Panasonic

4401

ANALOG PHOTOELECTRIC SMOKE DETECTOR

Fire alarm solutions
technical description

www.panasonic-fire-security.com

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1. INTRODUCTION

This document describes the Analog photoelectric smoke detector, type number 4401.
The document contains information about the product and instructions on how to mount and connect it.

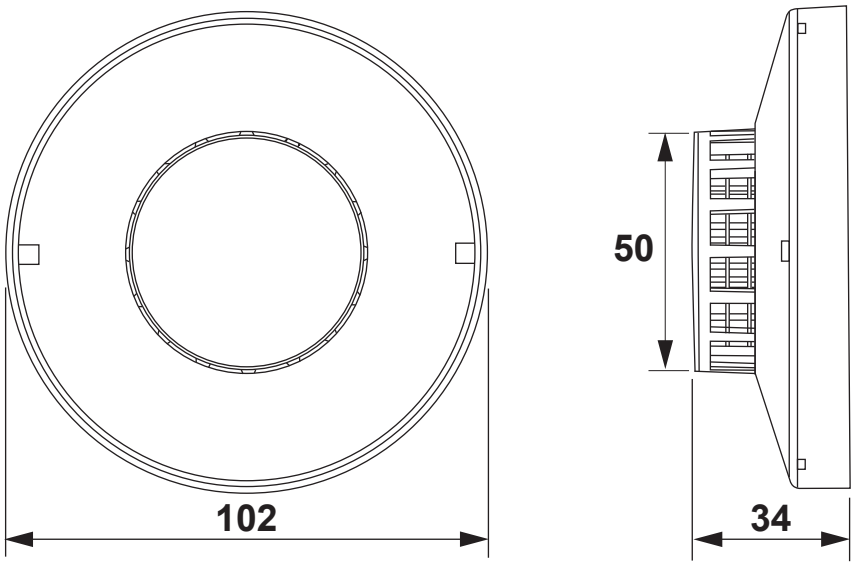
2. ABBREVIATIONS

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

3. GENERAL DESCRIPTION

The photoelectric smoke detector has low profile housing. The latest IC technology will secure the highest reliability possible.

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 blink (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 infrared light is used to detect smoke. The smoke enters the detection chamber through an insect filter and an optical labyrinth. This construction improves smoke inflow and causes steam to condense on the outer surface, preventing nuisance alarms.

3.3. EXTENDED FIRE DOOR CLOSING FUNCTION

The 4401 supports the ' Fire Door closing function' activated by a quiet alarm during disablement.
For more information, see Planning Instructions for the system.

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

4. FIRE ALARM

In this chapter only **Advanced mode** is described. The detectors are factory set to NORMAL mode but **Advanced mode** can be set with the address setting tool **4414** or **4414E**.

4.1. FIRE JUDGEMENT

Artificial Intelligence uses smoke sensing for the fire judgement, as well as variable sensitivity and time delay based on the smoke changes just before the alarm level is reached.
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 depends on the alarm threshold level, which depends on the area alarm algorithm ("learning mode").

4.1.1. ALARM THRESHOLD LEVELS

The analog smoke detector has the following fire alarm threshold levels:

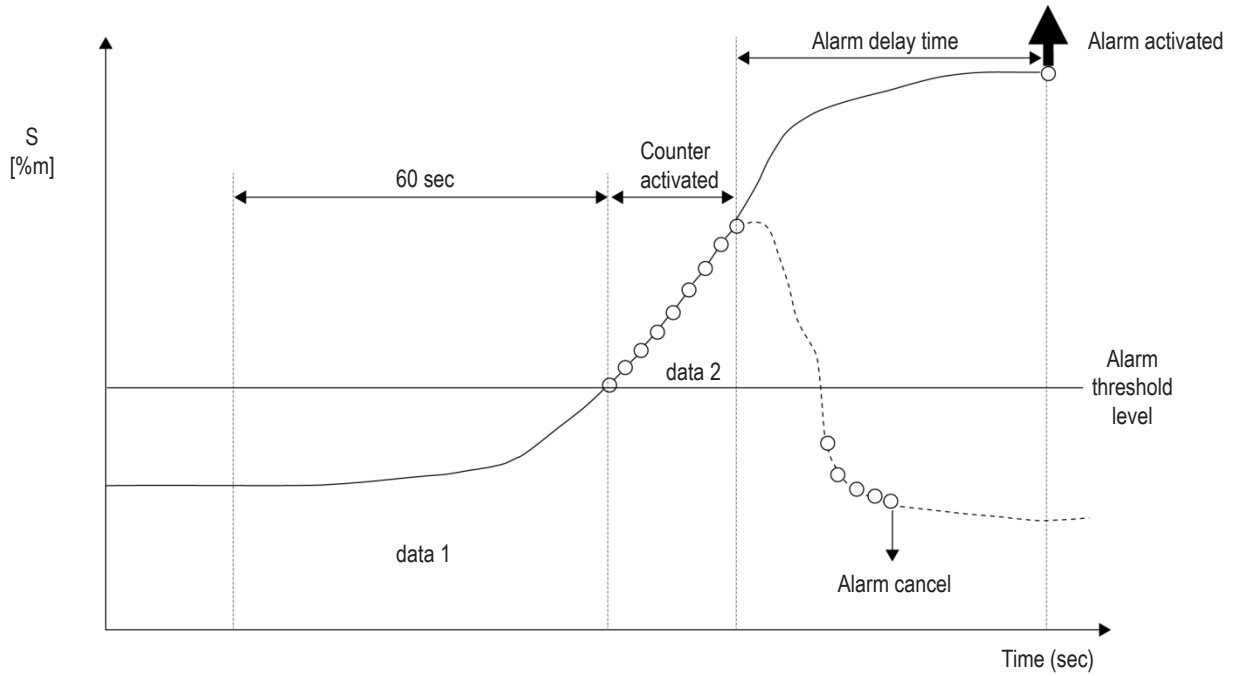
Area alarm algorithm	S [%/m]
Normal (default)	3.5
Smoke/steam (longer delay time)	3.5
Clean (higher sensitivity)	2.6

