Instruction manual for the
Infrared Point Type Flame Detector
(Model 2RA-P)

Contents

§ 1 Features

Nittan Model 2RA-P is a point type flame detector capable of providing a very fast response (high sensitivity) and is a sensor with state-of-art technology that drastically reduces the occurrence of false alarms despite of its high sensitivity.

It detects infrared energy emitted in fire and sends a signal to an automatic fire alarm system or to a fire alarm control panel.

1. It is capable of providing a supervision distance of 17m ~ 30m and a supervision angle of 100° Max.
2. For the detection of Infrared, it utilizes a " pyro-electric effect" is used to detect the flickering motions of the flame and monitors a special characteristics of CO_2 resonant emission from the flame (wavelength of 4.3µm) as well as a non-fire-alarm discrimination wavelength region (around 4.0µm), thus, increasing the reliability of the detector with respect to false alarms.
3. In case of a sensor or sensor circuit trouble, the operation indicator lamp will illuminate as a trouble signal.
4. A Swivel neck mechanism provides flexible movements, up-down and left-right, thus allowing the unit to be mounted on either ceiling or wall.
5. It is small and compact with state-of-art technology utilizing one of the most advanced technologies of microprocessor maximizing its ability to fullest possible.
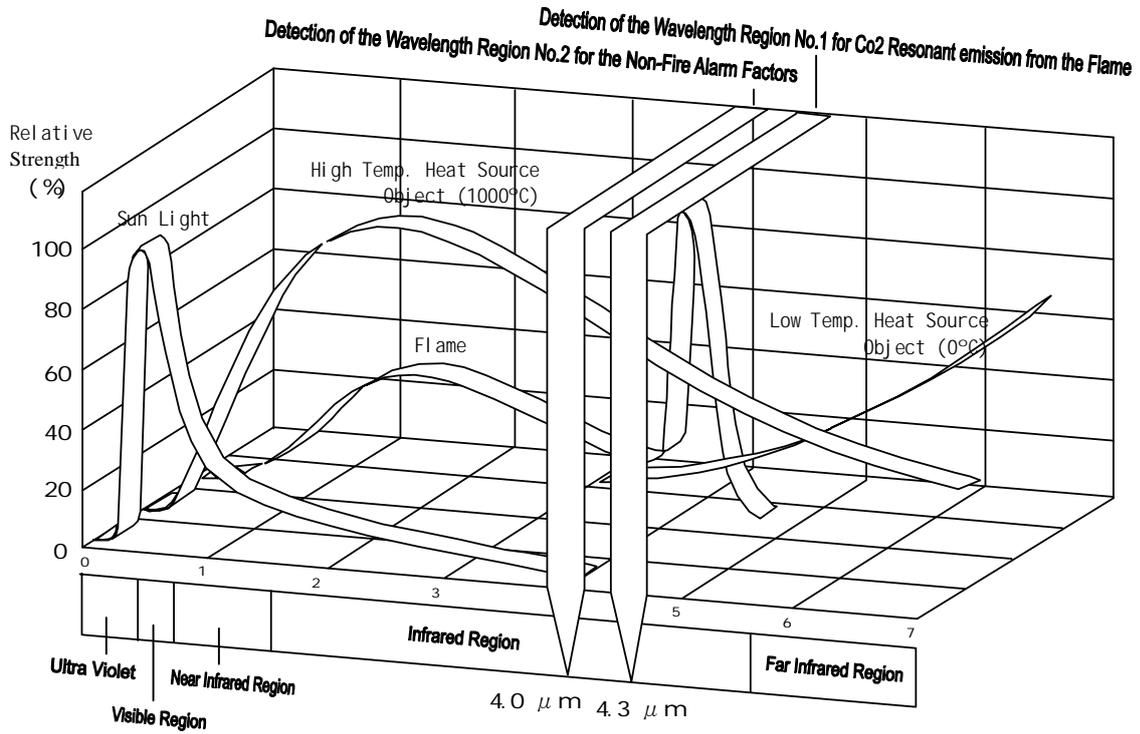
Detection of the Wavelength Region No.1 for Co2 Resonant emission from the Flame

Detection of the Wavelength Region No.2 for the Non-Fire Alarm Factors

Relative
Strength
(%)

High Temp. Heat Source
Object (1000°C)

Sun Light

100
80
60
40
20
0

Flame

Low Temp. Heat Source
Object (0°C)

