

PMA-12

Photonic multichannel analyzer



[Scientific applications]

UV to visible spectroscopy

Fluorescence spectroscopy

Raman scattering

Chemiluminescence analysis

Liquid chromatography

Gas chromatography

ICP emission analysis

Discharge spectrum analysis

Combustion analysis

Micro spectroscopy

[Industrial applications]

Water quality testing

Evaluation of light emitting devices and light sources

Chromaticity measurements

Impurities testing

Film thickness measurements

UV radiation measurements

Plasma monitoring

Fruit testing

Combustion monitoring

Color filter evaluation

PMA hotonic multichannel analyzer

**A compact unit containing a spectrometer, photo-detector and power supply.
Use of an optical fiber input makes spectral measurements easy.**

It becomes easier to use of PMA-12 because of USB2.0 interface.



The PMA-12 is compact spectral measurement apparatus that combines a spectrometer and optical detector into one unit. An optical fiber is used. Because of the high sensitivity, spectra can be obtained easily just by bringing the optical fiber close to the sample in normal applications, without a special light collection system. Since the spectrometer and photo-detector are fixed, the PMA-12 is stable and can be used with confidence for long periods of time. The wavelength axis and spectral response characteristics are already calibrated, so spectral measurements can be carried out easily and accurately.

C10544-01 C10544-02 High sensitivity superior cost-performance model

C10544-01, -02, which have the thermoelectric cooling type CCD linear image sensor that is used for astronomical observation, have realized both high performance and low price by rational design. The wavelength range for measurement is 300 nm to 800 nm for the C10544-01 and 340 nm to 830 nm for the C10544-02.

C10027-01 C10027-02 Ultra-high sensitivity model

This model uses a thermoelectrically cooled, back-thinned CCD linear image sensor that with higher sensitivity and lower noise. The C10027-01 is an ultra-high sensitivity model that combines this sensor with a small Czerny-Turner spectrograph capable of measurements over a wide range from the ultraviolet to the near infrared with high wavelength resolution. The wavelength range for measurements is 200 nm to 950 nm for the C10027-01 and 350 nm to 1100 nm for the C10027-02.

C10028-01 C10028-02 Near infrared model

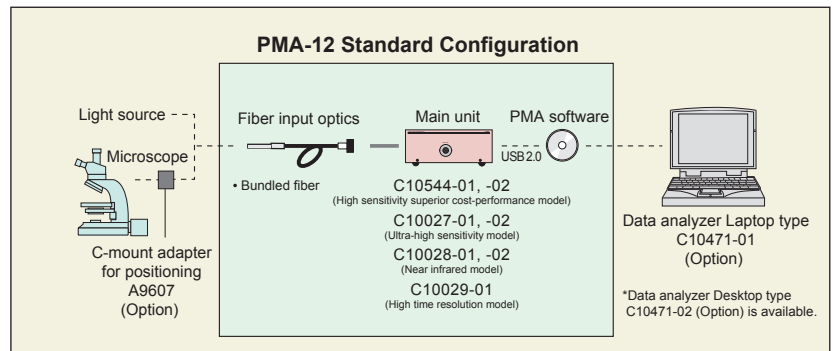
These are models using InGaAs linear image sensors and capable of measurements of reflection and absorption spectra in the near infrared with a large dynamic range. The wavelength range for measurements is 900 nm to 1650 nm for the C10028-01 and 1600 nm to 2350 nm for the C10028-02.

C10029-01 High time resolution model

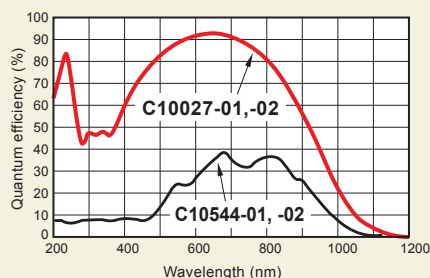
Coupling an image intensifier with a thermoelectrically cooled, back-thinned CCD linear image sensor, it is possible to have both high-speed gate measurements at a maximum of 10 ns and ultra-high sensitivity. This model is capable of high temporal resolution measurements in the nanosecond range and measurements of faint light.