4.1.2. ALARM DELAY TIME

The alarm delay time is based on the cause of alarm and the temporary smoke obscuration changes just before and after the alarm threshold level was passed. The delay time 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.

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.



Maximum alarm delay time is 60 seconds.

Alarm delay time (seconds)			
Area alarm algorithm	**S Data 1 (%/m)**		
Normal clean		data 1 < 0.2	45
	0.2 ≤	data 1 < 0.3	39
	0.3 ≤	data 1 < 0.4	30
	0.4 ≤	data 1< 1.3	18
	1.3 ≤	data 1	9
Smoke / Steam		data 1 < 0.2	45 + data2/2
	0.2 ≤	data1 < 0.3	39 + data2/2
	0.3 ≤	data1 < 0.4	30 + data2/2
	0.4 ≤	data1 < 1.3	18 + data2/2
	1.3 ≤	data1	9 + data2/2

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.

4.2. LEARNING FUNCTION

Depending on 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 two 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

4.3. 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.

4.4. ANALOG DATA OUTPUT

The smoke obscuration value (%/m) 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.

4.5. 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.

4.5.1. SERVICE SIGNAL

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

4.6. 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.

4.7. TEST MODE

For information about how to set the detector in test mode, see Planning Instructions or Operating Instructions.

It is possible to use test aerosol equipment for testing. For example “SOLO” or “Testifire”.

5. 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.

6. SET THE MODE

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

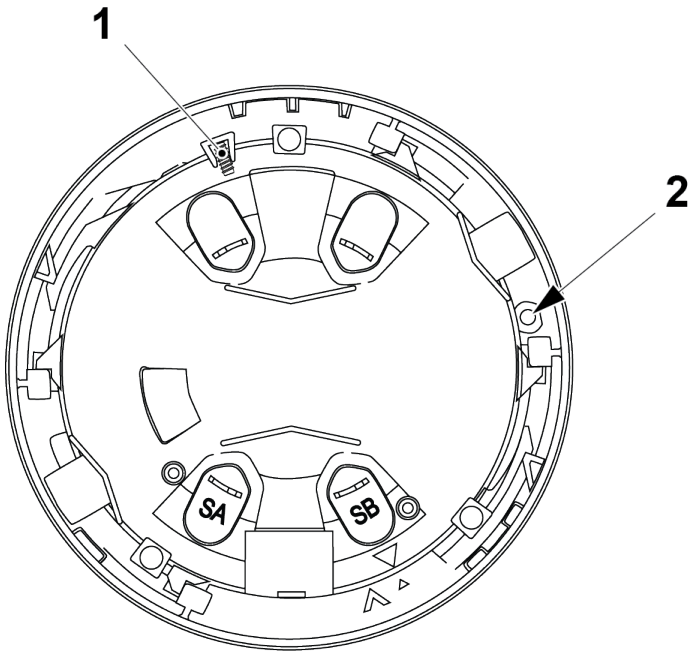
6.1. COMPATIBILITY TABLE

	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:	-	4301 or 3304	2330	2312
Fire judgement in:	Detector	CIE	Detector	CIE

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.

7. 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 clockwise.



