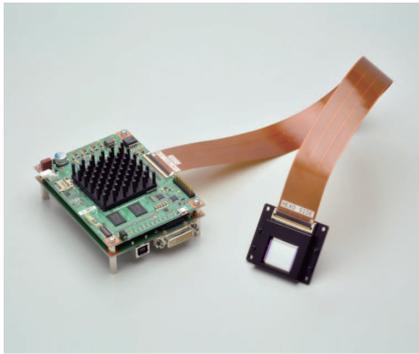


Spatial light modulators LCOS-SLM



X15223 series

Embedded LCOS-SLM module for easy integration into OEM and other instruments

The X15223 series is an LCOS-SLM designed to be installed in devices. The LCOS-SLM head and driver circuit are connected with a flexible cable and can easily be installed in devices. The LCOS-SLM head and driver circuit are smaller than those of the previous product making installation into more compact devices possible. The thermal design of the LCOS-SLM head is optimized for best heat removal. We also offer types with a heatsink for applications that require even higher heat radiation performance. The driver circuit supports a variety of interfaces to meet your system requirements. The product comes with a DVI interface for evaluation. The product can be customized to meet your needs. For details, consult with your nearest Hamamatsu sales office.

Features

- Compact, low price
- Easy to integrate cooling function to the head module
- Modulates only the phase of light
- High light utilization efficiency
- High diffraction efficiency
- High power handling capability
- Reflective type
- Trigger function

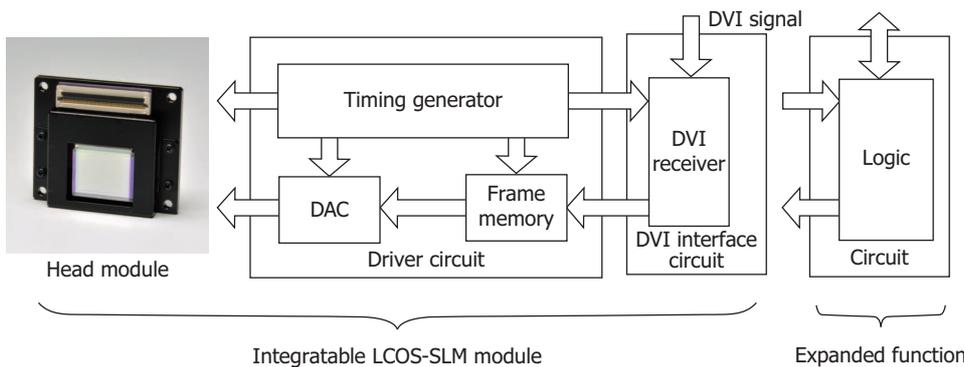
Applications

- Laser material processing
- Optical manipulation
- Wavefront correction
- Pulse shaping
- Optical testing

Accessories (included)

- Dedicated software (OS: Microsoft® Windows® 7/10)
- DVI interface circuit for evaluation

