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Mini-spectrometers

TM series | C10082MD C10083MD

For UV to near IR, integrating optical system, image sensor and circuit

TM series mini-spectrometers are polychromators integrated with optical elements, an image sensor and a driver circuit. Two models are available: C10082MD (TM-UV/VIS-MOS) and C10083MD (TM-VIS/NIR-MOS). Light to be measured is guided into the entrance port of TM series through an optical fiber and the spectrum measured with the built-in image sensor is output from the USB port to a PC for data acquisition. No external power supply is required since USB bus power is used for circuit operation.
Mini-spectrometer TM series comes supplied with free evaluation software that allows setting measurement conditions, acquiring and saving data, and displaying graphs. Original measurement software can be designed on an end-user's side as DLL's function specification is disclosed.

Features

- **High throughput due to transmission grating made of quartz**
- **Highly accurate optical characteristics**
- **No external power supply required: uses USB bus power**
- **Wide spectral response range**
- **Easy to install into equipment**
- **Wavelength conversion factor*1 is recorded in internal memory.**
- **Supports external trigger input*2**

Applications

- **Light source spectrum measurement**
- **Sunlight or illumination analysis**
- **Absorbance measurement**

*1: A conversion factor for converting the image sensor pixel number into a wavelength is recorded in the module. A calculation factor for converting the A/D converted count into the input light intensity is not provided.
*2: Coaxial cable for external trigger input sold separately. Refer to the "Mini-spectrometers Selection Guide" for details on external triggers.

Optical characteristics

Parameter		TM-UV/VIS-MOS	TM-VIS/NIR-MOS	Unit
		C10082MD	C10083MD	
Spectral response range		200 to 800	320 to 1000	nm
Spectral resolution (Spectral response half width)*3	Typ.	4	5	nm
	Max.	6	8	
Wavelength reproducibility*4		-0.2 to +0.2		nm
Wavelength temperature dependence		-0.4 to +0.4		nm/°C
Spectral stray light*3 *5		-35 max.	-33 max.	dB

*3: Depends on the slit opening. Values were measured with the slit listed in the table "Structure".
*4: Measured under constant light input conditions
*5: When monochromatic light of the following wavelengths is input, spectral stray light is defined as the ratio of the count measured at the input wavelength, to the count measured in a region of the input wavelength ±40 nm.
C10082MD: 500 nm, C10083MD: 650 nm

Electrical characteristics

Parameter	Specification	Unit
A/D conversion	16	bit
Integration time	5 to 10000	ms
Interface	USB 1.1	-
USB bus power current consumption	100 max.	mA

Structure

Parameter	Specification	Unit
Dimensions (W × D × H)	94 × 90 × 55	mm
Weight	470	g
Image sensor	CMOS linear image sensor (S8378-1024Q)	-
Number of pixels	1024	pixels
Slit*6 (H × V)	70 × 800	µm
NA*7	0.22	-
Connector for optical fiber	SMA905D	-

*6: Entrance slit aperture size
*7: Numerical aperture (solid angle)

