

**AQ23011A, AQ23012A  
Multi Application Test System  
Getting Started Guide**

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Thank you for purchasing the AQ23011A or AQ23012A Multi Application Test System (Frame). The AQ2300 Series consists of a frame and several modules. The frame can control the modules installed in its frame.

This user's manual explains the features, operating procedures, and handling precautions of the AQ2300 Series including its modules. To ensure correct use, please read this manual thoroughly before operation. Keep this manual in a safe place for quick reference.

The manuals for the frame are listed on the next page. Please read all manuals.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

| Document No. | Description                |
|--------------|----------------------------|
| PIM 113-01Z2 | List of worldwide contacts |

## Notes

- The contents of this manual are subject to change without prior notice as a result of improvements to the product's performance and functionality. Refer to our website to view our latest manuals.
- The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without the permission of YOKOGAWA is strictly prohibited.

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## Updating the Firmware

It is recommended to update the firmware to the latest version to improve the features and usability of the frame. Download the latest firmware from the YOKOGAWA website, or contact your nearest YOKOGAWA dealer for details.

## Using Open Source Software

This product includes open source software.

The license for each open source software can be found in TermsAndConditions\_OpenSourceSoftware.pdf in the \License folder of the frame's internal storage.

For how to access the \License folder in the internal memory of the frame's internal storage, see "How to View the User's Manual" on page xii.

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## Revisions

- 1st Edition: October 2024
- 2nd Edition: June 2025
- 3rd Edition: May 2026

# Manuals

The following manuals, including this one, are provided as manuals for this instrument. Please read all manuals.

## Manuals included with the product

| Manual title                                                                 | Manual No.       | Description                                                                                                                                                                                  |
|------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AQ23011A, AQ23012A<br>Multi-Application Test System<br>Getting Started Guide | IM AQ23011A-03EN | This document. Provided as a printed manual.<br>Explains the handling precautions, common operations, troubleshooting measures, and specifications of this instrument including its modules. |
| AQ23011A, AQ23012A Frame                                                     | IM AQ23011A-92Z1 | Document for China                                                                                                                                                                           |
| Safety Instruction Manual                                                    | IM 00C01C01-01Z1 | Safety manual (European languages)                                                                                                                                                           |

## Manuals included in the frame's internal storage

The following manuals are included in the internal storage of the frame. Download them to your PC for use. For downloading instructions, see page xii.

You can also download them from the YOKOGAWA website.

<https://tmi.yokogawa.com/jp/library/>

A printed manual can also be purchased separately. Contact your nearest YOKOGAWA dealer.

| Manual Title                                                                                 | Manual No.       | Description                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AQ23011A, AQ23012A<br>Multi-Application Test System<br>Features Guide                        | IM AQ23011A-01EN | Explains all the instrument's features including its modules, but excluding the communication interface features. This single PDF file contains both the Features Guide and the User's Manual. |
| AQ23011A, AQ23012A<br>Multi-Application Test System<br>User's Manual                         | IM AQ23011A-02EN | Explains how to operate this instrument including its modules.<br>This single PDF file contains both the Features Guide and the User's Manual.                                                 |
| AQ23011A, AQ23012A<br>Multi-Application Test System<br>Communication Interface User's Manual | IM AQ23011A-17EN | Explains the functions of this instrument's remote control interface, how to configure it, and the commands used to control this instrument from a PC through the interface.                   |

The "EN," "Z1," and "Z2" in the manual numbers are the language codes.

## Checking the Contents of the Package

Unpack the box, and check the following before operating the instrument. If the wrong items have been delivered, if items are missing, or if there is a problem with the appearance of the items, contact your nearest YOKOGAWA dealer.

### AQ23011A/AQ23012A Frame

Check that the product that you received is what you ordered by referring to the model name and suffix code given on the name plate on the rear panel of the frame.

| Models                  | Suffix Code <sup>1</sup> | Description                                             |
|-------------------------|--------------------------|---------------------------------------------------------|
| AQ23011A                |                          | Half size frame for AQ2300 series                       |
| AQ23012A                |                          | Full size frame for AQ2300 series                       |
| External interface      | -ETP                     | No Digital I/O, ExtTrigger I/O 2 per port               |
|                         | -EDP                     | Digital I/O 8ports, ExtTrigger I/O 1 port               |
| GP-IB Interface         | -N01                     | No GP-IB interface included.                            |
|                         | -C01                     | Equipped with GP-IB interface.                          |
| Power cord <sup>2</sup> | -D                       | UL/CSA standard and PSE compliant, rated voltage: 125 V |
|                         | -F                       | VDE/Korean standard, rated voltage: 250 V               |
|                         | -H                       | Chinese standard, rated voltage: 250 V                  |
|                         | -N                       | Brazilian standard, rated voltage: 250 V                |
|                         | -Q                       | British standard, rated voltage: 250 V                  |
|                         | -R                       | Australian standard, rated voltage: 250 V               |
|                         | -T                       | Taiwanese standard, rated voltage: 125 V                |
|                         | -B                       | Indian standard, 250 V                                  |
|                         | -U                       | IEC plug Type B, 250 V                                  |
|                         | -Y                       | No power cord included. <sup>3</sup>                    |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

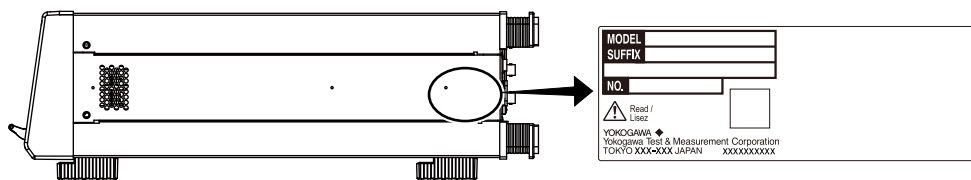
2 Make sure that the attached power cord complies with the designated standards of the country and area that you are using it in.

3 Prepare a power cord that complies with the standard specified by the country or region that the instrument will be used in.

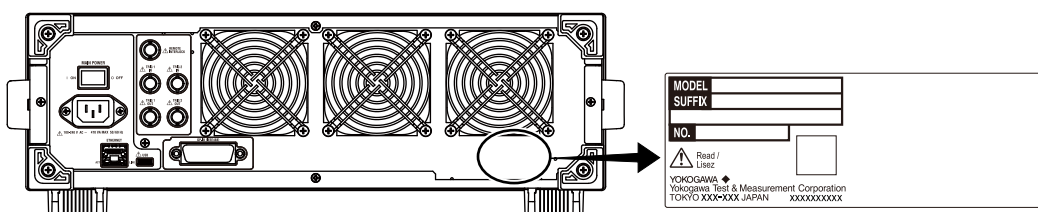
### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.

#### AQ23011A Frame



#### AQ23012A Frame



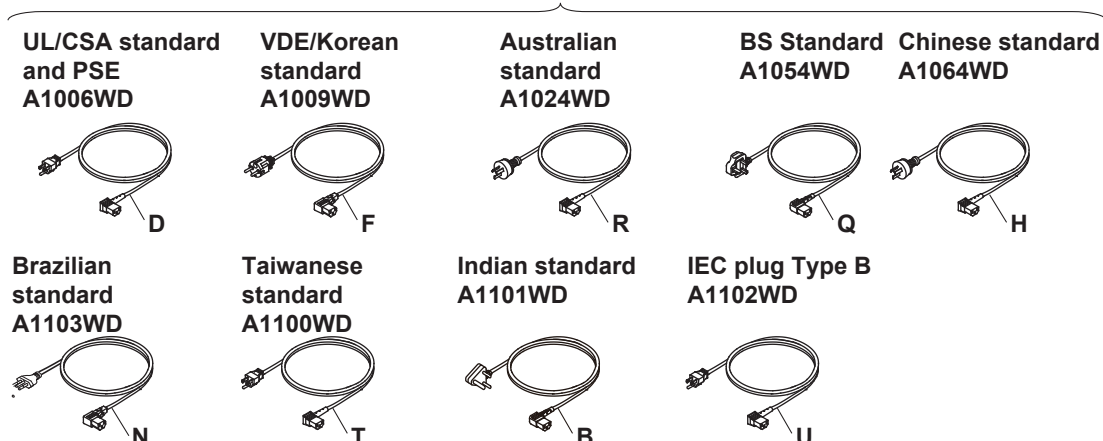
## Standard Accessories

The standard accessories below are supplied with the instrument. Check that all contents are present and undamaged.

Standard accessories are not covered by warranty.

| Item                      | Model or Part No. | Quantity | Specifications and Notes                                                                                                    |
|---------------------------|-------------------|----------|-----------------------------------------------------------------------------------------------------------------------------|
| Power cord <sup>1</sup>   | See below.        | (1)      | Included or not included depending on the suffix code                                                                       |
| Interlock short plug      | A1288JA           | 1        | —                                                                                                                           |
| Rubber stoppers           | A9088ZM           | 1        | 1 sheet (2 pieces), attached to the rear feet                                                                               |
| Digital I/O terminal plug | A3604JQ           | 2        | Included with models with the -EDP suffix code. FMC 0, 5/6-ST-2, 54; made by Phoenix Contact. Shipped inserted in terminal. |
| Manuals <sup>2</sup>      |                   |          |                                                                                                                             |
| Printed manuals           | IM AQ23011A-03EN  | 1        | Getting Started Guide (this guide)                                                                                          |
|                           | IM AQ23011A-92Z1  | 1        | Document for China                                                                                                          |
|                           | IM 00C01C01-01Z1  | 1        | Safety manual (European languages)                                                                                          |
|                           | PIM 113-01Z2      | 1        | List of worldwide contacts                                                                                                  |

### Power cord (one cord that matches the suffix code is included)<sup>1</sup>



- 1 Make sure that the attached power cord complies with the designated standards of the country and area that you are using it in. If the suffix code is -Y, a power cord is not included.
- 2 IM AQ23011A-01EN, IM AQ23011A-02EN, and IM AQ23011A-17EN are contained in PDF files in the instrument's internal memory. A printed manual can also be purchased separately. Contact your nearest YOKOGAWA dealer to purchase a copy.

AQ23811A Source Measure Unit (sold separately)

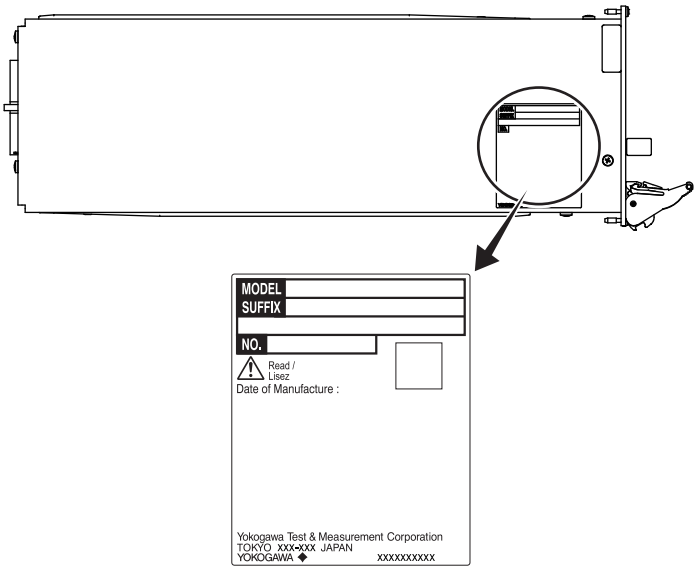
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models   | Suffix Code <sup>1</sup> | Description        |
|----------|--------------------------|--------------------|
| AQ23811A |                          | ±6 V /±600 mA, 2ch |
| Model    | -10                      | Standard model     |

1 For products whose suffix code contains “Z,” an exclusive manual may be included. Please read it along with the standard manual.

NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



Standard accessories

The following accessories are included.

| Item             | Model or Part No. | Quantity | Specifications and Notes                                                      |
|------------------|-------------------|----------|-------------------------------------------------------------------------------|
| Measurement plug | A3604JQ           | 2        | FMC 0, 5/6-ST-2, 54; made by Phoenix Contact<br>Shipped inserted in terminal  |
| Trigger plug     | A3606JQ           | 1        | DFMC 0, 5/2-ST-2, 54; made by Phoenix Contact<br>Shipped inserted in terminal |
| User's Manual    | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package                                          |
|                  | IM AQ23811A-92Z1  | 1        | Document for China                                                            |
|                  | PIM 113-01Z2      | 1        | List of worldwide contacts                                                    |

## AQ23111A Light Source (sold separately)

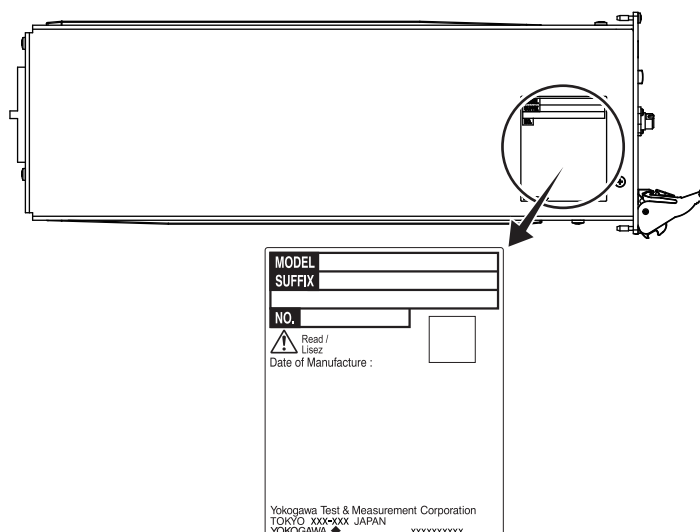
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models                  | Suffix Code <sup>1</sup> | Description                  |
|-------------------------|--------------------------|------------------------------|
| AQ23111A                |                          | Light source (1ch)           |
| Center wavelength, -W31 |                          | 1310 nm, DFB-LD              |
| Type                    |                          |                              |
|                         | -W55                     | 1550 nm, DFB-LD              |
|                         | -W62                     | 1625 nm, DFB-LD              |
|                         | -W65                     | 1650 nm, DFB-LD              |
| Fiber type              | -SMF                     | Single-mode fiber (9/125 μm) |
| Connector type          | -FCA                     | FC/Angled PC connector       |

<sup>1</sup> For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 1        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

<sup>1</sup> Attached to the module

### AQ23112A Light Source (sold separately)

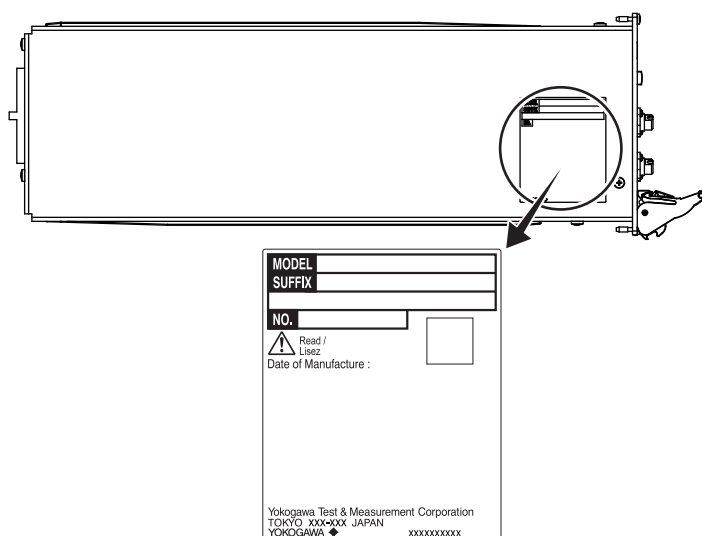
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models                  | Suffix Code <sup>1</sup> | Description                        |
|-------------------------|--------------------------|------------------------------------|
| AQ23112A                |                          | Light source (2ch)                 |
| Center wavelength, Type | -W3131                   | Ch1: 1310 nm, Ch2: 1310 nm, DFB-LD |
|                         | -W3155                   | Ch1: 1310 nm, Ch2: 1550 nm, DFB-LD |
|                         | -W3162                   | Ch1: 1310 nm, Ch2: 1625 nm, DFB-LD |
|                         | -W3165                   | Ch1: 1310 nm, Ch2: 1650 nm, DFB-LD |
|                         | -W5555                   | Ch1: 1550 nm, Ch2: 1550 nm, DFB-LD |
|                         | -W5562                   | Ch1: 1550 nm, Ch2: 1625 nm, DFB-LD |
|                         | -W5565                   | Ch1: 1550 nm, Ch2: 1650 nm, DFB-LD |
|                         | -W6262                   | Ch1: 1625 nm, Ch2: 1625 nm, DFB-LD |
|                         | -W6265                   | Ch1: 1625 nm, Ch2: 1650 nm, DFB-LD |
|                         | -W6565                   | Ch1: 1650 nm, Ch2: 1650 nm, DFB-LD |
| Fiber type              | -SMF                     | Single-mode fiber (9/125 μm)       |
| Connector type          | -FCA                     | FC/Angled PC connector             |

<sup>1</sup> For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 2        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

<sup>1</sup> Attached to the module

## AQ23191A Light Source (sold separately)

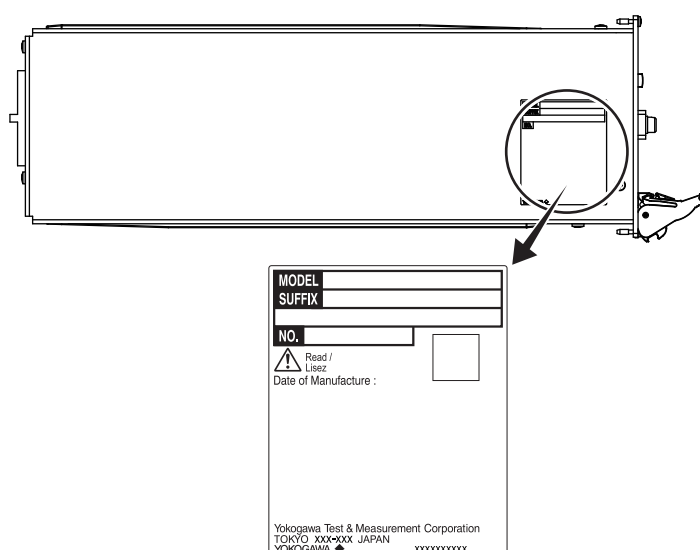
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models                | Suffix Code <sup>1</sup> | Description        |
|-----------------------|--------------------------|--------------------|
| AQ23191A              |                          | Light source (1ch) |
| Wavelength band, Type | -CB                      | C band, ASE        |
|                       | -CL                      | CL band, ASE       |
| Connector type        | -FCC                     | FC/PC connector    |
|                       | -SCC                     | SC/PC connector    |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 1        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

AQ23202A Interface Module (sold separately)

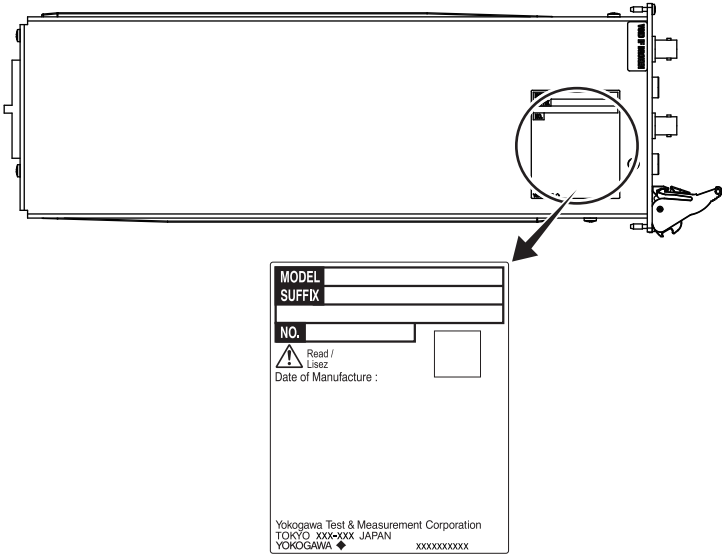
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models   | Suffix Code <sup>1</sup> | Description                                   |
|----------|--------------------------|-----------------------------------------------|
| AQ23202A |                          | Interface module for optical sensor head, 2ch |

1 For products whose suffix code contains “Z,” an exclusive manual may be included. Please read it along with the standard manual.

NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



Standard accessories

The following accessories are included.

| Item          | Model or Part No. | Quantity | Specifications and Notes             |
|---------------|-------------------|----------|--------------------------------------|
| User's Manual | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|               | IM AQ23811A-92Z1  | 1        | Document for China                   |
|               | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

## AQ23211A Optical Power Meter (sold separately)

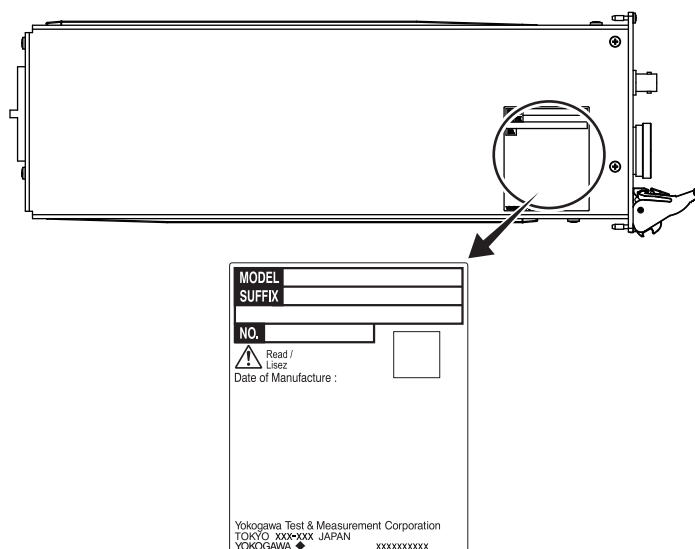
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models            | Suffix Code <sup>1</sup> | Description                                                 |
|-------------------|--------------------------|-------------------------------------------------------------|
| AQ23211A          |                          | Optical power meter, 1ch, standard                          |
| Connector adapter | -FCC                     | AQ9335C (FC) Connector adapter (with a light shielding cap) |
|                   | -SCC                     | AQ9335C (SC) Connector adapter (with a light shielding cap) |
|                   | -LCC                     | AQ9335C (LC) Connector adapter                              |
|                   | -MUC                     | AQ9335C (MU) Connector adapter                              |
|                   | -NCA                     | No connector adapter                                        |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                          | Model or Part No. | Quantity | Specifications and Notes             |
|-------------------------------|-------------------|----------|--------------------------------------|
| Ring <sup>1</sup>             | —                 | 1        |                                      |
| Protective cover <sup>1</sup> | —                 | 1        |                                      |
| User's Manual                 | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                               | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                               | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

### AQ23212A Optical Power Meter (sold separately)

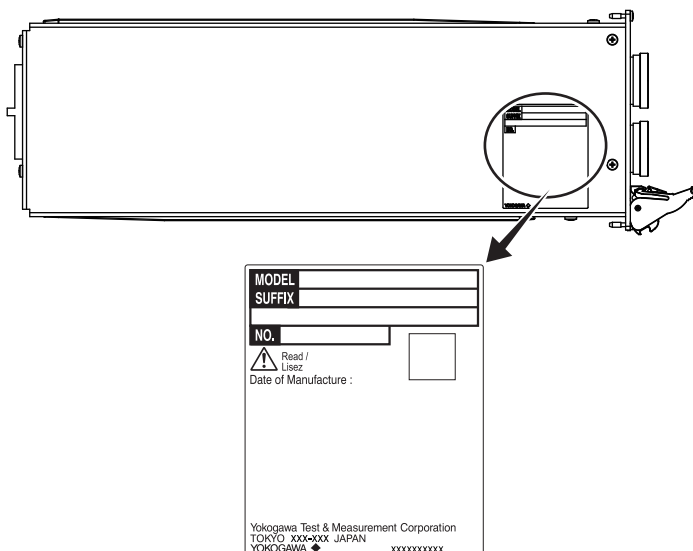
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models            | Suffix Code <sup>1</sup> | Description                                                 |
|-------------------|--------------------------|-------------------------------------------------------------|
| AQ23212A          |                          | Optical power meter, 2ch, standard                          |
| Connector adapter | -FCC                     | AQ9335C (FC) Connector adapter (with a light shielding cap) |
|                   | -SCC                     | AQ9335C (SC) Connector adapter (with a light shielding cap) |
|                   | -LCC                     | AQ9335C (LC) Connector adapter                              |
|                   | -MUC                     | AQ9335C (MU) Connector adapter                              |
|                   | -NCA                     | No connector adapter                                        |

<sup>1</sup> For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                          | Model or Part No. | Quantity | Specifications and Notes             |
|-------------------------------|-------------------|----------|--------------------------------------|
| Ring <sup>1</sup>             | —                 | 2        |                                      |
| Protective cover <sup>1</sup> | —                 | 2        |                                      |
| User's Manual                 | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                               | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                               | PIM 113-01Z2      | 1        | List of worldwide contacts           |

<sup>1</sup> Attached to the module

## AQ23221A Optical Power Meter (sold separately)

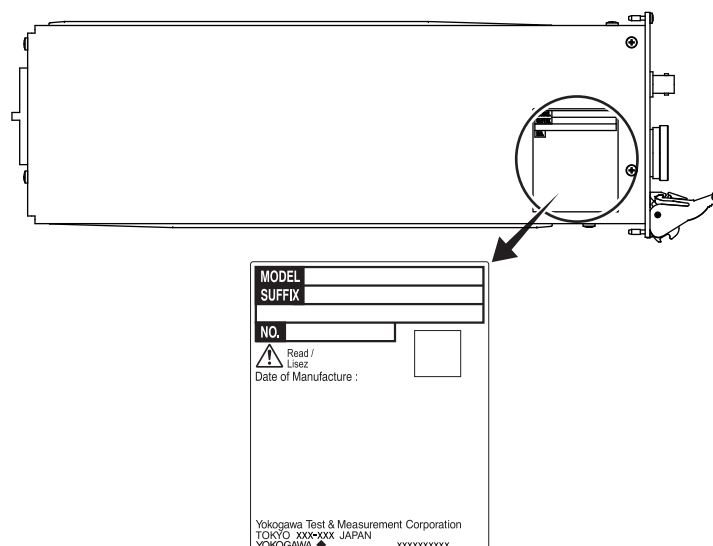
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models            | Suffix Code <sup>1</sup> | Description                                                 |
|-------------------|--------------------------|-------------------------------------------------------------|
| AQ23221A          |                          | Optical power meter, 1ch, high power                        |
| Connector adapter | -FCC                     | AQ9335C (FC) Connector adapter (with a light shielding cap) |
|                   | -SCC                     | AQ9335C (SC) Connector adapter (with a light shielding cap) |
|                   | -LCC                     | AQ9335C (LC) Connector adapter                              |
|                   | -MUC                     | AQ9335C (MU) Connector adapter                              |
|                   | -NCA                     | No connector adapter                                        |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                          | Model or Part No. | Quantity | Specifications and Notes             |
|-------------------------------|-------------------|----------|--------------------------------------|
| Ring <sup>1</sup>             | —                 | 1        |                                      |
| Protective cover <sup>1</sup> | —                 | 1        |                                      |
| User's Manual                 | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                               | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                               | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

## AQ23291A Optical Sensor Head (sold separately)

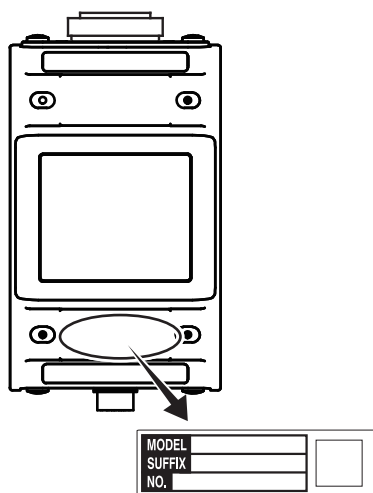
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models            | Suffix Code <sup>1</sup> | Description                                                 |
|-------------------|--------------------------|-------------------------------------------------------------|
| AQ23291A          |                          | Optical sensor head, InGaAs, $\phi$ 5 mm                    |
| Connection cable  | -L1                      | 1 m                                                         |
|                   | -L4                      | 4 m                                                         |
| Connector adapter | -FCC                     | AQ9335C (FC) Connector adapter (with a light shielding cap) |
|                   | -SCC                     | AQ9335C (SC) Connector adapter (with a light shielding cap) |
|                   | -LCC                     | AQ9335C (LC) Connector adapter                              |
|                   | -MUC                     | AQ9335C (MU) Connector adapter                              |
|                   | -NCA                     | No connector adapter                                        |

<sup>1</sup> For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Ring <sup>1</sup>           | —                 | 1        |                                      |
| Protective cap <sup>1</sup> | —                 | 1        |                                      |
| Connection cable            | A1638WL           | 1        | -L1 (length 1 m)                     |
|                             | A1639WL           | 1        | -L4 (length 4 m)                     |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

<sup>1</sup> Attached to the module

## AQ23295A Optical Sensor Head (sold separately)

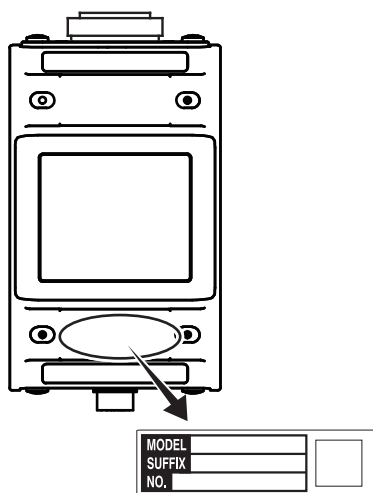
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models            | Suffix Code <sup>1</sup> | Description                                                 |
|-------------------|--------------------------|-------------------------------------------------------------|
| AQ23295A          |                          | Optical sensor head, Si, 5.8 × 5.8 mm                       |
| Connection cable  | -L1                      | 1 m                                                         |
|                   | -L4                      | 4 m                                                         |
| Connector adapter | -FCC                     | AQ9335C (FC) Connector adapter (with a light shielding cap) |
|                   | -SCC                     | AQ9335C (SC) Connector adapter (with a light shielding cap) |
|                   | -LCC                     | AQ9335C (LC) Connector adapter                              |
|                   | -MUC                     | AQ9335C (MU) Connector adapter                              |
|                   | -NCA                     | No connector adapter                                        |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Ring <sup>1</sup>           | —                 | 1        |                                      |
| Protective cap <sup>1</sup> | —                 | 1        |                                      |
| Connection cable            | A1638WL           | 1        | -L1 (length 1 m)                     |
|                             | A1639WL           | 1        | -L4 (length 4 m)                     |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

### AQ23311A Variable Optical Attenuator (sold separately)

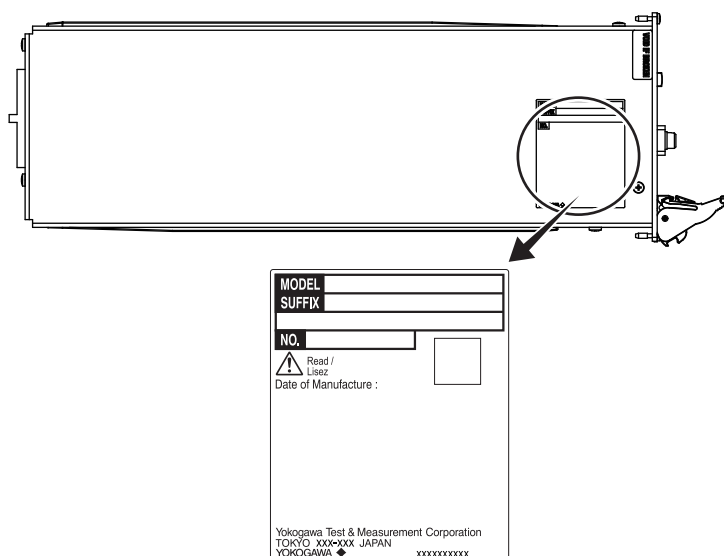
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models         | Suffix Code <sup>1</sup> | Description                                     |
|----------------|--------------------------|-------------------------------------------------|
| AQ23311A       |                          | Variable optical attenuator (no output monitor) |
| Fiber type     | -SMF                     | Single-mode fiber (9/125 μm)                    |
| Connector type | -FCC                     | FC /PC connector                                |
|                | -SCC                     | SC /PC connector                                |
| Monitor port   | /MP                      | Monitor output port                             |

<sup>1</sup> For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 2        |                                      |
|                             |                   | 3        | for suffix code /MP                  |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

<sup>1</sup> Attached to the module

## AQ23321A Variable Optical Attenuator (sold separately)

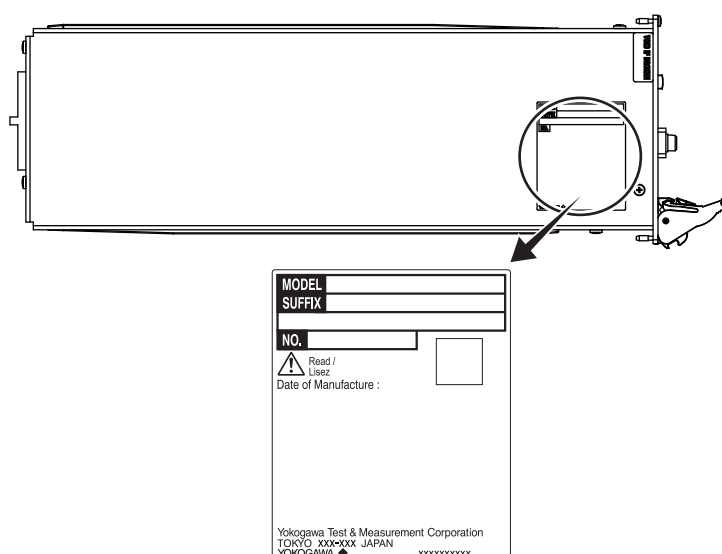
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models         | Suffix Code <sup>1</sup> | Description                                       |
|----------------|--------------------------|---------------------------------------------------|
| AQ23321A       |                          | Variable optical attenuator (with output monitor) |
| Fiber type     | -SMF                     | Single-mode fiber (9/125 μm)                      |
| Connector type | -FCC                     | FC /PC connector                                  |
|                | -SCC                     | SC /PC connector                                  |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 2        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

AQ23332A Variable Optical Attenuator (sold separately)

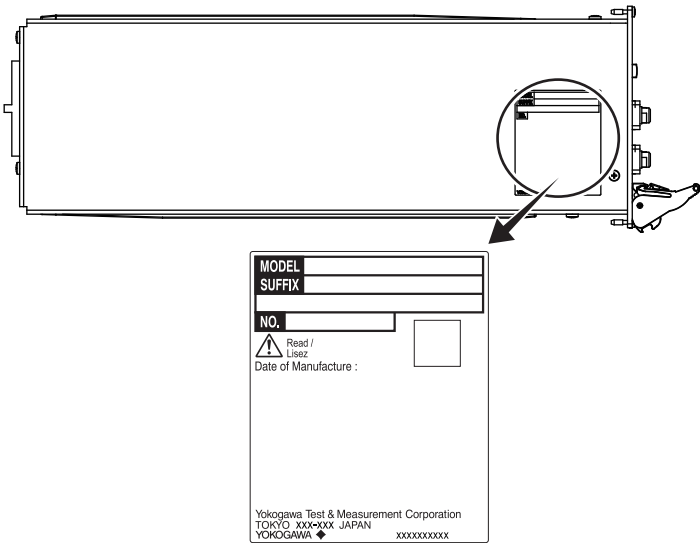
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models         | Suffix Code <sup>1</sup> | Description                                           |
|----------------|--------------------------|-------------------------------------------------------|
| AQ23332A       |                          | Variable optical attenuator, 2ch, with output monitor |
| Fiber type     | -SMF                     | Single-mode fiber (9/125 μm)                          |
| Connector type | -FCC                     | FC/PC connector                                       |
|                | -FCA                     | FC/Angled PC connector                                |

1 For products whose suffix code contains “Z,” an exclusive manual may be included. Please read it along with the standard manual.

NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 4        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

## AQ23411A Optical Switch (sold separately)

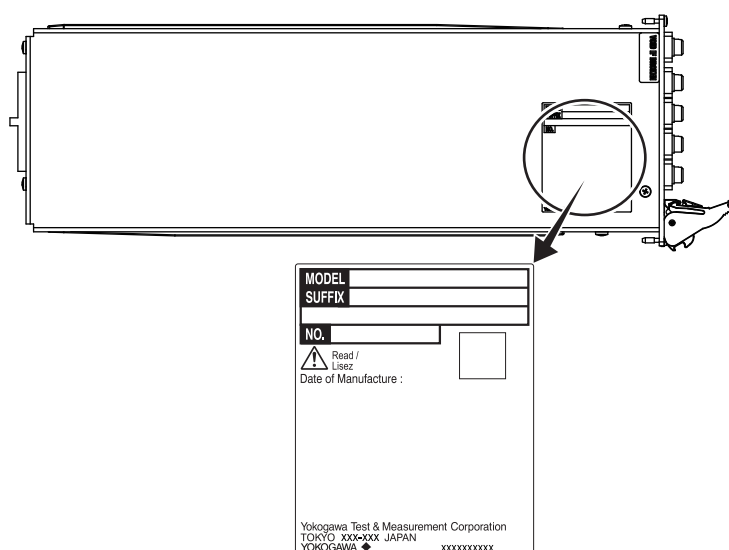
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models         | Suffix Code <sup>1</sup> | Description                  |
|----------------|--------------------------|------------------------------|
| AQ23411A       |                          | Optical switch, 1x4, Single  |
| Fiber type     | -SMF                     | Single-mode fiber (9/125 μm) |
| Connector type | -FCC                     | FC /PC connector             |
|                | -SCC                     | SC /PC connector             |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 5        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

AQ23412A Optical Switch (sold separately)

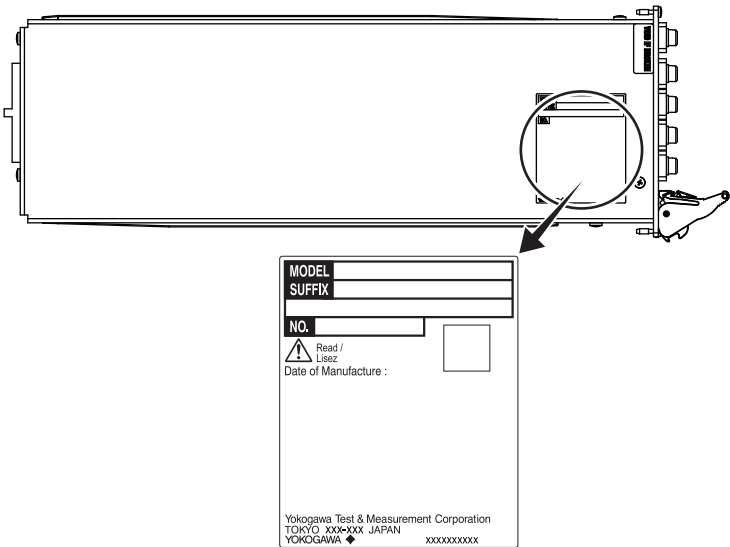
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models         | Suffix Code <sup>1</sup> | Description                  |
|----------------|--------------------------|------------------------------|
| AQ23412A       |                          | Optical switch, 1x8, Single  |
| Fiber type     | -SMF                     | Single-mode fiber (9/125 μm) |
| Connector type | -FCC                     | FC /PC connector             |
|                | -SCC                     | SC /PC connector             |

1 For products whose suffix code contains “Z,” an exclusive manual may be included. Please read it along with the standard manual.

NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 9        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

## AQ23413A Optical Switch (sold separately)

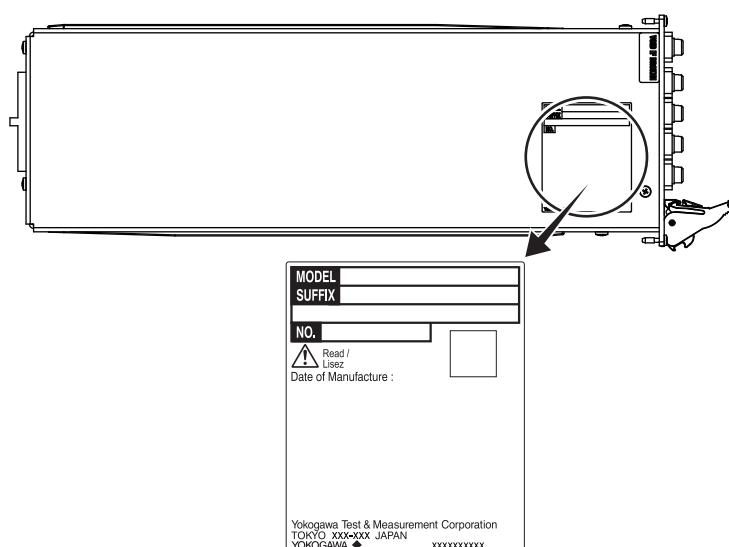
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models         | Suffix Code <sup>1</sup> | Description                  |
|----------------|--------------------------|------------------------------|
| AQ23413A       |                          | Optical switch, 1x16, Single |
| Fiber type     | -SMF                     | Single-mode fiber (9/125 μm) |
| Connector type | -FCC                     | FC /PC connector             |
|                | -SCC                     | SC /PC connector             |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 17       |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

AQ23421A Optical Switch (sold separately)

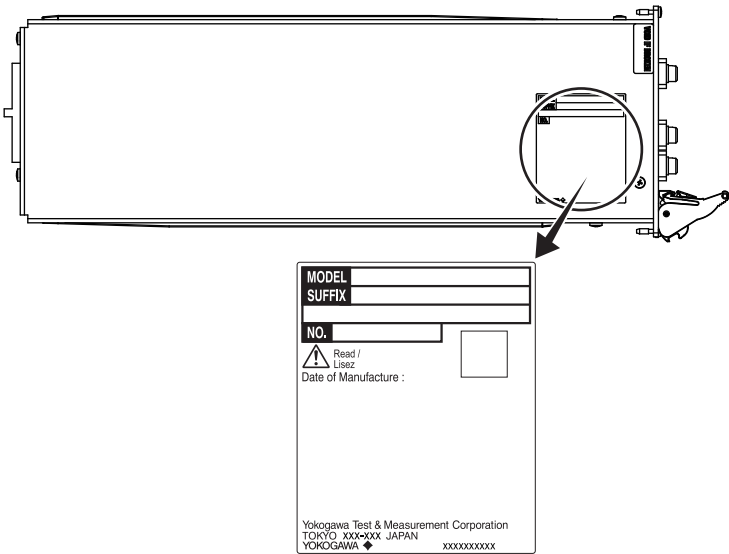
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models         | Suffix Code <sup>1</sup> | Description                  |
|----------------|--------------------------|------------------------------|
| AQ23421A       |                          | Optical switch, 1x2, Dual    |
| Fiber type     | -SMF                     | Single-mode fiber (9/125 μm) |
| Connector type | -FCC                     | FC /PC connector             |
|                | -SCC                     | SC /PC connector             |

1 For products whose suffix code contains “Z,” an exclusive manual may be included. Please read it along with the standard manual.

NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 6        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

## AQ23422A Optical Switch (sold separately)

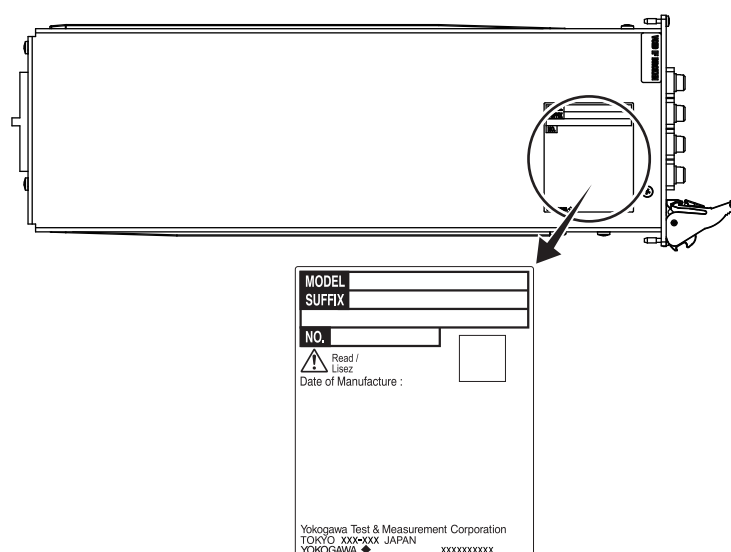
Check that the model name and suffix code given on the name plate on the side panel of the module are the same as those on your order.

| Models         | Suffix Code <sup>1</sup> | Description                  |
|----------------|--------------------------|------------------------------|
| AQ23422A       |                          | Optical switch, 2x2, Dual    |
| Fiber type     | -SMF                     | Single-mode fiber (9/125 μm) |
| Connector type | -FCC                     | FC /PC connector             |
|                | -SCC                     | SC /PC connector             |

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.

### NO. (Instrument Number)

This information is required when contacting your nearest YOKOGAWA dealer.



### Standard accessories

The following accessories are included.

| Item                        | Model or Part No. | Quantity | Specifications and Notes             |
|-----------------------------|-------------------|----------|--------------------------------------|
| Protective cap <sup>1</sup> | —                 | 8        |                                      |
| User's Manual               | IM AQ23811A-01EN  | 1        | Checking the Contents of the Package |
|                             | IM AQ23811A-92Z1  | 1        | Document for China                   |
|                             | PIM 113-01Z2      | 1        | List of worldwide contacts           |

1 Attached to the module

## Optional accessories (sold separately)

The following optional accessories are available for purchase separately. For information about ordering accessories, contact your nearest YOKOGAWA dealer.

| Model                            | Name                                | Notes                                   |
|----------------------------------|-------------------------------------|-----------------------------------------|
| 735186                           | Blank panel for AQ2300 series frame | For AQ23011A/AQ23012A frame, for 1 slot |
| 735183-03                        | AQ23011A rack mount kit             |                                         |
| 735183-09                        | AQ23012A rack mount kit             |                                         |
| AQ9335C(FC)<br>Connector adapter | AQ9335C-FCC                         | FC connector                            |
| AQ9335C(SC)<br>Connector adapter | AQ9335C-SCC                         | SC connector                            |
| AQ9335C(LC)<br>Connector adapter | AQ9335C-LCC                         | LC connector with a dust cap            |
| AQ9335C(MU)<br>Connector adapter | AQ9335C-MUC                         | MU connector with a dust cap            |
| Light shielding cap<br>(FC)      | M3407HA                             | Light shielding cap for an FC connector |
| Light shielding cap<br>(SC)      | M3407HB                             | Light shielding cap for an SC connector |
| Dust cap (LC)                    | M3407HD                             | Dust cap for an LC connector            |
| Dust cap (MU)                    | M3407HE                             | Dust cap for an MU connector            |

# Conventions Used in This Manual

## Prefixes k and K

Prefixes k and K used before units are distinguished as follows:

|    |               |                             |
|----|---------------|-----------------------------|
| k: | Denotes 1000. | Example: 12 kg, 100 kHz     |
| K: | Denotes 1024. | Example: 720 KB (file size) |

## Displayed characters

Bold characters in procedural explanations are used to indicate panel keys and characters displayed in the on-screen menu, which correspond to the panel keys.

## Notes

The notes and cautions in this manual are categorized using the following symbols.



*Improper handling or use can lead to injury to the user or damage to the instrument.* This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

### **WARNING**

Provides precautions to avoid the risk of fatal or serious injury to the user if the product is mishandled.

### **CAUTION**

Provides precautions to avoid the risk of minor injury to the user or damage to property if the product is mishandled.

## French

### **AVERTISSEMENT**

Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

### **ATTENTION**

Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

## **Note**

Provides important information for handling this instrument.

## Safety Precautions

This instrument is designed to be used by a person with specialized knowledge.

This instrument is an IEC safety class I instrument (provided with a terminal for protective earth grounding).

The general safety precautions described herein must be observed during all phases of operation.

If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. YOKOGAWA assumes no liability for the customer's failure to comply with these requirements.

This manual is part of the product and contains important information. Store this manual in a safe place close to the instrument so that you can refer to it immediately. Keep this manual until you dispose of the instrument.

