Panasonic

4400

ANALOG MULTI DETECTOR

Fire alarm solutions technical description

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1. INTRODUCTION

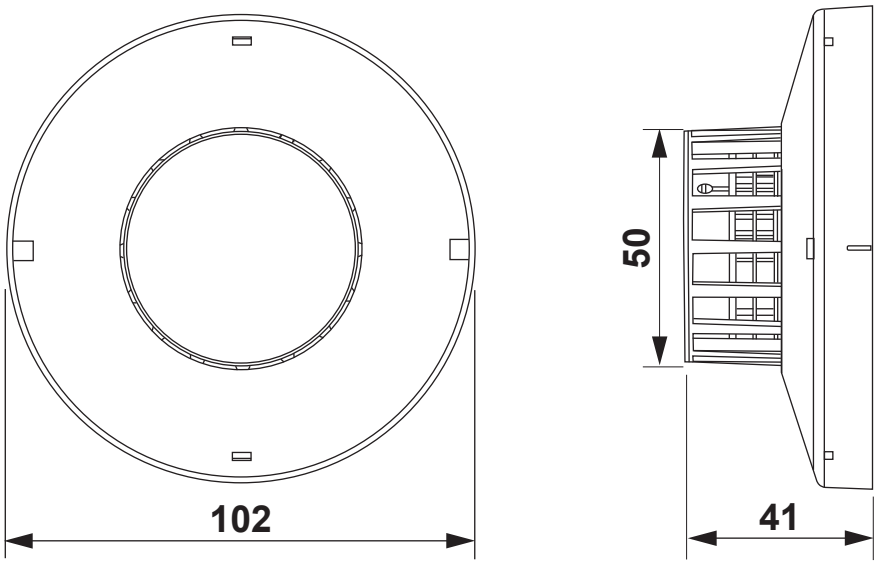
This document describes the Analog multi detector, type number 4400.
The document contains information about the product and instructions on how to mount and connect it.

2. ABBREVIATIONS

CCF	Contamination Compensation Factor	
CIE	Control and indicating equipment	= control unit
IR	Infrared	
LED	Light Emitting Diode	

3. GENERAL DESCRIPTION

The analog multi detector consists of one photoelectric (optical) smoke detector and one heat detector within the low profile housing.
The unit is intended for indoor use and in dry premises.



(Measure in mm)

3.1. LED

The detector has two red LEDs that are activated (flashing) when the detector is in fire alarm state.
The detector also has a green polling LED.
Via EBLWin, the green polling LED can in Advanced mode be set to be blinking (20 ms / 7 s) when the detector is polled or never to blink.

When the detector is in test mode the green polling LED will be turned off, indicating it is in test mode.

3.1.1. ADDRESS SETTING CHECK

The red LEDs will in all modes be blinking every second when the detector is powered and the COM Loop address is not set with the address setting tool, that is as long as the address is “000”.

3.2. IR LED

The smoke detection chamber consists of an IR LED and a photodiode. Reflection of the infrared light is used to detect smoke. The smoke enters the detection chamber through an insect filter and an optical labyrinth. This construction improves the smoke inflow and also causes steam to condense on the outer surface, to prevent nuisance alarms.

3.3. THERMISTOR

The heat sensing element is a thermistor. The heat detector can detect a methylated spirits (alcohol) fire (EN54-9, test fire TF6; liquid fire), which normally is impossible for a photo electric smoke detector to detect.

4. FIRE ALARM

4.1. FIRE JUDGEMENT

Artificial Intelligence uses combined smoke and heat sensing for the fire judgement. This will secure real fire alarms and minimize the not wanted nuisance alarms, for example due to artificial smoke or oil mist.

The fire judgement is depending on:

- (S) Smoke obscuration %/m
- (T) A fixed temperature °C
- (delta T) Temperature rise °C/168 sec

4.1.1. ALARM THRESHOLD LEVELS

There are alarm threshold levels (S, T, deltaT and 2S+deltaT) not only for fire alarm but also for pre-warning and heavy smoke / heat alarm.

