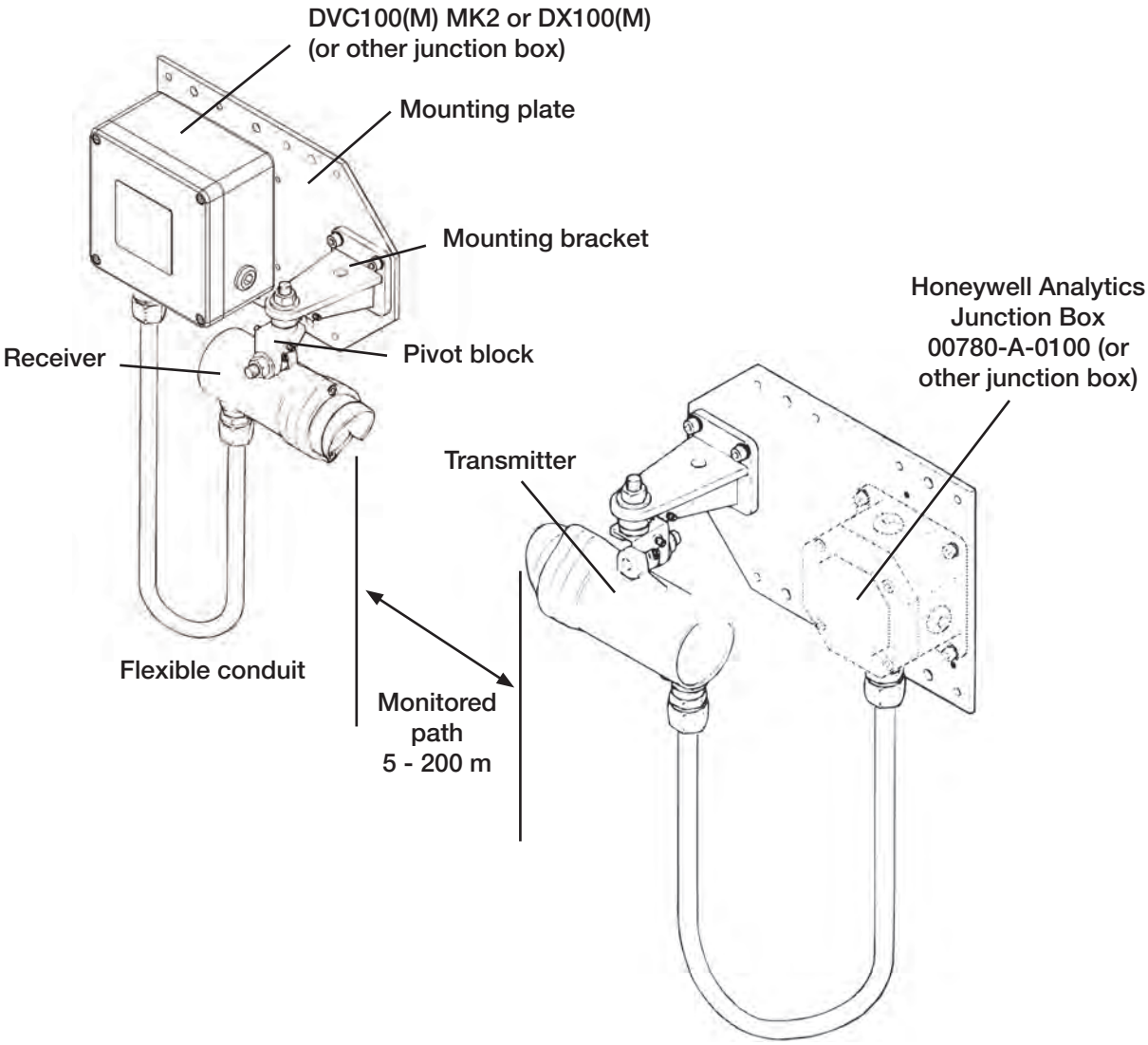
2. OVERVIEW

2.1 INTRODUCTION

Each type of Searchline Excel gas detector consists of two units, a Transmitter and a Receiver. This separate Transmitter/Receiver configuration provides the most reliable basis for open path gas detection.



