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1. INTRODUCTION

1.1 Product Overview

Nimbus is a dual wavelength, fixed point, infrared gas detector for the detection of common hydrocarbon gases in the range 0-100% LEL. It is designed for continuous operation and where speed of response and accuracy are essential. Nimbus is powered by 24 V dc and provides a 4-20 mA signal (sink or source) proportional to the gas concentration. This gas detector is certified flameproof and may be fitted in zone 1 or 2 hazardous environments

1.2 Product Description

Nimbus comprises two main parts, the docking station and IR detector. Diagrams 1 and 2 show the overall general arrangements of Nimbus. All housings are manufactured from LM25-TF marine grade alloy, and when assembled form an explosion proof detector for use in zone 1 or 2 hazardous environments. Nimbus is certified ATEX II 2G EEx d IIB +Hydrogen T6 and UL Class 1 Division 1 Groups B, C & D. All field cables are terminated at the docking station. The docking station is supplied with female M20 entry (alternative entries including 1/2 inch NPT are available upon request). Terminals for up to 2.5 mm² cable are provided for all connections. As with all IR gas detectors, Nimbus will not detect Hydrogen.

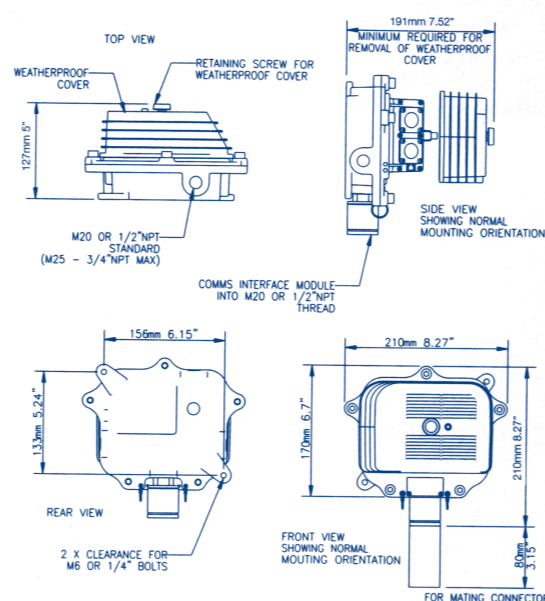


Diagram 1: Nimbus general arrangement with indoor spray/dust cover

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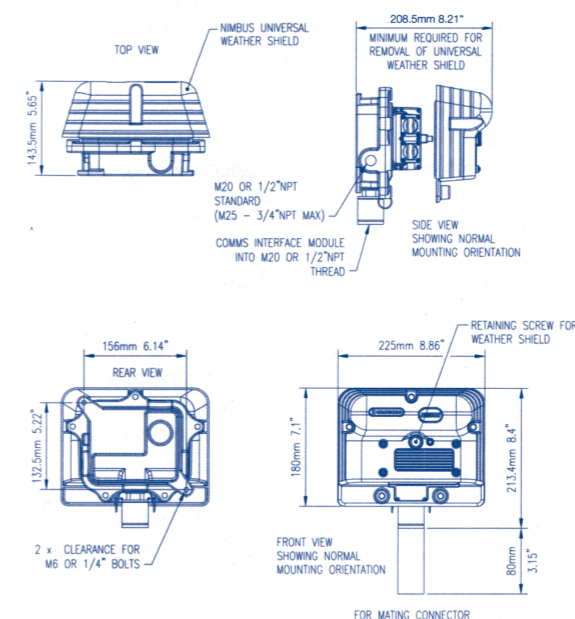


Diagram 2: Nimbus general arrangement with universal weathershield

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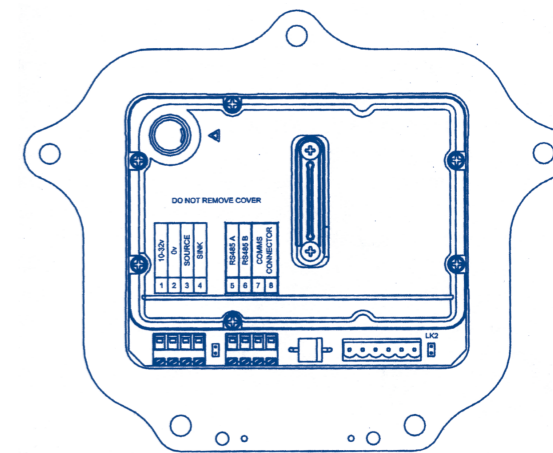


Diagram 3: Nimbus connection arrangement

Diagram 3 shows the Nimbus detector opened up to show the general wiring arrangement. Provision is made for the attachment of identification tags as required on the hinge rings.

