ADVANTEST

Q8221
Optical Multi Power Meter

High-Accuracy, High-Sensitivity and High-Speed Optical Power Meter

- Various Optical Sensors and Light Source Available
- High Accuracy :
  ± 2.5% (at the Calibration Point)
  ± 4.5% (over the entire Wavelength Range)
  Linearity: ± 0.5%
  Low Polarization Dependence : 0.003 dBp-p
- High Sensitivity : -94 dBm
- High Power Input Level : +27 dBm
- High Speed Measurement : Sampling Rate of 100 times/sec

Q8221

Flexible to User's Diversified Needs for Optical Power Measurement

Features

Flexible Combination-Two-Channel, Plug-In System.

The Q8221 uses a two-channel, plug-in system. Various types of optical sensors and light sources are available as plug-in units. The two channels can be used either independently or simultaneously. The Q8221 can handle a variety of applications by using the desired combination of optical sensors and light sources.

High Measurement Accuracy.
Ensures Accuracy Over the Entire Range of Power and Wavelength.

The optical sensors for Q8221 assure high accuracy of ±2.5% at calibration point (for short wavelength sensor: Q82214 is calibrated at 780nm, for long wavelength sensors: Q82208, Q82215 and Q82216 are calibrated at 1300nm, Q82227 and Q82232 are calibrated at 1550nm). In broad band wavelength region, they assure ±4.5% accuracy by compensating the sensitivity curve over wavelengths of each sensors. Further more, the linearity of ±0.5% is assured. Not only at the calibration point these sensors assure also broad band wavelength region and the level to be measured.

** Calibrations of Q82208, Q82215 and Q82216 at 1550 nm are also available as options (OPT.25).*

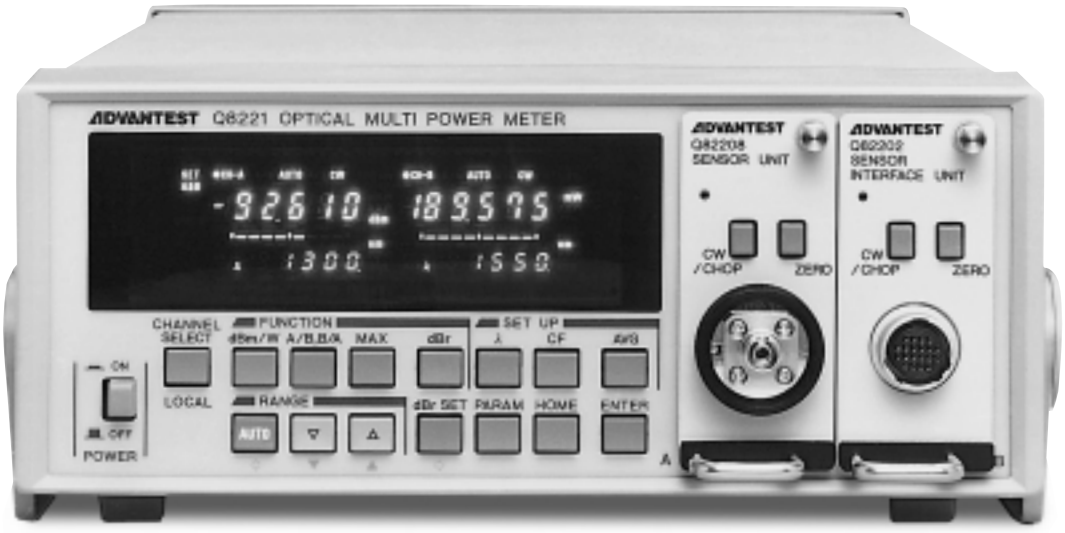
High-Sensitivity Sensors
Noise Level: -94 dBm.

The Q82208 and Q82232 Optical Sensors achieves high sensitivity by cooling the InGaAs photo-diode. The Q82208 especially achieves –94 dBm. High power can be measured with high linearity up to +10 dBm with all three types. These sensors are designed to satisfy user's diversified requests for the polarization dependency, return loss and sensor type. They can correspond to a wide variety of measurement requirements.

