

AQ-2140 Optical Multimeter

■ Realises four features – optical power meter, stabilized light source, loss test set and return loss unit in one package.



Introduction

In today's multimedia era a diversity of new services are starting up. Multimedia communication requires an optical access network to handle the large-capacity information transfers desired by society, and it is under construction now. The appearance of optical fiber amplifiers, meanwhile, has triggered a sharp climb in demand for all sorts of optical components. Against this background, the AQ2140 Optical Multimeter was developed to serve as a basic optical measurement instrument in a wide range of applications from R&D to optical fiber and component manufacture, and construction and maintenance. This single unit provides high precision, powerful functions and high-speed measurement, making it possible to use it as an optical power meter, a stabilized light source, a loss test set or a return loss measurement instrument.

Features

Sensor, sensor unit

● High accuracy

Measurement accuracy of $\pm 2.5\%$ is guaranteed under the reference conditions.

● Wide wavelength range and dynamic range

Covers a wide waveband from 400 to 1870nm, and provides a dynamic range of 100dB or more for loss measurement. (It depends on sensors.)

● Low polarization dependence

The AQ2733 and AQ2734 Sensor Units achieve a low polarization dependence of 0.02dBp-p or less.

● Support for the 1650nm band

The AQ2734 Sensor Unit uses a photodiode with flat wavelength sensitivity from 1300 to 1800nm, for accurate measurement at 1650nm as well.

Light source unit

● High stability

The LD unit has an internal isolator that maintain optical output level stability at $\pm 0.003\text{dB}$.

● Optical power attenuation function

Optical power can be decreased in 0.1dB steps to 6.0dB.

● Support for a variety of connectors

A wide variety of optical connectors can be used just by exchanging the universal and connector adapters (AQ4214 excluded).

Return loss unit

● High accuracy

Because internal self-reflectance data is stored by individual units in memory to correct operations, even high-reflectance attenuation can be measured with excellent accuracy.

● High stability

The internal high-stability sensor can be used together with the LD unit to provide stable reflectance attenuation measurement.

● Simple operation

Mounted with a return loss unit and LD unit, the display will show reflectance attenuation after measurement of reference reflectance by merely disconnecting the measured fiber cable.

Main frame

Sensor unit

● High-speed measurement

The minimum measurement interval is 10ms (single sensor unit), improving efficiency by slashing measurement time.

● Precise wavelength correction settings

Sensor wavelength sensitivity can be set in 1nm steps.

● Supports three relative measurement

Measurement can be referenced to measured values as in existing systems, or be based on a comparison with data from other channels, or against preset inputs.

● Selectable display resolution

Display resolution can be set to 0.1, 0.01 or 0.001, improving reading efficiency by providing the resolution needed for your specific application.

● Connection to external unit

By connecting extensional frame for Optical Multimeter AQ2141, unit of up to 16 external channels can be used. (Possible connection unit: select one unit from Sensor unit, OPM unit, Light source unit.)

● Data storage function

The main frame can store up to 1000 data points per channel, or 2000 total, and user-selected data can be output through the GP-IB interface.

● Data display function

Manual operation can be used to check not only individual data in memory, but also maximum, minimum and average values.

● Alignment function

The 5×7-dot display can be used as a bar graph for instant visual check of value change... handy indeed for cases where analog display is optimum.



● Measurement condition set-up function

Up to ten sets of measurement conditions can be stored for each channel and read out as required. One set must be defined as default for each channel.

Optical Multimeter Expansion Frame

Introduction

This frame expands the AQ2140 Optical Multimeter to support external units.

It can mount up to four channels for the AQ2140 Optical Multimeter, including sensor units, OPM units or light source units.

Features

- A single AQ2140 Optical Multimeter can be connected to up to four AQ2141 Optical Multimeter Expansion Frames, providing an increase of up to 16 external channels.
- The AQ2141 can also be used as a multi-channel light source by itself (does not support ATT function or 1 kHz or 2 kHz chopped light).



Control and indicators

Front panel

① Power switch

Florescent panel for display of measurement values, measurement conditions, etc.

③ CHAN

Selects the measurement channel.

④ dBm, W

Selects the units display for measurements.

⑤ DREF (display reference)

The reference value is fixed when the key is pressed, and the next measurement is a relative measurement to that reference.

⑥ A/B, A/REF

Comparative measurement between channels (A/B, B/A), or relative measurement compared to a set value (A/REF, B/REF).

⑦ RANGE

Turns measurement range fix on and off.

⑧ MODIFY KEY

Numeric value increment/decrement and auxiliary display select.

⑨ CW, CHOP

Selects the measurement mode.

⑩ ANALOG OUT

Linear output of voltage proportional to the measured values in each range (f.s.2V).

⑪ ZERO

Zero position adjust with sensor opaque.

⑫ Unit storage

Handy storage for the sensor unit, OPM unit, light source unit, and return loss measurement unit.

⑬ ENTER

Used to fix input in the set-up mode.

⑭ BLKG

Used to set the measurement display resolution.

⑮ MAX, MIN

On sub-display area, displays the maximum, minimum and difference after the key is pressed.

⑯ AVG

Turns on/off averaging processing.

⑰ SHIFT

Toggles between the measurement mode (functions printed on keytops) and the set-up mode (labels above keys).

Rear panel

⑱ Connection socket for external unit

⑲ GP-IB (24-pin)

⑳ Ground

㉑ Power supply plug socket

Set-up mode content (Function signed above keys)

LOCAL ····· Toggles the GP-IB interface between local and remote.

SYSTEM ····· Used to select system parameters such as measurement interval.

PRMTR ····· Used to select unit parameters such as correction and number of samples for averaging.

