, the detector should be removed and returned to Crowcon for repair.

### 3.4 Functional Testing

Prior to testing Cirrus inhibit any local control functions from the control panel to which Cirrus is connected.

Site procedures may dictate that the system be tested periodically with the target gas. A Calibration Cover (part no. C01660) is available which slides over the Weatherproof Cover. The cover has a 6mm OD compression fitting on the inlet and a 10 mm OD compression fitting on the outlet. Test gas may be plumbed to the cover and gas applied at a flow rate of 1.5 to 2.5 litres/minute for 1 minute. 50%LEL gas in air is recommended.

### 3.5 Maintenance

There are no user serviceable parts in Cirrus. Maintenance is limited to the cleaning of optics as and when required. The use of a lint free IPA impregnated cloth is recommended for cleaning of the optical surfaces.

### 3.6 Alteration of Configuration

Cirrus comes pre-calibrated and set with the configuration requested. This may be changed by use of the digital communications facilities (making use of a PC or PLC as a local master), or by use of the FRAM socket internal to the docking station.

Selections of fault current may be made from 0,2 or 24 mA. Gas type, full scale gas concentration, address, and period between self tests (if present) may be selected or changed. Custom software (SetCirrus) is available for IBM compatible PCs, details of this and the Modbus interface may be obtained from CROWCON.

## 4. SPARE PARTS AND ACCESSORIES

Description	Part Number
Weatherproof cover	S01721
Calibration cover	C01660
Flow adaptor	C01659
Pellistor mimic	C01648
5 mm Hex wrench	M07172
Calibration gas	Contact Crowcon

## 5. SPECIFICATION

<b>Function</b>	Detection of hydrocarbon gases in the 0–100% LEL range by infrared absorption
<b>Optical system</b>	Dual beam, dual wavelength, dual detector with fuzzy optics
<b>Operating voltage</b>	18–30 V dc (nominal 24 V)
<b>Typical outputs</b>	All levels configurable: 0 mA; fault 2 mA; dirty optics 4–20 mA; 0–100% LEL 22 mA; over range
<b>Response time</b>	T90 < 10 sec. (inc. Weatherproof Cover)
<b>Communications</b>	Modbus (RS485) serial link
<b>Dimensions</b>	240 x 130 x 175 mm (9 x 5.2 x 7 inches)
<b>Weight</b>	7 kg (15.4 lbs)
<b>Construction</b>	Stainless steel 316 ANC4
<b>General immunity</b>	Immune to sunlight and all catalyst poisons
<b>RF radiation</b>	Tested to EN55022 class B and meets EN50081-1
<b>RF immunity</b>	Tested to IEC801-3 and meets EN50082-2
<b>Temperature range</b>	-40 to +80°C (-40 to +176°F)
<b>Humidity range</b>	0–99% RH non-condensing
<b>Certification</b>	EEx d IIC T6 (EN50014, EN50018) (T <sub>amb</sub> = -40 to +65°C (-40 to +149°F)) EEx d IIC T5 (T <sub>amb</sub> = -40 to +80°C (-40 to +176°F)) UL Class 1, Zones 1&2 (UL2279) (-40 to 149°F)
<b>Ingress protection</b>	IP66 and IP67

## NOTES

This product has been tested and found to comply with the European Directive on EMC 89/336/EEC



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