Sensor Model	Polarization Dependency	Return Loss	Sensor Type
Q82208	0.02 dBp-p	45 dB(typical)	Plug-in Type
Q82232	0.003 dBp-p	14 dB	Pull-out Cable Type

High Power Input Optical Sensor (Q82227)
Maximum Input Power: +27 dBm

The Q82227 is for long-wavelength, high-sensitivity, and high power light. The sensor is capable of measuring light input up to +27 dBm. Thus, it is suitable for measuring output from optical-fiber amplifiers, the pumping light source of optical-fiber amplifiers, and high-output devices such as LDs for optical CATVs. Also, noise level for Q82227 is –80 dBm, therefore, it can corresponds to measurement where wide dynamic range is necessary.



Q8221 Optical Multi Power Meter

Low Polarization Dependency Optical Sensors (Q82232): 0.003 dBp-p or less

The high-sensitivity Q82232 Optical Sensor achieves low polarization dependence of 0.003 dBp-p. By combining with Q8163 Polarization Scrambler, it can be used for high-speed and high precision PDL measurement of the optical devices.

Sensors with Less Reflection and High-Return-Loss Adaptor with Minimum Reflection

If input light was reflected back, the influence on the system results in inaccurate measurement. The Q82208 Optical Sensor uses optical fiber with slant polished ends to suppress reflection (return loss of 50 dB or more). When using a PC polished connector, a high return loss of 45 dB or more can be obtained by using the low-loss, high-return-loss adaptor (typical return loss without this adaptor is 14 dB). This sensors fit optical fibers with a core diameter of 10µm with NA 0.19 or less, making them suitable for measurement of dispersion shift fibers. FC,SC,ST,MU,LC and plug-in connectors are available.

High Resolution Measurement. Display 0.001 dB/0.0001 dB GPIB Output.

Both absolute power measurement (dBm) and relative power measurement (dBr) are displayed with a resolution of 0.001dB. During GPIB output, data can be output with a resolution of 0.0001dB.

High-Speed, High-Throughput Measurement. Max.100 Times/Sec.

For all sensors, the Q8221 achieves a sampling speed of 100 times/sec. and a ranging speed (time required to move to a different range) of a maximum of 500 msec (minimum 20 msec). In addition, GPIB output can be transferred at a high speed of 100 times/sec., thus dramatically increasing the throughput of production lines.

Recording Function, PDL Measurement Function

Q8221 is capable of storing data containing 400 points with the A and B channels independently. Furthermore, stored data can be directly output to an external plotter as a graph. Also, PDL measurement is very easy with Q8221, because Q8221 can display maximum and minimum values as well as the difference between the maximum and minimum values of the measured data.

Applications

Measurement of Polarization Dependent Loss (PDL) in Optical Couplers by Simple Operation

High-speed and high-accuracy measurement of polarization dependent loss (PDL) can be made. The system supplies output of the DFB-LD light source with stable wavelength at stable level to the DUT via the isolator and the polarization controller, then inputs the output from the DUT to the Q82232. Measurement results are directly output to a PC via the GPIB using the recording function. The maximum and minimum values as well as PDL (maximum value minus minimum value) can be displayed on the Q8221 panel by simple push-button operation. Measurement time required is less than 1 sec. at PDL=0.2dB, which improves throughput dramatically.

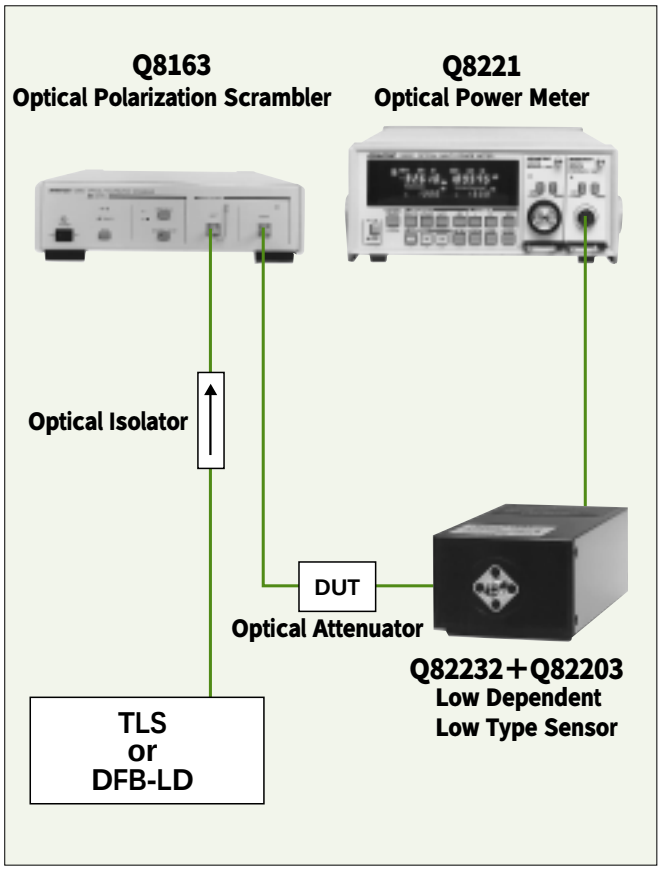
ADVANTEST's original polarization-variance method.

