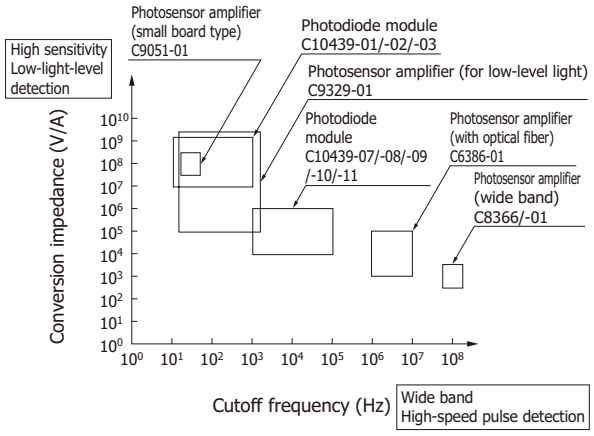
HAMAMATSU
PHOTON IS OUR BUSINESS

Photosensor amplifiers, Photodiode modules

Contents

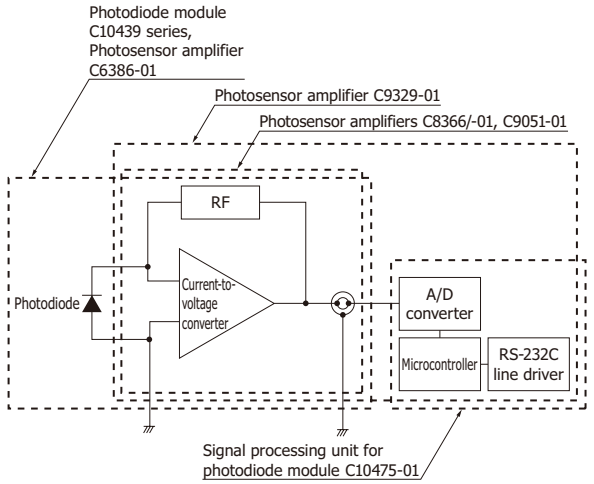
To make our photodiodes easier to use, we offer photosensor amplifiers and photodiode modules with an internal current-to-voltage conversion amplifier. Several types with different conversion impedance and frequency characteristics are available.

Conversion impedance vs. cutoff frequency



KACCB0189EC

Block diagram



KACCC0409EC

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 C9329-01 have a zero adjustment function to eliminate the offset.

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

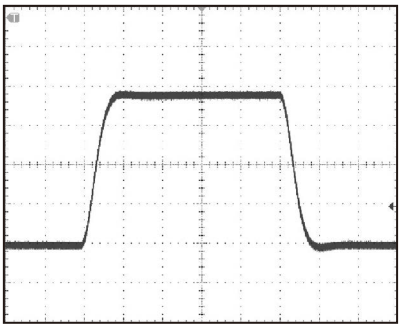
  The C8366/-01 wide-band type achieves high-speed response since a trimmer can adjust the feedback capacitance according to the PIN photodiode being connected.

- 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 (C9329-01)

[Figure 1-1] Oscilloscope output example of analog signal (C9329-01)

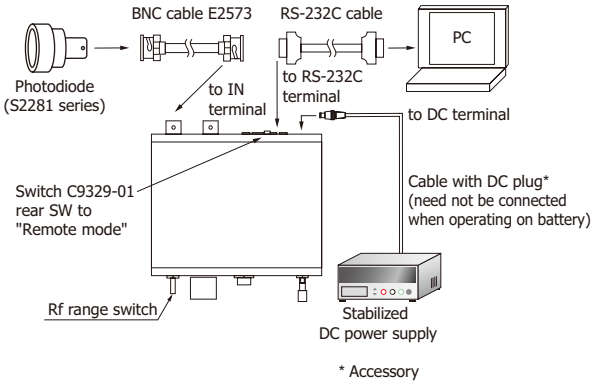


Vertical axis: 1 V/div., horizontal axis: 400 µs/div.
S2281-01 photodiode with BNC connector (Ct=3300 pF typ.), middle range
Light source: infrared LED (L9337-01), pulse width: 2 ms
Measuring device: TEKTRONIX TDS3034B (BW 20 MHz)
Ambient temperature: 25 °C, overshoot: approx. 3%

1 - 2 Usage (C9329-01)

The input section of the C9329-01 photosensor amplifier is a BNC connector, so use a BNC plug coaxial cable to connect it to a photodiode.
Use a dry battery or stabilized DC power supply 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 (C9329-01, digital operation mode)



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 the signal processing unit C10475-01 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, 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.

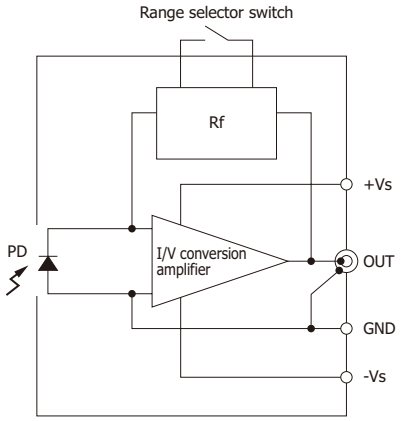
[Table 1-1] Hamamatsu photosensor amplifiers

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	10^3	Stabilized DC power supply (±15 V) or dry battery (9 V × 2)	Analog	Yes
			3 MHz	10^4			
			1 MHz	10^5			
C8366/-01	Wide bandwidth	Sold separately (high-speed Si PIN photodiode)	100 MHz	10^3	Stabilized DC power supply (±15 V)	Analog	No
C9051-01	Small board type	Sold separately (terminal capacitance: 15 nF or less)	16 Hz	10^8	Stabilized DC power supply (12 V)	Analog	No
C9329-01	For low-level light	Sold separately (terminal capacitance: 5 nF or less)	1600 Hz	10^5, 10^7	Stabilized DC power supply (12 V) or dry battery (9 V)	Analog Digital	Yes
			16 Hz	10^9			