2. OVERVIEW

There are three ranges of Searchline Excel gas detector. These are:

Open-Path	Short Range	5 – 40m	(15ft – 130ft)
	Medium Range	20 – 120m	(65ft – 390ft)
	Long Range	120 – 200m	(390ft – 650ft)

When designing an installation for Searchline Excel it is important that the correct range of the gas detector for each path to be monitored is selected and specified.

The Transmitter and Receiver are each mounted upon robust, adjustable mounting brackets. These brackets bolt to a mounting plate, which is designed to accommodate a variety of junction boxes, accessories and mechanical mounting configurations. The small size and flexibility of Searchline Excel and its mounting arrangements are intended to make correct installation design as simple as possible. Installation details are given in **Chapter 3**.

2.2 TRANSMITTER

The Searchline Excel Transmitter produces an intense, collimated infrared beam which is produced by a Xenon arc flashlamp.

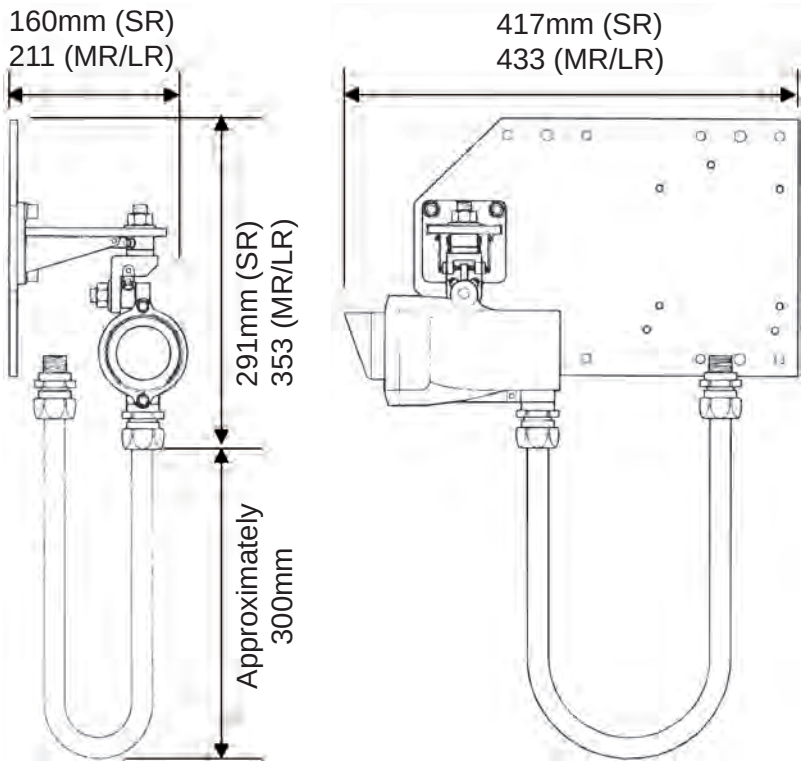
The flashlamp's infrared output is collimated using mirrors which enables a more uniform beam (no chromatic aberrations) to be produced and hence reduces alignment sensitivity. In order to prevent annoying visible flashes, the visible emissions from the flashlamp are blocked by a filter.

The Transmitter's flashlamp is pulsed at precisely 4Hz, each pulse lasting for approximately one microsecond. The precise timing and extremely short duration of these pulses give the Transmitter a very distinctive signature. This distinctive signature makes it easy for the Receiver to distinguish Searchline Excel Transmitter pulses from both natural and artificial sources of infrared radiation.

NOTE: THE INFRARED BEAM IS INVISIBLE AND EYE SAFE.

The medium and long range Transmitters contain a higher power flashlamp and larger optics than the standard short range unit. The resulting infrared beam is many times brighter which allows for a considerable increase in operating range.

2. OVERVIEW



The Transmitter window is heated to minimise condensation, frosting and the build up of snow. During particularly cold operating conditions, the heating of the Transmitter window is increased to turbo levels. The turbo mode can be disabled if not required.