By adopting the high-speed, optical-fiber polarization scramble unit, Q8163 Optical Polarization Scrambler achieves:

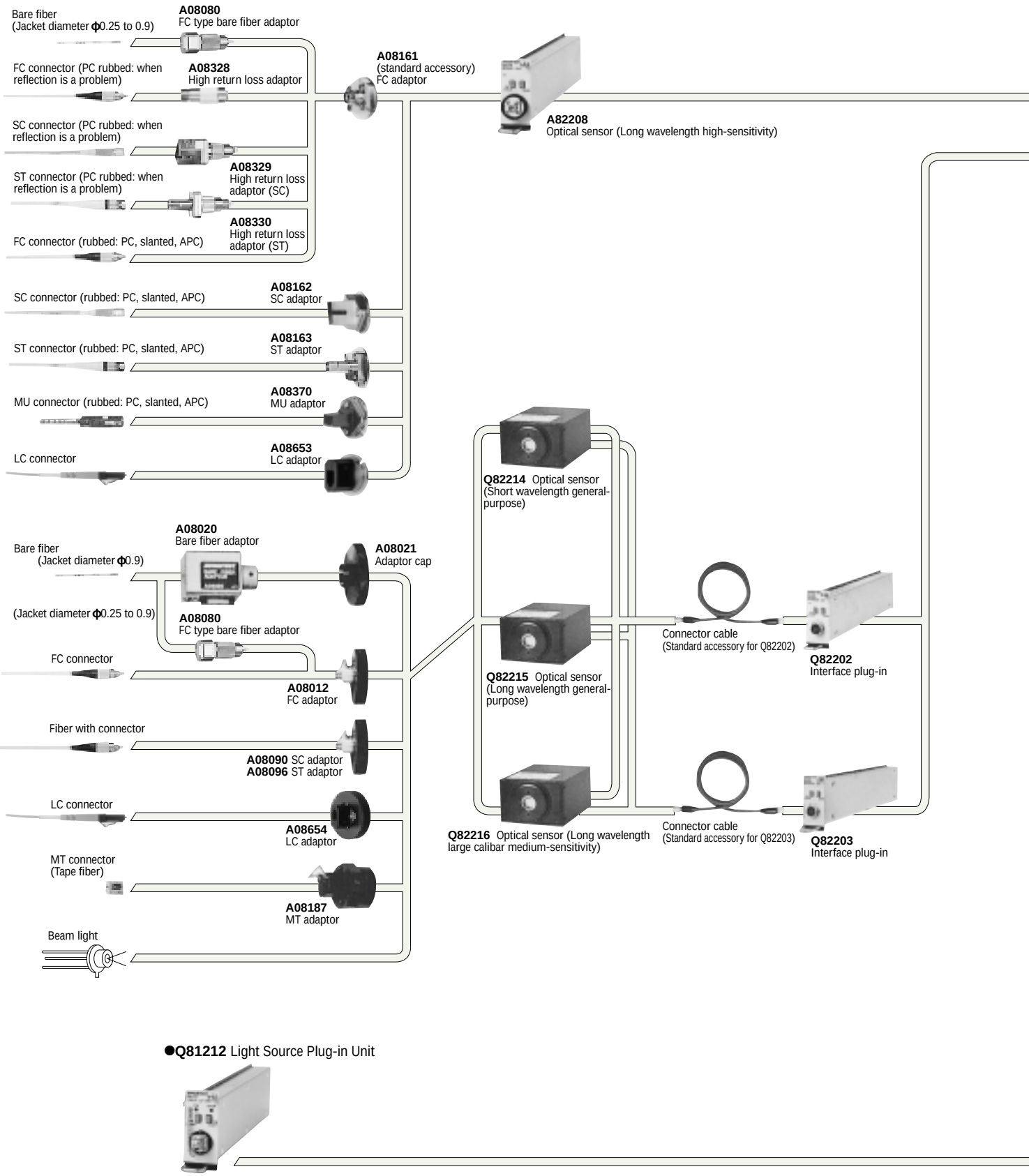
- ◆High-speed polarization variance
- ◆Low fluctuation of insertion loss
- ◆Low insertion loss
- ◆High reliability

