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Optical Test and Measurement System AQ8200 Series

For general evaluation of DWDM optical devices

AQ8202-01

AQ8202





AQ8204



AQ8203

There is a need for a system which generally tests/evaluates communication equipment/components because of the growth of the DWDM communications market. Also the need to control multiple frames with one controller unit is increasing. The AQ8200 Series Optical Test and Measurement System has a variety of frames – from 3-module mount type to 10-module mount type – to meet various demand such as research, development, testing, etc.
The lineup of modules to be mounted to the frames is: light sources such as WDM DFB-LD light source, optical attenuator, optical powermeter, optical switch, optical coupler, etc. It is effective for specification evaluation of DWDM-related parts such as MUX/DEMUX, AWG and EDFA.

Features

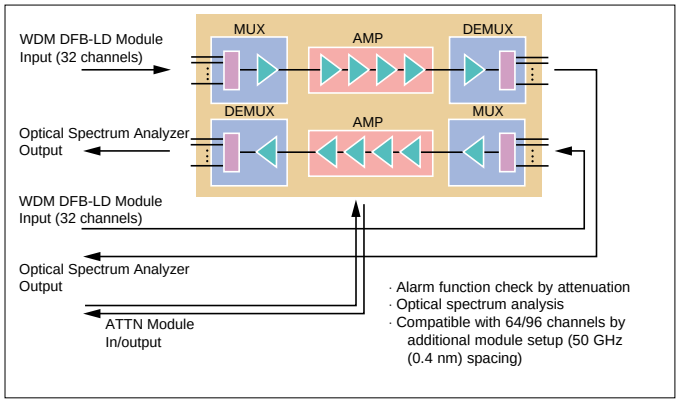
Select the frame according to application

- **AQ8202-01 System Controller**
  - Connects the AQ8202 Expander Frame and controls up to 40 modules
- **AQ8203 Halfsize Frame**
  - Compact and portable design
  - Three modules can be mounted
  - Connects the AQ8202 Expander Frame and controls up to 43 modules
- **AQ8204 Frame Controller**
  - A frame with controller that can be mounted with 8 modules
  - Connects the AQ8202 Expander Frame and controls up to 48 modules
- **AQ8202 Expander Frame**
  - A frame to be used when controlling more modules
  - Ten modules can be mounted
  - Up to four units can be connected to each of models AQ8202-01, AQ8203 and AQ8204

Applies mainframe for 19-inch rack
Highly visible 6.5-inch TFT color LCD (AQ8202-01)
Wide range of module lineup for varied applications

- WDM DFB-LD light source, ASE light source, ECL light source, optical attenuator, optical powermeter, optical switch, optical coupler, return loss measurement

DWDM Transmission System



Optical Test and Measurement System Components

Product name	Model	Slot width
Expander Frame	AQ8202	–
System Controller	AQ8202-01	–
Halfsize Frame	AQ8203	–
Frame Controller	AQ8204	–
WDM DFB-LD Module (Light source)	AQ8201-110	1 slot
ASE Module (Light source)	AQ8201-12, 12A	2 slots
ECL Module (Light source)	AQ8201-13, 13A, 13B, 13D	1 slot
OPM Module (Optical powermeter)	AQ8201-21	1 slot
DUAL OPM Module (Optical powermeter)	AQ8201-22	1 slot
ATTN Module (Optical attenuator)	AQ8201-32, 32A, 33, 33M	1 slot
OSW Module (Optical switch)	AQ8201-414, 418 AQ8201-43	1 slot 2 slots
DUAL OSW Module (Optical switch)	AQ8201-412, 422	1 slot
RLM Module (Return loss measurement)	AQ8201-71	1 slot
SPLTR/CPLR Module (Optical coupler)	AQ8201-818, 855, 873, 891	1 slot

Module Lineup


WDM DFB-LD Module


ASE Module


ECL Module


OPM Module


DUAL OPM Module


ATTN Module


OSW Module


DUAL OSW Module


RLM Module


SPLTR/CPLR Module

Operation Panel

■ System Controller
AQ8202-01

■ Frame Controller
AQ8204



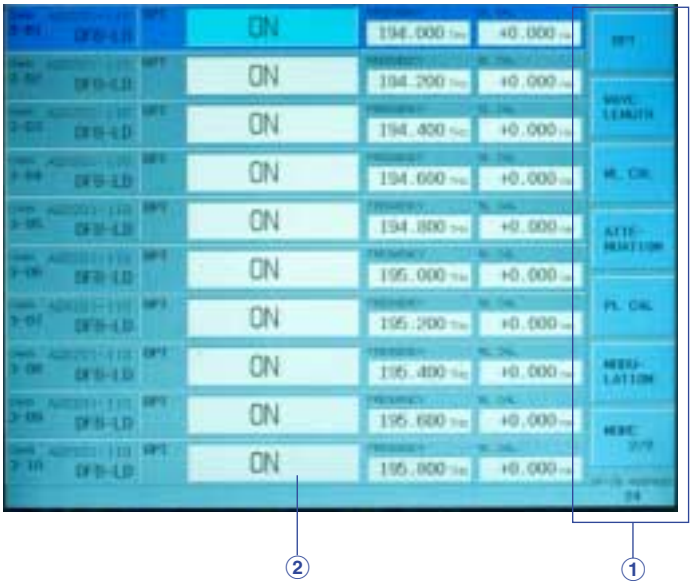
Operation panel of module

① The AQ8202-01 displays information for one frame (10 slots) simultaneously. The AQ8204 displays information for eight slots (one frame [10 slots] when connecting the AQ8202 Expander Frame) simultaneously.

