PRINCIPLES OF OPERATION

There are two basic types of projected light beam detectors, both of which operate on the principle of light obscuration: a light beam is projected across the area to be protected, and is monitored for obscuration due to smoke (See figure 1). There are two basic types:

An End-to-End type detector has separate transmitter and receiver units, mounted at either end of the area to be protected. A beam of infrared light is projected from the transmitter towards the receiver, and the signal strength received is monitored.

End-to End type detectors require power to be supplied both to the transmitter and the receiver ends of the detector. This leads to longer wiring runs, and thus greater installation costs than the reflective type device.

Reflective or Single-Ended type detectors have all the electronics, including the transmitter and receiver mounted in the same housing. The beam is transmitted towards a specially designed reflector mounted at the far end of the area to be protected, and the receiver monitors the attenuation of the returned signal.

The detector is typically calibrated to a number of preset sensitivity levels based on the attenuation of the beam seen by the receiver. The sensitivity setting is selected based on the beam range and site environment.

Unlike point type optical smoke detectors, the response of beam smoke detectors is generally less sensitive to the type and colour of smoke. Therefore, a beam smoke detector may be well suited to applications unsuitable for point optical smoke detectors, such as applications where the anticipated fire would produce black smoke. Beam smoke detectors do however require visible smoke and therefore may not be as sensitive as ion detectors in some applications.

Since the sudden and total obscuration of the light beam is not a typical smoke signature, the detector will normally see this as a fault condition, rather than an alarm. This minimizes the possibility of an unwanted alarm due to the blockage of the beam by a solid object, such as a sign or ladder, being inadvertently placed in the beam path. This “beam blocked” fault threshold will typically be set by the manufacturer at a sensitivity level exceeding 7 to 10dB.

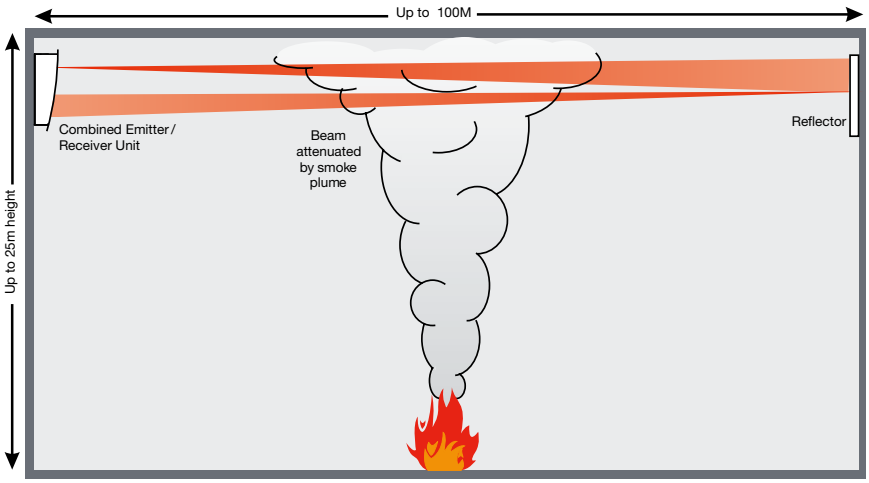


Figure 1: Operation of Reflective Type Optical Beam Smoke Detector

Very small, slow changes in the quality of the light source are also not typical of a smoke signature. These changes may occur because of environmental conditions such as dust and dirt accumulation on the transmitter and / or receivers’ optical assemblies. These changes are typically allowed for by automatic drift compensation. When the detector is first turned on and put through its setup programme, it assumes the light signal level at that time as a reference point for a normal condition. As the quality of the light signal degrades over time, due to dust build up, the detector will compensate for this change. The rate of compensation is limited to ensure that the detector will still be sensitive to slow or smouldering fires. When the detector can no longer compensate for the loss of signal (as with an excessive accumulation of dirt) the detector will signal a trouble condition.

Suitable Application

Like point smoke detectors, beam smoke detectors are inappropriate for outdoor applications. Environmental conditions such as temperature extremes, rain, snow, sleet, fog, and dew can interfere with the proper operation of the detector and cause nuisance alarms. In addition, outdoor conditions make smoke behaviour impossible to predict and thus will affect the detector’s response to a fire.

TESTING AND MAINTENANCE

Maintenance

As dust builds upon a beam detectors' optical components, its sensitivity will increase leading to an increased susceptibility to nuisance alarms. Most modern beam detectors such as these include algorithms to compensate for this gradual build up of dirt and reduce maintenance whilst retaining constant sensitivity. However, the detector lenses and reflector will still need to be cleaned periodically. The maintenance interval will be dependant on site conditions – the dirtier the site, the more frequent cleaning will be required.