<Major Specifications>

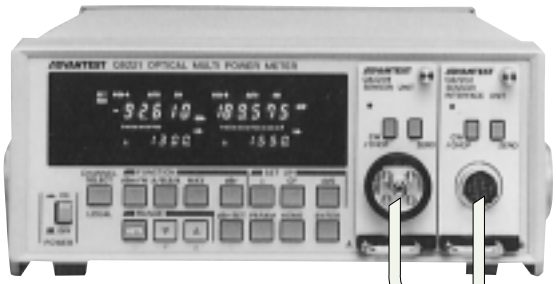
High-speed polarization variable: 500 rotations of the Poincaré sphere per second or more
Low fluctuation of insertion loss: ±0.005 dB or less
Low insertion loss: 3 dB or less



Sample Configurations



●**Q81212** Light Source Plug-in Unit



Q8221 Optical Multi Power Meter

FC connector (slanted rubbed)

A08328
High return loss adaptor
(for FC)

A08332
Remove
proof cap

FC connector (rubbed: PC)

SC connector (rubbed: PC)

A08329 High return loss adaptor (for SC)

ST connector (rubbed: PC)

A08330 High return loss adaptor (for ST)

Plug-in connector (rubbed: PC)

A08331 High return loss adaptor (for Plug-in)

A08340
FC adaptor
(Standard accessory)

Q82227
Optical sensor
(Long wavelength
high-sensitivity
high-power)

SC connector — **A08338** SC adaptor

ST connector — **A08339** ST adaptor

MU connector — **A08371** MU adaptor

LC connector — **A08655** LC adaptor

Connector cable
(Standard accessory for
Q82203)

Q82203
Interface plug-in

A08340
FC adaptor
(Standard accessory)

FC connector (rubbed: PC)

A08338
SC adaptor

SC connector (rubbed: PC)

A08339
ST adaptor

ST connector (rubbed: PC)

A08371
MU adaptor

MU connector (rubbed: PC)

A08655
LC adaptor

LC connector

Q82232
Optical sensor
(Long wavelength
high-sensitivity
low-polarization)

※Remove proof cap is used to prevent the mis-removing the high return loss adaptor from the sensor adaptor when removing the fiber connector.

