## Analogue Values & Sensor Recalibration

This Technology Guide explains the range of Analogue Values produced by the ESP Range of Sensors and which values relate to correct operation, maintenance faults and those outside of the sensor's working limits. It also summarises the way in which ESP sensors automatically recalibrate themselves after contamination.

With the Hochiki ESP Range of Sensors the analogue signal produced by the device is proportional to the smoke (or Heat) present in the sensing chamber. This level can be expressed as a numerical analogue value which can be read by the TCH-B100 Address programmer or the Control Panel itself.

The tables below show the correct operating ranges for each type of sensor, if the sensor values fall outside of these ranges then a maintenance fault will be displayed at the panel and the sensor will require cleaning and recalibration.

### TCH-B100 / B200

A Hand Held Address Programmer designed to address the ESP range of Sensors and other addressable devices such as the YBO-BS Base Sounder. Designed to be light, robust and easy to use it operates from a single PP3 size battery which can provide up to 8000 operations.

- Lightweight design
- Quick and reliable addressing
- Up to 8000 address settings from one battery
- Displays sensor analogue value
- Electronic linear heat detection
- Remote Indicator output
- Wide voltage range (9.5 ~ 30 Vdc)
- Twin fire LEDs allow 360° viewing
- Range of mounting bases
- Approved by Activfire (CSIRO)

### ALN-ASN

A Photoelectric Smoke Sensor incorporating Hochiki's unique High Performance Chamber which allows the sensor threshold level to be increased, thereby improving the signal to noise ratio and reducing susceptibility to false alarms.

- Removable, High Performance Chamber
- Twin fire LEDs allow 360° viewing
- Locking mechanism (sensor to base)
- Variable sensitivity
- Electronically addressed
- Pulsing/non-pulsing controlled from panel*
- Addressed via TCH-B1/200 Hand Held Programmer
- Approved by Activfire (CSIRO)

### ATJ-ASN

A Multi-Heat Sensor incorporating a variable Fixed Temperature heat element and Rate Of Rise heat element, both controlled from the Control Panel allowing either thermal element or both elements simultaneously to be active in making the fire decision.

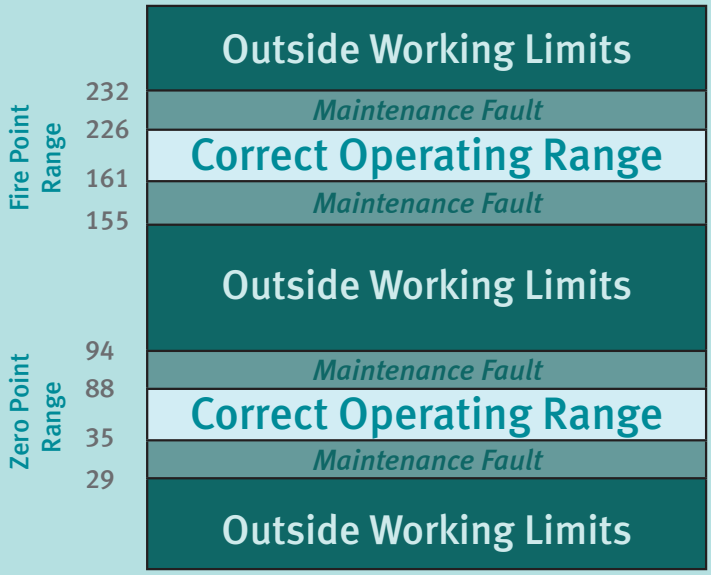
- User selectable modes
- Incorporates Fixed Temperature and Rate Of Rise Heat elements
- Twin fire LEDs allow 360° viewing
- Pulsing/non-pulsing controlled from panel*
- Electronically addressed
- Addressed via TCH-B1/200 Hand Held Programmer
- Activfire (CSIRO) approved to Classes A, B & C

### ACC-ASN

A Multi Sensor incorporating a thermal element and a High Performance photoelectric smoke chamber. Has three modes controlled from the Control Panel, allowing either the optical or thermal element or both to be active in making the fire decision.