### The following symbols are used on this instrument.

 Handle with care. Refer to the user's manual or service manual. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

 Alternating current

 ON (power)

 OFF (power)

 Laser radiation hazard

 Power-on state

 Power-off state

## French



À manipuler délicatement. Toujours se reporter aux manuels d'utilisation et d'entretien. Ce symbole a été apposé aux endroits dangereux de l'instrument pour lesquels des consignes spéciales d'utilisation ou de manipulation ont été émises. Le même symbole apparaît à l'endroit correspondant du manuel pour identifier les consignes qui s'y rapportent.



Courant alternatif



Marche (alimentation)



Arrêt (alimentation)



Danger : Appareil laser à rayonnement.



Marche



Arrêt

**Follow the precautions below. Failure to comply with the precautions below could lead to injury or death or damage to the instrument.**

## WARNING

### Use the instrument only for its intended purpose

This instrument functions as a source measure instrument that sources and measures voltage and current when an SMU is used in the frame. Use this instrument only for this purpose. When LS, OPM, VOA, and OSW are installed in the frame of this instrument, it functions as an optical measuring instrument for measuring optical characteristics and evaluating performance. Do not use this instrument for anything other than as an optical measuring instrument.

### Check the physical appearance

Do not use the instrument if there is a problem with its physical appearance.

### Use the correct power supply

Make sure that the power supply voltage matches the instrument's rated supply voltage and that it does not exceed the maximum voltage range of the power cord to use.

### Use the correct power cord and plug

To prevent electric shock and fire, be sure to use the power cord for this instrument. The main power plug must be plugged into an outlet with a protective earth terminal. Do not invalidate this protection by using an extension cord without protective earth grounding. Further, do not use this power cord with other instruments.

### **Connect the protective ground terminal**

To prevent electric shock, make sure to connect the instrument to a protective ground (earth) before turning on the power. The power cord to use is a three-prong type power cord. Connect the power cord to a properly grounded three-prong outlet.

### **Do not impair the protective grounding**

Never cut off the internal or external protective earth wire or disconnect the wiring of the protective ground terminal. Doing so may result in electric shock or damage to the instrument.

### **Do not use when the protection functions are defective**

Before using this instrument, check that the protection functions, such as the protective grounding and fuse, are working properly. If you suspect a defect, do not use the instrument.

### **Do not operate in an explosive atmosphere**

Do not operate the instrument in the presence of flammable gases or vapors. Doing so is extremely dangerous.

### **Do not remove the covers or disassemble or alter the instrument**

Only qualified YOKOGAWA personnel may remove the covers and disassemble or alter the instrument. The inside of the instrument is dangerous because parts of it have high voltages.

### **External connections**

Securely connect the protective grounding before connecting to the item under measurement or to an external control circuit.

Before touching a circuit, turn off its power and check that it has no voltage.

### **Precautions to Be Taken When Using the Modules**

- Do not apply voltage exceeding the maximum input voltage or maximum rated voltage to ground.
- To prevent electric shock, make sure to connect the protective ground terminal of the frame.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Otherwise, the electrical and mechanical protection functions will not be activated.
- Avoid continuous connection in an environment where a surge voltage may occur.

### **Measurement category**

The measurement category of this instrument's signal input terminals varies depending on the modules that are installed.

Use the instrument within the scope of the measurement category that corresponds to the module specifications. Do not use the instrument outside the scope of the measurement category that corresponds to the module specifications.

### **Using in a Floating Condition**

- If the frame is used in a floating condition, dangerous voltages may appear at the terminals depending on the external device connected. Be careful of electric shock and electric discharge.
- To prevent electric shock, remove rings, watches, and other metallic accessories and jewelry before operation.

**Wiring**

Dangerous voltages may appear at the terminals if the frame is used in a floating condition. If you do not connect the devices correctly, not only will it damage the instrument or the target device, it may also lead to electric shock or fire. Be careful when you wire the cables, and be sure to check the following points.

- When using an SMU, make sure that the electric potential of each output terminal is within  $\pm 42 \text{ V}_{\text{peak}}$  relative to the ground.

Before output (before turning on the output), check that:

- Cables have been connected to the output terminals of this instrument correctly.
- Cables have been connected to the target device correctly.

During output

- Never touch the terminals or cables when the instrument's output is on.

**Accessories**

Use the accessories specified in this manual. Moreover, use the accessories of this product only with Yokogawa products that specify them as accessories. Do not use faulty accessories.

**Install or use the instrument in appropriate locations**

- Do not install the instrument outdoors or in locations subject to rain or water. Do not use the instrument in such locations.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

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---

**CAUTION**

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**Operating environment limitations**

This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference.

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## AVERTISSEMENT

### **Utilisez cet instrument uniquement pour l'usage prévu.**

Cet instrument fonctionne comme un instrument de mesure conçu pour la source et la mesure de la tension et du courant lorsqu'un SMU est utilisé dans le châssis. Lorsque les modules LS, OPM, VOA et OSW sont installés dans le cadre de cet appareil, celui-ci fonctionne comme un instrument de mesure optique pour mesurer les caractéristiques optiques et évaluer les performances.

Utilisez cet instrument uniquement à cet effet.

### **Inspecter l'apparence physique**

N'utilisez pas l'instrument s'il y a un problème avec son apparence physique.

### **Utiliser l'alimentation électrique adéquate**

Assurez-vous que la tension d'alimentation correspond à la tension d'alimentation nominale de l'appareil et qu'elle ne dépasse pas la plage de tension maximale du cordon d'alimentation à utiliser.

### **Utiliser le cordon d'alimentation et la fiche adaptés**

Pour éviter tout risque de choc électrique, utiliser exclusivement le cordon d'alimentation prévu pour cet instrument. La fiche doit être branchée sur une prise secteur raccordée à la terre. En cas d'utilisation d'une rallonge, celle-ci doit être impérativement reliée à la terre. Par ailleurs, ne pas utiliser ce cordon d'alimentation avec d'autres instruments.

### **Brancher la prise de terre**

Avant de mettre l'instrument sous tension, pour éviter tout choc électrique, veillez à raccorder l'instrument à une mise à la terre de protection. Le cordon d'alimentation à utiliser est un cordon d'alimentation à trois broches. Brancher le cordon d'alimentation sur une prise de courant à trois plots et mise à la terre.

### **Ne pas entraver la mise à la terre de protection**

Ne jamais neutraliser le fil de terre interne ou externe, ni débrancher la borne de mise à la terre. Cela pourrait entraîner un choc électrique ou endommager l'instrument.

### **Ne pas utiliser lorsque les fonctions de protection sont défectueuses**

Avant d'utiliser l'instrument, vérifier que les fonctions de protection, telles que le raccordement à la terre et le fusible, fonctionnent correctement. En cas de dysfonctionnement possible, ne pas utiliser l'instrument.

### **Ne pas utiliser dans un environnement explosif**

Ne pas utiliser l'instrument en présence de gaz ou de vapeurs inflammables. Cela pourrait être extrêmement dangereux.

### **Ne pas retirer le capot, ni démonter ou modifier l'instrument**

Seul le personnel YOKOGAWA qualifié est habilité à retirer le capot et à démonter ou modifier l'instrument. Certains composants à l'intérieur de l'instrument sont à haute tension et par conséquent, représentent un danger.

**Relier l'instrument à la terre avant de le brancher sur des connexions externes**

Toujours relier l'instrument à la terre avant de le brancher aux appareils à mesurer ou à une commande externe.

Avant de toucher un circuit, mettre l'instrument hors tension et vérifier l'absence de tension.

**Précautions à prendre lors de l'utilisation des modules**

- Ne pas appliquer une tension dépassant la tension d'entrée maximum ou la tension nominale à la terre maximum.
- Pour éviter une électrocution, assurez-vous de connecter la borne de mise à la terre de protection du châssis.
- Pour éviter tout risque d'un choc électrique, s'assurer de serrer les vis de module. Sinon les fonctions de protection électrique et mécanique ne seront pas activées.
- Évitez un branchement continu dans un environnement pouvant être soumis à une surtension.

**Catégorie de mesure**

La catégorie de mesure de ces bornes d'entrée de signal de l'instrument varie en fonction des modules installés.

Utilisez l'instrument dans les limites de la catégorie de mesure qui correspondent aux spécifications du module. N'utilisez pas l'instrument en dehors des limites de la catégorie de mesure qui correspondent aux spécifications du module.

**Utilisation dans un état flottant**

- Si le châssis est utilisé dans un état flottant, des tensions dangereuses peuvent apparaître au niveau des bornes en fonction de l'appareil externe connecté. Faites attention aux électrocutions et aux décharges électriques.
- Pour éviter une électrocution, retirez toute bague, montre et autres accessoires métalliques et bijoux avant l'utilisation.

 **Branchez correctement les câbles**

Des tensions dangereuses peuvent apparaître au niveau des bornes si le châssis est utilisé dans un état flottant.

Si vous ne raccordez pas correctement les appareils, non seulement ils endommageront l'instrument ou l'appareil cible, mais cela peut aussi entraîner une électrocution ou un incendie. Soyez prudent lorsque vous branchez les câbles et assurez-vous de vérifier les points suivants.

- Lors de l'utilisation d'un SMU, assurez-vous que le potentiel électrique de chaque borne de sortie est à une valeur de crête de  $\pm 42$  V par rapport à la terre.

Avant la sortie (avant d'activer la sortie), vérifiez que :

- Les câbles ont été connectés correctement aux bornes de sortie de l'instrument.
- Les câbles ont été correctement connectés à l'appareil cible.

Pendant l'activation

- Ne touchez jamais les bornes ou les câbles lorsque la puissance de l'instrument est activée.

**Accessoires**

Utiliser les accessoires spécifiés dans ce manuel. En outre, utiliser les accessoires de ce produit uniquement avec des produits Yokogawa pour lesquels ils sont spécifiés comme accessoires. Ne pas utiliser d'accessoires défectueux.

## Safety Precautions

### Installer et utiliser l'instrument aux emplacements appropriés

- Ne pas installer l'instrument à l'extérieur ou dans des endroits exposés à la pluie ou à l'eau.  
Do not use the instrument in such locations.
- Installer l'instrument de manière à pouvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.

## ATTENTION

### Limitations relatives à l'environnement opérationnel

Ce produit est un produit de classe A (pour environnements industriels). L'utilisation de ce produit dans un zone résidentielle peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.

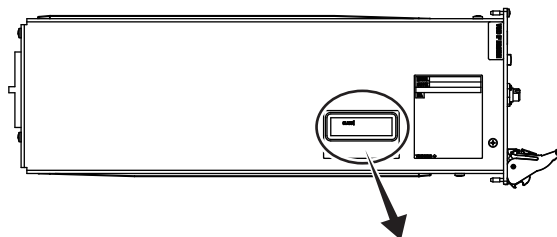
## Safety Precautions for Laser Products

### AQ23111A, AQ23112, and AQ23191A Modules

This instrument uses a laser light source. This instrument is a class 1 laser product as defined by IEC 60825-1:2014 Safety of Laser Products—Part1: Equipment Classification, and Requirements. In addition, this module complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56, dated May 8, 2019.

Laser classes differ depending on the standard number and year. Take safety measures according to the laser class corresponding to the standard of the country or region that the instrument will be used in.

- **AQ23111A**



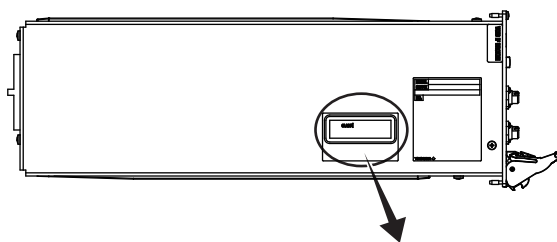
**Laser Class 1 Label**  
Avoid direct eye exposure.



Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56, dated May 8, 2019.  
4-9-8 Myojin-cho, Hachioji-shi, Tokyo 192-8566, Japan

| Class | Laser Type | Center wavelength | Maximum Output Power | Mode Field Diameter | Repetition Rate | Beam divergence angle (all angles @ $1/e^2$ ) |
|-------|------------|-------------------|----------------------|---------------------|-----------------|-----------------------------------------------|
| 1     | DFB-Laser  | 1310 to 1650 nm   | 40 mW                | 9 $\mu$ m           | CW              | 11.5°                                         |

• AQ23112A



**Laser Class 1 Label**  
Avoid direct eye exposure.

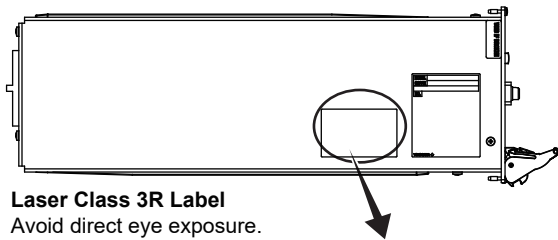


Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.  
 4-9-8 Myojin-cho, Hachioji-shi, Tokyo 192-8566, Japan

| Class | Laser Type | Center wavelength | Maximum Output Power | Mode Field Diameter | Repetition Rate | Beam divergence angle (all angles @ 1/e <sup>2</sup> ) |
|-------|------------|-------------------|----------------------|---------------------|-----------------|--------------------------------------------------------|
| 1     | DFB-Laser  | 1310 to 1650 nm   | 40 mW                | 9 μm                | CW              | 11.5°                                                  |

Safety Precautions

• AQ23191A



**Laser Class 3R Label**  
Avoid direct eye exposure.

**AQ23191A-CB**



Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.  
4-9-8 Myojin-cho, Hachioji-shi, Tokyo 192-8566, Japan

**AQ23191A-CL**



Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.  
4-9-8 Myojin-cho, Hachioji-shi, Tokyo 192-8566, Japan

**AQ23191A-CB**



**AQ23191A-CL**



| Class | Laser Type | Center wavelength | Maximum Output Power | Mode Field Diameter | Repetition Rate | Beam divergence angle (all angles @ 1/e <sup>2</sup> ) |
|-------|------------|-------------------|----------------------|---------------------|-----------------|--------------------------------------------------------|
| 3R    | ASE Source | C band<br>CL band | 160 mW<br>130 mW     | 9 μm                | CW              | 11.5°                                                  |

# Regulations and Sales in Various Countries and Regions

## Waste Electrical and Electronic Equipment (WEEE)



(EU WEEE Directive valid only in the EEA\* and UK WEEE Regulation in the UK)  
This product complies with the WEEE marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste. When disposing of products in the EEA or UK, contact your local Yokogawa office in the EEA or UK respectively.

\* EEA: European Economic Area

## Batteries and waste batteries



(EU Battery Directive/Regulation valid only in the EEA and UK Battery Regulation in the UK)

Batteries are included in this product. This marking indicates they shall be sorted out and collected as ordained in the EU battery Directive/Regulation and UK battery Regulation.

Battery type: Lithium battery

When you need to replace batteries, contact your local Yokogawa office in the EEA or UK respectively.

## Authorized representative in the EEA

Yokogawa Europe B.V. is the authorized representative of Yokogawa Test & Measurement Corporation for this product in the EEA. To contact Yokogawa Europe B.V., see the separate list of worldwide contacts, PIM 113-01Z2.

## 關於在台灣銷售

This section is valid only in Taiwan.

關於在台灣所販賣的符合其相關規定的電源線 A1100WD 的限用物質含量信息，請至下麵的網址進行查詢

<https://tmi.yokogawa.com/support/service-warranty-quality/product-compliance/>

## Compliance with the Radio Waves Act (Republic of Korea)

This product complies with the Radio Waves Act (Republic of Korea).

- 1) Trade Name: Yokogawa Test & Measurement Corporation
- 2) Model & Model Name: See the table below.
- 3) Date of Manufacture: Listed on the instrument
- 4) Manufacturer: Yokogawa Test & Measurement Corporation
- 5) Country of origin: Japan

| Model    | Model Name                    | Registration Website URL                                                                              |
|----------|-------------------------------|-------------------------------------------------------------------------------------------------------|
| AQ23011A | Multi-Application Test System | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-1">http://www.rra.go.kr/selfform/IMY-EEN531-1</a>   |
| AQ23012A | Multi-Application Test System | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-2">http://www.rra.go.kr/selfform/IMY-EEN531-2</a>   |
| AQ23811A | Source Measure Unit           | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-3">http://www.rra.go.kr/selfform/IMY-EEN531-3</a>   |
| AQ23211A | Optical Power Meter           | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-4">http://www.rra.go.kr/selfform/IMY-EEN531-4</a>   |
| AQ23212A | Optical Power Meter           | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-5">http://www.rra.go.kr/selfform/IMY-EEN531-5</a>   |
| AQ23202A | Interface Module              | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-6">http://www.rra.go.kr/selfform/IMY-EEN531-6</a>   |
| AQ23291A | Optical Sensor Head           | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-7">http://www.rra.go.kr/selfform/IMY-EEN531-7</a>   |
| AQ23295A | Optical Sensor Head           | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-8">http://www.rra.go.kr/selfform/IMY-EEN531-8</a>   |
| AQ23221A | Optical Power Meter           | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-9">http://www.rra.go.kr/selfform/IMY-EEN531-9</a>   |
| AQ23311A | Variable Optical Attenuator   | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-10">http://www.rra.go.kr/selfform/IMY-EEN531-10</a> |
| AQ23321A | Variable Optical Attenuator   | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-11">http://www.rra.go.kr/selfform/IMY-EEN531-11</a> |
| AQ23332A | Variable Optical Attenuator   | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-12">http://www.rra.go.kr/selfform/IMY-EEN531-12</a> |
| AQ23411A | Optical Switch                | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-13">http://www.rra.go.kr/selfform/IMY-EEN531-13</a> |
| AQ23412A | Optical Switch                | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-13">http://www.rra.go.kr/selfform/IMY-EEN531-13</a> |
| AQ23413A | Optical Switch                | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-14">http://www.rra.go.kr/selfform/IMY-EEN531-14</a> |
| AQ23421A | Optical Switch                | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-15">http://www.rra.go.kr/selfform/IMY-EEN531-15</a> |
| AQ23422A | Optical Switch                | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-15">http://www.rra.go.kr/selfform/IMY-EEN531-15</a> |
| AQ23111A | Light source                  | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-16">http://www.rra.go.kr/selfform/IMY-EEN531-16</a> |
| AQ23112A | Light source                  | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-16">http://www.rra.go.kr/selfform/IMY-EEN531-16</a> |
| AQ23191A | Light source                  | <a href="http://www.rra.go.kr/selfform/IMY-EEN531-17">http://www.rra.go.kr/selfform/IMY-EEN531-17</a> |

## Disposal

When disposing of YOKOGAWA products, follow the laws and ordinances of the country or region where the products will be disposed of.

## How to View the User's Manual

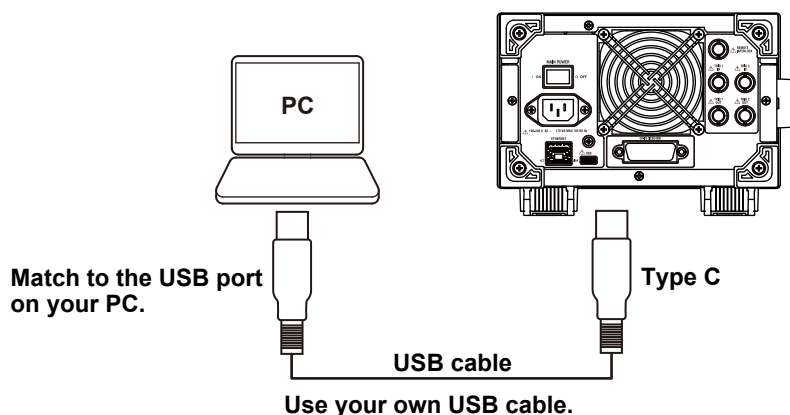
The following PDF file is stored in the MANUAL folder in the frame's internal storage device.

| File name                                                                               | Manual Title                                                                                    | Manual No.       |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------|
| Features&Operation_Manual_Japanese_*.pdf<br>The asterisk represents the edition number. | AQ23011A, AQ23012A<br>Multi-Application Test System<br>Features Guide                           | IM AQ23011A-01EN |
|                                                                                         | AQ23011A, AQ23012A<br>Multi-Application Test System<br>User's Manual                            | IM AQ23011A-02EN |
| Communication_Interface_Japanese_1.pdf<br>The asterisk represents the edition number.   | AQ23011A, AQ23012A<br>Multi-Application Test System<br>Communication Interface<br>User's Manual | IM AQ23011A-17EN |

To view the PDF file above, you need Adobe Reader 5.0 or later.

Follow the procedure below to open the PDF file.

1. Turn on the power to the instrument.
2. Connect the type C USB port on the rear panel of the instrument to the USB port of the PC with a USB cable. For a description of the rear panel, see Chapter 1, "Component Names and Functions." If the instrument is connected to the PC for the first time as a mass storage device, a USB driver is automatically installed in the PC.



3. On your PC, start Explorer or another browser. A list appears showing the folders in the frame's internal storage.
4. Open the /MANUAL folder. The following PDF file will be displayed.
5. Open the PDF file. The user's manual appears on the computer screen. If necessary, download the PDF data to your PC.

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## Chapter 1 Component Names and Functions

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**Chapter 6 Specifications**

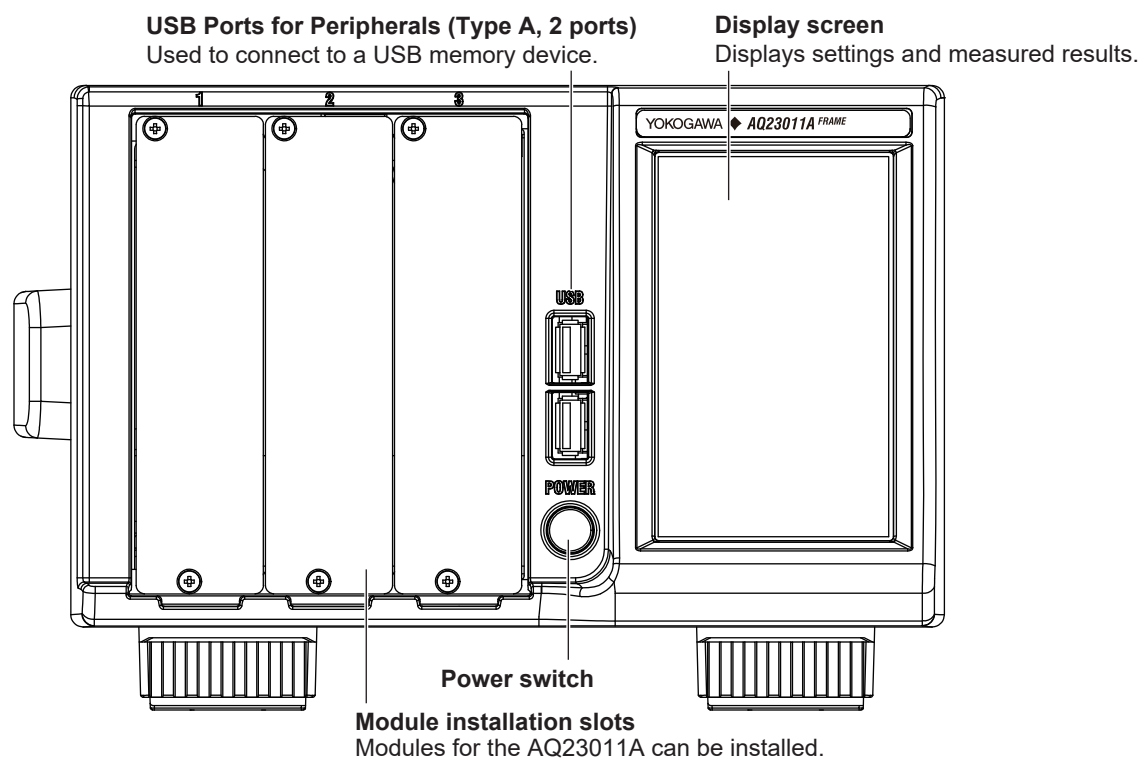
|      |                                                             |      |
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**1****2****3****4****5****6**

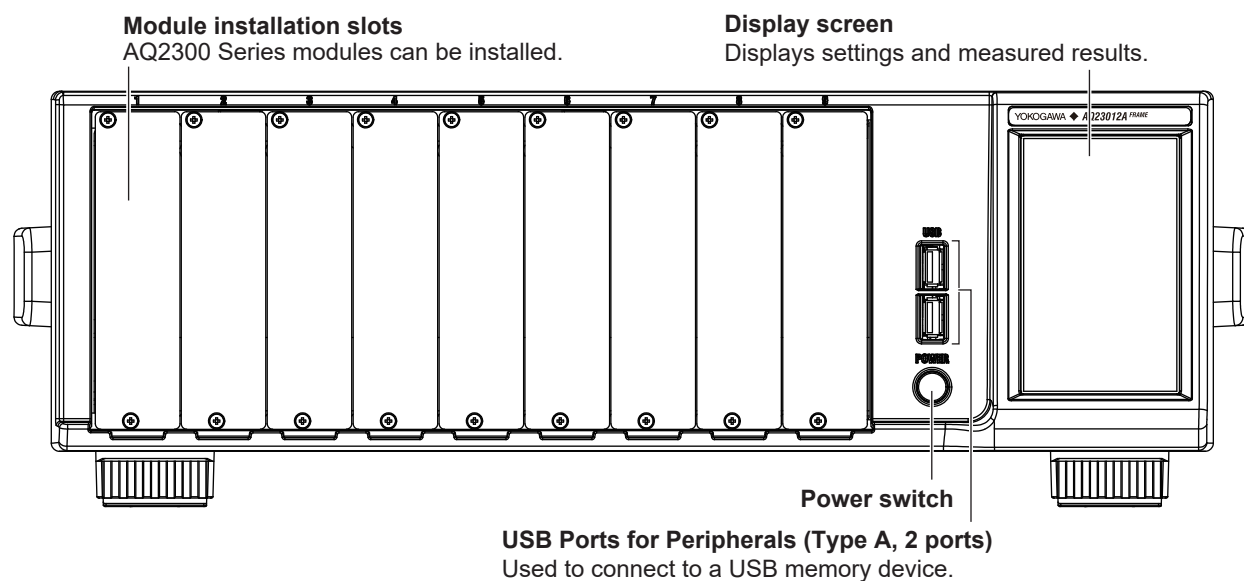
## 1.1 Front Panel

### Frame

#### AQ23011A (three slots)

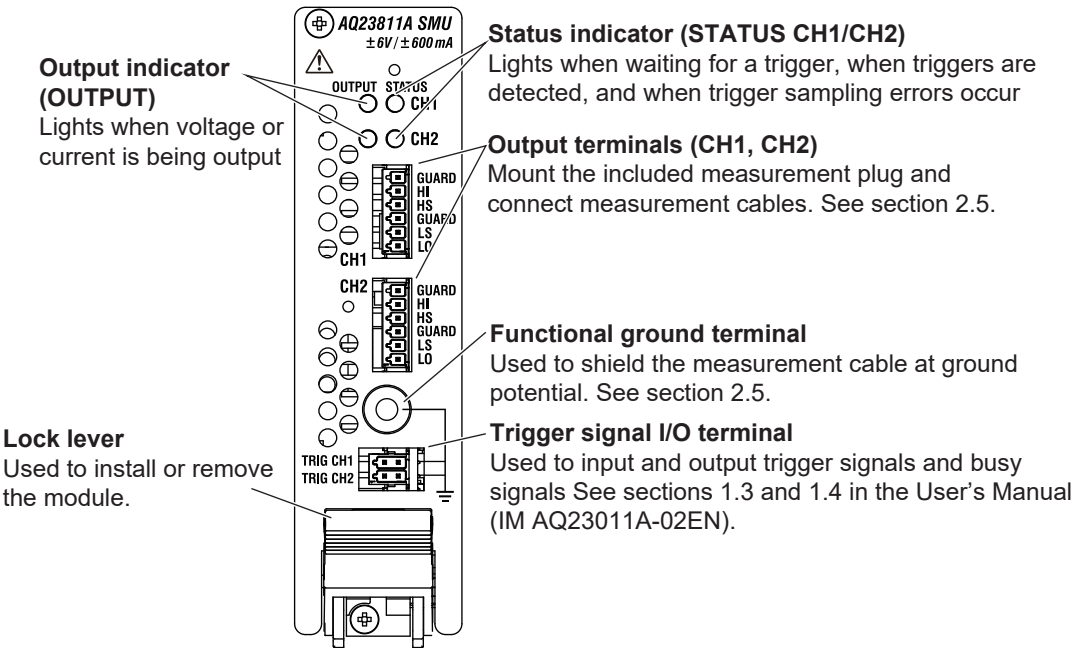


#### AQ23012A (nine slots)



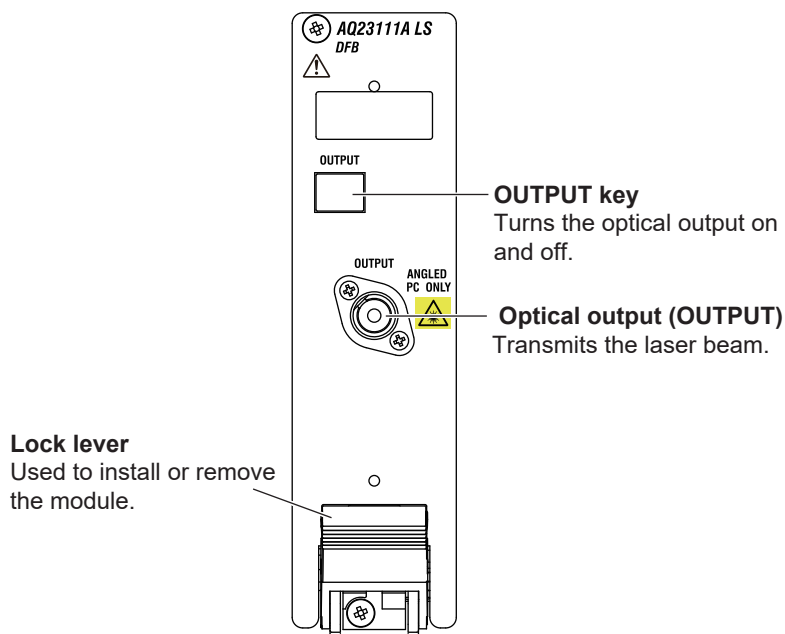
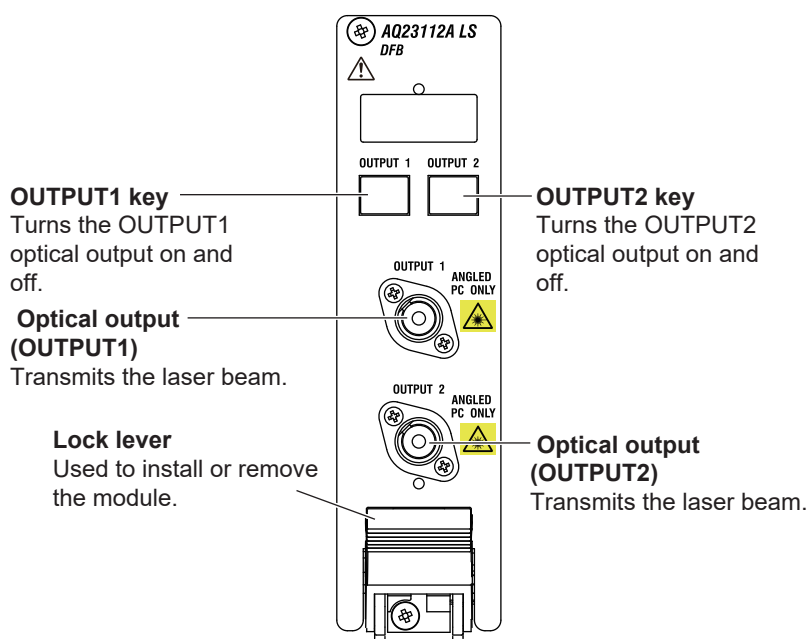
# Module

## AQ23811A Source Measure Unit (SMU)

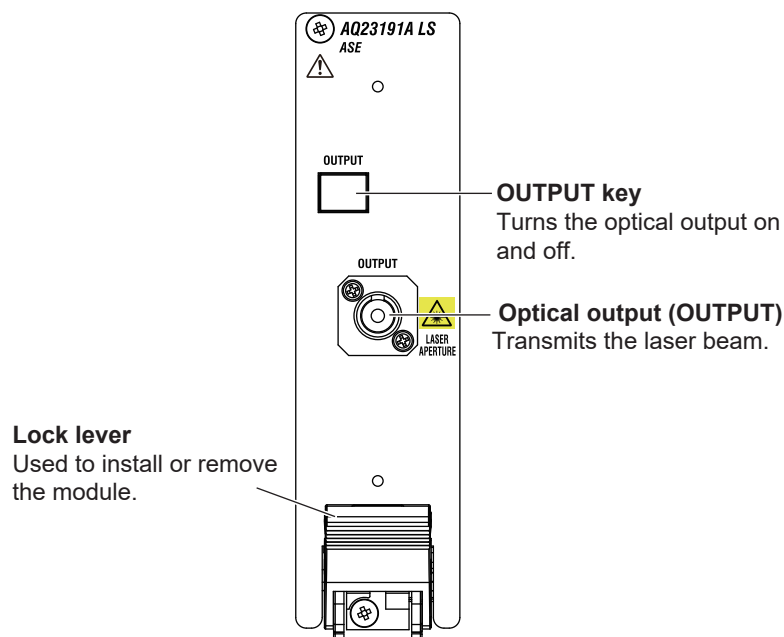


• Conditions that cause output indicator and status indicator to light

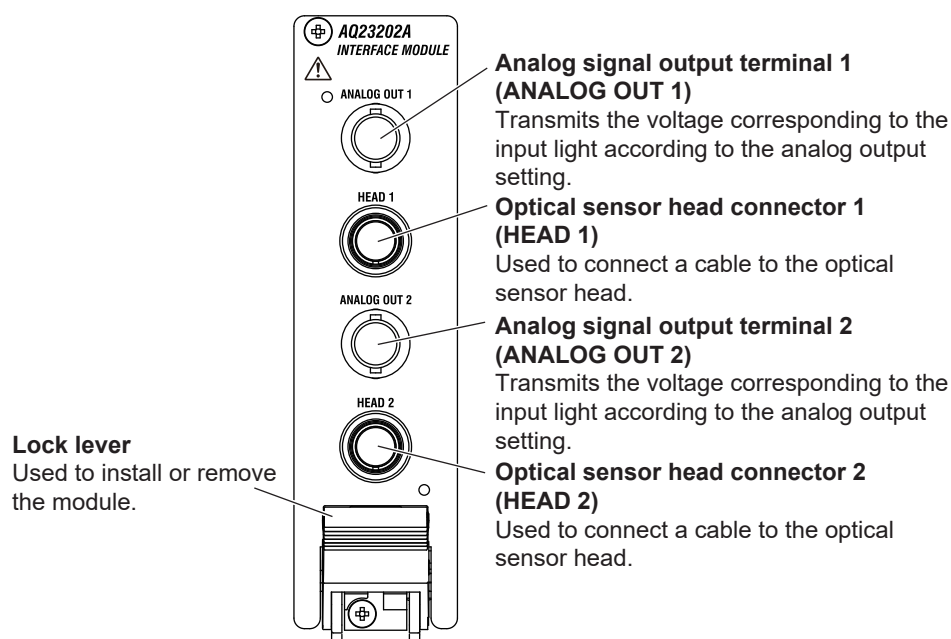
| Indicator name | Color  | On state | Conditions                      |
|----------------|--------|----------|---------------------------------|
| OUTPUT         | Green  | Solid    | Voltage or current being output |
|                |        | Blinking | Module starting                 |
|                | Orange | Solid    | Limiter activated               |
|                | Red    | Solid    | Module operation error          |
| STATUS         | Green  | Solid    | Trigger-wait state              |
|                | Orange | Solid    | Trigger detected                |
|                | Red    | Solid    | Trigger sampling error          |

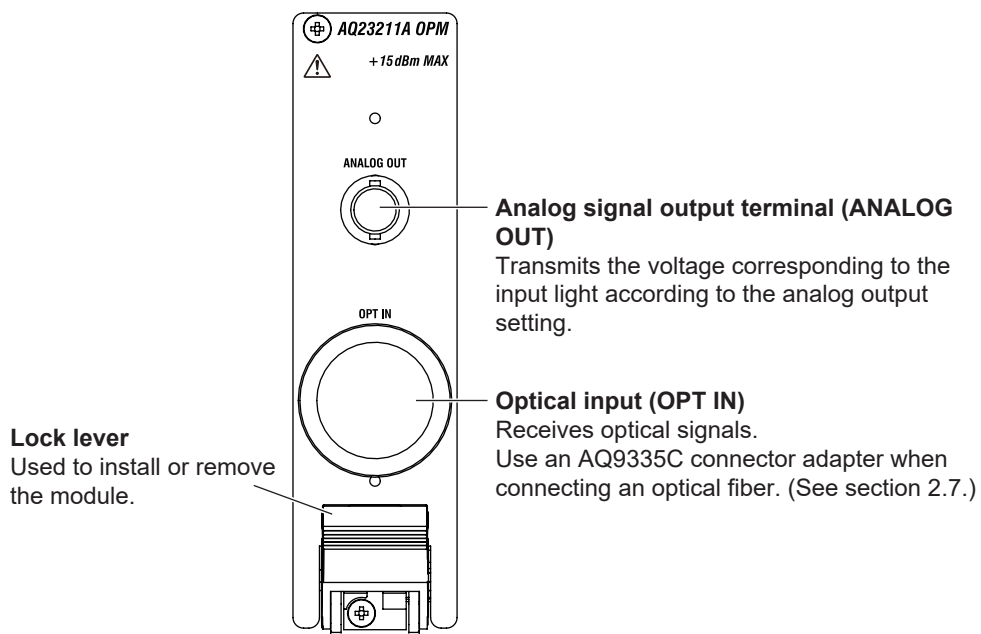
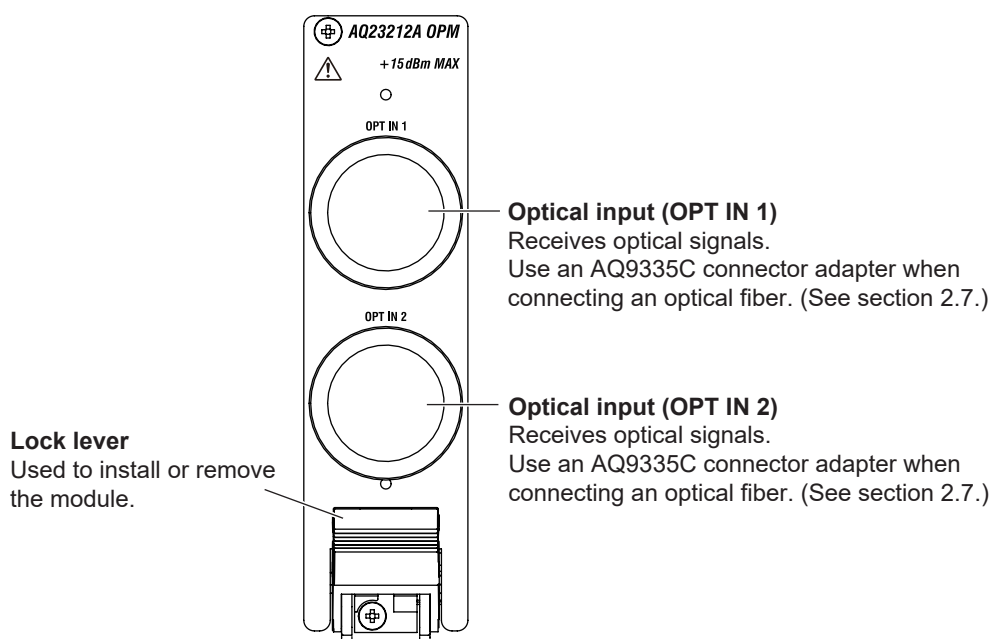
**AQ23111A Light Source (LS)****AQ23112A Light Source (LS)**

### AQ23191A Light Source (LS)

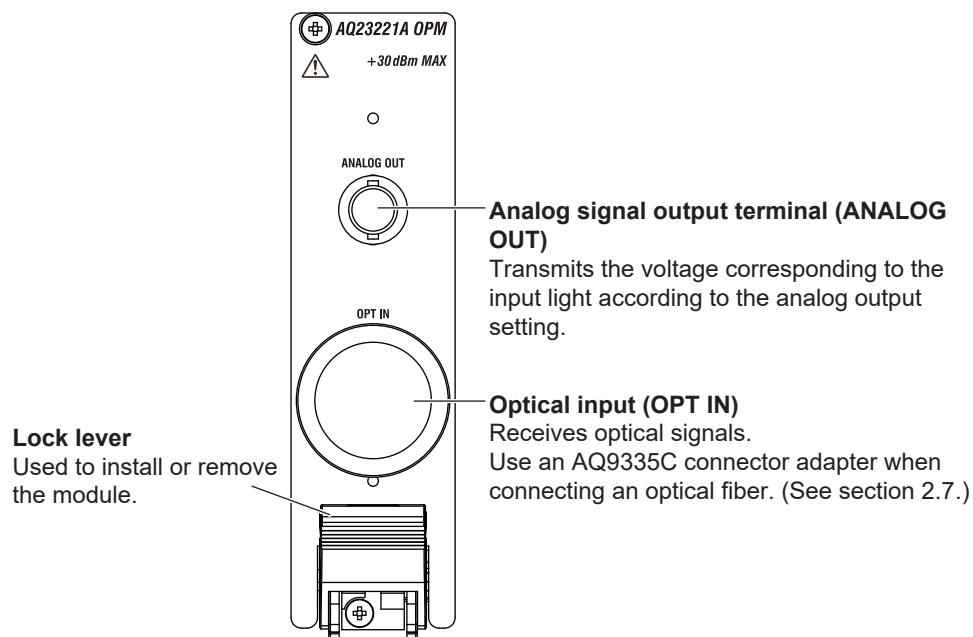


### AQ23202A Interface Module (OPM)

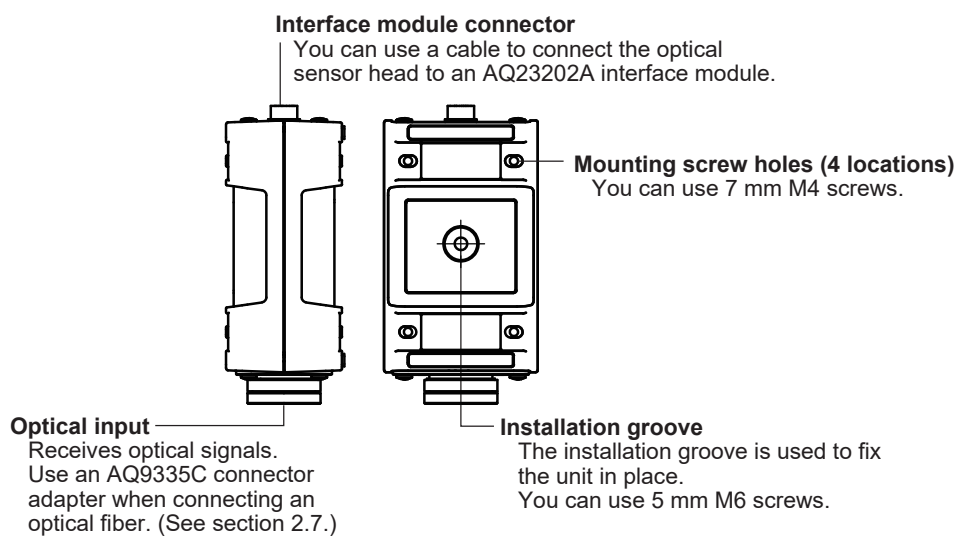


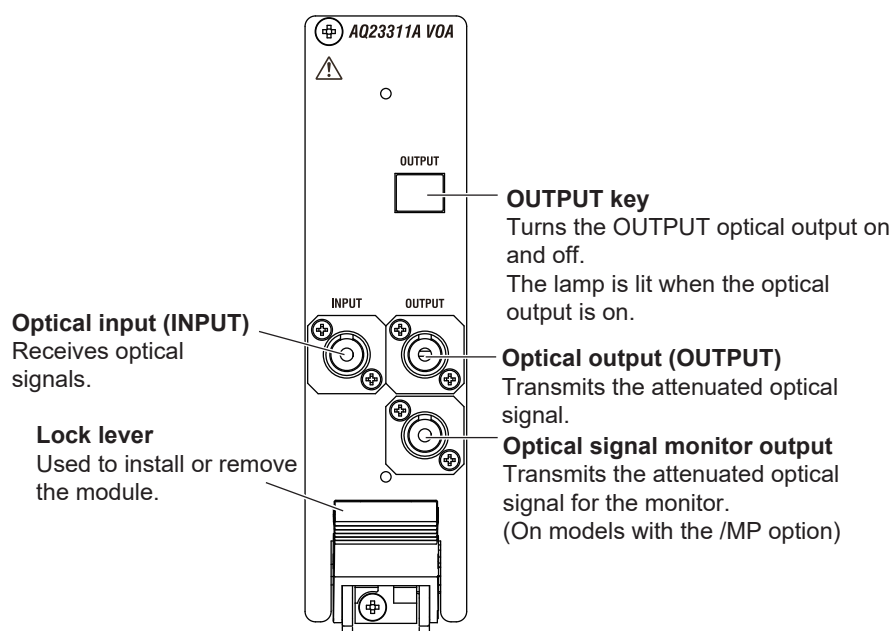
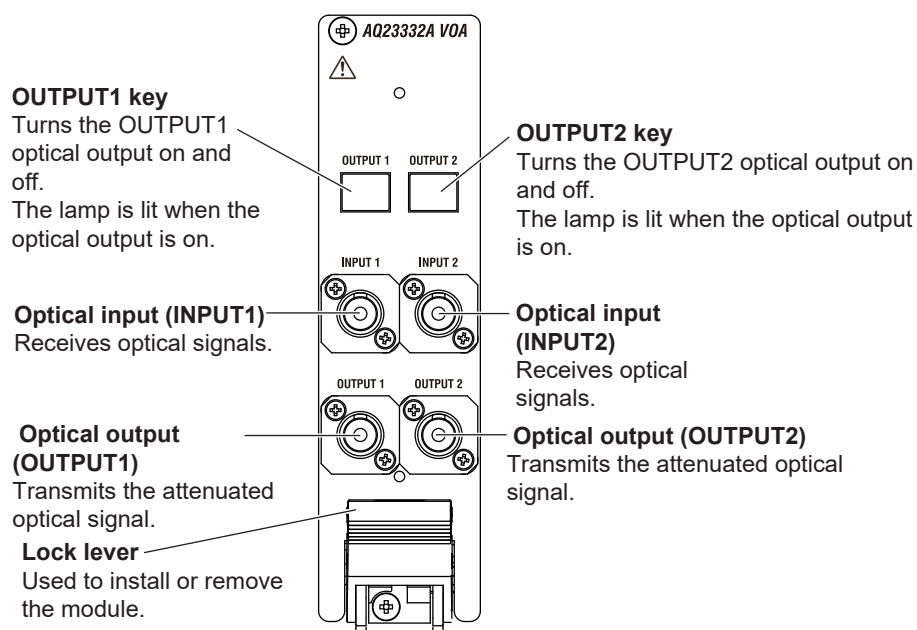
**AQ23211A Optical Power Meter (OPM)****AQ23212A Optical Power Meter (OPM)**

### AQ23221A Optical Power Meter (OPM)



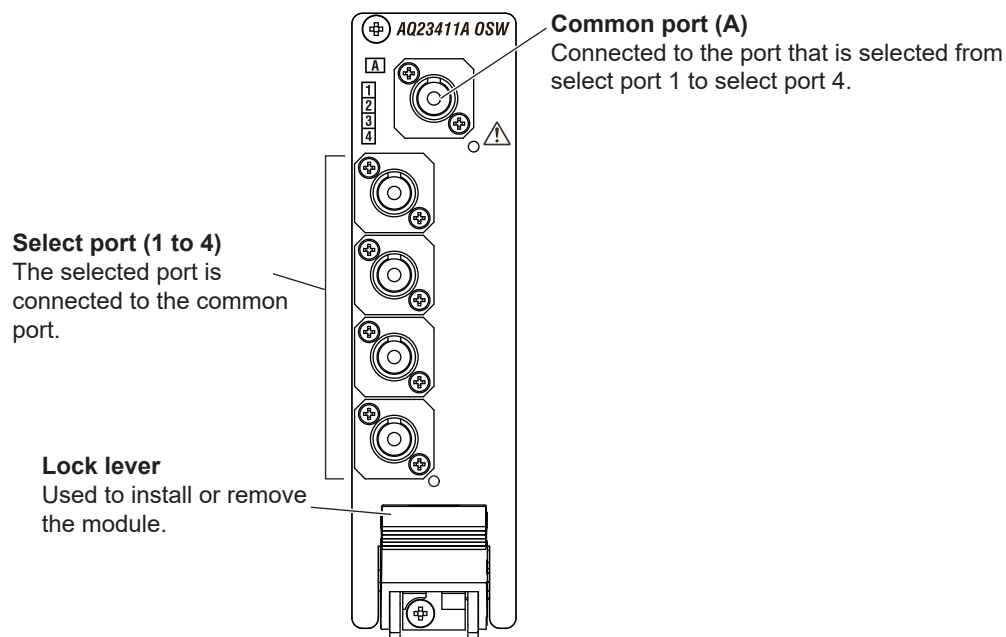
### AQ23291A, AQ23295A Optical Sensor Head (OPM)



**AQ23311A, AQ23321A Variable Optical Attenuator (VOA)****AQ23332A Variable Optical Attenuator (VOA)**

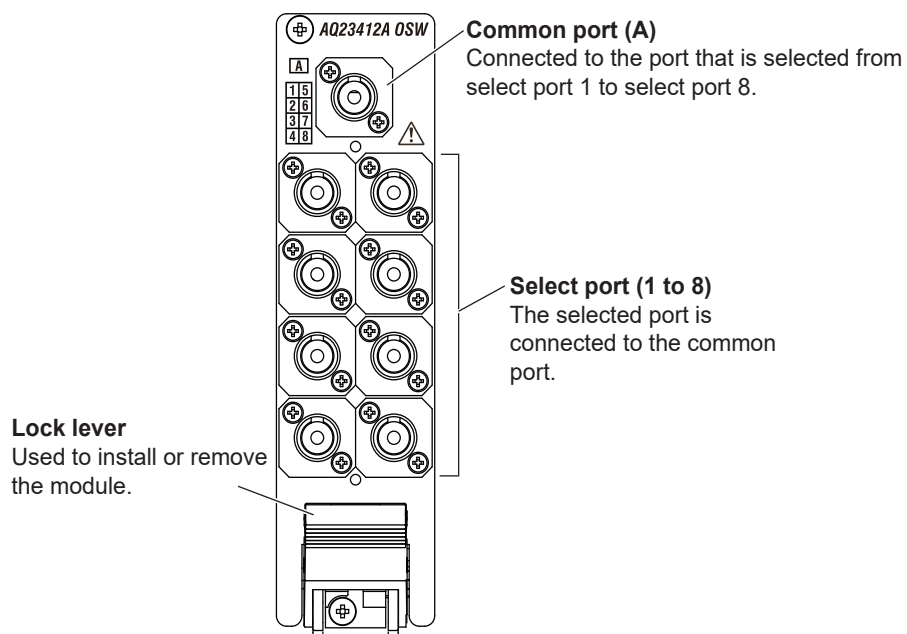
### AQ23411A Optical Switch (OSW)

#### 1×4 Type



### AQ23412A Optical Switch (OSW)

#### 1×8 Type

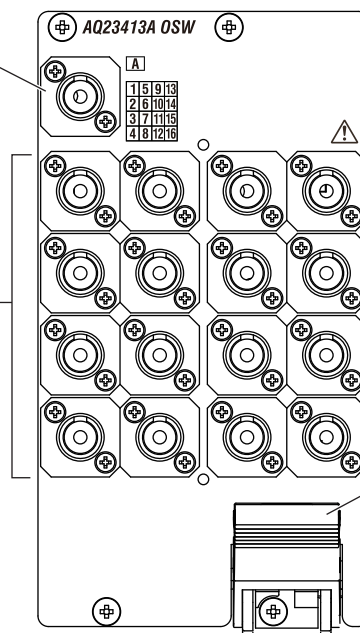


**AQ23413A Optical Switch (OSW)****1×16 Type****Common port (A)**

Connected to the port that is selected from select port 1 to select port 16.