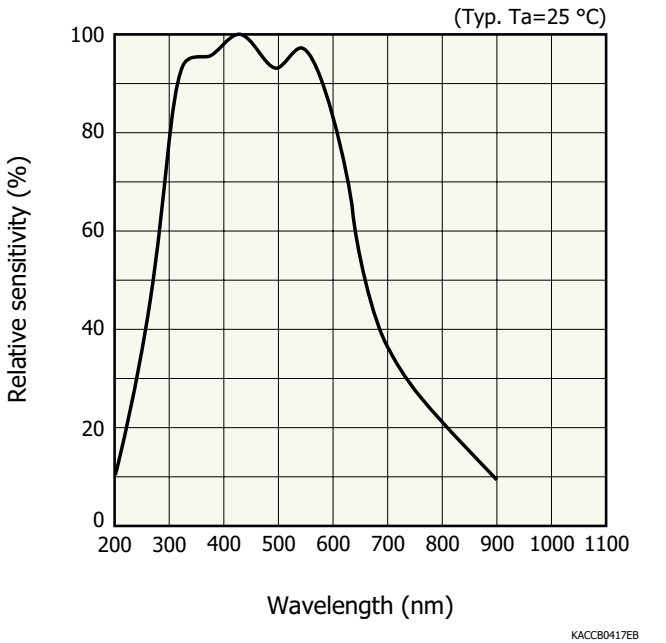
Absolute maximum ratings

Parameter	Value	Unit
Operating temperature*8	+5 to +40	°C
Storage temperature*8	-20 to +70	°C

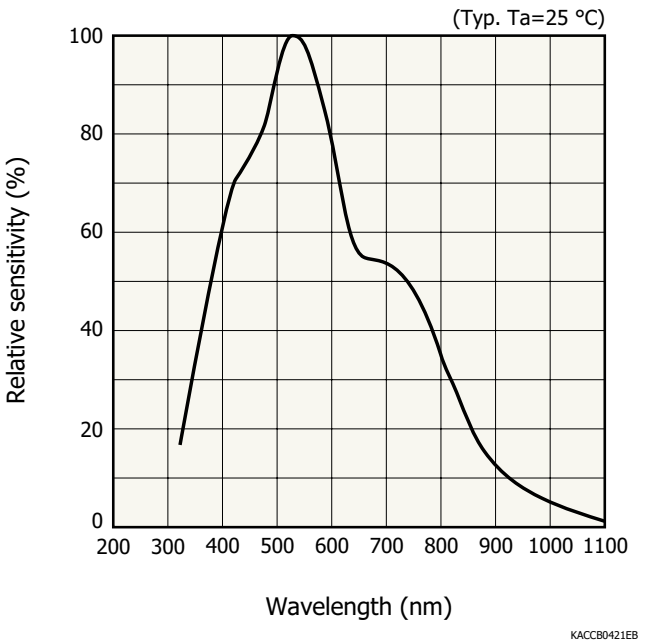
*8: No dew condensation
When there is a temperature difference between a product and the surrounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Spectral response

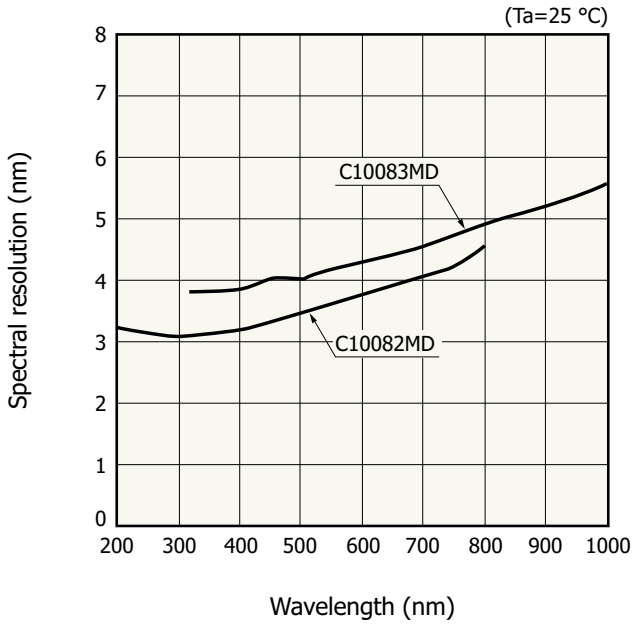
C10082MD



C10083MD



Spectral resolution vs. wavelength (typical example)



