

Photosensor amplifiers, Photodiode modules



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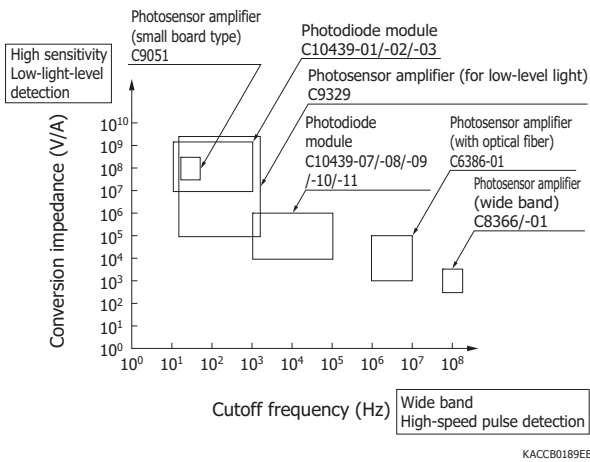
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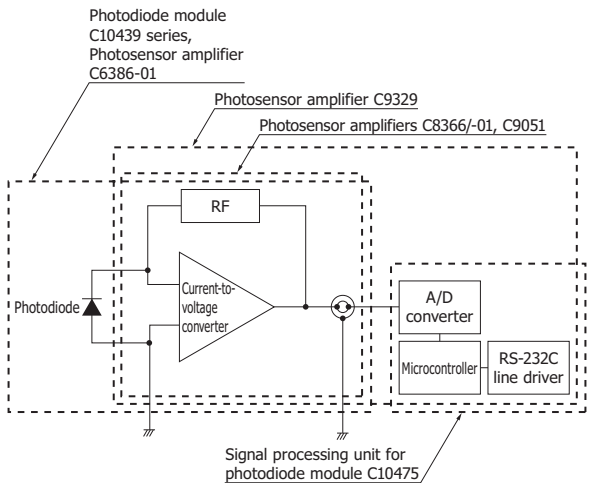
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To make our photodiodes easier to use, we offer photosensor amplifiers and photodiode modules with an internal current-to-voltage conversion amplifier. Several types with different conversion impedance and frequency characteristics are available.

Conversion impedance vs. cutoff frequency



Block diagram



1. Photosensor amplifiers

Photosensor amplifiers are modules that incorporate a current-to-voltage conversion amplifier designed to amplify weak photocurrent in a photodiode with low noise.

1-1 Features

High accuracy and low noise

High-precision, low-noise components are used and arranged in a noise-resistant configuration. The C6386-01 and C9329 have a zero adjustment function to eliminate the offset.

- ▶ Dry battery operation (C6386-01, C9329)
- ▶ Switchable detection sensitivity (C6386-01, C9329)
- ▶ Wide bandwidth type available (C8366/-01)

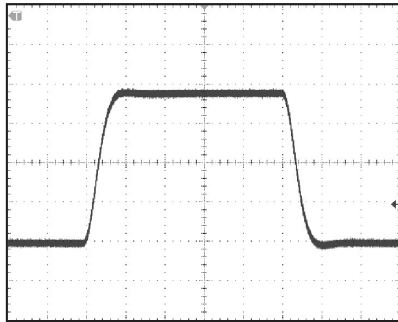
The C8366/-01 wide-band type achieves high-speed response since a trimmer can adjust the feedback capacitance according to the PIN photodiode being connected.

Optical fiber type available (C6386-01)

The C6386-01 optical fiber type uses an optical fiber that guides light to the internal photodiode. This reduces effects from noise on the photodiode and circuitry even if there is a noise source near the location of the light being measured.

With a data logger function (C9329)

[Figure 1-1] Oscilloscope output example of analog signal (C9329)



Vertical axis: 1 V/div., horizontal axis: 400 μ s/div.
 S2281-01 photodiode with BNC connector (Ct=3300 pF typ.), middle range
 Light source: infrared LED (L9337-01), pulse width: 2 ms
 Measuring device: TEKTRONIX TDS3034B (BW 20 MHz)
 Ambient temperature: 25 °C, overshoot: approx. 3%

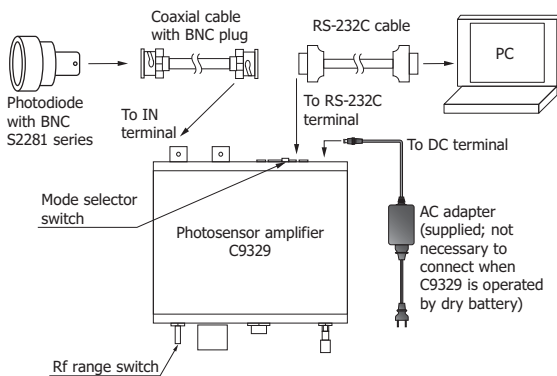
1 - 2 Usage (C9329)

The input section of the C9329 photosensor amplifier is a BNC connector, so use a BNC plug coaxial cable to connect it to a photodiode.