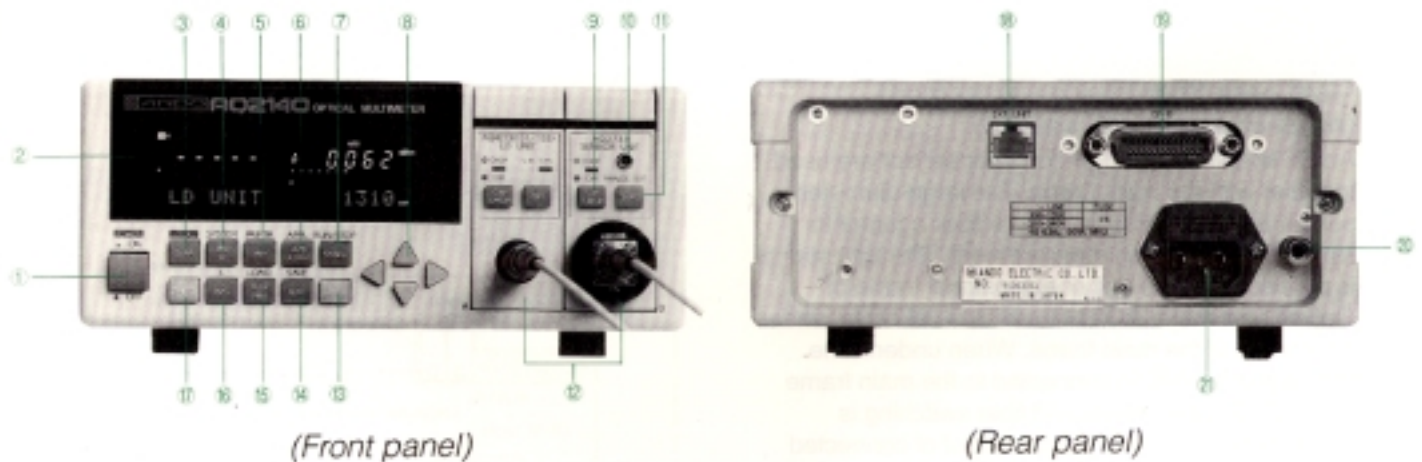
APPL ····· Use to select application (data storage, plot out, alignment, show).

RUN/STOP ····· Application execution/stop.

λ ········· Selects calibration wavelength for correction of sensor wavelength sensitivity.

LOAD ····· Loads parameter table to set unit parameters.

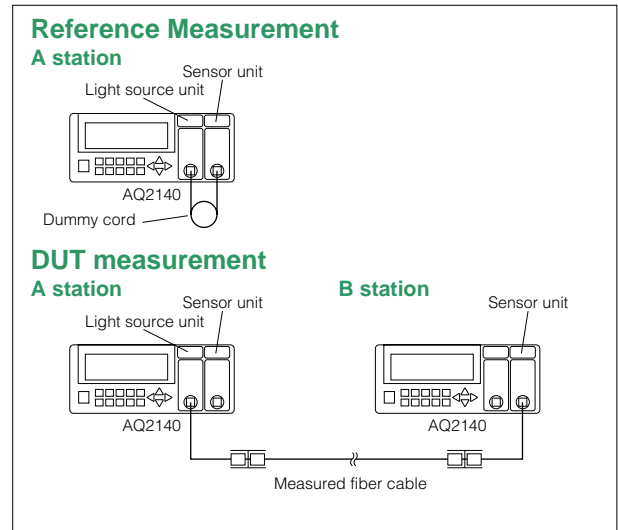
SAVE ····· Saves parameter table.



Application examples

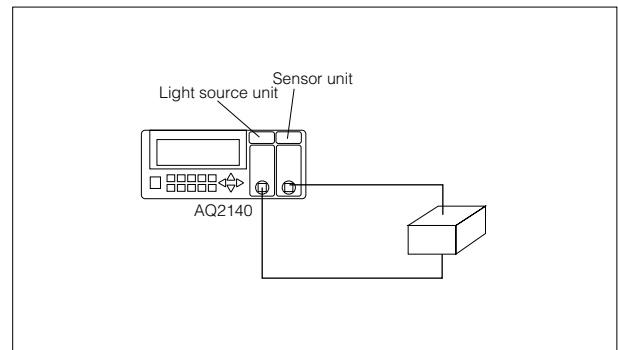
Optical fiber loss measurement

Total loss after laying optical fiber is measured at Station A using a reference value, and at Station B as a relative value. Station A measurement unit is equipped with its own light source unit and sensor unit. The reference value at Station A is input into the Station B main frame through an optical fiber telephone or similar system, and then the relative value with respect to that reference measured to determine total optical fiber cable loss.



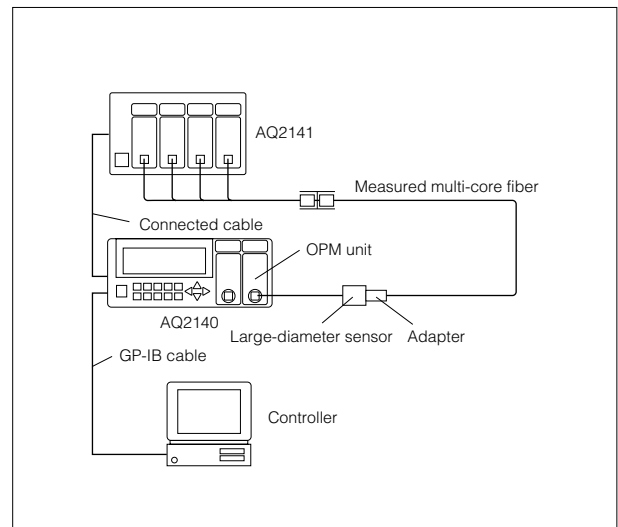
Optical component measurement

For optical component measurement use the light source unit and sensor unit together. With the LD unit, peak loss up to 93dB can be measured.