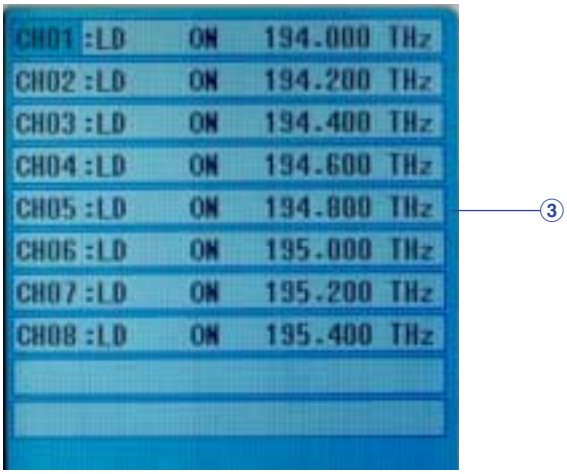
② Rotary knob (AQ8202-01) and operation switches are designed for simple adjustment and operation of mounted modules.

Module Display Screens

AQ8202-01 display screen



AQ8203, AQ8204 display screen



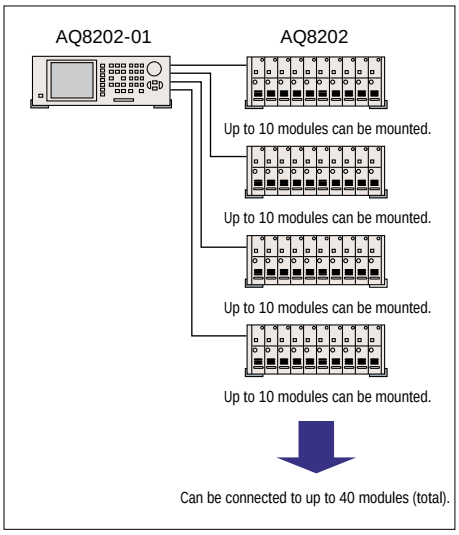
Displays set-up and measurement results for modules slot by slot

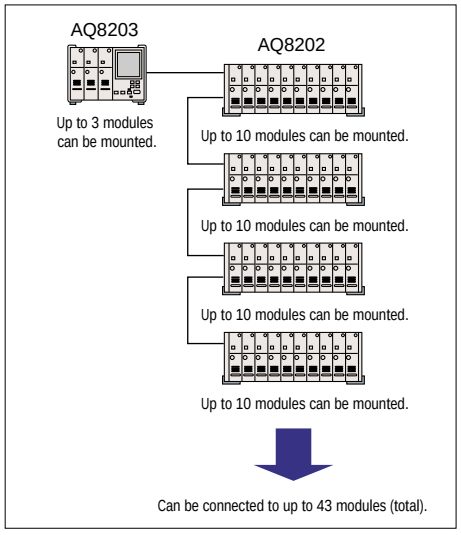
① Displays the function key menu for the selected module.

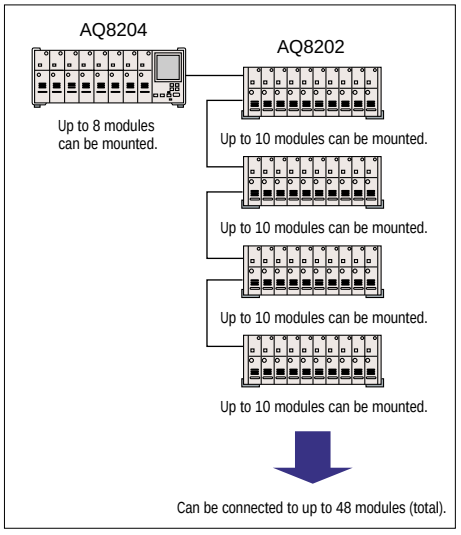
② WDM DFB-LD module: Displays optical output on/off, wavelength and attenuation settings.

③ Displays optical output on/off, wavelength and attenuation settings. (Details are displayed module by module.)