0   1   2   3   5   6   7

Infrared Region

Far Infrared Region

Ultra Violet

Near Infrared Region

Visible Region

4.0 μm 4.3 μm

Fig-1 : Various Light Spectrum Emission Strength

Ceiling Mounting(Surface type)

Wall Mounting(Surface type)
In case of 30° Inclination

50   50

10 m

50

30

10 m

340 ㎡

570 ㎡

Surface of Wall

0

⬯ : Supervising Area
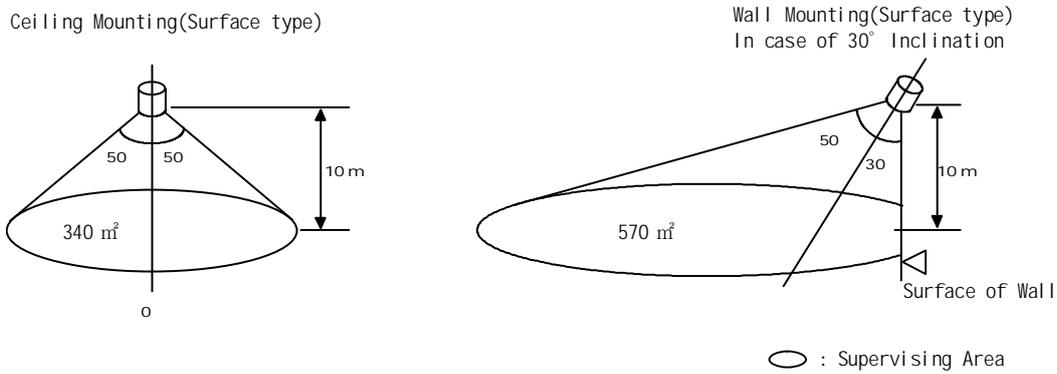
Fig-2 : Examples of Flame Detector Installation

§ 2 Specification

Product Model Number	2RA-P					
Type	Infrared Spot Type Flame Detector					
Approval Number						
Rated Voltage	DC24V (Operating Voltage Range 10 – 30V Ripple Current)					
Supervising Current	180μA (at DC24V)					
Rated Current	165mA (L – C: 65mA, P+ – C: 100mA)					
Nominal Supervision Distance	17m (17m ~ 30m)	17m	19m	20m	25m	30m
View Angle	100° Max (± 50°)	100°	90°	80°	60°	20°
Operation Indication	Red LED: Alarm --- Lit Trouble --- Flickering					
Detection Method	CO2 Resonant Emission, Flickering, 2 Wavelength					
Ambient Condition	Indoor – 10 ~ +50°C					
Materials	Head: ACS (White) Base: Policarbonate (White)					
Weight	Head: 150g Base: approx. 50g					

Fig-1 : Structure & Equivalent Circuit
Infrared Spot Type Flame Detector

Pyro-electric Material

Light (Infrared Ray)

+

Output

Equivalent Circuit of Pyro-electric Effect Type Infrared Sensor

Pyro-electric effect Type Infrared Sensor × 2 (for the 1st & 2nd wavelength)

FET

Pyro-electric Material

Band Pass Filter for specific infrared wavelength

Light (Infrared Ray)