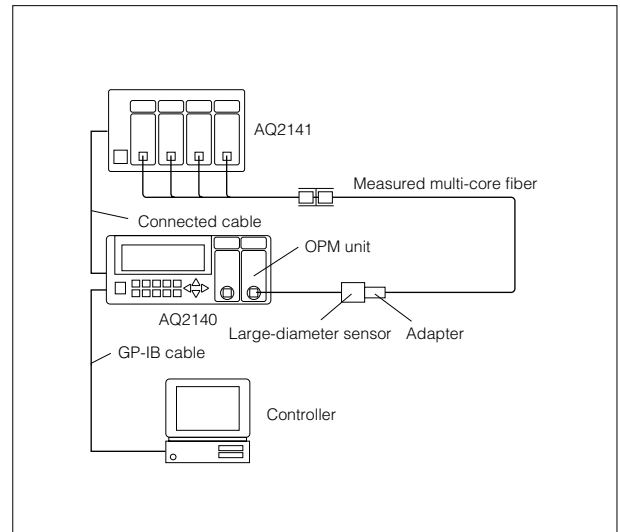
Multi-core fiber loss measurement (multi-channel light source)

An OPM unit and a large-diameter sensor are used together with the main frame. The large-diameter sensor uses a special multi-core fiber adapter for simple high-precision measurement. The light source is connected to the unit of extensional frame of Optical Multimeter AQ2141 with special cable, under the control of the main frame. When underframe. PC control, the PC is connected to the main frame by a GP-IB cable. Measured fiber switching is handled by turning the optical output of connected to AQ2141 on/off.



Multi-core fiber loss measurement (multi-channel selector)

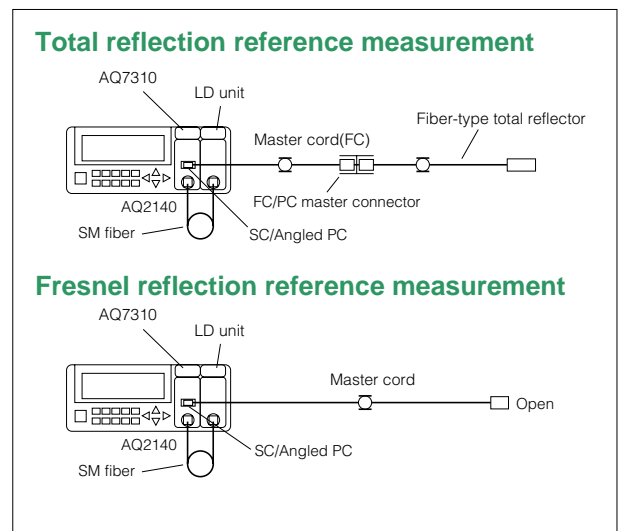
An OPM unit and a large-diameter sensor are used together with the main frame. The large-diameter sensor uses a special multi-core fiber adapter for simple high-precision measurement. Externally, the multi-channel light source is connected, under the control of the main frame. Light channel selector is also connected externally and measurement is done by switching channel of measured multi-core fiber. When under PC control, the PC is connected to the main frame with a GP-IB cable.



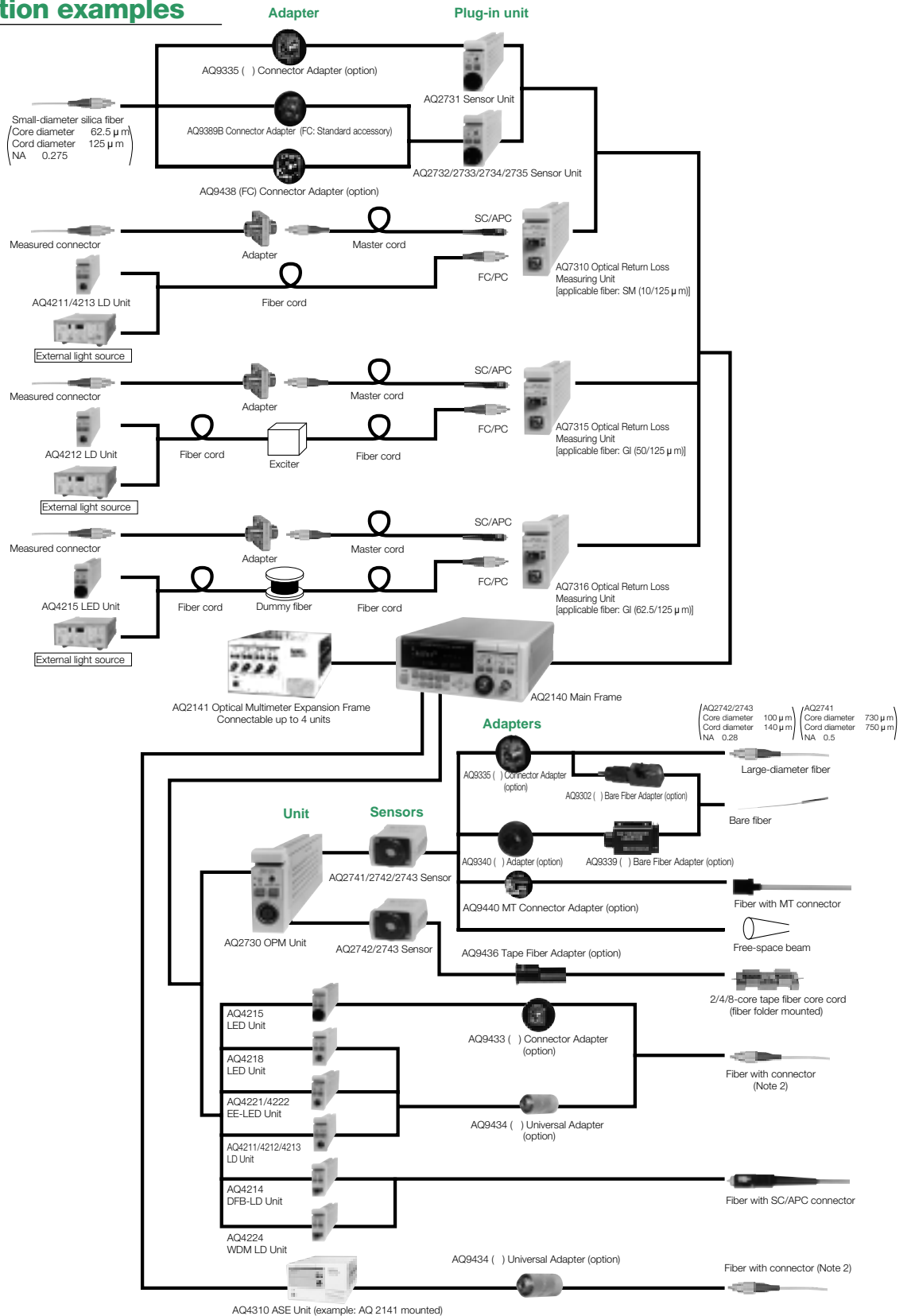
Return loss measurement of optical connectors and devices

The measurement system consists of the AQ7310 Optical Return Loss Measuring Unit (10/125 μ m), LD Unit and the master cord for AQ7310. Both total reflectance and Fresnel reflection reference measurement are supported.