●Q8221 Optical Sensor Specifications

				
Model		Q82214	Q82215	Q82216
Product Type		Short Wavelength General-Purpose	Long Wavelength General-Purpose	Long Wavelength Large-Caliber Medium-Sensivity
Wavelength Range		400 to 1100nm	800 to 1750nm	
Power Range		−80 to +17dBm *1	−60 to +10dBm *1	−77 to +10dBm *1
Range *2	Max.	CW 200mW / CHOP 200mW	CW 20mW / CHOP 20mW	CW 20mW / CHOP 20mW
	Min.	CW 20nW / CHOP 20nW	CW 2000nW / CHOP 2000nW	CW 20nW / CHOP 20nW
Sensor Element		Si 8mmϕ	Ge 5mmϕ	Ge 5mmϕ Cooled
Optical Input Form	Beam	Possible (optical Input Diameter 8mmϕ)	Possible (optical Input Diameter 5mmϕ)	
	Fiber	Core Diameter≦100μm,NA≦0.3 PC,APC,and Slanted Rubbed Connectors (Use With Appropriate Connector Adaptor For Each)		
Measurement Accuracy *3,*8	At Calibration Wavelength	CW ±3.0% / CHOP ±4.0% — 780nm 1mW 0 to 40°C	CW ±3.0% / CHOP ±4.0% — 1300nm 1mW 0 to 40°C	CW ±2.5% / CHOP ±3.5% — 1300nm 1mW 0 to 40°C
	At Wide Wavelength range	CW ±5.0% / CHOP ±6.0% — 480 to 900nm 1mW 23 ±3°C	CW ±5.0% / CHOP ±6.0% — 950 to 1600nm 1mW 23 ±3°C	CW ±4.5% / CHOP ±5.5% — 950 to 1600nm 1mW 0 to 40°C
Linearity (At Average Time: 1 sec.)		±0.5%±10pW −54 to +17dBm 23±3°C	±0.5%±1nW −37 to +10dBm 23±3°C	±0.5%±20pW −47 to +10dBm 23±3°C
		±1.0%±10pW −57 to +17dBm 23±3°C	±1.0%±1nW −40 to +10dBm 23±3°C	±1.0%±20pW −50 to +10dBm 23±3°C
Noise Level *4	At Averaging Time:1 sec.	−80dBm	−60dBm	−77dBm
	Without Averaging *5			
	SLOW (approx.9/sec.)	−75dBm	−55dBm	−72dBm
	FS-1 (approx.30/sec.)	−71dBm	−51dBm	−68dBm
	FS-2 (approx.50/sec.)	−69dBm	−48dBm	−65dBm
	FS-3 (approx.100/sec.)	−66dBm	−45dBm	−62dBm
Polarization Dependence (at wavelength 1550nm)		——	0.03dBp-p (Typical)*6	0.03dBp-p (Typical)*6
Return Loss	With APC, or slanted Rubbed Connector	60dB or more		
	With high return loss adaptor *7	45dB or more (Typical 47dB)		
	With PC rubbed connector	approx. 14dB		
Dimensions and Mass		Approx.60(W)×43(H)×110(D)mm 270g or less		
Connectors to Adaptor Correspondence List	FC	A08012		
	SC	A08090		
	ST	A08096		
	MU	A08369		
	LC	A08654		
	Plug-in	——		
	MT Adaptor (Mating to 12-pin SMF)	——	A08187 (Mating to 12-pin SMF)	
High Return Loss Adaptor Correspondence List*9	FC	A08328		
	SC	A08329		
	ST	A08330		
	Plug-in	A08331		
Connection to the Q8221 Main Uint		Q82202 or Q82203 Interface Plug-in Unit Required. Connection Cable Available as Accessory with Q82202, or Q82203		

*1 Level at Max.is when optical input was received with entire sensor area.
*2 Full Scale of the range. Measurable power range is shown above
*3 CW:Continuous Optical Measurement Mode used. CHOP:270Hz Chopped light Measurement Mode used.
*4 Noise Level with CW Mode and at calibration wavelength (With CHOP Mode, noise level at FS-1,FS-2 and FS-3 is approx. the same as at SLOW.)
*5 SLOW:Integration Time, 100 msec FS-1:Integration Time, 20 msec FS-2:Integration Time, 7 msec FS-3:Integration Time, 2 msec
*6 Typical Figure (Not Specified)
*7 When using PC rubbed connector with return loss 45dB or more.