Manufacturer's instructions' should be referred to for cleaning procedures, however a fairly typical maintenance method is to clean the detector lenses and reflector with a damp soft cloth and a mild soap. Solvents should not normally be used.

Note: Before carrying out any maintenance on the detector, notify the relevant authorities that the fire detection system is undergoing maintenance, and that the system is therefore temporarily out of service. Disable the relevant zone to prevent unwanted alarms.

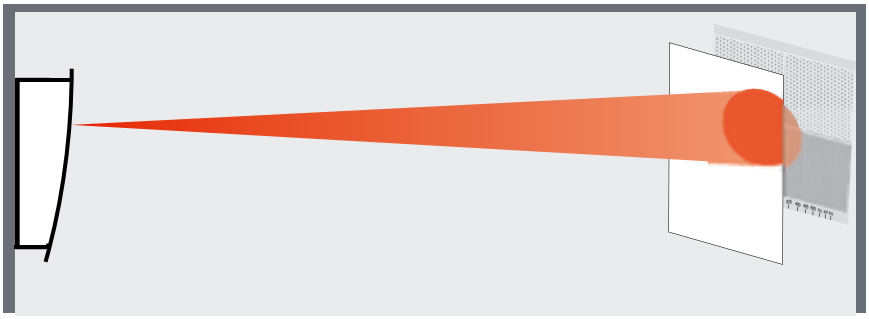


Figure 3: Beam Detector Functional Testing

Functional Testing

Following installation, or any routine maintenance work, beam detectors should undergo functional testing.

The normal means of testing a beam detector is to place a filter in the path of the beam to reduce the amount of received light below the detector threshold and thus produce an alarm.

With the Honeywell beam detector, a graduated scale is marked on the reflector. To test the sensitivity, a suitable piece of opaque material is used to block off a section of the reflector corresponding to the sensitivity, checking that the detector reacts as expected.

By their nature, most beam detectors are mounted in high inaccessible areas, often requiring the use of a cherry picker or similar machinery to reach them. It can therefore be an expensive and time consuming procedure to test them.

The Honeywell beam detectors have overcome this problem by incorporating a unique automatic test feature. On command from a remote station, a servo controlled calibrated filter is moved in front of the receiver, simulating the effect of smoke on the beam. If the correct signal reduction in the returned light is detected then the detector will enter the alarm condition, otherwise a fault is returned. The Asuretest function meets the periodic maintenance and testing requirements of most local standards, testing both the electronics and optics of the unit installation.

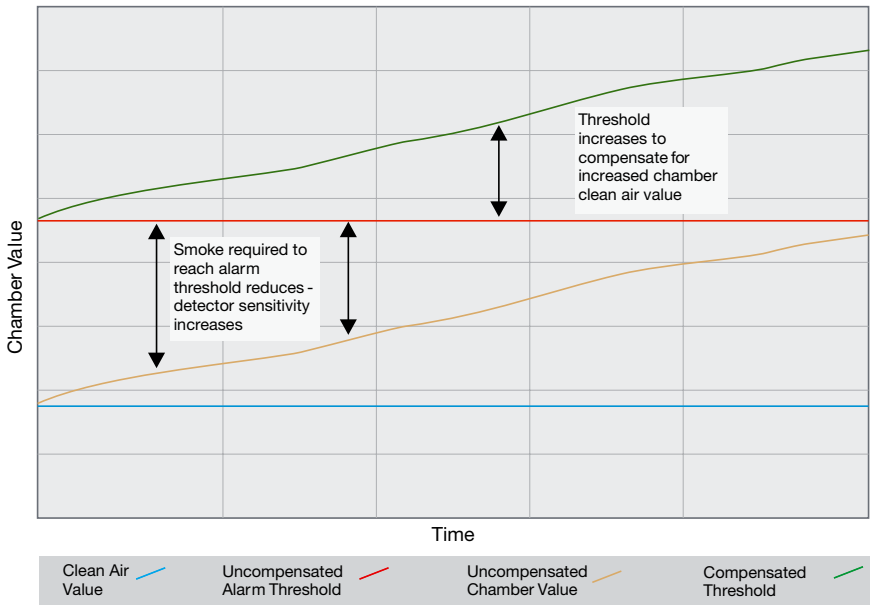
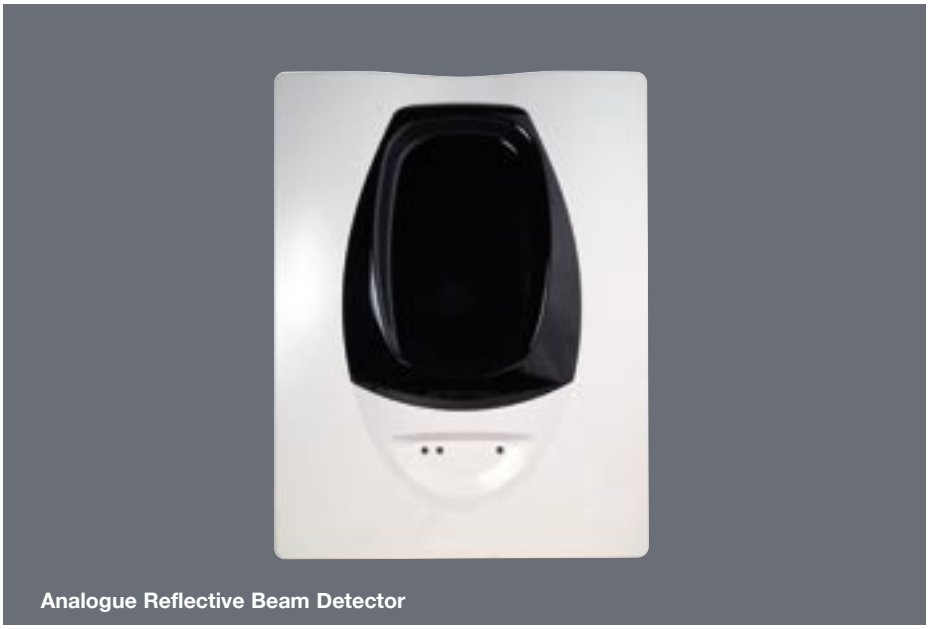