Magnified Drawing of Pyro-electric Effect Type Infrared Sensor

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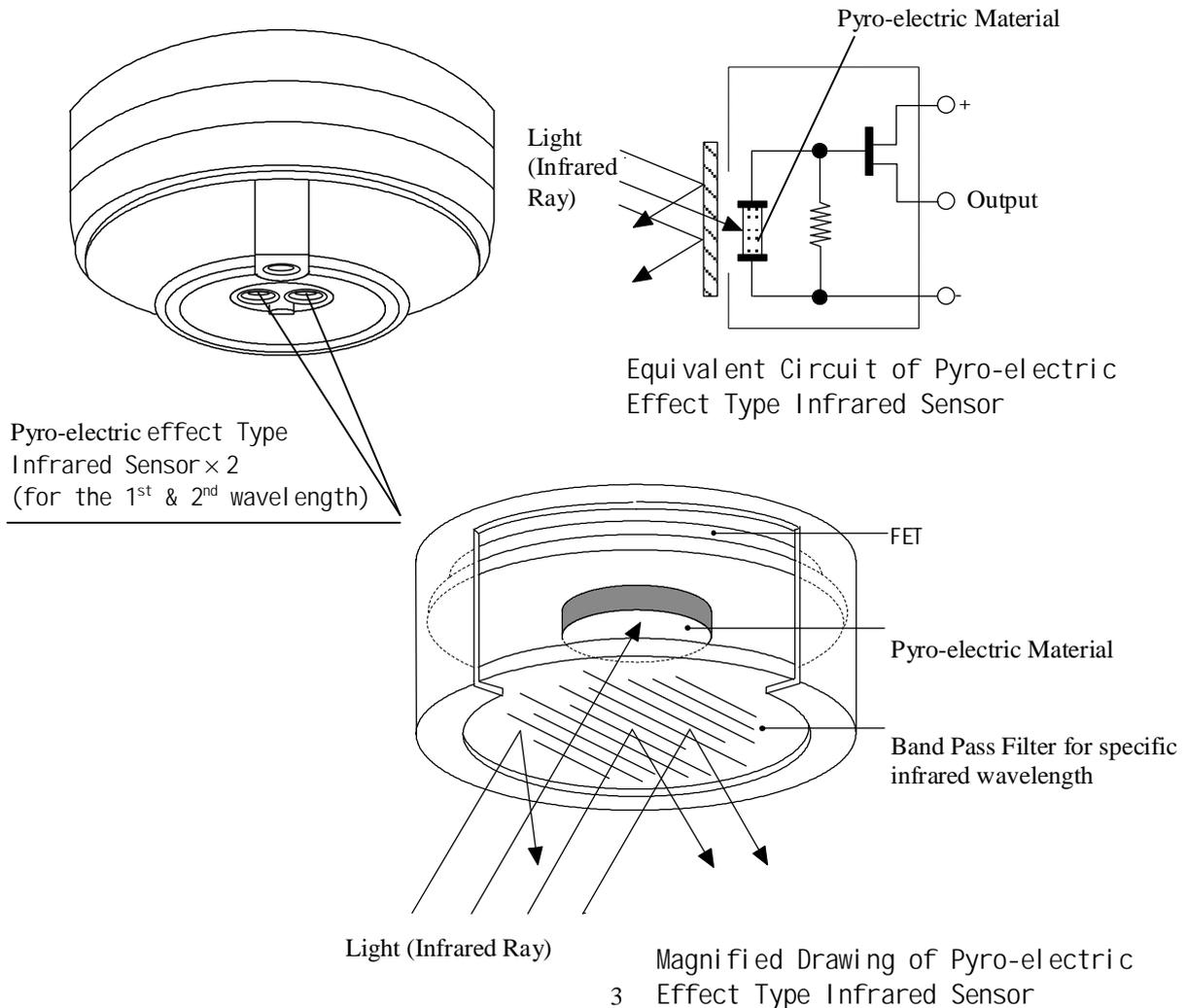
§ 3. Principle of Operation

1) Pyroelectic Effect and Pyroelectric Detection

   The Pyroelectic element used for detecting Infrared has a characteristic of self-polarization effect. Upon the incidence of infrared on the Pyroelectric element, its state of polarization changes as its internal temperature changes, causing the electrical charges to be unbalanced. This effect is called " Pyroelectric effect".

   These unbalanced electrical charges can be converted into a voltage change, thus, functioning as an Infra-Red sensor.

2) CO2 Resonant Emission Method

   A flaming fire emits spectrum emission peak strength around the wavelength of 4.3μm (infrared zone). This is due to a discharge of large amount of CO_2 gas in a fire. This phenomenon is called CO_2 resonant emission, which is one of the discriminating factors (outstanding features) of flaming fires.

3) Flickering Method

   The flame generated in the infrared zone during fire has flickering movements of 1 – 10 Hz. 2RA-P is set to respond only to 1 – 10 Hz of flickering movements with the Pyroelectric element, which only generates a voltage change upon the incidence of infrared, and a special filtering circuit. Therefore, it does not respond to the small light generating sources and small heat generating which are likely produce only a small amount of change in light quantity.

4) 2 Wave-lengths Method

   2RA-P monitors simultaneously 2 wavelengths: CO_2 resonant emission region (the wavelength of around 4.3μm) and the non-fire-alarm discrimination wavelength region (wavelength around 4.0μm). (The most of existing flame detectors only monitor one wavelength).