**Select port (1 to 16)**

The selected port is connected to the common port.

**Lock lever**

Used to install or remove the module.

**AQ23421A Optical Switch (OSW)****1×2 Type****Common port (A)****CH1**

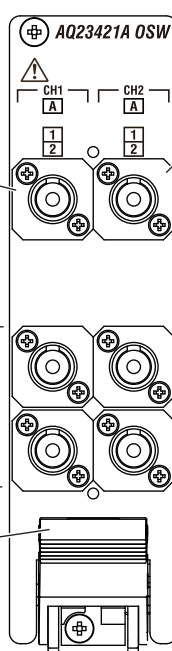
Connected to the port that is selected from CH1 select port 1 and 2.

**Select port (1 to 2)****CH1**

The selected port is connected to the CH1 common port.

**Lock lever**

Used to install or remove the module.

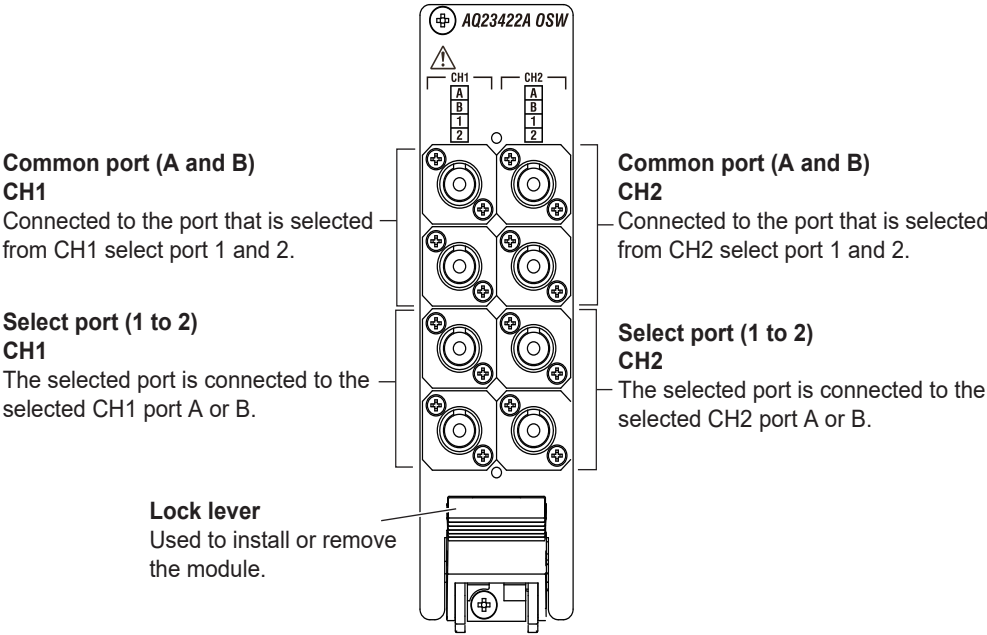
**Common port (A)****CH2**

Connected to the port that is selected from CH2 select port 1 and 2.

**Select port (1 to 2)****CH2**

The selected port is connected to the CH2 common port.

**AQ23422A Optical Switch (OSW)**  
**2×2 Type**

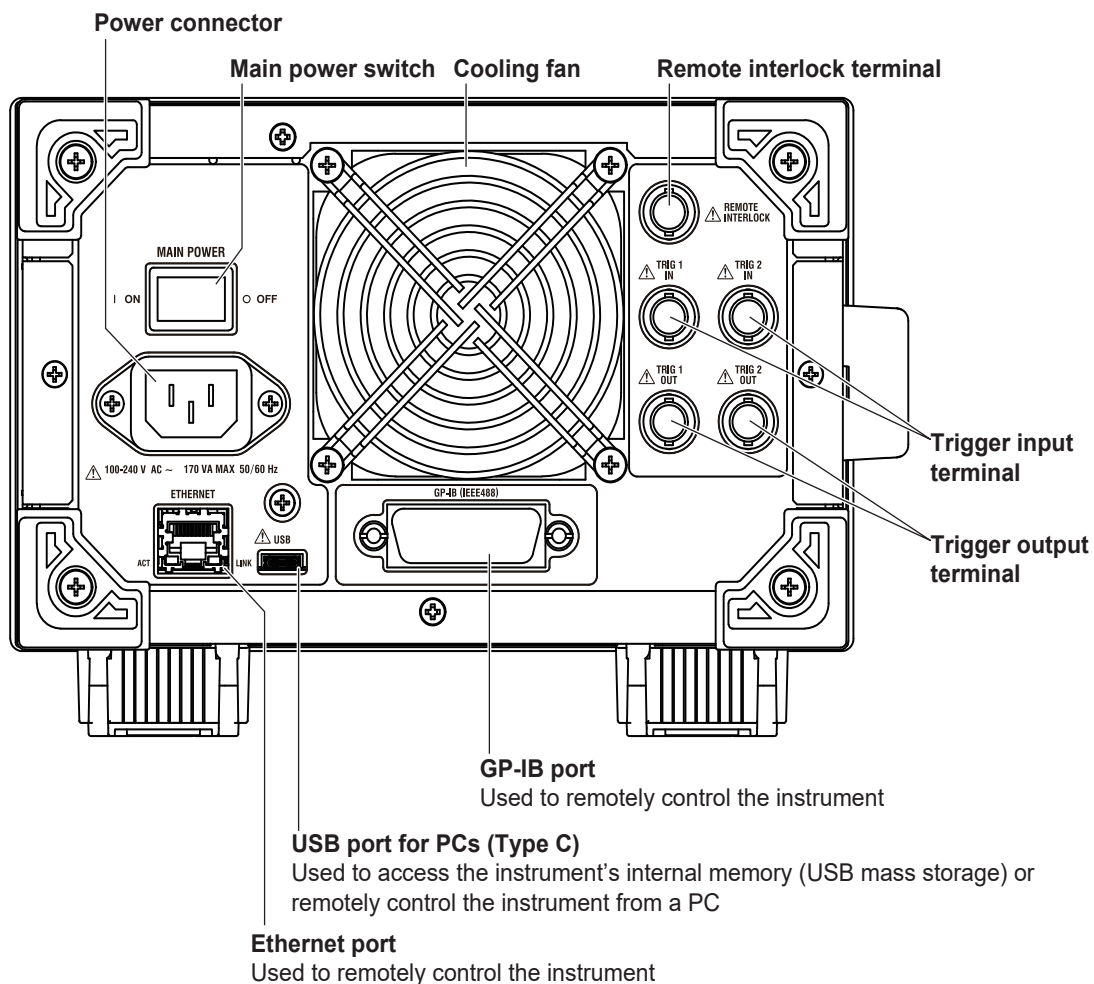


## 1.2 Rear Panel

### Frame

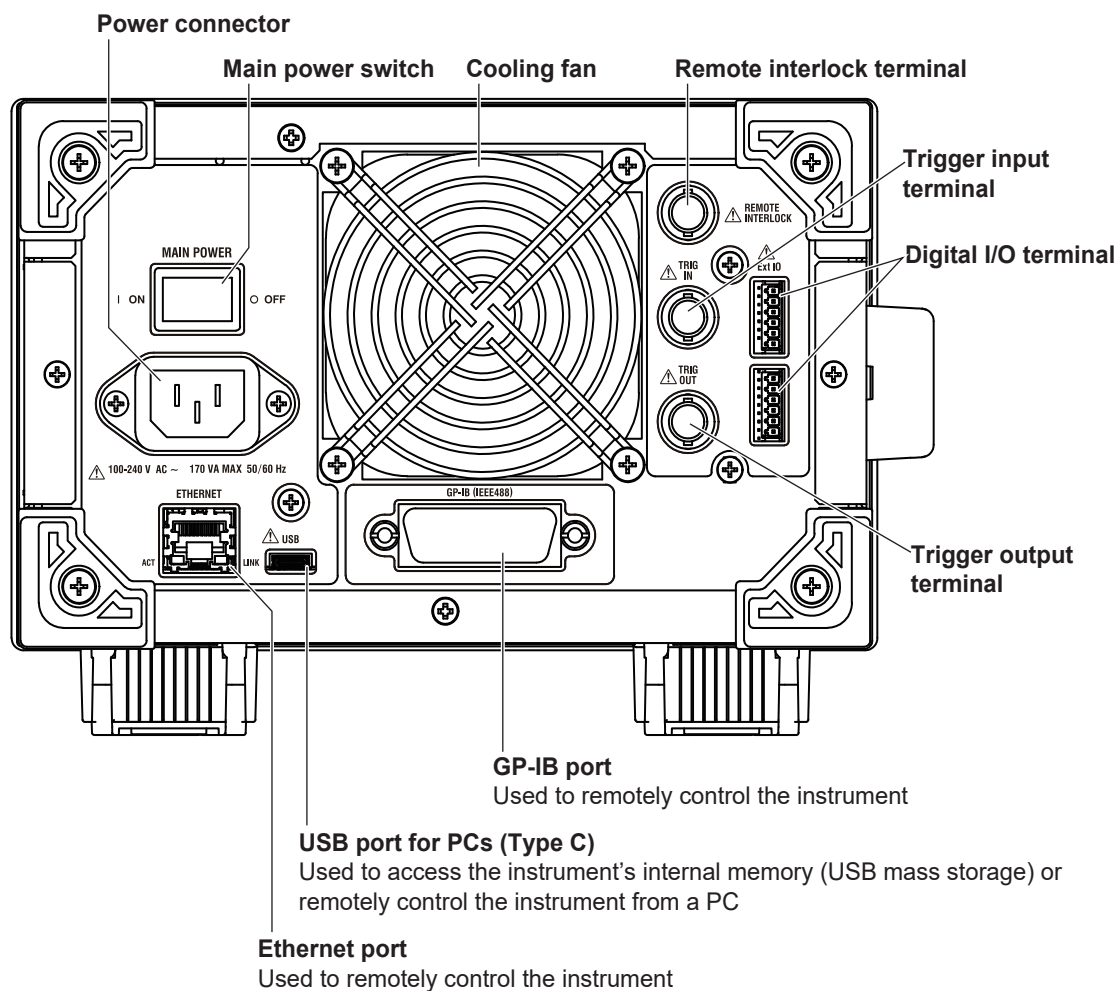
AQ23011A (three slots)

- Suffix code -ETP-C01

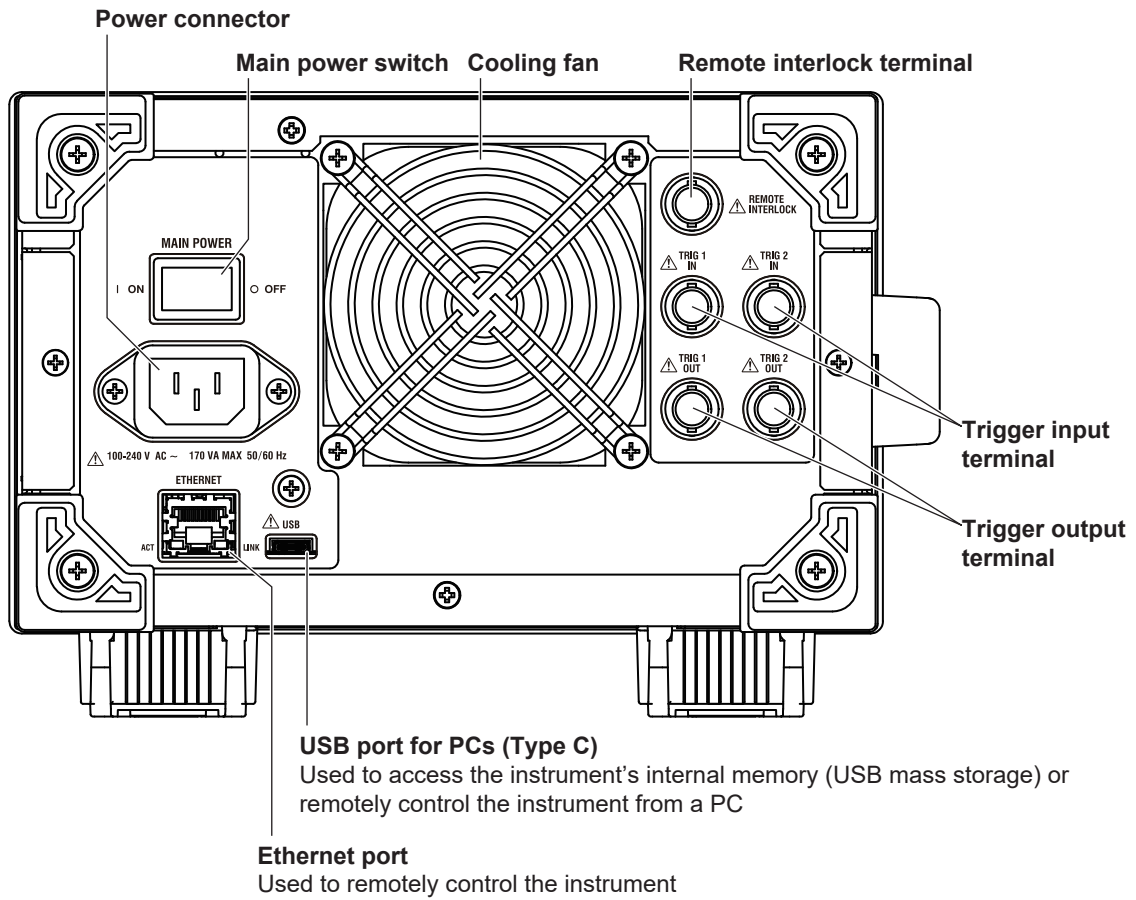


## 1.2 Rear Panel

- Suffix code -EDP-C01

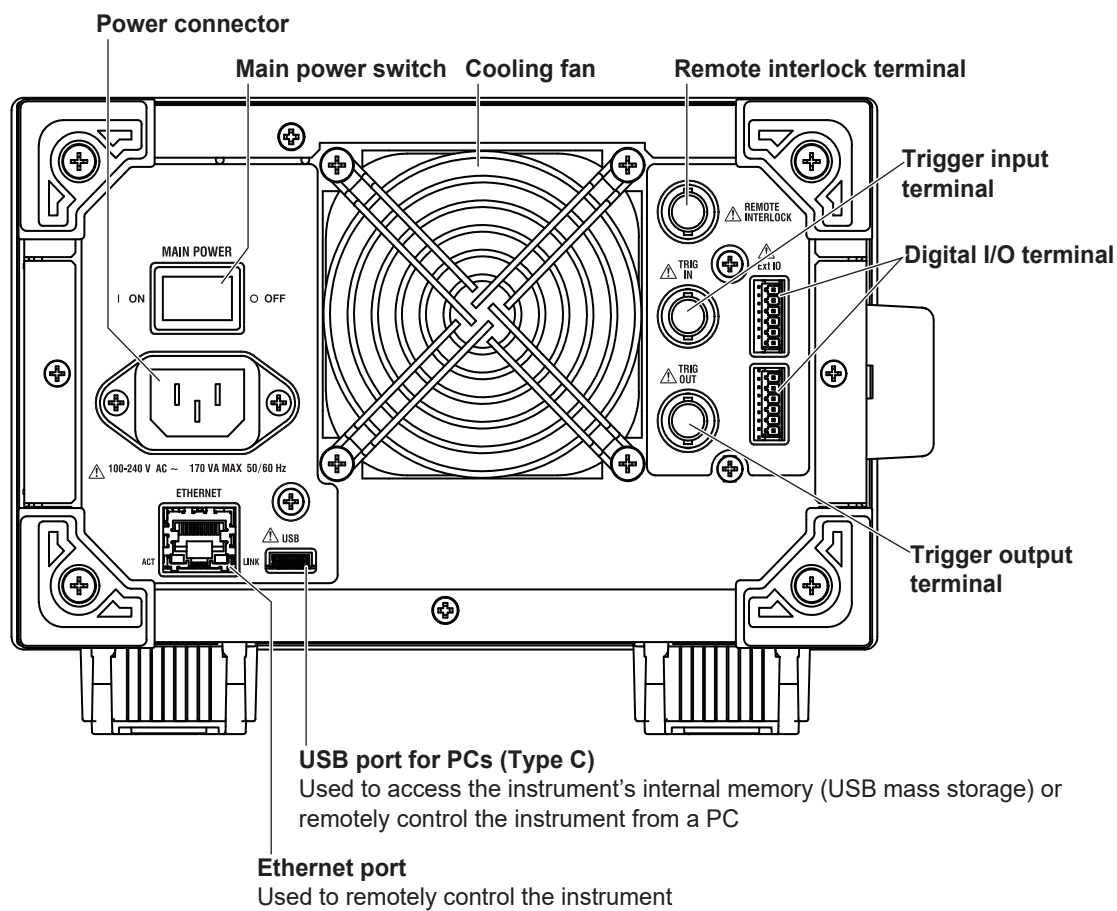


- Suffix code -ETP-N01



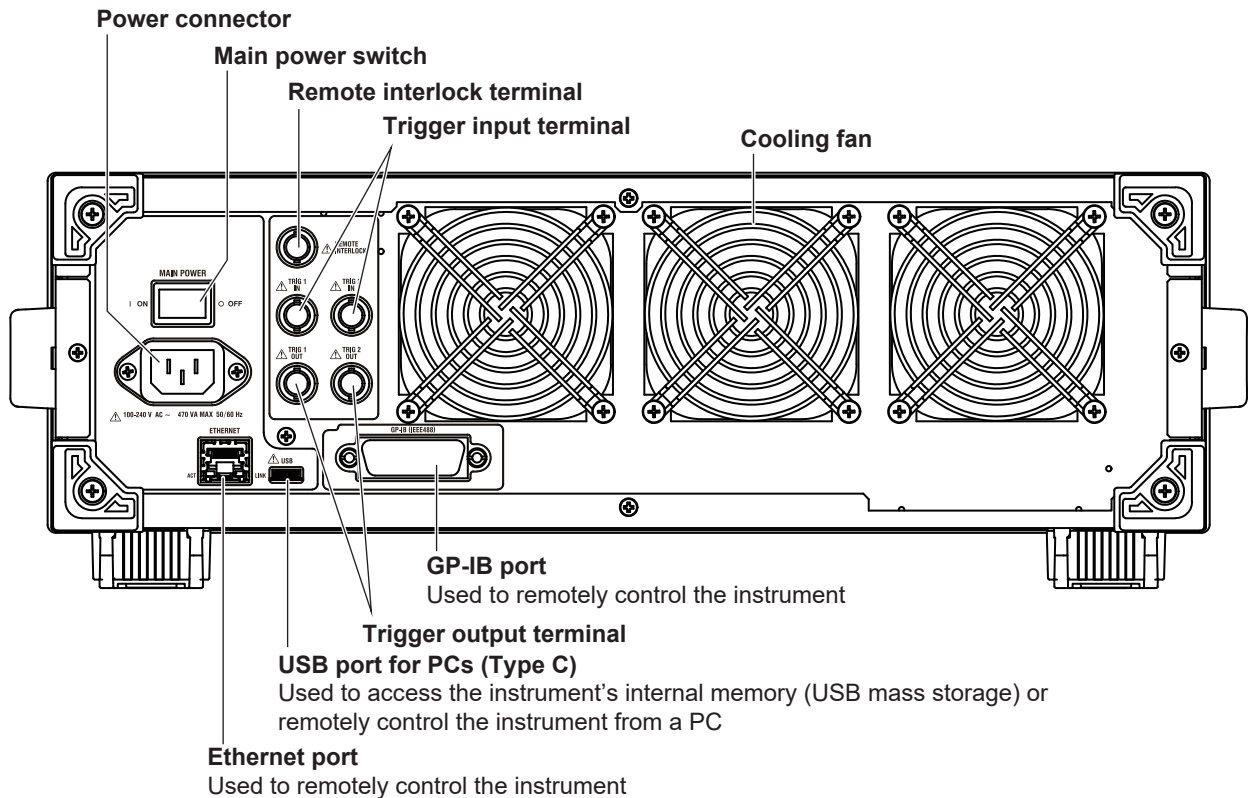
## 1.2 Rear Panel

- Suffix code -EDP-N01

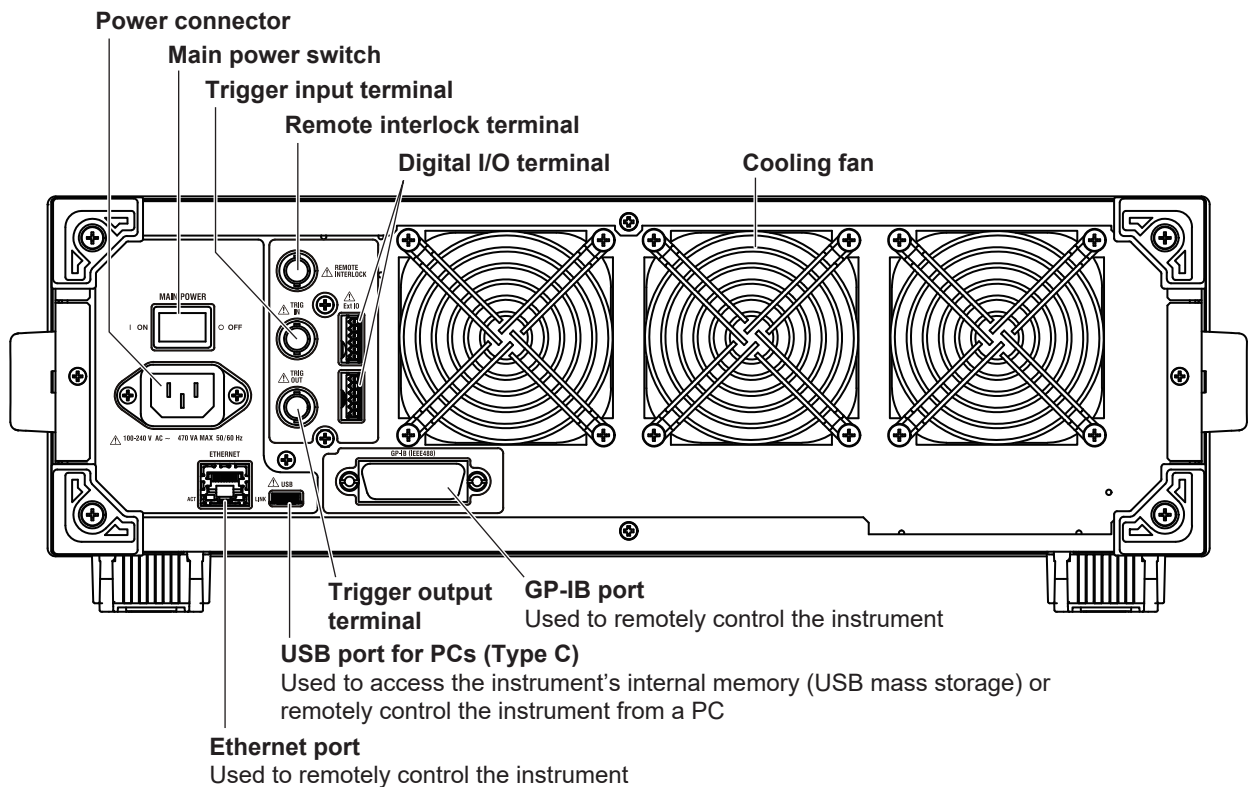


**AQ23012A (nine slots)**

- Suffix code -ETP-C01

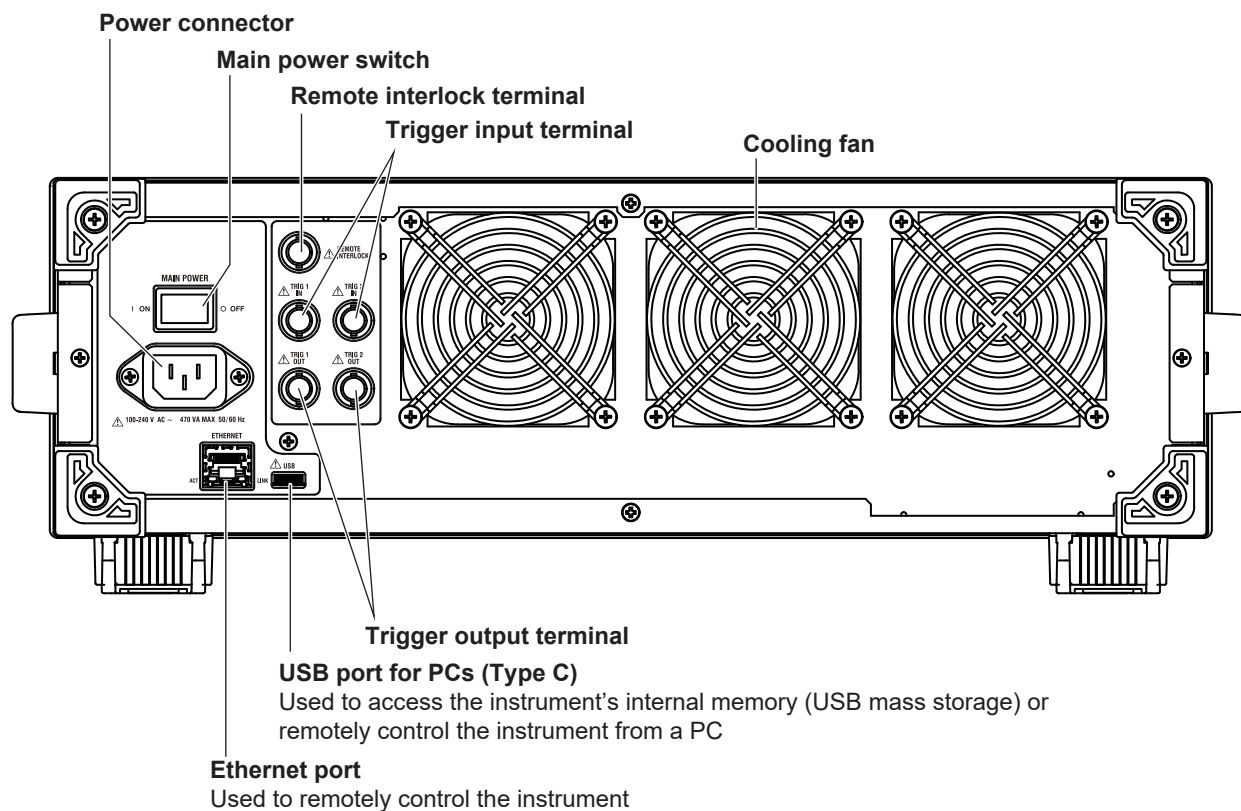


- Suffix code -EDP-C01

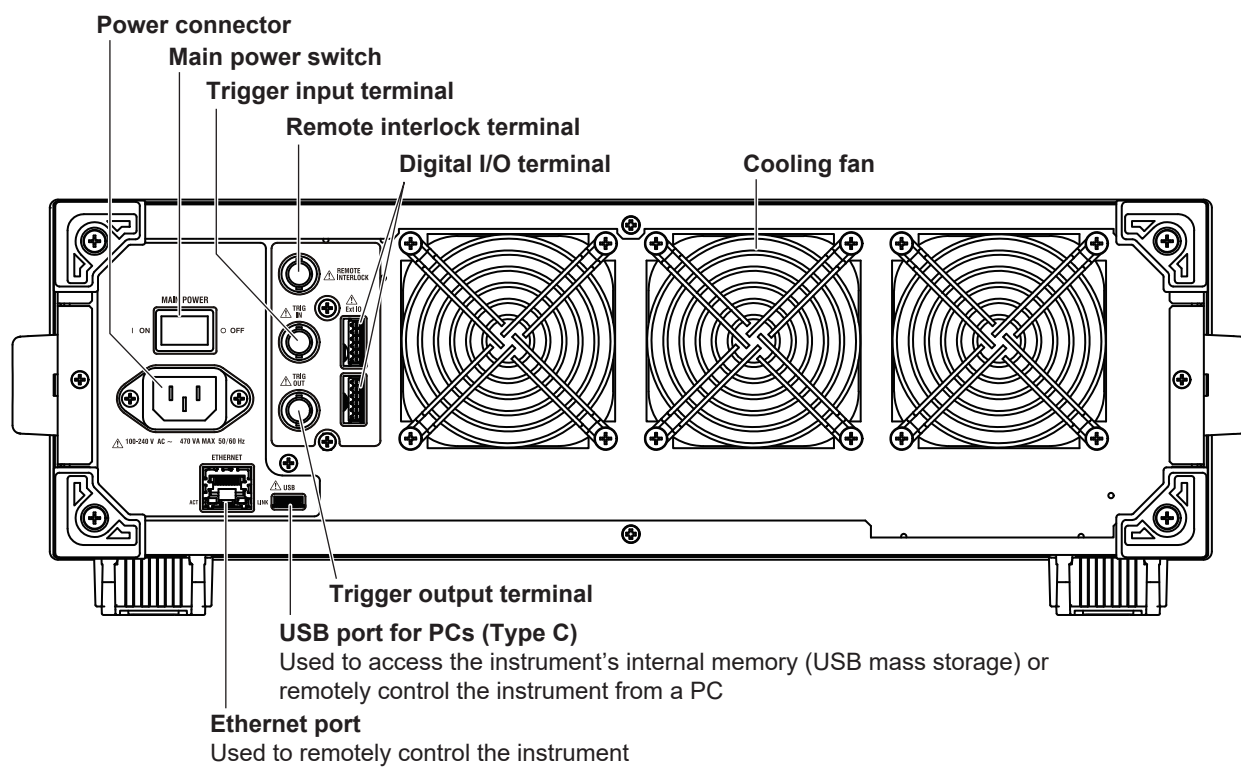


## 1.2 Rear Panel

- **Suffix code -ETP-N01**

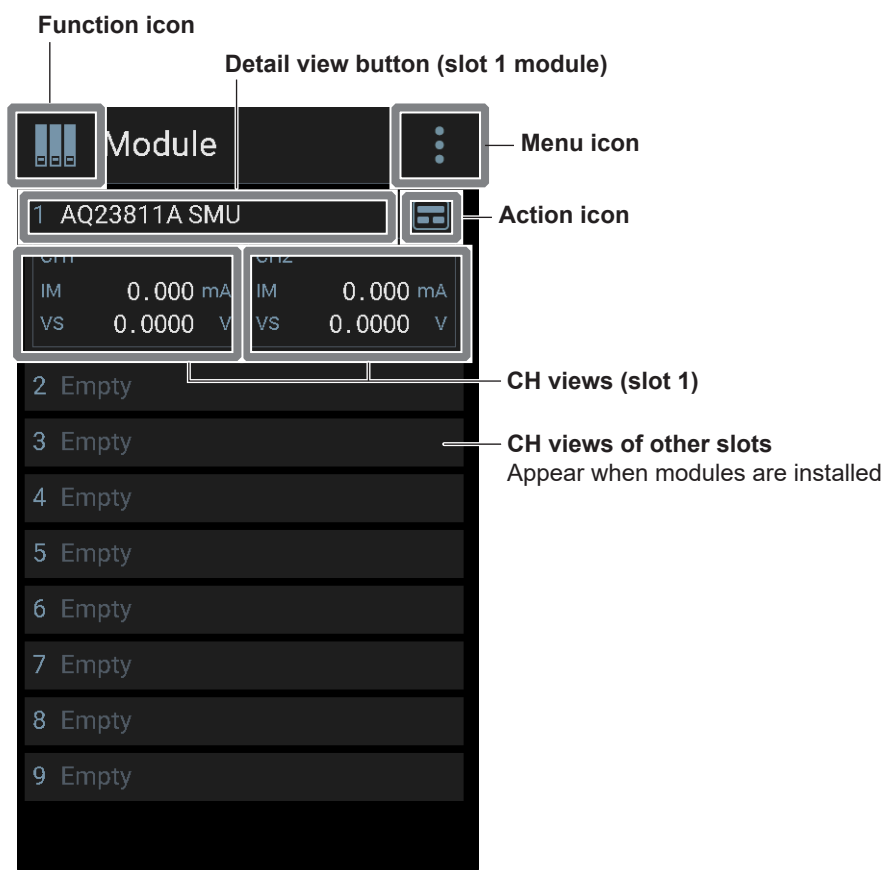


- **Suffix code -EDP-N01**



## 1.3 Display Screen

### Top screen (summary view)



#### Function icon

Used to display the function menu.

The following five screens can be switched from the function menu. For details, see section 3.2.

- Module screen (summary view of the top screen)
- Trigger screen
- Application screen
- File screen
- System screen

#### Detail view button

Used to show a detail view. For details about the detail view, see page 1-19.

### 1.3 Screens

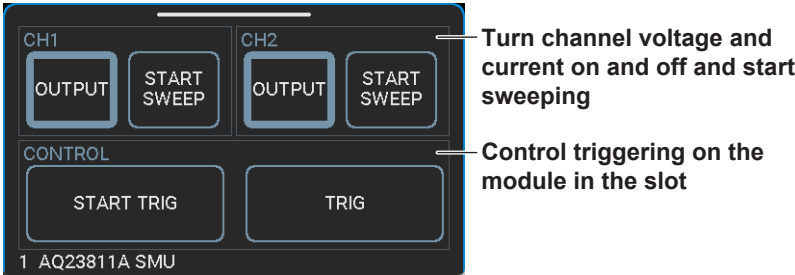
#### Action icon

Used to show the action screen.

- **SMU**

On the action screen, you can turn voltage and current output on and off and generate triggers. For details, see section 1.1 in IM AQ23011A-02EN.

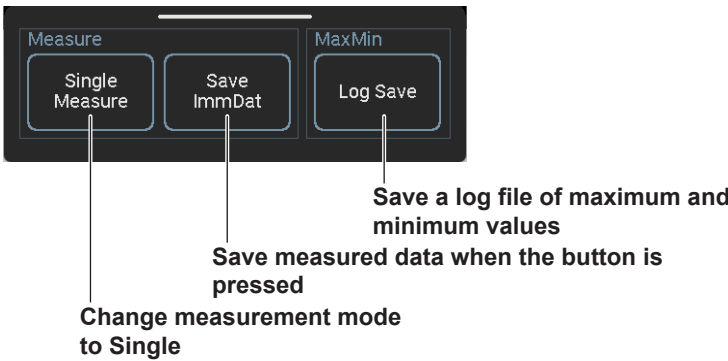
#### Action screen



- **OPM**

On the action screen, you can set the single measurement mode, save measured data, and so on. For details, see sections 2.1 and 2.8 in IM AQ23011A-02EN.

#### Action screen



- **VOA**

On the action screen, you can turn the optical output on and off. For details, see sections 2.1 and 3.4 in IM AQ23011A-02EN.

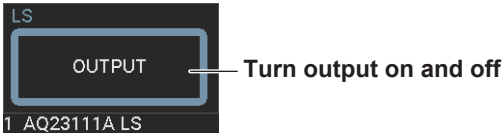
#### Action screen



- **LS**

On the action screen, you can turn the optical output on and off. For details, see sections 2.1 and 5.6 in IM AQ23011A-02EN.

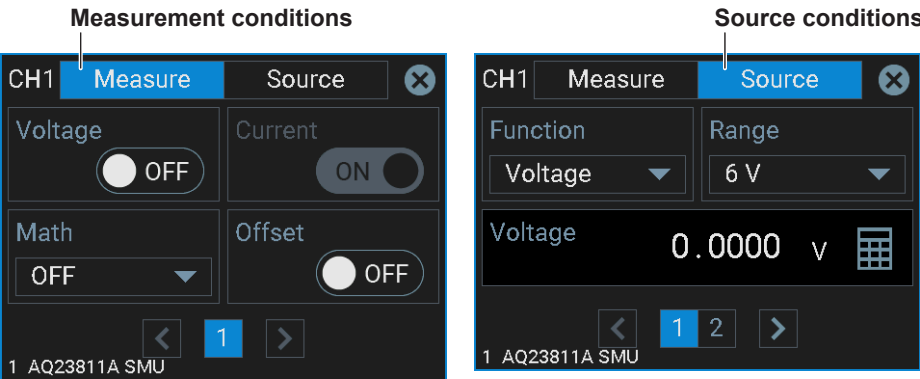
#### Action screen



CH Display

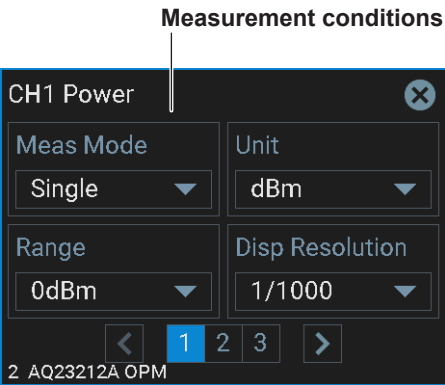
• SMU

You can edit the CH source conditions and measurement conditions. For details, see sections 1.1 and 1.2 in IM AQ23011A-02EN.



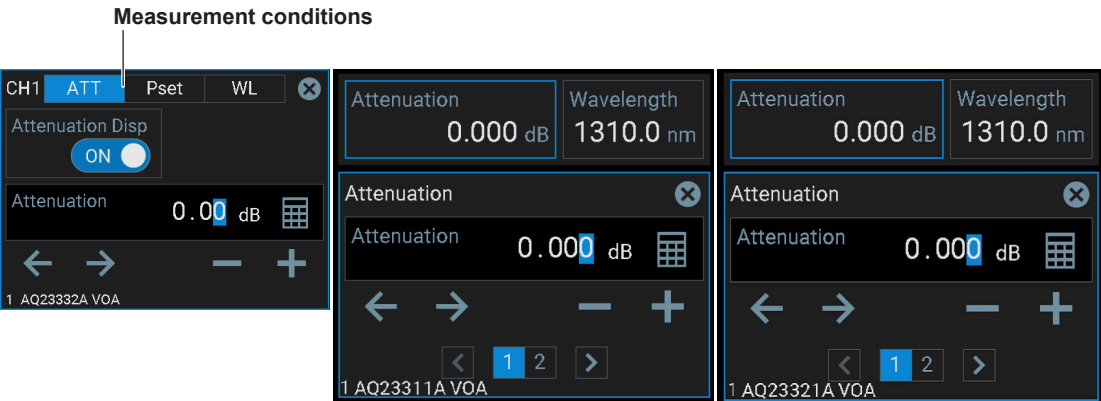
• OPM

You can edit the channel measurement conditions. For details, see sections 2.1 to 2.3 in IM AQ23011A-02EN.



• VOA

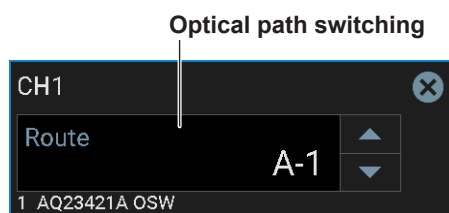
You can edit the channel measurement conditions. For details, see sections 3.1 to 3.3 and 3.10 in IM AQ23011A-02EN.



### 1.3 Screens

- **OSW**

You can control the optical path for each channel. For details, see section 4.1 in IM AQ23011A-02EN.



- **LS**

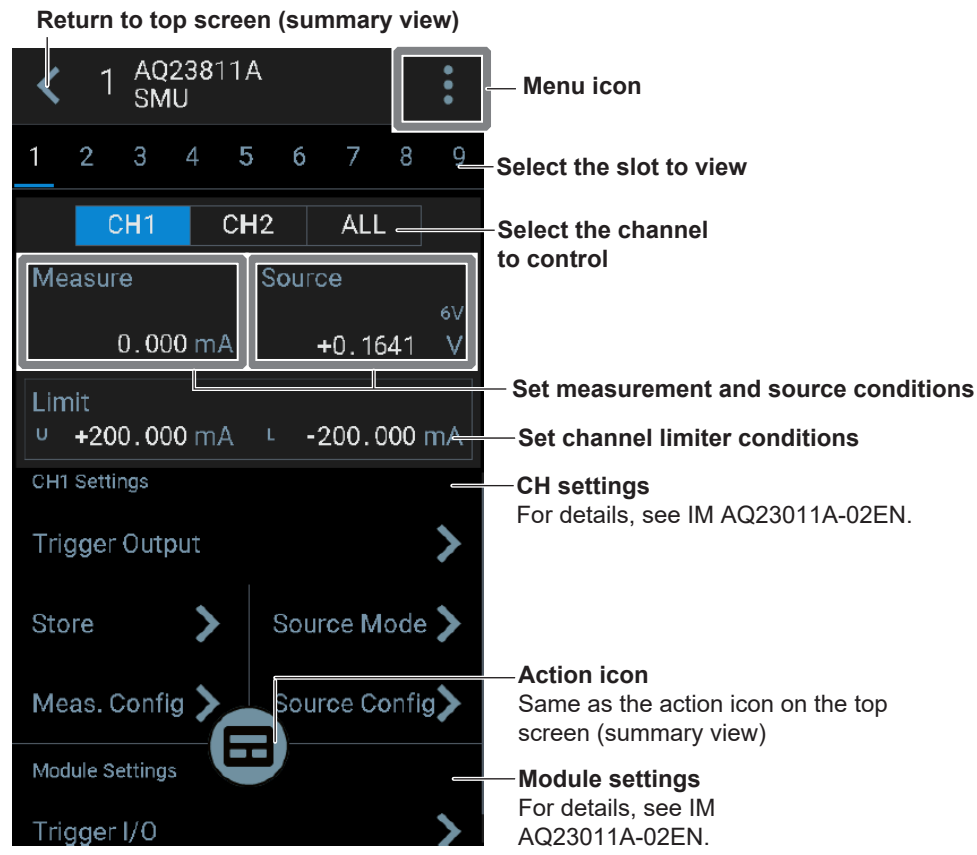
You can edit the channel optical output conditions. For details, see section 4.1 in IM AQ23011A-02EN.



#### Menu icon

The items that can be executed vary for each operation screen, so see the section describing each operation for details.

## Detail view (for SMU)

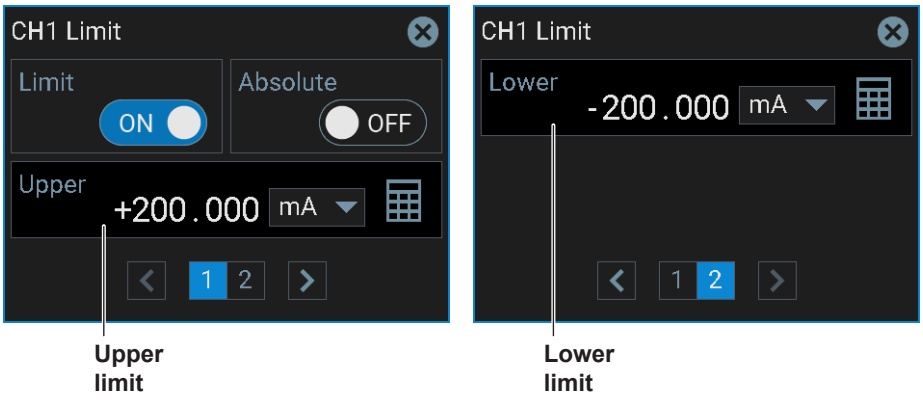


### Set measurement and source conditions

- **Measurement conditions**  
The items are the same as the measurement conditions of the CH view on the top screen (summary view).
- **Source conditions**  
The items are the same as the source conditions of the CH view on the top screen (summary view).