System Configuration

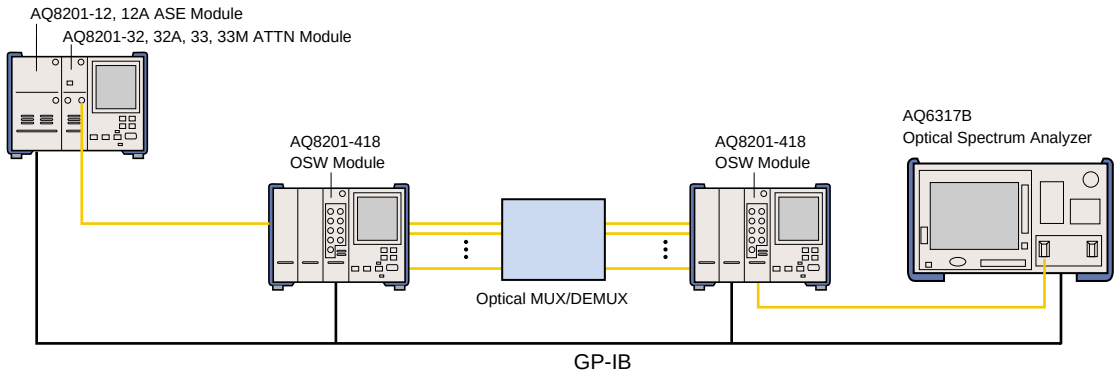




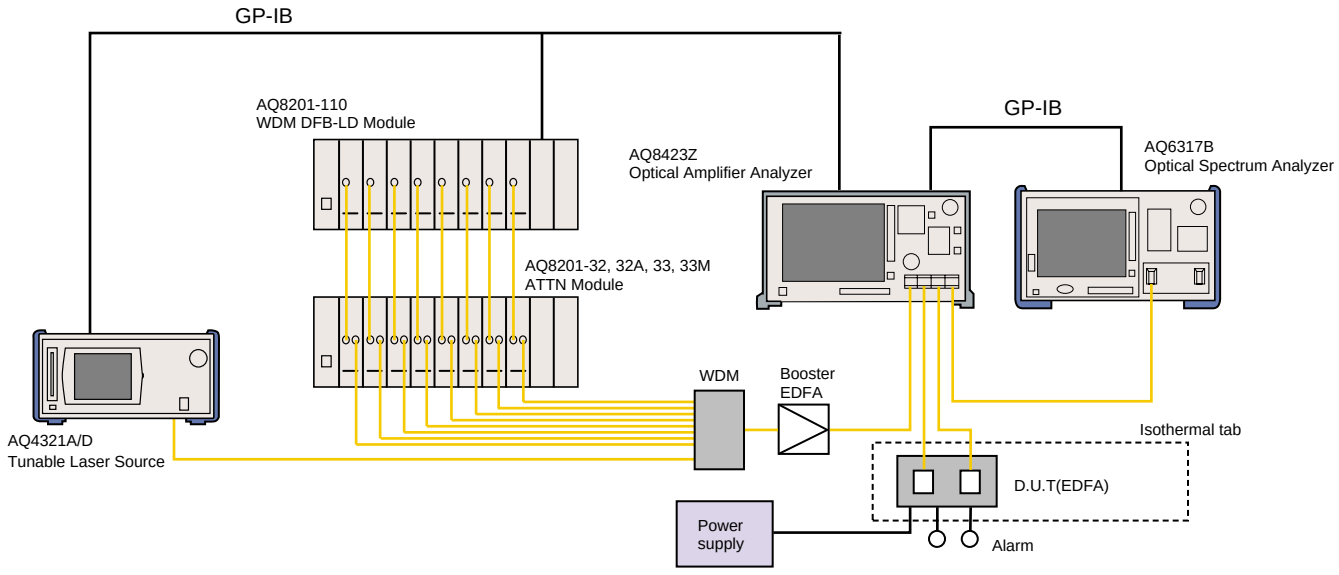


Application

- **MUX/DEMUX: AWG, FBG, filter, etc.**
  Evaluation items: insertion loss, pass central wavelength, linearity, NdB bandwidth, etc.



- **Optical amplifiers: EDFA, SOA, etc.**
  Evaluation items: gain, NF, linearity, output power, etc.



Mountable Modules

- AQ8201-110 WDM DFB-LD Module (Light source)
- AQ8201-12 ASE Module (Light source)
- AQ8201-12A ASE Module (High-power type light source)
- AQ8201-13 ECL Module (Light source)
- AQ8201-13A ECL Module (Light source for PMF)
- AQ8201-13B ECL Module (Light source for L-band)
- AQ8201-13D ECL Module (Light source for PMF, L-band)
- AQ8201-21 OPM Module (Optical powermeter)
- AQ8201-22 DUAL OPM Module (2-channel optical powermeter)
- AQ8201-32 ATTN Module (Optical attenuator)
- AQ8201-32A ATTN Module (Optical attenuator for L-band)
- AQ8201-33 ATTN Module (High-resolution type optical attenuator for L-band)
- AQ8201-33M ATTN Module (Optical attenuator with monitor port for L-band)
- AQ8201-43 OSW Module (Optical switch 1 input port - 12 output ports)
- AQ8201-414 OSW Module (Optical switch 1 input port - 4 output ports)
- AQ8201-418 OSW Module (Optical switch 1 input port - 8 output ports)
- AQ8201-412 DUAL OSW Module (Optical switch 1 input port - 2 output ports)
- AQ8201-422 DUAL OSW Module (Optical switch 2 input ports - 2 output ports
- AQ8201-71 RLM Module (Return loss measurement)
- AQ8201-818 SPLTR/CPLR Module (Optical coupler 1 x 8-split)
- AQ8201-855 3 x SPLTR/CPLR Module (Optical coupler 1 x 2-split, split ratio 50:50)
- AQ8201-873 3 x SPLTR/CPLR Module (Optical coupler 1 x 2-split, split ratio 70:30)
- AQ8201-891 3 x SPLTR/CPLR Module (Optical coupler 1 x 2-split, split ratio 90:10)