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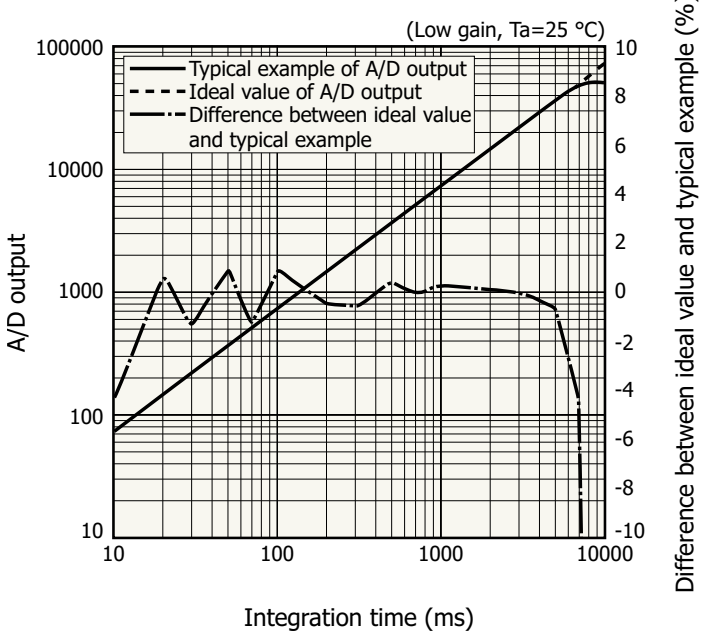
Linearity (typical example)



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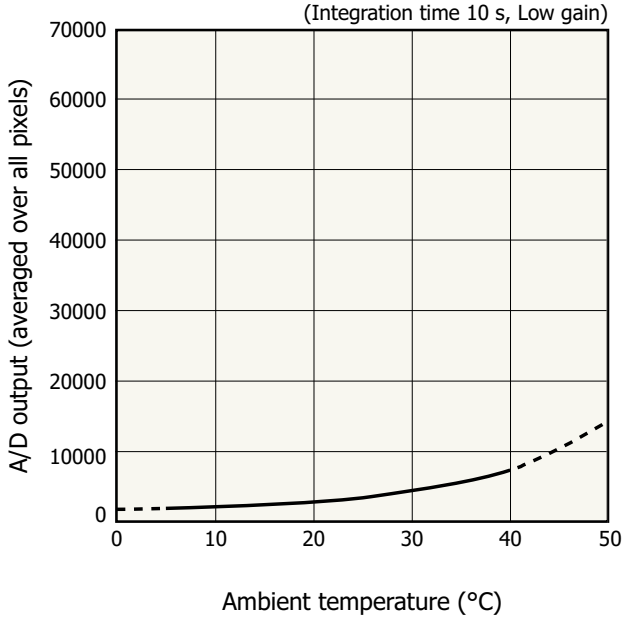
A/D output is the output with dark output is subtracted when light is input. The difference between the ideal value and typical example contains a measurement error. The smaller the A/D output, the larger the measurement error.

Dark output vs. ambient temperature (typical example)



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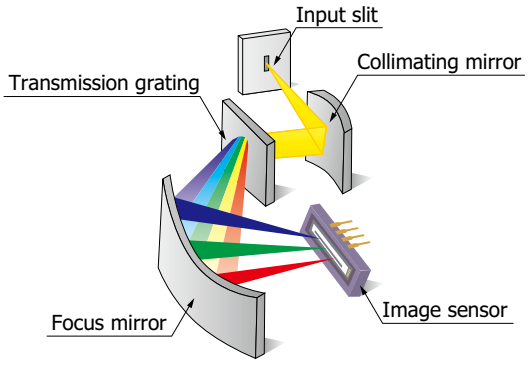
A/D output is the sum of the sensor and circuit offset outputs and the sensor dark output.

Optical component layout

TM series mini-spectrometers use a transmission holographic grating made of quartz and precision optical components arranged on a rugged optical base, making it possible to deliver high throughput and highly accurate optical characteristics.



