# NEWS RELEASE

Hamamatsu Photonics releases a new highly sensitive photon-counting head with lens, ideal for blood testing with compact instruments

October 4, 2023
**Hamamatsu Photonics K. K.**
Headquarters: 325-6, Sunayama-cho, Naka-ku,
Hamamatsu City, Japan
President and CEO: Tadashi Maruno

Hamamatsu Photonics has developed a new photon-counting head with lens by applying our well-known capabilities in photomultiplier tubes (PMT) and optical design technology. The photon counting head[1], 'H10682-110W', is integrated with a newly designed condenser lens offering high light-collecting efficiency while using a thin profile. Its sensitivity is 5 times superior to our currently available products, though still maintaining the same small size.

The H10682-110W can be installed into compact in-vitro diagnostic instruments to increase their sensitivity. This reduces the amount of blood and other specimens that need to be collected from patients while still providing the same accuracy, making testing more comfortable. Another benefit is the shorter measurement time which will lower the workload of medical staff.

Sales of the H10682-110W will start on Wednesday, November 1 this year for domestic and overseas manufacturers of compact in-vitro diagnostic instruments and other measurement devices utilizing low-level light. The H10682-110W will also be on exhibit at "PHOTON FAIR 2023" which is an all-inclusive Hamamatsu Photonics exhibition showing off our advanced technologies and products from Thursday, November 16 at Act City Hamamatsu.

Newly developed photon counting head with lens H10682-110W

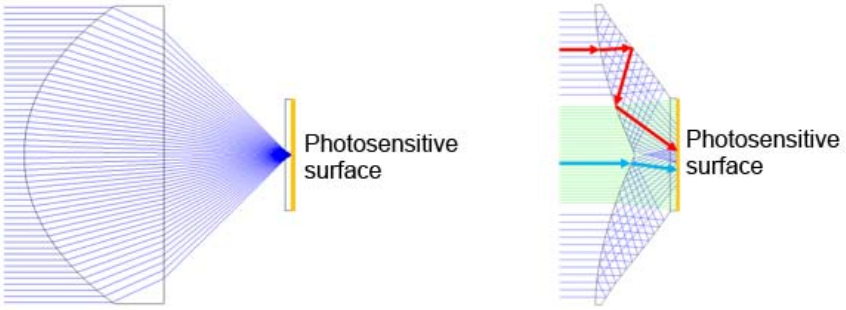
1: A high-sensitivity sensor head that contains a PMT along with a high-voltage power supply circuit needed for PMT operation, and a photon counting circuit for measuring the number of photons (light particles). It offers excellent signal-to-noise ratio and stability for low-level-light measurements.

HAMAMATSU
PHOTON IS OUR BUSINESS

## Product overview

Hamamatsu Photonics has been manufacturing and selling small-sized photon counting heads with a photosensitive area of 8 mm in diameter. However, the amount of light entering this small photosensitive area is low and insufficient for compact in-vitro diagnostic instruments to make accurate and rapid measurements. This has led to market demands for even higher sensitivity. Combining a photon counting head with lens allows the collection of the target light onto the photosensitive area to increase the amount of incident light and in this way provide higher sensitivity. However, ordinary condenser lenses require a specific distance between the lens and the photosensitive surface which makes the size of compact in-vitro diagnostic instruments large and bulky. To handle this challenge, we maintained the size of the product small all while increasing its sensitivity.

In addition to applying optical design technology using free-form surfaces, we collaborated with the Vrije Universiteit Brussel which has advanced technological capabilities in the field of optics and succeeded in developing a novel lens with a special shape. While ordinary lenses utilize refraction of incident light to collect light, our newly designed lens uses refraction, reflection and total-internal-reflection of incident light to collect light. This lens also allows the collection of light through different optical paths in the center and at its periphery, making it possible to collect light very efficiently in spite of its thin profile. Moreover, the shape of the lens is optimized to match the shape and characteristics of the PMT and in this way enhance detection efficiency. Our newly designed lens exhibits an excellent light-collection effect not only for collimated light but also for diffused light which is usually quite difficult to collect.




Light collected by ordinary lens (left) and by the newly developed lens (right)

Installing the H10682-110W into compact in-vitro diagnostic instruments such as chemiluminescence immunoassay analyzers[2] used for blood testing will increase their sensitivity. The newly designed lens also offers good prospects spanning a diverse range of applications including analytical instruments, medical diagnosis, communications, and semiconductors where compact and highly sensitive photodetectors are required.

We will be working to expand H10682-110W sales and also continue to develop various types of lensed photon counting heads with different photosensitive area diameters to meet current and future market demands.

2: An immunoassay analyzer designed to detect target molecules in a specimen by measuring the luminescent intensity of extremely weak diffused light from labeled chemiluminescent substances. It is capable of testing the composition of blood, urine, and numerous other specimens.

## Main features

### 1. Small size and high sensitivity

By mounting a newly designed thin but high light-collecting lens onto a photon counting head, we boosted its sensitivity up to 5 times while maintaining the same small size of our current products.

### 2. Effective for collimated light and diffused light

The newly designed lens has a large light-input diameter and light- acceptance angle making it highly effective for collecting not only collimated light but also diffused light which is usually difficult to collect. If offers great prospects spanning a wide range of applications involving low-light-level measurements.

### ●Main specifications

| Parameter | H10682-110W | Unit |
|---|---|---|
| Spectral response range | 380 to 700 (peak wavelength: 400) | nm |
| External dimensions (W×H×D) | H10682-110 unit: 22 × 36 × 40<br>Lens unit: 24 × 24 × 7 | mm |
| Effective photosensitive area | 21 | mm dia. |
| Dark count | Typical: 50, Maximum: 100 | $s^{-1}$ |
| Input voltage | +4.75 to +5.25 | V |