Q82227		Q82232		Q82208		Model	
Long Wavelength High-Sensitivity High-Power		Long Wavelength High-Sensitivity Low Polarization		Long Wavelength High-Sensitivity		Product Type	
900 to 1650nm				800 to 1700nm		Wavelength Range	
−80 to +27dBm		−94 to +10dBm				Power Range	
CW 2000mW 20nW	CHOP 2000mW 2000nW	CW 20mW 200pW	CHOP 20mW 200nW	CW 20mW 200pW	CHOP 20mW 200nW	Range *2 Max. Min.	
InGaAs Cooled						Sensor Element	
Not Possible						Beam	Optical Input Form
Core Diameter≦10μm, NA≦0.19 PC and Slanted Rubbed Connectors		Core Diameter≦10μm,NA≦0.19 PC Rubbed Connector		Core Diameter≦62.5μm, NA≦0.21 PC, APC, and Slanted Rubbed Connectors		Fiber	
CW ±2.5%	CHOP ±3.5%	CW ±2.5%	CHOP ±3.5%	CW ±2.5%	CHOP ±3.5%	Measurement Accuracy*3, *8	
1550nm 1mW 0 to 40°C				1300nm 1mW 0 to 40°C		At Calibration Wavelength	
CW ±4.5%	CHOP ±5.5%	CW ±4.5%	CHOP ±5.5%	CW ±4.5%	CHOP ±5.5%	At Wide Wavelength range	
950 to 1630nm 1mW 0 to 40°C		950 to 1600nm 1mW 0 to 40°C		1000 to 1650nm 1mW 0 to 40°C			
±0.5%±10pW −58 to +27dBm 0 to 40°C		±0.5%±0.4pW −72 to +10dBm 0 to 40°C				Linearity (At Average Time: 1sec.)	
±1.0%±10pW −61 to +27dBm 0 to 40°C		±1.0%±0.4pW −75 to +10dBm 0 to 40°C					
−80dBm		−94dBm				At Averaging Time:1 sec.	Noise Level*4
−79dBm		−93dBm				Without Averaging *5 SLOW (approx.9/sec.)	
−76dBm		−90dBm		−91dBm		FS-1 (approx.30/sec.)	
−70dBm		−88dBm		−90dBm		FS-2 (approx.50/sec.)	
−67dBm		−85dBm		−87dBm		FS-3 (approx.100/sec.)	
0.05dBp-p or less		0.003dBp-p or less		0.02dBp-p or less (Typical 0.015dBp-p)		Polarization Dependence (at wavelength 1550nm)	
60dB or more		——		50dB or more		With APC, or slanted Rubbed Connector	Return Loss
45dB or more (Typical 47dB)		——		43dB or more (Typical 45dB)		With high return loss adaptor*7	
approx. 14dB				approx. 14dB		With PC rubbed connector	
Approx.60(W)×43(H)×135(D)mm 500g ro less		Approx.60(W)×43(H)×135(D)mm 590g ro less		Plugs into Q8221		Dimensions and Mass	
A08340 (Standard Accessory)				A08161 (Standard Accessory)		FC	Connectors to Adaptor Correspondence List
A08338				A08162		SC	
A08339				A08163		ST	
A08371				A08370		MU	
A08655				A08653		LC	
——				Jack-type Possible		Plug-in	
——						MT Adaptor (Mating to 12-pin SMF)	
A08328		Usage of high return loss adaptors are not possible		A08328		FC	High return loss adaptor Correspondence List*9
A08329		Usage of high return loss adaptors are not possible		A08329		SC	
A08330		Usage of high return loss adaptors are not possible		A08330		ST	
A08331		Usage of high return loss adaptors are not possible		A08331		Plug-in	
Q82203 Required Connection Cable Available as Accessory with Q82203				Q82202 or Q82203 Not Required		Connection to the Q8221 Main Unit	

*8 Calibrations of Q82215,Q82216 and Q82208 are also available as options (OPT82215+25,OPT82216+25,OPT82208+25).
Measurement accuracy value for the option sensors are the same as in the chart above at 1550 nm calibration wavelength.
*9 Connection loss with single mode fiber is 0.07dB(typical)

Specifications

Q81212 Light Source Plug-In Unit

Photoemittion element:	FP-LD
Wavelength:	1550 ±20nm
Spectrum half value:	10nm or less
Output power:	0 ±1 dBm (At the photoemittion edge of 2m fiber (SM 10/125 µm))
Output power (Variable):	0 to -6dB, in 0.1dB steps
Stability:	±0.01 dB or less (23±1° C/1min) ±0.05 dB or less (Between 0 to 40°C ±2°C/1h) ±1 dB or less (0 to 40°C/8h)
Output waveform:	CW or chopped light; 270Hz (±0.1%) with duty of 50 ±5%, 2kHz/4kHz (±0.1%) with duty of 50 ±10%
Output connector:	FC type
Preheating time:	60 minutes after power on