   2RA-P declares a fire if only if the following condition is reached: an increase of signal level from CO_2 resonant emission region and the signal level from the non-fire-alarm signal level is lower than that of CO_2 resonant emission region. (The sunlight and high temperature heat source has a lower signal level than the non-fire-alarm discrimination wavelength signal level).

   In other words, The 1st wavelength Level > The 2nd wavelength: Fire Alarm.

Conversely, The 2nd wavelength > The 1st wavelength: Non-Fire Alarm, and continues to monitor.
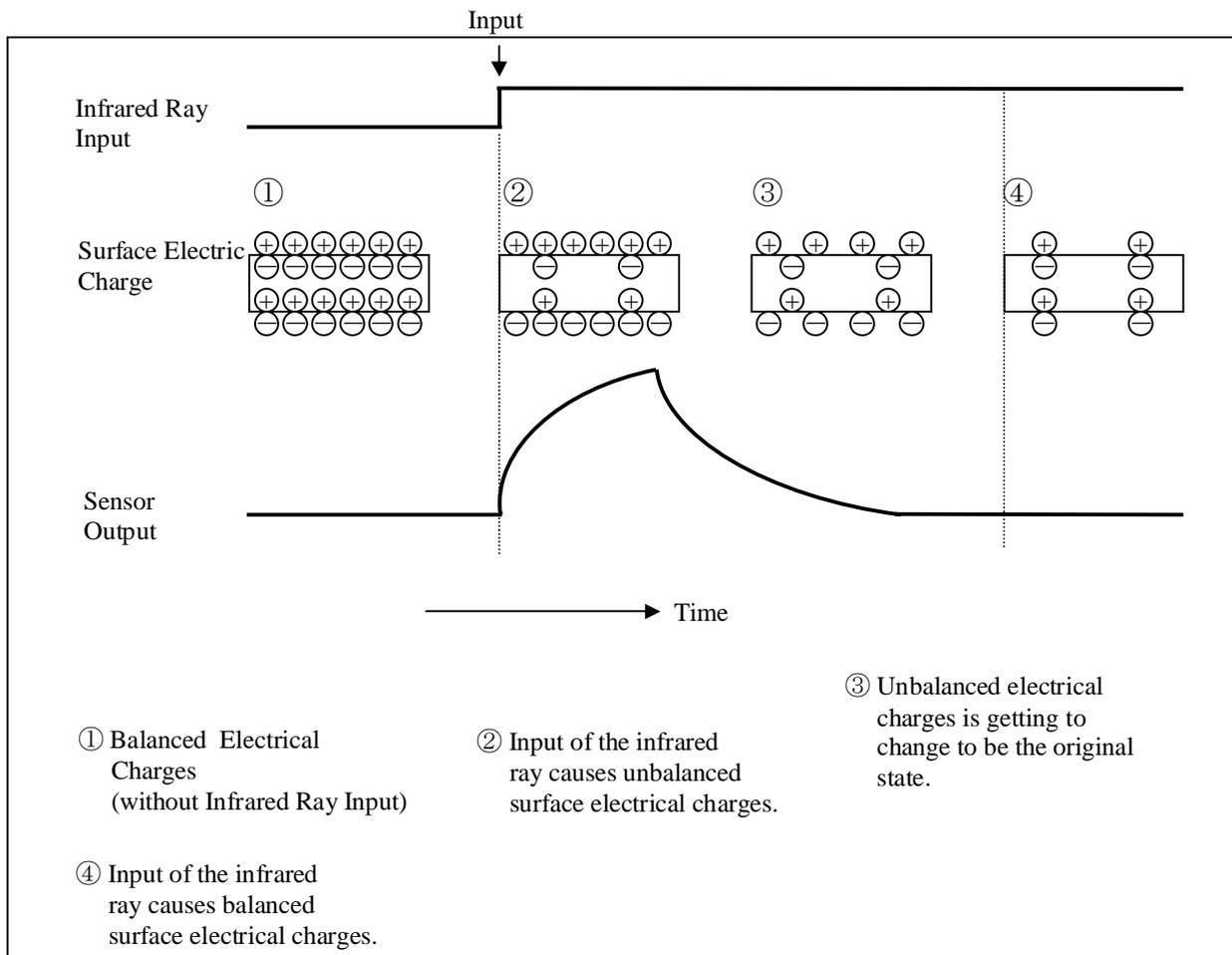

Fig-2 : Concept Drawing of Pyro-electric Effect

§ 4 Control Panel and Field Wiring

4-1 Standard

(1) The terminals L and C are non-polarized. Therefore, the detector lines from the control panels (L and C wires) can be connected to the terminal L and C of the base disregarding its polarity.