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2. INSTALLATION

WARNING: Nimbus is designed for use in zone 1 and 2 hazardous areas and is certified to ATEX II 2G EEx d IIB +Hydrogen T6 and UL Class 1 Division 1 Groups B, C & D. 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 BS EN 50073:1999 - 'Guide for Selection, Installation, Use and Maintenance of Apparatus for the Detection and Measurement of Combustible Gases or Oxygen'. 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 Nimbus gas detector should be mounted where the flammable gas to be detected is most likely to be present. Note the following points when locating gas detectors:

- To detect gases which are lighter than air (e.g. methane) detectors should be mounted at high level
- To detect heavier than air gases (e.g. butane) detectors should be mounted at low level.
- Consider the possible damage caused by natural events e.g. 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 current. 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

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5. SPECIFICATION

Function	The detection of common hydrocarbon gases C1 to C6 + ethanol, ethylene and LPG in the LEL range by means of infrared absorption
Dimensions	125x170x210 mm (5"x6.8"x8.3")
Weight	2.5 kg (5.5 lbs)
Construction	LM25 marine grade alloy polyester powder coated
Optical system	Dual wavelength, dual detector
Optical performance	Correct operation with up to 90% obscuration Dirty optics warning above 75% (configurable) Heated optics to avoid condensation
Power consumption	Operating voltage: 10 to 32 V dc (nominal 24 V)
Link LK2 Fitted	Operating current: 300 mA maximum (7.2 W @ 24 V, 3 W @ 10 V)
Link LK2 Not Fitted	Operating current: 180 mA maximum (4.3 W @ 24 V, 1.8 W @ 10 V)
Typical Output Signals	All levels Configurable - simultaneous sink and source output 0 mA: fault 2 mA: dirty optics 4-20 mA: 0-100% LEL 24 mA over range Current output can drive into a maximum of 350Ω
Status Light	Green - normal function Orange - fault Red - detecting gas 22 other conditions indicated by flash rate
Communications	Modbus RS485 serial link
Functional testing	Flow adaptor for gassing
Accuracy	±2% of gas reading ≤50% LEL* ±5% of gas reading >50% to 100% LEL*
Response time	<7 seconds - T90* <3 seconds for instantaneous high levels of gas*
Temperature range	-40°C to +65°C (-40°F to +149°F)
Humidity range	0 to 99% RH non-condensing
European Approvals and Standards	ATEX II 2G EEx d IIB +Hydrogen T6 T _{amb} = -40°C to 65°C EN50014, EN50018
UL Approvals and Standards	Class 1, Div 1, Groups B,C & D T _{amb} = -20°C to 65°C UL 1203 (When connected to a class 2 power supply)
Global Approvals	IECEX
Ingress protection	IP66 (jets of water) IP67 (submersion), NEMA4X
Light immunity	Totally immune to all external light, both constant and modulated (including sunlight, white light, flashing beacons etc)
General immunity	Totally immune to all catalyst poisons
Electromagnetic	Gas detection standard EN50270
Compatibility	RF emissions EN50081-2 RF immunity EN50082-2

*typical data measured in Crowcon's laboratory

in the selection and siting of gas detectors.

It is possible to site the Nimbus in direct sunlight. If the Nimbus surface temperatures likely to exceed 55°C (131°F) it is recommended that a sunshade be fitted (Crowcon part No C01816). Any other sunshade should be spaced at least 5 cm from the Nimbus to allow uninterrupted gas flow.

When Nimbus is being used outside, or where it will be exposed to wind, rain or sun, the universal weather shield (S011216) should be fitted to ensure correct operation. When being used indoors, particularly if the area is likely to be hosed down, then the indoor spray/dust cover (C01743) should be used.

2.2 Mounting

Diagrams 1 and 2 show the typical Nimbus mounting arrangement. The indoor spray/dust cover and the Universal Weathershield have been designed to allow maximum gas flow into the optical chamber in this orientation so providing the best speed of response while ensuring a high degree of water ingress protection from rain or hose.

Nimbus may be mounted in open locations (for example on oil platforms or refineries) together with the Universal Weathershield (S011216) which has been designed to

enhance the gas detection response time.