- User selectable modes
- Incorporates Optical & Heat elements
- Removable, High Performance Chamber
- Twin fire LEDs allow 360° viewing
- Pulsing/non-pulsing controlled from panel*
- Variable sensitivity
- Electronically addressed
- Addressed via TCH-B1/200 Hand Held Programmer
- Approved by Activfire (CSIRO)

## ALN-ASN Operating Ranges




Zero Point ~ 61
Fire Point ~ 193

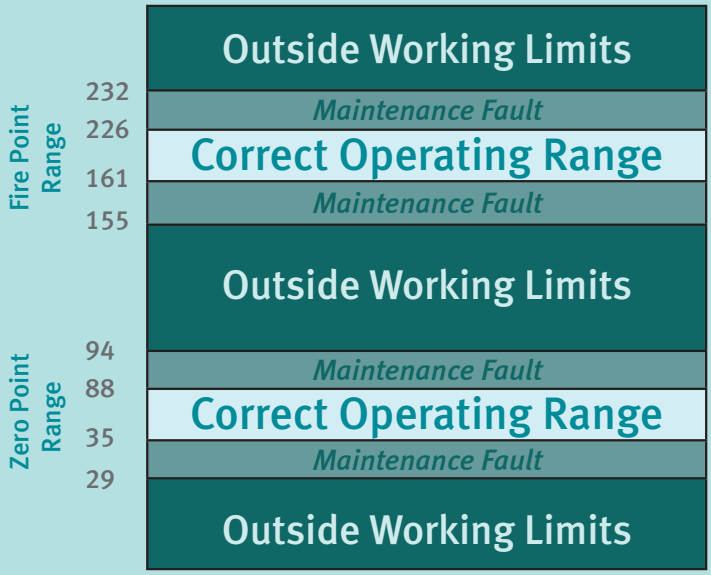
## ATJ-ASN & ACB-ASN/W Operating Ranges

As the ATJ-ASN and ACB-ASN Heat Sensor analogue values are in direct correlation to the temperature within the room in which they are located, there are no graphs displaying values. The values would vary depending on the background temperature within the room itself. However the temperature in °C can be calculated from the value displayed by the TCH-B1/200 using the simple formula below:


$$\frac{\text{ANALOGUE VALUE ON TCH-B100}}{2} - 20 = \text{TEMPERATURE °C}$$

Example: $\frac{82}{2} - 20 = 21°C$

## ACC-EN Operating Ranges




Zero Point ~ 61
Fire Point ~ 193

NOTE: When reading the analogue value of the ACC-ASN multi-sensor, the TCH-B1/200 will only display the value for the smoke chamber.

# ACC-ASN Multi Sensor

Multi-sensor detection is becoming increasingly popular with consultants and specifiers particularly for systems where a change of detection method and/or sensitivity is required at different times of the day.

Multi-sensors are particularly valuable in situations where one detection method alone is not suitable for the environment. The ACA-E Multi-Sensor has Flat Response Capability in single Photoelectric Smoke Detection Mode as well as in Multi-Sensor Mode (incorporating photoelectric smoke and heat detection) negating the need for the ionisation smoke detection method.

## ACC-ASN

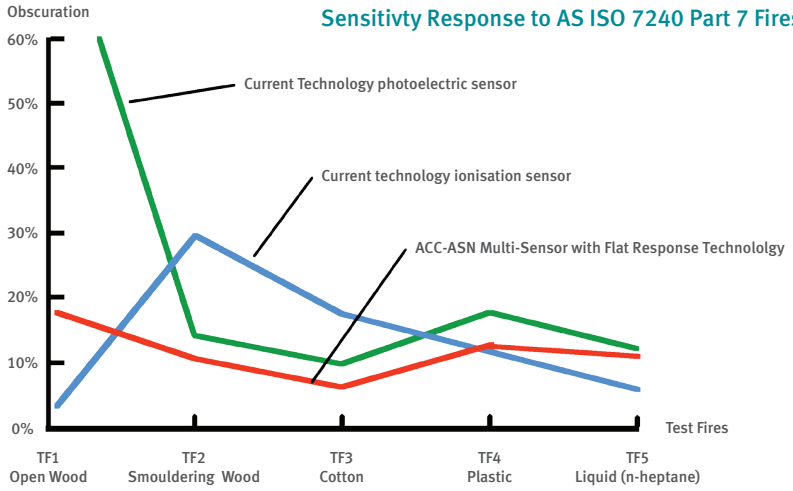
**A Multi Sensor**

Incorporating a thermal element and a High Performance photoelectric smoke chamber. Has three modes controlled from the Control Panel, allowing either the optical or thermal element or both to be active in making the fire decision.

- User selectable modes
- Incorporates Optical & Heat elements
- Removable, High Performance Chamber
- Twin fire LEDs allow 360° viewing
- Pulsing/non-pulsing controlled from panel*
- Variable sensitivity
- Electronically addressed
- Addressed via TCH-B100 Hand Held Programmer
- Approved by Activfire (CSIRO)

## Flat Respone Technology

The 'Flat Response' performance within the Hochiki ALG, ALK Photoelectric Smoke Sensor's and the ACA is achieved with the Photoelectric chamber only. This dramatic improvement to the chamber performance has been achieved using Hochiki's patented chamber design. The graph below shows that the 'Flat Response' characteristics prevent the sensors from being sensitive to particular particle types of smoke and insensitive to others hence extending the detection range and minimising unwanted alarms.