Area alarm algorithm	S [%/m]	T [degrees]	ΔT [deg./168sec]	2S+ΔT
Normal	5	57	18	12
Smoke / Steam	5	57	18	12
Clean	3.7	57	18	10
Heater	5	57	Not used	12
Cooking / Welding	5	57	18	14

4.1.2. ALARM DELAY TIME

The alarm delay time is based on the cause of alarm and the temporary temperature and/or smoke obscuration changes just before and after the alarm threshold level was passed. The delay time before can be shortened up to 50 % (for example from 20 to 10 seconds), or the delay time can be extended in order to reduce nuisance alarms.

The detector has a counter that will start to count when the alarm threshold level is exceeded. The counter starts at 0 and cannot be negative. When the counter value reaches 9 the delay time starts.

SMOKE

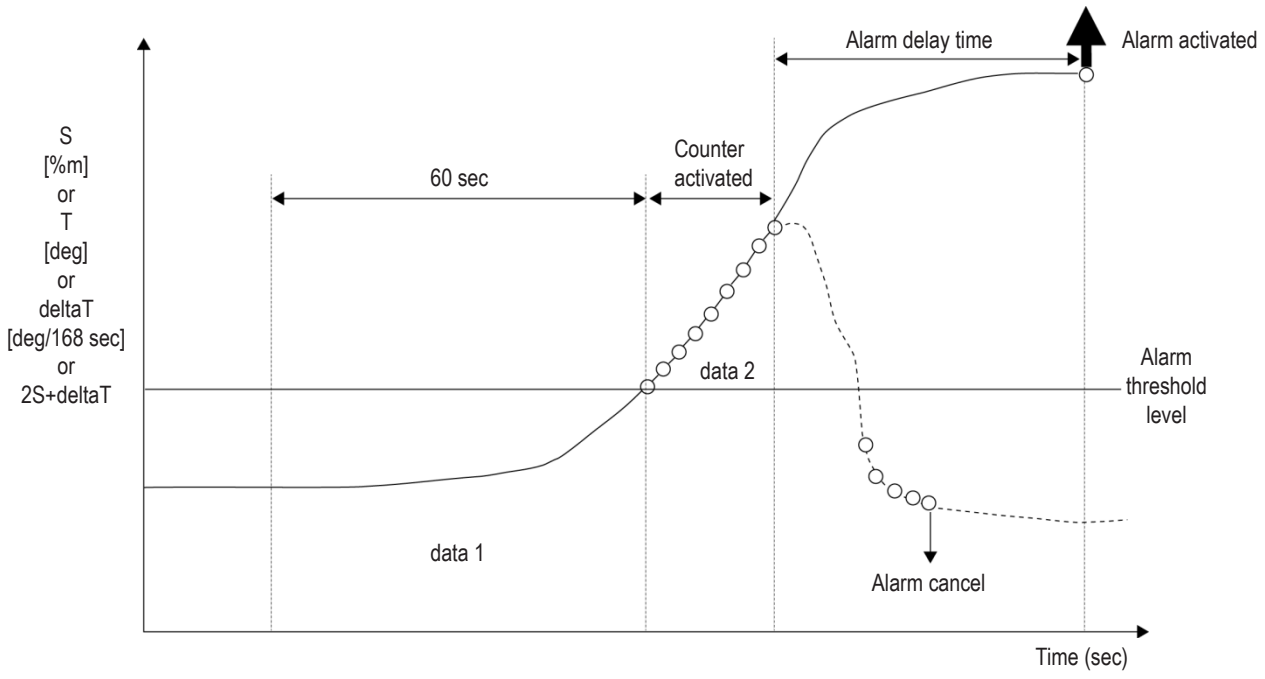
When the smoke obscuration value S exceeds the alarm threshold level the counter value increases by 1 every second.
When S falls below the alarm threshold level the counter value decreases by 2 every second.