Features

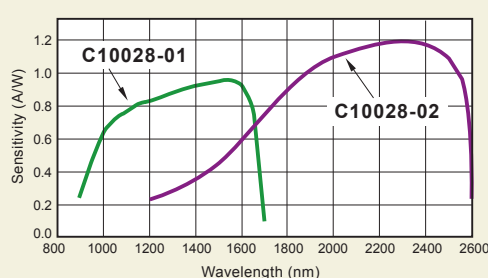
- Spectrometer, photo-detector and power supply in a compact unit
- Real-time measurements (Simultaneous measurement of multiple wavelengths possible)
- Easy measurements with optical fiber
- Spectral response and wavelength axis characteristics calibrated
- Wide range of variations



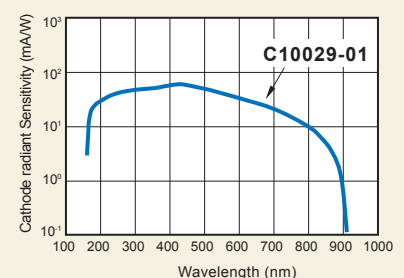
● CCD and BT- CCD linear image sensor



● InGaAs linear image sensor



● I.I. + BT- CCD linear image sensor



Measurement modes

Standard measurements

This is the most basic measurement mode.

Applications: emission spectra for light sources, fluorescence, plasma and the like.

Reflective measurements

This is the measurement mode for finding spectral reflectance.

Applications: reflectance measurements for optical filters, coatings and the like.

Transmittance and absorption measurements

This is the measurement mode for finding spectral transmittance and absorption.

Applications: measurements of transmittance and absorption in optical filters, films, solutions and the like.

Chromaticity measurements (light-source color)

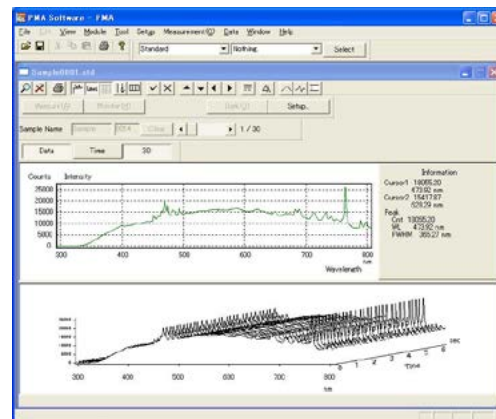
This is the measurement mode for finding the light-source color for luminous bodies.

Applications: color evaluation in light sources for illumination, LEDs and the like.

Chromaticity measurements (object color)

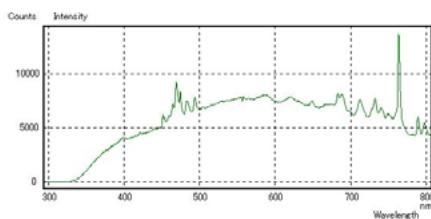
This is the mode for finding the color of objects that are either reflective or transmit light.

Applications: color evaluation of paint, fabric, printed matter and the like.