**NOTE:** It should be borne in mind that the sensor spacing defined in installation standards is different for smoke and heat sensors. Therefore this must be taken into consideration when designing systems that may involve a mode change, in other words, smoke to heat.

## Modes of Operation

The ACC-ASN has 3 possible modes of operation which are selected directly from the control panel. These are Photoelectric Smoke Detection Mode, Heat Detection Mode and Multi-Sensor Mode.

The ACC-ASN will always default to the Multi-Sensor Mode on power-up. However, during initialisation, if the user has previously programmed the ACC-ASN to employ a different Mode then the control panel will immediately send the appropriate command to the Multi-Sensor and recalibrate the sensor for the mode selected.

ACC-ASN(WHT)

## Photoelectric Smoke Detection Mode

In this mode, the photoelectric chamber is the primary detection method and performs similarly to the ALN-ASN. The sensor continuously monitors the response back from the photodiode even in no-smoke conditions to ensure that the infra-red emitter and receiver are functioning correctly. The sensitivity is also fully adjustable which allows it to be varied from 1% through to 4.5%/m.

## Heat Detection Mode

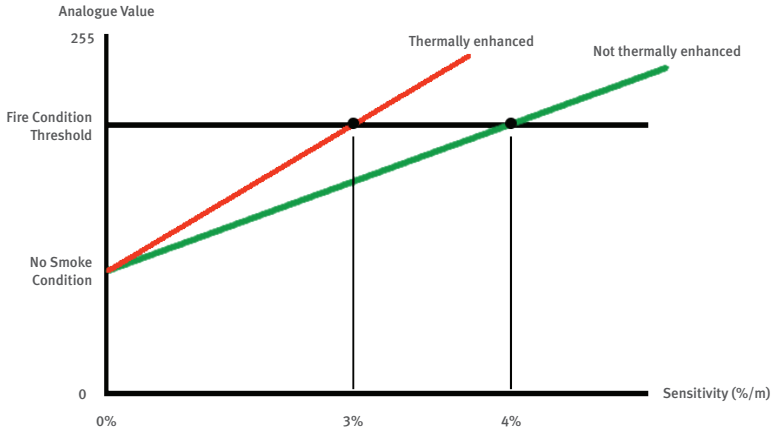
In this mode the thermistor is the primary detection method and performs similarly to the ATJ-ASN. The internal processor linearises the output of the thermistor and the analogue output can be directly related to °C by the following formula : OUTPUT = (ANALOGUE VALUE/2) - 20. The sensor has adjustable sensitivity that allows the sensitivity to varied from 0°C through to 88°C.

## Multi-Sensor Mode

In this mode both the photoelectric element and the heat element are active in the fire decision process. Essentially, the device is operating as a photoelectric smoke sensor but the photoelectric sensitivity is enhanced when a temperature rise above 40°C is detected by the heat-sensing element. The ACC-ASN achieves this utilising a microprocessor with an algorithm. This algorithm linearises the heat detection element and calculates the enhancement to the sensitivity of the photoelectric element. This additional sensitivity of the photoelectric element provides an earlier response to fire whilst still maintaining low false-alarm characteristics.

## Example

This graph shows how the ACC-ASN Multi-Sensor's photoelectric smoke sensitivity is enhanced when the temperature exceeds 40°C in Multi-Sensor Mode .




The green line represents the analogue value output of the ACC-ASN increasing as the photoelectric element detects smoke without any thermal enhancement. The sensitivity in this instance is shown as 4%/m, indicated where the green line intersects the Fire Condition Threshold.

When the temperature exceeds 40°C the photoelectric smoke sensitivity is increased as shown by the red line so that the Fire Condition Threshold is reached earlier, at a sensitivity of only 3%/m.

NOTE: In Multi-Sensor Mode, the ACC-ASN cannot initiate a fire condition by the detection of heat alone, smoke must also be present. The device can however initiate a fire condition by the detection of smoke only in Multi-Sensor Mode, and this response is similar to that of the ALG / ALK sensor.

## Sensor Recalibration

Once installed the sensors performance will vary over time due to gradual contamination by the environment. This can lead to either the device becoming over-sensitive (unwanted alarms) or become so contaminated that it fails to respond to smoke altogether. To overcome this contamination the ESP system automatically re-calibrates all smoke sensors every 24 hours maintaining the sensor at its optimum performance.

However the sensor will eventually reach a point where it can no longer re-calibrate satisfactorily (maintenance fault). At this point it can either be serviced or replaced.