Electrical connections to the Transmitter are made via wires which run through the protective, flexible conduit. There are three Transmitter wires, red (+24V), black (0V) and green/yellow (GND).

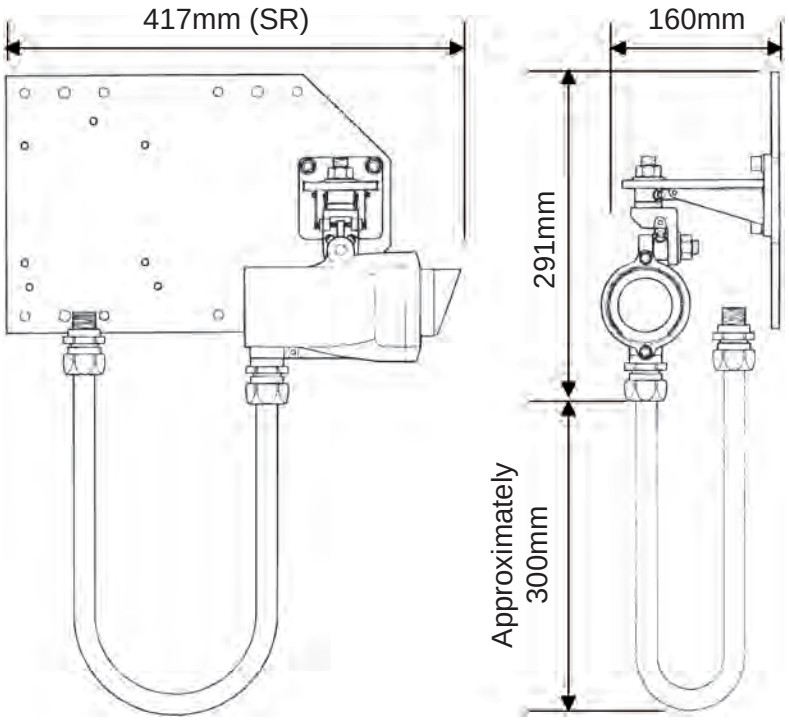
2.3 RECEIVER

The Searchline Excel Receiver collects infrared radiation from the Transmitter and performs measurements to enable hydrocarbon gases in the beam path to be detected.

Infrared radiation is collected by a single, silicon lens, which is common to both the sample and reference measurement channels. This radiation is divided by a beamsplitter and fed to two filtered detectors, sample and reference.

The sample detector input is filtered at wavelengths where strong infrared absorption is exhibited by the target gas. The reference detector input is filtered at nearby wavelengths, where strong infrared absorption is ***not*** exhibited by the target gas. By calculating the ratio of the sample to reference signal it is possible to measure the quantity of gas in the beam, whilst compensating for the effects of rain, fog, dirt etc.

2. OVERVIEW



The solid state, photovoltaic detectors used in Searchline Excel provide an exceptional dynamic range and superb temperature and long term stability. These features contribute strongly to the solar immunity and stability of Searchline Excel.

The Receiver contains all of the electronics necessary to amplify, condition and process the signals received by the infrared detectors. The advanced signal processing of Searchline Excel employs two microprocessors.

One microprocessor, the Digital Signal Processor (DSP), is used to perform the necessary intensive signal processing calculations.

The other microprocessor, the microcontroller, controls the overall function of the unit and performs the final calculations to determine the correct gas reading and output state.

The primary output of the Receiver is a signal in the range 4 - 20mA and is available as either source or sink options. For most applications, the output is calibrated for a range of 0 to 5 LEL. m. (See **Appendix B** for the explanation of LEL.m and other terms)

The Receiver also features an RS485 output which is used to communicate with the associated SHC1 Handheld Interrogator. The SHC1 is used to perform final alignment, commissioning, functional testing and diagnostic procedures.

The Receiver window is heated to minimise condensation, frosting and the buildup of snow. The level of heating applied is controlled by the microcontroller and is adjusted from zero to maximum depending on the window temperature.