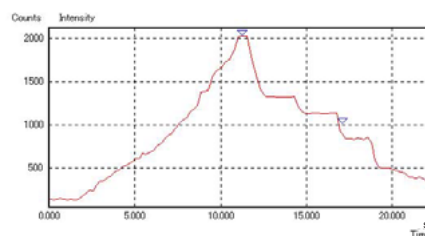


Display modes

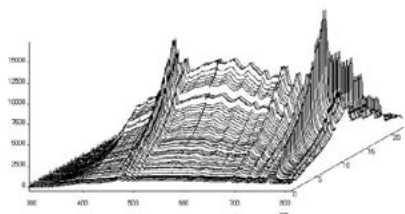
Spectrum display



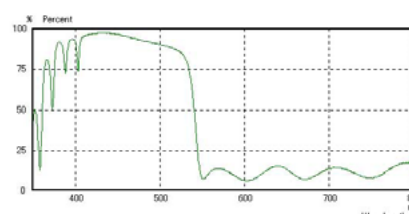
Display of changes over time



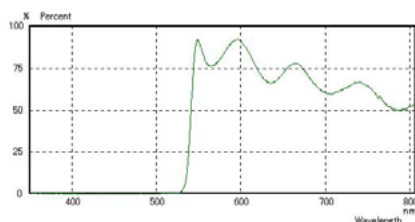
3-D display



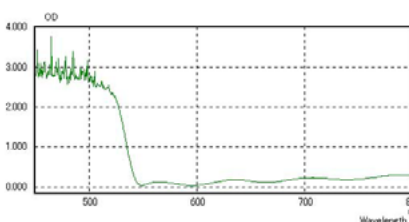
Reflectivity display



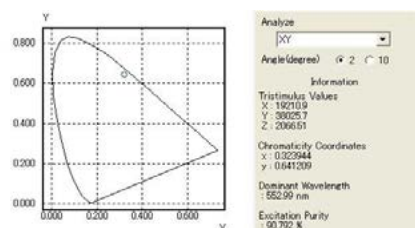
Transmittance display



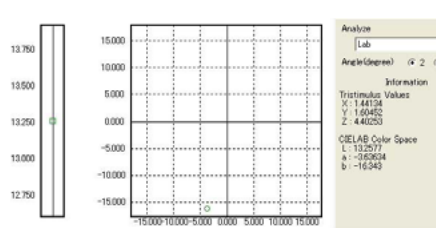
Absorbance display (OD)



Color coordinate display

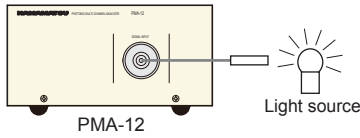


Spatial color coordinate display



Light source measurements

Measurement of emission spectra in light sources such as lamps and LEDs



<Configuration>

- Standard PMA-12 configuration (C10544, C10027, etc.)

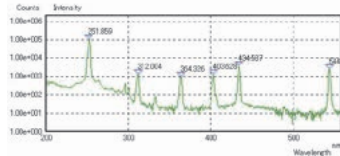
Option

- Data analyzer C10471-01,-02

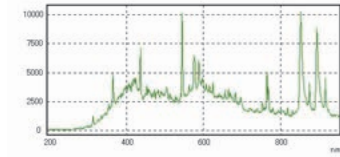
<Applications>

- Evaluation of color temperature and color rendering properties in light sources for illumination
- LED chromaticity evaluations
- Special applications of light source spectral evaluations

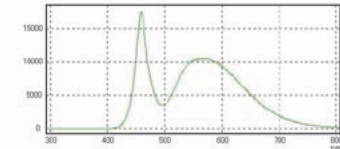
Germicidal lamp emission spectrum



Metal halide lamp emission spectrum

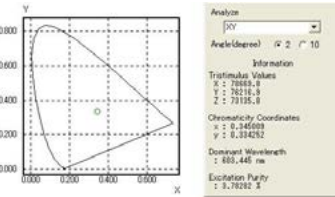


White LED emission spectrum

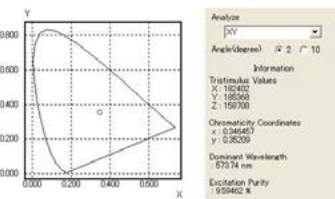


■ Analysis of light source color by emission spectrum (chromaticity, color temperature, color rendering properties, etc., possible)