TEMPERATURE

When the temperature value T exceeds the alarm threshold level the counter value increases by 3 every second.
When the temperature rise deltaT exceeds the alarm threshold level the counter value increases by 3 every second.
When T or deltaT falls below the alarm threshold level the counter value decreases by 2 every second.

SMOKE AND TEMPERATURE

When **2S+deltaT** exceed the alarm threshold level the counter value increases by 1 every second.
When **2S+deltaT** falls below the alarm threshold level the counter value decreases by 2 every second.



Maximum alarm delay time is 60 seconds.

If the cause of an alarm is **T** or **deltaT** the alarm delay time will be 9 seconds.
The alarm delay time function will be cancelled after 18 seconds if one of the following conditions is true:
S (%/m) > fire threshold level (S) x 2 or **T** (°C) > fire threshold level (T) or **deltaT** (°C/168 sec.) > fire threshold level (deltaT).

Alarm delay time (seconds)					
Area alarm algorithm	**S** **Data 1 (%/m)**		**T**	**deltaT**	**2S+deltaT**
Normal	data 1 < 0.6	45	9	9	data2´/ data2
	0.6 ≤ data 1 < 0.8	30			
	0.8 ≤ data 1 < 2.5	18			
	2.5 ≤ data 1	9			
Smoke / Steam	data 1 < 0.2	45 + data2/2	9	9	data2´/ data2
	0.2 ≤ data 1 < 0.3	30 + data2/2			
	0.3 ≤ data 1 < 0.4	18 + data2/2			
	0.4 ≤ data 1 < 1.3	9 + data2/2			
Clean	data1 < 0.3	45	9	9	data2´/ data2
	0.3 ≤ data1 < 0.4	30			
	0.4 ≤ data1 < 1.3	18			
	1.3 ≤ data1	9			
Heater	data1 < 0.6	45	9	Not used	data2´/ data2
	0.6 ≤ data1 < 0.8	30			
	0.8 ≤ data1 < 2.5	18			
	2.5 ≤ data1	9			
Cooking / Welding	data1 < 0.6	45	9	9	data2´
	0.6 ≤ data1 < 0.8	30			
	0.8 ≤ data1 < 2.5	18			
	2.5 ≤ data1	9			

data1 = The average smoke obscuration value for 60 seconds before the alarm threshold level was passed.

data2 = The sum of the difference between the smoke obscuration value and the alarm threshold level every second during the counter period.

data2' = The sum of the difference between the 2S+deltaT value and alarm threshold level every second during the counter period.

4.2. LEARNING FUNCTION

Depending on the local temperature changes and the local occurrence of smoke where the detector is situated, each detector can after a learning period adapt a more appropriate alarm algorithm than the default (Normal).
A learning period contains of twenty 36h-periods (20 x 36h = 720h = 30 days = one month).
When three (or more) of the 36h-periods, during the learning period, have exceeded the area alarm algorithm **level**, the area alarm algorithm will be adapted.
For the Clean area alarm algorithm to be adapted there must be no 36-periods that have exceeded the level during a full learning period. The clean area alarm algorithm will be changed back to the Normal area Alarm algorithm directly if any 36h period exceeds the level.
The minimum time for the area alarm algorithm to change back to Normal is one 36h-period.

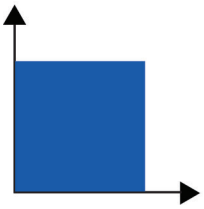
4.2.1. AREA ALARM ALGORITHMS

Normal area is the default area alarm algorithm for each detector. There are four other **Area alarm algorithms** that can be adapted after the learning period:

- **Smoke – Steam area**, is depending on occurrence of smoke, **level 1** = S [%/m] > half the fire alarm threshold level (S)
- **Clean area**, is the most sensitive condition, requiring a very clean and stable environment. The values for **level 1** must not be exceeded
- **Heater area**, is depending on rise of temperature, **level 2** = deltaT [°C/168 sec] ≥ 12 (approx. 4.3°C/min)
- **Cooking – Welding area**, is depending on occurrence of smoke together with rise of temperature, **level 3** = 2S+deltaT ≥ 10.