Block diagram

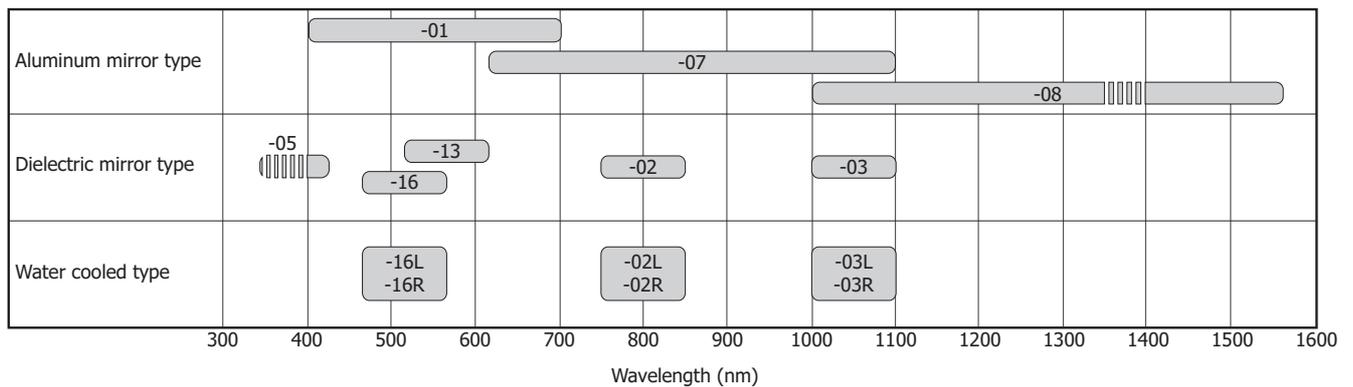


KACC1005EA

Selection guide

There are eight types each in the X15223 series, which cover different wavelengths of light sources. They can be grouped into dielectric mirror types (-02/-03/-05/-13/-16) and aluminum mirror types (-01/-07/-08). To enhance the reflectivity of the device, dielectric mirror types have dielectric mirrors corresponding to different wavelengths of laser light source. [-02: titanium sapphire laser (800 nm band), -03: YAG laser (1064 nm), -05: LD (405 nm), -13: YAG laser 2nd harmonic (532 nm)/He-Ne laser (633 nm), YAG laser 2nd harmonic (532 nm)]. The increased reflectivity achieved by the dielectric mirror decreases the internal absorption rate. This allows accommodation for high powered lasers, but the covered wavelength range is narrowed. Aluminum mirror types use reflections from the aluminum electrodes on the CMOS chip. The reflectivity is inferior to that of the former, but the reflection wavelength range is wider, covering a range of 400 nm to 1550 nm with just three types. For the wavelength band between 1350 and 1400 nm on the -08 type, the reflectance degrades about 5% due to the absorption by the glass substrate. Dielectric mirror types for the 532 nm band are available in -13 and -16. The -16 is designed to be more light-resistant to short-pulse lasers than the -13.

[Figure 1] Spectral Response



KACCB0593EA

Structure

Parameter	Number of pixels (pixels)	Pixel pitch (μm)	Effective area size (mm)	Fill factor (%)	Input signal
X15223 series	1272 × 1024	12.5	15.9 × 12.8	96	Digital Video Interface (DVI-D)

Absolute maximum ratings

Parameter	Supply voltage (V)	Operating temperature*1 (°C)	Storage temperature*1 (°C)	Withstand pressure of water stream connector (MPa)
X15223-01/-02/-03/-05/-07/-08/-13/-16	16.5	+10 to +40	-20 to +55	-
X15223-02L/-02R/-03L/-03R/-16L/-16R				0.3

*1: No condensation. Humidity can cause deterioration of characteristics, so be careful with the humidity.

The characteristics of this product depend on temperature. Using this product at an ambient temperature of about 25 °C is recommended. When there is a temperature difference between a product and the surrounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Electrical characteristics (DVI-I/F circuit)

Parameter	DVI signal format (pixels)	Input signal level (levels)	DVI frame rate Typ. (Hz)	Input voltage (DC)			Power consumption (VA)
				Min. (V)	Typ. (V)	Max. (V)	
X15223 series	1280 × 1024	256	60	15.5	16.0	16.5	16

Electrical and optical characteristics

Parameter	Readout light wavelength (nm)	Light utilization efficiency typ. (%)	Rise time* ² (ms)	Fall time* ² (ms)
X15223-01	400 to 700	79 (633 nm)	5 (633 nm)	25 (633 nm)
X15223-02	800 ± 50	97 (785 nm)	30 (785 nm)	80 (785 nm)
X15223-02L				
X15223-02R				
X15223-03	1050 ± 50	97 (1064 nm)	25 (1064 nm)	80 (1064 nm)
X15223-03L				
X15223-03R				
X15223-05	410 ± 10	97 (405 nm)	10 (405 nm)	20 (405 nm)
X15223-07	620 to 1100	82 (1064 nm)	10 (1064 nm)	80 (1064 nm)
X15223-08	1000 to 1550	80 (1550 nm)	30 (1550 nm)	140 (1550 nm)
X15223-13	530 to 635	97 (532 nm)	10 (532 nm)	25 (532 nm)
X15223-16	510 ± 50	97 (532 nm)	11 (532 nm)	34 (532 nm)
X15223-16L				
X15223-16R				