Optical Power Measurement

Sensor Plug-in channels:	2 channels (Channels A and B)
Resolution:	0.001 dB at dBm or dB read out (0.0001 dB when data output using GPIB) Max. 199,999 count at W read out
Measurement Mode:	CW, or Chopped light (270Hz±0.2%) measurement mode selectable.
Sensor wavelength sensitivity compensation:	If a wavelength is entered, an internal compensation value for the sensor wavelength sensitivity at that wavelength is automatically applied.
Relative value measurement (dBr):	The value relative to reference value is measured and displayed in dB with a maximum resolution of 0.001 dB. (0.0001 dB when data output using GPIB)
Units display:	W (mW, µW, nW, pW), dBm, dB
Display of measured value:	5-1/2-digit (7 segment FL Device)
Range setting:	Automatic, manual, or remote
Integration time:	100msec, 20msec, 7msec, 2msec
Measurement speed:	Approx. 100 measurements/s (with an integration time of 2 msec, 1 channel operation), Approx. 50 measurements/s (with an integration time of 7 msec, 1 channel operation), Approx. 30 measurements/s (with an integration time of 20 msec, 1 channel operation), Appprox. 9 measurements/s (with an integration time of 100 msec, 1 channel operation)
Level meter:	Displays with 11 dots according to the measurement value.
Calculation Function:	A/B, B/A, CF (When W is selected as unit, the measurement value is multiplied by a constant; When dBm is selected, offset is possible)
Maximum hold function:	Displays the maximum measurement value.
Averaging Function:	The number of averaging can be set to 2 to 256 times according to the need using the running averaging method.

Interface Plug-in

A/D error:	±0.01% ±5 count

Light Source Plug-in Unit

Unit plug-in channels:	2 channels (Channles A and B) maximum
Output power adjustment function:	The output power can be varied from 0 to -6.0 dB, with a setting resolution of 0.1dB.
Output mode:	CW or Chopped light (270Hz, 2kHz, 4kHz) mode selectable.

Other Functions

Record functions, PDL/PDR*

Measurement functions:	Can store up to 400 measurement data for each of channels A and B in the backup memory. The stored data can be read from a personal computer via the GPIB interface. Values in the memory can be displayed also as Max.,Min.,Difference (Max.-Min.)
Memory function:	Up to five settings for each of channels A and B can be stored and read.
Direct plotting function:	The measurement data stored by the record function can be plotted directly on an external plotter in the form of graphs.
Brightness control function:	The brightness of the indicator can be adjusted in five steps.

Output functions

GPIB interface:	IEEE488-1978
Analog output:	Outputs an analog signal proportional to the input optical power.
Output voltage:	0 to +2V (F.S.) for each range
Output impedance:	0.5Ω or less
Output terminal:	BNC connector

General Specifications

Ambient conditions:	0 to +40°C, RH 85 % or less
Storing conditions:	-25 to +70°C
Power Requirements:	100 to 240 V AC, 48 to 66 Hz
Power Consumption:	50 VA or less (including the plug-in and sensors)
Dimensions:	Approx.212(W) x 88(H) x 360(D)mm
Mass:	3.9kg or less (including the plug-in unit)

Standard Accessories

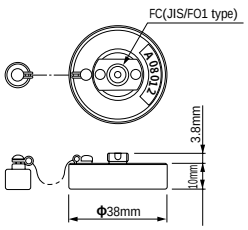
Power cable:	1
Fuse:	2
Instruction Manual:	1

Optional Accesories

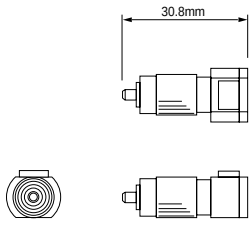
A02463:	Rack Mount Set (EIA single)
A02464:	Rack Mount Set (EIS twin)
A02263:	Rack Mount Set (JIS single)
A02264:	Rack Mount Set (JIS twin)
OCS-F2SFW-2:	Optical Fiber Cord (GI 50/125 µm, 2m)
OCS-F2SPS-2:	Optical Fiber Cord (SM 10/125 µm, 2m)