Use a dry battery or AC adapter (supplied) to supply power to the photosensor amplifier.

Analog or digital operation mode is selectable for data output. In analog mode, measurements are made by connecting the output to a measuring device such as an oscilloscope using a BNC plug coaxial cable. In digital mode, digital signals (16 bits) can be obtained by serial connection (RS-232C) to a PC.

[Figure 1-2] Connection example (C9329, digital operation mode)



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[Table 1-1] Hamamatsu photosensor amplifiers

Type no.	Feature	Photodiode	Cutoff frequency	Conversion impedance (V/A)	Power supply	Output	Zero adjustment knob
C6386-01	With optical fiber (1 m)	Internally mounted	10 MHz 3 MHz 1 MHz	10^3 10^4 10^5	External power supply (± 15 V) or dry battery (9 V \times 2)	Analog	Yes
C8366/-01	Wide bandwidth	Sold separately (high-speed Si PIN photodiode)	100 MHz	10^3	External power supply (± 15 V)	Analog	No
C9051	Small board type	Sold separately (terminal capacitance: 15 nF or less)	16 Hz	10^8	AC adapter (12 V)	Analog	No
C9329	For low-level light	Sold separately (terminal capacitance: 5 nF or less)	1600 Hz 16 Hz	$10^5, 10^7$ 10^9	AC adapter (12 V) or dry battery (9 V)	Analog Digital	Yes

2. Photodiode modules

Photodiode modules are high-precision photodetectors that include a Si or InGaAs photodiode together with a current-to-voltage conversion amplifier. The output is an analog voltage and can be easily checked with a voltmeter and the like.

Photodiode modules have a sensitivity range (high/low) switching function, so a highly accurate output can be obtained by selecting a sensitivity range that matches the light level to be detected.

Hamamatsu also provides a signal processing unit for photodiode module (sold separately) that converts the output of a photodiode module into digital signals. High-resolution digital signals (16 bits) can be obtained by serial connection (RS-232C) to a PC. Measurement data can then easily be stored into the PC using sample software that comes with the signal processing unit. Measurement data can also be stored in the internal memory (data logger function). The controller operates also on dry battery and so can be used easily.

2 - 1 Features

▶ Internal photodiode

Si photodiode, InGaAs photodiode, InAsSb photovoltaic detector, two-color detector types are available.

▶ Voltage output for easy handling

▶ Selectable sensitivity (high/low range)

▶ Compact size

▶ Can be mounted on optical bench rod (M4)

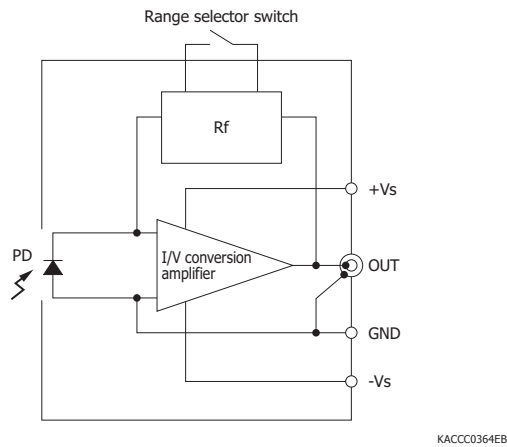
▶ Signal processing unit photodiode module is provided (sold separately).

Measurement data can be easily loaded into a PC using sample software that comes with the signal processing unit.