Others

- AQ8201-91 Vent cover (with slit, 1-slot type)
- AQ8201-92 Blank cover (without slit, 1-slot type)

Specifications

AQ8202-01 System Controller

Display	6.5-inch TFT color LCD
Serial interface	For AQ8202 connection: 4
GP-IB interface	IEEE-488.2 compatible
VGA interface	D-sub 15-pin
Power requirements	AC 100 to 120 (±10 %)/200 to 240 (±10 %) V, 50/60 Hz, Max. 30 VA
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation) Overvoltage category: II, contamination level: 2, maximum altitude: 2000 m
Dimensions and mass	Approx. 425 (W) x 132.5 (H) x 110 (D) mm Approx. 4 kg
Accessories	Battery cable: 1 (with 3/2 terminal conversion plug), remote interlock short plug: 1, remote interlock connecting plug: 1, dust cover (for GP-IB connector: 1, for VGA connector: 1, for external expansion connector: 4), instruction manual: 1
Options	19-inch rack mount kit A (132.5)

AQ8202 Expander Frame

Serial interface	For connection of AQ8202-01, AQ8203, AQ8204
Number of mountable modules	10
Power requirements	AC 100 to 120 (±10 %)/200 to 240 (±10 %) V, 50/60 Hz, Max. 600 VA
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation) Overvoltage category: II, contamination level: 2, maximum altitude: 2000 m
Dimensions and mass	Approx. 425 (W) x 132.5 (H) x 500 (D) mm Approx. 10 kg
Accessories	Battery cable: 1 (with 3/2 terminal conversion plug), dust cover (for external expansion connector): 4, external expansion cable (1m): 1, instruction manual: 1
Options	AQ8202-901 Rack mount kit (for attaching AQ8202-01 Connection rack), AQ8202-903 Blank panel (19-inch EIA standard rack 3U blank panel), 19-inch rack mount kit A (132.5)

Calibration is required when mounting AQ8201-11 and AQ8201-12* you already use

AQ8203 Halfsize Frame

Display	STN color LCD
Serial interface	For AQ8202 connection
GP-IB interface	IEEE-488.2 compatible
Number of mountable modules	3
Power requirements	AC 100 to 120 (±10 %)/200 to 240 (±10 %) V, 50/60 Hz, Max. 190 VA
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation) Overvoltage category: II, contamination level: 2, maximum altitude: 2000 m
Dimensions and mass	Approx. 212 (W) x 132.5 (H) x 400 (D) mm Approx. 5.4 kg
Accessories	Battery cable: 1 (with 3/2 terminal conversion plug), remote interlock short plug:1, remote interlock connecting plug: 1, optical output control key: 2, blank panel: 2, dust cover (for GP-IB connector: 1, for external expansion connector: 1), instruction manual: 1
Options	19-inch rack mount kit B (132.5) for connecting 2 units of AQ8203 19-inch rack mount kit C (132.5) for mounting 1 unit (left mount) of AQ8203 19-inch rack mount kit D (132.5) for mounting 1 unit (right mount) of AQ8203

AQ8204 Frame Controller

Display	STN color LCD
Serial interface	For AQ8202 connection
GP-IB interface	IEEE-488.2 compatible
Number of mountable modules	8
Power requirements	AC 100 to 120 (±10 %)/200 to 240 (±10 %) V, 50/60 Hz, Max. 600 VA
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation) Overvoltage category: II, contamination level: 2, maximum altitude: 2000 m
Dimensions and mass	Approx. 425 (W) x 132.5 (H) x 500 (D) mm Approx. 10 kg
Accessories	Battery cable: 1 (with 3/2 terminal conversion plug), remote interlock short plug: 1, remote interlock connecting plug: 1, optical output control key: 2, dust cover (for GP-IB connector: 1, for external expansion connector: 1), instruction manual: 1
Options	19-inch rack mount kit A (132.5)

AQ8201-110 WDM DFB-LD Module (Light source)

Available wavelength range		1524.110 to 1620.500 nm [1]
Wavelength accuracy		±0.01 nm (typ.) [2]
Wavelength setting resolution		0.001 nm
Spectral linewidth	NARROW	5 MHz or less [3]
	WIDE	50 MHz (typ.) [3]
Optical output level		+10 dBm or more [2, 4]
SMSR		45 dB (typ.) [3]
Output level stability	15 minutes	Within ±0.005 dB [5]
	24 hours	Within ±0.03 dB [5]
Wavelength stability	15 minutes	Within ±0.005 nm [2]
	24 hours	Within ±0.01 nm [2]
Wavelength range		1.6 nm or more [2]
Optical attenuation range		10 dB (0.01 dB step)
Optical isolation		55 dB (typ.)
RIN		-145 dB/Hz (typ.) [3]
Internal modulation		100 Hz to 300 kHz (CHOP)
Applicable fiber		SM (9/125 µm)
Optical connector		FC/Angled PC [6]
Laser product safety class		IEC60825-1: class3A, 21CFR1040.10: class IIIb [7]
Environmental conditions		Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass		Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.7 kg