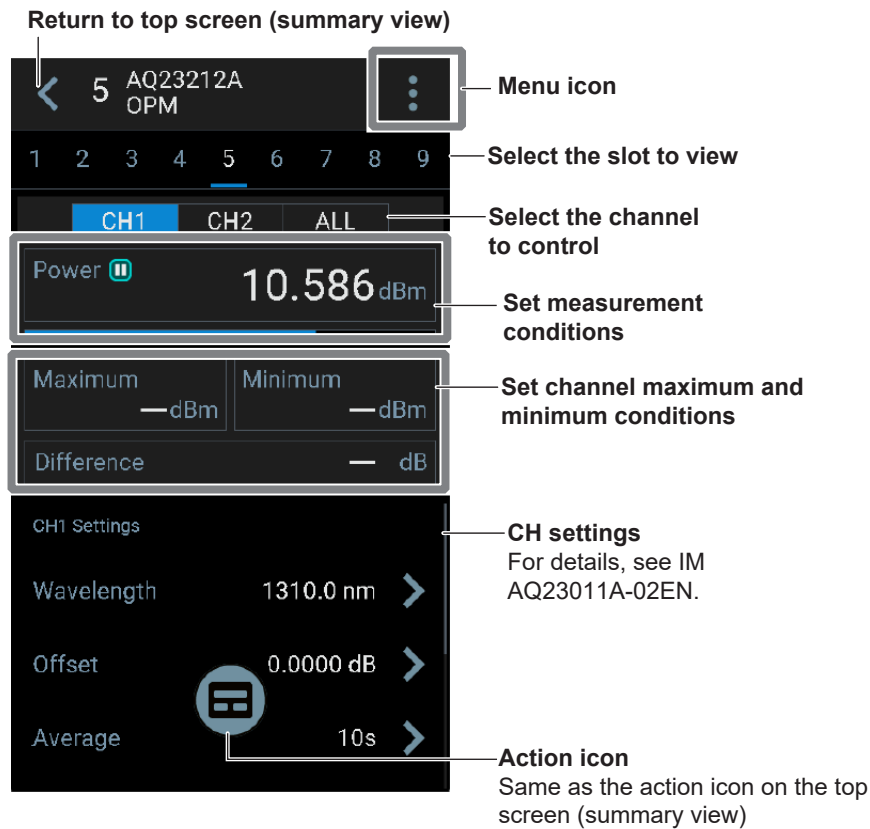
### Set channel limiter conditions

You can set the upper-limit and lower-limit limiters of the channel source conditions. For details, see section 1.1 in IM AQ23011A-02EN.



### Detail view (for OPM)

This is an example of the detailed display for the AQ23212A.

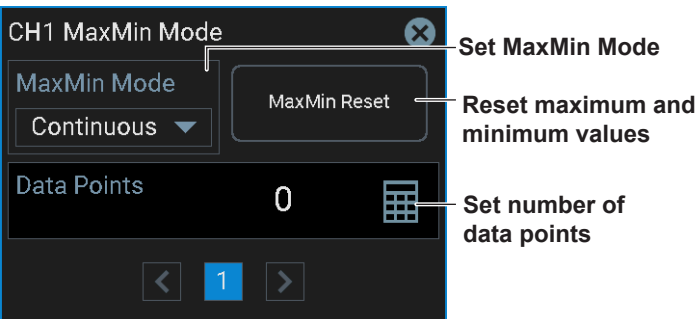


#### Set measurement conditions

The items are the same as the measurement conditions of the CH view on the top screen (summary view).

#### Set channel maximum and minimum conditions

You can configure the settings for CH Max/Min measurements. For details, see section 2.4 in IM AQ23011A-02EN.

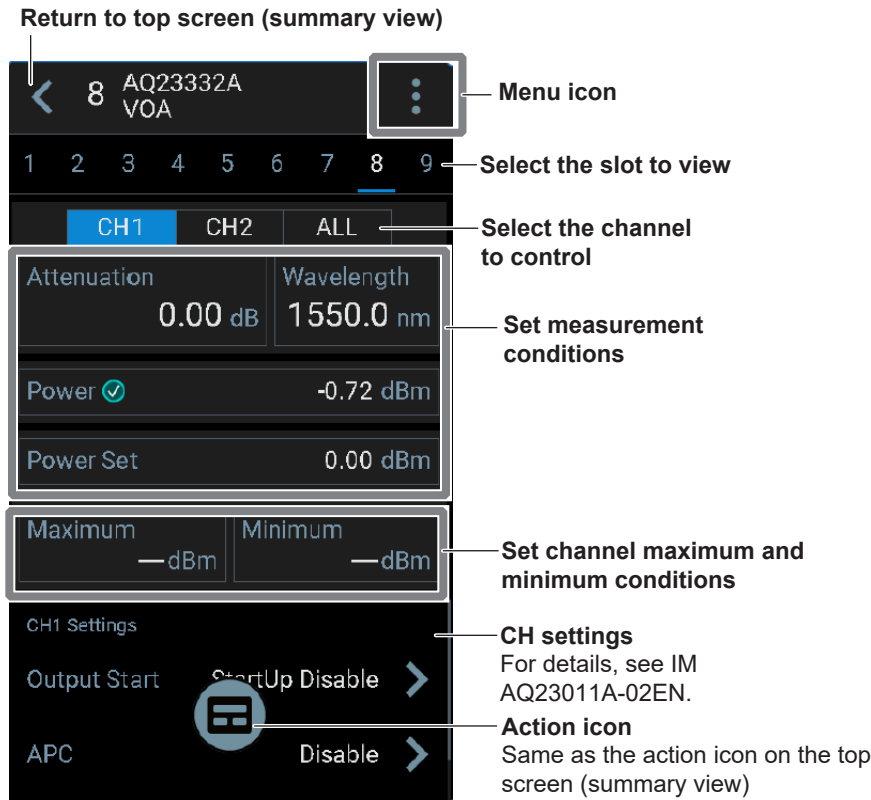


#### Menu icon

The items that can be executed vary for each operation screen, so see the section describing each operation for details.

### Detail view (for VOA)

This is an example of the detailed display for the AQ23332A.

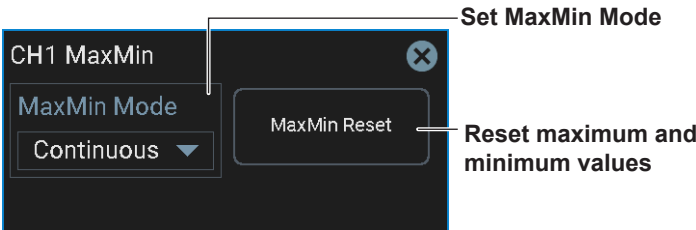


#### Set measurement conditions

The items are the same as the measurement conditions of the CH view on the top screen (summary view).

#### Set channel maximum and minimum conditions

You can configure the settings for CH Max/Min measurements. For details, see section 3.9 in IM AQ23011A-02EN.

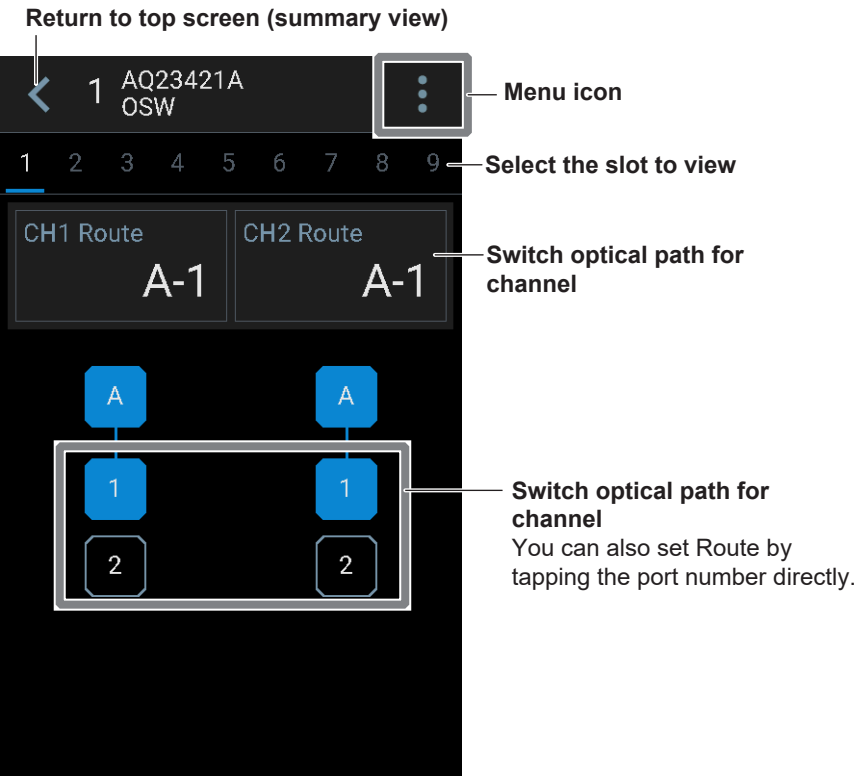


#### Menu icon

The items that can be executed vary for each operation screen, so see the section describing each operation for details.

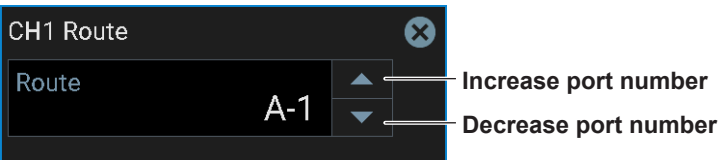
Detail view (for OSW)

This is an example of the detailed display for the AQ23421A.



Switch optical path for channel

You can set switching of the channel optical path. For details, see section 4.1 in IM AQ23011A-02EN.

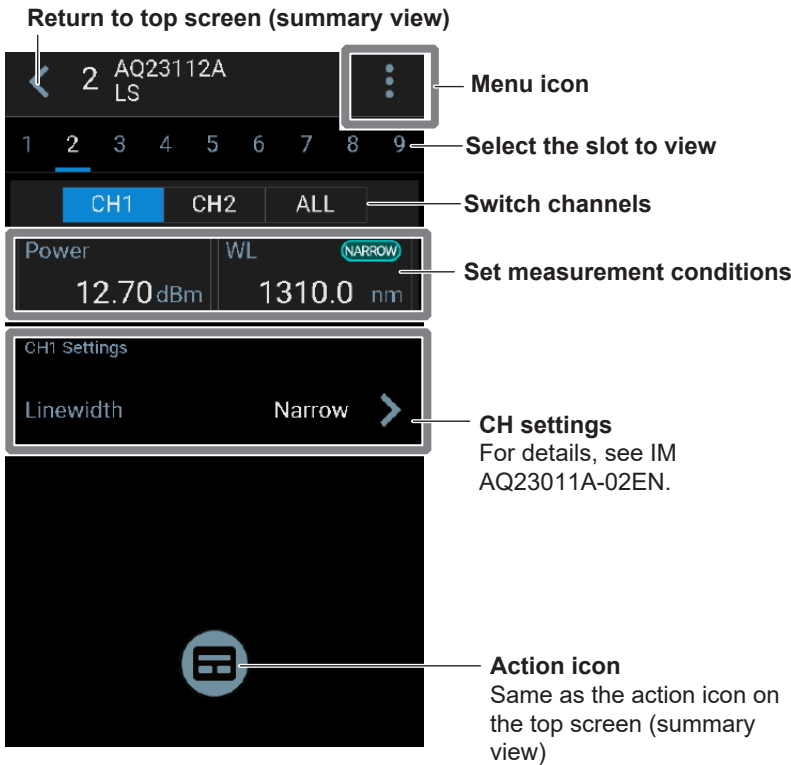


Menu icon

The items that can be executed vary for each operation screen, so see the section describing each operation for details.

### Detail view (for LS)

This is an example of the detailed display for the AQ23112A.



#### Set measurement conditions

The items are the same as the measurement conditions of the CH view on the top screen (summary view).

## 2.1 Handling Precautions

### Safety precautions

If you are using this instrument for the first time, make sure to thoroughly read the safety precautions given on page vii.

#### Do not remove the case

Do not remove the case from the instrument. Some sections inside the instrument have high voltages and are extremely dangerous. For internal inspection and adjustment, contact your nearest YOKOGAWA dealer.

#### Unplug if abnormal behavior occurs

If you notice smoke or unusual odors coming from the instrument, immediately turn off the power and unplug the power cord. Then, contact your nearest YOKOGAWA dealer.

#### Correct the Problem If Output Is Forcibly Turned Off

If the instrument detects an internal circuit error due to an excessive external input or electrical oscillation, the output is turned off, the ERROR key illuminates, and the error message “An input error occurred, so the module output was turned off” is displayed. If this happens, remove the cause of the problem, such as the external load, and turn the output on again. If the output still turns off after you have corrected the problem, the instrument may be malfunctioning. Contact your nearest YOKOGAWA dealer. Note that even if the instrument is returned to normal, the error display remains until you manually clear it (see section 5.2, “Error Code Descriptions and Corrective Actions”) or use communication commands to read the error information.

#### Turn the Power Switch Off If Overheat is Detected

If the instrument detects an overheat condition such as when the inlet or outlet ports for the cooling fan are obstructed or the fan is stopped, the instrument turns the output off and displays an “The module is overheated and the slot power has been turned off” warning. If this happens, immediately turn the power switch off. Check that there is adequate space around the instrument, and check for and remove any foreign objects that are caught in the cooling fan on the rear panel. If the same warning appears when you turn the power switch on after waiting a sufficient amount of time, the instrument may be malfunctioning. Contact your nearest YOKOGAWA dealer.

### **Do not damage the power cord**

Nothing should be placed on top of the power cord, and it should be kept away from any heat sources. When removing the plug from the power outlet, do not pull on the cord. Pull from the plug. If the power cord is damaged or if you are using the instrument in a location where the power supply specifications are different, purchase a power cord that matches the specifications of the region that the instrument will be used in.

### **Operating environment and conditions**

This instrument complies with emission and immunity standards under specific operating environment and operating conditions. If the installation, wiring, and so on are not appropriate, the compliance conditions of the EMC standard may not be met. In such cases, the user will be required to take appropriate measures.

## **General handling precautions**

### **Do not place objects on top of the instrument**

Never place objects such as other instruments or objects that contain water on top of the instrument. Doing so may damage the instrument.

### **Do Not Apply Shock or Vibration**

Do not apply shock or vibration. Doing so may damage the instrument. In addition, applying shock to the input/output terminal or the connected cables can cause electrical noise to enter or be generated from the instrument.

### **Do not damage the LCD**

Because the LCD is very vulnerable and can be easily scratched, do not allow any sharp objects near it. Also, it should not be exposed to vibrations and shocks.

### **Keep electrically charged objects away from the instrument**

Keep electrically charged objects away from the input and output connectors. They may damage the internal circuitry.

### **During extended periods of non-use**

Unplug the power cord from the outlet.

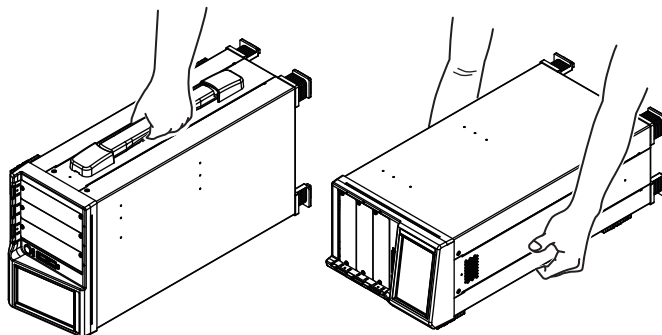
### **Module Handling Precautions**

- Do not expose the modules to excessive shock.
- Do not remove the cover.
- Do not touch the metal parts of the module connectors with your hands.

### When carrying the instrument

Remove the power cord and connecting cables. When carrying the instrument, either hold the handle or hold the instrument with both hands as shown in the figure below.

AQ23011A Frame



### When Cleaning the Instrument

When cleaning the case or the operation panel, first remove the power cord from the outlet, and then wipe with a dry, soft, clean cloth. Do not use chemicals such as benzene or thinner. These can cause discoloring and deformation.

## 2.2 Installing the Instrument



### WARNING

- This instrument is designed to be used indoors. Do not install or use it outdoors.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

### CAUTION

If you block the inlet ports on the right and bottom or the outlet ports on the rear side of the instrument, the instrument will become hot and may break down.

#### French



### AVERTISSEMENT

- Cet instrument est conçu pour être utilisé à l'intérieur. Ne l'installez pas et ne l'utilisez pas à l'extérieur.
- Installer l'instrument de manière à pouvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.

### ATTENTION

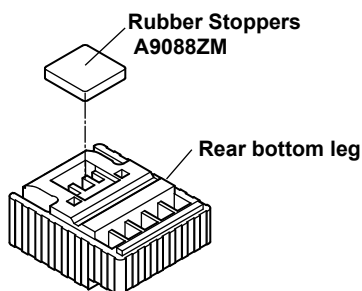
Si vous bloquez les orifices d'entrée situés à droite et sous l'instrument ou les orifices de sortie arrière, l'instrument surchauffe et risque de tomber en panne.

## Installation conditions

Install the instrument in a place that meets the following conditions.

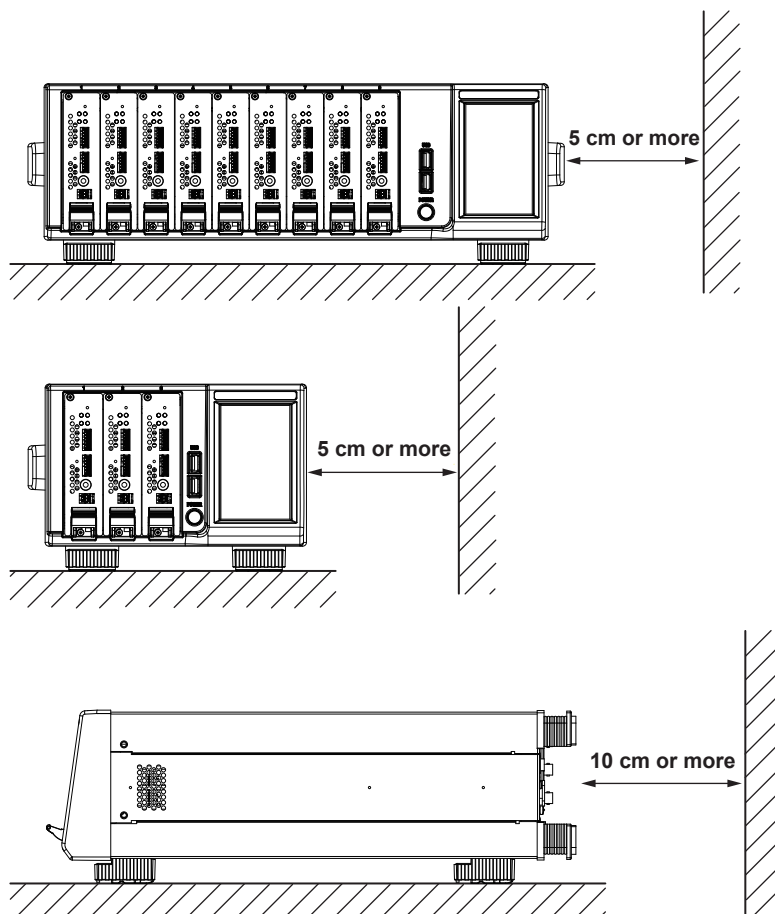
### Flat, even surface

Install the instrument in the correct orientation in a safe place, with no tilting from front to back or left to right. If the instrument is installed in a horizontal position, rubber stoppers can be attached to the feet at the rear of the instrument to prevent the instrument from sliding. One set of rubber stoppers (two stoppers) are included with the instrument.



**Well-ventilated location**

Inlet ports are located on the right and bottom of the instrument. There are also outlet ports for the cooling fan on the rear side. To prevent internal overheating, allow for enough space around the instrument (see the figure below), and do not block the inlet and outlet ports.



When connecting cables, ensure there is sufficient space beyond what is shown in the figure above to work.

**Ambient temperature and humidity**

Ambient temperature: 5 to 40 °C

Ambient humidity: 20 to 80 % RH; no condensation

**Note**

- To ensure high measurement accuracy, operate the instrument in the  $23 \pm 5$  °C temperature range and  $50 \% \pm 10$  % relative humidity range.
- Condensation may occur if the instrument is moved to another place where the ambient temperature or humidity is higher, or if the temperature changes rapidly. In such cases, allow the instrument adjust to the new environment for at least a hour before using the instrument.

### Do not install the instrument in the following places:

- Outdoors
- In direct sunlight or near heat sources
- Where the instrument is exposed to water or other liquids
- Where an excessive amount of soot, steam, dust, or corrosive gas is present
- Near strong electromagnetic field sources
- Near high voltage equipment or power lines
- Where the level of mechanical vibration is high
- On an unstable surface

### Storage location

When storing the instrument, avoid the following places.

- In direct sunlight
- Where the temperature is 60 °C or higher
- Where the relative humidity is 80 % or higher
- Near a high-temperature heat source
- Where the level of mechanical vibration is high
- Where there are corrosive or explosive gases
- Where an excessive amount of soot, dust, salt, or iron is present
- Where water, oil, or chemicals may splash onto the instrument
- Outdoors or in locations subject to rain or water

### Rack mounting

To mount the instrument on a rack, use a rack mount kit (sold separately).

For the procedure to rack mount the instrument, see the instructions that are included with the rack mount kit.

| Model     | Name                    |
|-----------|-------------------------|
| 735183-03 | AQ23011A rack mount kit |
| 735183-09 | AQ23012A rack mount kit |

## Attaching and removing blank panels

### WARNING

To prevent electric shock, and to ensure that the instrument performs within its specifications, be sure to cover any unused slots with the blank panels sold separately.

This is also necessary as using the instrument without the blank panels allows dust to enter the instrument, which may cause a malfunction due to internal overheating.

### French

### AVERTISSEMENT

Pour éviter tout choc électrique et garantir un fonctionnement de l'instrument conforme aux spécifications, veiller à couvrir tous les emplacements non utilisés des panneaux vides vendus séparément.

Ceci est aussi nécessaire car l'utilisation de l'instrument sans les panneaux de cache favorise la pénétration de poussière dans l'instrument, ce qui peut entraîner un dysfonctionnement dû à une surchauffe interne.

Remove the blank panel when you install a module into the frame.

### Removal

1. Loosen the screws at the top and bottom of the blank panel.
2. Grasp the screws at the top and bottom of the blank panel, and pull the panel toward you.

### Note

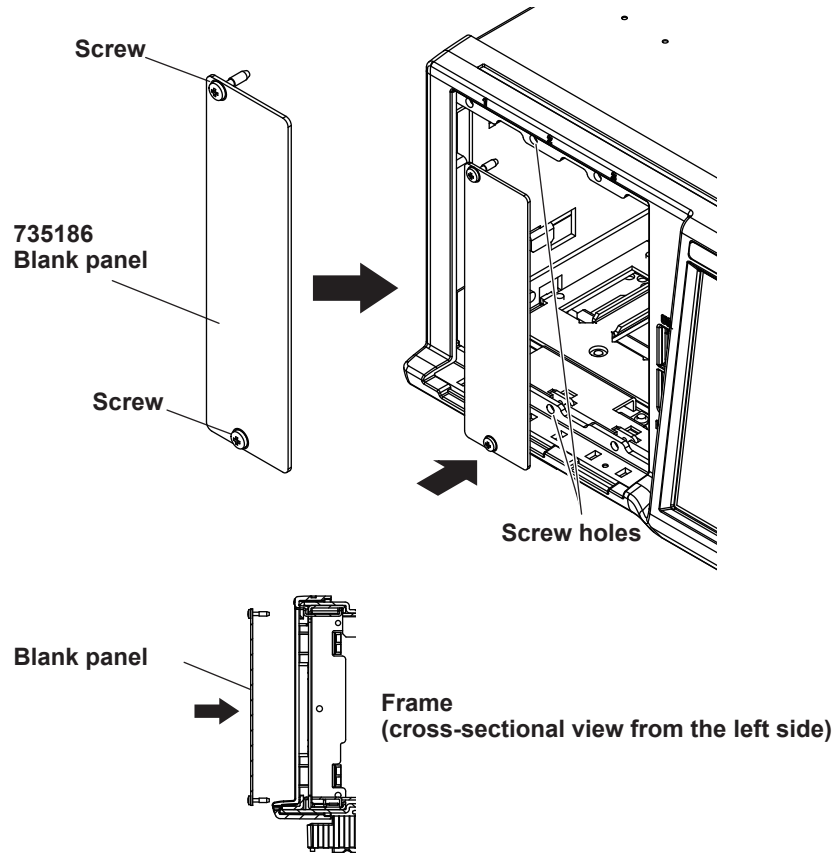
The blank panel is constructed so that the screw does not fall out.

## 2.2 Installing the Instrument

---

### Attachment

1. Insert the blank panel screws into the top and bottom screw holes of a frame slot.



## Installing and uninstalling modules

### WARNING

- Do not apply input voltage exceeding the maximum input voltage, withstand voltage, or allowable surge voltage.
- Do not leave the modules connected to the I/O terminals in environments in which voltages exceeding than the allowable surge voltage may occur.

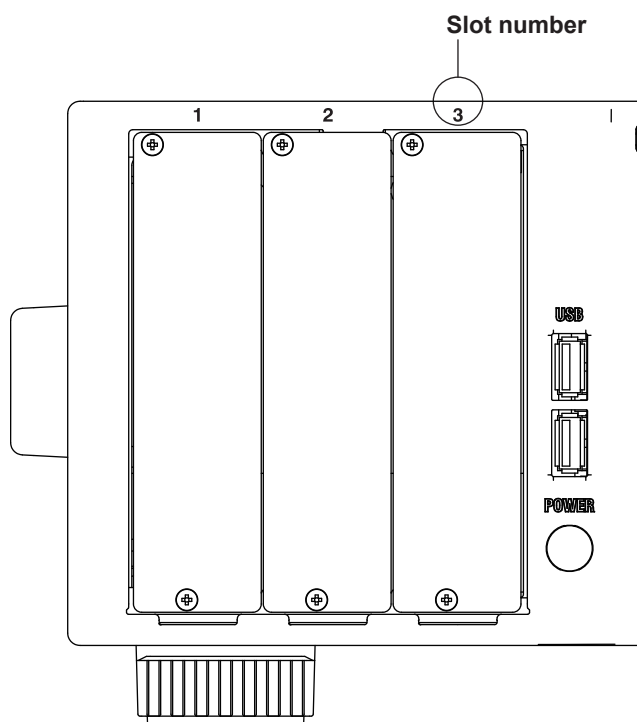
### French

### AVERTISSEMENT

- Ne pas dépasser les valeurs maximales de tension d'entrée, de tension de maintien ou de surtension admissible.
- Ne laissez pas les modules connectés aux bornes E/S dans des environnements où des tensions supérieures à la surtension admissible peuvent se produire.

### Module installation slots

You can install a maximum of three modules into the AQ23011A Frame and a maximum of nine modules into the AQ23012A Frame. The slots are assigned numbers 1, 2, 3, and so on, starting from the left of the instrument, when the frame controller is viewed from the front.



### Note

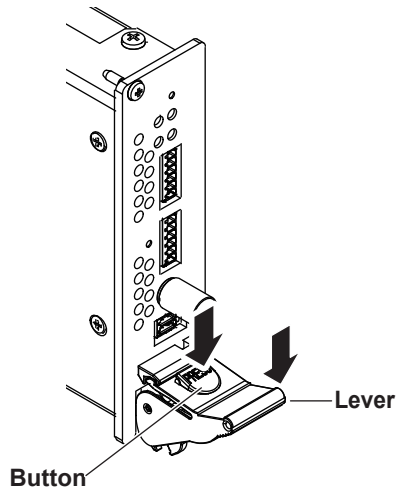
You can install and uninstall modules while the frame is turned on.

## 2.2 Installing the Instrument

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### Installing a module

1. Push down on the lever while holding down the button on the lever.

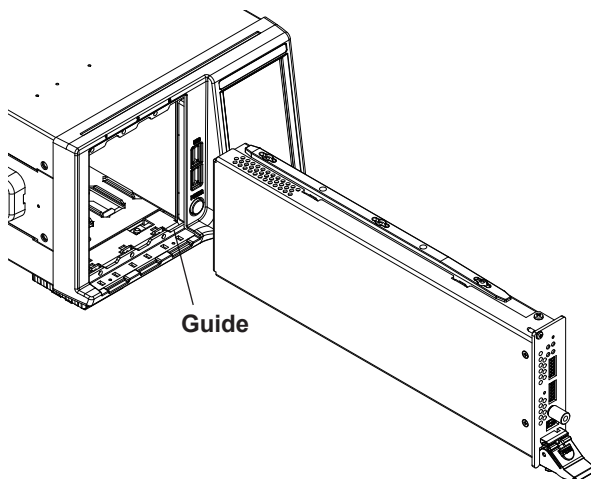


### Note

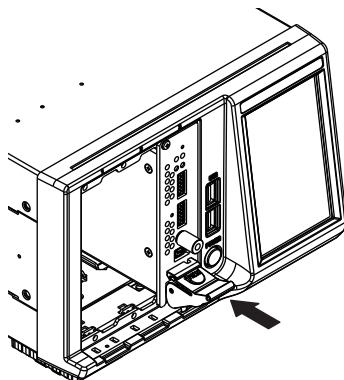
When inserting a module, always check its vertical orientation.

---

2. Align the groove on the bottom of the module with the guide on the slot that you want to install the module into, and slowly insert the module into the frame controller.



3. Once the module is inserted and butted in, slowly and forcefully pull up on the lever and push the module in. Then, fasten the screws to secure it.



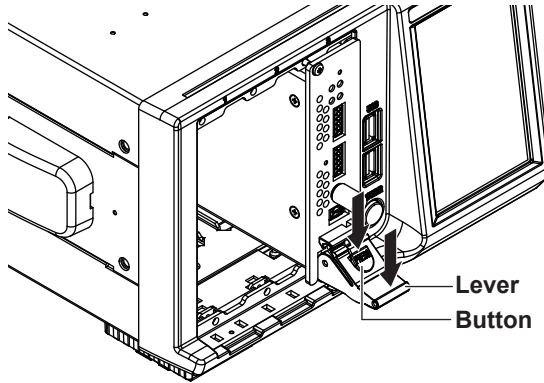
### Uninstalling a module

1. Loosen the fixing screws.

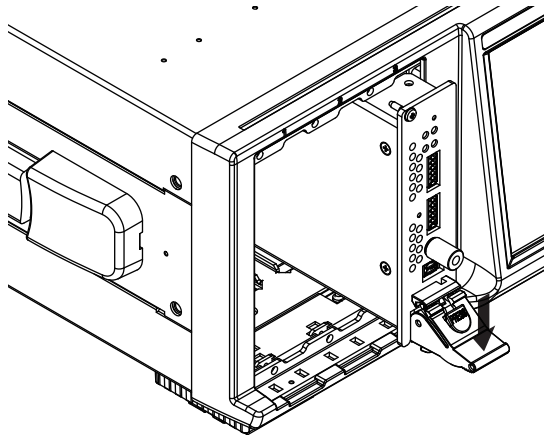
#### Note

Modules are constructed so that the fixing screws do not fall out.

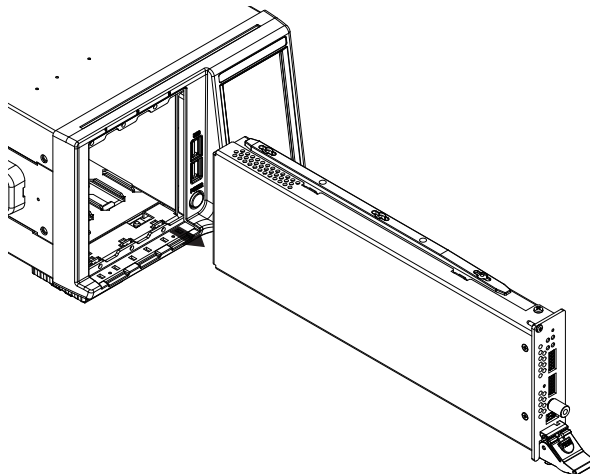
2. Push down on the lever while holding down the button on the lever.



3. Slowly push the lever down until the module projects approximately 1 cm out from the frame.



4. Slowly pull the module out from the frame's slot.



## 2.3 Connecting to the Power Supply

### Before connecting the power supply



#### WARNING

- Make sure that the power supply voltage matches the instrument's rated supply voltage and that it does not exceed the maximum voltage range of the power cord to use.
- Connect the power cord after checking that the power switch of the instrument is turned off.
- To prevent electric shock and fire, use the power cord for this instrument.
- To prevent electric shock, make sure to connect the instrument to a protective ground (earth). Connect the instrument's power cord to a properly grounded three-prong outlet.
- Do not use an ungrounded extension cord. If you do, the instrument will not be grounded.
- If there is no AC outlet that is compatible with the power cord that you will be using and you cannot ground the instrument, do not use the instrument.

#### French



#### AVERTISSEMENT

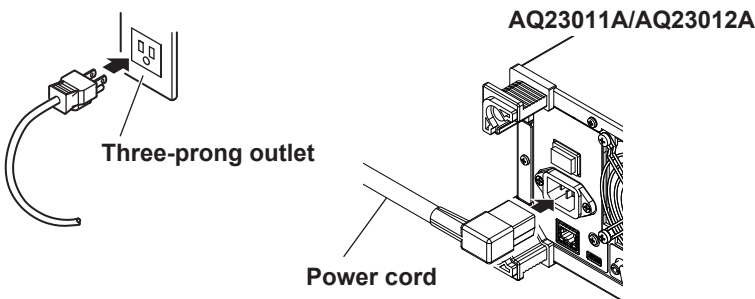
- Assurez-vous que la tension d'alimentation correspond à la tension d'alimentation nominale de l'appareil et qu'elle ne dépasse pas la plage de tension maximale du cordon d'alimentation à utiliser.
- Brancher le cordon d'alimentation après avoir vérifié que l'interrupteur d'alimentation de l'instrument est sur OFF.
- Pour éviter tout risque de choc électrique, utiliser exclusivement le cordon d'alimentation prévu pour cet instrument.
- Pour éviter tout choc électrique, veillez à raccorder l'instrument à une mise à la terre de protection. Connect the instrument's power cord to a properly grounded three-prong outlet.
- Toujours utiliser une rallonge avec broche de mise à la terre, à défaut de quoi l'instrument ne serait pas relié à la terre.
- Si une sortie CA conforme au câble d'alimentation fourni n'est pas disponible et que vous ne pouvez pas relier l'instrument à la terre, ne l'utilisez pas.

## Connecting the Power Cord

1. Check that the instrument's power switch is off.
2. Connect the power cord plug to the power inlet on the rear panel of the instrument.
3. Connect the other end of the cord to an outlet that meets the following conditions. Connect the power plug to a properly grounded three-prong outlet.

|                                  |                                                                  |
|----------------------------------|------------------------------------------------------------------|
| Rated supply voltage*            | 100 to 120 VAC/200 to 240 VAC                                    |
| Permitted supply voltage range   | 90 to 132 VAC/198 to 264 VAC                                     |
| Rated power frequency            | 50/60 Hz                                                         |
| Permitted supply frequency range | 48 to 63 Hz                                                      |
| Maximum power consumption        | 170 VA (AQ23011A), 470 VA (AQ23012A) including installed modules |

\* This instrument can use a 100 V or a 200 V power supply. The maximum voltage rating differs according to the type of power cord. Check that the voltage supplied to the instrument is less than or equal to the maximum voltage rating of the power cord that you will be using before use.



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## 2.4 Turning the Power On and Off

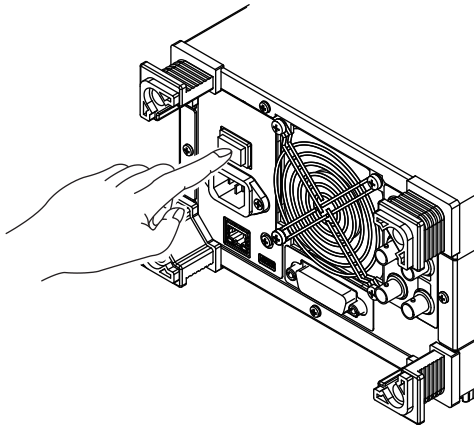
### Turning the POWER Switch On

Before turning on the power, check that:

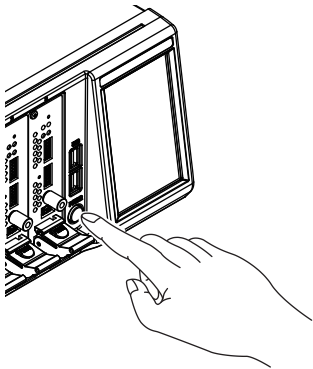
- The instrument is installed properly. See section 2.2, “Installing the Instrument.”
- The power cord is connected properly. See the previous page.

#### Turning the POWER Switch On

1. Press the main power switch on the rear panel.



2. Press the power switch on the front panel.



---

#### Note

- If the instrument does not show the summary view or detail view when the power is turned on, turn the power off, and then check that:
    - The power cord is securely connected.
    - The correct voltage is coming to the power outlet (see the previous page).If the instrument still does not work properly after checking these items, contact your nearest YOKOGAWA dealer for repairs.
  - Depending on the type and number of modules installed in the frame, startup (startup screen display) may take some time.
-

**For Taking Accurate Measurements**

After turning on the power switch, wait at least 1 hour to allow the instrument to warm up. For modules that have been exposed to a humid environment for an extended period of time, warm up for at least 2 hours after running electricity.

**Turning the POWER Switch Off**

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**CAUTION**

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- Turning off the power switch or unplugging the power cord while the instrument is saving data may corrupt the media on which data is being saved. Also, the data being saved is not guaranteed. Always turn the instrument off after data has been saved.
- Turn the SMU output off when you turn the instrument off. Otherwise, the SMU may be damaged.

---

**French**

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**ATTENTION**

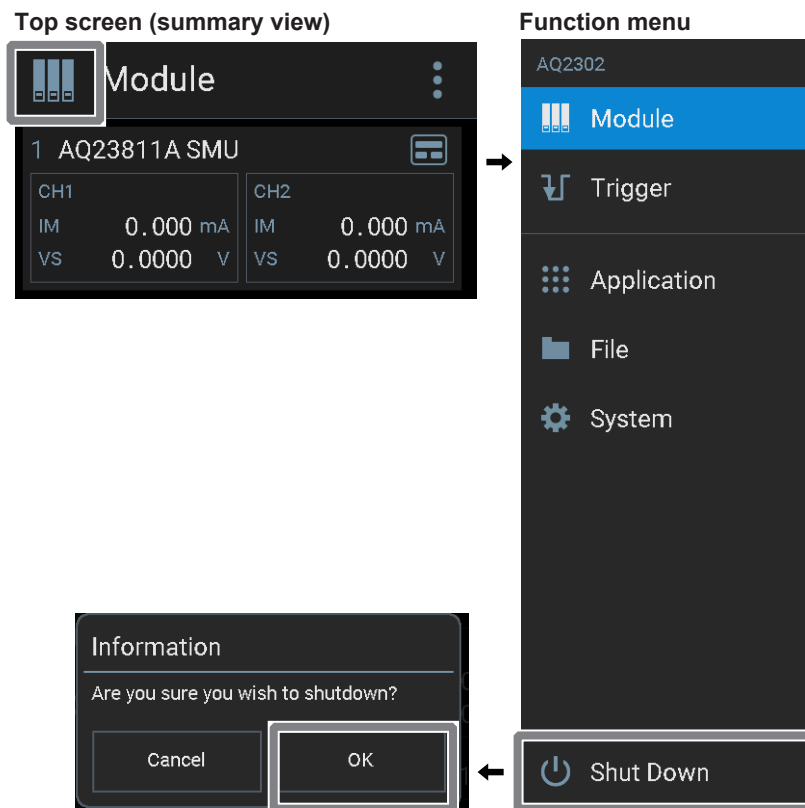
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- Éteindre l'interrupteur d'alimentation ou le débranchement du câble d'alimentation pendant que l'instrument enregistre des données pourrait corrompre le média sur lequel les données sont enregistrées. De plus, les données enregistrées ne sont pas garanties. Les données en cours d'enregistrement pourront également être perdues. Always turn the instrument off after data has been saved.
- Désactivez la sortie SMU lorsque vous mettez l'instrument hors tension. Sinon, le SMU risque d'être endommagé.

## 2.4 Turning the Power On and Off

### Turning the POWER Switch Off

1. Press the power switch on the front panel, or tap the function icon  on the top screen (summary view) and then tap **Shut Down**.



2. A shutdown confirmation dialog box opens. Tap OK.
3. Press the main power switch on the rear panel.

## 2.5 Wiring Precautions

Be sure to observe the following warnings and cautions when connecting a cable to an SMU. Failure to do so may cause electric shock or damage to the instrument.



### WARNING

#### Before Wiring

- Ground the frame before connecting the it to the target device. The power cord that comes with the frame is a three-prong cord. Connect the power cord to a properly grounded three-prong outlet.
- Be sure to turn the SMU output off before you connect the source/measure target.

#### Wiring

- Connect the cable to the output terminal of the SMU by mounting the attached measurement plug.
- Only use a cable whose conductive parts are covered for connecting to the measurement plug. Exposed conductive parts can lead to electric shock.
- Do not use cables whose conductive parts are exposed due to tears in the insulation or broken cables as they may lead to electric shock.
- Do not connect a voltage source in voltage source mode or a current source in current source mode. An incorrect connection may damage the SMU.
- Do not connect a load exceeding the following maximum output across the HI-LO terminals.

| Voltage source range | Maximum Output |
|----------------------|----------------|
| 6 V range            | ±600 mA        |
| Current source range | Maximum Output |
| 200 nA range         | ±6 V           |
| 2 µA range           | ±6 V           |
| 20 µA range          | ±6 V           |
| 200 µA range         | ±6 V           |
| 2 mA range           | ±6 V           |
| 20 mA range          | ±6 V           |
| 200 mA range         | ±6 V           |
| 600 mA range         | ±6 V           |

- The maximum allowable voltage between the case and each terminal is  $\pm 42$  V<sub>peak</sub>. Exceeding this voltage may damage the SMU.
- Keep the voltage source across HI-HS and LO-LS no greater than  $\pm 0.25$  V<sub>peak</sub>.
- When making a four-terminal connection, be careful that the connection to the HS-LS terminals does not get cut. If the voltage is not sensed correctly, abnormal voltage may appear across the HI-LO terminals.
- When making a two-terminal connection, use the HI-LO terminals. If the HS-LS terminals are used, the current flows through the SENSE line. This prohibits the SMU from generating correct output and can damage the SMU.
- Do not connect active loads such as voltage/current sources to the GUARD terminal. Wrong connection may damage this instrument.



### CAUTION

- Use conducting wires that have adequate margins of withstand voltage and current capacity with respect to the voltage or current to be used.
- To prevent oscillations due to stray capacitance and cable inductance, use coaxial cables to connect to the HI and LO terminals. Likewise, use coaxial cables to connect to the HS and LS terminals. Keep the cables short.
- If a current source that exceeds the current limiter setting is connected in voltage source mode; if a voltage source that exceeds the voltage limiter setting is connected in current source mode; or if a load that exceeds the source range listed above is connected, an abnormal load is detected, and the output is turned off. Do not connect these types of loads to this instrument. Doing so may damage the instrument.
- Do not turn the power off while sourcing when the DUT is connected. Doing so may damage the DUT.

## French



### AVERTISSEMENT

#### Avant d'effectuer le câblage

- Mettez le châssis à la terre avant de le raccorder à l'appareil cible. Le cordon d'alimentation fourni avec le châssis est un cordon à trois broches. Branchez le cordon d'alimentation à une prise de courant à trois broches correctement mise à la terre.
- Veillez à désactiver la sortie SMU avant de connecter la cible source/mesure.

#### Raccordez les câbles correctement

- Raccordez le câble à la borne de sortie du SMU en fixant la fiche de mesure jointe.
- Utilisez seulement un câble dont les parties conductrices sont recouvertes pour le raccordement à la prise de mesure. Les parties conductrices exposées peuvent provoquer une électrocution.
- N'utilisez pas de câbles dont les parties conductrices sont exposées à cause d'une rupture de l'isolation ou de câbles cassés, car cela risque de provoquer une électrocution.
- Ne connectez pas une source de tension en mode source de tension ou une source de courant en mode source de courant. Un raccordement incorrect peut endommager le SMU.
- Ne connectez pas une charge excédant la sortie maximale suivante au niveau des bornes HI-LO.

| Plage de la source de tension | Sortie maximale |
|-------------------------------|-----------------|
| Plage de 6 V                  | ±600 mA         |
| Plage de la source de courant | Sortie maximale |
| Plage de 200 nA               | ±6 V            |
| Plage de 2 µA                 | ±6 V            |
| Plage de 20 µA                | ±6 V            |
| Plage de 200 µA               | ±6 V            |
| Plage de 2 mA range           | ±6 V            |
| Plage de 20 mA range          | ±6 V            |
| Plage de 200 mA range         | ±6 V            |
| Plage de 600 mA range         | ±6 V            |

- La tension maximale admissible entre le boîtier et chaque borne est à une valeur de crête de  $\pm 42$  V. Si cette tension est excédée, cela peut endommager le SMU.
- Maintenez la source de tension au niveau des bornes HI-HS et LO-LS à une valeur de crête maximum de  $\pm 0,25$  V.
- Lors d'une connexion à quatre bornes, veillez à ce que la connexion aux bornes HS-LS ne soit pas coupée. Si la tension n'est pas correctement détectée, une tension anormale peut apparaître au niveau des bornes HI-LO.
- Lors d'une connexion à deux bornes, utilisez les bornes HI-LO. Si les bornes HS-LS sont utilisées, le courant circule à travers la ligne SENSE. Cela empêche le SMU de générer une sortie correcte et peut endommager le SMU.
- Ne raccordez pas de charges actives telles que des sources de tension/courant à la borne GUARD. Une mauvaise connexion peut endommager cet instrument.



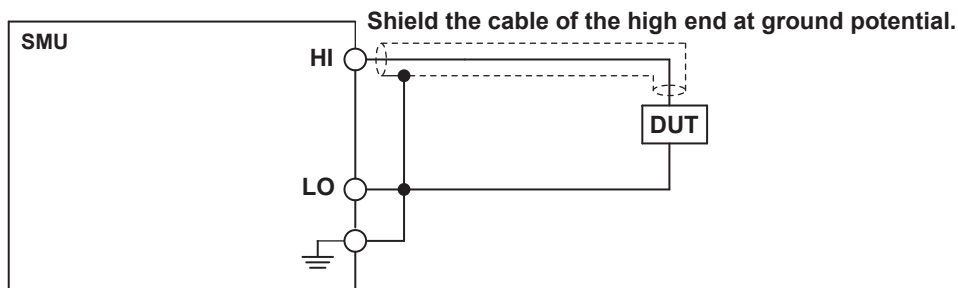
### ATTENTION

- Utilisez des fils conducteurs qui ont des marges adéquates de tension de tenue et de capacité de courant par rapport à la tension ou au courant à utiliser.
- Pour éviter les oscillations dues à une capacité parasite et à l'inductance des fils, utilisez des câbles coaxiaux pour connecter aux bornes HI et LO. De même, utilisez des câbles coaxiaux pour connecter les bornes HS et LS. Gardez les câbles courts.
- Si une source de courant qui dépasse le réglage du limiteur de courant est connectée en mode source de tension ; si une source de tension qui dépasse le réglage du limiteur de tension est connectée en mode source de courant ; ou si une charge qui dépasse la plage de source indiquée ci-dessus est connectée, une charge anormale est détectée et la sortie est désactivée. Ne connectez pas ces types de charges à cet instrument. Cela pourrait endommager l'instrument.
- Ne mettez pas l'appareil hors tension pendant le départ de courant lorsque l'appareil testé est connecté. Cela pourrait endommager l'appareil testé.

### Note

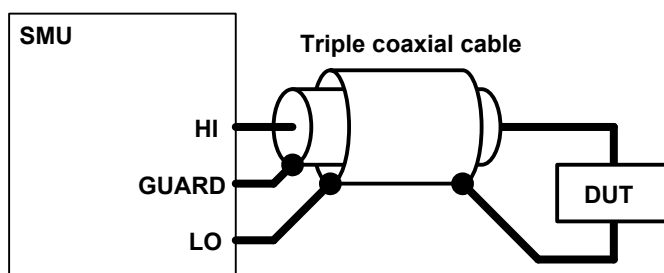
- Susceptibility to the effects of noise increases when sourcing or measuring minute currents. Take measures such as using shielded wires. Using the functional ground terminal on the front panel and connecting it as shown in the figure below is effective.

#### Measures to reduce noise when handling low current



- When dealing with a small current range, problems such as slow response speed due to stray capacitance in the output cable or errors due to leakage current may occur. In such a case, it is expected that shortening the output cable as much as possible or using a triple coaxial cable and making the connection using the GUARD terminal of this instrument will improve such a problem. However, in the case of a connection using the GUARD terminal, if the capacitance between the GUARD terminal and the Hi and Hs terminals becomes large, the output may become unstable.