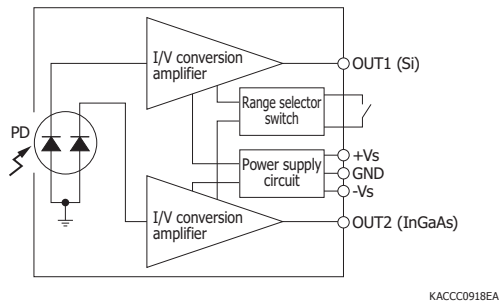
2 - 2 Structure

[Figure 2-1] Block diagram

(a) C10439-01/-02/-03/-07/-08/-09/-10/-11/-14



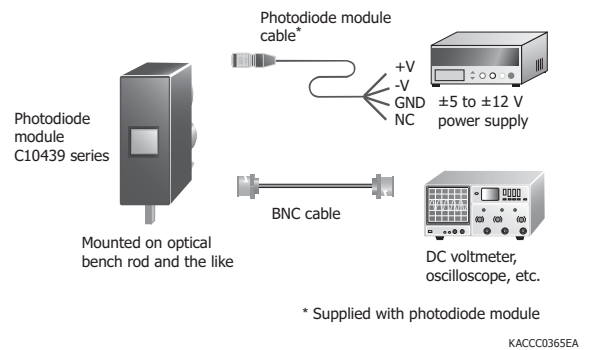
(b) C10439-15



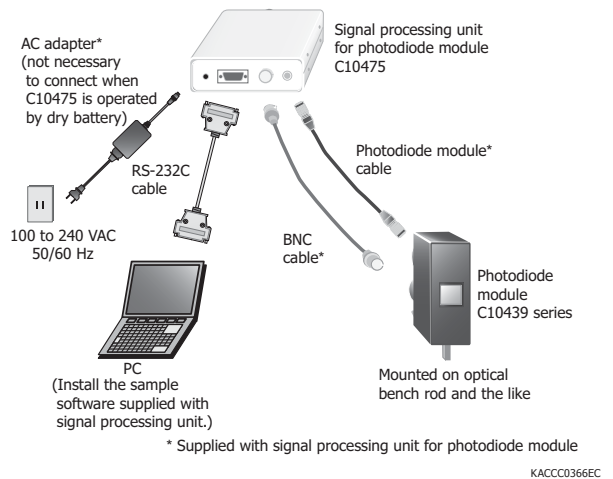
2 - 3 How to use

[Figure 2-2] Connection examples (C10439 series)

(a) Connection to DC voltmeter or oscilloscope



(b) Connection to signal processing unit for photodiode module

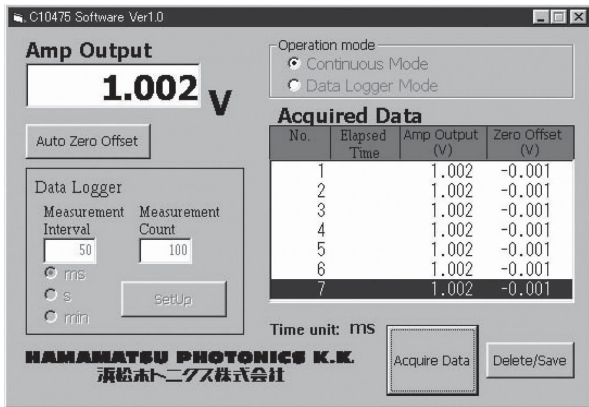


[Table 2-1] Hamamatsu photodiode modules

Type no.	Photodiode	Photosensitive area (mm)	Output	Conversion impedance (V/A)	Cutoff frequency	Supply voltage		
C10439-01	Si	2.4 × 2.4	Analog	High gain: 10 ⁹ Low gain: 10 ⁷	High gain: 10 Hz Low gain: 1 kHz	External power supply (±5 to ±12 V)		
C10439-02		5.8 × 5.8						
C10439-03		10 × 10						
C10439-07		2.4 × 2.4		High gain: 10 ⁶ Low gain: 10 ⁴	High gain: 1 kHz Low gain: 100 kHz*			
C10439-08		5.8 × 5.8						
C10439-09		10 × 10						
C10439-10	InGaAs	φ1		High gain: 10 ⁷ Low gain: 10 ⁶	High gain: 100 Hz Low gain: 1 kHz			
C10439-11		φ3						
C10439-14	InAsSb	0.7 × 0.7						
C10439-15	Si	2.4 × 2.4					High gain: 10 ⁶ Low gain: 10 ⁵	High gain: 10 kHz Low gain: 100 kHz*
	InGaAs	φ1						

* When output amplitude is 2 Vp-p

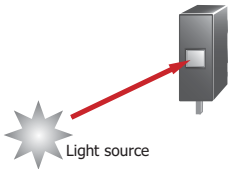
[Figure 2-3] Example of sample software (supplied with C10475) displayed on PC screen



2 - 4 Applications

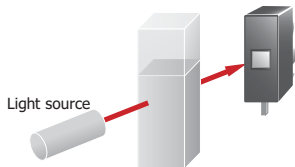
[Figure 2-4] Photodiode module application examples

(a) Optical power monitors, laser/LED monitors, and illuminometers



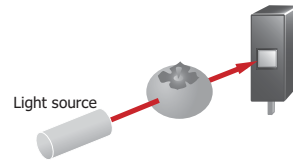
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(b) Water pollution measurement



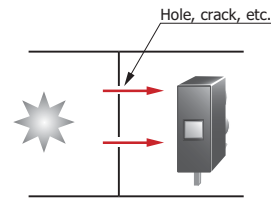
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(c) Brix meters



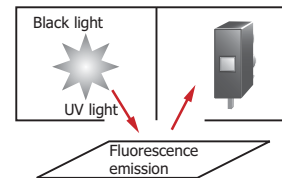
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(d) Light leakage detection



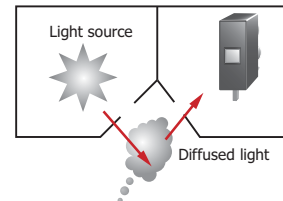
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(e) Detection of fluorescence from printed matter



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(f) Gas/smoke detection



KACCC0415EA

Information described in this material is current as of December 2020.

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