*Specifications assured at fixed temperature within 25±3 °C
*Specifications assured after warm-up for one hour
Notes:
1) Select from AQ8201-110 available wavelength.
2) Ambient temperature: 25±3 °C (at constant temperature), CW light, attenuation 0.0 dB, central wavelength, at fiber end (FC/Angled PC-FC/SPC, 2 m, SMF), spectral linewidth: NARROW
3) CW light, attenuation 0.0 dB, central wavelength
4) Using master cord
5) Ambient temperature: 25±3 °C (at constant temperature), CW light, attenuation 0.0 dB, central wavelength, at fiber end (FC/Angled PC-FC/SPC, 2 m, SMF), spectral linewidth: WIDE
6) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)
7) Label examples

Laser product safety class label



• Option 01 (for high output level)

Optical output level	+13 dBm or more

Note: Ambient temperature: 25±3 °C, CW light, attenuation 0.0 dB, central wavelength, at fiber end (FC/Angled PC-FC/SPC, 2 m, SMF or PMF), spectral linewidth: NARROW, using master cord

• Option 02 (for PMF)

Applicable fiber	PM (9/125 µm)
Polarization extinction ratio	20 dB or more Note

Note: CW light, attenuation 0.0 dB, central wavelength, spectral linewidth: NARROW, assured at the end of the optical connector mounted on the panel

• Option 03 External modulation (for sine waveform)

External modulation	100 Hz to 300 kHz
Input connector	SMA

Note: Cannot use Option 03 and Option 04 simultaneously

• Option 04 External modulation (for CHOP)

External modulation	100 Hz to 300 kHz
Input connector	SMA

Note: Cannot use Option 04 and Option 03 simultaneously

*Option 01 – 04 can be specified only in case of new order; unless specifically noted, options can be used simultaneously

AQ8201-12, 12A ASE Module (Light source)

Spectrum density (-13 dBm/nm)		1525 to 1570 nm (typ.) [1] 1530 to 1565 nm [1]
Total output power		+10 dBm or more [1, 2] (AQ8201-12) +15 dBm or more [1, 2] (AQ8201-12A)
Output level stability	5 minutes	±0.005 dB (typ.) [1, 3]
	1 hour	Within ±0.05 dB [1, 4]
Optical modulation mode		CW
Polarization extinction ratio		0.1 dB (typ.)
Optical attenuation range		6 dB (0.1 dB step)
Applicable fiber		SM (9/125 µm)
Optical connector		AQ9441 (*) Universal Adapter (option) [5]
Laser product safety class		IEC60825-1: class 3A 21CFR1040.10: class IIIb [6]
Environmental conditions		Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass		Approx. 79.5 (W) x 130 (H) x 339 (D) mm Approx. 1.3 kg

*Specifications assured at fixed temperature within 25±3 °C
*Specifications assured after warm-up for one hour
Notes:
1) CW light, attenuation 0.0 dB, at SM fiber end (both end FC/PC, 2 m)
2) Using master cord
3) 5 minutes (at constant temperature in 20 to 30 °C)
4) One hour (at a temperature in 5 to 40 °C)
5) Specify FC, SC or ST.
6) Label examples

Laser product safety class label



AQ8201-13/-13B ECL Module (Light source)

Model			AQ8201-13	AQ8201-13B
Available wavelength range			1460 to 1580 nm	1500 to 1620 nm
Wavelength setting resolution			10 pm	
Wavelength accuracy			Within ±0.2 nm [1, 2, 3, 4]	
Wavelength repeatability			±50 pm (typ.) [1, 2, 4]	
Wavelength setting time			3 seconds (typ.) [5]	
Spectral linewidth	NARROW		5 MHz (typ.) [1, 2]	
	WIDE		100 MHz (typ.) [1, 2]	
Optical output level	1460 to 1580 nm		+6 dBm or more [1, 2, 6]	
	1490 to 1580 nm		+8 dBm or more [1, 2, 6]	
	1520 to 1580 nm		+10 dBm or more [1, 2, 6]	
	1500 to 1620 nm		+6 dBm (typ.) [1, 2, 6]	
	1530 to 1620 nm		+8 dBm (typ.) [1, 2, 6]	
	1560 to 1620 nm		+10 dBm (typ.) [1, 2, 6]	
SMSR			45 dB or more [1, 2, 7]	
Output level stability		15 minutes	Within ±0.005 dB [1, 2, 4, 8]	
		1 hour	Within ±0.01 dB [1, 2, 4, 8]	
Wavelength stability		15 minutes	Within ±0.005 nm [1, 2, 4]	
		24 hours	±0.01 nm (typ.) [1, 2, 4]	
Optical attenuation range			10 dB (0.01 dB step) [1, 7]	
RIN			-145 dB/Hz (typ.) [1, 2]	
External modulation			100 Hz to 300 kHz (Sine Wave)	
Applicable fiber			SM (9/125 µm)	
Optical connector			FC/Angled PC [9]	
Laser product safety class			IEC60825-1: class3A 21CFR1040.10: class IIIb [10]	
Environmental conditions			Operation temperature: 23 ± 5 °C [11] Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)	
Dimensions and mass			Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 1.2 kg	