#### Measures to improve response when handling minute current

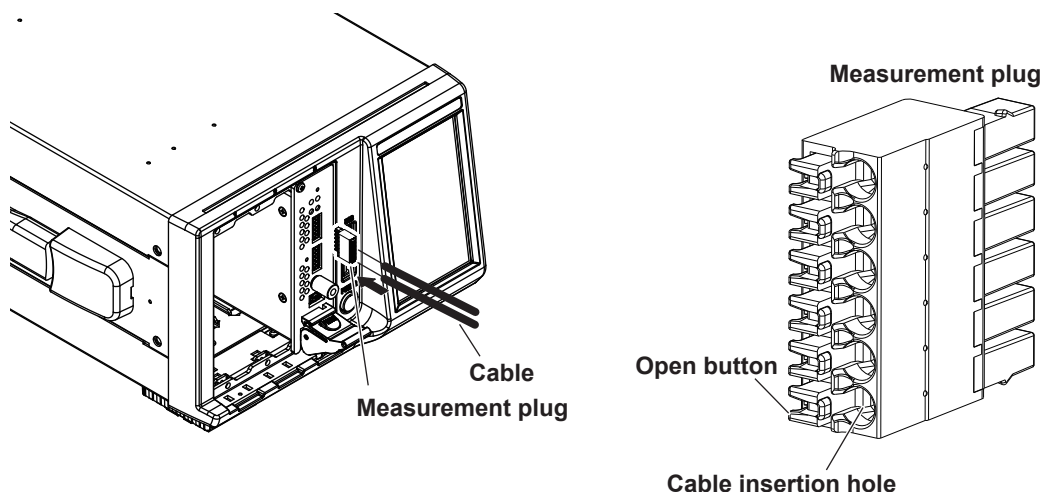


**For a four-terminal connection (remote sense), place the HI output and HI sense (HS) inside the GUARD.**

- When the SMU output is connected to a load with a pre-stored charge, depending on the set current range, the protection function of the SMU may be activated and the output may be turned off. In such cases, restart the output at a higher current range and discharge the electric charge before use.

## Connecting cables

1. Connect a measurement plug to the instrument.
2. While pushing in the open button of the measurement plug with a screwdriver or the like, insert the conductive part of the cable into the cable insertion slot.
3. Release the open button on the measurement plug.



### • About wiring

#### Core processing

Single wires or stranded wires can be connected without core processing. Soldering (pre-tinning) of the core wire is not recommended.

#### Wiring

- Single wire/stranded wire: 0.14 mm<sup>2</sup> to 0.5 mm<sup>2</sup>
- Stranded wire without plastic sleeve and with ferrule: 0.25 mm<sup>2</sup> to 0.34 mm<sup>2</sup>
- Stranded wire with plastic sleeve and with ferrule: 0.14 mm<sup>2</sup> to 0.25 mm<sup>2</sup>
- AWG26-20

#### Length of stripped wire

7 mm

## 2.6 Connecting a USB Storage Device

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### CAUTION

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Do not unplug the storage device while data is being written to it. Unplugging the storage device while writing may corrupt the storage device.

---

#### Compatible USB storage devices

You can use USB memory devices. USB storage devices that the instrument cannot recognize cannot be used.

When the USB storage drive is partitioned, only the first drive is recognized.

#### Connection procedure

Connect a USB storage device to one of the USB ports (Type A) for peripherals on the front panel of the instrument. For information on the workflow, see section 1.1.

#### Removing Elements

This instrument supports hot-plugging of USB storage devices, allowing USB storage devices to be removed while the instrument is powered on.

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### French

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### ATTENTION

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Ne débranchez pas l'appareil de stockage lorsque des données sont écrites dessus. Le fait de débrancher l'appareil de stockage pendant l'écriture peut endommager l'appareil de stockage.

---

#### Compatible USB storage devices

You can use USB memory devices. USB storage devices that the instrument cannot recognize cannot be used.

When the USB storage drive is partitioned, only the first drive is recognized.

#### Connection procedure

Connect a USB storage device to one of the USB ports (Type A) for peripherals on the front panel of the instrument. See section 1.1.

#### Removal procedure

This instrument supports hot-plugging of USB storage devices, allowing USB storage devices to be removed while the instrument is powered on.

## 2.7 Connecting and Disconnecting Connector Adapters

Replacing the connector adapter allows the module to be connected to various optical connectors.

### How to Connect and Disconnect the AQ9335C Connector Adapter

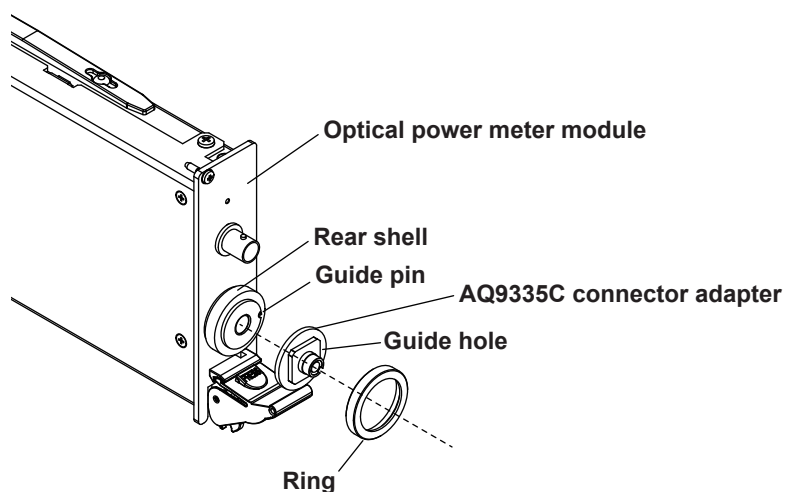
The AQ9335C connector adapter can be used with the AQ23211A, AQ23221A, AQ23291A, AQ23295A, and AQ23212A optical power meters.

#### Attachment

1. Fit the guide holes of the connector adapter onto the guide pins on the rear shell.
2. Screw in the connector adapter's ring to secure the adapter.

#### Removal

1. Turn the ring to remove the connector adapter.



## 2.8 Connecting Optical Fiber Cables



### CAUTION

Only connect an angled-physical-contact type optical fiber to the ANGLED PC ONLY optical connector. Other types of connectors can damage the connector's ferrule end.

#### French

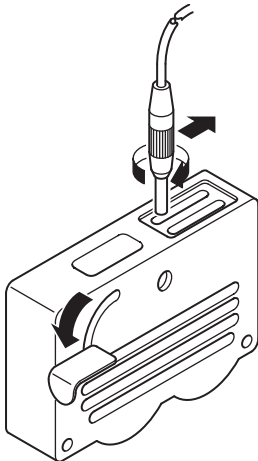


### ATTENTION

Ne brancher que des fibres optiques de type APC (contact physique avec angle) au connecteur optique ANGLED PC ONLY. D'autres types de connecteurs pourraient endommager l'embout du connecteur.

Clean the connector end face of the optical fiber cable under measurement before connecting it to the instrument. If dust is adhered to the connector end face, it may damage the instrument's optical connector. If this happens, the instrument will not be able to make correct measurements.

1. Firmly press the connector end face of the optical fiber cable against the cleaning surface of the cleaner.
2. While pressing the end face against the cleaner, turn the cable.
3. While pressing the end face against the cleaner, move the cable.
4. Change the cleaning surface of the cleaner, and repeat steps 1 to 3.



### Note

- If you do not firmly press the connector end face of the optical fiber cable against the cleaner, the end face may not be cleaned completely.
- You can purchase an optical fiber cable cleaner from NTT-AT Corporation.

## 2.9 Connecting Cables

### CAUTION

If the interface module is currently installed in the frame, turn the frame off, or uninstall the interface module from the frame, and then carry out the procedure below.

### French

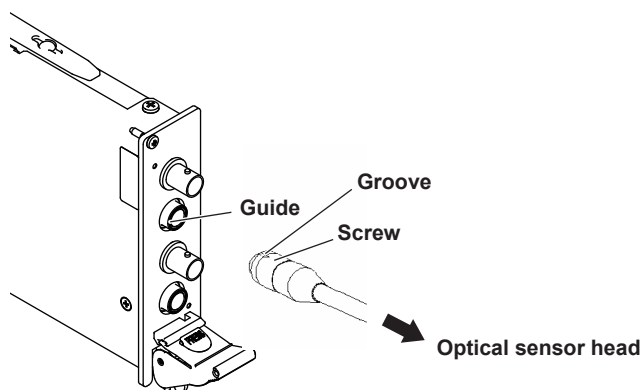
### ATTENTION

Si le contrôleur dispose d'un module d'interface, mettre le contrôleur hors tension ou désinstaller le module d'interface, puis suivre la procédure ci-dessous.

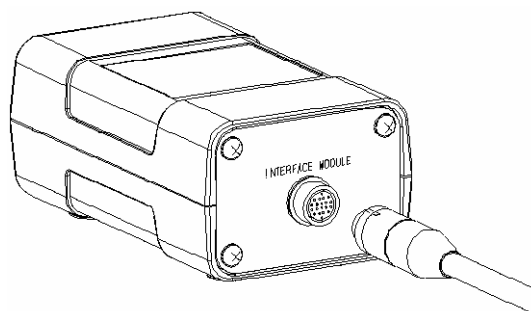
## How to Connect the Optical Sensor Head and Interface Module

### Attachment

1. Insert the cable connector into the connector on the front of the interface module (make sure that the guide pin of the connector on the module fits into the groove of the cable connector), and then tighten the screw to secure them.



2. Similarly, connect the cable to the connector on the rear panel of the optical sensor head.



## 3.1 Touch-panel Operations

### Basic touch panel operations

The basic touch-panel operations are as follows.

#### Tap

A tap is a light touch on the screen.

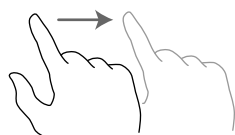
This is used to select a menu, enter data, and so on.



#### Dragging

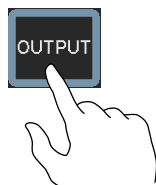
Drag refers to the act of pressing your finger against the screen and sliding your finger.

This is used to move the display position on the screen, for example.



#### Long tap

A long tap is when you place your finger on a specific position (button) on the screen and hold it still for about 2 seconds. This is used to turn on the output of the source block.



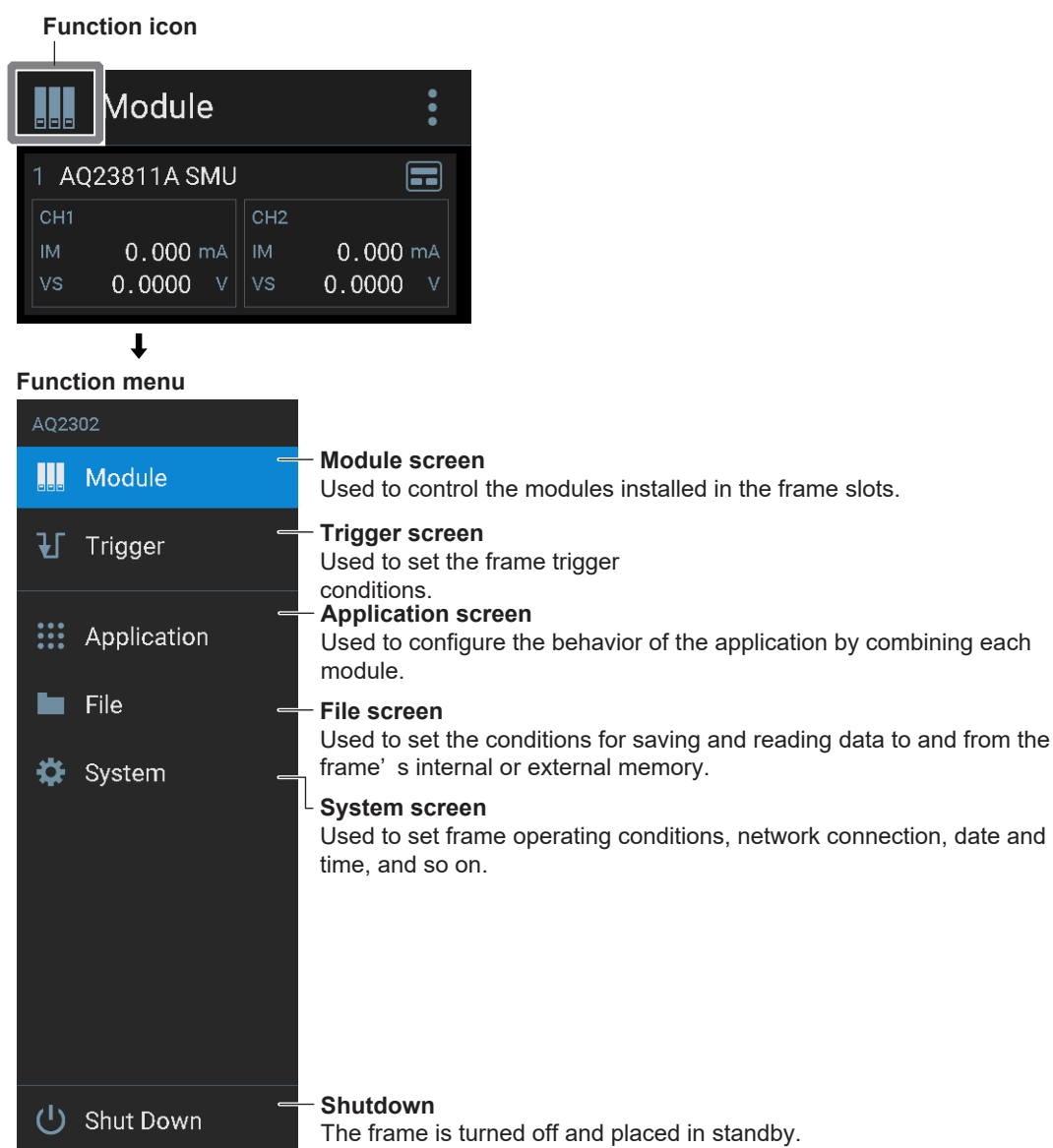
## 3.2 Switching the Display

### Function Menus

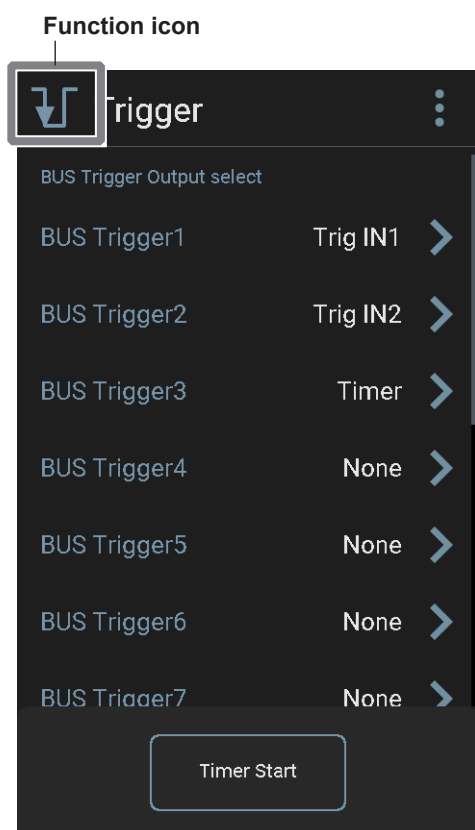
When the frame starts, the summary view of the top screen (Module screen) appears. Tap the function icon in the upper left corner of the menu screen to display the function menu.

You can switch to other screens from the function menu.

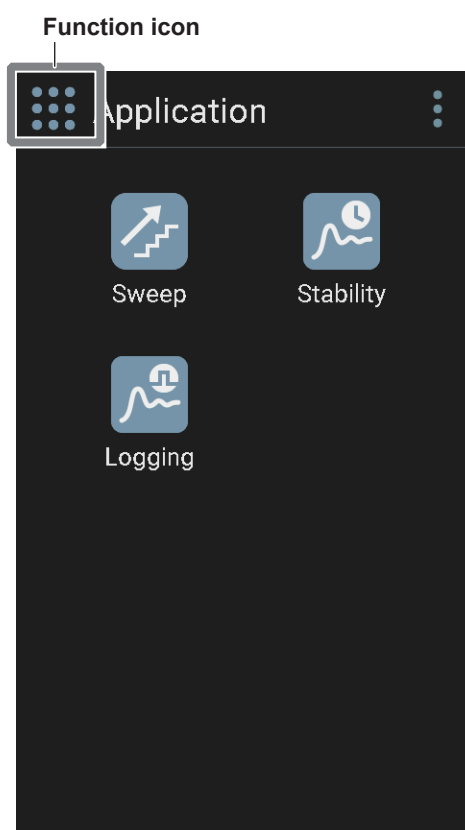
#### Summary view of the top screen (Module screen)



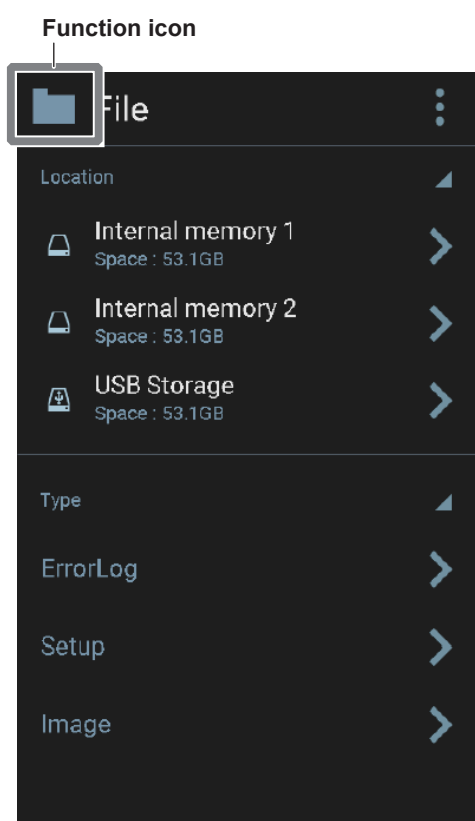
## Trigger screen



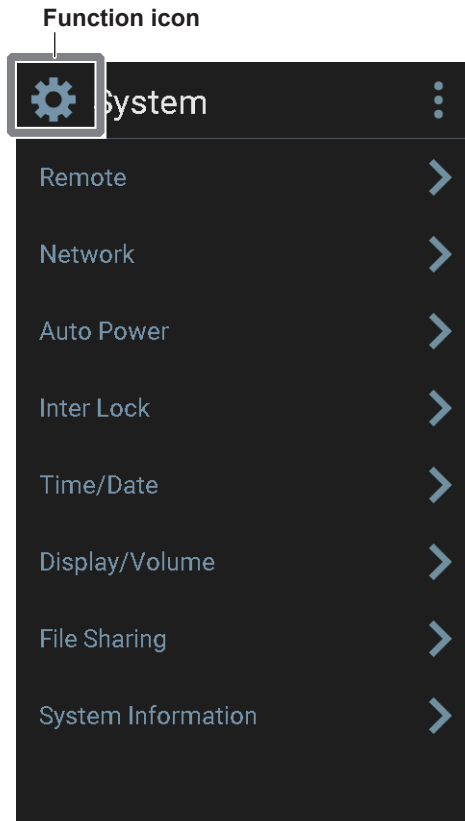
## Application screen



## File screen



## System screen

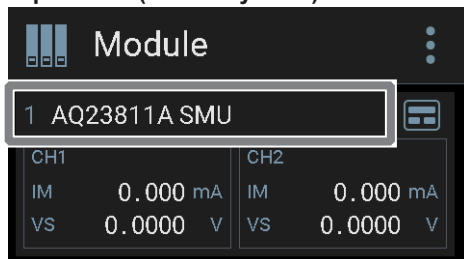


### 3.3 Selecting the Connection Type (remote sense/ local sense)

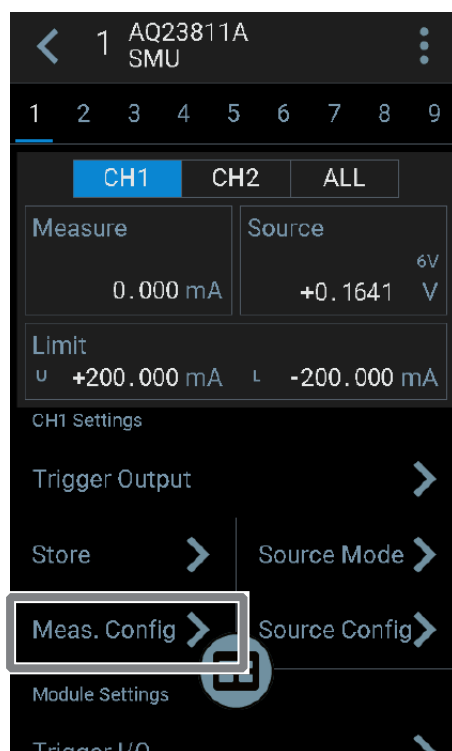
#### Procedure

1. Tap a module name on the top screen (summary view).
2. In the detail view, tap **Measure Config**. A Measure Config screen appears.
3. Tap **Wire** on the Measure Config screen. A Wire screen appears.
4. Select **2wire** or **4wire**.

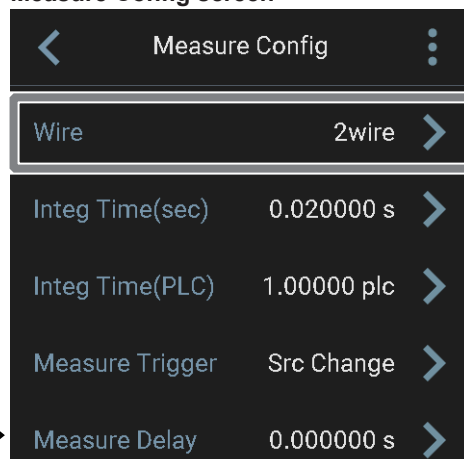
Top screen (summary view)



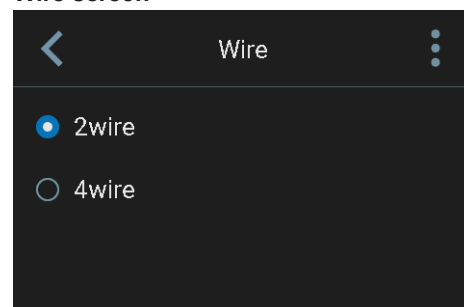
Detail view



Measure Config screen



Wire screen



## Explanation

Set the wiring method to 2wire (two-terminal connection) 4wire (four-terminal connection).

### 2wire (local sense)

This is a wiring method in which the Hi and Lo of the output terminals are connected to the DUT. Select this when the effect of cable resistance can be ignored.

### 4wire (remote sense)

In this wiring method, SENSE Hi and Lo are connected in parallel in addition to the wiring of the Hi and Lo of the output terminals to the DUT.

For voltage sourcing, connecting them near the DUT reduces the effect of cable resistance and allows the desired voltage to be applied to the DUT.

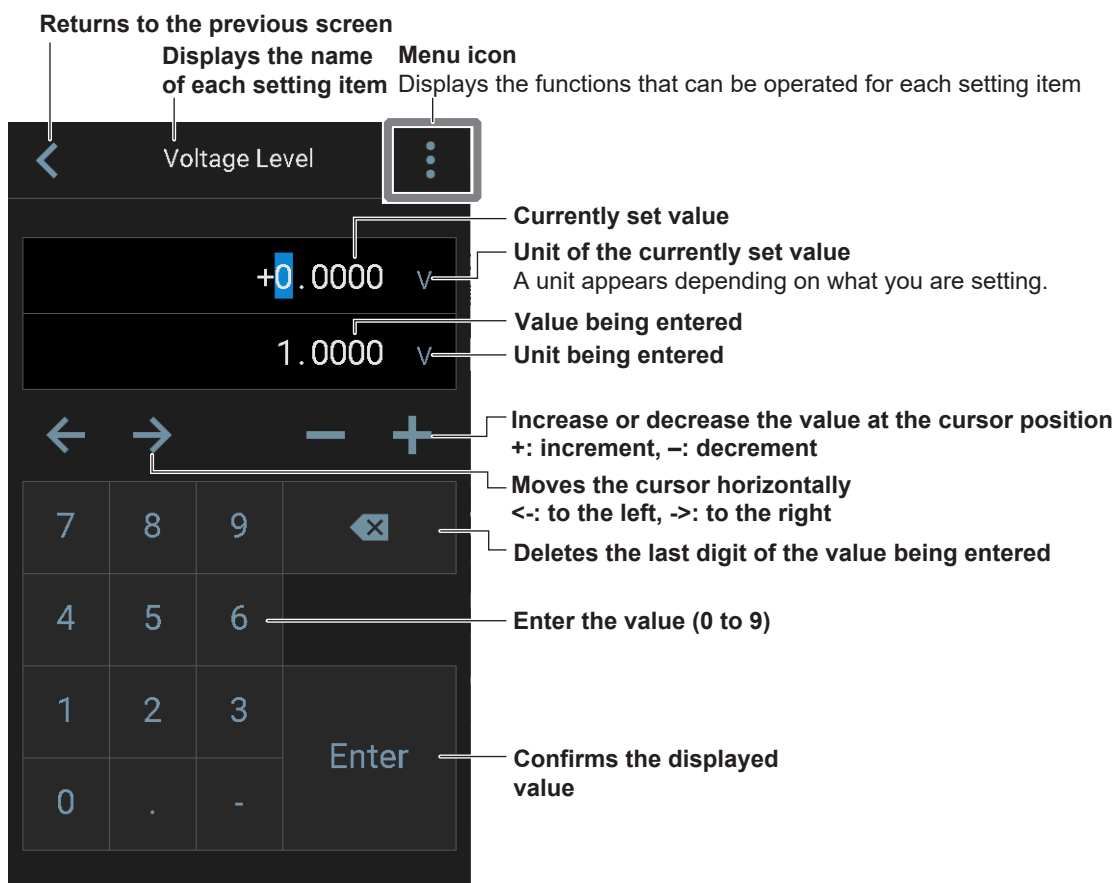
In addition, this method is effective for measuring voltage at high precision when the running current is large and the voltage appearing at the DUT is small, such as for low-resistance measurement.

## 3.4 Entering Values and Text

### Entering values

#### Entering a decimal value (0 to 9)

Enter a number between 0 and 9. Depending on the setting, a menu will appear for entering the unit in addition to the number.



**Entering a time**

Enter numbers between 0 and 9 for the time (hour, minute).

Returns to the previous screen

Displays the name of each setting item

Startup time

Time

Hour

Minute

Currently set value (hour)

Currently set value (minute)

Enter the value (0 to 9)

Deletes the value at the cursor position  
(Returns to the default value)

Moves the cursor horizontally  
<=: to the left, ->: to the right

Confirms the displayed value

7 8 9

4 5 6

1 2 3

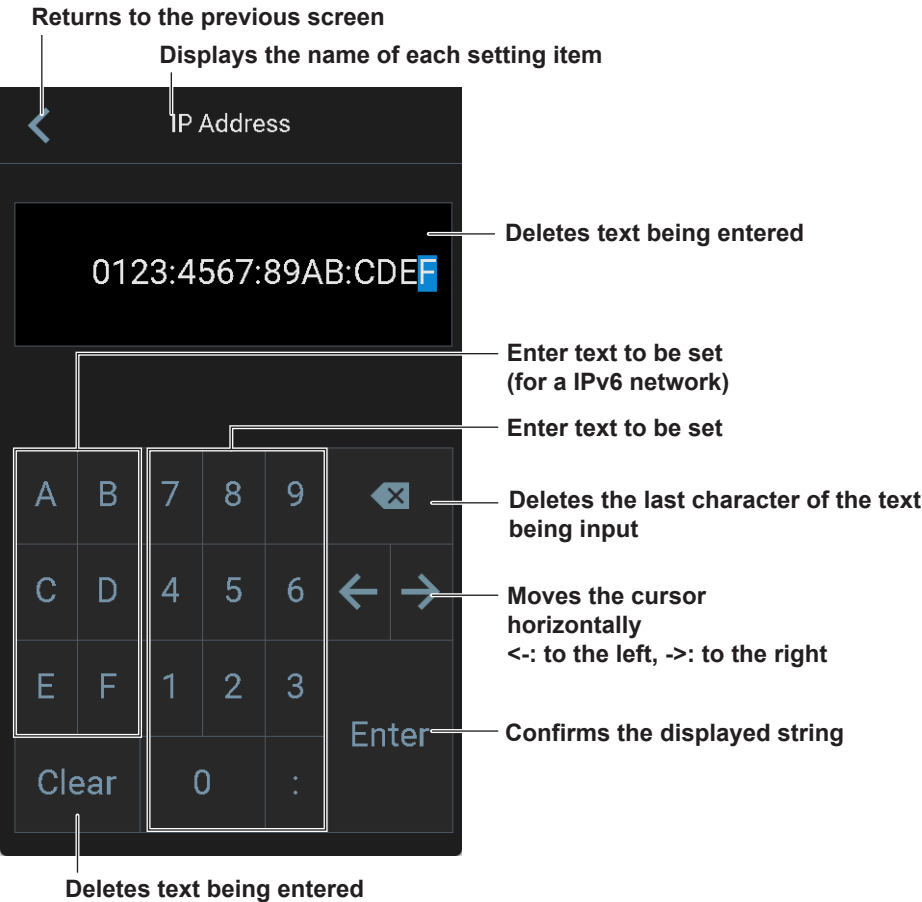
0

Enter

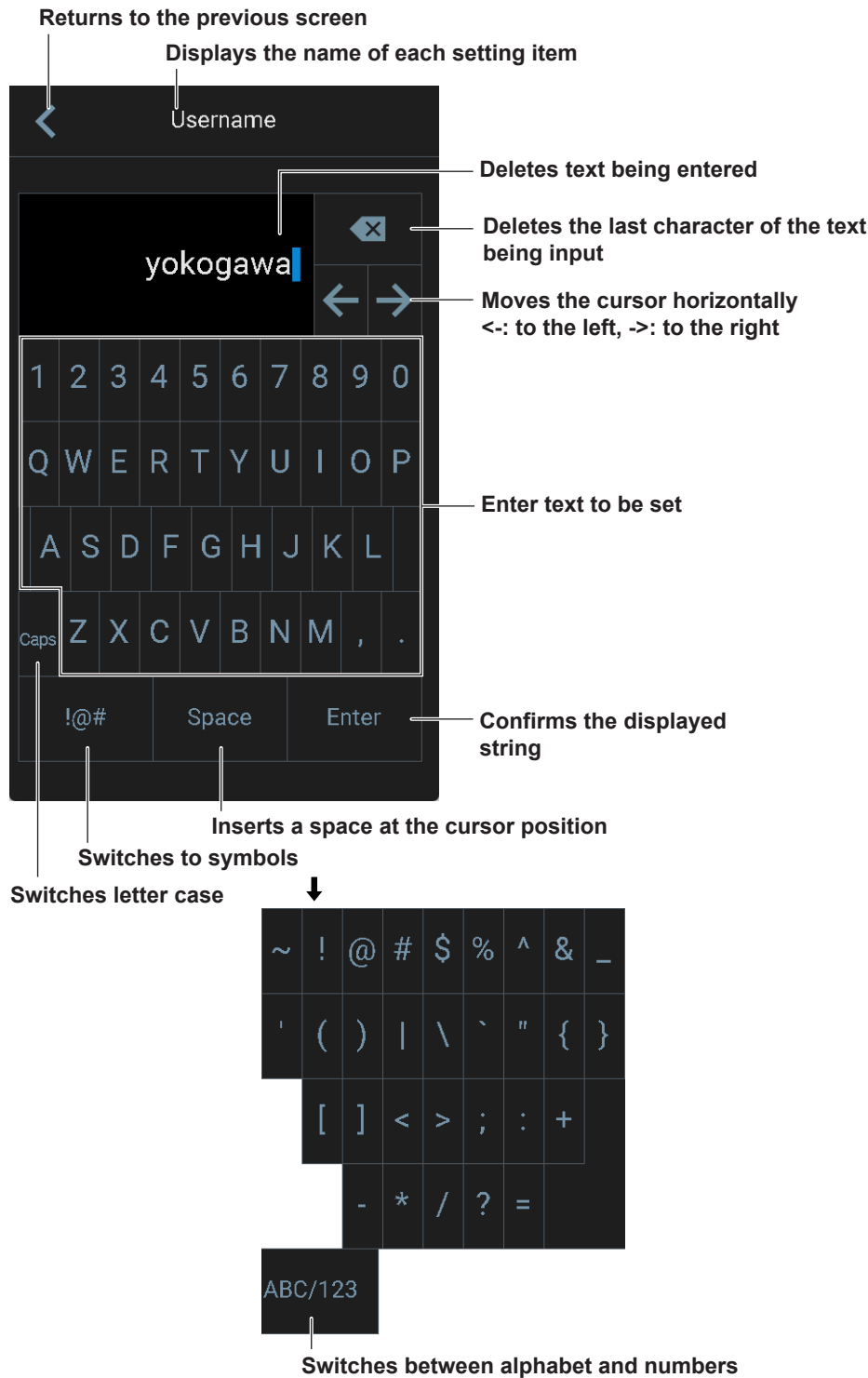
**Note** For details on setting the date and time, see section 3.5.

## Entering character strings

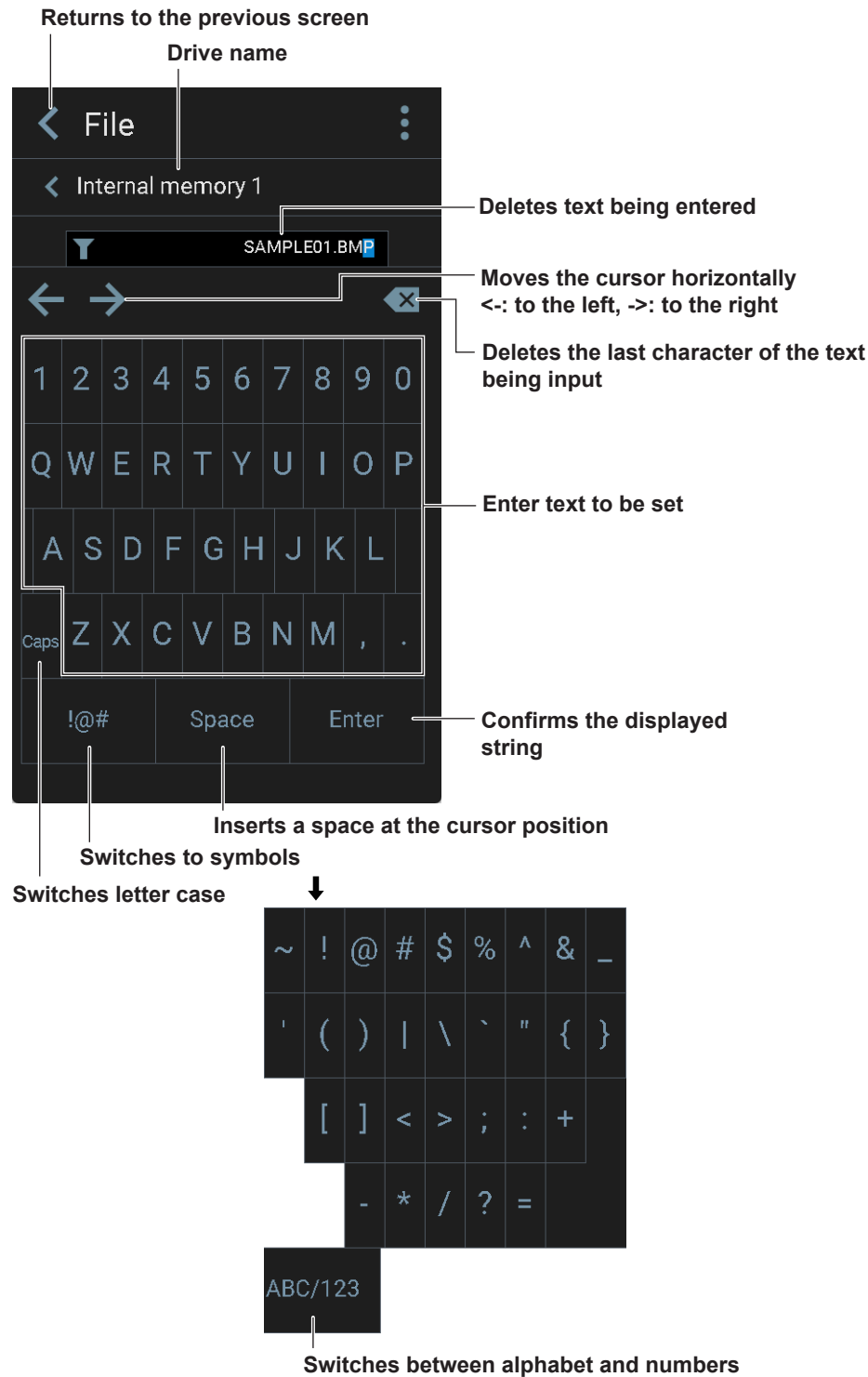
### Entering a network address



Entering a user name, password, or the like



Entering filter conditions

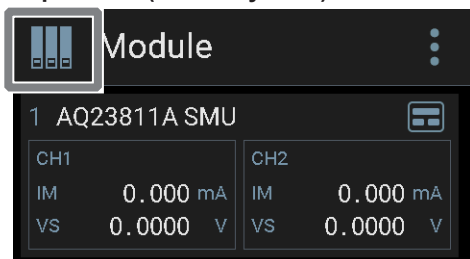


## 3.5 Setting the Date, Time, and the Time Difference from GMT (Greenwich Mean Time)

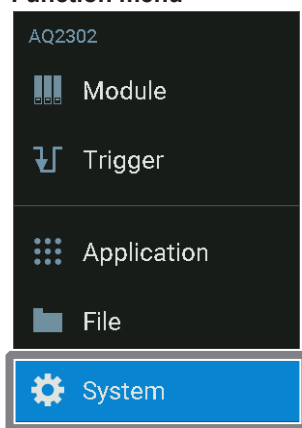
### Procedure

1. On the top screen (summary view), tap the function icon . A function menu appears.
2. Tap **System**. A System menu appears.
3. Tap **Time/Date**. A Time/Date screen appears.

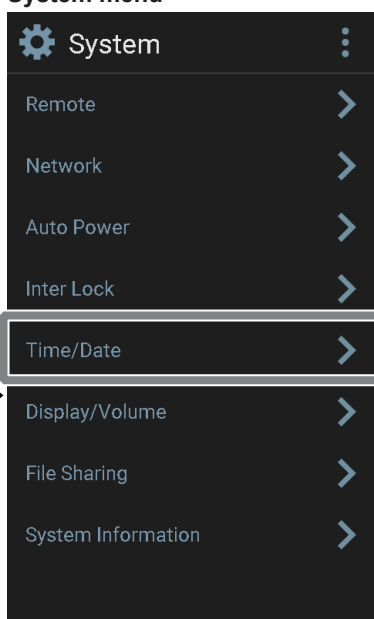
Top screen (summary view)



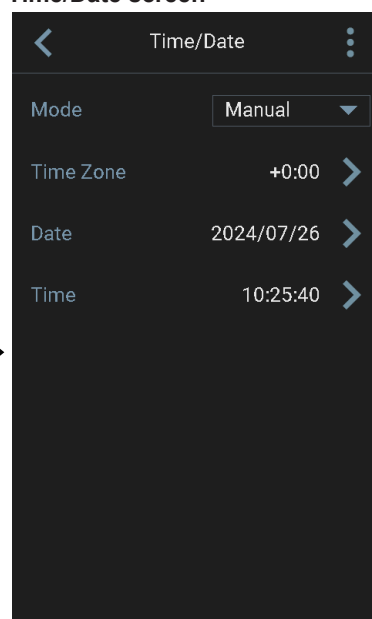
Function menu



System menu



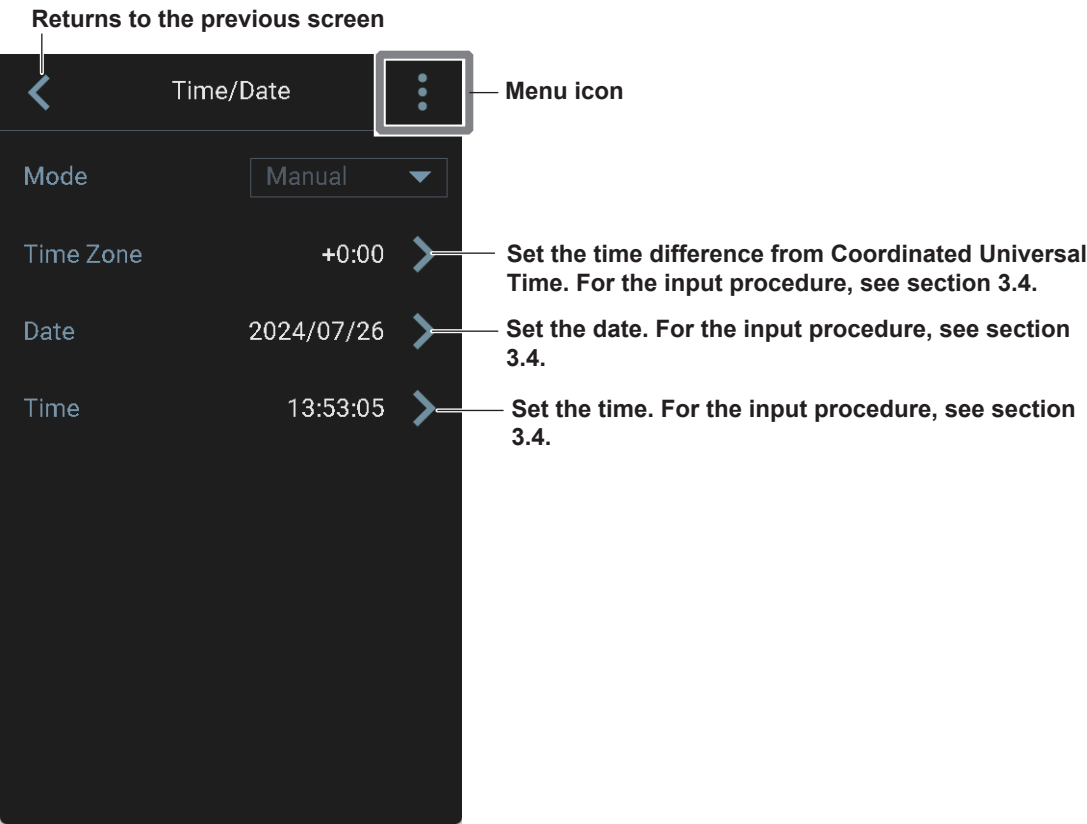
Time/Date screen



3.5 Setting the Date, Time, and the Time Difference from GMT (Greenwich Mean Time)

Time/Date screen

Set the date and time.



Returns to the previous screen

Menu icon

Set the time difference from Coordinated Universal Time. For the input procedure, see section 3.4.

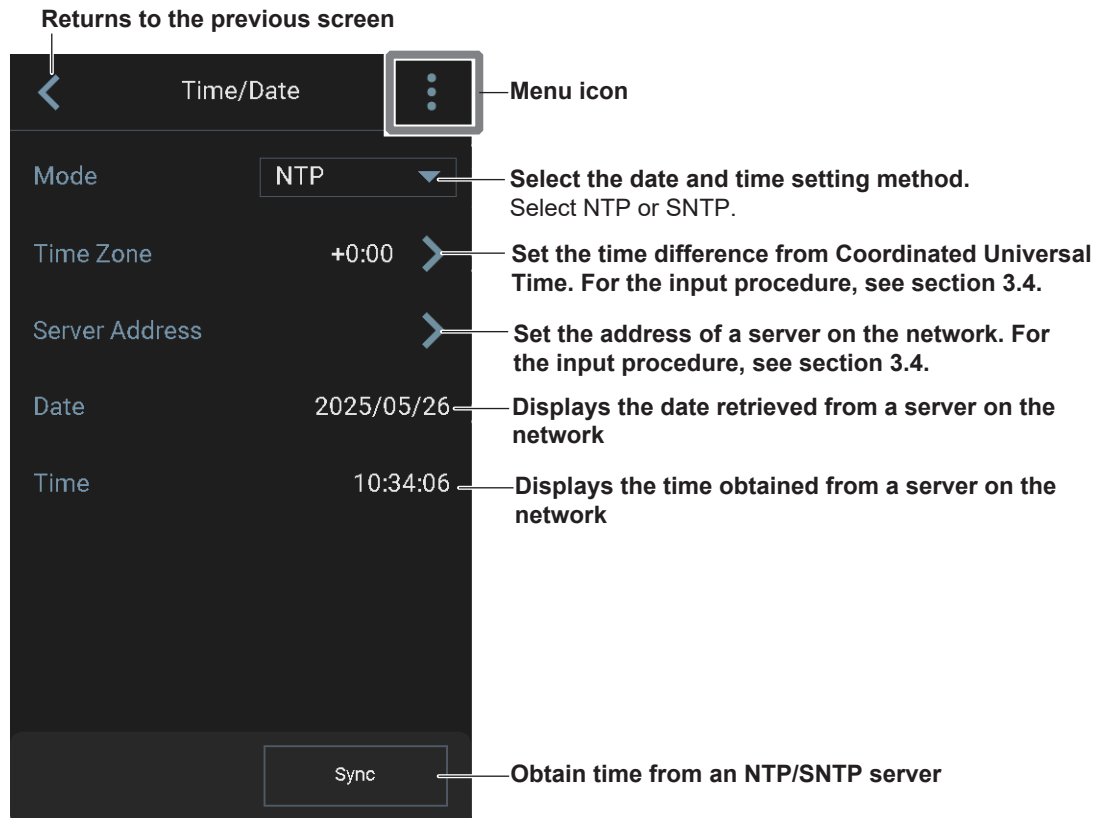
Set the date. For the input procedure, see section 3.4.

Set the time. For the input procedure, see section 3.4.

Menu icon

- **Take a Screenshot**  
Takes a screenshot of the frame display screen and saves it as screenshot data in the instrument.

- NTP/SNTP mode



#### Menu icon

- Take a Screenshot

Takes a screenshot of the frame display screen and saves it as screenshot data in the instrument.

## Explanation

### Setting the Date and Time

- **Date (Year/Month/Day)**  
Set the year in Western calendar year.
- **Time (Hour/Minute)**  
Set the hour in 24-hour format.

### Note

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- The date and time settings are backed up with the internal lithium battery when the power is turned off.
  - The instrument has leap-year information.
- 

### Setting the Time Difference from GMT (Greenwich Mean Time)

Set the time difference in the range of –12 hours 00 minutes to 13 hours 00 minutes.

For example, Japan standard time is ahead of GMT by 9 hours. In this case, set Hour to -9 and Minute to 00.

### Checking the standard time

Using one of the methods below, check the standard time of the region where you are using the instrument.

- Check the Date, Time, Language, and Regional Options on your PC (Windows).
- Check the website at the following URL: <https://www.worldtimeserver.com/>

### Note

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This instrument does not support Daylight Saving Time. To set the time to Daylight Saving Time, reset the time difference from Greenwich Mean Time.

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# 4.1 Frame

## REMOTE INTERLOCK



### CAUTION

Only apply signals that meet the specifications. Doing so may damage the instrument.

### French



### ATTENTION

Appliquez seulement des signaux qui répondent aux spécifications. Cela pourrait endommager l'instrument.

### Interlock terminal

An interlock terminal is provided as an output safety device.



| Item           | Specification      |
|----------------|--------------------|
| Connector type | BNC, contact input |

## TRIG IN 1/2 (trigger in)



### CAUTION

Only apply signals that meet the specifications. Excessive voltage or the like may damage the instrument.

### French



### ATTENTION

Appliquez seulement des signaux qui répondent aux spécifications. Une tension excessive ou similaire peut endommager l'instrument.

## 4.1 Frame

### External trigger input terminal

This terminal is used to apply external trigger signals for the module to start sourcing or measuring.



| Item              | Specification                |
|-------------------|------------------------------|
| Connector type    | BNC                          |
| Input level       | 5 V TTL                      |
| Input pulse width | 10 µs or more                |
| Input logic       | Negative logic, falling edge |

## TRIG OUT 1/2 (trigger out)



### CAUTION

Do not apply an external voltage to the TRIGGER OUT terminal. Doing so may damage the instrument.

### French



### ATTENTION

N'appliquez pas de tension externe à la borne TRIGGER OUT. Cela pourrait endommager l'instrument.