Measurement consists of three steps – condition setup, reference reflectance measurement and actual measurement – with all operations handled in response to display instructions. Measurement results include corrections, so that direct readings are actual return loss. For GI measurement, use AQ7315 (50/125 μ m) or AQ7316 (62.5/125 μ m).



Configuration examples



Option

Product name	Model	Contents	Note
Optical Multimeter Expansion Frame	AQ2141	One of the sensors (sensor unit, OPM unit) or light sources (light source units) has 4 channels per unit, Max. 16 channels connectable. (4 units of AQ2141 are connectable to AQ2140.)	
OPM Unit	AQ2730	For AQ2741/2742/2743 Sensors	
Sensor Unit	AQ2731	400 to 1100nm, -93 to +3dBm, for optical fiber emission	Also select AQ9335 (*) Connector Adapter (option). (*: Requires FC, SC, ST, DIN, or HMS-10/A connector.) AQ9389B Connector Adapter (FC): Accessory.
	AQ2732	700 to 1700nm, -73 to +10dBm, for optical fiber emission	
	AQ2733	700 to 1700nm, -93 to +10dBm, for optical fiber emission	
	AQ2734	900 to 1870nm, -83 to +3dBm, for optical fiber emission	
	AQ2735	700 to 1700nm, -73 to +27dBm, for optical fiber emission	
Sensor	AQ2741	400 to 1100nm, -73 to +10dBm, for large-diameter fiber emission/free-space beam	Also select AQ9335 (*) Connector Adapter (option). (*: Requires FC, SC, ST, DIN or HMS-10/A connector.)
	AQ2742	750 to 1800nm, -53 to +10dBm, for large-diameter fiber emission/free-space beam	
	AQ2743	750 to 1800nm, -73 to +10dBm, for large-diameter fiber emission/free-space beam	
Optical Return Loss Measuring Unit	AQ7310	1280 to 1600nm, applicable fiber: SM (10/125μm)	Also select master cord for AQ7310 (*) (option) (*: FC, SC, open)
	AQ7315	1270 to 1330nm, applicable fiber: GI (50/125μm)	Also select master cord for AQ7315 (*) (option) (*: FC, SC, open)
	AQ7316	1280 to 1340nm, applicable fiber: GI (62.5/125μm)	Also select master cord for AQ7316 (*) (option) (*: FC, SC, open)
Connector Adapter	AQ9335 (*)	For AQ2731 Sensor Unit, AQ2741/2742/2743 Sensors	
	AQ9433 (*)	For AQ4215 LED Unit	
	AQ9438 (FC)	High return loss adapter, for AQ2732/2733/2734/2735 Sensor Units	
Bare Fiber Adapter	AQ9302 ()	For connecting optical fiber core cord and AQ2741/2742/2743 Sensors	() : Cord diameter. For diameter of fibers, please consult your vendor or our sales offices.
	AQ9339 ()		
Adapter	AQ9340	For connecting AQ2741/2742/2743 Sensors and AQ9339 () Bare Fiber Adapter	Be sure to purchase this when you purchase AQ9339 for the first time.
Universal Adapter	AQ9434 (*)	For AQ4218 LED Unit, AQ4221/4222 EE-LED Units, AQ4211/4212/4213 LD Units, AQ4310 ASE Unit	
Tape Fiber Adapter	AQ9436	For 2/4/8 core tape fiber core code adapter, AQ2742/2743 Sensors	Exclusive use for relative value measurement of CHOP light.
MT Connector Adapter	AQ9440	For 2/4/8 MT Connector Adapter, AQ2741/2742/2743 Sensors	
Fiber Cord with SPC Connector	—	One end (*), one end (*) (length :2m standard), for LD Unit, ASE Unit	*: Requires FC/SPC, SC/SPC or ST/SPC.
Fiber Cord with SC/APC Connector	—	One end SC/APC, one end (*) (length: 2m standard), for AQ4214DFB-LD Unit, AQ4224 WDM LD Unit	*: Requires FC/SPC, SC/SPC ST/SPC, SC/APC or open.
Master Cord for AQ7310 (FC, SC, open)	—	Used with AQ7310 Optical Return Loss Measuring Unit One end SC/APC, one end high-reflectance attenuation FC master cord (return loss 50dB or more, length: 1m) One end SC/APC, one end high-reflectance attenuation SC master cord (return loss 50dB or more, length: 1m) One end SC/APC, one end open (length: 2m)	
Master Cord for AQ7315 (FC, SC, open)	—	Used with AQ7315 Optical Return Loss Measuring Unit One end SC/APC, one end FC master cord (length: 1m) One end SC/APC, one end SC master cord (length: 1m) One end SC/APC, one end open (length: 2m)	
Master Cord for AQ7316 (FC, SC, open)	—	Used with AQ7316 Optical Return Loss Measuring Unit One end SC/APC, one end FC master cord (length: 1m) One end SC/APC, one end SC master cord (length: 1m) One end SC/APC, one end open (length: 2m)	
Optical Reflector	AQ9316C (*)	Used with AQ7310 Optical Return Loss Measuring Unit One end FC master, one end reflector One end SC master, one end reflector	Necessary when measured at total reflection reference. (*: Requires FC or SC.)
Optical Reflector for AQ7315	—	Used with AQ7315 Optical Return Loss Measuring Unit One end FC master, one end reflector	Also compatible with one end SC master, one end reflector.
Optical Reflector for AQ7316	—	Used with AQ7316 Optical Return Loss Measuring Unit One end FC master, one end reflector	
Carrying Case	AZ8114	Storage case: Main frame (1), units (2), sensors (2), connector adapters (4), universal adapter (1), power cord (1), fiber cord (2m) (2), instruction manual (1). Dimensions: approx. 450(W) x 180(H) x 450(D) mm	Unit is mounted to Main frame.