Metal halide lamp chromaticity evaluation

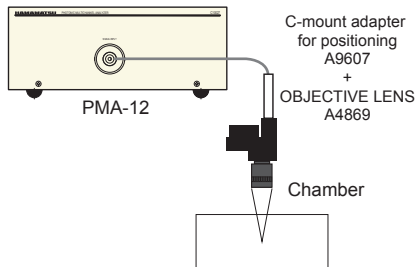


White LED chromaticity evaluations



Emission spectrum measurements

Emission spectrum measurements for plasma, electric discharge, ablation and the like



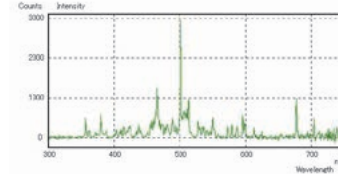
<Configuration>

- Standard PMA-12 configuration (C10027, C10029, etc.)
- Data analyzer C10471-01,-02
- C-mount adapter for positioning A9607
- OBJECTIVE LENS A4869
- Digital delay generator C13430-01

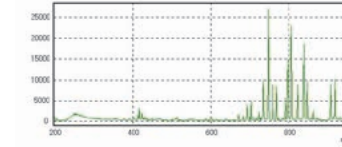
<Applications>

- Plasma component analysis
- Analysis of various emission phenomena

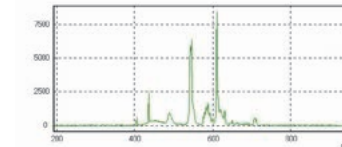
Electric discharge emission spectrum



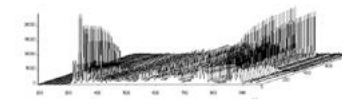
Emission spectrum during oxide film etching



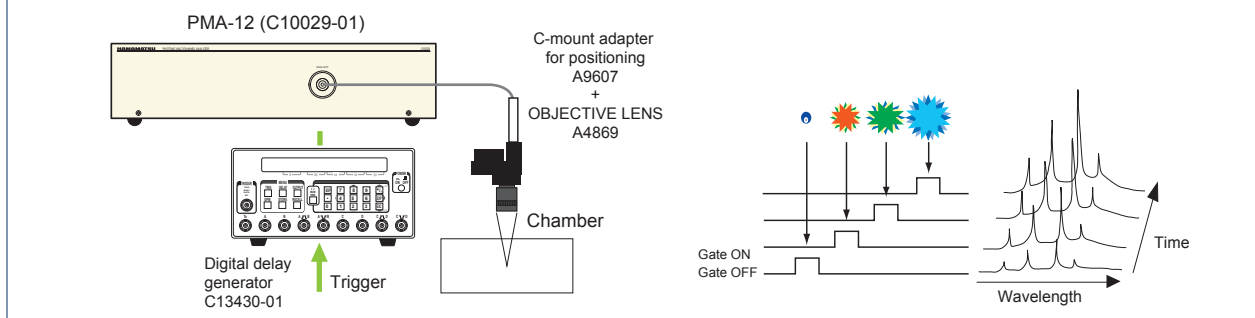
Emission spectrum during nitride film etching



Temporal changes in plasma emission spectrum

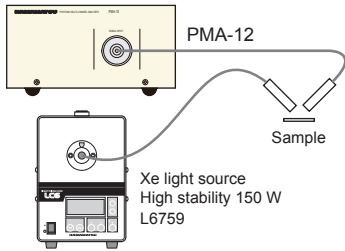


Example of temporal resolution (gate operation) measurements



Reflective spectrum measurements

Measurement of spectral reflectance in optical filters, anti-reflective films (AR coatings) and the like



<Configuration>

- Standard PMA-12 configuration (C10544, C10027, etc.)