*Specifications assured after warm-up for one hour
Notes:
1) Temperature fixed at 23 °C, CW light, 2 m fiber output, single vertical mode
2) Optical attenuation: 0.00 dB
3) After wavelength calibration
4) AQ8201-13: 1520 to 1570 nm, AQ8201-13B: 1560 to 1610 nm
5) Full span (120 nm)
6) Using master cord
7) AQ8201-13: wavelength; 1550 nm, AQ8201-13B: wavelength; 1580 nm
8) Spectrum linewidth: WIDE
9) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)
10) Label examples

Laser product safety class label



11) Ambient temperature of mainframe

AQ8201-13A/-13D ECL Module (Light source supports PMF)

Model			AQ8201-13A	AQ8201-13D
Available wavelength range			1460 to 1580 nm	1500 to 1620 nm
Wavelength setting resolution			10 pm	
Wavelength accuracy			Within ±0.2 nm [1, 2, 3, 4]	
Wavelength repeatability			±50 pm (typ.) [1, 2, 4]	
Wavelength setting time			3 seconds (typ.) [5]	
Spectral linewidth	NARROW		5 MHz (typ.) [1, 2]	
	WIDE		100 MHz (typ.) [1, 2]	
Optical output level	1460 to 1580 nm		+5 dBm or more [1, 2, 6]	
	1490 to 1580 nm		+7 dBm or more [1, 2, 6]	
	1520 to 1580 nm		+9 dBm (typ.) [1, 2, 6]	
	1500 to 1620 nm		+5 dBm (typ.) [1, 2, 6]	
	1530 to 1620 nm		+7 dBm (typ.) [1, 2, 6]	
	1560 to 1620 nm		+9 dBm (typ.) [1, 2, 6]	
SMSR			45 dB or more [1, 2, 7]	
Output level stability		15 minutes	Within ±0.005 dB [1, 2, 4, 8]	
		1 hour	Within ±0.01 dB [1, 2, 4, 8]	
Wavelength stability		15 minutes	Within ±0.005 nm [1, 2, 4]	
		24 hours	±0.01 nm (typ.) [1, 2, 4]	
Optical attenuation range			10 dB (0.01 dB step) [1, 7]	
RIN			-145 dB/Hz (typ.) [1, 2]	
External modulation			100 Hz to 300 kHz (Sine Wave)	
Polarization extinction ratio			20 dB (typ.) [9]	
Applicable fiber			PM (9/125 µm)	
Optical connector			FC/Angled PC [10]	
Laser product safety class			IEC60825-1: class3A 21CFR1040.10: class IIIb [11]	
Environmental conditions			Operation temperature: 5 to 40 °C [12] Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)	
Dimensions and mass			Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 1.2 kg	

*Specifications assured after warm-up for one hour
Notes:
1) Temperature fixed at 23 °C, CW light, 2 m fiber output, single vertical mode
2) Optical attenuation: 0.00 dB
3) After wavelength calibration
4) AQ8201-13A: 1520 to 1570 nm, AQ8201-13D: 1560 to 1610 nm
5) Full span (120 nm)
6) Using master cord
7) AQ8201-13A: wavelength; 1550 nm, AQ8201-13D: wavelength; 1580 nm
8) Spectrum linewidth: WIDE
9) At the end of the optical connector mounted on the panel (CW light, attenuation 0.0 dB, wavelength: 1550 nm)
10) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)
11) Label examples

Laser product safety class label



12) Ambient temperature of mainframe

AQ8201-21 OPM Module (Optical powermeter)

Wavelength range		700 to 1700 nm
Photodetector		Cooled InGaAs
Application		Small-diameter silica fiber emission [1)]
Optical connector		AQ9389B (FC) Connector Adapter: standard [2)]
Polarization dependent loss		0.02 dB$_{P-P}$ (typ.) [3)]
Power range	CW light	-80 to +27 dBm [4)]
	Chopped light	-80 to +24 dBm [4)]
Inaccuracy under reference condition		±2.5 % (at 1310 nm calibration point) [5)]
Total accuracy		±5 % (1000 to1650 nm) [6)]
Linearity		±0.05 dB (1000 to 1650 nm, -40 to +27 dBm) [7)]
Noise	CW light	-73 dBm or less [8)]
	Chopped light	
Environmental conditions		Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass		Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.8 kg
Accessories		Plug for analogue output

*Specifications assured at fixed temperature within 23±5 °C
*Specifications assured after warm-up for one hour
Notes:
1) Applicable fiber ≦ 62.5/125 µm (GI), NA ≦ 0.275
2) ST and SC connector are also available 3) At 1550 nm wavelength, SM fiber
4) At 1310 nm wavelength
5) Reference conditions:
1. Power level: -20 dBm (10 µW), CW light 2. SM fiber, master FC connector
3. Ambient temperature: 23±5 °C 4. Calibrated with AQ9389B (FC) connector adapter (If you disconnect connector adapter, the accuracy of specifications may be lost. When you change connector adapter, we recommend you to have recalibration.)
6) Operation conditions:
1. Power level: -20 dBm (10 µW), CW light 2. ≦ 50 µm optical fiber, NA ≦ 0.2
3. Ambient temperature: 23±5 °C 4. With AQ9389B (FC) connector adapter
7) 1. Linearity at a wavelength within wavelength specified in total accuracy
2. CW light, ambient temperature: 23±5 °C
8) 1. Averaging 1s (averaging executed 10 times)
2. In wavelength 1200 to 1600 nm
3. CW, chopped light (270 Hz)