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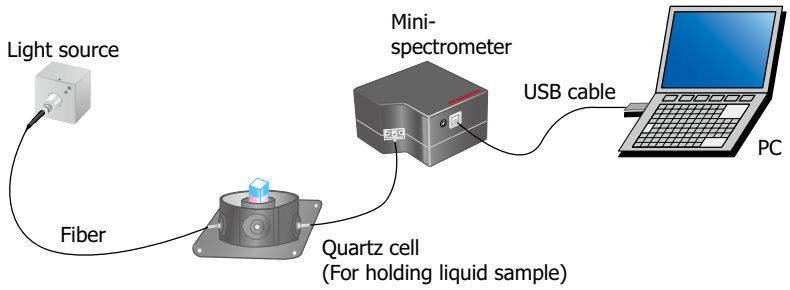
Connection example (transmission light measurement)

Light to be measured is guided into the entrance port of TM series through an optical fiber and the spectrum measured with the built-in image sensor is output through the USB port to a PC for data acquisition. There are no moving parts inside the unit so stable measurements are obtained at all times. An optical fiber that guides light input from external sources allows a flexible measurement setup.



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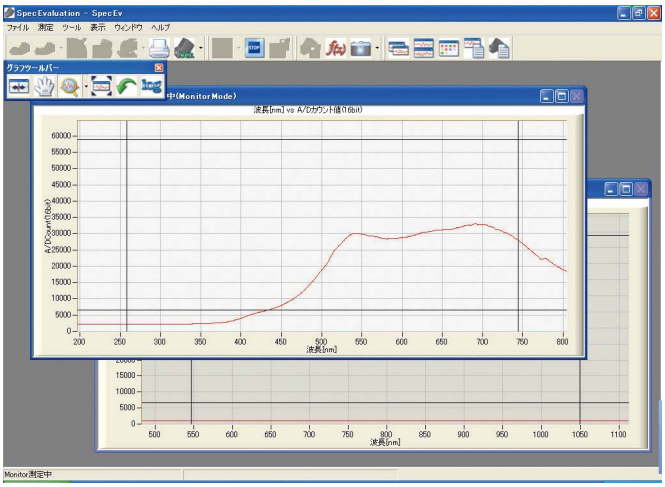
Evaluation software package (supplied with unit)

Installing the evaluation software package (Spec Evaluation. exe)*9 into your PC allows running the following basic tasks:

- Measurement data acquisition and save
- Measurement condition setup
- Module information acquisition
  (wavelength conversion factor, polychromator type, etc.)
- Graphic display
- Arithmetic operation
  Pixel number to wavelength conversion
  Comparison calculation with reference data
  (transmittance, reflectance)
  Dark subtraction
  Gaussian approximation (peak position and count, FWHM)



Note:

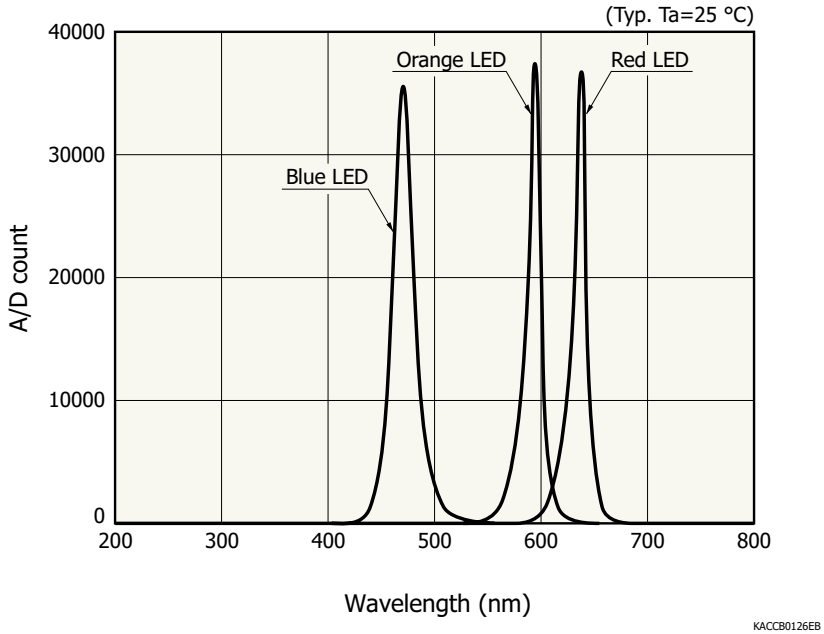
- Two or more mini-spectrometers can be connected and used with one PC simultaneously.
- The external trigger input function works with DLL, but does not function on the supplied evaluation software. If using an external trigger input, the user software must be configured to support that function.