### External Trigger Output Terminal

This terminal outputs busy signals or trigger signals to an external device in sync with the module's sourcing or measuring.



| Item               | Specification                |
|--------------------|------------------------------|
| Connector type     | BNC                          |
| Output level       | 5 V TTL                      |
| Output pulse width | 10 µs or more                |
| Output logic       | Negative logic, falling edge |

## EXT IO (digital I/O)



### CAUTION

- Do not apply a voltage exceeding the TTL level to the input.
- Do not short or apply an external voltage to the output.

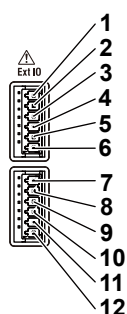
## French

**ATTENTION**

- N'appliquez pas une tension supérieure au niveau TTL à l'entrée.
- Ne pas court-circuiter ou appliquer une tension externe à la sortie.

**Digital I/O terminal**

For digital input/output terminals (EXT IO), there is no setting on the instrument's screen for input/output. Pin assignments and functions are fixed. Make connections according to the following pin assignments.

**Pinout**

- **Signals and functions**

| Signal name | Function                        | Pin number |
|-------------|---------------------------------|------------|
| GND         | Signal ground                   | 1          |
| IO [0]      | Digital I/O                     | 2          |
| IO [1]      | Digital I/O                     | 3          |
| IO [2]      | Digital I/O                     | 4          |
| IO [3]      | Digital I/O                     | 5          |
| VCC         | Signal power supply (3.3 V/5 V) | 6          |
| GND         | Signal ground                   | 7          |
| IO [4]      | Digital I/O                     | 8          |
| IO [5]      | Digital I/O                     | 9          |
| IO [6]      | Digital I/O                     | 10         |
| IO [7]      | Digital I/O                     | 11         |
| VCC         | Signal power supply (3.3 V/5 V) | 12         |

Digital I/O (IO[0] to IO[7]) operate as the following signals.

- Switch between input and output using a remote control command
- Set the logic level (3.3 V/5 V) using a remote control command.
- Numerically read the digital I/O signal values using a remote control command
- Detect changes in the digital I/O signal values using a remote control command
- Apply sweep start triggers using digital input signals
- Generate a digital output signal when sweeping stops

# 4.2 SMU

## Output terminals (CH1, CH2)



### CAUTION

Do not connect a load exceeding the following maximum output across the HI–LO and HS–LS terminals.  
Keep the voltage source across HI-HS and LO-LS no greater than  $\pm 0.25 V_{peak}$ .

### French



### ATTENTION

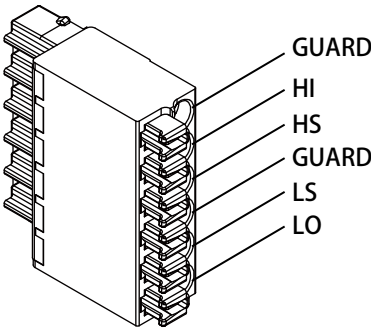
N'appliquez pas une tension supérieure au niveau TTL à la borne TRIG IN/OUT. Cela pourrait endommager l'instrument.

### Measurement plug

Connect a measurement cable.

| Item           | Specification                                |
|----------------|----------------------------------------------|
| Connector type | Push-in connection plug, analog input/output |

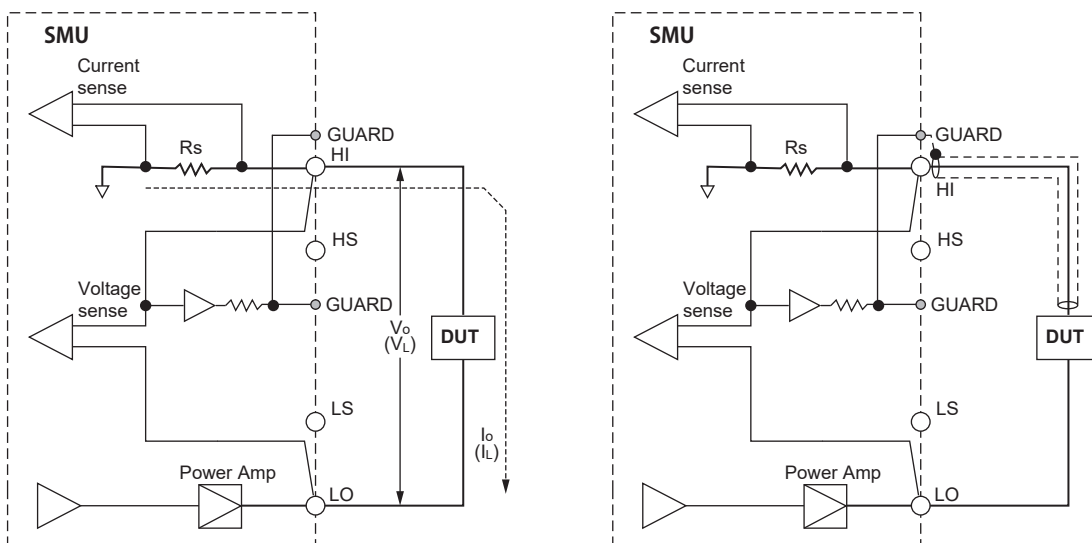
### Pinout



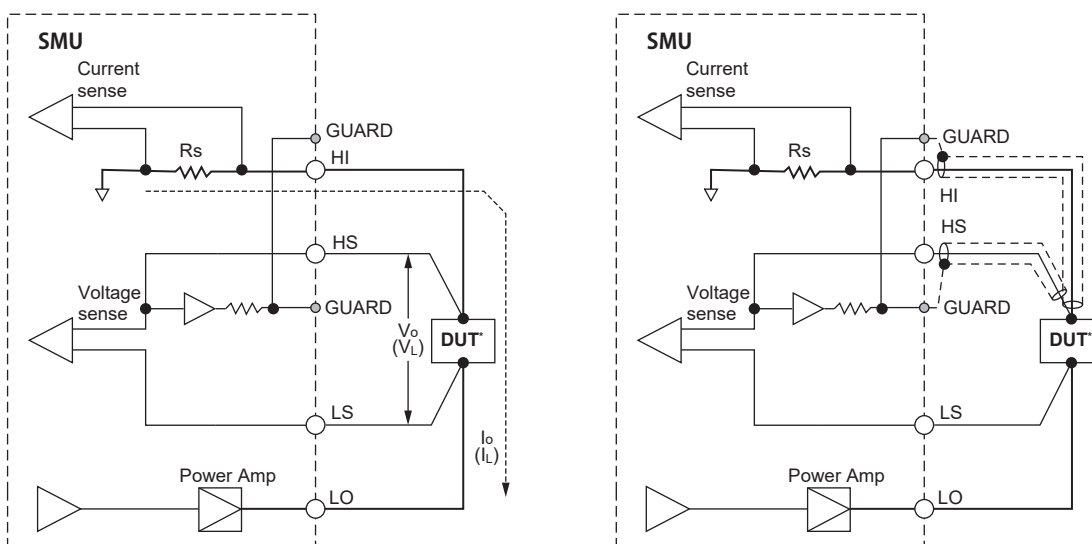
### Signals and functions

| Item  | Function                                                                                                                                                                                             |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HI    | Voltage, current output terminals                                                                                                                                                                    |
| LO    | Voltage, current output terminals                                                                                                                                                                    |
| HS    | Voltage sense terminal for 4-wire connections                                                                                                                                                        |
| LS    | Voltage sense terminal for 4-wire connections                                                                                                                                                        |
| GUARD | Guard terminal (two terminals internally connected). Can be used for the HI and HS shields when you want to reduce leakage current and improve response during low-current sourcing and measurement. |

- 2W (2-terminal connection = local sense) / GUARD wiring example (right)



- 4W (4-terminal connection = remote sense) / GUARD wiring example (right)



### Core processing

Single wires or stranded wires can be connected without core processing. Soldering (pre-tinning) of the core wire is not recommended.

### Wiring

- Single wire/stranded wire: 0.14 mm<sup>2</sup> to 0.5 mm<sup>2</sup>
- Stranded wire without plastic sleeve and with ferrule: 0.25 mm<sup>2</sup> to 0.34 mm<sup>2</sup>
- Stranded wire with plastic sleeve and with ferrule: 0.14 mm<sup>2</sup> to 0.25 mm<sup>2</sup>
- AWG26-20

### Length of stripped wire

7 mm

# TRIG CH1/CH2 (trigger I/O)



## CAUTION

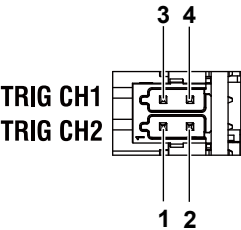
Do not apply a voltage exceeding the TTL level to the TRIG IN/OUT terminal. Doing so may damage the instrument.

### Trigger signal I/O terminal

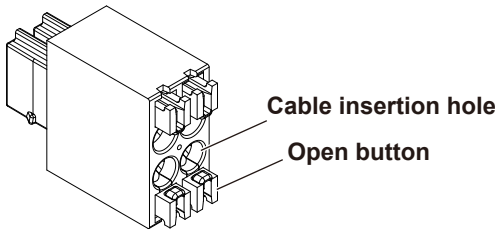
These terminals can receive and output trigger signals, busy signals, and measurement start signals. Each terminal can be set to either input or output.

| Item            | Specification                |
|-----------------|------------------------------|
| Connector type  | Push-in connection plug      |
| I/O level       | 5 V TTL                      |
| I/O pulse width | 10 $\mu$ s or more           |
| I/O logic       | Negative logic, falling edge |

### Pinout



### Trigger plug



### Core processing

Single wires or stranded wires can be connected without core processing. Soldering (pre-tinning) of the core wire is not recommended.

### Wiring

- Single wire/stranded wire: 0.14 mm<sup>2</sup> to 0.5 mm<sup>2</sup>
- Stranded wire without plastic sleeve and with ferrule: 0.25 mm<sup>2</sup> to 0.34 mm<sup>2</sup>
- Stranded wire with plastic sleeve and with ferrule: 0.14 mm<sup>2</sup> to 0.25 mm<sup>2</sup>
- AWG26-20

### Length of stripped wire

7 mm

• **Signals and functions**

| Signal name | Input or output | Function                                                                                                                                    | Pin number |
|-------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------|
| TRIG CH1    | Input           | Receives any of the following signals to be used as the CH1 trigger source.<br>• Sweep trigger<br>• Measurement trigger<br>• Source trigger | 3          |
|             | Output          | Can output any of the following status signals.<br>• Sweep busy (SwpBusy)<br>• Source busy (SrcBusy)<br>• Measurement start (MeasStart)     |            |
| GND         | —               | Ground                                                                                                                                      | 4          |
| TRIG CH2    | Input           | Receives any of the following signals to be used as the CH2 trigger source.<br>• Sweep trigger<br>• Measurement trigger<br>• Source trigger | 1          |
|             | Output          | Can output any of the following status signals.<br>• Sweep busy (SwpBusy)<br>• Source busy (SrcBusy)<br>• Measurement start (MeasStart)     |            |
| GND         | —               | Ground                                                                                                                                      | 2          |

# 4.3 OPM

## Analog Out (ANALOG OUT)

### Analog Signal Output Terminal

This terminal transmits a voltage level that corresponds to the level of the optical signal that is applied to the OPM.

Use cables that are 3 m or shorter in length.

- **AQ23202A, AQ23211A, AQ23221A**

ANALOG OUT



| Item             | Specification                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------|
| Connector type   | BNC connector                                                                                                |
| Output level     |                                                                                                              |
| AUTO mode        | Outputs approx. 0 to 2 V or approx. 0 to 5 V in proportion to the measurement power (W) for each power range |
| LINEAR mode      | Outputs approx. 0 to 2 V or approx. 0 to 5 V in proportion to the measurement power (W) setting range        |
| LOG mode         | Outputs approx. 0 to 2 V or approx. 0 to 5 V in proportion to the measurement power (dBm) setting range      |
| Trigger mode     | Outputs 0 V or 5 V pulses                                                                                    |
| Output impedance | Approx. 100 Ω                                                                                                |

## 5.1 Troubleshooting

If servicing is necessary, or if the instrument does not operate properly even after you have attempted to deal with the problem according to the instructions in this section, contact your nearest YOKOGAWA dealer.

| Description                                                                                                                            | Probable cause                                             | Corrective action                                                                                                                                                                                                                                      | Refer to Section                    |
|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| The instrument does not turn on.                                                                                                       | The power source is not connected.                         | Check the frame's power cable connection. If they are loose, connect them firmly.                                                                                                                                                                      | Section 2.3                         |
| Cannot perform panel operations.                                                                                                       | The instrument is in remote mode.                          | To perform panel operations, cancel remote control mode from the remote controller to put the instrument into local mode.                                                                                                                              | Section 2.2 in IM AQ23011A-17EN     |
| The USB storage feature does not work.                                                                                                 | The PC does not support the USB mass storage class.        | The USB storage feature is valid on Windows PCs. Using Device Manager, check that the instrument is recognized.                                                                                                                                        | —                                   |
| The source level or measured value is strange.                                                                                         | Insufficient warm-up.                                      | Warm up the instrument for 30 minutes after turning on the power.                                                                                                                                                                                      | —                                   |
|                                                                                                                                        | The ambient temperature is fluctuating.                    | Use the instrument in a stable environment that meets the specifications.                                                                                                                                                                              | —                                   |
|                                                                                                                                        | The signal contains noise.                                 | Use the instrument in an environment free of noise. Exercise caution especially when handling minute voltage or current.                                                                                                                               | Section 2.5                         |
|                                                                                                                                        | The instrument is oscillating.                             | Check whether the load is within the allowable range. Use coaxial cable for wiring.                                                                                                                                                                    | Section 2.5                         |
|                                                                                                                                        | Inappropriate connection.                                  | In the case of a four-terminal connection, check that the connection is correct. Note that in the case of a two-terminal connection, the lead wire resistance and contact resistance have an effect on the operation when the output current is large. | Section 2.5                         |
| The output is forced off, and the error message "An input error occurred, connected so the module output was turned off" is displayed. | A load that is outside of the specifications is connected. | Connect a load that is within the specifications.                                                                                                                                                                                                      | Section 2.1                         |
| "The module is overheated and the slot power has been turned off" is displayed.                                                        | The outlet or inlet ports are blocked.                     | Provide adequate space around the instrument.                                                                                                                                                                                                          | Sections 2.1 and 2.2                |
| Unable to save data to the storage device.                                                                                             | No free space on the storage device.                       | Delete unneeded files or format the storage device.                                                                                                                                                                                                    | —                                   |
| Unable to configure the instrument through the communication interface.                                                                | Communication settings do not match.                       | Match the communication settings with the PC.                                                                                                                                                                                                          | Chapters 1 to 3 in IM AQ23011A-17EN |

## 5.2 Error Messages and Corrective Actions

Messages may appear on the screen while you are using this instrument. This section describes the error messages and how to respond to them. If the corrective action states that servicing is required, contact your nearest YOKOGAWA dealer.

| Error No. | Error messages                                                        | Corrective action                                                                                                                                                                                            |
|-----------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2         | Frame temperature is over limit.<br>Shutdown will after 5 seconds.    | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required. |
| 200       | Data type error.                                                      | Check the <DATA> format.                                                                                                                                                                                     |
| 209       | Undefined header.                                                     | Check the command.                                                                                                                                                                                           |
| 320       | Illegal parameter value.                                              | Check the command and parameter format.                                                                                                                                                                      |
| 1001      | Failed to frame update.                                               | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 1002      | Failed to initialize the frame.                                       | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 1004      | USB memory can not be recognized.                                     | Contact your nearest YOKOGAWA dealer for details on what USB memory devices have been confirmed to work with the instrument.                                                                                 |
| 1007      | Failed to setup system log.                                           | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 1010      | Failed to File Sharing setting.                                       | Check the file or folder name.                                                                                                                                                                               |
| 1012      | Failed to unlock the interlock.                                       | Enter the correct password.                                                                                                                                                                                  |
| 1015      | An error occurred while executing Load Frame setting.                 | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 1017      | Failed to setup time zone setting.                                    | Check the time zone.                                                                                                                                                                                         |
| 1018      | Fail to SNTP/NTP setting.                                             | Contact the network administrator.                                                                                                                                                                           |
| 1019      | Failed to setup the LCD brightness setting.                           | Set the brightness within the correct range.                                                                                                                                                                 |
| 1020      | Failed to setup volume setting.                                       | Set the volume within the correct range.                                                                                                                                                                     |
| 1022      | The request could not be accepted because another process is running. | Wait a moment, and then try again.                                                                                                                                                                           |
| 1023      | The request could not be accepted.                                    | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 1024      | Frame temperature is over limit.                                      | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required. |
| 1025      | FAN not working.                                                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 1026      | Frame temperature is over limit.                                      | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required. |
| 1027      | Failed to read the frame temperature.                                 | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 1028      | Invalid user name.                                                    | Enter the correct user name.                                                                                                                                                                                 |
| 1029      | Invalid password.                                                     | Enter the correct password.                                                                                                                                                                                  |
| 1040      | Failed to setup network setting.                                      | Contact the network administrator.                                                                                                                                                                           |
| 1041      | Failed to setup firewall setting.                                     | Contact the network administrator.                                                                                                                                                                           |
| 1042      | Failed to setup encryption setting.                                   | Check the remote control settings.                                                                                                                                                                           |
| 1043      | The address is too long.                                              | Enter the correct address.                                                                                                                                                                                   |
| 1051      | Invalid trigger number.                                               | Enter the correct trigger number.                                                                                                                                                                            |

| Error No. | Error messages                                                                                             | Corrective action                                                                                                                |
|-----------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1060      | Digital I/O control error.                                                                                 | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1061      | Digital I/O control error.                                                                                 | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1062      | Digital I/O control error.                                                                                 | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1103      | A file or folder with the same name already exists.                                                        | Check the file that you are trying to load. If you are sure, delete the already existing file.                                   |
| 1104      | Invalid file name or folder name. The following characters cannot be used.<br>\\ / : ; * ? " ' < >   % . , | Set the correct file and folder names.                                                                                           |
| 1105      | File or folder does not exist.                                                                             | Check the file or folder name.                                                                                                   |
| 1106      | Failed to delete the file or folder.                                                                       | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1107      | Failed to copy the file or folder.                                                                         | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1108      | Failed to create folder.                                                                                   | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1109      | Failed to save the file.                                                                                   | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1110      | Failed to load the file.                                                                                   | The file may be corrupt. Recreate the file that you are trying to load.                                                          |
| 1111      | Failed to rename the file.                                                                                 | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1118      | Failed to copy the folder. The destination folder is a subfolder of the source folder.                     | Set the correct copy destination.                                                                                                |
| 1119      | The file name or folder name cannot be blank.                                                              | Set the correct file or folder name.                                                                                             |
| 1120      | File execution error.                                                                                      | Check the file operation.                                                                                                        |
| 1121      | The relative path is invalid. Please select same current drive.                                            | Set the correct relative path.                                                                                                   |
| 1122      | Cannot recognize the file system.                                                                          | The file may be corrupt. Recreate the file that you are trying to load.                                                          |
| 1123      | Failed to capture screen image.                                                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1124      | Failed to save screenshot.                                                                                 | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1125      | The path name is too long.                                                                                 | Set the path name with the correct length.                                                                                       |
| 1127      | Failed to copy the file or folder. The source and destination cannot be the same media.                    | Separate source and destination devices.                                                                                         |
| 1128      | The file is empty.                                                                                         | Recreate the file that you are trying to load.                                                                                   |
| 1129      | The number of screenshot files is limited.                                                                 | Delete files to decrease the number of files on the storage device, or switch to a different storage device that has more space. |
| 1130      | Failed to load the update file.                                                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1131      | Failed to load the program sweep file.                                                                     | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1132      | The maximum number of auto-saved files has been reached.                                                   | Delete files to decrease the number of files on the storage device, or switch to a different storage device that has more space. |
| 1133      | Failed to save the sweep result file.                                                                      | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1134      | Failed to save the store result file.                                                                      | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1135      | Invalid frame setting file.                                                                                | Use a file in which the frame settings are correctly saved.                                                                      |

## 5.2 Error Messages and Corrective Actions

| Error No. | Error messages                                                                                   | Corrective action                                                                                                                |
|-----------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1136      | Invalid module setting file.                                                                     | Use a file that contains valid module settings.                                                                                  |
| 1137      | Invalid frame update file.                                                                       | Use a correct file.                                                                                                              |
| 1138      | Invalid module update file.                                                                      | Use a correct file.                                                                                                              |
| 1139      | Failed to unmount.                                                                               | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1140      | Failed to save the Firewall setting file.                                                        | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1141      | Failed to save the system log file.                                                              | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1142      | The number of MaxMin Log Files is limited.                                                       | Delete files to decrease the number of files on the storage device, or switch to a different storage device that has more space. |
| 1143      | The number of Single Measure Files is limited.                                                   | Delete files to decrease the number of files on the storage device, or switch to a different storage device that has more space. |
| 1144      | Failed to save the MaxMin Log File.                                                              | Try again with a different USB memory device. If the same message continues to appear, servicing is required.                    |
| 1201      | Module self-test failed.                                                                         | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1202      | Module update failed.                                                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1203      | Failed to initialize the module.                                                                 | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1204      | Module status error.                                                                             | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1205      | InterLock error.                                                                                 | Release the interlock before turning the output on.                                                                              |
| 1206      | Calibration error.                                                                               | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1207      | Module selftest failed.                                                                          | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1300      | An error occurred while measurment.                                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1301      | An error occurred while exiting application.                                                     | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1302      | A module was removed while the application was running.Exit the application.                     | Close the Application menu before removing the module.                                                                           |
| 1303      | An error occurred while setting application.                                                     | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1304      | The wavelength common setting cannot be enabled.Please check the wavelength range of the module. | Check the wavelength range of the module.                                                                                        |
| 1305      | Inter lock is enabled.Exit the application.                                                      | Release the interlock and then restart the application.                                                                          |
| 1400      | An error occurred while measurment.                                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1401      | An error occurred while exiting application.                                                     | Restart the instrument. If the same message continues to appear, servicing is required.                                          |
| 1402      | No module specified.                                                                             | Specify the OPM module to be used.                                                                                               |
| 1403      | A module was removed while the application was running.Exit the application.                     | Close the Application menu before removing the module.                                                                           |
| 1404      | The wavelength common setting cannot be enabled.Please check the wavelength range of the module. | Check the wavelength range of the module.                                                                                        |
| 1405      | Out of the setting range.                                                                        | Set the value within the correct range.                                                                                          |
| 1500      | An error occurred while measurment.                                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                          |

| Error No. | Error messages                                                                                             | Corrective action                                                                                                                                                                                                                     |
|-----------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1501      | An error occurred while exiting application.                                                               | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                               |
| 1502      | No module specified.                                                                                       | Specify the OPM module to be used.                                                                                                                                                                                                    |
| 1503      | A module was removed while the application was running.<br>Exit the application.                           | Close the Application menu before removing the module.                                                                                                                                                                                |
| 1504      | The wavelength common setting cannot be enabled.<br>Please check the wavelength range of the module.       | Check the wavelength range of the module.                                                                                                                                                                                             |
| 1505      | Out of the setting range.                                                                                  | Set the value within the correct range.                                                                                                                                                                                               |
| 1900      | Web Remote receive error.                                                                                  | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                               |
| 1901      | Web Remote receive error.                                                                                  | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                               |
| 1902      | Web Remote receive error.                                                                                  | Resynchronize with WebRemote. If the same message continues to appear, turn the frame power off, close the web browser, restart the frame, and then try reconnecting. If the same message continues to appear, servicing is required. |
| 1903      | The application is running.Web Remote operation is not available.                                          | Close the Application menu and then execute the operation.                                                                                                                                                                            |
| 1904      | The SMU is executing a sweep.Web Remote operation is not available.                                        | Stop the SMU sweep and then execute the operation.                                                                                                                                                                                    |
| 2002      | Module preparation error.                                                                                  | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                               |
| 2003      | Module communication error.                                                                                | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                               |
| 2005      | Module communication error.                                                                                | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                               |
| 2006      | Module communication error.                                                                                | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                               |
| 2007      | The module cannot communicate.                                                                             | Wait a moment, and then try again. If the same message continues to appear, servicing is required.                                                                                                                                    |
| 2008      | Module status error.                                                                                       | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                               |
| 2009      | This module is not supported version.<br>Please update the Frame firmware.                                 | Update the frame software.<br>Contact your local YOKOGAWA dealer for the latest version of the software.                                                                                                                              |
| 2011      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot1. | Check the BUS trigger input/output settings for slot 1.                                                                                                                                                                               |
| 2012      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot2. | Check the BUS trigger input/output settings for slot 2.                                                                                                                                                                               |
| 2013      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot3. | Check the BUS trigger input/output settings for slot 3.                                                                                                                                                                               |
| 2014      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot4. | Check the BUS trigger input/output settings for slot 4.                                                                                                                                                                               |
| 2015      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot5. | Check the BUS trigger input/output settings for slot 5.                                                                                                                                                                               |

## 5.2 Error Messages and Corrective Actions

| Error No. | Error messages                                                                                             | Corrective action                                                                                                                                                                                            |
|-----------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2016      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot6. | Check the BUS trigger input/output settings for slot 6.                                                                                                                                                      |
| 2017      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot7. | Check the BUS trigger input/output settings for slot 7.                                                                                                                                                      |
| 2018      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot8. | Check the BUS trigger input/output settings for slot 8.                                                                                                                                                      |
| 2019      | There is a conflict in the BUS Trigger Output settings.<br>Please check the Trigger I/O setting for Slot9. | Check the BUS trigger input/output settings for slot 9.                                                                                                                                                      |
| 2100      | Temperature is over limit.                                                                                 | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required. |
| 2101      | Flash ROM fatal error.                                                                                     | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2102      | Opt lock error.                                                                                            | Release the interlock before turning the output on.                                                                                                                                                          |
| 2110      | Module communication error.                                                                                | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2111      | Module execution error.                                                                                    | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2112      | Module voltage error.                                                                                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2113      | Module voltage error.                                                                                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2120      | Module warning.                                                                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2121      | Module warning.                                                                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2122      | Module warning.                                                                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2123      | Module warning.                                                                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2124      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2125      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2126      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2127      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2130      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2131      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2132      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2133      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2134      | Module fatal error.                                                                                        | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |

| Error No. | Error messages                                                   | Corrective action                                                                                                                                                                                                       |
|-----------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2135      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2136      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2137      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2138      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2139      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2140      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2141      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2142      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2143      | Module fatal error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2144      | An error occurred while loading setup file.                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2200      | An error occurred while executing calibration of the OPM module. | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2201      | An error occurred while measuring.                               | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2202      | An error occurred while loading setup file.                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2203      | Input power over.                                                | Set the optical input power to a value that is less than or equal to the maximum optical input level.                                                                                                                   |
| 2204      | Input power over.                                                | Set the optical input power to a value that is less than or equal to the maximum optical input level.                                                                                                                   |
| 2205      | Failed to Zeroset.                                               | After checking that light can be cut off, execute the zero-set procedure again. If the same message continues to appear, servicing is required.                                                                         |
| 2206      | PD Module error.                                                 | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required.            |
| 2207      | Header error.                                                    | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2208      | Head Flash read error.                                           | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2209      | Head Flash read error.                                           | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2210      | Head Flash read error.                                           | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2211      | Head communicate error.                                          | With the module removed, disconnect and reconnect the head. Then, reattach the module. If the same message continues to appear, restart the instrument. If the same message continues to appear, servicing is required. |
| 2212      | Head voltage error.                                              | With the module removed, disconnect and reconnect the head. Then, reattach the module. If the same message continues to appear, restart the instrument. If the same message continues to appear, servicing is required. |
| 2213      | Temperature is over limit.                                       | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required.            |

## 5.2 Error Messages and Corrective Actions

| Error No. | Error messages                                                   | Corrective action                                                                                                                                                                                                       |
|-----------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2214      | Head error.                                                      | With the module removed, disconnect and reconnect the head. Then, reattach the module. If the same message continues to appear, restart the instrument. If the same message continues to appear, servicing is required. |
| 2215      | Head error.                                                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2216      | Module self-test failed.                                         | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2217      | Failed to get the MaxMin data.                                   | Execute the MaxMin measurement first.                                                                                                                                                                                   |
| 2300      | An error occurred while executing calibration of the VOA module. | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2301      | An error occurred while measuring.                               | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2302      | An error occurred while loading setup file.                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2303      | Temperature is over limit.                                       | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required.            |
| 2304      | Module update failed.                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2305      | The module is not operating.                                     | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2306      | Initialization error.                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2307      | Memory check error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2308      | Temperature is over limit.                                       | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required.            |
| 2309      | Over current error.                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2310      | Failed to Zeroset.                                               | After checking that light can be cut off, execute the zero-set procedure again. If the same message continues to appear, servicing is required.                                                                         |
| 2311      | Failed to Zeroset.                                               | After checking that light can be cut off, execute the zero-set procedure again. If the same message continues to appear, servicing is required.                                                                         |
| 2312      | Input power over.                                                | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2313      | Trigger input error.                                             | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2314      | OSW control error.                                               | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2330      | Initialization error.                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2331      | ATTN table error.                                                | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2332      | VOA voltage error.                                               | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2400      | An error occurred while loading setup file.                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2401      | Temperature is over limit.                                       | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |
| 2402      | Module update failed.                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                                 |

| Error No. | Error messages                                                                   | Corrective action                                                                                                                                                                                            |
|-----------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2403      | The module is not operating.                                                     | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2404      | Initialization error.                                                            | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2405      | Memory check error.                                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2406      | Temperature is over limit.                                                       | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required. |
| 2407      | Over current error.                                                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2801      | An error occurred while executing calibration of the SMU module.                 | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2802      | An error occurred while measuring.                                               | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2803      | An error occurred while executing store.                                         | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2804      | An error occurred while executing sweep.                                         | Stop sweeping first and then change the settings.                                                                                                                                                            |
| 2806      | An error occurred while loading setup file.                                      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2807      | An error occurred while loading program sweep file.                              | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2809      | A input error occurred, so the module output was turned off.                     | Connect a load that is within the specifications.                                                                                                                                                            |
| 2810      | A control error occurred, so the module output was turned off.                   | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2811      | A internal communication error occurred, and the slot power was turned off.      | Restart the instrument. If the same message continues to appear, servicing is required.                                                                                                                      |
| 2812      | The module is overheated and the slot power has been turned off.                 | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required. |
| 2813      | The output cannot be turned on because the module is too hot.                    | Turn the power off and confirm that the frame's inlet and outlet ports are not blocked. After waiting for some time, restart the instrument. If the same message continues to appear, servicing is required. |
| 2814      | The module has entered fallback mode.<br>Please update the module firmware.      | Update the module software. Contact your local YOKOGAWA dealer for the latest version of the software.                                                                                                       |
| 2815      | The module could not be started correctly.<br>Please update the module firmware. | Update the module software. Contact your local YOKOGAWA dealer for the latest version of the software.                                                                                                       |
| 2816      | The sweep settings are inappropriate, and calculation is not possible.           | Set the correct start and stop values.                                                                                                                                                                       |

## 5.3 Exchanging Modules

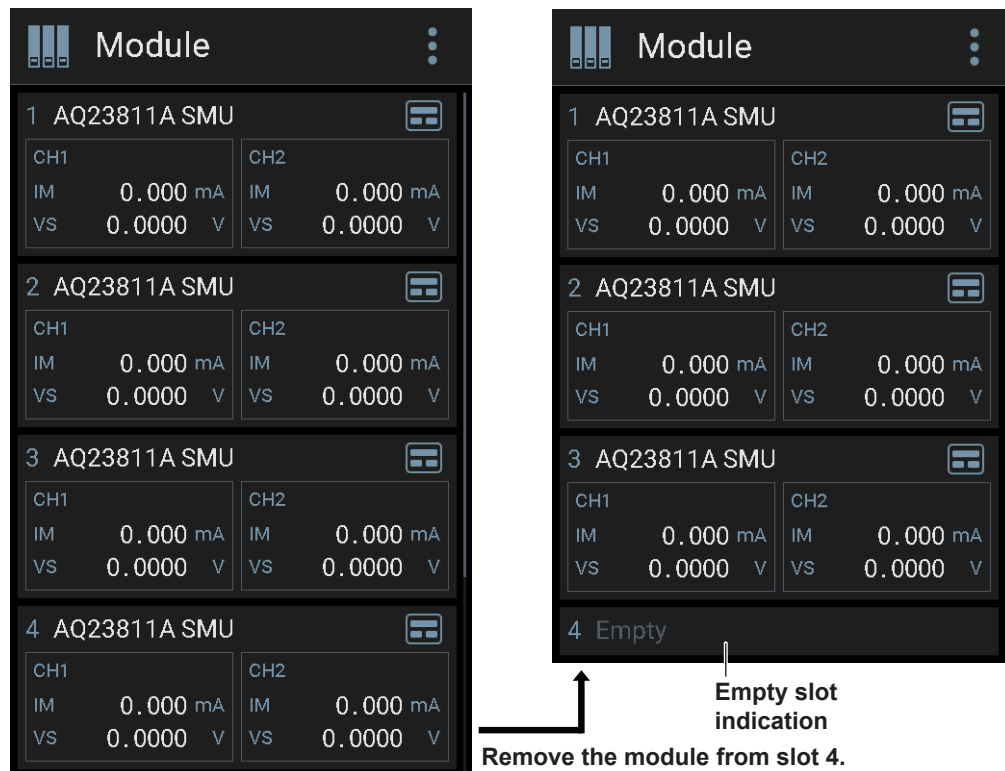
You can install and uninstall modules while the frame is turned on.

### Uninstalling a module

You can uninstall modules from the frame while the instrument is on.

For the module installation/uninstallation procedure, see “Installing and Uninstalling Modules” in section 2.2.

As an example, the screen when removing a module installed in slot 4 of the frame is shown below.



### Note

When a screen other than the detail or overview view is showing, unplugging the module closes the currently displayed screen. The detail or overview view is shown the next time the module is installed.

### Installing a module

You can install a module while the instrument is on.

When a module is installed, it is automatically detected.

## 5.4 Routine Maintenance



### WARNING

Do not clean optical connectors or optical adapters while light is being emitted.  
The emitted light includes wavelengths that are invisible to the human eye.



### CAUTION

Follow the precautions below. Otherwise, you may damage the instrument.

- Turn the instrument off before starting maintenance.
- Do not use chemicals such as thinner, benzene, or alcohol. Doing so may cause discoloration and deformation.

### French



### AVERTISSEMENT

Ne nettoyez pas les connecteurs optiques ou les adaptateurs optiques pendant qu'une lumière est émise.

La lumière émise comprend des longueurs d'onde invisibles à l'œil humain.

### ATTENTION

Le non-respect des précautions suivantes risque de provoquer des dysfonctionnements de l'instrument.

- Mettre l'instrument hors tension avant la maintenance.
- Ne pas utiliser de produits chimiques (par exemple, diluants, benzène ou alcool) pour éviter toute décoloration ou déformation.

### Notes before storage

Wipe the instrument off with a cloth to remove dust, fingerprints, and other dirt.

For instructions on how to clean the exterior of the instrument, see “Cleaning the Frame Controller and Modules.”

### Notes when re-using the instrument

Before using the instrument again after long-term storage, make sure that it operates normally. Check that it operates correctly in the same way that was outlined above in the section “Notes before storage.”

### Cleaning the frame and modules

To use this instrument for as long as possible and to prevent problems or malfunctions, routine maintenance is necessary.

## 5.4 Routine Maintenance

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- When cleaning the case or the operation panel, first remove the power cord from the outlet, and then wipe with a dry, soft, clean cloth.
- Dust the electrical interface area with an air spray.

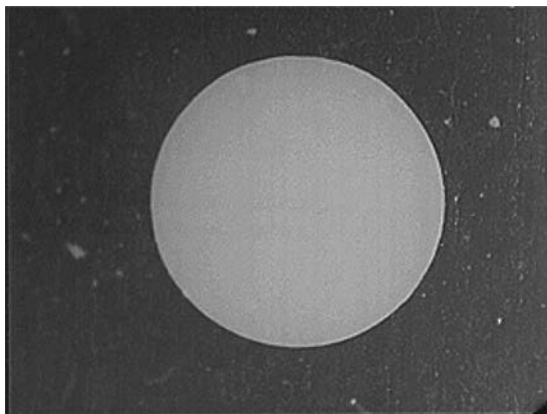
### **Why It Is Necessary to Clean the Optical Interface**

The optical connectors and optical plugs are the only optical components whose optical fiber end faces are exposed to the outside. Even a tiny scratch on their end faces that cannot be detected by the naked eye greatly affects their optical performance. If optical connectors are connected improperly, if they are connected without the removal of dust or dirt, or if they are cleaned improperly, the optical connector end faces may be damaged.

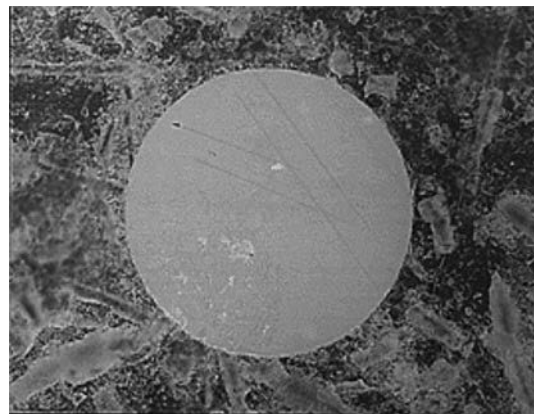
When connecting optical connectors, you must properly align the ferrule cores of both optical connectors. An optical adapter is used for this connection, but if the connection is made with dirt or dust attached to the ferrule side face or ferrule guide (sleeve) of the optical adapter, the cores cannot be properly aligned. This may lead to problems such as optical power loss, transmission mode disturbances, and an increased optical reflection at the connection point. Consequently, the instrument will not be able to take proper measurements. To prevent problems such as these, it is necessary to keep the optical connectors clean and to make proper connections when connecting optical connectors to measuring instruments or to other optical connectors.

When you use this instrument, clean the ferrule every time it is connected and clean the precision sleeve at least once every 30 connections. In particular, if you use optical connectors such as those described on the following page, we recommend that you clean them before every use.

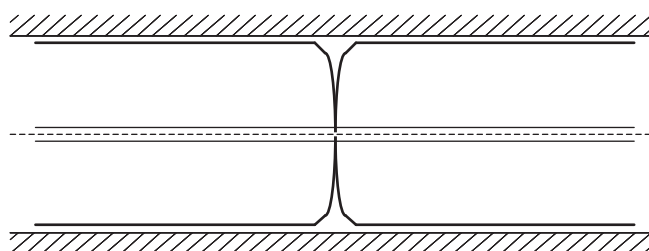
- Optical connectors are connected after a metallic sleeve has been inserted  
Particles that are worn off of the metallic sleeve may stick to the ferrule side face or end face particularly easily.
- Optical connectors that have ferrule materials that easily wear out, such as metallic or crystallized glass ferrule  
Ferrule particles may wear off easily from connecting and disconnecting the optical connector.
- Optical connectors and precision sleeves, with which plastic shell type optical connectors are repeatedly engaged  
Plastic particles wear off easily from the repeated engagement of the shell.



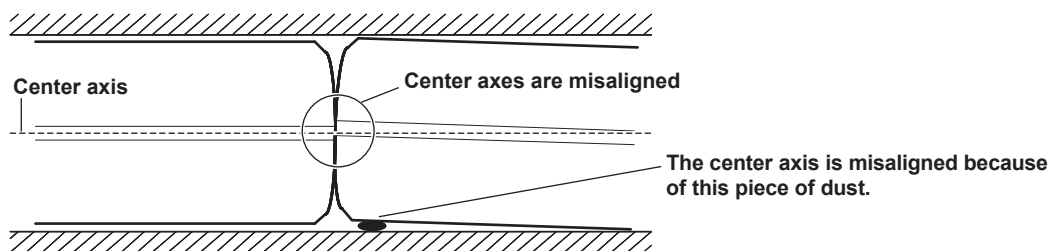
Enlarged photo of a good optical connector connection



Enlarged photo of a scratched optical connector connection



Correctly aligned optical connectors



Optical connectors whose axes are misaligned due to a piece of dust

#### Tools Required for Cleaning Optical Interfaces

When cleaning an optical interface, prepare the following:

- Isopropyl alcohol
- Cleaning paper
- Stick-type cleaner
- Compressed air
- An optical connector end face magnifying microscope

### How to Clean Optical Connectors

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#### **CAUTION**

If you use dirty cleaning paper, you may damage the end face. Always use new pieces of cleaning paper.

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### French

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#### **ATTENTION**

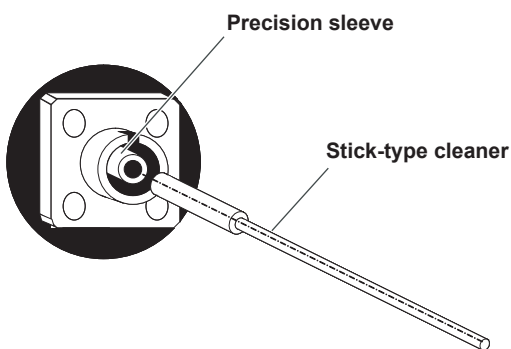
L'utilisation de lingettes de nettoyage sales risque d'endommager l'extrémité. Toujours utiliser des lingettes de nettoyage neuves.

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1. Soak a piece of cleaning paper in the isopropyl alcohol, and pinch the cleaning paper on the sides of the optical ferrule. Rub the sides of the ferrule with the cleaning paper.
2. Soak another piece of cleaning paper in the isopropyl alcohol, and rub the cleaning paper against the ferrule end face.
3. Wipe of the moisture with another piece of cleaning paper. After that, use the compressed air to remove any remaining dust.
4. Use the optical connector end face magnifying microscope to inspect the end face. Repeat the cleaning process until the end face is clear of dirt and dust.

### How to Clean the AQ9335C Optical Connector Adapter

1. Soak a stick-type cleaner in the isopropyl alcohol, and slowly insert it into the optical connector adapter's precision sleeve. Use the stick-type cleaner to clean the adapter's inner walls.
2. Wipe of the moisture with another stick-type cleaner. After that, use the compressed air to remove any remaining dust.



### How to Clean the Optical Input Section of the AQ23211A and AQ23212A Optical Power Meter Modules



#### CAUTION

Wipe the light receiving glass softly. Strong pressure may scratch the glass or break the components.

### French

#### ATTENTION

Nettoyer avec précaution le verre récepteur de lumière. Toute pression forte risque de rayer le verre ou de casser les composants.

The light receiving glass on the module may be scratched during cleaning.

Using a brush that has been used many times or a brush that has not been used for a long time may scratch the light receiving glass. Use new brushes when cleaning this optical input connector.

1. Use the compressed air to remove small amounts of dust and dirt.
2. If there is dirt or dust that you cannot remove with the compressed air, soak a piece of cleaning paper in the isopropyl alcohol, and softly wipe the surface of the light receiving glass. Then, use the compressed air to remove any lint that remains on the light receiving glass.

### Precautions for Routine Use

To protect the optical interfaces, always strictly observe the following points during routine use.

- To prevent dust from adhering to the optical interfaces, always attach dust caps to the optical connectors and the instrument's optical interfaces that are not being used.
- To prevent the connector end faces from getting dirty or being damaged, never touch the optical interfaces with anything (except when cleaning them or carrying out adjustments).
- When connecting the optical connectors, always insert them straight so that the connector end face does not touch the connector adapter, the nearby panel, or nearby components.

### How to Clean the Optical Input Section of the AQ23221A Optical Power Meter Module

Because the light receiving surface is very sensitive, never rub it to clean off dust particles.

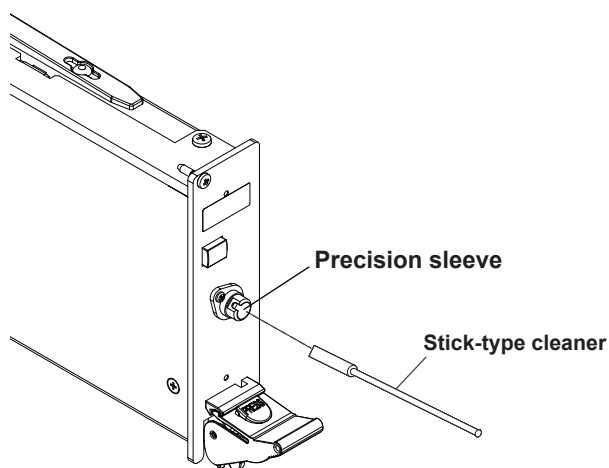
Use the compressed air to remove small amounts of dust and dirt.

### How to Clean the Optical Input Section of the AQ23291A and AQ23295A Optical Power Meter Modules

See "How to Clean the Optical Input Section of the AQ23211A Optical Power Meter Module."

### How to Clean the Optical Output Section of the AQ23111A, AQ23112A, and AQ23191A Light Source Modules

1. Soak a stick-type cleaner in the isopropyl alcohol, and slowly insert it into the optical output connector's precision sleeve. Rotate the stick-type cleaner while pressing lightly against the inner walls.



### How to Clean the Optical Input/Output Section of the AQ23311A, AQ23321A, and AQ23332A Variable Optical Attenuator Modules

See "How to Clean the Optical Output Section of the AQ23111A, AQ23112A, and AQ23191A Light Source Modules."

### How to Clean the Optical Input/Output Section of the AQ23411A, AQ23412A, AQ23413A, AQ23421A, and AQ23422A Optical Switch Modules

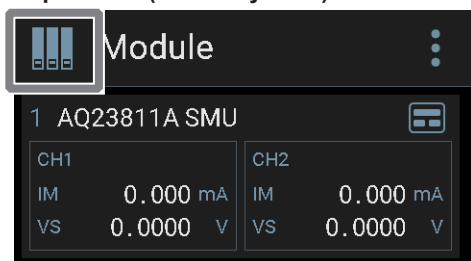
See "How to Clean the Optical Output Section of the AQ23111A, AQ23112A, and AQ23191A Light Source Modules."

## 5.5 Viewing Product Information

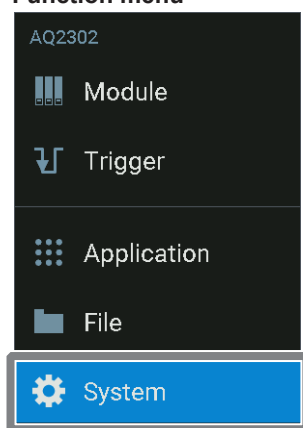
### Procedure

1. On the top screen (summary view), tap the function icon . A function menu appears.
2. Tap **System**. A System menu appears.
3. Tap **System Information**. A System Information screen appears.

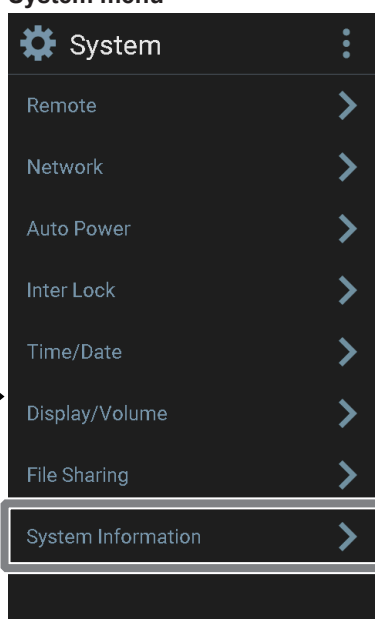
Top screen (summary view)



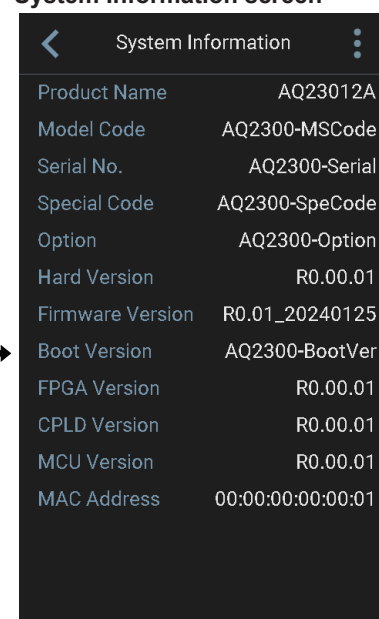
Function menu



System menu



System Information screen



## 5.6 Updating the Firmware

The firmware in the the frame or module can be updated when new features are added or when the firmware version of the frame or module is upgraded. Download the update firmware from the YOKOGAWA website.