For internal use the Nimbus fitted with the indoor spray/dust cover may be positioned in any orientation.

If Nimbus is to be installed in very dusty environments or in a desert where fine sand is constantly present it is strongly recommended that it is installed with the weathershield (and optical components) facing the ground as shown in the appendix on page 18. This will prevent the optical system being contaminated by dust or sand.

2.3 Cabling Requirements

Cabling to Nimbus 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, but suitable explosion proof glands must be used at all times. Alternative cabling techniques, such as steel conduit may be accepted providing appropriate standards are met.

NOTE: It is essential that cable glands are correctly installed and securely tightened to ensure that certification and water ingress protection are maintained.

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2. INSTALLATION (Continued)

Nimbus requires a dc supply in the range 10-32 V. Care should be taken to ensure the minimum dc supply of 10 V 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 V has a guaranteed minimum supply of 18 V. The maximum voltage drop allowed is therefore 8 V. Nimbus can demand up to 180 mA (with Link LK2 removed) so the maximum loop resistance allowed is 44 Ω. A 1.5 mm² cable will typically allow a cable run of up to 1800 m to the detector (3.6 km total cable length).

Table 1a and 1b below show maximum cable distances given typical figures as described in the example above. Table 1a and b are provided for guidance only, actual cable parameters for each application should be used to calculate maximum cable distances.

C.S.A. (mm ²)	Resistance (Ω per km)	Max distance from control panel (m)
1.0	18.1	730
1.5	12.1	1100
2.5	7.4	1800

Table 1a: Maximum cable distances for typical cables with Link LK2 fitted (Anti-Condensation heater)

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C.S.A. (mm ²)	Resistance (Ω per km)	Max distance from control panel (m)
1.0	18.1	1270
1.5	12.1	1830
2.5	7.4	3000

Table 1b: Maximum cable distances for typical cables with Link LK2 removed

2.4 Electrical Connection

Nimbus has three possible electrical configurations. Current source 4-20 mA, current sink 4-20 mA, or both together for redundant operation.

Refer to diagram 3 for terminal layout and diagram 4 for electrical connections. Terminals are designated as follows:

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

Unused terminals must not be used to terminate spare cores.

NOTE: Link 1 (LK1) should only be fitted if local regulations require the 0V supply to the detector to be connected to earth. This link is not normally fitted.

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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.

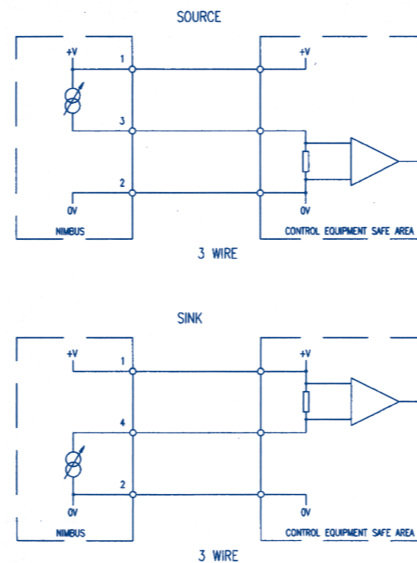


Diagram 4: Nimbus electrical wiring

NOTE: The UL classified version of Nimbus must be connected to Class 2 Power Supply.

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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: Nimbus is factory calibrated to detect the required flammable gas and provide a 4-20 mA output proportional to LEL levels 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 Nimbus. Please contact the supplier of the control panel being used for assistance.

3.1 Initial Start Up

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

Nimbus is supplied with Link LK2 fitted as standard. This provides the maximum heating to the optical system to allow Nimbus to operate where condensation is a problem.

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Determine whether there is a requirement for the extra heating element to prevent condensation. If not remove the Link LK2 which is situated to the right of the connectors on the Optical Mounting Plate (see diagram 3).

Once field cabling is complete and connections have been checked, the 24 V dc supply may be switched on. After switch on, Nimbus performs a self check routine, and must be allowed to warm up. This usually takes 10 seconds. However, if this is the first time the unit has been powered since installation, please leave the detector powered for 3 hours, **DO NOT** gas test the unit during this time.

After the warm up period, Nimbus is fully operational and the output signal is proportional to the concentration of hydrocarbon gas or vapour present at the detector, relative to the calibration gas concentration. As standard, Nimbus provides a 4-20 mA signal proportional to 0-100%LEL methane. 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 please refer to Section 3.3 'Fault Diagnosis'.