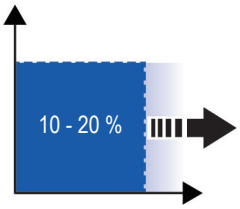
S has to be ≥ 2.5 and deltaT has to be ≥ 3.

Normal area
(default)



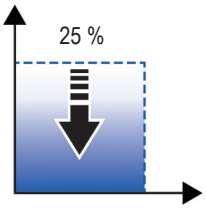
Normal sensitivity
and delay time

Smoke-steam area
(longer delay time)



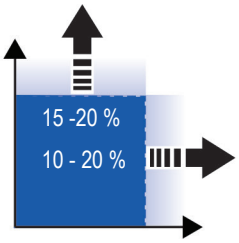
Delay time 10-20%
longer than normal

Clean area
(higher sensitivity)



Approximately 25% more
sensitivity than normally

Cooking-welding area
(longer delay time and lower sensitivity)



15-20% less sensitivity and delay time
10-20% longer than normal

The **Heater area** alarm algorithm is similar to the alarm algorithm for the **Normal** area but the rate-of-rise function (deltaT) will not be used for alarm activation.

The learning function for **Heater area** and **Cooking – Welding area** are the same as for Smoke - Steam area but level 2 and level 3 are used instead of level 1.

4.2.2. WITHOUT LEARNING FUNCTION

If the area where the detector is placed is known, for example a kitchen, the learning function should be turned off and the detector should be programmed via EBLWin to its correct algorithm.

If manually set, also an alternative area alarm algorithm can be set that can be controlled via a one or two time channels.

4.3. ANALOG DATA OUTPUT

The smoke obscuration value (%/m) and the temperature (°C) can be shown via the CIE. A new value is calculated in the detector every second. The smoke obscuration value is an average value for the last four seconds.

4.4. SENSITIVITY COMPENSATION

In order to maintain a constant sensitivity regardless of the contamination of the detector, a Contamination Compensation Factor (CCF) is subtracted from the momentary smoke obscuration values before evaluated in the alarm algorithms.
The CCF is calculated during a 36 hours period as follows:
During 13 minutes, all the momentary smoke obscuration values are saved and an average value is calculated. The CCF will be changed directly if the average value is lower than the actual CCF, else no change.
This is valid for 18 hours. Then the CCF will be changed also if the average value is higher than the actual CCF. (It will normally be higher because of contamination.)
After another 18 hours the CCF will be changed if the average value is lower or higher than the actual CCF and it will be saved in the detector's non-volatile memory.
A new 18 + 18 = 36 hours period starts with an average value calculation every 13th minute.

4.4.1. SERVICE SIGNAL

A service signal will be activated when the detectors CCF value is 2%/m and the detector has to be replaced.

4.5. SELF DIAGNOSIS OF INTERNAL DEVICES

The detectors perform an internal check of some vital functions and components (for example the IR-LED). A separate fault message will be shown in the CIE.

4.6. TEST MODE

For information about how to set the detector in test mode, see Planning Instructions or Operating Instructions.
When the detector is set in test mode, smoke will activate the fire alarm without heat. This allows the detector to be tested without using heat.
It is possible to use test aerosol equipment for testing. For example “SOLO” or “Testifire”.

5. FUNCTION

5.1. DISABLE THE SMOKE SENSOR

The function is valid for EBLOne, EBL512 G3 and EBL128 from version 2.4.0.

It is possible to disable the smoke sensor only in a 4400, if it is set to Advanced mode.
The disablement can be performed through, EBLWeb or EBLWin:

- EBL512 G3; go to zone or zone/address menu H2/B1
- EBLOne; go to Disable menu >
- EBL128; go to zone or zone/address menu H2/B1

The disablement is indicated by the text 'Smoke only', which is added to the disablement text in menu Disablement H4/U1.