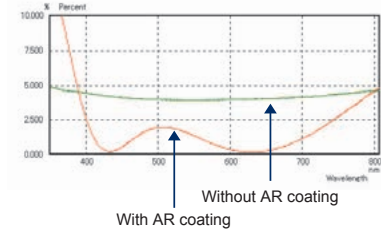
Options

- Data analyzer C10471-01,-02
- Xe light source High stability 150 W L6759
- Optical split fiber UV to VIS 2 m A10193-01

<Applications>

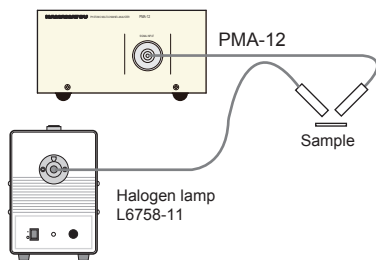
- Inspection of coatings
- Monitoring thin film growth

AR coating reflection spectrum



Object color measurements

Object color evaluation of paint, fabric, printed matter and the like



<Configuration>

- Standard PMA-12 configuration (C10544, C10027, etc.)

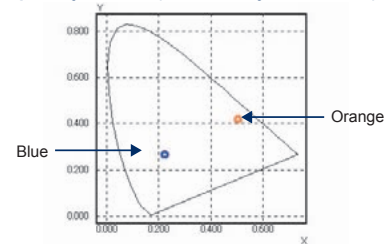
Options

- Data analyzer C10471-01,-02
- Halogen lamp L6758-11

<Applications>

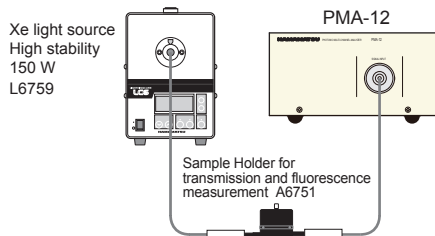
- Paint inspections
- Color evaluations in printed matter, fabric, plastics, etc.

Paper object color (chromaticity coordinates)



Absorption spectrum measurements

Spectral transmittance and absorption measurements in optical filters, films, solutions and the like



<Configuration>

- Standard PMA-12 configuration (C10544, C10027, etc.)

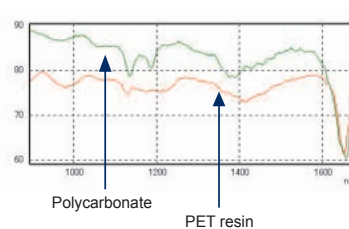
Options

- Data analyzer C10471-01,-02
- Xe light source High stability 150 W L6759
- Sample Holder for transmission and fluorescence measurement A6751

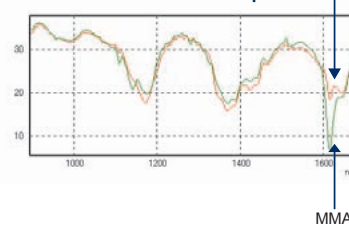
<Applications>

- Absorption spectrum evaluations for solutions and films
- Component analysis for samples
- Monitoring chemical changes

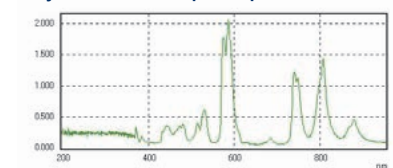
Component analysis of plastics using transmission spectra (polycarbonate and PET resins)



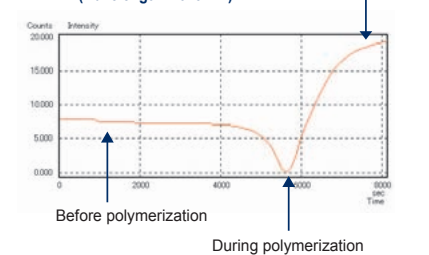
MMA and PMMA transmission spectra



Didymium film absorption spectrum

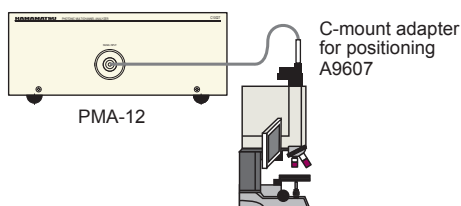


Changes in transmissivity in the polymerization from MMA to PMMA (wavelength: 1615 nm)



Microscopic spectral measurements

Spectral distribution measurements under a microscope



<Configuration>

- Standard PMA-12 configuration (C10027, C10029, etc.)