(2) There are 2 terminals of each L and C on the base for the purpose of making a loop wire to the next detector.
(3) The voltage and the current capacity are 30V and less than 65mA respectively.

Standard Connection
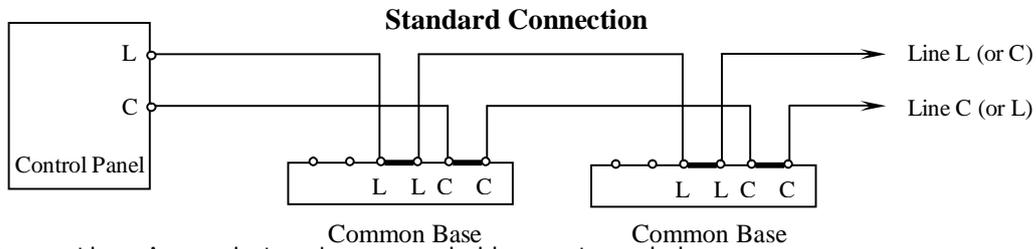
4-2 Connecting Annunciator Lamp or similar external lamps

Note 1: For connection of the external loads with 1PF1 and 1PF2, the connection must be made via FIRE ALARM RESET SIGNAL TRANSFER terminal, N and N`.
Note 2: If the external load is connected to 1PF0, TEST RESET (AUTO REST) function is disabled. (This is the same as operating FIRE RESET SWITCH).

(1) One-to-One connection (one detector and one external)
   1. Perform the same wiring connection as the standard wiring.
   2. Connect one of wires of the external load to the terminal for FIRE RESET PULSE SIGNAL TRANSFER N (or N`) of the fire alarm control panel and other wire to the terminal P+ of the base.
   3. The power supply to the external load is made for the terminal I+ of the control panel.
   4. The voltage and the current capacity across the terminal P+ and the terminal C are 30V and less than 100mA respectively.

One to One Connection (One External Load and One Detector)
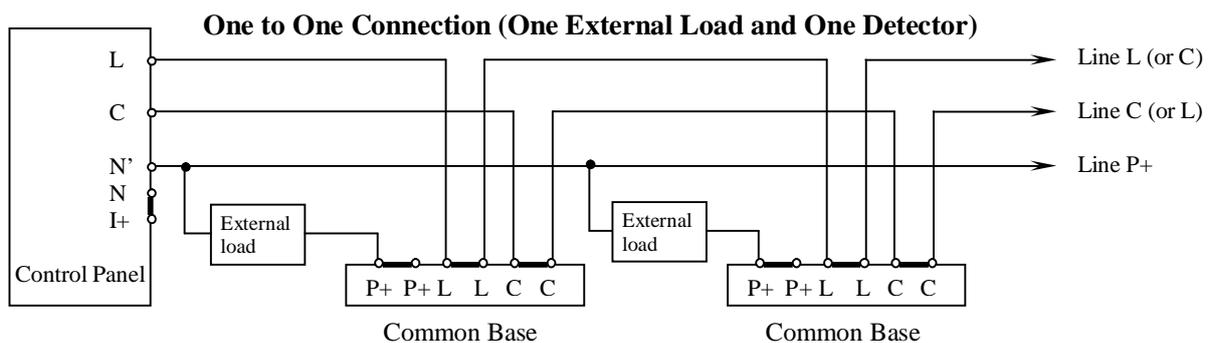
(2) One external load representing several detectors
   1. Basically the same as the above (1). Since one external load represents several detectors, the terminal P+ must be looped.
   2. An operation of any of the detector will operate the external load.