Zone XXX address XX disabled Smoke only
yyyy-mm-dd hh:mm

Zone XXX is disabled
Automatic re-enable hh:mm
yyyy-mm-dd hh:mm

Menu

It is also possible to disable the smoke sensor only by a time channel in a 4400, if it is set to Advanced mode.
The disablement by time channel is indicated by the text 'Smoke only', which is added to the disablement text in menu Disablement by time channel. For EBL512 G3 and EBL128; go to H2/U2, and for EBLOne; go to > > .

Zone XXX address XX disabled by time
Channel Smoke only

Zone XXX address YY disabled by time
channel.

Number of disablement by time channel: 2

Menu

6. SET THE COM LOOP ADDRESS

Each COM loop unit has to have a unique COM loop address (001-253). The address is set with the Address Setting Tool (4414 or 4414E).

The COM loop address and mode settings have to be done before the unit is connected to the COM loop.

7. SET THE MODE

The mode is set with the Address Setting Tool (4414 or 4414E) according to the table below.

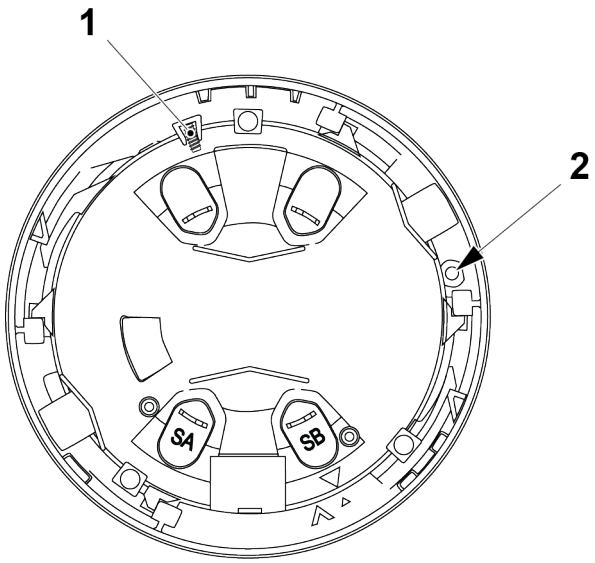
7.1. COMPATIBILITY TABLE

	Advanced mode	NORMAL mode	2330 mode	2312 mode
EBL512 G3	V ≥ 2.0	All versions	Not used	Not used
EBLOne	V ≥ 3.3	Not used	Not used	Not used
EBL128	V ≥ 2.0	All versions	Not used	Not used
Configured as:	-	-	2316 or 2317	-
Fire judgement in:	Detector	CIE	Detector	-

A detector set in NORMAL mode will use the normal mode algorithms. These algorithms are calculated in the CIE and not in the detector. These normal mode algorithms are described in the Planning Instructions for the system.

8. MOUNTING

The detector is plugged in an analog base.
Place the detector in the base with the detector's "Mark" in the same position as the "Mark" on the base and turn the detector clock-wise.