APC: Angled PC SPC: Super PC

Product name	Model	Emission wavelength (nm)	Spectral (Note 1) halfwidth/width (nm)	Optical output level (dBm)	Applicable optical fiber	Notes
LED Unit	AQ4215 (085)	850 ± 15	60 or less	-15 or more	GI	Also select AQ9433 (*) Connector Adapter (option). (*: Requires FC, SC, ST, DIN or HMS-10/A connector.)
	AQ4215 (131)	1310 ± 30	140 or less	-21/-40 or more	GI/SM	
	AQ4215 (155)	1550 ± 35	195 or less	-43 or more		
	AQ4218 (131)	1310 ± 10	20 or less			
	AQ4218 (155)	1550 ± 10	25 or less	-50 or more		
EE-LED Unit	AQ4221 (131)	1310 ± 10	20 or less	-28 or more	SM	Also select AQ9434 (*) Universal Adapter (option). (*: Requires FC, SC, ST, DIN or HMS-10/A connector.) (Note 2)
	AQ4221 (155)	1550 ± 10	25 or less	-32 or more		
	AQ4222 (131)	1310 ± 40	100 or less	-15 typ.		
	AQ4222 (155)	1550 ± 30	140 or less	-17 typ.		
LD Unit	AQ4211 (131)	1310 ± 20	5 or less	0 or more	GI	
	AQ4211 (155)	1550 ± 20				
	AQ4211 (165)	1650 +5/-10	10 or less			
	AQ4212 (130)	1300 ± 20	5 or less			
DFB-LD Unit	AQ4213 (131/155)	1310/1550 ± 20	5/10 or less	-1 or more	SM	Also select fiber cord with SP/SPC connector.
	AQ4214 (131)	1310 ± 10	0.1 or less	0 or more		
	AQ4214 (155)	1550 ± 10				
WDM LD Unit	AQ4224 (155)	1530 to 1570		+3 or more		Also select fiber cord with SC/APC connector. Specify emission wavelength range from 1530 to 1570nm. Please refer to specifications of AQ4224 (155) for details.
ASE Unit	AQ4310 (155)	1550 ± 20	40 or more	+8 or more		Also select AQ9434 (*) Universal Adapter (option). (*: Requires FC, SC, ST, DIN or HMS-10/A connector.) (Note 2)

Note 1: LED is spectral halfwidth, and LD is spectral width.
Note 2: LD Unit, ASE Unit uses fiber cord with SPC connector.

Specifications

Main frame

Display	Measurements: 7-segment fluorescent display panel, 5 and 1/2 digits, 13-dot bar graph. Intensity: 4 levels (100%, 75%, 50%, 25%)
Unit display	Absolute: dBm, mW, μ W, nW, pW Relative: dB Comparative: None
Calibration factor	Correction of sensor wavelength sensitivity (1nm steps) or input of relative value
Range	Automatic or fixed (up/down)
Measurement mode	Selectable, CW light/chopped light (270Hz, 1kHz, 2kHz)
Optical output waveform	Selectable, CW light/chopped light (270Hz, 1kHz, 2kHz)
Measurement interval (see note)	Selectable 10(20)/50/100ms
Averaging	Sequential average (2/5/10/20/50/100/200 times), on/off select
Display resolution	Selectable (0.1, 0.01, 0.001)
Relative measurement	Relative to reference setting or to displayed measurement value
Data storage	Max. 1,000 samples (each channel)
Attenuation setting	Peak attenuation 6.0dB(0.1dB steps)
Measurement condition setup function	10 condition sets are stored for read and use (one defined as default)
Plotter function	Memory data is graphed for output to external plotter
Data hold	Measurement maximum, minimum and difference
GP-IB	Compatible with IEEE-488
Power requirements	AC100 to 120, 200, to 240V, 48 to 63Hz, Max. 80VA
Environmental conditions	Operating temperature: 0 to 50°C, storage temperature: -25 to +70°C, humidity: 85% RH or less
Dimensions and mass	Approx. 212(W) x 88(H) x 350(D) mm, approx. 3kg
Accessories	Power cord, instruction manual, blank panel, dust cover for external extension, dust cover for GP-IB connector: one

* These specifications are applied when the AQ2141 Optical Multimeter Expansion Frame is disconnected.

Note: Value in parentheses () is minimum when two sensors connected.

OPM units, sensor units, sensors

Model	AQ2731	AQ2732	AQ2733
Unit name	Sensor Unit	Sensor Unit	Sensor Unit
Wavelength range	400 to 1100nm	700 to 1700nm	
Photoreceptor	Si	InGaAs	Cooled InGaAs
Application	Small-diameter silica fiber emission ¹⁾		
Input	AQ9335(*)connector adapter: Option ³⁾	AQ9389B (FC) connector adapter: Standard ⁴⁾	
Polarization dependency loss ⁶⁾	Not specified	0.02dB P-P typ.	0.02dB P-P or less
Power range ⁷⁾	CW light	-100 to +10dBm (0.1pW to 2mW)	-110 to +10dBm (0.01pW to 10mW)
	Chopped light	-100 to 0dBm (0.1pW to 1mW)	-90 to +7dBm (1pW to 5mW)
Inaccuracy under reference conditions ⁸⁾	±2.5% (at 850nm calibration point)	±2.5% (at 1310nm calibration point)	
Total accuracy ⁹⁾	±5% (500 to 900nm)	±5% (1000 to 1600nm)	±5% (1000 to 1650nm)
Linearity ¹⁰⁾ (constant temperature 23±5°C)	±0.05dB (500 to 900nm, -70 to +3dBm)	±0.05dB (1000 to 1600nm, -50 to +10dBm)	±0.05dB (1000 to 1650nm, -70 to +10dBm)
Noise ¹¹⁾	CW light	-93dBm or less	-73dBm or less
	Chopped light	-93dBm or less	-83dBm or less
Analog out	0 to approx. +2V for each range, output impedance: 1.5k Ω or less		
Zero set	Automatic zero adjust		