*2: Time required to change from 10% to 90% for 2π modulation (typical value)

Operating characteristics

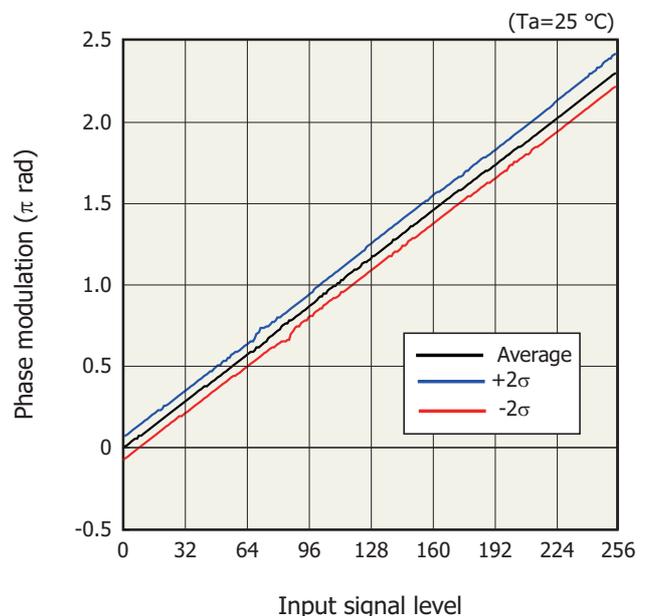
Light utilization efficiency

The X15223 series have high light utilization efficiency, which is defined as a ratio of the 0th order diffraction light level to the input light level. This high light utilization efficiency mainly depends on reflectivity, and the amount of diffraction loss caused by the pixel structure. We adopted advanced CMOS technology to make the diffraction loss smaller. As a result, the diffraction loss is less than 5%. The -02/-03/-05/-13/-16 types have a dielectric mirror which has high reflectivity. The -01/-07/-08 types have relatively low reflectivity compared to the ones with the dielectric mirror but have wide spectral response characteristics and high linearity.

High phase modulation

The X15223 series can achieve phase modulation of more than 2π radians over the 400-1550 nm readout wavelength range. The X15223 series comes pre-calibrated from the factory for a specified wavelength range to have more than 2π radians of phase modulation and high linear characteristics. Figure 2 shows typical phase modulation characteristics. A phase modulation of 2π radians or more and a linear phase response are achieved. The phase modulation curves for 95% pixels lies within $\pm 2\sigma$.

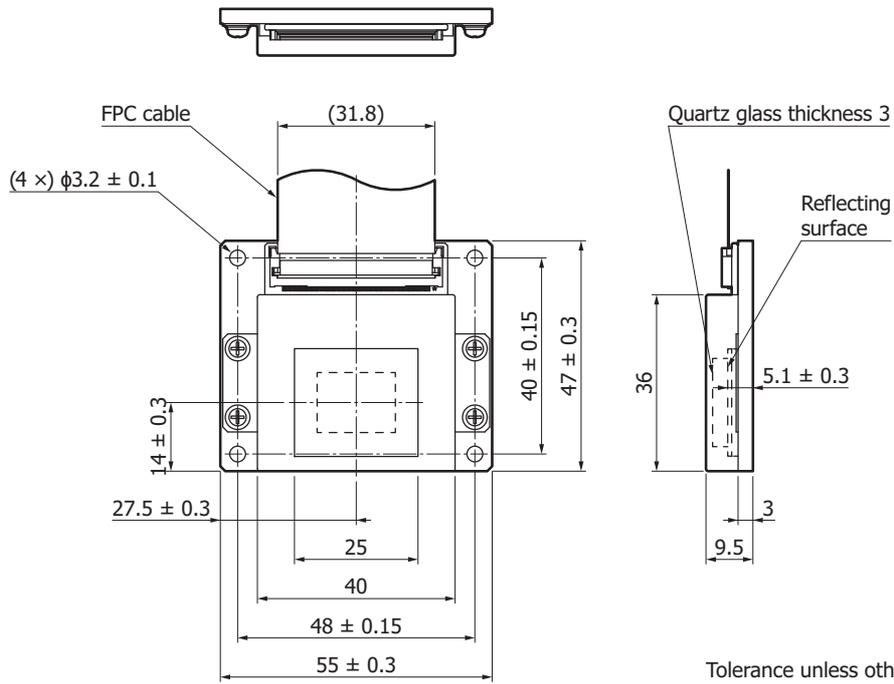
[Figure 2] Phase modulation (typical example)