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

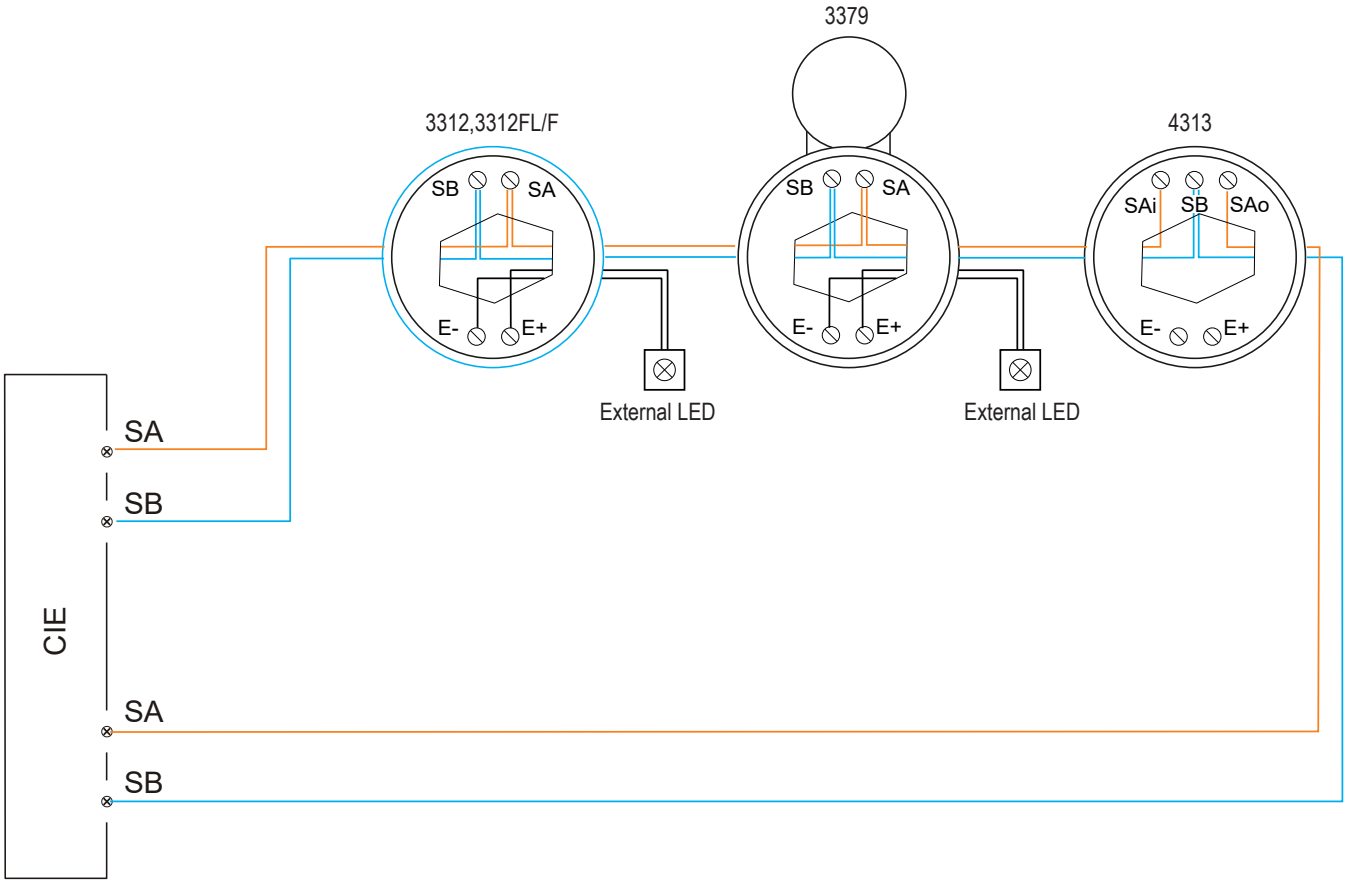
7.1. LOCKING SCREW

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.

8. 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)

9. TECHNICAL DATA

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

Voltage: Allowed Normal	 12 – 32.0 V DC 24V DC
Current: Quiescent Active (incl. internal LED) Active (incl. internal LED)	 0.3 mA (plus 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 34mm
Weight:	75 g
Colour 4401W	White (10Y9/0.5, Munsell colour code)

10. APPROVALS

Applicable directive/ Approval	Applicable standards	Notified body
CPR	EN54-7	VdS No. 0786-CPR-21175
VdS	EN54-7:2018 VdS 2344:2014-07 VdS 2543:2021-03	VdS No. G212107
EMC	EN61000-6-3 (Emission) EN50130-4 (Immunity)	Self declaration VdS
RoHS	EN IEC 63000	Self declaration

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