<https://tmi.yokogawa.com/library/>

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### CAUTION

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- After you update the firmware on an instrument, all of its settings are reset to their default values. If necessary, save the setting information before you update the firmware.
- Do not decode or modify the files that are used to update the firmware.
- Always update the firmware to the most recent version.

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### French

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### ATTENTION

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- Après la mise à jour du micrologiciel d'un instrument, tous les paramètres sont réinitialisés sur les valeurs initiales. Le cas échéant, enregistrer les paramètres avant de mettre le micrologiciel à jour.
- Ne pas décoder ou modifier les fichiers servant à la mise à jour du micrologiciel.
- Toujours installer la mise à jour la plus récente du micrologiciel.

### Update preparation

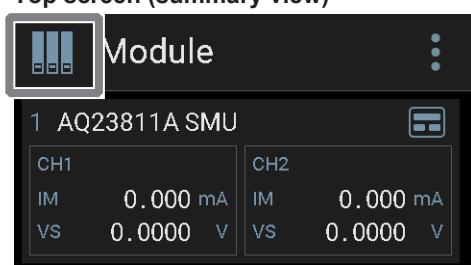
Specify the update firmware (.UPD extension) file stored in a USB memory device or the internal memory of this instrument to perform the update.

## Procedure

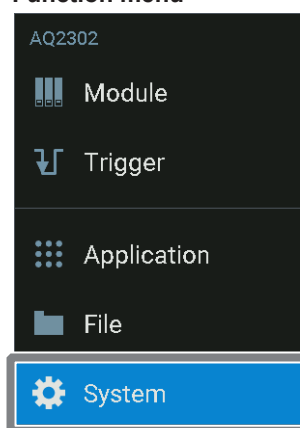
### Updating the frame

1. On the top screen (summary view), tap the function icon . A function menu appears.
2. Tap **System**. A System menu appears.
3. Tap **System Information**. A System Information screen appears.
4. On the System Information screen, tap the menu icon . A menu appears.
5. Tap **Update firmware**. A file selection window appears.
6. Tap the name of the file containing the updated firmware (.UPD extension).
7. Tap **Select**. An update will be implemented.

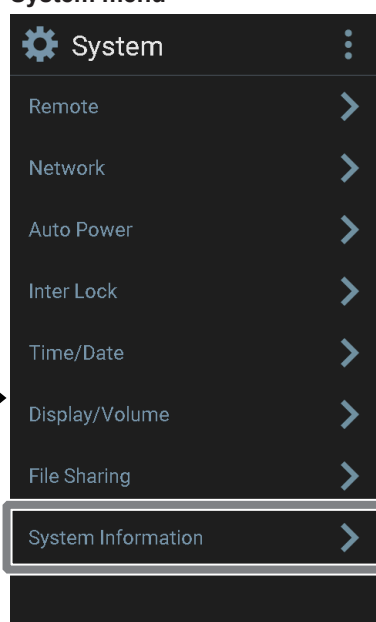
Top screen (summary view)



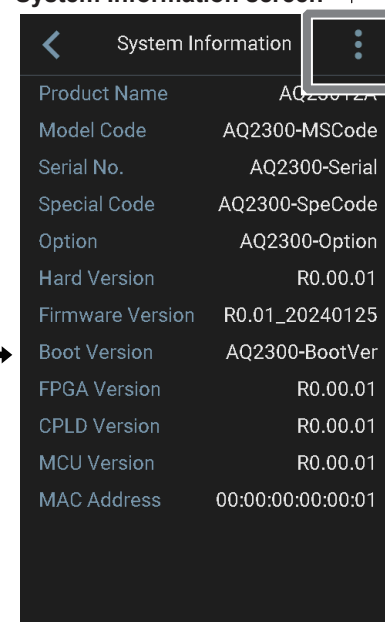
Function menu



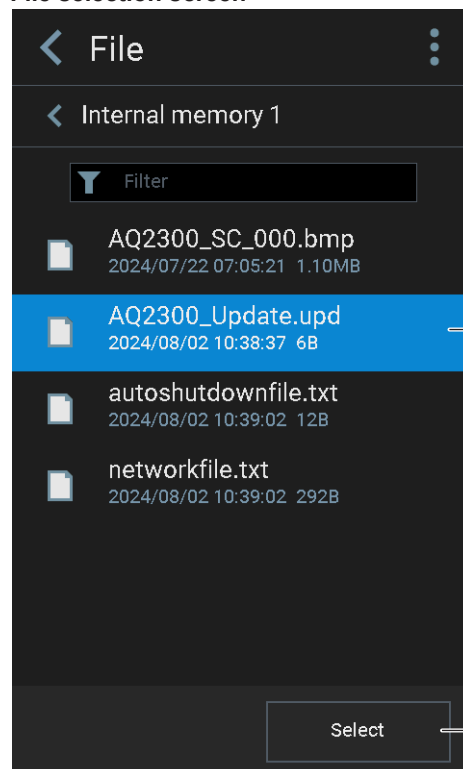
System menu



System Information screen

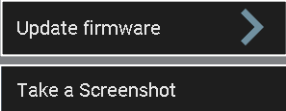


File selection screen



Specify the file containing the updated firmware.

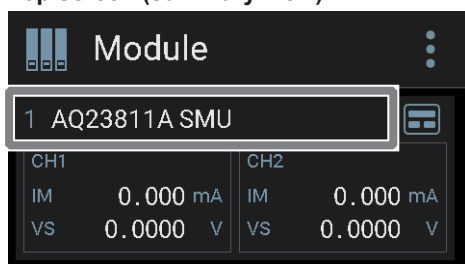
Selects the specified file



### Updating a module

1. On the top screen (summary view), tap the name of the module of the slot that you want to implement the update to.
2. In the detail view, tap the menu icon . A menu appears.
3. Tap **Module Information**. A Module Information screen appears.
4. On the Module Information screen, tap the menu icon . A menu appears.
5. Tap **Update firmware**. A file selection window appears.
6. Tap the name of the file containing the updated firmware (.UPD extension).
7. Tap **Select**. An update will be implemented.

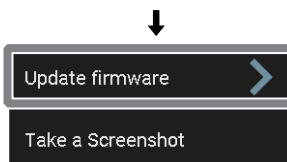
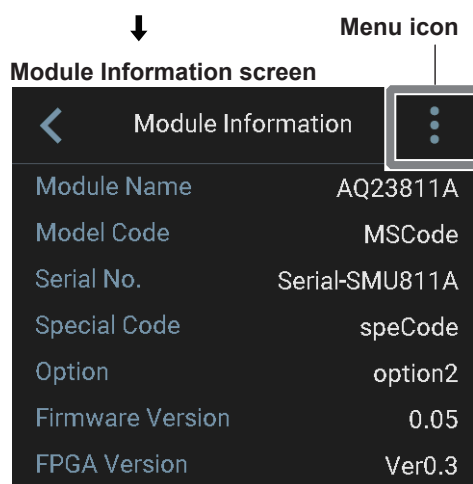
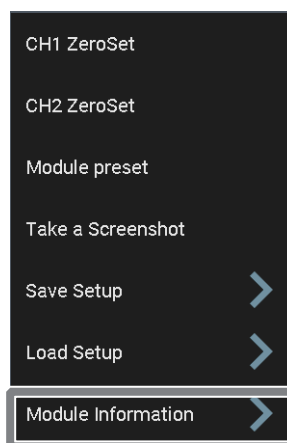
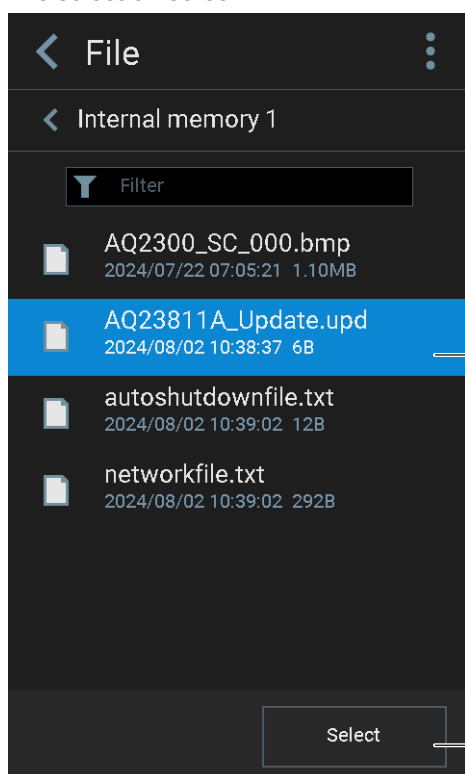
Top screen (summary view)



Detail



File selection screen



Specify the file containing the updated firmware.

Selects the specified file

## 5.7 Recommended Replacement Parts

The life and replacement period for expendable items varies depending on the conditions of use. Refer to the table below as a general guideline.

For part replacement and purchase, contact your nearest YOKOGAWA dealer. You cannot replace them by yourself.

### Parts with Limited Service Life

| Part name     | Service life                                                 |
|---------------|--------------------------------------------------------------|
| LCD backlight | Under normal conditions of use,<br>approximately 70000 hours |

### Consumable parts

We recommend replacement at the following cycles.

| Part name                        | Recommended replacement cycle | Notes             |
|----------------------------------|-------------------------------|-------------------|
| Cooling fan                      | 3 year                        |                   |
| Backup battery (lithium battery) | 5 year                        |                   |
| VOA module shutter               | 150000 times                  | AQ23311A/AQ23321A |

## 6.1 AQ23011A/AQ23012A Frame

### Performance and Functional Specifications

| Item                   |                                          |                                          | Specification                                                                                   |                           |                              |  |
|------------------------|------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------|------------------------------|--|
| Number of slots        |                                          |                                          | AQ23011A: 3<br>AQ23012A: 9                                                                      |                           |                              |  |
| Display device         |                                          |                                          | 4.3-inch LCD (touch panel)                                                                      |                           |                              |  |
| Remote interface       | Ethernet                                 | Number of ports                          | 1                                                                                               |                           |                              |  |
|                        |                                          | Connector type                           | RJ-45                                                                                           |                           |                              |  |
|                        |                                          | Electrical and mechanical specifications | Complies with IEEE802.3 <sup>1</sup>                                                            |                           |                              |  |
|                        |                                          | Transmission system                      | Ethernet (1000BASE-T)                                                                           |                           |                              |  |
|                        |                                          | Transfer rate                            | 1000 Mbps max.                                                                                  |                           |                              |  |
|                        |                                          | Communication protocol                   | TCP/IP                                                                                          |                           |                              |  |
|                        |                                          | Supported services                       | DHCP, remote control                                                                            |                           |                              |  |
|                        |                                          | Ports                                    | 0 to 65535                                                                                      |                           |                              |  |
|                        |                                          | USB                                      | Number of ports                                                                                 | 1                         |                              |  |
|                        | Connector type                           |                                          | USB type C plug                                                                                 |                           |                              |  |
|                        | Electrical and mechanical specifications |                                          | Complies with USB Rev 2.0 <sup>1, 2</sup>                                                       |                           |                              |  |
|                        | Supported protocols                      |                                          | USB-TMC, Mass Storage                                                                           |                           |                              |  |
|                        | Supported services                       |                                          | Remote control, Mass Storage                                                                    |                           |                              |  |
|                        | System requirements:                     |                                          | A device with a standard USB port and with the USB communication driver installed. <sup>2</sup> |                           |                              |  |
|                        | Remote interlock safety feature          |                                          |                                                                                                 | Connector                 | BNC connector, contact input |  |
|                        | External trigger                         |                                          | Trigger input 1                                                                                 | Connector type            | BNC connector                |  |
|                        |                                          |                                          |                                                                                                 | Electrical Specifications | TTL level: negative logic    |  |
|                        |                                          | Trigger output 1                         | Connector type                                                                                  | BNC connector             |                              |  |
|                        |                                          |                                          | Electrical Specifications                                                                       | TTL level: negative logic |                              |  |
| External interface     | USB                                      | Number of ports                          | 2                                                                                               |                           |                              |  |
|                        |                                          | Connector type                           | USB type A (receptacle)                                                                         |                           |                              |  |
|                        |                                          | Electrical and mechanical specifications | Complies with USB Rev 2.0 <sup>1</sup>                                                          |                           |                              |  |
|                        |                                          | Compatible devices                       | USB Mass Storage Class flash memory, USB HID Class keyboard                                     |                           |                              |  |
|                        |                                          | Power supply                             | 5V, 500mA                                                                                       |                           |                              |  |
|                        |                                          |                                          |                                                                                                 |                           |                              |  |
| Suffix code            |                                          |                                          | ETP                                                                                             | EDP                       |                              |  |
| External trigger       | Trigger input 2                          | Connector type                           | BNC connector                                                                                   | —                         |                              |  |
|                        |                                          | Electrical Specifications                | TTL level: negative logic                                                                       | —                         |                              |  |
|                        | Trigger output 2                         | Connector type                           | BNC connector                                                                                   | —                         |                              |  |
|                        |                                          | Electrical Specifications                | TTL level: negative logic                                                                       | —                         |                              |  |
|                        | Digital I/O                              | Number of ports                          |                                                                                                 | —                         | 8                            |  |
| Level                  |                                          | —                                        | 5V CMOS/3.3 CMOS                                                                                |                           |                              |  |
| Connector              |                                          | —                                        | MC 0,5/ 6-G-2,54 P20 THR R44×2                                                                  |                           |                              |  |
| Power supply (VCC Pin) |                                          | —                                        | 5V, 500mA or 3V, 300mA                                                                          |                           |                              |  |

## 6.1 AQ23011A/AQ23012A Frame

| Suffix code      |       |                                          | C01                                                                                  | N01 |
|------------------|-------|------------------------------------------|--------------------------------------------------------------------------------------|-----|
| Remote interface | GP-IB | Electrical and mechanical specifications | Complies with IEEE488 <sup>1</sup>                                                   | —   |
|                  |       | Functional specifications                | SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0                                        | —   |
|                  |       | Protocol                                 | Conforms to IEEE488.2                                                                | —   |
|                  |       | Code                                     | ISO (ASCII) codes                                                                    | —   |
|                  |       | Mode                                     | Addressable mode                                                                     | —   |
|                  |       | Addresses                                | 0 to 30                                                                              | —   |
|                  |       | Clearing remote mode                     | The LOCAL button key can be used to clear remote mode (except during Local Lockout). | —   |

<sup>1</sup> Use cables of 3 m or less in length.

<sup>2</sup> A separate driver (YTUSB, TMCTL) is required.

## General specifications

| Item                                                      |                                | Specification                                                                                                         |
|-----------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Power supply                                              | Rated supply voltage           | 100 to 240 VAC                                                                                                        |
|                                                           | Rated power frequency          | 50/60 Hz                                                                                                              |
|                                                           | Permitted supply voltage range | 90 VAC to 264 VAC                                                                                                     |
| Maximum power consumption                                 |                                | AQ23011A: 170 VA (including installed modules)<br>AQ23012A: 470 VA (including installed modules)                      |
| Withstand voltage (between the power supply and case)     |                                | 1.5 kVAC for 1 minute                                                                                                 |
| Insulation resistance (between the power supply and case) |                                | 500 VDC, 10 MΩ or more                                                                                                |
| Operating conditions                                      | Ambient temperature            | 5 to 40°C                                                                                                             |
|                                                           | Ambient humidity               | 20 to 80 % RH (no condensation)                                                                                       |
|                                                           | Altitude                       | 2000 m or less                                                                                                        |
| Store conditions                                          | Ambient temperature            | –20 to +60 °C                                                                                                         |
|                                                           | Ambient humidity               | 20 to 80 % RH (no condensation)                                                                                       |
|                                                           | Altitude                       | 3000 m or less                                                                                                        |
| Dimensions                                                |                                | AQ23011A: 213 × 132 × 420 mm (excluding protrusions)<br>AQ23012A: 426 × 132 × 470 mm (excluding protrusions)          |
| Weight                                                    |                                | AQ23011A: approx. 6 kg (not including installed modules)<br>AQ23012A: approx. 10 kg (not including installed modules) |
| Safety standards                                          | Compliant standards            | EN 61010-1, overvoltage category II <sup>1</sup> , pollution degree 2 <sup>2</sup> , EN IEC 61010-2-030               |

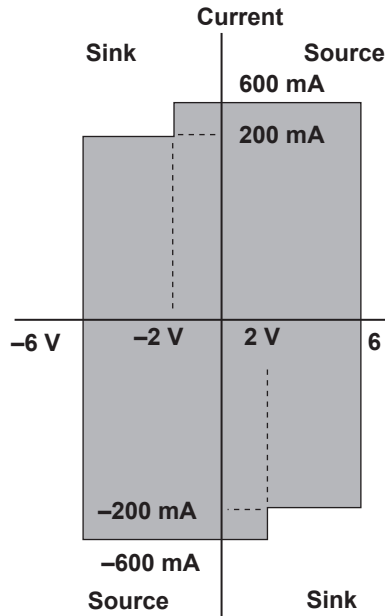
| Item                                |                     | Specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Emissions                           | Compliant standards | EN 61326-1: Class A Group 1 <sup>3</sup> Table 2<br>EN 61000-3-2<br>EN 61000-3-3<br>EMC Regulatory Arrangement in Australia and New Zealand EN61326-1: Class A, Group 1 Table 2<br>Korea Electromagnetic Conformity Standard( 한국 전자파적합성기준 )<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference.                                                                                                                                                                                                                                                                                                                                                                                           |
|                                     | Cable conditions    | <ul style="list-style-type: none"> <li>• Interlock terminal (REMOTE INTERLOCK)<br/>Use a BNC coaxial cable that is 3 m in length or less.</li> <li>• External trigger input terminal (TRIG IN)<br/>Use a BNC coaxial cable that is 3 m in length or less.</li> <li>• External trigger output terminal (TRIG OUT)<br/>Use a BNC coaxial cable that is 3 m in length or less.</li> <li>• USB port (type A)<br/>Use a USB shielded cable that is 3 m in length or less.</li> <li>• USB port (Type C)<br/>Use a USB shielded cable that is 3 m in length or less.</li> <li>• Ethernet interface connector<br/>Use a category 5e or better Ethernet cable (STP) that is 3 m in length or less.</li> <li>• GP-IB port<br/>Use a GP-IB shielded cable that is 3 m in length or less.</li> <li>• Digital I/O terminal<br/>Use a cable that is 3 m in length or less.</li> </ul> |
| Immunity                            | Compliant standards | EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                     | Cable conditions    | The same as the cable conditions listed above for emissions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Environmental standard <sup>4</sup> |                     | EU RoHS Directive compliant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

- 1 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.
- 2 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).
- 3 Group1: Equipment that does not intentionally generate or use radio-frequency (RF) energy
- 4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

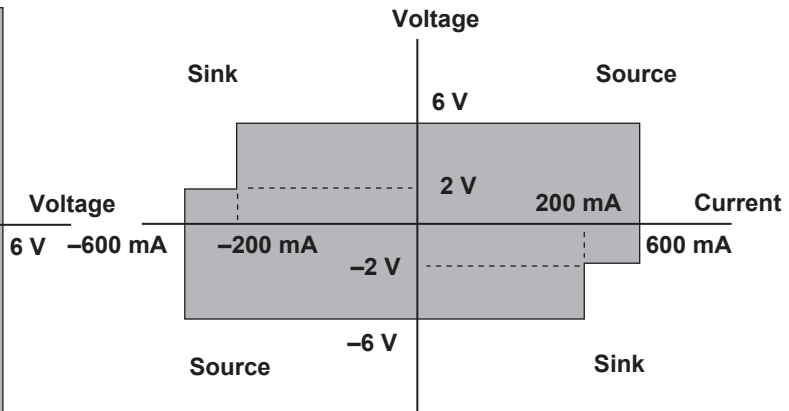
## 6.2 AQ23811A Source Measure Unit

### Source section

Voltage source mode



Current source mode



#### DC Voltage Source

| Voltage source range | Source Range | Setting resolution | Max. Load Current              | 1-Year Accuracy <sup>2</sup> ± (% of setting + V) | Temperature Coefficient ± (% of setting + V)/°C |
|----------------------|--------------|--------------------|--------------------------------|---------------------------------------------------|-------------------------------------------------|
| 6 V                  | ±6.0000 V    | 100 µV             | ± 600 mA/± 200 mA <sup>1</sup> | 0.02+500 µV                                       | 0.002+30 µ                                      |

- Maximum sink load current exceeding ±2 V is up to ±200 mA.
- The accuracy is for standard operating conditions with the output open and after applying the zero-set function. When the temperature is in the range of 5 to 18 °C or 28 to 40 °C, add the temperature coefficient.

#### DC Current Source

| Current source range | Source Range | Setting resolution | Max. Load Voltage      | 1-Year Accuracy <sup>2</sup> ± (% of setting + A) | Temperature Coefficient ± (% of setting + A)/°C |
|----------------------|--------------|--------------------|------------------------|---------------------------------------------------|-------------------------------------------------|
| 200 nA               | ±200.000 nA  | 1 pA               | ±6 V                   | 0.05+100 pA                                       | 0.003+5 pA                                      |
| 2 µA                 | ±2.00000 µA  | 10 pA              | ±6 V                   | 0.04+300 pA                                       | 0.002+20 pA                                     |
| 20 µA                | ±20.0000 µA  | 100 pA             | ±6 V                   | 0.03+3 nA                                         | 0.002+200 pA                                    |
| 200 µA               | ±200.000 µA  | 1 nA               | ±6 V                   | 0.03+30 nA                                        | 0.002+2 nA                                      |
| 2 mA                 | ±2.00000 mA  | 10 nA              | ±6 V                   | 0.03+300 nA                                       | 0.002+20 nA                                     |
| 20 mA                | ±20.0000 mA  | 100 nA             | ±6 V                   | 0.03+3 µA                                         | 0.002+200 nA                                    |
| 200 mA               | ±200.000 mA  | 1 µA               | ±6 V                   | 0.03+30 µA                                        | 0.002+2 µA                                      |
| 600 mA               | ±600.00 mA   | 10 µA              | ±6 V/±2 V <sup>1</sup> | 0.05+300 µA                                       | 0.003+10 µA                                     |

- Maximum sink load voltage exceeding ±600 mA is up to ±2 V.
- The accuracy is for standard operating conditions with the output shorted and after applying the zero-set function. When the temperature is in the range of 5 to 18 °C or 28 to 40 °C, add the temperature coefficient.

**Current limiter**

| Setting  <sup>1</sup> |            | Current Ranges | Setting resolution | Minimum Setting  <sup>2</sup> |
|-----------------------|------------|----------------|--------------------|-------------------------------|
| Min                   | Max.       |                |                    |                               |
| 10.000 nA             | 200.000 nA | 200 nA         | 1 pA               | 10 nA                         |
| 0.20001 µA            | 2.00000 µA | 2 µA           | 10 pA              | 10 nA                         |
| 2.0001 µA             | 20.0000 µA | 20 µA          | 100 pA             | 100 nA                        |
| 20.001 µA             | 200.000 µA | 200 µA         | 1 nA               | 1 µA                          |
| 0.20001 mA            | 2.00000 mA | 2 mA           | 10 nA              | 10 µA                         |
| 2.0001 mA             | 20.0000 mA | 20 mA          | 100 nA             | 100 µA                        |
| 20.001 mA             | 200.000 mA | 200 mA         | 1 µA               | 1 mA                          |
| 200.01 mA             | 600.00 mA  | 600 mA         | 10 µA              | 1 mA                          |

1 The current range is fixed to larger of the two values, Hi limiter or Lo limiter.

2 Minimum setting for when tracking is off

**Voltage limiter**

| Setting  |          | Voltage Ranges | Setting resolution | Minimum Setting |
|----------|----------|----------------|--------------------|-----------------|
| Min      | Max.     |                |                    |                 |
| 0.0050 V | 6.0000 V | 6 V            | 100 µV             | 5 mV            |

**LC load**

The maximum inductance L load and maximum capacitance C load are shown in the table below.<sup>1</sup>

|                       |        |
|-----------------------|--------|
| Maximum inductance L  | 10 µH  |
| Maximum capacitance C | 100 µF |

1 Response adjustment may be necessary.

**Response****R, L, and C settings**

A feature for entering to the device the values of resistance R, inductance L, and capacitance C connected to the load in order to obtain optimum response performance. Set R and C for voltage source mode and R and L for current source mode. The setting ranges are as follows:

| Load          | Setting range            | Setting resolution   |
|---------------|--------------------------|----------------------|
| Resistance R  | 0 to 100 MΩ <sup>1</sup> | 3 significant digits |
| Inductance L  | 0 to 100 mH <sup>2</sup> | 3 significant digits |
| Capacitance C | 0 to 100 µF              | 3 significant digits |

1 Enter 100 MΩ for 100 MΩ and greater.

2 If a resonance point exists or a low loss L is added, the output may become unstable.

**Voltage source mode response time**

| Voltage Ranges | Current limiter setting | Response time <sup>1</sup> (Typical value) | Connected load conditions |       | RC setting |       |
|----------------|-------------------------|--------------------------------------------|---------------------------|-------|------------|-------|
|                |                         |                                            | R                         | C     | R          | C     |
| 6 V            | 200 nA                  | 2.5 ms                                     | >1 GΩ                     | 25 pF | 100 MΩ     | 25 pF |
|                | 2 µA                    | 0.5 ms                                     |                           |       |            |       |
|                | 20 µA                   | 50 µs                                      |                           |       |            |       |
|                | 200 µA                  | 10 µs                                      |                           |       |            |       |
|                | 2 mA                    |                                            |                           |       |            |       |
|                | 20 mA                   |                                            |                           |       |            |       |
|                | 200 mA                  |                                            |                           |       |            |       |
|                | 600 mA                  |                                            |                           |       |            |       |

1 The time from the beginning of the change to within 0.1 % of the final value when the output voltage is varied from 0 V to 6 V.

## 6.2 AQ23811A Source Measure Unit

### Current source mode response time

| Current Ranges | Voltage limiter setting | Response time <sup>1</sup><br>(Typical value) | Connected load conditions |        | RL setting |        |
|----------------|-------------------------|-----------------------------------------------|---------------------------|--------|------------|--------|
|                |                         |                                               | R                         | L      | R          | L      |
| 200 nA         | ±6 V                    | 150 µs                                        | 1 MΩ                      | 20 nH  | 1 MΩ       | 20 nH  |
| 2 µA           |                         |                                               | 100 kΩ                    |        | 100 kΩ     |        |
| 20 µA          |                         |                                               | 10 kΩ                     |        | 10 kΩ      |        |
| 200 µA         |                         | 20 µs                                         | 1 kΩ                      |        | 1 kΩ       |        |
| 2 mA           |                         |                                               | 100 Ω                     |        | 100 Ω      |        |
| 20 mA          |                         |                                               | 10 Ω                      |        | 10 Ω       |        |
| 200 mA         |                         | 15 µs                                         | 1 Ω                       | 200 nH | 1 Ω        | 200 nH |
| 600 mA         |                         |                                               |                           |        |            |        |

1 The time from the beginning of the change to within 0.1 % of the final value when the output current is varied from 0 A to the full-scale current of the setting range.

## Measurement Section

Measurement accuracies and temperature coefficients are the same as those for source. However, add measurement noise according to the integration time.

For details on measurement noise, see the section on measurement noise.

### DC Voltage Measurement

| Voltage Ranges | Measurement time period | Measurement resolution |
|----------------|-------------------------|------------------------|
| 6 V            | ±6.3000 V               | 100 µV                 |

### DC Current Measurement

| Current Ranges | Measurement time period | Measurement resolution | Shunt Resistance |
|----------------|-------------------------|------------------------|------------------|
| 200 nA         | ±210.000 nA             | 1 pA                   | 5 MΩ             |
| 2 µA           | ±2.10000 µA             | 10 pA                  | 1 MΩ             |
| 20 µA          | ±21.0000 µA             | 100 pA                 | 100 kΩ           |
| 200 µA         | ±210.000 µA             | 1 nA                   | 10 kΩ            |
| 2 mA           | ±2.10000 mA             | 10 nA                  | 1 kΩ             |
| 20 mA          | ±21.0000 mA             | 100 nA                 | 100 Ω            |
| 200 mA         | ±210.000 mA             | 1 µA                   | 10 Ω             |
| 600 mA         | ±630.00 mA              | 10 µA                  | 1 Ω              |

## Noise

### Broadband noise

20 mVp-p

Typical value. During voltage sourcing with the output open. At 10 Hz to 20 MHz.

### Measurement noise

| Voltage Ranges | Integration time T and added accuracy (1 year) $\pm(V)$ |                                             |                                          |                                     |
|----------------|---------------------------------------------------------|---------------------------------------------|------------------------------------------|-------------------------------------|
|                | $2\ \mu\text{s} \leq T < 20\ \mu\text{s}$               | $20\ \mu\text{s} \leq T < 200\ \mu\text{s}$ | $200\ \mu\text{s} \leq T < 2\ \text{ms}$ | $2\ \text{ms} \leq T < 1\text{PLC}$ |
| 6 V            | 5000 $\mu\text{V}$                                      | 2000 $\mu\text{V}$                          | 500 $\mu\text{V}$                        | 200 $\mu\text{V}$                   |

| Current Ranges    | Integration time T and added accuracy (1 year) $\pm(A)$ |                                             |                                          |                                     |
|-------------------|---------------------------------------------------------|---------------------------------------------|------------------------------------------|-------------------------------------|
|                   | $2\ \mu\text{s} \leq T < 20\ \mu\text{s}$               | $20\ \mu\text{s} \leq T < 200\ \mu\text{s}$ | $200\ \mu\text{s} \leq T < 2\ \text{ms}$ | $2\ \text{ms} \leq T < 1\text{PLC}$ |
| 200 nA            | 500 pA                                                  | 400 pA                                      | 50 pA                                    | 5 pA                                |
| 2 $\mu\text{A}$   | 5000 pA                                                 | 4000 pA                                     | 200 pA                                   | 20 pA                               |
| 20 $\mu\text{A}$  | 5 nA                                                    | 4 nA                                        | 0.5 nA                                   | 0.05 nA                             |
| 200 $\mu\text{A}$ | 50 nA                                                   | 20 nA                                       | 2 nA                                     | 0.5 nA                              |
| 2 mA              | 2000 nA                                                 | 200 nA                                      | 20 nA                                    | 5 nA                                |
| 20 mA             | 20 $\mu\text{A}$                                        | 2 $\mu\text{A}$                             | 0.2 $\mu\text{A}$                        | 0.05 $\mu\text{A}$                  |
| 200 mA            | 100 $\mu\text{A}$                                       | 10 $\mu\text{A}$                            | 2 $\mu\text{A}$                          | 0.5 $\mu\text{A}$                   |
| 600 mA            | 200 $\mu\text{A}$                                       | 50 $\mu\text{A}$                            | 20 $\mu\text{A}$                         | 2 $\mu\text{A}$                     |

## Function

| Item        |                     | Specification                                                                                                    |
|-------------|---------------------|------------------------------------------------------------------------------------------------------------------|
| Output      | Source Mode         | Voltage, current                                                                                                 |
|             | Source waveform     | DC                                                                                                               |
|             |                     | Pulse (pulse width 50 $\mu\text{s}$ to 1 s)                                                                      |
|             | Number of channels  | 2                                                                                                                |
|             | Sweep Mode          | Linear, log, program (100001 steps maximum)                                                                      |
|             | Trigger             | BUS Trigger1 to 9, front panel trigger input terminal (cycle: 100 $\mu\text{s}$ or more)                         |
|             | Sweep start         | BUS Trigger1 to 9, front panel trigger input terminal (100 $\mu\text{s}$ cycle or more)                          |
|             | Source delay        | 1 $\mu\text{s}$ to 1.000000 s                                                                                    |
|             | Response adjustment | R (voltage, current source), L (current source), C (voltage source)                                              |
|             | Protection          | Overvoltage and overcurrent (output off when detected), overheat (output off or power off when detected)         |
|             | User Adjustment     | Gain and offset can be adjusted within $\pm 0.2\%$ of the factory adjusted values.                               |
| Measurement | Measuring mode      | Voltage, current                                                                                                 |
|             | Number of channels  | 2                                                                                                                |
|             | Integration time    | 2 $\mu\text{s}$ to 1.000000 s                                                                                    |
|             | Trigger             | BUS Trigger1 to 9, front panel trigger input terminal (100 $\mu\text{s}$ cycle or more) <input type="checkbox"/> |
|             | Measurement delay   | 0 $\mu\text{s}$ to 1.000000 s                                                                                    |
|             | Voltage sense       | Two-wire system and four-wire system switching                                                                   |
|             | Math                | Power ( $V \times I$ ), resistance ( $V/I$ )                                                                     |
| Trigger     | Connector type      | Push-in spring connection plug (AWG26-20)                                                                        |
|             | I/O level           | 5 V TTL                                                                                                          |
|             | I/O logic           | Negative logic, falling edge, select input or output for each channel                                            |
|             | Minimum pulse width | 10 $\mu\text{s}$                                                                                                 |
|             | Input signal        | Sweep start, source trigger, measurement trigger                                                                 |
|             | Output signal       | Sweep busy, source busy, measurement busy, measurement start (select one)                                        |

## General specifications

| Item                                |                     | Specification                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard operating conditions       |                     | Temperature: 23 °C ± 5 °C<br>Humidity: 80 % RH or less (no condensation)                                                                                                                                                                                                                                                                      |
| Operating environment               |                     | Temperature: 5 °C to 40 °C<br>Humidity: 80 % RH or less (no condensation)                                                                                                                                                                                                                                                                     |
| Storage environment                 |                     | Temperature: -15 °C to 60 °C<br>Humidity: 20 to 80 % RH (no condensation)                                                                                                                                                                                                                                                                     |
| Warm-up time                        |                     | Approx. 30 minutes (when stored under standard operating conditions)                                                                                                                                                                                                                                                                          |
| Operating altitude                  |                     | 2000 m or less                                                                                                                                                                                                                                                                                                                                |
| Installation location               |                     | Indoor use                                                                                                                                                                                                                                                                                                                                    |
| Installation orientation            |                     | Horizontal (frame)                                                                                                                                                                                                                                                                                                                            |
| Rated supply voltage                |                     | 12.2 VDC (supplied from the frame)                                                                                                                                                                                                                                                                                                            |
| Permitted voltage range             |                     | DC11.6 V to 12.8 V                                                                                                                                                                                                                                                                                                                            |
| Maximum power consumption           |                     | Approx. 26 W                                                                                                                                                                                                                                                                                                                                  |
| Maximum input voltage               |                     | OUTPUT Hi – OUTPUT Lo: ±6 V<br>SENSE Hi – OUTPUT Hi: ±0.25 V<br>SENSE Lo – OUTPUT Lo: ±0.25 V                                                                                                                                                                                                                                                 |
| Maximum input common mode voltage   |                     | All Terminal 42 V <sub>peak</sub>                                                                                                                                                                                                                                                                                                             |
| Withstand Voltage                   |                     | Between the frame connectors and output terminals: 500 VAC for 1 minute<br>Between the CH1 output terminals and CH2 output terminals: 500 VAC for 1 minute                                                                                                                                                                                    |
| Dimensions                          |                     | 116.5 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions)                                                                                                                                                                                                                                                                                     |
| Weight                              |                     | Approx. 800 g                                                                                                                                                                                                                                                                                                                                 |
| Cooling method                      |                     | Forced air cooling (by fan built into frame)                                                                                                                                                                                                                                                                                                  |
| Calibration Period                  |                     | 1 year                                                                                                                                                                                                                                                                                                                                        |
| Safety standards <sup>1</sup>       |                     | EN 61010-1<br>EN IEC 61010-2-030<br>Pollution degree 2 <sup>2</sup> , overvoltage category I <sup>3</sup> , measurement category: O (other) <sup>4</sup>                                                                                                                                                                                      |
| Emission <sup>1</sup>               | Compliant standards | EN 61326-1 Class A<br>EN 61326-2-1<br>EN 55011 Class A Group 1<br>EN 61000-3-2, EN IEC 61000-3-2<br>EN 61000-3-3<br>EMC Regulatory Arrangement in Australia and New Zealand EN 55011 Class A, Group 1<br>Korea Electromagnetic Conformity Standard ( 한국 전자파적합성기준 )                                                                            |
|                                     | Cable conditions    | • Output terminals (Output terminals)<br>Use AWG26-20 twisted pair cables of 3 m or less in length.<br>Cover the twisted pair cables with braided wire and connect the braided wire to the functional ground terminal.<br>• Trigger signal I/O terminal (Trigger signal I/O terminal)<br>Use 1.5D-2V coaxial cables of 3 m or less in length. |
| Immunity <sup>1</sup>               | Compliant standards | EN 61326-1 Table 2 (for use in industrial locations)<br>EN 61326-2-1<br>Immunity influence: within the source or measurement value ±20 % of range                                                                                                                                                                                             |
|                                     | Cable conditions    | The same as the cable conditions listed above for emissions                                                                                                                                                                                                                                                                                   |
| Environmental standard <sup>5</sup> |                     | EU RoHS Directive compliant                                                                                                                                                                                                                                                                                                                   |

<sup>1</sup> Specified with the module installed in the specified frame.

<sup>2</sup> Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

<sup>3</sup> The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Overvoltage Category I applies to equipment that is connected to a circuit that has been designed to suppress overvoltage caused by transient phenomena to an adequately low level.

- 4 The measurement category of this instrument's signal input terminals is Other (O). Do not use it to measure the main power supply or for Measurement Categories II, III, and IV. Measurement category O applies to measurement of circuits that are not directly connected to a main power source. This category applies to measurement of secondary electric circuits in equipment across a transformer. The estimated transient overvoltage that may appear at the instrument's signal input terminals is 1500 V. Measurement category II applies to measurement of circuits, such as household electric appliances and portable electric tools, that are connected to low-voltage installations. Measurement category III applies to measurement of facility circuits, such as distribution boards and circuit breakers. Measurement category IV applies to measurement of power source circuits, such as entrance cables to buildings and cable systems, for low-voltage installations.
- 5 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.3 AQ23111A LS Module

### Performance and Functional Specifications

| Item                                                    | Specification                                                            |                    |                    |                    |
|---------------------------------------------------------|--------------------------------------------------------------------------|--------------------|--------------------|--------------------|
|                                                         | Suffix code (-W31)                                                       | Suffix code (-W55) | Suffix code (-W62) | Suffix code (-W65) |
| Center wavelength <sup>1, 2, 4</sup>                    | 1310 nm±5 nm                                                             | 1550 nm±5 nm       | 1625 nm±5 nm       | 1650 nm±5 nm       |
| Device type                                             | DFB-LD                                                                   |                    |                    |                    |
| Optical fiber type                                      | SMF (ITU-T G.652.D)                                                      |                    |                    |                    |
| Optical connector                                       | FC/Angled PC                                                             |                    |                    |                    |
| Optical output <sup>1, 2, 5</sup>                       | ≥+10 dBm (≥10 mW)                                                        |                    |                    |                    |
| Optical Output Stability (5 minutes) <sup>1, 3, 5</sup> | ±0.005 dB                                                                |                    |                    |                    |
| Optical output adjustment range <sup>3, 5</sup>         | Max. 6 dB (resolution 0.01 dB (typ.))                                    |                    |                    |                    |
| Spectrum line width <sup>1, 6</sup>                     | Narrow: (10 MHz (typ.)), Wide: 100 MHz (typ.)                            |                    |                    |                    |
| Side mode suppression ratio (SMSR) <sup>1, 2, 4</sup>   | ≥35 dB                                                                   |                    |                    |                    |
| Relative Intensity Noise (RIN) <sup>1, 2, 4, 6</sup>    | -135 dB/Hz (typ.)                                                        |                    |                    |                    |
| Laser safety class                                      | EN 60825-1: 2014+A11: 2021, IEC 60825-1: 2014, GB/T 7247.1-2024, Class 1 |                    |                    |                    |

\* All values in the specifications assume a warm-up period of 30 minutes.

\* Environmental conditions conform to the frame specifications.

1 At maximum output

2 Ambient temperature 23 ± 2 °C (constant temperature)

3 Constant temperature ±0.5 °C

4 Linewidth: Narrow

5 Linewidth: Wide

6 This is not a guaranteed value.

### General specifications

| Item                                | Specification                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               | The same as the frame's operating environment                                                                                                                                                                                                                                                             |
| Storage environment                 | Ambient temperature: -20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                                                                       |
| Installation location               | Indoor use                                                                                                                                                                                                                                                                                                |
| Dimensions                          | 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)                                                                                                                                                                                                                                       |
| Weight                              | Approx. 0.8 kg                                                                                                                                                                                                                                                                                            |
| Safety standards <sup>1</sup>       | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030, EN 60825-1: 2014+A11: 2021<br>IEC 60825-1: 2014, GB/T 7247.1-2024                                                                                                                              |
| Emission <sup>1</sup>               | Compliant standards<br>EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards<br>EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> | EU RoHS Directive compliant                                                                                                                                                                                                                                                                               |

1 Specified with the module installed in the specified frame.

2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.4 AQ23112A LS Module

### Performance and Functional Specifications

| Item                                                    | Specification                                                            |                    |                    |                    |
|---------------------------------------------------------|--------------------------------------------------------------------------|--------------------|--------------------|--------------------|
|                                                         | Suffix code (-W31)                                                       | Suffix code (-W55) | Suffix code (-W62) | Suffix code (-W65) |
| Center wavelength <sup>1, 2, 4</sup>                    | 1310 nm±5 nm                                                             | 1550 nm±5 nm       | 1625 nm±5 nm       | 1650 nm±5 nm       |
| Device type                                             | DFB-LD                                                                   |                    |                    |                    |
| Optical fiber type                                      | SMF (ITU-T G.652.D)                                                      |                    |                    |                    |
| Optical connector                                       | FC/Angled PC                                                             |                    |                    |                    |
| Optical output <sup>1, 2, 5</sup>                       | ≥+10 dBm (≥10 mW)                                                        |                    |                    |                    |
| Optical Output Stability (5 minutes) <sup>1, 3, 5</sup> | ±0.005 dB                                                                |                    |                    |                    |
| Optical output adjustment range                         | Max. 6 dB (resolution 0.01 dB (typ.))                                    |                    |                    |                    |
| Spectrum line width <sup>1, 6</sup>                     | Narrow: (10 MHz (typ.), Wide: 100 MHz (typ.)                             |                    |                    |                    |
| Side mode suppression ratio (SMSR) <sup>1, 2, 4</sup>   | ≥35 dB                                                                   |                    |                    |                    |
| Relative Intensity Noise (RIN) <sup>1, 2, 4, 6</sup>    | -135 dB/Hz (typ.)                                                        |                    |                    |                    |
| Laser safety class                                      | EN 60825-1: 2014+A11: 2021, IEC 60825-1: 2014, GB/T 7247.1-2024, Class 1 |                    |                    |                    |

\* All values in the specifications assume a warm-up period of 30 minutes.

\* Environmental conditions conform to the frame specifications.

1 At maximum output

2 Ambient temperature 23 ± 2 °C (constant temperature)

3 Constant temperature ±0.5 °C

4 Linewidth: Narrow

5 Linewidth: Wide

6 This is not a guaranteed value.

### General specifications

| Item                                | Specification                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               | The same as the frame's operating environment                                                                                                                                                                                                                                                             |
| Storage environment                 | Ambient temperature: -20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                                                                       |
| Installation location               | Indoor use                                                                                                                                                                                                                                                                                                |
| Dimensions                          | 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)                                                                                                                                                                                                                                       |
| Weight                              | Approx. 0.8 kg                                                                                                                                                                                                                                                                                            |
| Safety standards <sup>1</sup>       | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030, EN 60825-1: 2014+A11: 2021<br>IEC 60825-1: 2014, GB/T 7247.1-2024                                                                                                                              |
| Emission <sup>1</sup>               | Compliant standards<br>EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards<br>EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> | EU RoHS Directive compliant                                                                                                                                                                                                                                                                               |

1 Specified with the module installed in the specified frame.

2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.5 AQ23191A LS Module

### Performance and Functional Specifications

| Item                                    | Specification                                                             |                    |
|-----------------------------------------|---------------------------------------------------------------------------|--------------------|
|                                         | Suffix code (-CB)                                                         | Suffix code (-CL)  |
| Device type                             | ASE                                                                       |                    |
| Optical fiber type                      | SMF (ITU-T G.652.D)                                                       |                    |
| Optical connector                       | FC/PC or SC/PC                                                            |                    |
| Wavelength band                         | C-band                                                                    | CL-band            |
| Wavelength range                        | 1530 nm to 1560 nm                                                        | 1530 nm to 1600 nm |
| Spectral power density <sup>1</sup>     | ≥-9 dBm/nm                                                                | ≥-14 dBm/nm        |
| Optical output <sup>1</sup>             | ≥+16 dBm (≥40 mW)                                                         |                    |
| Optical output stability <sup>1,2</sup> | ±0.005 dB (5 minutes), ±0.03 dB (8 hours)                                 |                    |
| Degree of polarization <sup>1</sup>     | <5%                                                                       |                    |
| Laser safety class                      | EN 60825-1: 2014+A11: 2021, IEC 60825-1: 2014, GB/T 7247.1-2024, Class 3R |                    |

\* All values in the specifications assume a warm-up period of 60 minutes.

\* Environmental conditions conform to the frame specifications.

1 Ambient temperature 23 ± 2 °C (constant temperature)

2 Constant temperature ±0.5 °C

### General specifications

| Item                                | Specification                                                                                                                                                                |                                                                                                                                                                                                                                                                                    |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               | The same as the frame's operating environment                                                                                                                                |                                                                                                                                                                                                                                                                                    |
| Storage environment                 | Ambient temperature: -20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                          |                                                                                                                                                                                                                                                                                    |
| Installation location               | Indoor use                                                                                                                                                                   |                                                                                                                                                                                                                                                                                    |
| Dimensions                          | 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)                                                                                                          |                                                                                                                                                                                                                                                                                    |
| Weight                              | Approx. 0.9 kg                                                                                                                                                               |                                                                                                                                                                                                                                                                                    |
| Safety standards <sup>1</sup>       | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030, EN 60825-1: 2014+A11: 2021<br>IEC 60825-1: 2014, GB/T 7247.1-2024 |                                                                                                                                                                                                                                                                                    |
| Emission <sup>1</sup>               | Compliant standards                                                                                                                                                          | EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards                                                                                                                                                          | EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> | EU RoHS Directive compliant                                                                                                                                                  |                                                                                                                                                                                                                                                                                    |

1 Specified with the module installed in the specified frame.

2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-0122).

## 6.6 AQ23202A Interface Module

### Performance and Functional Specifications

| Item                 | Specification              |
|----------------------|----------------------------|
| Number of channels   | 2                          |
| Analog output        |                            |
| Output voltage range | Approx. 0 to 2 V, 0 to 5 V |
| Output impedance     | Approx. 100 $\Omega$       |
| Connector type       | BNC connector              |

### General specifications

| Item                                | Specification                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               | The same as the frame's operating environment                                                                                                                                                                                                                                                             |
| Storage environment                 | Ambient temperature: -20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                                                                       |
| Installation location               | Indoor use                                                                                                                                                                                                                                                                                                |
| Dimensions                          | 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)                                                                                                                                                                                                                                       |
| Weight                              | Approx. 0.7 kg                                                                                                                                                                                                                                                                                            |
| Safety standards <sup>1</sup>       | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030                                                                                                                                                                                                 |
| Emission <sup>1</sup>               | Compliant standards<br>EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards<br>EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> | EU RoHS Directive compliant                                                                                                                                                                                                                                                                               |

<sup>1</sup> Specified with the module installed in the specified frame.