Figure 2: Dust Build up and Drift Compensation

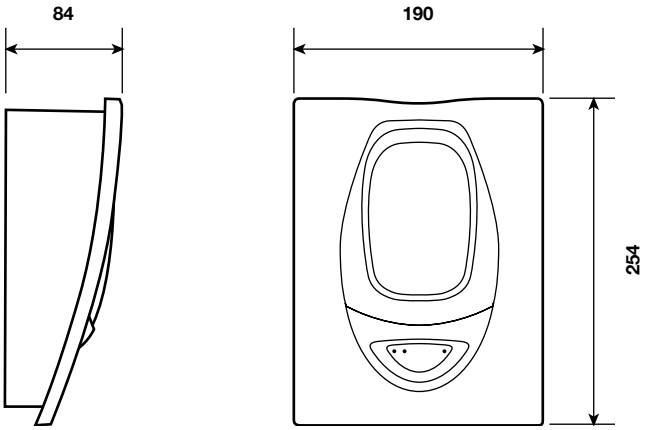
Section 6.1.4: Analogue Addressable – Ancillaries



Analogue Reflective Beam Detector

TECHNICAL SPECIFICATION	
Operating Voltage Range	0.5-2.5mm^2
Typical Standby Current	2mA @ 24V dc (No communications, LED off)
Maximum Alarm Current	8.5mA (LED on)
Application Temperature Range	-30ºC to +55ºC
Relative Humidity	0 to 95% (non condensing)
Ingress Protection	IP54
Weight	1.77 kg
Max Wire Gauge for Terminals	2.0mm^2
Colour	White trim, black box
Material	Lens cover – Lexan, Backbox – Noryl
Reflector	200 x 230mm (5-70m range, supplied as standard)
Relevant Standards	EN 54 Parts 12 & 17
Approvals	CPD, LPCB, BOSEC, VdS

Dimensions (mm)



These detectors are addressable reflector-type linear optical beam smoke detectors designed to be connected directly to the loop, available in TC800 or System Sensor Protocol. The self test feature affords remote testing, in accordance with the standards, saving time and money by reducing the need for special height access equipment.

- Well suited for protecting buildings with large open spaces: warehouses, atriums etc
- Mechanical filter option to facilitate remote testing – saves time and money with regard to servicing
- Easy alignment – saving installation time

ORDER CODES

TC800 Protocol

Analogue Reflective Beam Detector with Self Test Function	TC847A1004EUR

System Sensor Protocol

Analogue Reflective Beam Detector with Self Test Function	6500S

Accessories – for both protocols

Heater Kit (beam) to reduce build up of condensate	BEAMHK
Heater Kit (30-70m range Reflector Panel) to reduce build up of condensate	BEAMHKR
Long Range Reflector Kit (70-100m range)	BEAMLRK
Multi-mount Accessory for ceiling or wall mounting (adjusts angle up and down or side to side)	BEAMMMK
Surface Mount Accessory (back box to be used with the BEAMMMK)	BEAMSMK
Remote Test Key Switch	6500RTS-KEY