Options

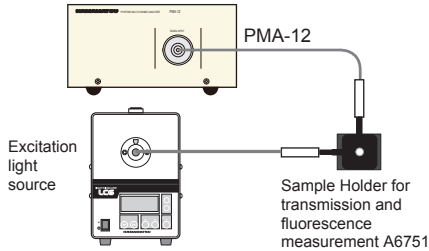
- Data analyzer C10471-01,-02
- C-mount adapter for positioning A9607

<Applications>

- Measurement of bioluminescence
- Measurements on semiconductor wafer, LCD and other microstructures

Emission spectrum measurements

For fluorescent samples such as fluorescent lamps and EL devices



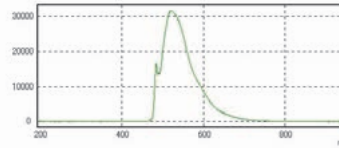
<Configuration>

- Standard PMA-12 configuration (C10544, C10027, etc.)

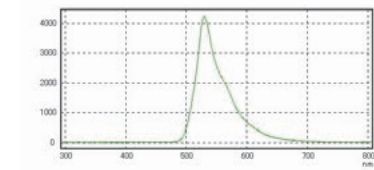
Options

- Data analyzer C10471-01,-02
- Excitation light source: laser, xenon lamp, etc.
- Sample Holder for transmission and fluorescence measurement A6751

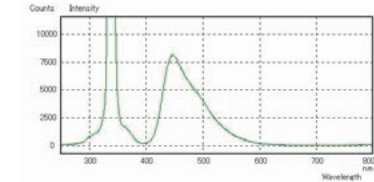
Fluorescence indicator (Fluorescein) emission spectrum



Chemiluminescence emission spectrum



Fluorescent lamp fluorescent body emission spectrum

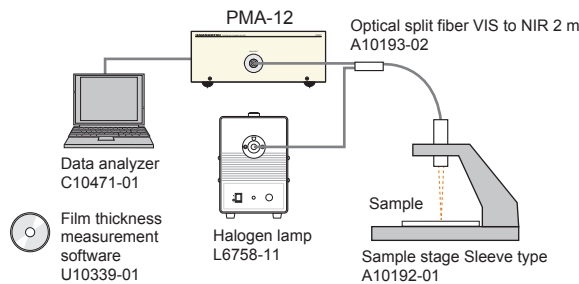


<Applications>

- Fluorescence spectroscopy
- Monitoring chemical light emissions

Film thickness measurements

Film thickness measurements using spectral reflectance or transmittance



<Configuration>

- Standard PMA-12 configuration (C10027)

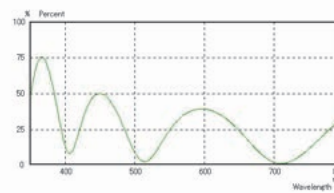
Options

- Data analyzer C10471-01,-02
- Halogen lamp L6758-11
- Optical split fiber VIS to NIR 2 m A10193-02
- Film thickness measurement software U10339-01

<Applications>

- Monitoring thin film growth
- Film thickness management
- Resist film thickness measurements

ITO film interference spectrum



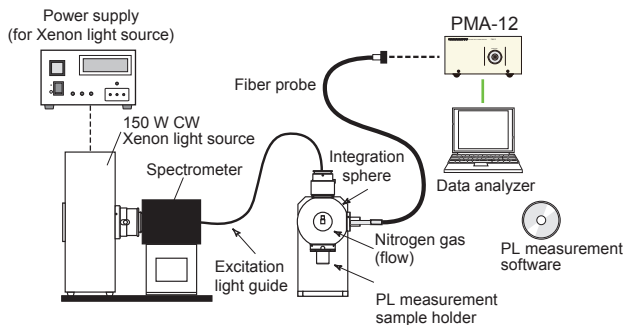
Optical Gauge series

C10178, C10323

We can offer specialized machine for film thickness measurement. Please refer the detail in specific brochure.