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3. OPERATION (Continued)

3.2 Normal Operation

Nimbus includes a tricolour LED visible via a light pipe which protrudes through the cover. The LED gives the user basic information concerning the state of the detector. This is summarised in Table 2 below.

Operational State	Led indication	Detector Output	Comment
Start up	OGOG	2 mA	10 Seconds
Normal	G---	4.0-7.2 mA	-6%-20%
Normal	RR--	7.2-10.4 mA	20%-40%
Normal	R-R-	10.4-21 mA	40%-106%
Dirty Optics	O---	2 mA	Recoverable Fault
Recoverable	O-O-	0 mA	
Fault			
Unrecoverable	OOO-	0 mA	
Fault			
Overrange	RRR-	22 mA	

O=Orange, G=Green, R=Red, -= no illumination

NOTE: All 'Detector Output' ranges are configurable using Nimbus PC software.

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3.3 Fault Diagnosis

Nimbus is designed to provide stand alone 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 or beam block signalled by 0 mA.

Nimbus 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 a beam obscured or 0 mA signalling a beam blocked condition. This may be cleared by removing the indoor spray/dust cover or Universal Weathershield and cleaning the optics with an IPA impregnated lint free cloth. It is advisable to inhibit the control panel before cleaning the optics. Beam block may also be cleared in this way. For other types of fault, remove power from the detector, wait 10 seconds and reconnect the power. If carrying out the self check routine (10 seconds) the output remains at 0 mA, it is worthwhile checking the supply voltage is correct and that the operating temperature is between -40°C and +65°C. If these are correct then leave the detector continuously powered for more than 26 hours and its internal fault correction routines may sort out the fault. If after this time the mA output is still at 0 mA (i.e the unit is still in fault)

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then the Nimbus may be damaged. Contact Crowcon for advice on repair or servicing.

3.4 Functional Testing

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

Site procedures may dictate that the system be tested periodically with the target gas. This can be achieved using the calibration cover (C01744).

3.5 Maintenance

There are no user serviceable parts in Nimbus. Maintenance is limited to the cleaning of optics as and when required. For this operation lint free cloth is recommended.

NOTE: Dismantling or tampering with the optical alignment of Nimbus, including the mirrors, will affect the ability of the instrument to detect flammable gas and will void the warranty.

Calibration and Configuration of the Nimbus detector should be carried out using a Windows based computer running *NimbusPC* software. The *NimbusPc* on-line help file provides details on how to perform these functions, as well as information on the Nimbus itself.

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4. SPARE PARTS & ACCESSORIES

Description	Part Number
Indoor spray/dust cover	C01743
Calibration cover	C01744
Pellistor mimic	C01648
Sunshade	S011216
Imperial allen key	C01747
(for UL approved Nimbus)	
Metal allen key	C01746
(for CENELEC approved Nimbus)	
Calibration Gas	Contact Crowcon
Universal Weathershield	C01822

4.1 Communications

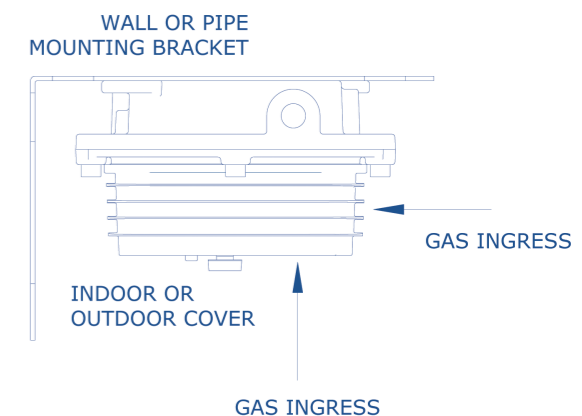
Nimbus is fitted with an optical Communication Interface Module (CIM) which is designed to allow the connection of a Windows based portable PC running *NimbusPC* software.

The software allows the user to calibrate the detector, and also check and adjust the detector's operating parameters. The software includes a full on line help file to guide the user.

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Portable PC's should only be used where the detector is mounted in a safe area, or where a 'hot work permit' has been issued.

Nimbus also provides an RS485 Modbus to DCS or SCADA systems. This output can also be used to interrogate a detector remotely using *NimbusPC*.



Appendix, Recommended mounting orientation in very dusty environments

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