1. Locking screw
2. Locking screw hole (prepared for drilling through detector body)

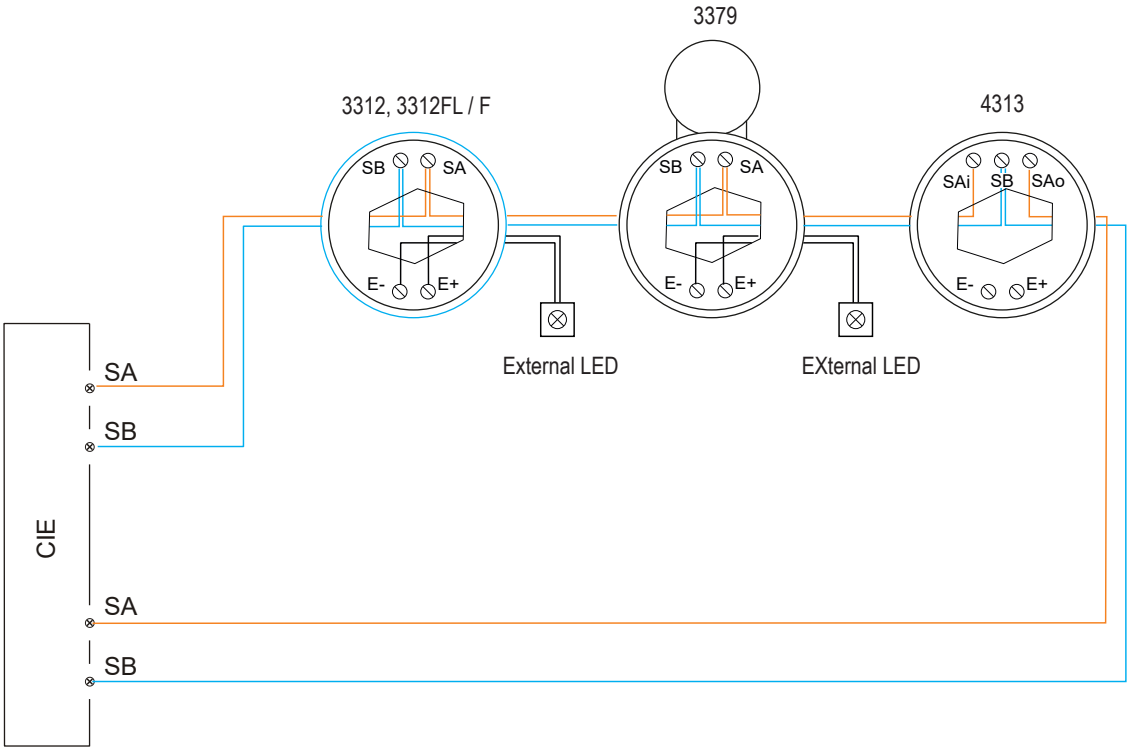
8.1. LOCKING SCREW

The detector is prepared for mechanical locking with analog base 3312x / 4313 / 3379. One hexagon socket screw is attached (1.5 mm Hex key to be used). The locking screw hole (2.5-2.7 mm) has to be drilled.

9. INSTALLATION AND WIRING

The detector is plugged in an analog base 3312x / 4313 / 3379. The COM Loop and external LED are connected to the analog base.

Screen wire termination is not provided.



	3312F / 3312FL	3312 / 4313 / 3379
Wire size (Min)	Ø 0.6 mm (0.3 mm²)	Ø 0.6 mm (0.3 mm²)
Wire size (Max)	Ø 1.2 mm (1.13 mm²)	Ø 1.6 mm (2 mm²)

10. TECHNICAL DATA

All current consumptions are valid by nominal voltage and by 25 °C.

Voltage: Allowed Normal	 12 – 30V DC 24V DC
Current: Quiescent Active (incl. internal LED) Active (incl. external LED)	 0.3 mA (+0.025 if green polling LED is used) 1.3 mA 1.8 mA
Address range	001-253
Address setting	With address setting tool
Short circuit isolator	No
Internal battery	No
Material	Polycarbonate Alloy
Ambient temperature: Operating Storage	 -10 to +50 °C -25 to +75 °C
Ambient humidity	Maximum 95 % RH (Non condensing)
Ingress protection rating	IP41
Size: Ø x H	 102 x 41 mm
Weight	75 g
Colour 4400W	White (10Y9/0.5, Munsell colour code)

11. APPROVALS

Applicable directive/ Approval	Applicable standards	Notified body
CPR	EN54-5 EN54-7	VdS No. 0786-CPR-21172
VdS	EN54-5:2017 + A1 2018 EN54-7:2018 VdS 2344:2014-07 VdS 2543:2021-03 CEA 4021:2003-07	VdS No. G212106
EMC	EN61000-6-3 (Emission) EN50130-4 (Immunity)	Self declaration VdS
RoHS	EN IEC 63000	Self declaration

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Panasonic Fire & Security Europe AB
Jungmansgatan 12
SE-211 11 Malmö
SE
Tel: +46 (0)40 697 70 00