KACCB0271EA

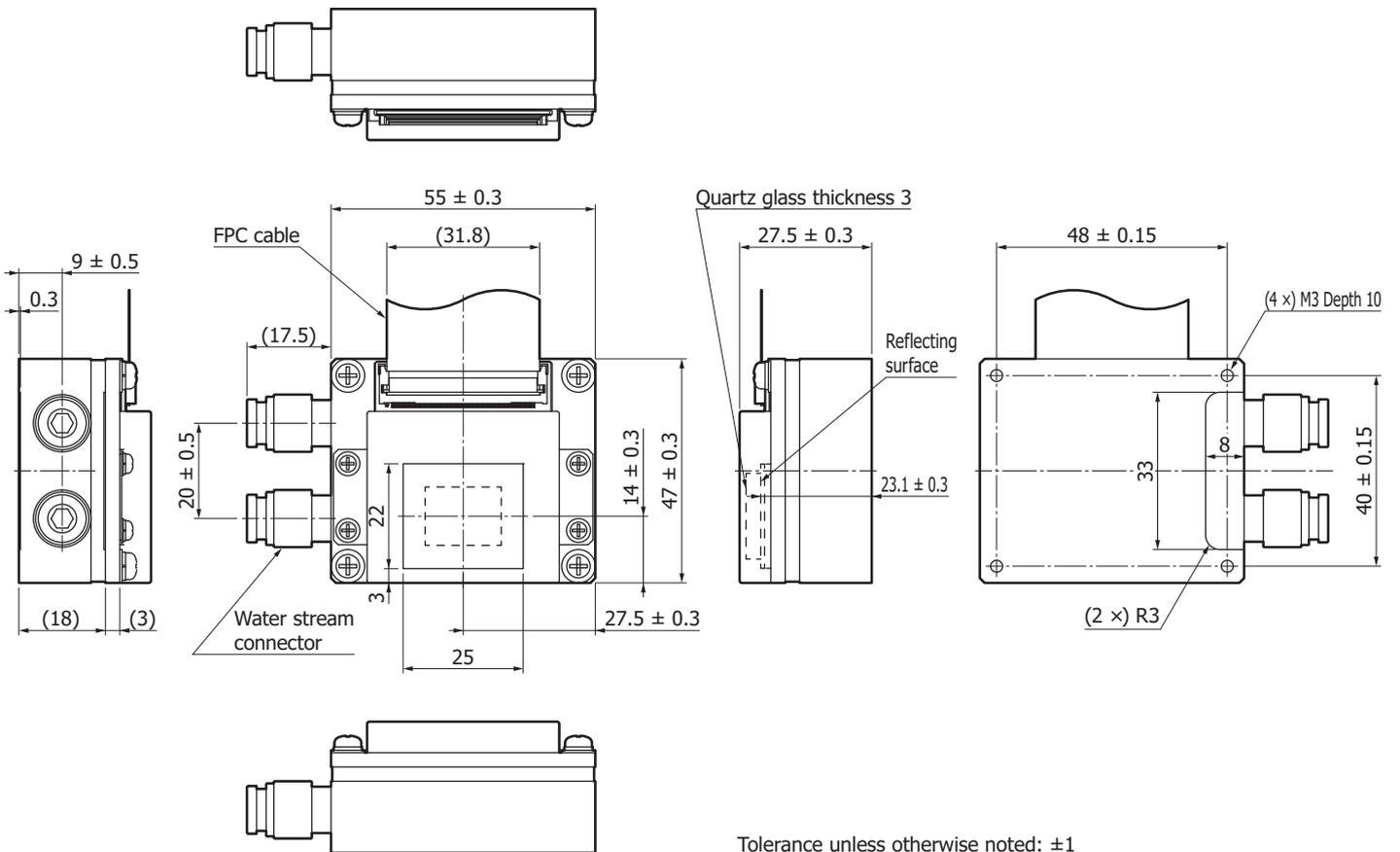
Dimensional outlines (unit: mm)