Model	AQ2734	AQ2735	AQ2741	AQ2742	AQ2743
Unit name	Sensor Unit	Sensor Unit	Sensor	OPM Unit	Sensor
Wavelength range	900 to 1870nm	700 to 1700nm	400 to 1100nm	750 to 1800nm	
Photoreceptor	Cooled InGaAs		Si 110mm	Ge ϕ 5mm	Cooled Ge ϕ 5mm
Application	Small-diameter silica fiber emission ¹⁾		Large-diameter fiber emission, free-space beam ²⁾		
Input	AQ 9389B (FC) connector adapter: Standard ⁴⁾		Photodiode direct ⁵⁾		
Polarization dependency ⁶⁾	0.02dB P-P or less	0.02dB P-P typ.	Not specified	0.03dB P-P typ.	
Power range ⁷⁾	CW light	-90 to +3dBm (1pW to 2mW)	-80 to +27dBm (10pW to 0.5W)	-80 to +10dBm (10pW to 10mW)	-60 to +10dBm (1nW to 10mW)
	Chopped light	-90 to 0dBm (1pW to 1mW)	-80 to +24dBm (10pW to 0.25W)	-90 to +7dBm (1pW to 5mW)	-70 to +7dBm (0.1nW to 5mW)
Inaccuracy under reference conditions ⁸⁾	±2.5% (at 1310nm calibration point)		±2.5% (at 850nm calibration point)	±2.5% (at 1310nm calibration point)	
Total accuracy ⁹⁾	±5% (1200 to 1700nm)	±5% (1000 to 1650nm)	±5% (500 to 900nm)	±5% (950 to 1600nm)	
Linearity ¹⁰⁾ (constant temperature 23±5°C)	±0.05dB (1200 to 1700nm, -60 to +3dBm)	±0.05dB (1000 to 1650nm, -40 to +27dBm)	±0.05dB (500 to 900nm, -50 to +10dBm)	±0.05dB (950 to 1600nm, -30 to +10dBm)	±0.05dB (950 to 1600nm, -50 to +10dBm)
Noise ¹¹⁾	CW light	-83dBm or less	-73dBm or less	-73dBm or less	-73dBm or less
	Chopped light	-83dBm or less	-73dBm or less	-83dBm or less	-63dBm or less
Analog out	0 to approx. +2V for each range, output impedance: 1.5k Ω or less				
Zero set	Automatic zero adjust				

Notes

- 1) Applicable fiber 62.5/125 μ m (SI) NA 0.275
- 2) Applicable fiber 730/750 μ m (SI) NA 0.5 AQ2741 sensor 100/140 μ m (SI) NA 0.28 AQ2742/2743 sensors
- 3) (*) indicates connector type. Specify FC, SC, ST, DIN or HMS-10/A connector. For other connectors please consult your vendor or the manufacturer.
- 4) Can be used with other connectors in addition to FC. For other connectors please consult your vendor or the manufacturer.
- 5) Used in combination with the AQ9335(*) connector adapter. (*) indicates connector type. Specify FC, SC, ST, DIN or HMS-10/A connector. For other connectors please consult your vendor or the manufacturer.
- 6) Wavelength 1550nm, SM fiber
- 7) AQ2731 sensor unit and AQ2741 sensor at wavelength 850nm, AQ2732/2733/2734/2735 sensor units and AQ2742/2743 sensor at wavelength 1310nm.
- 8) Reference conditions
 - (1) Power level -20dBm (10 μ W), CW light
 - (2) AQ2731 sensor unit and AQ2741/2742/2743 sensors with SM fiber, NA = 0.1, AQ2732/2733/2734/2735 sensor units with 10 μ m optical fiber, master cord FC connector.
 - (3) Ambient temperature: AQ2731/2732 sensor unit and AQ2741/2742 sensor at 23±1°C, AQ2733/2734/2735 sensor units and AQ2743 sensor at 23±5°C.
 - (4) 2731 sensor unit and AQ2741/2742/2743 sensors with FC connector adapter. AQ2732/2733/2734/2735 sensor units with AQ9389B FC connector adapter.

- 9) Operating conditions
 - (1) Power level -20dBm (10 μ W), CW light
 - (2) 50 μ m optical fiber, NA 0.2
 - (3) Ambient temperature: AQ2731/2732 sensor units and AQ2741/2742 sensors at 23±1°C, AQ2733/2734/2735 sensor units and AQ2743 sensor at 23±5°C.
 - (4) 2731 sensor unit and AQ2741/2742/2743 sensors with AQ9335 (*) FC connector adapter. AQ2732/2733/2734/2735 sensor units with AQ9389B (FC/SC) connector adapter.
- 10) (1) Linearity for one wavelength within wavelength specified in total measurement accuracy.
 - (2) CW light, ambient temperature: AQ2731/2732 sensor units and AQ2741/2742 sensors at 23±1°C, AQ2733/2734/2735 sensor units and AQ2743 sensor at 23±5°C.
- 11) (1) Averaging 1s (measurement interval 100ms, averaging executed 10 times).
 - (2) AQ2731 sensor units and AQ2741 sensor at 700 to 900nm, AQ2732/2733/2734/2735 sensor units and AQ2742/2743 sensor at 1200 to 1600nm.
 - (3) CW, chopped (270Hz).
 - (4) Ambient temperature: AQ2734 sensor unit at 0 to 30°C

High return loss connector adapter

Model	AQ9438 (FC)
Unit name	High Return Loss Connector Adapter
Applicable fiber	SM (10/125μm)
Return loss ¹⁾	40dB or more
Insertion loss ²⁾	0.2dB or less

Notes

- 1) Wavelength 1310/1550nm, SM fiber. When connected PC polished plug with 40dB or more.
2) Wavelength 1310/1550nm, SM fiber. Standard AQ9389B (FC) Connector Adapter as reference.

