NEWS RELEASE

Hamamatsu Photonics has developed a UV-sensitive model of “mini-spectrometer micro series” that offer high sensitivity, fingertip size and low cost.
These features help slash the size of environmental measuring instruments such as those needed for water quality monitoring and analysis.
Sample products will be available from November 15, 2023

November 1, 2023
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Hamamatsu Photonics now introduces a UV-sensitive model of “mini-spectrometer micro series” called the C16767MA that is highly sensitive to UV light. The C16767MA was designed and developed by leveraging our unique micro-electro-mechanical system (MEMS) technology and advanced opto-semiconductor manufacturing technology.

The C16767MA separates UV light in the range of 190 to 440 nm or nanometers (a nanometer is one billionth of a meter) into multiple wavelengths and then simultaneously measures the light intensity at each wavelength. As just one application, for example, the C16767MA can be mounted in compact water quality monitors. Installing these monitors in rivers, lakes or oceans allows inspecting and analyzing the content of multiple types of pollutants in water via absorption spectrophotometry (*1). The C16767MA also assists in designing and manufacturing inexpensive water quality monitors that are easily installable in large numbers at many testing sites to monitor water quality, thus improving the accuracy of water quality assessment over broad-ranging areas. By expanding sales of the C16767MA, we will contribute to ensuring safer water and address climate change.

Sales of the C16767MA will start on Wednesday, November 15 this year for domestic and overseas manufacturers of environmental measurement instruments. The C16767MA will also be on display at “PHOTON FAIR 2023” which is an all-inclusive Hamamatsu Photonics exhibition showing off our advanced technologies and products along with the tremendous possibilities of light. The exhibition will be held over three days starting from Thursday, November 16 at Act City Hamamatsu (Naka-ku, Hamamatsu City, Japan) for the first time in 5 years.

*1: Absorption spectrophotometry is an analytical technique based on the ability of a substance to absorb light. By shining light on a sample such as water and measuring its absorbance, the concentration of contaminants in the sample can be determined.

Product overview

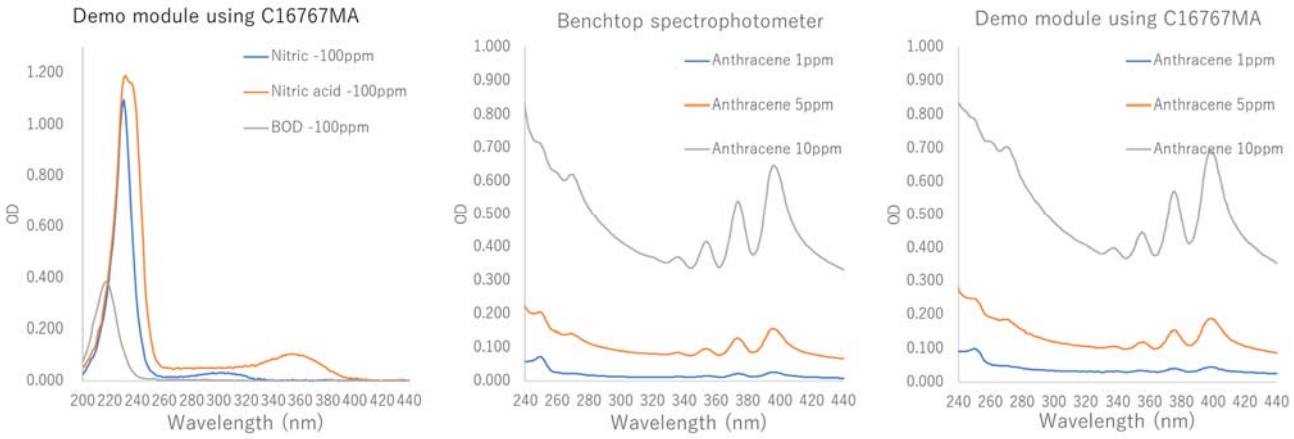
The C16767MA is a finger-tip sized mini-spectrometer having UV sensitivity.

We develop, manufacture and sell photodetectors and light sources designed and optimized for environmental measurement instruments that are essential for detecting trace amounts of environmental pollutants. There are already inexpensive compact water monitors available that are installed in large numbers at testing sites in rivers, lakes and oceans to monitor water quality and most of these utilize photodiodes as the detector. However, these water quality monitors are limited by the number of substances they can detect. Expensive water quality analyzers on the other hand can simultaneously detect multiple types of substances because they incorporate a large spectrometer capable of separating UV light into multiple wavelengths and measuring the

light intensity at each wavelength simultaneously, However, these expensive analyzers are usually large benchtop units not designed for field work, so the collected samples have to be brought into a laboratory for analysis. This situation has created a rise in market demand for small, low-cost UV mini-spectrometers that will allow making smaller and inexpensive water quality monitors installable in large numbers at remote testing sites to speedily detect multiple organic pollutants.