AQ8201-22 DUAL OPM Module (Optical powermeter)

Wavelength range	1280 to 1700 nm
Photodetector	InGaAs
Application	Small-diameter silica fiber emission [1)]
Optical connector	AQ9389B (FC) Connector Adapter (standard) [2)]
Polarization dependent loss	0.02 dB$_{P-P}$ (typ.) [3)]
Power range (CW light)	-80 to +10 dBm [3)]
Inaccuracy under reference condition	±2.5 % (at 1550 nm calibration point) [4)]
Total accuracy	±5 % (1470 to1610 nm) [6)]
Linearity	±0.05 dB (1470 to 1610 nm, -73 to +10 dBm) [6)]
Noise (CW light)	-73 dBm or less [7)]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 1.2 kg

*Specifications assured at fixed temperature within 23±1 °C
*Specifications assured after warm-up for one hour
Notes:
1) Applicable fiber ≦ 9/125 µm (SM), NA ≦ 0.1
2) ST and SC connector are also available 3) At 1550 nm wavelength, SM fiber
4) Reference conditions:
1. Power level: 0 dBm, CW light 2. SM fiber, master FC connector NA ≦ 0.1
3. Calibrated with AQ9389B (FC) connector adapter (If you disconnect connector adapter, the accuracy of specifications may be lost. When you change connector adapter, we recommend recalibration.)
5) Operation conditions:
1. Power level: 0 dBm, CW light 2. SM fiber, FC connector NA ≦ 0.1
6) 1. Linearity at a wavelength within wavelength specified in total accuracy. 2. CW light
7) 1. Averaging 1s (averaging executed 10 times)
2. In wavelength 1470 to 1610 nm 3. CW light

AQ8201-32 ATTN Module (Optical attenuator)

Wavelength range	1200 to 1600 nm
Insertion loss	2.5 dB or less (1310/1550 nm) [1, 2)]
Maximum attenuation level	60 dB
Attenuation deviation	Within ±0.1 dB (1310/1550 nm) [1, 2)]
Repeatability	Within ±0.02 dB [1)]
Minimum attenuation step	0.01 dB
Optical return loss	60 dB or more (1310/1550 nm) [1, 2, 3)]
Polarization dependent loss	0.05 dB$_{P-P}$ (typ.) (1550 nm) [1)]
Maximum input power	+23 dBm
Shutter isolation	100 dB or more
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [4)]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 1 kg

*Specifications assured at fixed temperature within 25±3 °C.
*Specifications assured after warm-up for one hour.
Notes:
1) At constant temperature
2) Using master cord
3) With FC/Angled PC connector (Return loss: 63 dB or more)
4) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)

AQ8201-32A, 33 ATTN Module (Supports L-band)

Wavelength range	1480 to 1650 nm
Insertion loss	2.5 dB or less (1550 nm) [1, 2)]
Maximum attenuation level	60 dB
Attenuation deviation	Within ±0.1 dB (1520 to 1620 nm) [1, 2, 3)]
Repeatability	±0.01 dB (typ.) (AQ8201-32A) ±0.005 dB (typ.) (AQ8201-33)
Minimum attenuation step	0.01 dB (AQ8201-32A) 0.001 dB (AQ8201-33)
Optical return loss	60 dB or more (1550 nm) [1, 2, 4)]
Polarization dependent loss	0.05 dB$_{P-P}$ (typ.) (1550 nm) [1)]
Maximum input power	+23 dBm
Shutter isolation	100 dB or more
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [5)]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 1 kg

*Specifications assured at fixed temperature within 25 °C.
*Specifications assured after warm-up for one hour
Notes:
1) At constant temperature
2) Using master cord
3) Except polarization dependent loss
4) With FC/Angled PC connector (Return loss: 63 dB or more)
5) Angled PC manufactured by SEIKOH GIKEN or reference product (step type)

AQ8201-33M ATTN Module (With monitor port)

Wavelength range	1480 to 1650 nm
Insertion loss	4.0 dB or less (1550 nm) [1, 2]
Maximum attenuation level	60 dB
Attenuation deviation	Within ±0.1 dB (1520 to 1620 nm) [1, 2, 3]
Repeatability	±0.01 dB (typ.) [1]
Minimum attenuation step	0.001 dB
Optical return loss	50 dB or more (1550 nm) [1, 2, 4]
Polarization dependent loss	0.1 dB_{P-P} (typ.) (1550 nm) [1]
Maximum input power	+23 dBm
Monitor output	10 dB (typ.) [5]
Shutter isolation	100 dB or more
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [6]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 1 kg

*Specifications assured at fixed temperature within 25 °C
*Specifications assured after warm-up for one hour
Notes:
1) At constant temperature
2) Using master cord
3) Except polarization dependent loss
4) With FC/Angled PC connector (Return loss: 63 dB or more)
5) To output port
6) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)