Quantum yield measurement system

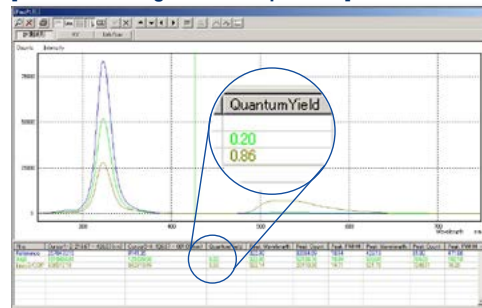
Measurement of quantum yield, external quantum efficiency, brightness light distribution characteristics



<Applications>

- Research of fluorescence materials in physics or chemistry
- Quantum yield measurement of emission materials
- Internal quantum yield measurement of fluorescence materials

[Screen showing emission spectrum]



Absolute PL quantum yield spectrometer C9920-02,-02G,-03,-03G

External quantum efficiency measurement system C9920-12

Light distribution measurement system C9920-11

We can offer specialized machine for OLED measurement. Please refer the detail in specific brochure.

Options



Sample Holder for transmission and fluorescence measurement A6751

This is a dedicated holder with an integrated condensing lens for the use with vials.



Reflection measurement optics A9665

These are optics making it possible to illuminate the sample at 45° from the light source and measure the reflected light.



Variable angle reflection measure optics A10687

These are optics making it possible to change the angle of input and output ports at maximum 60° and measure the reflected light and fluorescence.



Digital delay generator C13430-01

This outputs the gate pulse necessary for an external trigger and gate operation.



Optical split fiber A10193-01,-02

It is very useful for reflectance measurement or film thickness measurement. We have two kind of fiber. One is A10193-01 for visible range and the other is A10193-02 for from visible range to near infrared range.



C-mount fiber adapter A6399

This is an adapter for securing the fiber input optics to the C-mount of a microscope or the like. The A6399 is usable in UV to NIR wavelength.



C-mount adapter for positioning A9607

In addition to the function of the C-mount fiber adapter, the measurement position can be checked. The A9607 is usable in UV to NIR wavelength.



Data analyzer C10471-01,-02

A data analyzer is provided. There are the C10471-01 notebook model and the C10471-02 desktop model .



OBJECTIVE LENS A4869

Condensing lens for UV. f=50 mm, F3.5 (A6399 or A9607 required)



Integrating sphere A5640

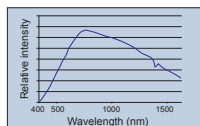
This is the integrating sphere for getting complete diffuse light. You can get even intensity light without spread of light source or influence of directional characteristics. (A6399 required)



Halogen lamp L6758-11

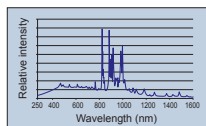
This is a halogen light source with output wavelengths from 400 nm to 1600 nm for excitation and absorption measurements.

★ Light guide connector A10194-01 is needed to connect with 2 split fiber.



Xe light source High stability 150 W L6759

This is a high stability xenon light source with output wavelengths from 250 nm to 1600 nm for excitation and absorption measurements.



Attenuation fiber adapter A10474-01

This adaptor is used when the light power is too strong. It can reduce the input light power by using a pin-hole. (fading rate approx 1 /20 to 1 /500)

Software library U10472-01

This is the software library which controls the PMA-12 series.

Color measurement library U10473-01

This is the software library which controls the PMA-12 series and calculates the chromaticity.