Return loss unit

Model	AQ7310 ^{1,2)}	AQ7315 ^{3,4,5)}
Unit name	Optical Return Loss Measuring Unit	
Wavelength range	1280 to 1600nm	1270 to 1330nm
Dynamic range ⁶⁾	65dB or more	40dB or more
Relative measurement accuracy ⁷⁾	Within ±0.4dB (0 to 50dB) Within ±0.7dB (50 to 60dB)	Within ±0.5dB (0 to 30dB) Within ±1.0dB (30 to 40dB)
Measurement stability	Within ±0.02dB ⁸⁾	Within 1dB _{r-p} ⁹⁾
Applicable fiber	SM (10/125μm)	GI (50/125μm)
Light source input connector	FC/PC	
Measurement output connector ¹⁰⁾	SC/APC	

Notes

- 1) With AQ4211/AQ4213 LD Unit, with 1280 to 1600nm wavelength range. At 23±1°C, with Fresnel reflection reference.
2) Requires master cord for AQ7310.
3) When using the AQ4212 (130) LD Unit. At 23°C with total reflection reference.
4) Requires master cord for AQ7315
5) AQ7315's LD light source output is needed to be connected to exciter. (*)

(*) Recommended exciters

Maker	Unit name	Notes
Sumitomo Electric Industries, LTD.	Exciter for loss measurement of GI type optical fiber LF-2C	—
Fujikura Ltd.	Dummy fiber for optical loss measurement FMC-03	With front protecting cover
	Dummy fiber for optical loss measurement FMC-04	Without front protecting cover
The Furukawa Electric co.,LTD.	GSSG type exciter	

6) Varies with master cord.

7) Varies with light source stability, photoreceptor linearity, and isolation of optical coupler.

8) Display stability with Fresnel reflection measurement, 5 minutes.

9) Display stability with total reflection reference measurement, 5 minutes.

10) Manufactured by SEIKOH GIKEN. APC: Angled PC

* Please consult your vendor or our sales offices on AQ7316 (applicable fiber: GI (62.5/125μm)).

Light source unit (LED)

Model	AQ4215 (085)	AQ4215 (131)	AQ4215 (155)	AQ4218 (131)	AQ4218 (155)
Unit name	LED Unit				
Emission device	LED				
Center wavelength ¹⁾	850 ± 15nm	1310 ± 30nm	1550 ± 35nm	1310 ± 10nm	1550 ± 10nm
Applicable fiber	GI (50/125μm, 62.5/125μm)	GI (50/125μm, 62.5/125μm)/ SM (10/125μm)	SM (10/125μm)		
Spectral halfwidth ²⁾	60nm or less	140nm or less	195nm or less	20nm or less	25nm or less
Optical output level ³⁾	GI (50/125μm)	-15dBm or more	-21dBm or more	—	
	SM (10/125μm)	—	-40dBm or more	-43dBm or more	-50dBm or more
Output level	Temperature stability	—			0.2dB or less ⁴⁾
	Time stability	Within ±0.005dB ⁵⁾ Within ±0.03dB ⁷⁾	Within ±0.005dB ⁶⁾ Within ±0.03dB ⁸⁾		Within ±0.003dB ⁶⁾ Within ±0.03dB ⁸⁾
Optical connector ⁹⁾	AQ9433 (*) Connector Adapter: option			AQ9434 (*) Universal Adapter: option	

Model	AQ4221 (131)	AQ4221 (155)	AQ4222 (131)	AQ4222 (155)
Unit name	EE-LED Unit			
Emission device	EE-LED			
Center wavelength ¹⁾	1310 ± 10nm	1550 ± 10nm	1310 ± 40nm	1550 ± 30nm
Applicable fiber	SM (10/125μm)			
Spectral halfwidth ²⁾	20nm or less	25nm or less	100nm or less	140nm or less
Optical output level ³⁾	GI (50/125μm)	—		
	SM (10/125μm)	-28dBm or more	-32dBm or more	-15dBm typ.
Output level	Temperature stability	—		
	Time stability	Within ±0.005dB ⁶⁾ Within ±0.03dB ⁸⁾	±0.005dB typ. ⁶⁾ ±0.05dB typ. ⁸⁾	±0.003dB typ. ⁶⁾ ±0.03dB typ. ⁸⁾
Optical connector ¹⁰⁾	AQ9434 (*) Universal Adapter: option			

Notes

- 1) At 25°C
2) At 25°C. Spectral halfwidth shown as FWHM.
3) CW light, 0 to 50°C, 2m fiber injection end
4) 0 to 50°C (8 hours), connector injection end
5) Constant temperature, 5 minutes (single temperature between 20 and 30°C), GI (50/125μm), 2m injection end
6) Constant temperature, 5 minutes (single temperature between 20 and 30°C), SM (10/125μm), 2m injection end
7) ±1°C (1 hour) between 0 and 50°C, GI (50/125μm), 2m injection end
8) ±1°C (1 hour) between 0 and 50°C, SM (10/125μm), 2m injection end
9) ±1°C (1 hour) between 0 and 40°C, SM (10/125μm), 2m injection end
10) (*) indicates connector type. Specify FC, SC, ST, DIN or HMS-10/A connector. For other connectors please consult your vendor or our sales offices.