*PDR: Polarization Dependent Radio

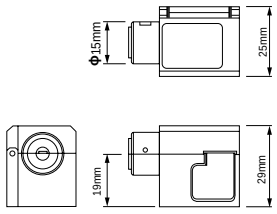
●Optical Adaptors Dimensions



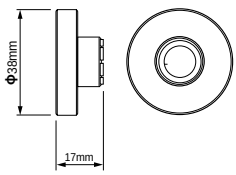
A08012 FC Adaptor



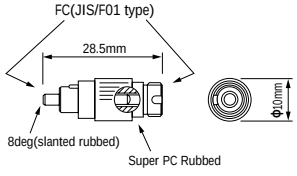
A08080 FC type Bare fiber adaptor



A08020 Bare fiber adaptor

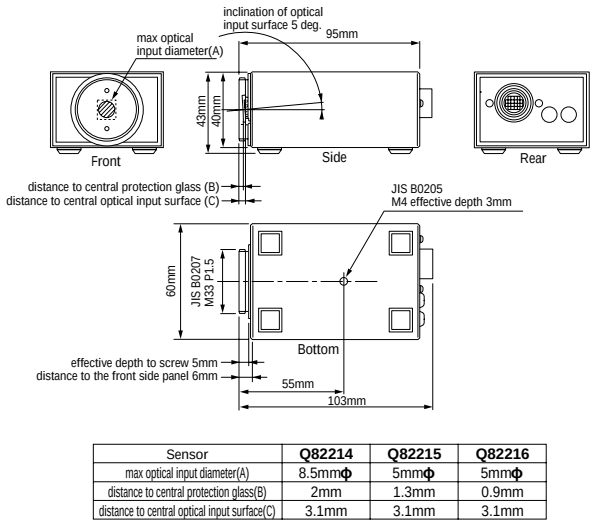


A08021 Adaptor cap



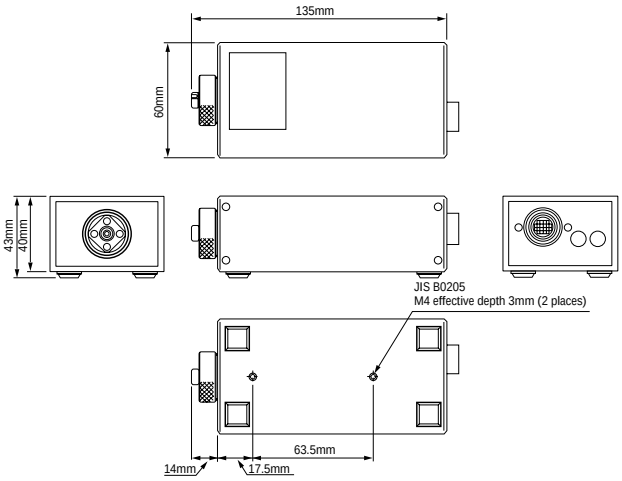
A08328 High return loss adaptor

●Q8221 Optical Sensors Dimensions



Sensor	Q82214	Q82215	Q82216
max optical input diameter(A)	8.5mmϕ	5mmϕ	5mmϕ
distance to central protection glass(B)	2mm	1.3mm	0.9mm
distance to central optical input surface(C)	3.1mm	3.1mm	3.1mm

Q82214, Q82215, Q82216 Optical Sensor



Q82227, Q82232 Optical Sensor

●Q8221

Product Type		Sensor	Model	Accessories
Interface		For Q82214/15/16	Q82202	Connection Cable
		For Q82214/15/16/27/32	Q82203	Connection Cable
Optical Sensor			Q82208	A08161
			Q82214	
			Q82215	
			Q82216	
			Q82227	A08340
			Q82232	A08340
Light Source	1550nm LD		Q81212	
Adaptor	FC	For Q82214/15/16	A08012	
	D4	For Q82214/15/16	A08013	
	Bare Fiber	For Q82214/15/16	A08020	
	Bare Fiber Adaptor Cap	For Q82214/15/16	A08021	
	SMA	For Q82214/15/16	A08028	
	FC Type Bare Fiber Adaptor	For All Sensor	A08080	
	SC	For Q82214/15/16	A08090	
	ST	For Q82214/15/16	A08096	
	MU	For Q82214/15/16	A08369	
	LC	For Q82214/15/16	A08654	
	FC	For Q82208	A08161	
	SC	For Q82208	A08162	
	ST	For Q82208	A08163	
	MU	For Q82208	A08370	
	LC	For Q82208	A08653	
	FC	For Q82227/82232	A08340	
	SC	For Q82227/82232	A08338	
	ST	For Q82227/82232	A08339	
	MU	For Q82227/82232	A08371	
	LC	For Q82227/82232	A08655	
	FC Type High Return Loss Adaptor	For All Sensor	A08328	
	SC Type High Return Loss Adaptor	For All Sensor	A08329	
	ST Type High Return Loss Adaptor	For All Sensor	A08330	
	PI Type High Return Loss Adaptor	For All Sensor	A08331	
	Remove Proof Cap	For Q82227	A08332	

CE

Please be sure to read the product manual thoroughly before using the products.
Specifications may change without notification.

ADVANTEST

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