Electrical connections to the Receiver are made via wires which run through the protective flexible conduit. There are six Receiver wires, red (+24V), black (0V), white (4 - 20mA), orange (RS485 A), blue (RS485 B) and green / yellow (GND).

3. INSTALLATION AND OPERATION

k. All electrical equipment connected to the gas detector should comply with EN61000-6-3:2007 and EN61000-6-2:2005.

l. The 24V supply should be free from large transients and fluctuations.

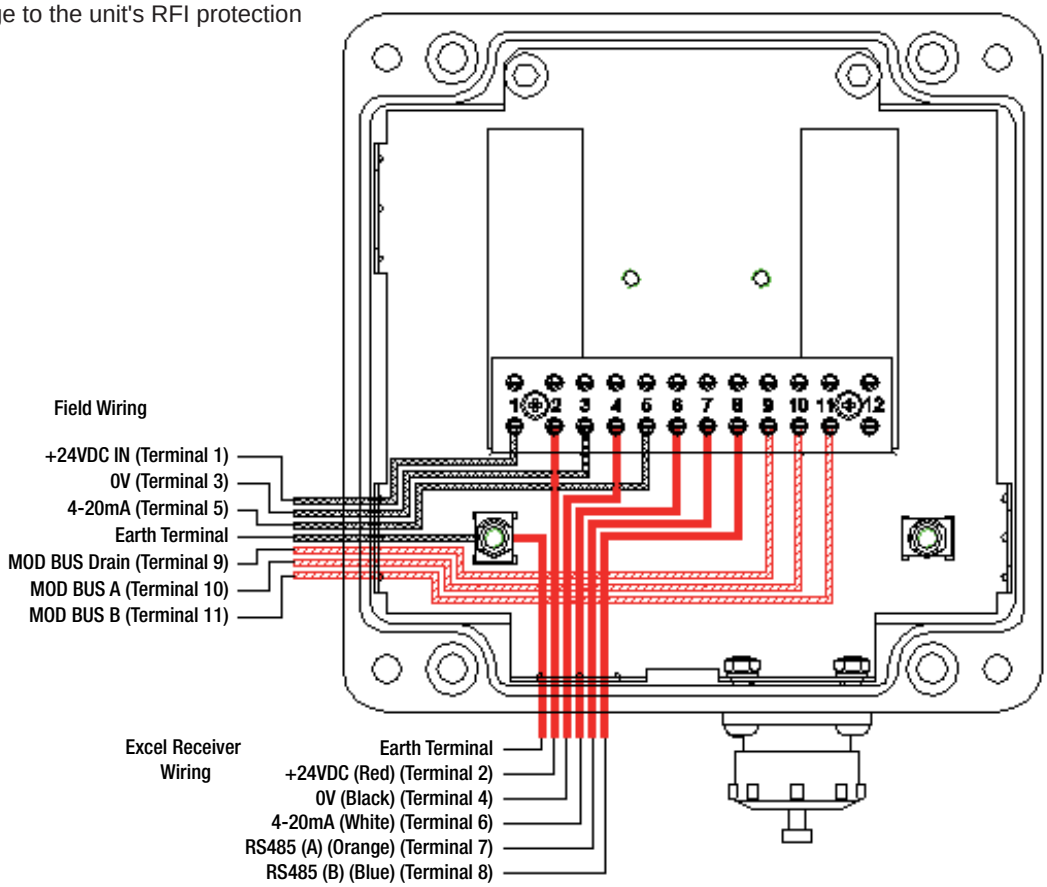
m. The field cabling conductors should have sufficient cross sectional area to ensure that the minimum supply voltage applied to the gas detector is 18V at a current of 420mA. This corresponds to a maximum round loop impedance of 14 ohms for a nominal 24V system supply.

n. Receivers should not be installed in close proximity to the antennae of high powered radio, radar and satellite communication equipment.

The following diagrams show typical earth bonding arrangements for various installations.

3.3.2 Receiver Connections via DVC100(M) MK2

The earth bonding arrangement must ensure that the maximum peak voltage between the unit case earth and any field cable conductor is less than 350V. Voltages in excess of this can cause permanent damage to the unit's RFI protection filters.



