

XLlogger

Motion Detector

XLS1042



Technical Specifications

Range: 0.4 – 6 m

Resolution: ± 1.5 m

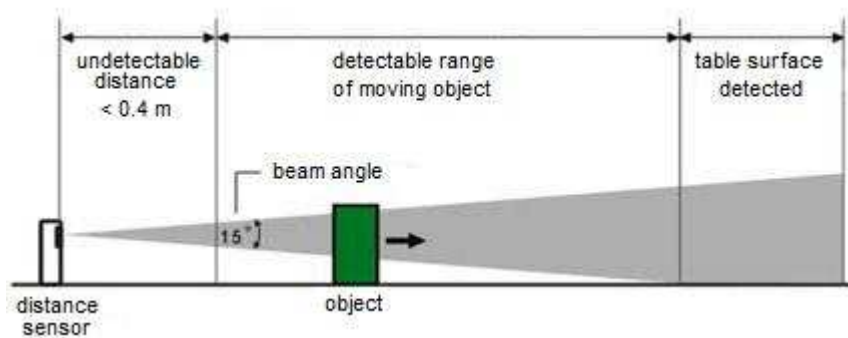
Beam Angle: Cone, $\sim 15^\circ$

Sampling Rate: depends on measuring distance (see below), maximum 50 samples/s

Measuring Principle: Ultra sonic transducer

Instructions

- Do not place the motion detector in direct contact with water or chemicals or use in a very humid atmosphere.
- For a moving object to be correctly detected it must be kept within the ultrasonic beam angle of 15° .
- The motion detector operates using an ultra sonic beam to measure distance from a reflecting surface, eg a piece of card. The ultra sonic beam will be reflected off any surrounding objects, walls, floor, ceiling and these should be taken into account when positioning experiments and determining sampling rates.
- When positioning the sensor for an experiment, take account of the beam angle to ensure accurate readings. The following diagram indicates this.



- Distance measurements are based on a velocity of sound in air of 340 m/s. The actual velocity of sound in air depends on temperature and humidity but for most purposes this value is sufficient. If distance measurements need to be corrected for a different value of the velocity of sound then the following formula should be used:

$$D + d = v (t/2)$$

where D = distance to object in m
 d = modified non-sensing distance in m (taken as 0.2m)
 v = velocity of sound in m/s
 t = measured time interval between outgoing and incoming pulse

- The default XLlogger sampling rate of taking readings every 0.1s will allow for distance measurements in air over the full range of 0.4 – 6 m. If faster sampling rates are required then the maximum distance that can be measured is reduced because of the time interval taken for the ultrasonic sound pulse to travel to the object and back. The maximum distance that can be measured is given by:

$$D_{\max} = v (\Delta t/4) - d$$

where D_{\max} = maximum distance that can be measured in m
 d = modified non-sensing distance in m (taken as 0.2m)
 v = velocity of sound in m/s (taken as 340 m/s for air)
 Δt = time interval between readings in s

This then simplifies to:

$$D = 85\Delta t - 0.2$$

Hence at the fastest sampling rate of readings taken every 0.02s, distances can only be measured between 0.4m and 1.5m.