Photonic Multichannel Spectral Analyzer Model: PMA-11

The PMA-11 is a spectral analyzer that integrates a spectrograph and high performance multi-channel photodetector in a single compact chassis. Light collection is simplified through the use of optical fiber. The diffraction grating of the spectrograph and multi-channel photodetector are rigidly fixed, resulting in excellent wavelength reproducibility. The wavelength axis and spectral response characteristics are calibrated at the factory, so that spectral measurements can be carried out easily and accurately.

The PMA-11 series offers four different multi-channel photo-detectors to choose from, for additional flexibility in grating selection, allowing the user to optimize the performance for the application at hand.

Equipped with a standard SCSI interface, the PMA-11 is easily connected to any type of computer for data collection and analysis.

- Compact Integration of a Spectrograph and Multi-channel Photodetector
- High Sensitivity
- Easy Measurement Using Optical Fiber Input
A compact unit containing a multi-channel photo-detector, and power supply all in one. Optical fiber input makes spectral measurements easier than ever.

**FEATURES**

- **Measurements of the spectrum are easier and more accurate than ever before**
  The spectrum can now be easily measured by light collection through an optical fiber. The wavelength axis and spectral response characteristics are calibrated at the factory, so that spectral measurements can be carried out easily and accurately.

- **Superb cost performance model: C5965**
  The C5965 uses a MOS linear image sensor realises high performance and low cost.

- **High sensitivity model: C5966**
  The C5699 uses the CCD linear image sensor has sensitivity a hundred times better than the C5965 model.

- **Ultra-high sensitivity model: C7473-36**
  The C7473-36 consists the thermoelectric-cooling type BT-CCD image sensors, which have a high quantum efficiency and a compact Czerny-Turner type spectrograph. The simultaneous measurement of the wavelength from an ultraviolet to a near-infrared region with high wavelength resolution and high sensitivity is realised.

- **Near infrared model: C8147-34, C8147-38**
  The C8147 realises a simultaneous and high-resolution measurement of absorption or reflection spectra in a near infrared wavelength region with a wide dynamic range and low noise.

- **High efficiency optics**
  Adoption of a Ø1mm bundle fiber and a bright spectrograph detects a measured light efficiently.

- **Compact design**
  High performance is built in a small case. This completely new design ensures that the PMA-11 will fit anywhere.

- **External synchronisation can be used**
  Measurements can now be carried out synchronised to external trigger signals, allowing measurement of pulse phenomena.

- **Standard SCSI interface allows connection to computer**

**APPLICATIONS**

**[Scientific applications]**
- UV to visible spectroscopy
- Fluorescence spectroscopy
- Raman scattering
- Chemiluminescence analysis
- Liquid chromatography
- Gas chromatography
- ICP emission analysis
- Discharge emission analysis
- Combustion analysis
- Micro spectroscopy

**[Industrial applications]**
- Water quality testing
- Evaluation of light sources
- Chromaticity measurements
- Impurities testing
- Thin film thickness monitors
- UV-ray monitors
- Plasma monitors
- Fruit tester
- Plastic sorting
- Color filter testing

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![Diagram of PMA-11 Standard Configuration](image)
MEASUREMENT EXAMPLES

1. Luminescence spectrum of a deuterium lamp

2. Absorption spectrum of a didymium filter

3. Luminescence spectrum of an LED

4. Chromaticity coordinates of an LED

5. Fluorescence spectrum of fluorosein

6. 3-d display of plasma emission spectra

7. Transmittance spectra in near infrared region
   Dotted line: Compact disc
   Solid line: PET bottle

8. Transmittance spectra in near infrared region
   Dotted line: Styren monomer
   Solid line: Polystyren
**SPECIFICATIONS**