2 - 2 Structure

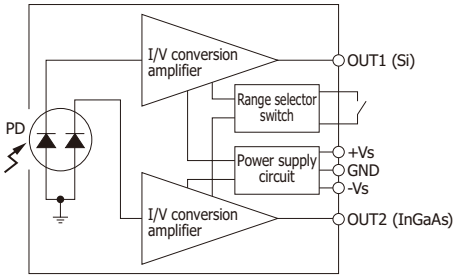
[Figure 2-1] Block diagram

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



KACCC0364EB

(b) C10439-15

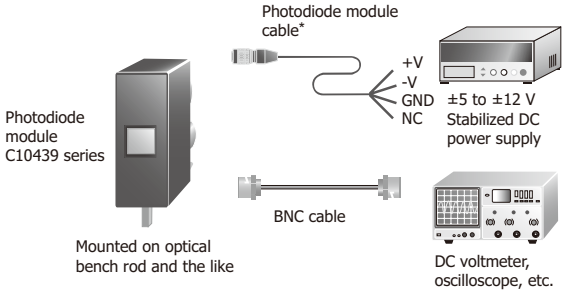


KACCC0918EA

2 - 3 How to use

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

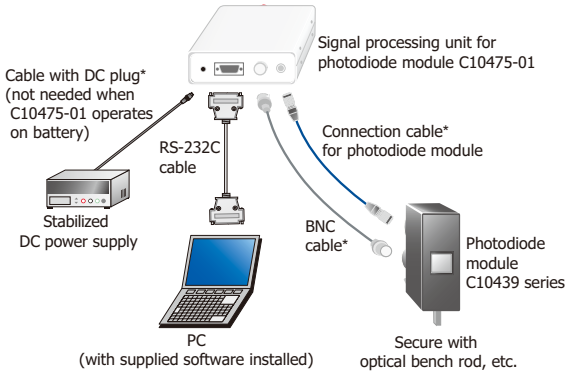
(a) Connection to DC voltmeter or oscilloscope



* Supplied with photodiode module

KACCC0365EB

(b) Connection to signal processing unit for photodiode module



* Accessories

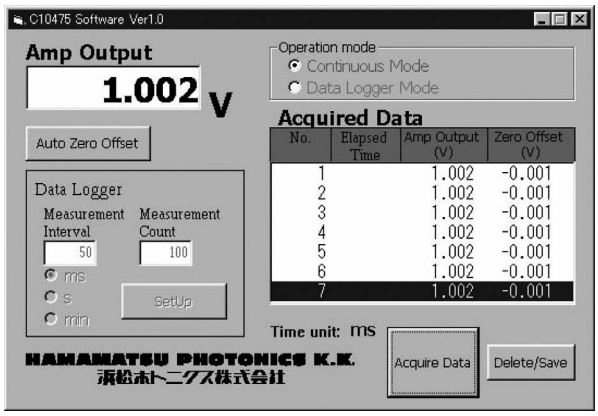
KACCC1186EA

[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	Stabilized DC 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				
C10439-11		ϕ3				
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

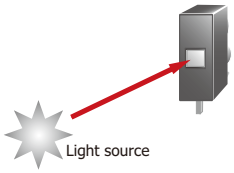
[Figure 2-3] Example of sample software
(supplied with C10475-01) displayed on PC screen



2 - 4 Applications

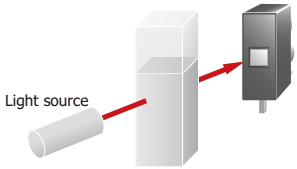
[Figure 2-4] Photodiode module application examples

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



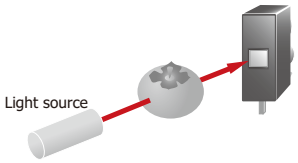
KACCC0410EA

(b) Water pollution measurement



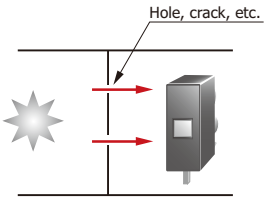
KACCC0411EA

(c) Brix meters



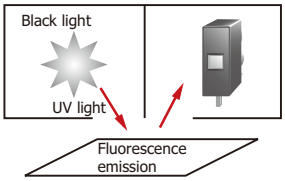
KACCC0412EA

(d) Light leakage detection



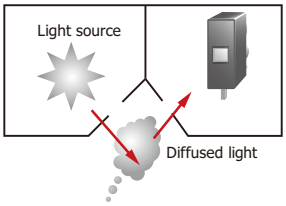
KACCC0413EA

(e) Detection of fluorescence from printed matter



KACCC0414EA

(f) Gas/smoke detection



KACCC0415EA

HAMAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184
U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218
Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de
France: HAMAMATSU PHOTONICS FRANCE S.A.R.L.: 19 Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr
United Kingdom: HAMAMATSU PHOTONICS UK LIMITED: 2 Howard Court,10 Tewin Road, Welwyn Garden City, Hertfordshire, AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk
North Europe: HAMAMATSU PHOTONICS NORDEN AB: Torshamnsgatan 35, 16440 Kista, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: info@hamamatsu.se
Italy: HAMAMATSU PHOTONICS ITALIA S.R.L.: Strada della Moia, 1 int. 6 20044 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it
China: HAMAMATSU PHOTONICS (CHINA) CO., LTD.: 1201, Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn
Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 8F-3, No.158, Section 2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw

Cat. No. KACC9015E02 Mar. 2023 DN