We offer a lineup of fingertip-sized mini-spectrometers called the “micro series” that are designed and fabricated based on our unique in-house MEMS technology. However, these mini-spectrometers have one shortcoming in that incident UV light gradually lowers the image sensor sensitivity. This problem currently limits their applications to analysis tasks using visible light specroscopy. To cope with this issue, we improved the image sensor photosensitive area to boost its resistance to UV light and also optimized the shape of the diffraction grating used in the mini-specrometer. By also leveraging our unique opto-semiconductor device manufacturing technology, we were able to form a filter on the image sensor to suppress stray light (*2) that is generated when UV light is dispersed into wavelengths. All of this work led to a successful development of a UV-sensitive model of “micro series mini-spectrometer” that offers high sensitivity in the spectral range of 190 to 440 nm as well as a fingertip size and low cost.

*2: Stray light is unwanted light other than the signal light used for measurement. Stray light can cause problems including measurement errors.

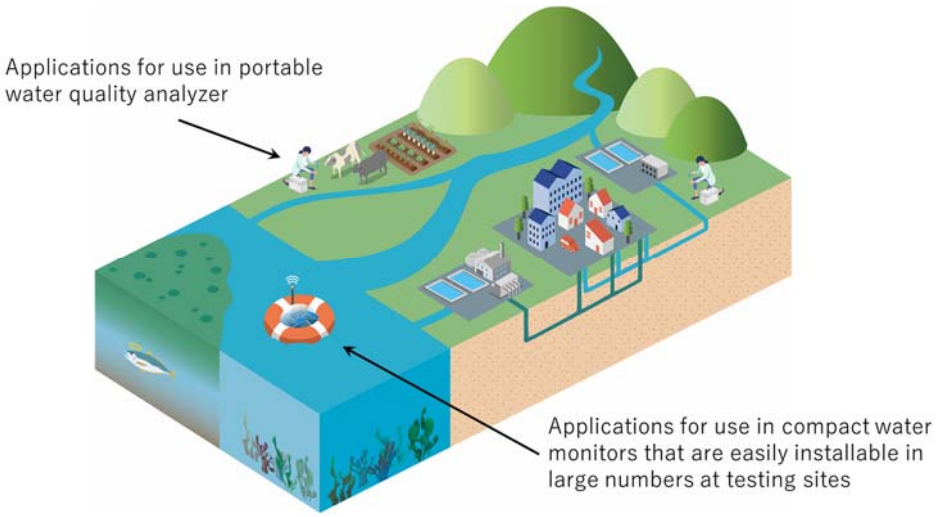


Measurement examples using C16767MA

The C16767MA gives good results in measuring nitrite, nitric acid, and organic pollution parameters (BOD or biochemical oxygen demand levels) [left], which are common test items for water quality. Measurement of organic compound anthracene [middle] achieved results comparable to those obtained from a benchtop spectrophotometer [right].

Mounting the C16767MA internally in compact water quality monitors for placement in rivers, lakes or oceans means that the content of multiple pollutant types in water can now be measured and analyzed via absorption spectrophotometry. The C16767MA allows designing and manufacturing inexpensive water quality monitors that can be installed and set up in large numbers at many testing sites to monitor water quality and so will hugely improve the accuracy of water quality assessment over a vastly broader area. The C16767MA is also ideal for use in portable water quality analyzers that can be carried to the measurement site to analyze water quality. By expanding sales of the C16767MA, we will contribute to ensuring safer and higher quality water and addressing climate change. Other potential applications include analysis of hazardous air pollutants, performance evaluation of UV-LEDs, and monitoring of semiconductor processes.

We will continue to design and develop small-size, low-cost “mini-spectrometer micro series” offering high sensitivity in the infrared region.



Application examples of compact and inexpensive water quality monitor with intenally mounted C16767MA

Main features

1. Image sensor with enhanced resistance to UV light

The image sensors for our currently available “mini-spectrometer micro series” are sensitive to light at wavelengths from 200 to 1000 nm. However, their sensitivity gradually weakens when illuminated with UV light. Nitrogen compounds and other pollutants in rivers, lakes and ocean water are likely to absorb UV light, so “mini-spectrometer micro series” must maintain high UV sensitivity in order to still be able to detect those substances. By improving the image sensor structure, we succeeded in enhancing its ability to withstand UV light.

2. Diffraction grating compatible with UV light

The shape of the diffraction grating was redesigned and optimized to efficiently disperse UV light into wavelengths. The spectral resolution was also improved by shrinking the groove spacing to approximately 500 nm which is half that of conventional groove spacing.

3. Stray light filter formed on image sensor

Stray light may be generated when UV light is dispersed into wavelengths. To keep stray light out of the image sensor, we formed a silicon nitride thin film on the image sensor by applying our unique in-house opto-semiconductor device manufacturing technology.

●Main specifications

Parameter	C16767MA	Unit
Spectral response range	190 to 440	nm
Spectral resolution FWHM (Typ.)	5.5	nm
Outside dimensions (W×H×D)	20.1 × 12.5 × 10.1	mm
Weight	5	g

Micro series mini-spectrometer C16767MA