Note: Using metal cable glands will connect the screen of the cable to the Excel Body.

3. INSTALLATION AND OPERATION

3.4 POWER SUPPLY

3.4.1 General

The Searchline Excel gas detector is designed to be operated from a nominal 24V DC supply. The supply voltage at the terminals must be within the range 18 to 32V.

The unit maximum power consumption and cable lengths are as follows:

Unit Type	Maximum Power Consumption (W)	Maximum Cable Length (m) with 1.5mm² Conductors (12 ohms/km)	Maximum Cable Length (m) with 2.5mm² Conductors (7.6 ohms/km)
Receiver (All ranges)	8	550	900
SR Transmitter, (Turbo heating enabled)	5	900	1,400
SR Transmitter, (Turbo heating disabled)	3.5	1,300	2,000
MR/LR Transmitter, (Turbo heating enabled)	7.5	600	950
MR/LR Transmitter, (Turbo heating disabled)	5.5	820	1,300

Notes:

1. Control room supply voltage assumed to be +24V.

2. Standard configuration of the Transmitter is with turbo heating enabled.

Terminal sizes:
DVC100(M) MK2 0.5mm² - 4mm² (20AWG - 12AWG)
DX100(M) 0.5mm² - 4mm² (20AWG - 12AWG)
Honeywell Analytics Junction Box 00780-A-0100 0.5mm² - 6mm² (20AWG - 10AWG)

3.4.2 Power Supply Connections - Turbo heating Disabled

When connected as shown in section **3.3.4 Transmitter Connections** all ranges of Transmitter have turbo heating mode enabled.

This means that during conditions of low ambient temperature, additional heating power is applied to the unit's window to minimise condensation, frosting and snow buildup.

If the application/installation does not require turbo heating, reduced power consumption can be achieved by disabling this mode.

The turbo heating is disabled by reversing the power supply connections to the Transmitter as shown in the following diagram. All other connections remain the same.

6. SPECIFICATIONS

6.1 SYSTEM

	OPEN-PATH		
	SHORT RANGE	**MEDIUM RANGE**	**LONG RANGE**
Available Gases	All: Methane, Ethane, Propane, Butane, Pentane, Ethylene, Propylene, Butadiene.		
Range	0 - 5 LELm	0 - 5 LELm	0 - 5 LELm
Recommended Alarm Setting	Low 1 LELm High 3 LELm	Low 1 LELm High 3 LELm	Low 1 LELm High 3 LELm
Minimum Alarm Setting	0.5LELm	0.5LELm	0.5LELm
Path Length	5 - 40m (15 - 130ft)	40 - 120m (130 - 390ft)	120 - 200m (390 - 650ft)
Speed of Response	T90 less than 3seconds	T90 less than 3seconds	T90 less than 3seconds
Output signal	4 – 20mA Normal operation (0 – 5LELm)	4 – 20mA Normal operation (0 – 5LELm)	4 – 20mA Normal operation (0 – 5LELm)
Operating Temp.	All: -40°C to +65°C (-40°F to +150°F)		
Humidity	All: 0 – 99%RH Non-condensing		
Pressure	All: 91.5kPa – 105.5kPa (915 – 1055mBar, non-compensated)		
Repeatability	±0.4LELm	±0.4LELm	±0.4LELm
Temperature Drift (-40°C to+65°C)	±0.2LEL.m @ zero ±0.5LEL.m @3LEL.m	±0.2LEL.m @ zero ±0.5LEL.m @3LEL.m	±0.2LEL.m @ zero ±0.5LEL.m @3LEL.m	±10%LEL (%LEL/m) @ zero ±15%LEL (%LEL/m) @ 60%LEL
Warm-up Time	All: less than 5 minutes (operational), Less than 1 hour (fully stabilised)		
Power Supply	All: 18 to 32V		
Power Consumption	* Turbo heating activated (below 0°C)		
Transmitter **Receiver**	3.5/5* W max 8W maximum	5.5/7.5* W max. 8W maximum	5.5/7.5* W max. 8W maximum
Enclosure Material	All: 316 Stainless Steel		
Weight **Transmitter** **Receiver**	 3.5kg 3.5kg	 7.0kg 3.5kg	 7.0kg 3.5kg
Vibration	All: 2 – 60Hz, maximum peak to peak amplitude 1mm.		
Divergence/ Misalignment Tolerance	±0.5° (~±35cm at 40m)	±0.5° (~±105cm at 120m)	±0.5° (~±175cm at 200m)
IP rating	All: IP66/67		