AQ8201-412/-422 DUAL OSW Module

Number of channels	1 x 2 (AQ8201-412) 2 x 2 (AQ8201-422)
Wavelength range	1480 to 1620 nm
Insertion loss	1.7 dB or less [1]
Optical return loss	50 dB or more [1]
Optical isolation	60 dB or more [1]
Polarization dependent loss	0.05 dB_{P-P} (typ.) [1]
Repeatability	±0.02 dB (typ.) [1, 2]
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [3]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.6 kg (AQ8201-412) Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.7 kg (AQ8201-422)

*Specifications assured at fixed temperature within 25±3 °C
Notes:
1) At constant temperature, using master cord including connector, at 1550 nm wavelength
2) After warm-up for one hour
6) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)

AQ8201-414/-418/-43 OSW Module

Number of channels	1 x 4 (AQ8201-414) 1 x 8 (AQ8201-418) 1 x 12 (AQ8201-43)
Wavelength range	1480 to 1620 nm
Insertion loss	1.5 dB or less [1]
Optical return loss	55 dB or more [1]
Optical isolation	70 dB or more [1]
Polarization dependent loss	0.05 dB_{P-P} (typ.) [1]
Repeatability	±0.02 dB (typ.) [1, 2]
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [3]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.6 kg (AQ8201-414) Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.7 kg (AQ8201-418) Approx. 79.5 (W) x 130 (H) x 339 (D) mm Approx. 1.0 kg (AQ8201-43)

*Specifications assured at fixed temperature within 25±3 °C
Notes:
1) At constant temperature, using master cord including connector, at 1550 nm wavelength
2) After warm-up for one hour
6) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)

AQ8201-71 RLM Module (Return loss measurement)

Wavelength range	1280 to 1620 nm
Dynamic range	65 dB or more [1]
Relative measurement accuracy	Within ±0.4 dB (0 to 50 dB) [2] Within ±0.7 dB (50 to 60 dB) [2]
Measurement stability	Within ±0.02 dB [3]
Applicable fiber	SM (9/125 µm)
Input connector (from light source)	FC/PC
Output connector(to DUT)	SC/Angled PC [4, 5]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 1.2 kg
Options	Master cord (FC), (SC) and (Open) for AQ8201-71

*Specifications assured after warm-up for one hour
General conditions other than specified:
• Optical input level: -5 to 0 dBm, CHOP (270 Hz)
• Wavelength: 1550 nm
• Reference: Fresnel reflection (using master cord for AQ8201-71)
• Ambient temperature: 23±1 °C
Notes:
1) Varies depending on master cord
2) Depends on stability of light source used, linearity of photo receiver and isolation of optical directional coupler
3) Display stability with Fresnel reflection measurement: 5 minutes
4) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)
5) Do not connect other master cord than that specified by ANDO to output connector

AQ8201-818 SPLTR/CPLR Module

Wavelength range	1480 to 1620 nm
Insertion loss (All ports)	12.5 dB or less [1]
Directivity	45 dB or more [1]
Polarization dependent loss	0.2 dB P-P (typ.) [1]
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [2]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.6 kg

*Specifications assured at fixed temperature within 25±3 °C
Notes:
1) At constant temperature, using master cord including connector, at 1550 nm wavelength
2) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)

AQ8201-855 3 x SPLTR/CPLR Module

Wavelength range	1480 to 1620 nm
Insertion loss (All ports)	4.5 dB or less [1]
Directivity	50 dB or more [1]
Polarization dependent loss	0.1 dB P-P (typ.) [1]
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [2]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.6 kg

*Specifications assured at fixed temperature within 25±3°C
Notes:
1) At constant temperature, using master cord including connector, at 1550 nm wavelength
2) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)

AQ8201-873 3 x SPLTR/CPLR Module

Wavelength range	1480 to 1620 nm
Insertion loss (70 % ports)	3.0 dB or less [1]
Insertion loss (30 % ports)	7.0 dB or less [1]
Directivity	50 dB or more [1]
Polarization dependent loss	0.1 dB P-P (typ.) [1]
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [2]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.6 kg

*Specifications assured at fixed temperature within 25±3 °C
Notes:
1) At constant temperature, using master cord including connector, at 1550 nm wavelength
2) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)

AQ8201-891 3 x SPLTR/CPLR Module

Wavelength range	1480 to 1620 nm
Insertion loss (90 % ports)	1.5 dB or less [1]
Insertion loss (10 % ports)	12.5 dB or less [1]
Directivity	50 dB or more [1]
Polarization dependent loss	0.1 dB P-P (typ.) [1]
Applicable fiber	SM (9/125 µm)
Optical connector	FC/Angled PC [2]
Environmental conditions	Operation temperature: 5 to 40 °C Storage temperature: 0 to 50 °C Humidity: 85 % RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) x 130 (H) x 339 (D) mm Approx. 0.6 kg

*Specifications assured at fixed temperature within 25±3 °C
Notes:
1) At constant temperature, using master cord including connector, at 1550 nm wavelength
2) Angled PC manufactured by SEIKOH GIKEN or equivalent (step type)

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**Specifications are subject to change without notice.*

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