Light source unit (LD)

Model	AQ4211 (131)	AQ4211 (155)	AQ4211 (165)	AQ4212 (130)	AQ4213 (131/155)	AQ4214 (131)	A4214 (155)
Unit name	LD Unit					DFB-LD Unit	
Emission device	LD					DFB-LD	
Center wavelength ¹⁾	1310 ± 20nm	1550 ± 20nm	1650+5nm/-10nm	1300 ± 20nm	1310/1550 ± 20nm	1310 ± 10nm	1550 ± 10nm
Applicable fiber	SM (10/125μm)			GI (50/125μm)	SM (10/125μm)		
Spectral width ²⁾	5nm or less	10nm or less		5nm or less	5/10nm or less	0.1nm or less	
Optical output level ³⁾	GI (50/125μm)	—————		0dB or more	—————		
	SM (10/125μm)	0dBm or more			—————	-1dBm or more	0dBm or more
Output level	Temperature stability	0.2dB or less ⁴⁾		0.3dB or less ⁵⁾	0.3dB or less ⁴⁾	0.3dB or less ⁵⁾	0.3dB or less ⁵⁾
	Time stability	Within ±0.003dB ⁴⁾ Within ±0.03dB ⁷⁾		Within ±0.005dB ⁴⁾ Within ±0.05dB ⁴⁾	Within ±0.01dB ³⁾ Within ±0.05dB ¹⁰⁾	Within ±0.005dB ⁴⁾ Within ±0.05dB ⁴⁾	Within ±0.01dB ⁴⁾ Within ±0.05dB ⁴⁾
Optical connector	AQ9434 (*) Universal Adapter: option ¹¹⁾					SC/APC ¹²⁾	

Notes

- 1) At 25°C 2) At 25°C. Spectral width shown as RMS. (2σ, -20dB)
- 3) CW light, 2m fiber injection end
- 4) 0 to 50°C (8 hours), connector injection end
- 5) 0 to 40°C (8 hours), connector injection end
- 6) Constant temperature, 5 minutes (single temperature between 20 and 30°C), SM (10/125μm), 2m injection end

- 7) ±1°C (1 hour) between 0 and 50°C, SM (10/125μm), 2m injection end
- 8) ±1°C (1 hour) between 0 and 40°C, SM (10/125μm), 2m injection end
- 9) Constant temperature, 5 minutes (single temperature between 20 and 30°C), GI (50/125μm), 2m injection end
- 10) ±1°C (1 hour) between 0 and 50°C, GI (50/125μm), 2m injection end
- 11) (*) indicates connector type. Specify FC, SC, ST, DIN or HMS-10/A connector. For other connectors please consult your vendor or our sales offices.
- 12) Manufactured by SEIKOH GIKEN. APC: Angled PC

Light source unit

Model	AQ4224 (155)	
Unit name	WDM LD Unit	
Selectable wavelength range ¹⁾	1530 to 1570nm	
Center wavelength ^{2, 7)}	λP ± 0.1nm	
Applicable fiber ³⁾	SM (10/125μm)	
Spectral width ^{2, 4)}	0.1nm or less	
Wavelength adjustment	Adjustment range	1nm ⁸⁾
	Resolution	0.01nm ⁸⁾
Optical output level ⁹⁾	+10dBm or more	
Center wavelength stability	Within 0.01nm ^{2, 5)} Within 0.03nm ^{2, 6, 8)}	
Output level	Temperature stability	±0.3dB ^{8, 9)}
	Time stability	Within ±0.01dB ^{2, 5)} Within ±0.05dB ^{2, 6, 8)}
Optical connector ¹⁰⁾	SC/APC	

Notes

- 1) Please consult your vendor or our sales offices for information on other wavelength range than above.
- 2) CW light, 0.0dB attenuation, at connecting fiber output point (SC/APC-FC/SPC, 2m, SMF).
- 3) Please consult your vendor or our sales offices for information on other fibers.
- 4) rms (2α, -20dB) Note 5: 5 minutes (constant and single temperature between 20 and 30°C)
- 6) 1 hour (±1°C between 10 and 30°C)
- 7) λp: 1552.5nm ± (n × 0.8nm) = 193.1 THz ± (n × 100GHz) Note 8: Representative rate
- 9) Environmental temperature between 10 and 30°C
- 10) Manufactured by SEIKOH GIKEN. APC: Angled PC

Model	AQ4310 (155)	
Unit name	ASE Unit	
Spectrum density (-13dBm/nm)	1525 to 1570nm (typ.) 1530 to 1565nm	
Applicable fiber	SM (10/125μm)	
Total output power ^{1, 2)}	+10dBm or more	
Output level	Temperature stability	±0.3dB ⁵⁾
	Time stability	Within ±0.005dB ^{1, 6)} Within ±0.05dB ¹⁾
Polar wave light extinction comparison	0.1dB typ.	
Optical connector ⁷⁾	AQ9434 (*) Universal Adapter (option)	

Notes

- 1) CW light, 0.0dB attenuation, at SM fiber (10/125μm) 2m output point.
 - 2) At 25°C.
 - 3) 8 hours (at 0 to 40°C)
 - 4) 5 minutes (single temperature between 20 and 30°C)
 - 5) *: connector type. Select FC, SC, ST, DIN or HMS-10/A. Please consult your vendor or our sales offices for information on other connectors.
- * This unit can be mounted by AQ2141 Optical Multimeter Expansion Frame. By connecting AQ2141 mounted AQ4310 (155) and AQ2140, the operation from AQ2140 becomes possible.

Expansion frame

Model	AQ2141
Unit name	Optical Multimeter Expansion Frame
Number of connecting unit	Max. 4 channels
Number of channel connection	Max. 16, connectable 4 units max. to AQ2140 ¹⁾
Connectable unit ²⁾	One of sensors ³⁾ (Sensor unit, OPM unit) or light sources ⁴⁾ (Light source unit)
Interface	Original serial interface
Environmental conditions	Operating temperature: 0 to 50°C, Storage temperature: -25 to +70°C, Humidity: 85% RH or less
Power requirements	AC100 to 240V, 48 to 63Hz, approx. 60VA
Dimensions and mass	Approx. 212 (W) x 133 (H) x 350 (D) mm, approx. 3.5kg
Accessories	Power cord: 1, connecting cord: 1, user's manual: 1

* Needs AQ2140 to make sensor units work.

Notes

- 1) When connected to AQ2140 you already have, some AQ2140 models may require factory updates to software depending on their version.
- 2) Optical return loss measurement unit is not supported.
- 3) Sensors and OPM units should all be of the same type. Some sensors and OPM units may require factory updates to software depending on their version. Please consult your vendor or our sales offices for information on software.
- 4) Light source units may be freely mixed.