7. CERTIFICATION

7.1 GENERAL

The Searchline Excel system is certified to Ex d and has the following major ATEX, IECEx, UL and CSA approvals for worldwide acceptance:

ATEX & IECEx

II 2G, Ex d IIC T5 (T_{amb} -40 to +65°C) Gb

Ex d IIC T6 (T_{amb} -40 to +40°C)

Certificate Numbers:

Open Path Short Range Transmitter, and Receivers: BAS98ATEX2165X.

Open Path Long Range/Mid Range Transmitters:BAS98ATEX2299X.

Open Path Short Range Transmitter, and Receivers: IECEx BAS 09.0100X

Open Path Long Range/Mid Range Transmitters: IECEx BAS 09.0101X

UL

Class 1 Groups B, C, D

Class 1 Zone 1 AEx d IIB + Hydrogen (Amb -40°C to +65°C)

File No. E91044

CSA

Class 1 Div 1 groups B, C, D, T5 and

Exd IIC T5 (Amb -40 to +65°C)

File No. LR 48148-38

FM

Class I Div 1 groups B, C, D & T5

(Tamb -40 to +65°C)

The Searchline Excel system has been designed, built and tested to meet the latest European standards for Radio Frequency Immunity (RFI).

It has been tested and approved to the following British Standards Institute (BSI) regulations: EN50270:2006.

APPENDIX C - ACCESSORIES & SPARE PARTS

02104-N-6007	Long and medium range alignment and conformity kit including handheld interrogator, telescope, carry case and test filters for CSA approved systems
Accessories	
Handheld Interrogator and accessories	
04230-A-1001	Hand Held Interrogator ATEX Certified (4V0 software) for Optima, Optima Plus and Excel
2104B2351	Hand Held Interrogator UL Certified (4V0 software) for Optima, Optima Plus and Excel
2104B2354	Hand Held Interrogator CSA Certified (4V0 software) for Optima, Optima Plus and Excel
2108B1455	Hand Held EEPROM upgrade (4V0)
04320-A-1025	SHC Protection Device Module and Lead
2104B6250	SHC Calibrator Connector System 10m
DVC/DX Interfaces	
2104B6212	DVC100M MK2 Termination Unit ATEX with MODBUS capability
2104B2382	DX100M XP Termination Unit UL with MODBUS capability
Installation Accessories	
2104D0295	Sun/Heat Shade (Deluge Cover)
210-190-045	Killark Junction Box (excludes terminals)
2992A0071	Conduit Assembly for Excel UL certified
0230-0069	Stainless Steel enclosure NEMA 4X 3/4" NPT UL
02104-N-9880	Upgrade to Nickel Plated Glands
Gas Test Equipment	
2104N2999	Excel Test filters kit & Manual
2104B2326	Gassing Cell
Spares	
2104B2391	Short Range Telescope (bayonet fitting)
2104B2322	Medium / Long Range Telescope (callipers)
210-190-003	Short Range Alignment Case
2104B0300	Searchline Excel Isolation Kit Short Range
2104B0310	Searchline Excel Isolation Kit Medium/Long Range
2104B2301	Mounting Bracket Short Range & Insul. Kit
2104B2302	Mounting Bracket Long Range & Insul. Kit
2104D0237	Mounting Plate
2104B2071	Short Range Transmitter Incl Conduit ATEX
2104B2081	Med Range Transmitter Incl Conduit ATEX
2104B2091	Long Range Transmitter Incl Conduit ATEX
2104B2111	Receiver Std Version Short Range ATEX
2104B2112	Short Range Receiver Sink ATEX