Head section (X15223-01/-02/-03/-05/-07/-08/-13/-16)



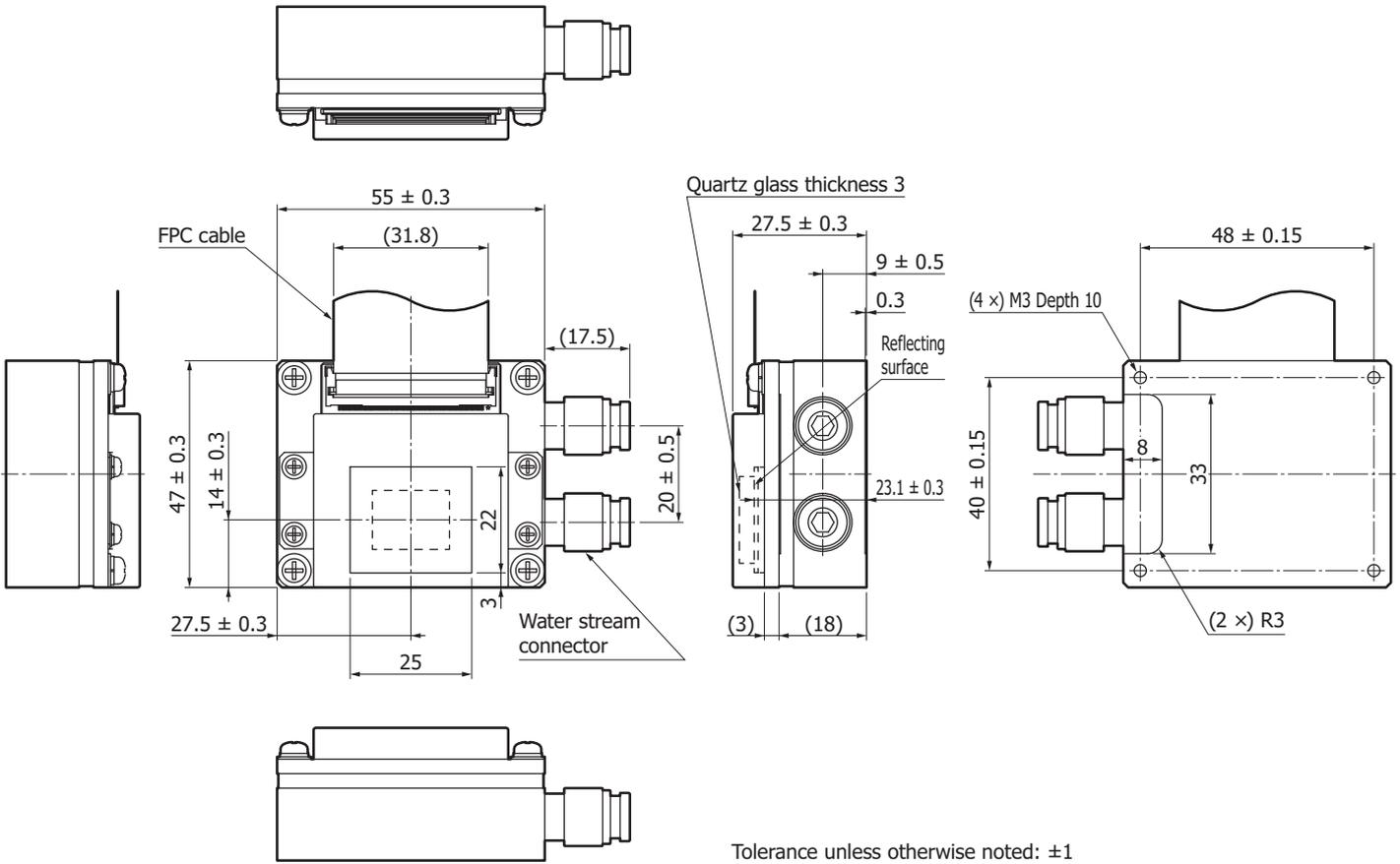
KACCA0445EB

Head section (water cooled type X15223-02L/-03L/-16L)



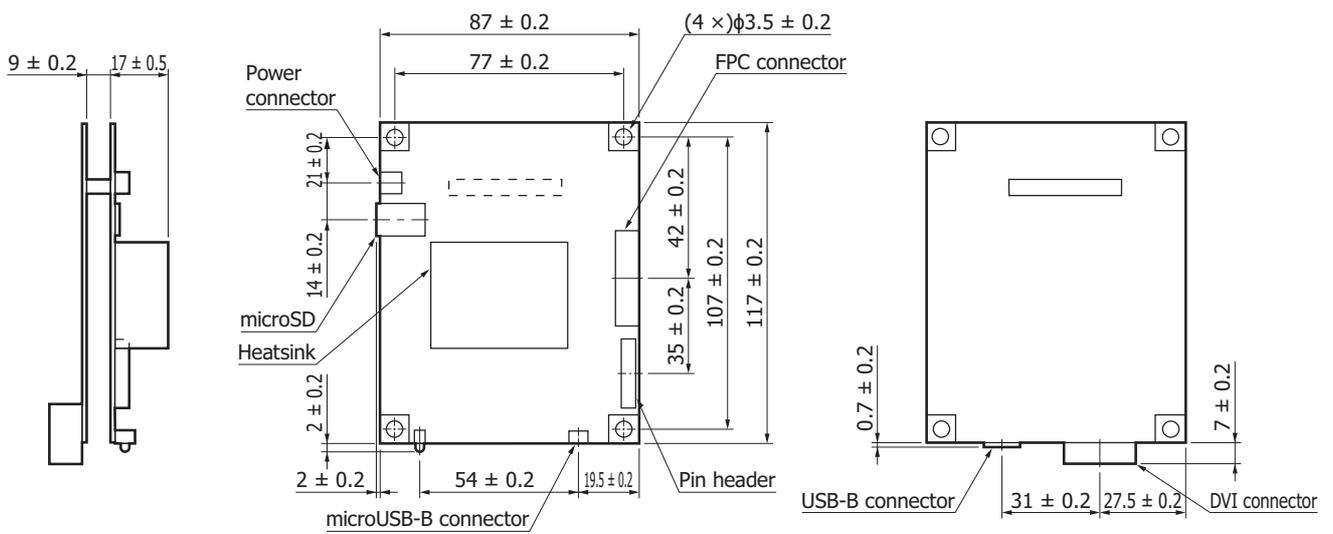
KACCA0446EA

Head section (water cooled type X15223-02R/-03R/-16R)



KACCA0447EA

Controller section



KACCA0448EA

Related information

www.hamamatsu.com/sp/ssd/doc_en.html

- Precautions
- Disclaimer

Information described in this material is current as of December 2019.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

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, N.J. 08907, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218, E-mail: usa@hamamatsu.com

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergstr. 10, D-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, United Kingdom, 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, 20020 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.: B1201, Jiaming Center, No.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, Section2, 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