**Main unit**

<table>
<thead>
<tr>
<th>Type No.</th>
<th>C5965-31</th>
<th>C5966-3x</th>
<th>C7473-36</th>
<th>C8147-34</th>
<th>C8147-38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photodetector</td>
<td>MOS linear image sensor</td>
<td>CCD linear image sensor</td>
<td>BT-CCD linear image sensor</td>
<td>InGaAs linear image sensor</td>
<td>InGaAs linear image sensor</td>
</tr>
<tr>
<td>No. of photosensitive device channels</td>
<td>1024 ch</td>
<td>1024 ch</td>
<td>256 ch</td>
<td>512 ch</td>
<td>1024 ch</td>
</tr>
<tr>
<td>Channel size</td>
<td>25μm (H) × 2.5 mm (V)</td>
<td>24μm (H) × 3.07 mm (V)</td>
<td>24μm (H) × 2.928 mm (V)</td>
<td>50μm (H) × 250μm (V)</td>
<td>250μm (V)</td>
</tr>
<tr>
<td>Cooling temperature</td>
<td>non-cooling</td>
<td>0°C</td>
<td>-15°C</td>
<td>0°C</td>
<td>-10°C</td>
</tr>
<tr>
<td>Read-out noise</td>
<td>10,000 electrons</td>
<td>60 electrons</td>
<td>10 electrons</td>
<td>12,500 electrons</td>
<td>200,000 electrons</td>
</tr>
<tr>
<td>Dark current</td>
<td>12,500 electrons/scan (at 25°C, 20ms)</td>
<td>512 electrons/scan (at 0°C, 20ms)</td>
<td>75 electrons/scan (at -15°C, 20ms)</td>
<td>20,000 electrons/scan (at 0°C, 5ms)</td>
<td>2.5 × 10^7 electrons/scan (at -10°C, 5ms)</td>
</tr>
<tr>
<td>A/D resolution</td>
<td>16bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spectrophotograph F number</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spectrophotograph type</td>
<td>Concave spherical grating type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simultaneous measurement wavelength range</td>
<td>300 nm to 800 nm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wavelength resolution</td>
<td>&lt; 3 nm (FWHM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective light-receiving area of optical fiber</td>
<td>≈ 1 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical fiber length</td>
<td>1.5 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure time</td>
<td>5 ms to 20 ms (typ.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External trigger input</td>
<td>TTL level / High impedance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>SCSI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line voltage</td>
<td>AC100V to 240V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Basic software**

**Measurement functions**

- Spectral measurement
- Reflection spectra measurement
- Absorption spectra measurement
- Color measurement

**Temporal resolution measurement functions**

- Temporal fluctuation of spectra over time
- Temporal fluctuation of reflection factor and transmission factor over time

**Data acquisition condition setting**

- Exposure time
- Memory integration count times
- Temporal fluctuation measurement

**Calibration and correction**

- Wavelength axis
- Sensitivity uniformity
- Dark current

**Display functions**

- Spectrum (non-limited accumulation)
- Temporal fluctuation of waveform over time (non-limited accumulation)
- Chromaticity diagram

**Wavelength axis display**

- Wavelength (nm), Wavenumber (cm⁻¹), Energy (eV)

**Brightness axis display**

- Linear, logarithm

**Cursor analysis functions**

- Wavelength (Wavenumber etc.) vs. intensity
- Peak detection
- FWHM between two cursors
- Integrated intensity

**Other analytical functions**

- Smoothing
- Differential waveform
- Color measurement

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**DIMENSIONAL OUTLINES (Unit : mm)**

<table>
<thead>
<tr>
<th>Product No.</th>
<th>C5965-31</th>
<th>C5966-3x</th>
<th>C7473-36</th>
<th>C8147-34</th>
<th>C8147-38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber input optics (approx. 100g)</td>
<td>C8147 (approx. 7.5kg)</td>
<td>C7473 (approx. 5kg)</td>
<td>C5965, C5966 (approx. 4.5kg)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**HAMAMATSU PHOTONICS K.K., Systems Division**

812 Joko-cho, Hamamatsu City, 431-3196, Japan, Telephone: (81)53-431-0124, Fax: (81)53-435-1574, E-mail: export@sys.hpk.co.jp

U.S.A. and Canada: Hamamatsu Photonics Systems: 360 Fort Hill Road, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1)908-231-1116, Fax: (1)908-231-0852, E-mail: usa@hamamatsu.com

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-2658, E-mail: info@hamamatsu.de,

France: Hamamatsu Photonics France S.A.R.L.: 8, 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: info@hamamatsu.fr

Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Mota, 1/E 20020 Arone (Milano), Italy, Telephone: 39(02)-935 81 733, Fax: 39(02)-935 81 741, E-mail: info@hamamatsu.it

United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire, AL7 1BW, U.K., Telephone: (44)1707-294888, Fax: (44)1707-325777, E-mail: info@hamamatsu.co.uk

North Europe: Hamamatsu Photonics Norden AB: Smidesvägs 12, SE-171 41 Solna, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01, E-mail: info@hamamatsu.se

Australia: Hamamatsu Photonics Australia PTY. LTD.: 75-77 Burwood Rd, Burwood, NSW 2136, Australia, Telephone: (61)3-9844-3000, Fax: (61)3-9844-3099, E-mail: info@hamamatsu.com.au

Web: http://www.hamamatsu.com

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