*9: Compatible OS: Microsoft Windows 10 Professional (32-bit, 64-bit)

DLL for controlling hardware is also provided.
You can develop your own measurement programs by using a following software development environment.
Microsoft Visual Studio® 2008 (SP1) Visual C++®
Microsoft Visual Studio 2008 (SP1) Visual Basic®
Note: Microsoft, Windows, Visual Studio, Visual C++ and Visual Basic are either registerd trademarks or trademarks of Microsoft Corporation in the United States and other countries.

Measurement example (C10082MA)

Line spectra from visible LED



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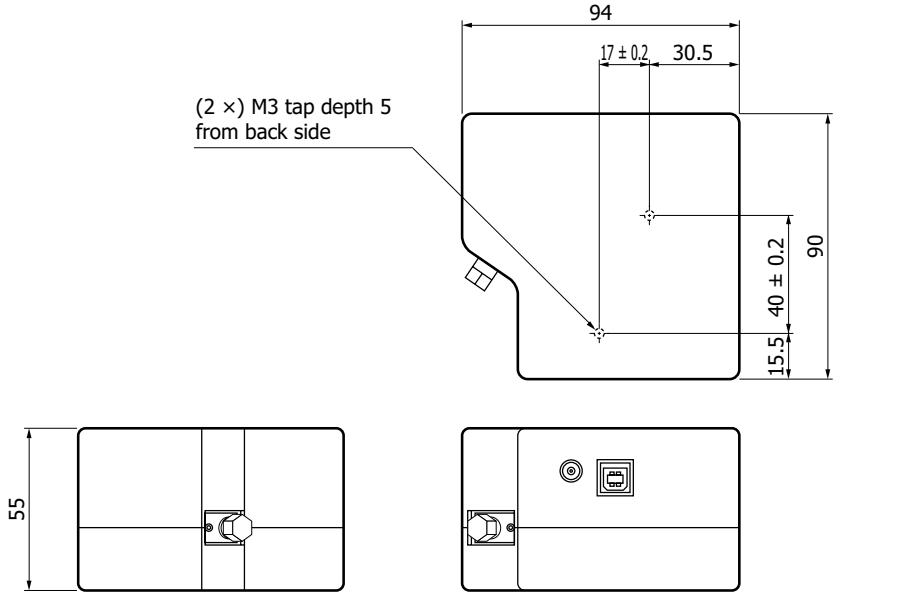
Dimensional outline (unit: mm)



Tolerance unless otherwise noted: ±0.5
Weight: 470 g

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Accessories

· USB cable
· Dedicated software (evaluation software, sample software, DLL)

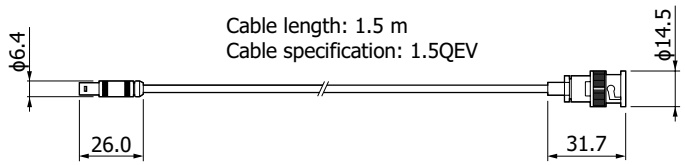
Options (sold separately)

· Optical fiber for light input

Type no.	Product name	Core diameter (µm)	Specification
A16962-01	Fiber for UV/visible range (resistance to UV)	600	NA=0.22, length 1.5 m, connectorized SMA905D at both ends

· Coaxial cable for external trigger input A10670

Dimensional outline (unit: mm)



LEMO connector
FFA.00.250 (made by LEMO)

BNC connector
BNC-P-1.5 (40) (made by HIROSE or equivalent)

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Related information

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

■ Precautions

· Disclaimer
· Mini-spectrometers

■ Technical information

· Mini-spectrometers

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