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One External Load Representing Several Detectors.
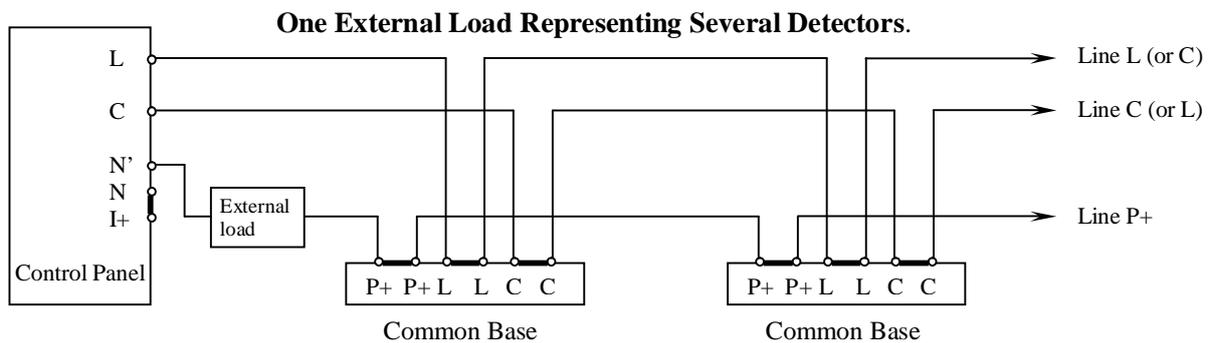
§5   Recommended Places of Installation and consideration

∩ Recommended Places of Installation and consideration

1) Places where a special protection are especially required or desired for preservation purpose	National and Historical Buildings, Libraries, Museums, Buddhist Temples, and Private Housings
2) Hazardous material Collection and storage areas	Parking Lots, Garages, Package Distribution Center, Electric Power Generating Rooms, Truck Yards, Engine Test Rooms
3) Flammable Materials Fabrication Areas	Paper Miles, Wood Working Factories, Paint Shops, Rubber Products Manufacturers, Machine Shops, Garages Recycle Centers
4) Warehouses	Papers, Woods, Resins, Rubber, Paper Boards, Clothing
4) Garbs Collection Areas	Garages, Used Tires, Automobile Junk Yards, Paper recycle Centers
5) Others	Prevention of fire spread, Forest Fires, Machinery Engine Rooms

∩ Installation Considerations

1) Model 2RA-P flame detector should be installed in each protection that is divided by the walls. Any part of the space under 1.2m above the floor of the protection area should be within the nominal distance of supervision 17m (55 feet) of distance from the detector. Also, its angle of detection should be within the angle of 100º (±50º of the center of the detector).
2) The detector must be installed in a way that it will effectively detect fire of the space that is being supervising.
3) Avoid places where maintenance is difficult.
4) If an obstacle is present in the supervising space (1.2 m above the floor), an additional detector installation is necessary.

5) Provide a few meters of distance away from any plants in then protection area. The reflection of the Sunlight may produce chops (flickering) and may obstruct the supervision view of the detector.
6) For those of installation
7) Avoid the installations near to smoking rooms, kitchens, space heaters, and incinerators that are conducive to cause fire.
8) If the installation is in the places where the presence of dust and small particles are imminent, it is recommend to carry out a frequent periodically cleaning, especially paying the attention to remove any obstacles from the windows. The dust on the lens is most likely to cause miss-alarms.

§6　Maintenance Procedures

(a)　Make sure that the detectors installed is an appropriate type for the location and its supervision space and supervision distance is correct.
(b)　The maintenance tools are stored in a place where an easy inventory and management of such tolls are possible.
(c)　The supervision area must be free from objects, which may interfere the supervision angle to achieve an effective supervision.

Flame Detector	Installation Environment	Visual Inspection of Installation Condition	(a)　Not intended for an outdoor application such (1) The detectors are mounted either on the ceiling or on the wall. (2) Each supervision area separated by wall should have at one detector is installed. The distance from any point within the space 1.2 m above the floor shall be within the rated supervision distance. (3) No obstacle which may interfere the vision of the detector (4) No Sunlight is directed to the detector with exception that the detector is provided with a light protection plate.

Flame Detector	Operational Test	Measurement of actual response time by applying the infrared or ultraviolet	The response time shall be within the time specified in the table below:

Response Time Detector	Flame Detector Type		
	Indoor	Outdoor	Road
Flame Detector	30 sec	30 sec	30 sec

§ 7   Detector Mounting Angle

Generally speaking a wall surface is not necessary to be perdendicure to the floor. It is strongly recommend to use a level meter to determine an accurate angle of the mounting.

Examples of using a level meter (Mounting angle = Ø = 30°)

1. Mount the angle adjustment (detector) on the wall where the detector to be mounted.
2. Place the level meter on top the base and find the horizontal line by using the angle adjustment device.
3. From the horizontal line, determine the mounting angle of Ø = 30° by using the angle adjustment device.