SPECIFICATIONS

Model	C10544-01	C10544-02	C10027-01	C10027-02	C10028-01	C10028-02	C10029-01
Photo-detector	CCD linear image sensor		BT- CCD linear image sensor		InGaAs linear image sensor		I.I. + BT- CCD linear image sensor
Wavelength (nm)	300 to 800	340 to 830	200 to 950	350 to 1100	900 to 1650	1600 to 2350	200 to 860
Wavelength resolution (FWHM)*1	< 3 nm		< 2 nm	< 2.5 nm	< 9 nm		< 3 nm
Exposure time (Exposure Start Mode)	19 ms to 64 s (1 ms to 64 s)		19 ms to 64 s (1 ms to 64 s)		5 ms to 64 s (1 ms to 64 s)	5 ms to 50 ms (1 ms to 64 s)	19 ms to 64 s (1 ms to 64 s)
Gate time*2	-		-		-	-	≥ 10 ns
Gate repetition	-		-		-	-	≤ 200 kHz
Number of photosensitive device channels	1024 ch		1024 ch		256 ch		900 ch
Pixel size	24 μm × 3.07 mm		24 μm × 2.928 mm		50 μm × 250 μm		24 μm × 2.928 mm ³
Device cooling temperature	0 °C		-15 °C		-10 °C		-15 °C ³
Read-out noise (electrons)	18		16		12 500		16 ³
Dark current (electrons/scan)	400 (0 °C : 20 ms)		75 (-15 °C : 20 ms)		20 000 (-10 °C : 20 ms)	2.5 × 10 ⁷ (-10 °C : 20 ms)	75 ³ (-15 °C : 20 ms)
AD resolution	16 bit						
Spectrograph	Concave spherical grating type			Czerny-Turner type			
Spectrograph F number	3			4			
Fiber receiving area	Φ1 mm						
Fiber type	Bundled fiber Φ12 mm SUS tube						
Fiber length	1.5 m ⁴						
External trigger input	TTL level / High impedance						
Interface	USB 2.0						
Power supply	AC 100 V to AC 240 V, 50 Hz / 60 Hz (Power supply voltage variation ±10 %)						

*1 Confirmed with mercury and argon atomic beams.

*2 The gate time is controlled by the external gate pulse width.

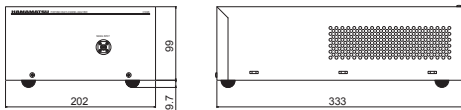
*3 I.I. characteristics are not included.

*4 A 1.5 m cable is included as standard.

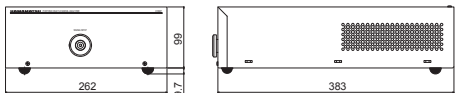
Dimensional outlines (Unit : mm)

Main unit

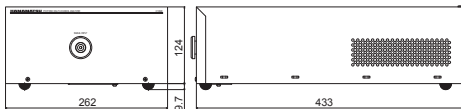
• C10544-01, -02



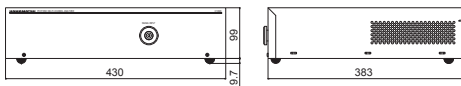
• C10027-01, -02



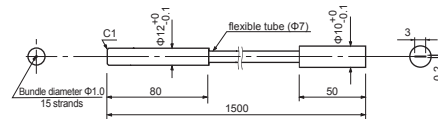
• C10028-01, -02



• C10029-01



Fiber input optics for C10544, C10027, C10028, C10029 (approx. 100 g)



Basic software for PMA-12 U6039-01

- Measurement functions Monitoring measurement
Data measurement
- Temporal resolution measurement functions ... Temporal fluctuation of spectra
Temporal fluctuation in reflectivity and transmissivity
- Data acquisition condition settings Exposure time settings
Memory integration count assignment
- Calibration/correction Wavelength axis calibration
Sensitivity inconsistency calibration
Dark current correction
- Display functions Spectrum display
Display temporal waveform fluctuations
- Wavelength axis display Wavelength, Wave number, Raman shift, energy (eV)
- Brightness axis display Linear, Logarithm
- Cursor analysis functions Wavelength (wave number, etc.) vs. Intensity
Peak detection
FWHM measurement
Integrated intensity
- Other analytical functions Smoothing
Differential waveform
Color calculation (XYZ, xy, uv, Lab)

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