<sup>2</sup> The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

<sup>3</sup> Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

<sup>4</sup> For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.7 AQ23211A, AQ23212A Optical Power Meter

### Performance and Functional Specifications

| Item                                       | Specification                                                                                                   |          |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------|
|                                            | AQ23211A                                                                                                        | AQ23212A |
| Number of channels                         | 1                                                                                                               | 2        |
| Photo sensor element                       | InGaAs                                                                                                          |          |
| Temperature control (Peltier device, etc.) | None                                                                                                            |          |
| Wavelength range                           | 800 nm to 1700 nm                                                                                               |          |
| Power range                                | -90 dBm to +15 dBm <sup>1</sup>                                                                                 |          |
| Minimum display resolution                 | 1/10000                                                                                                         |          |
| Applicable optical fiber <sup>2</sup>      | SMF (ITU-T G.652.D)<br>MMF (GI 50/125) (ITU-T G.651.1)<br>MMF (GI 62.5/125) (IEC 60793-2)                       |          |
| Uncertainty at reference conditions        | ±2.5%                                                                                                           |          |
| Ambient temperature                        | 23 °C ± 1 °C (constant temperature)                                                                             |          |
| Power level                                | 100 µW, CW                                                                                                      |          |
| Wavelength range                           | 1310 nm±20 nm<br>1550 nm±20 nm                                                                                  |          |
| Beam condition                             | SMF (ITU-T G.652.D) NA=0.1                                                                                      |          |
| Light incidence condition                  | FC/PC                                                                                                           |          |
| Spectral Width                             | ≤10 nm                                                                                                          |          |
| Aging conditions                           | Less than one year ±0.0 %<br>Less than two years ±0.5 %<br>Two years or more ±1.0 %                             |          |
| Sensor average time setting                | 1 s                                                                                                             |          |
| Polarization dependence                    | Not included.                                                                                                   |          |
| Wavelength setting accuracy                | Within ±0.5 nm                                                                                                  |          |
| Total uncertainty                          | ±5%±5 pW                                                                                                        |          |
| Ambient temperature                        | 23 °C ± 1 °C (constant temperature)                                                                             |          |
| Power level                                | 100 nW to 10 mW, CW                                                                                             |          |
| Wavelength range                           | 1200 nm to 1600 nm                                                                                              |          |
| Beam condition                             | SMF (ITU-T G.652.D)<br>Add ±1 % for MMF (GI 50/125) (ITU-T G.651.1)<br>Add ±9 % MMF (GI 62.5/125) (IEC 60793-2) |          |
| Light incidence condition                  | FC/PC                                                                                                           |          |
| Spectral Width                             | ≤10 nm                                                                                                          |          |
| Aging conditions                           | Less than one year ±0.0 %<br>Less than two years ±0.5 %<br>Two years or more ±1.0 %                             |          |
| Sensor average time setting                | 1 s                                                                                                             |          |
| Range                                      | Auto range                                                                                                      |          |
| Polarization dependence                    | Not included.                                                                                                   |          |
| Wavelength setting accuracy                | Within ±0.5 nm                                                                                                  |          |
| Polarization dependence                    | Typ. 0.02dB                                                                                                     |          |
| Ambient temperature                        | 23 °C ± 1 °C (constant temperature)                                                                             |          |
| Wavelength                                 | 1550 nm                                                                                                         |          |
| Beam condition                             | SMF (ITU-T G.652.D)                                                                                             |          |
| Light incidence condition                  | FC/PC                                                                                                           |          |

| Item                           | Specification                                                                       |          |
|--------------------------------|-------------------------------------------------------------------------------------|----------|
|                                | AQ23211A                                                                            | AQ23212A |
| Linearity                      | $\leq \pm 0.02 \text{ dB} \pm 5 \text{ pW}$                                         |          |
| Ambient temperature            | $23 \text{ }^{\circ}\text{C} \pm 1 \text{ }^{\circ}\text{C}$ (constant temperature) |          |
| Power level                    | 100 nW to 10 mW, CW                                                                 |          |
| Wavelength range               | 1200 nm to 1600 nm                                                                  |          |
| Beam condition                 | SMF(ITU-T G.652.D) NA=0.1                                                           |          |
| Range                          | Auto range                                                                          |          |
| Sensor average time setting    | 1 s                                                                                 |          |
| Light incidence condition      | FC/PC                                                                               |          |
| Noise level <sup>3</sup>       | $\leq 5 \text{ pW} (-83 \text{ dBm})$                                               |          |
| Ambient temperature            | $23 \text{ }^{\circ}\text{C} \pm 1 \text{ }^{\circ}\text{C}$ (constant temperature) |          |
| Wavelength range               | 1200 nm to 1600 nm                                                                  |          |
| Sensor average time setting    | 1 s                                                                                 |          |
| Averaging time (minimum)       | 20 $\mu\text{s}$                                                                    |          |
| Optical connector              | AQ9335C(FC, SC, LC, MU)                                                             |          |
| Recommended calibration period | 1 year                                                                              |          |
| Analog output                  | Use                                                                                 | None     |

\* All values in the specifications assume a warm-up period of 60 minutes.

1 Power display range at 1310 nm

2 When using the AQ9335C connector adapter

3 Within 5 minutes after executing zero-set

## General specifications

| Item                                | Specification                                                                                                                                                                                                                                                                        |               |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|                                     | AQ23211A                                                                                                                                                                                                                                                                             | AQ23212A      |
| Operating environment               |                                                                                                                                                                                                                                                                                      |               |
| Ambient temperature                 | 5 to +40°C                                                                                                                                                                                                                                                                           |               |
| Ambient humidity                    | 20 to 80 % RH (no condensation)                                                                                                                                                                                                                                                      |               |
| Altitude                            | 2000 m or less                                                                                                                                                                                                                                                                       |               |
| Storage temperature                 |                                                                                                                                                                                                                                                                                      |               |
| Ambient temperature                 | -20 to +60 °C                                                                                                                                                                                                                                                                        |               |
| Ambient humidity                    | 20 to 80 % RH (no condensation)                                                                                                                                                                                                                                                      |               |
| Dimensions                          | 117 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions)                                                                                                                                                                                                                              |               |
| Weight                              | Approx. 800 g                                                                                                                                                                                                                                                                        | Approx. 900 g |
| Safety standards <sup>1</sup>       | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup>                                                                                                                                                                                                  |               |
| Emission <sup>1</sup>               | EN 61326-1 Class A<br>EN 61000-3-2<br>EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |               |
| Immunity <sup>1</sup>               | EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                                 |               |
| Environmental standard <sup>4</sup> | EU RoHS Directive compliant                                                                                                                                                                                                                                                          |               |

1 Specified with the module installed in the specified frame.

2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.8 AQ23221A Optical Power Meter

### Performance and Functional Specifications

| Item                                       | Specification                                                                                                           |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Number of channels                         | 1                                                                                                                       |
| Photo sensor element                       | InGaAs                                                                                                                  |
| Temperature control (Peltier device, etc.) | None                                                                                                                    |
| Wavelength range                           | 970 nm to 1660 nm                                                                                                       |
| Power range <sup>1</sup>                   | -70 dBm to +30 dBm                                                                                                      |
| Minimum display resolution                 | 1/10000                                                                                                                 |
| Applicable optical fiber <sup>2</sup>      | SMF(ITU-T G.652.D)<br>MMF(GI 50/125)(ITU-T G.651.1)<br>MMF(GI 62.5/125)(IEC 60793-2)                                    |
| Uncertainty at reference conditions        | ±3.0%                                                                                                                   |
| Ambient temperature                        | 23 °C ± 1 °C (constant temperature)                                                                                     |
| Power level                                | 100 μW, CW                                                                                                              |
| Wavelength range                           | 1310 nm±20 nm<br>1550 nm±20 nm                                                                                          |
| Beam condition                             | SMF(ITU-T G.652.D) NA=0.1                                                                                               |
| Light incidence condition                  | FC/PC                                                                                                                   |
| Spectral Width                             | ≤10 nm                                                                                                                  |
| Aging conditions                           | Less than one year ±0.0 %<br>One year or more ±0.5 %                                                                    |
| Sensor average time setting                | 1 s                                                                                                                     |
| Polarization dependence                    | Not included.                                                                                                           |
| Wavelength setting accuracy                | Within ±0.5 nm                                                                                                          |
| Total uncertainty                          | ±5%±2 nW                                                                                                                |
| Ambient temperature                        | 23 °C ± 1 °C (constant temperature)                                                                                     |
| Power level                                | 1 μW to 1 W, CW                                                                                                         |
| Wavelength range                           | 1260 nm to 1600 nm                                                                                                      |
| Beam condition                             | Beam condition<br>SMF (ITU-T G.652.D),<br>MMF (GI 50/125) (ITU-T G.651.1),<br>MMF (GI 62.5/125) (IEC 60793-2), NA≤0.275 |
| Light incidence condition                  | FC/PC                                                                                                                   |
| Spectral Width                             | ≤10 nm                                                                                                                  |
| Aging conditions                           | Less than one year ±0.0 %<br>One year or more ±0.5 %                                                                    |
| Sensor average time setting                | 1 s                                                                                                                     |
| Range                                      | Auto range                                                                                                              |
| Polarization dependence                    | Not included.                                                                                                           |
| Wavelength setting accuracy                | Within ±0.5 nm                                                                                                          |
| Polarization dependence                    | Typ. 0.03 dB                                                                                                            |
| Ambient temperature                        | 23 °C ± 1 °C (constant temperature)                                                                                     |
| Wavelength                                 | 1550 nm                                                                                                                 |
| Beam condition                             | SMF(ITU-T G.652.D)                                                                                                      |
| Light incidence condition                  | FC/PC                                                                                                                   |
| Linearity                                  | ≤±0.05 dB±2 nW                                                                                                          |
| Ambient temperature                        | 23 °C ± 2 °C (constant temperature)                                                                                     |

| Item                           | Specification                           |
|--------------------------------|-----------------------------------------|
| Power level                    | 1 $\mu$ W to 1 W, CW                    |
| Wavelength range               | 1260 nm to 1620 nm                      |
| Beam condition                 | SMF(ITU-T G.652.D) NA=0.1               |
| Range                          | Auto range                              |
| Sensor average time setting    | 1 s                                     |
| Light incidence condition      | FC/PC                                   |
| Noise level <sup>3</sup>       | $\leq 2$ nW(−57 dBm)                    |
| Ambient temperature            | 23 °C $\pm$ 1 °C (constant temperature) |
| Wavelength range               | 1260 nm to 1600 nm                      |
| Sensor average time setting    | 1 s                                     |
| Averaging time (minimum)       | 20 $\mu$ s                              |
| Optical connector              | AQ9335C(FC, SC, LC, MU)                 |
| Recommended calibration period | 1 year                                  |
| Warm-up time                   | 1 hour                                  |
| Analog output                  | Use                                     |

1 Power display range at 1310 nm

2 When using the AQ9335C connector adapter

3 Within 5 minutes after executing zero-set

## General specifications

| Item                                | Specification                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               | The same as the frame's operating environment                                                                                                                                                                                                                                                             |
| Storage environment                 | Ambient temperature: −20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                                                                       |
| Installation location               | Indoor use                                                                                                                                                                                                                                                                                                |
| Dimensions                          | 116.2 (H) $\times$ 31 (W) $\times$ 321.5 (D) mm (excluding protrusions, one slot)                                                                                                                                                                                                                         |
| Weight                              | Approx. 0.7 kg                                                                                                                                                                                                                                                                                            |
| Safety standards <sup>1</sup>       | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030                                                                                                                                                                                                 |
| Emission <sup>1</sup>               | Compliant standards<br>EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards<br>EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> | EU RoHS Directive compliant                                                                                                                                                                                                                                                                               |

1 Specified with the module installed in the specified frame.

2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.9 AQ23291A, AQ23295A Optical Sensor Head

### Performance and Functional Specifications

| Item                                       | Specification                                                                                                       |                                                                       |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
|                                            | AQ23291A                                                                                                            | AQ23295A                                                              |
| Number of channels                         | 1                                                                                                                   |                                                                       |
| Photo sensor element                       | InGaAs                                                                                                              | Si                                                                    |
| Temperature control (Peltier device, etc.) | Use                                                                                                                 |                                                                       |
| Wavelength range                           | 800 nm to 1700 nm                                                                                                   | 400 nm to 1100 nm                                                     |
| Power range                                | −90 dBm to +15 dBm <sup>1</sup>                                                                                     | −90 dBm to +10 dBm                                                    |
| Minimum display resolution                 | 1/10000                                                                                                             |                                                                       |
| Applicable optical fiber <sup>2</sup>      | SMF (ITU-T G.652.D)<br>MMF (GI 50/125) (ITU-T G.651.1)<br>MMF (GI 62.5/125) (IEC 60793-2)                           |                                                                       |
| Uncertainty at reference conditions        | ±1.8%                                                                                                               | ±2.5%                                                                 |
| Ambient temperature                        | 23°C±2°C                                                                                                            |                                                                       |
| Power level                                | 100 µW, CW                                                                                                          |                                                                       |
| Wavelength range                           | 1310 nm±20 nm<br>1550 nm±20 nm                                                                                      | 850 nm±15 nm                                                          |
| Beam condition                             | SMF (ITU-T G.652.D) NA=0.1                                                                                          | 850 nm SMF (Modefield diameter 5.0 ± 0.5 µm 850 nm, NA = 0.14 (typ.)) |
| Light incidence condition                  | FC/PC                                                                                                               |                                                                       |
| Spectral Width                             | ≤10 nm                                                                                                              |                                                                       |
| Aging conditions                           | Less than one year ±0.0 %<br>Less than two years ±0.4 %<br>Two years or more ±0.8 %                                 |                                                                       |
| Sensor average time setting                | 1 s                                                                                                                 |                                                                       |
| Polarization dependence                    | Not included.                                                                                                       | No specification                                                      |
| Wavelength setting accuracy                | Within ±0.5 nm                                                                                                      |                                                                       |
| Total uncertainty                          | ±5%±5 pW                                                                                                            |                                                                       |
| Ambient temperature                        | 23°C±5°C                                                                                                            |                                                                       |
| Power level                                | 1 nW to 10 mW, CW                                                                                                   |                                                                       |
| Wavelength range                           | 1000 nm to 1630 nm                                                                                                  | 500 nm to 900 nm                                                      |
| Beam condition                             | SMF (ITU-T G.652.D) MMF (GI 50/125) (ITU-T G.651.1), NA≤0.2 (MMF (GI 62.5/125) (IEC 60793-2), add ±1% for NA≤0.275) |                                                                       |
| Light incidence condition                  | FC/PC                                                                                                               |                                                                       |
| Spectral Width                             | ≤10 nm                                                                                                              |                                                                       |
| Aging conditions                           | Less than one year ±0.0 %<br>Less than two years ±0.4 %<br>Two years or more ±0.8 %                                 |                                                                       |
| Sensor average time setting                | 1 s                                                                                                                 |                                                                       |
| Range                                      | Auto range                                                                                                          |                                                                       |
| Polarization dependence                    | Not included.                                                                                                       | No specification                                                      |
| Wavelength setting accuracy                | Within ±0.5 nm                                                                                                      |                                                                       |
| Polarization dependence                    | Typ. 0.025 dB                                                                                                       | No specification                                                      |
| Ambient temperature                        | 23 °C ± 2 °C (constant temperature)                                                                                 | —                                                                     |
| Wavelength                                 | 1550 nm                                                                                                             | —                                                                     |
| Beam condition                             | SMF (ITU-T G.652.D)                                                                                                 | —                                                                     |

| Item                           | Specification                                                                       |                                                                                                                                                                                                   |
|--------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                | AQ23291A                                                                            | AQ23295A                                                                                                                                                                                          |
| Light incidence condition      | FC/PC                                                                               | —                                                                                                                                                                                                 |
| Linearity                      | $\leq \pm 0.015 \text{ dB} \pm 5 \text{ pW}$                                        | $\leq \pm 0.04 \text{ dB} \pm 5 \text{ pW} (850 \text{ nm})$                                                                                                                                      |
| Ambient temperature            | $23 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$ (constant temperature) |                                                                                                                                                                                                   |
| Power level                    | 1 nW to 10 mW, CW                                                                   |                                                                                                                                                                                                   |
| Wavelength range               | 1000 nm to 1630 nm                                                                  | 500 nm to 900 nm                                                                                                                                                                                  |
| Beam condition                 | SMF (ITU-T G.652.D) NA=0.1                                                          | 850 nm SMF<br>(Modefield diameter $5.0 \pm 0.5 \text{ }\mu\text{m}$ @850 nm, NA=0.14 (typ.)<br>MMF (GI 50/125) (ITU-T G.651.1), NA=0.2 (typ.)<br>MMF (GI 62.5/125) (IEC 60793-2), NA=0.275 (typ.) |
| Range                          | Auto range                                                                          |                                                                                                                                                                                                   |
| Sensor average time setting    | 1 s                                                                                 |                                                                                                                                                                                                   |
| Light incidence condition      | FC/PC                                                                               |                                                                                                                                                                                                   |
| Noise level <sup>3</sup>       | $\leq 5 \text{ pW} (-83 \text{ dBm})$                                               |                                                                                                                                                                                                   |
| Ambient temperature            | $23 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$ (constant temperature) |                                                                                                                                                                                                   |
| Wavelength range               | 1000 nm to 1630 nm                                                                  | 500 nm to 900 nm                                                                                                                                                                                  |
| Sensor average time setting    | 1 s                                                                                 |                                                                                                                                                                                                   |
| Averaging time (minimum)       | 20 $\mu\text{s}$                                                                    |                                                                                                                                                                                                   |
| Optical connector              | AQ9335C (FC, SC, LC, MU)                                                            |                                                                                                                                                                                                   |
| Recommended calibration period | 1 year                                                                              |                                                                                                                                                                                                   |

1 Power display range at 1310 nm

2 When using the AQ9335C connector adapter

3 Within 5 minutes after executing zero-set

## General specifications

| Item                                |                     | Specification                                                                                                                                                                                                                                                                      |
|-------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               |                     | The same as the frame's operating environment                                                                                                                                                                                                                                      |
| Storage environment                 |                     | Ambient temperature: $-20$ to $+60 \text{ }^{\circ}\text{C}$<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                      |
| Installation location               |                     | Indoor use                                                                                                                                                                                                                                                                         |
| Dimensions                          |                     | 46 (H) $\times$ 61 (W) $\times$ 100 (D) mm (excluding protrusions)                                                                                                                                                                                                                 |
| Weight                              |                     | Approx. 0.3 kg                                                                                                                                                                                                                                                                     |
| Safety standards <sup>1</sup>       |                     | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030                                                                                                                                                                          |
| Emission <sup>1</sup>               | Compliant standards | EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards | EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> |                     | EU RoHS Directive compliant                                                                                                                                                                                                                                                        |

1 Specified with the module installed in the specified frame.

2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.10 AQ23311A, AQ23321A Variable Optical Attenuator Module

### Performance and Functional Specifications

| Item                      | Specification                                                               |                                                                             |
|---------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
|                           | AQ23311A                                                                    | AQ23321A                                                                    |
| Wavelength range          | 1200 nm to 1700 nm                                                          |                                                                             |
| Insertion Loss            | 1.0 dB (typ.) <sup>1, 2, 3, 4</sup><br>1.6 dB or less <sup>1, 2, 3, 5</sup> | 1.9 dB (typ.) <sup>1, 2, 3, 4</sup><br>2.3 dB or less <sup>1, 2, 3, 5</sup> |
| Maximum attenuation       | 60 dB                                                                       |                                                                             |
| Attenuation accuracy      | ±0.1 dB or less <sup>2, 3, 6, 7</sup>                                       |                                                                             |
| Reproducibility           | ±0.01 dB or less <sup>1, 2, 8</sup>                                         |                                                                             |
| Display resolution        | 0.001 dB                                                                    |                                                                             |
| Output Monitor Accuracy   | —                                                                           | ±5 % or less <sup>2, 9, 10, 11, 12</sup>                                    |
| Optical Return Loss       | 45 dB or more <sup>3, 6, 11, 12</sup>                                       |                                                                             |
| Polarization dependence   | 0.08 dBp-p or less <sup>3, 6</sup>                                          | 0.1 dBp-p or less <sup>3, 6</sup>                                           |
| Maximum input power       | +23 dBm                                                                     |                                                                             |
| Shutter isolation         | 90 dB or more                                                               |                                                                             |
| Applicable optical fiber  | SMF(ITU-T G.652.D)                                                          |                                                                             |
| Optical connector         | FC/PC or SC/PC                                                              |                                                                             |
| Monitor port option (/MP) |                                                                             |                                                                             |
| Monitor Port Output       | −13 dB(typ.) <sup>1, 2, 3, 13</sup>                                         | —                                                                           |
| Insertion Loss            | 2.3 dB or less <sup>1, 2, 3</sup>                                           | —                                                                           |
| Polarization dependence   | 0.1 dBp-p or less <sup>3, 6</sup>                                           | —                                                                           |

\* All values in the specifications assume a warm-up period of 60 minutes. Unless otherwise noted, all specifications include connectors.

\* Environmental conditions conform to the frame specifications.

1 Wavelength: 1310 nm±15 nm, 1550 nm±15 nm

2 Ambient temperature 23 ± 2 °C (constant temperature)

3 When using the Yokogawa reference master cord (SMF)

4 Connectors not included

5 Connectors included

6 Wavelength: 1550 nm±15 nm

7 0.15 dB or less if the wavelength is 1310 nm ± 15 nm

8 2σ

9 Polarization dependence is not included.

10 Wavelength: Any one wavelength within 1310 nm ± 15 nm or 1550 nm ± 15 nm

11 Output power: −10 dBm

12 When using PC connectors (return loss 48 dB or more)

13 Output ratio

## General specifications

| Item                                |                     | Specification                                                                                                                                                                                                                                                                      |
|-------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               |                     | The same as the frame's operating environment                                                                                                                                                                                                                                      |
| Storage environment                 |                     | Ambient temperature: -20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                                                |
| Installation location               |                     | Indoor use                                                                                                                                                                                                                                                                         |
| Dimensions                          |                     | 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)                                                                                                                                                                                                                |
| Weight                              |                     | Approx. 0.9 kg                                                                                                                                                                                                                                                                     |
| Safety standards <sup>1</sup>       |                     | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030                                                                                                                                                                          |
| Emission <sup>1</sup>               | Compliant standards | EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards | EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> |                     | EU RoHS Directive compliant                                                                                                                                                                                                                                                        |

- 1 Specified with the module installed in the specified frame.
- 2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.
- 3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).
- 4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.11 AQ23332A Variable Optical Attenuator Module

### Performance and Functional Specifications

| Item                      | Specification                                                                                                                                                                                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wavelength range          | 1260 nm to 1640 nm                                                                                                                                                                                           |
| Insertion Loss            | 1.8 dB(typ.) <sup>1, 2, 3, 4</sup><br>2.4 dB or less <sup>1, 2, 3, 5</sup>                                                                                                                                   |
| Maximum attenuation       | 40 dB                                                                                                                                                                                                        |
| Attenuation accuracy      | ±0.15 dB typ. (at attenuation setting 0 to 10 dB) <sup>1, 2, 3, 6, 7</sup><br>±0.30 dB typ. (at attenuation setting 10 to 20 dB) <sup>1, 2, 3, 6, 7</sup>                                                    |
| Reproducibility           | ±0.02 dB typ. (at attenuation setting 0 to 30 dB) <sup>1, 2, 3, 6, 7, 12</sup><br>±0.05 dB typ. (at attenuation setting 30 to 40 dB) <sup>1, 2, 3, 6, 7, 12</sup>                                            |
| Display resolution        | 0.001 dB                                                                                                                                                                                                     |
| Attenuation setting speed | 5 ms <sup>8</sup>                                                                                                                                                                                            |
| Output Monitor Accuracy   | ≤5 % <sup>1, 2, 3, 6, 7, 9, 10</sup>                                                                                                                                                                         |
| Optical return loss       | ≥40 dB <sup>1, 2, 3, 11</sup>                                                                                                                                                                                |
| Polarization dependence   | 0.3 dBp-p (at attenuation setting 0 to 10 dB) <sup>1, 2, 3</sup><br>0.4 dBp-p (at attenuation setting 10 to 20 dB) <sup>1, 2, 3</sup><br>0.6 dB typ. (at attenuation setting 20 to 30 dB) <sup>1, 2, 3</sup> |
| Maximum input power       | +23 dBm                                                                                                                                                                                                      |
| Shutter isolation         | ≥70 dB                                                                                                                                                                                                       |
| Applicable optical fiber  | SMF(ITU-T G.652.D)                                                                                                                                                                                           |
| Optical connector         | FC/PC or FC/Angled PC                                                                                                                                                                                        |

\* All values in the specifications assume a warm-up period of 60 minutes. Unless otherwise noted, all specifications include connectors.

\* Environmental conditions conform to the frame specifications.

1 Wavelength: 1550nm±15nm

2 Ambient temperature 23 ± 2 °C (constant temperature)

3 When using the Yokogawa reference master cord (SMF)

4 Connectors not included

5 Connectors included

6 2σ

7 Polarization dependence is not included.

8 Time required to stabilize within ±0.1 dB of the attenuation setting value

9 Attenuation setting: 0 dB

10 Output power: -10dBm

11 When using PC connectors (return loss 48 dB or more)

12 Short-term

## General specifications

| Item                                |                     | Specification                                                                                                                                                                                                                                                                      |
|-------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               |                     | The same as the frame's operating environment                                                                                                                                                                                                                                      |
| Storage environment                 |                     | Ambient temperature: -20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                                                |
| Installation location               |                     | Indoor use                                                                                                                                                                                                                                                                         |
| Dimensions                          |                     | 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)                                                                                                                                                                                                                |
| Weight                              |                     | Approx. 0.8 kg                                                                                                                                                                                                                                                                     |
| Safety standards <sup>1</sup>       |                     | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030                                                                                                                                                                          |
| Emission <sup>1</sup>               | Compliant standards | EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards | EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> |                     | EU RoHS Directive compliant                                                                                                                                                                                                                                                        |

- 1 Specified with the module installed in the specified frame.
- 2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.
- 3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).
- 4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.12 AQ23411A, AQ23412A, AQ23413A Optical Switch Module

### Performance and Functional Specifications

| Item                     | Specification                                                      |
|--------------------------|--------------------------------------------------------------------|
| Port configuration       | AQ23411A: 1×4, AQ23412A: 1×8, AQ23413A: 1×16                       |
| Number of switches       | 1                                                                  |
| Wavelength               | 1260 nm to 1650 nm                                                 |
| Insertion Loss           | 1.0 dB typ. <sup>1, 2, 3, 4</sup><br>≤1.4 dB <sup>1, 2, 3, 5</sup> |
| Reproducibility          | ±0.01 dB or less <sup>1, 2, 6</sup>                                |
| Crosstalk                | -80 dB or less <sup>1, 2, 3</sup>                                  |
| Optical return loss      | 45 dB or more <sup>1, 2, 3, 7</sup>                                |
| Maximum input power      | +27 dBm                                                            |
| Polarization dependence  | 0.08 dBp-p or less <sup>1, 2, 3</sup>                              |
| Applicable optical fiber | SMF(ITU-T G.652.D)                                                 |
| Optical connector        | FC/PC or SC/PC                                                     |

\* All values in the specifications assume a warm-up period of 60 minutes. Unless otherwise noted, all specifications include connectors.

\* Environmental conditions conform to the frame specifications.

1 Wavelength: 1310 nm ± 15 nm, 1550 nm ± 15 nm

2 Ambient temperature 23 ± 2 °C (constant temperature)

3 When using the Yokogawa reference master cord (SMF)

4 Connectors not included

5 Connectors included

6 2σ

7 When using PC connectors (return loss 48 dB or more)

### General specifications

| Item                                | Specification                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               | The same as the frame's operating environment                                                                                                                                                                                                                                                             |
| Storage environment                 | Ambient temperature: -20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                                                                       |
| Installation location               | Indoor use                                                                                                                                                                                                                                                                                                |
| Dimensions                          | AQ23411A: 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)<br>AQ23412A: 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)<br>AQ23413A: 116.2 (H) × 62.5 (W) × 321.5 (D) mm (excluding protrusions, two slots)                                                        |
| Weight                              | AQ23411A: approx. 0.8 kg, AQ23412A: approx. 0.8 kg, AQ23413A: approx. 1.3 kg                                                                                                                                                                                                                              |
| Safety standards <sup>1</sup>       | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030                                                                                                                                                                                                 |
| Emission <sup>1</sup>               | Compliant standards<br>EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards<br>EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> | EU RoHS Directive compliant                                                                                                                                                                                                                                                                               |

1 Specified with the module installed in the specified frame.

2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

## 6.13 AQ23421A, AQ23422A Optical Switch Module

### Performance and Functional Specifications

| Item                     | Specification                                                      |
|--------------------------|--------------------------------------------------------------------|
| Port configuration       | AQ23421A: 1×2, AQ23422A: 2×2                                       |
| Number of switches       | 2                                                                  |
| Wavelength               | 1260 nm to 1650 nm                                                 |
| Insertion Loss           | 1.0 dB typ. <sup>1, 2, 3, 4</sup><br>≤1.4 dB <sup>1, 2, 3, 5</sup> |
| Reproducibility          | ±0.01 dB or less <sup>1, 2, 6</sup>                                |
| Crosstalk                | -50 dB or less <sup>1, 2, 3</sup>                                  |
| Optical return loss      | 45 dB or more <sup>1, 2, 3, 7</sup>                                |
| Maximum input power      | +27 dBm                                                            |
| Polarization dependence  | 0.08 dBp-p or less <sup>2, 3, 8</sup>                              |
| Applicable optical fiber | SMF (ITU-T G.652.D)                                                |
| Optical connector        | FC/PC or SC/PC                                                     |

\* All values in the specifications assume a warm-up period of 60 minutes. Unless otherwise noted, all specifications include connectors.

\* Environmental conditions conform to the frame specifications.

1 Wavelength: 1310 nm ± 15 nm, 1550 nm ± 15 nm

2 Ambient temperature 23 ± 2 °C (constant temperature)

3 When using the Yokogawa reference master cord (SMF)

4 Connectors not included

5 Connectors included

6 2σ

7 When using PC connectors (return loss 48 dB or more)

8 Wavelength: 1550 nm ± 15 nm<sup>1</sup> Wavelength: 1310 nm ± 15 nm, 1550 nm ± 15 nm

### General specifications

| Item                                | Specification                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating environment               | The same as the frame's operating environment                                                                                                                                                                                                                                                             |
| Storage environment                 | Ambient temperature: -20 to +60 °C<br>Ambient humidity: 20 to 80 % RH (no condensation)<br>Altitude: 3000 m or less                                                                                                                                                                                       |
| Installation location               | Indoor use                                                                                                                                                                                                                                                                                                |
| Dimensions                          | 116.2 (H) × 31 (W) × 321.5 (D) mm (excluding protrusions, one slot)                                                                                                                                                                                                                                       |
| Weight                              | Approx. 0.7 kg                                                                                                                                                                                                                                                                                            |
| Safety standards <sup>1</sup>       | EN 61010-1<br>Overvoltage category II, <sup>2</sup> pollution degree 2 <sup>3</sup><br>EN IEC 61010-2-030                                                                                                                                                                                                 |
| Emission <sup>1</sup>               | Compliant standards<br>EN 61326-1 Class A<br>EN 61000-3-2, EN 61000-3-3<br>This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference. |
| Immunity <sup>1</sup>               | Compliant standards<br>EN 61326-1 Table 2 (for use in industrial locations)                                                                                                                                                                                                                               |
| Environmental standard <sup>4</sup> | EU RoHS Directive compliant                                                                                                                                                                                                                                                                               |

1 Specified with the module installed in the specified frame.

2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

3 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to sealed space (with no pollution or only dry non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

4 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).

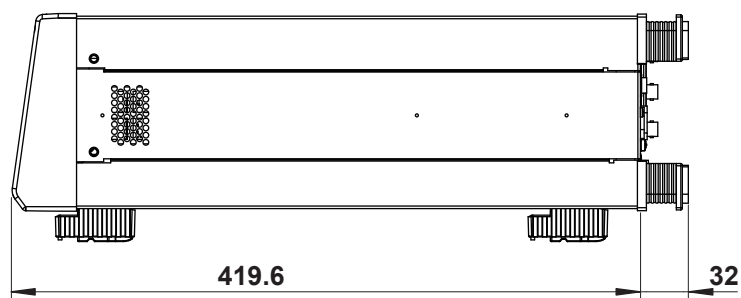
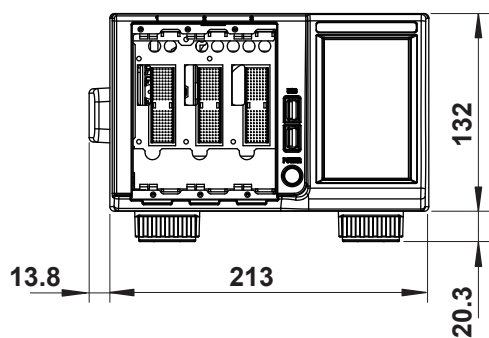
Unless otherwise specified, tolerances are  $\pm 3\%$  (however, tolerances are  $\pm 0.3$  mm when below 10 mm).

Technical drawing of a vertical rectangular object, possibly a door or panel. The drawing includes a side view on the left showing a handle and a top view at the top showing a small square feature. The main body is a large rectangle with a few small dots indicating fasteners or mounting points.

A detailed line drawing of the rear panel of the device. It features a central square cooling fan with a cross-hatch pattern. To the left of the fan are a rectangular port, a standard AC power inlet, and a USB Type-A port. To the right of the fan are four circular ports arranged in a 2x2 grid. The panel is secured by four corner screws. At the bottom, there are two multi-pin connectors for external displays or sensors.

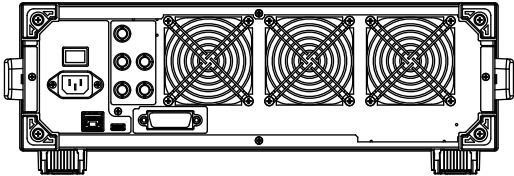
The rear view of the device shows a power cord with a standard three-pronged plug. A large circular ventilation fan is centrally located. To the right of the fan are four circular ports, with the top two labeled 'ANTENNA'. Below the fan is a small rectangular port labeled 'ETHERNET'. The device is secured with four screws at the corners and has two sets of pins at the bottom for connection to a base or another unit.

### Rear view

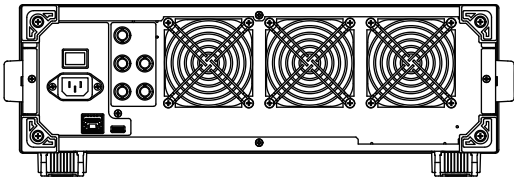


AQ23012A Frame

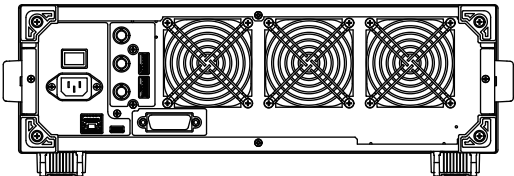
AQ23012A-ETP-C01



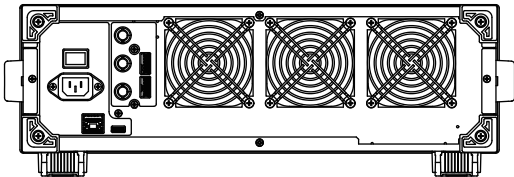
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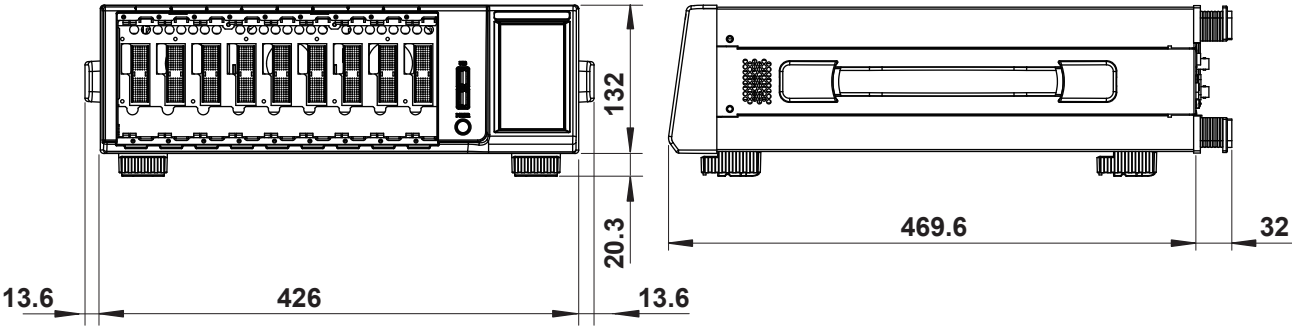
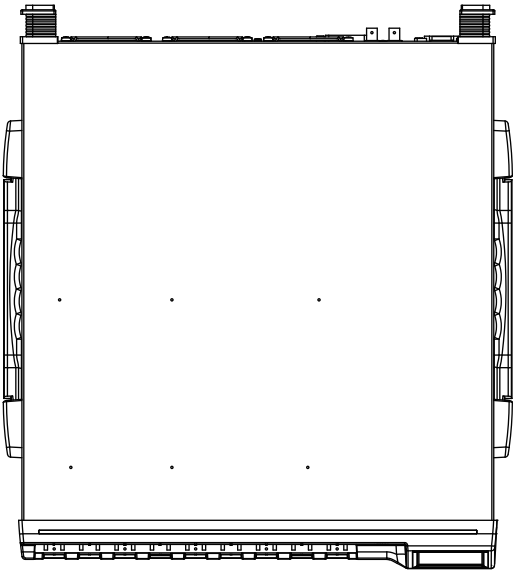
AQ23012A-EDP-C01



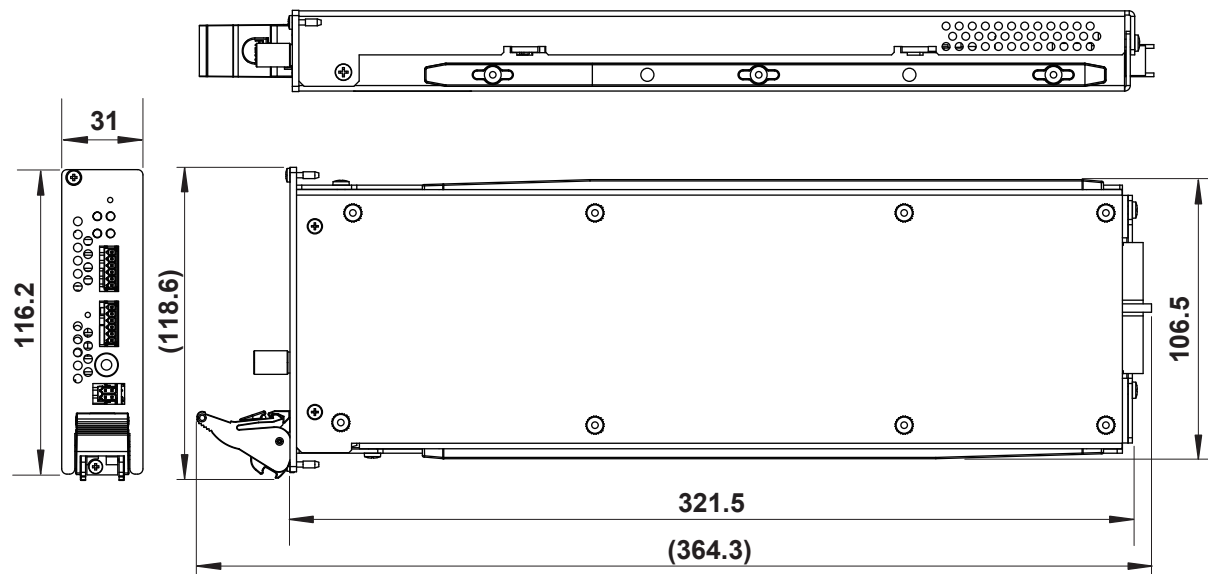
AQ23012A-EDP-N01



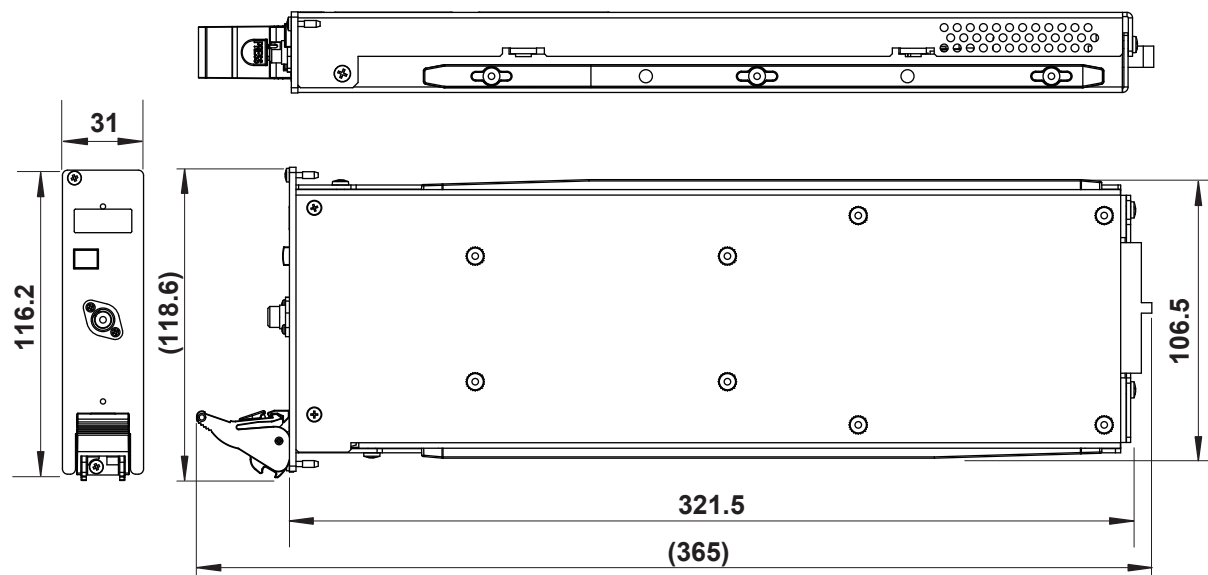
Rear view



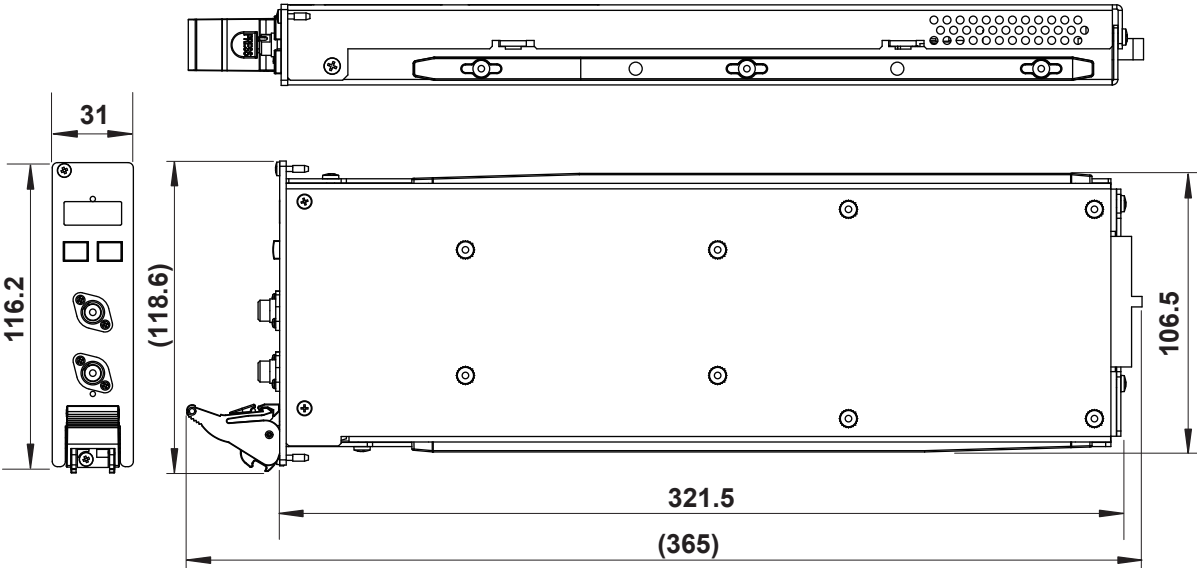
AQ23811A Source Measure Unit



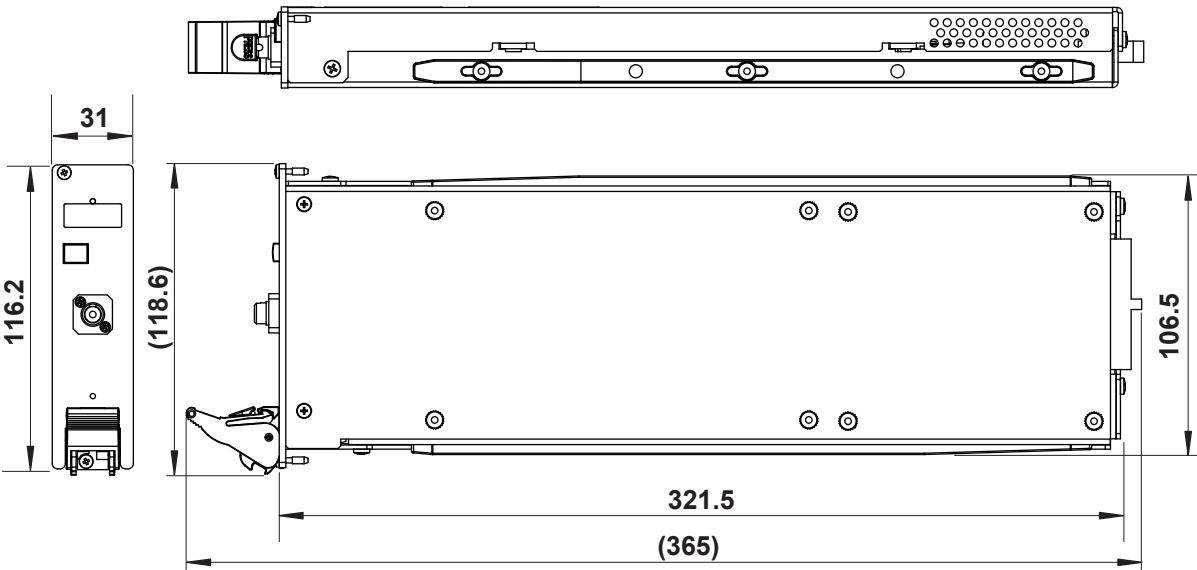
AQ23111A Light Source



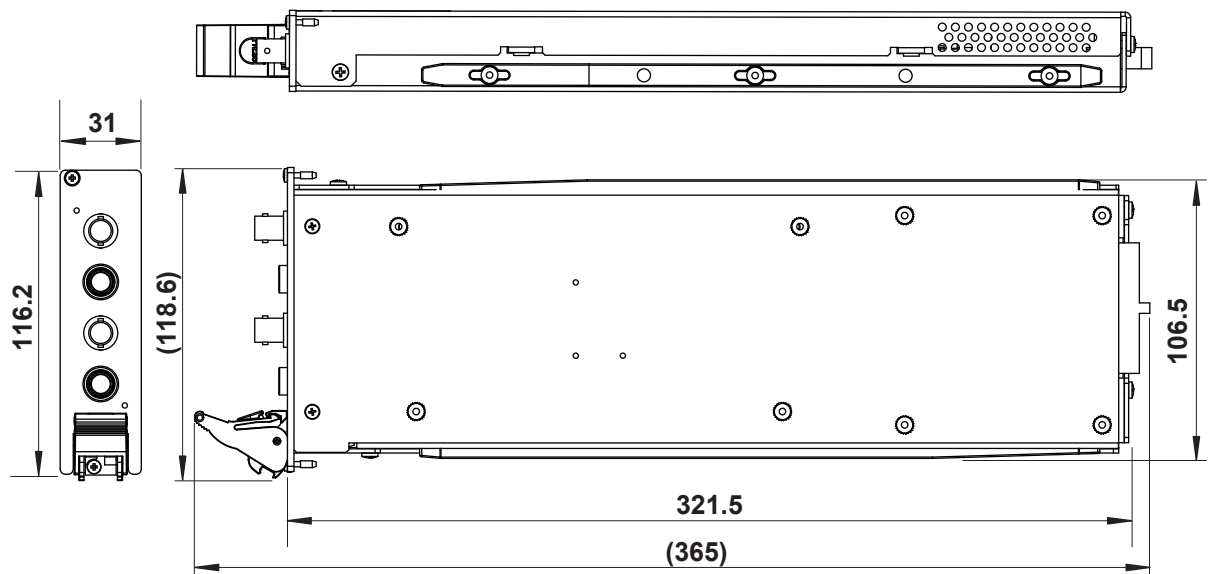
AQ23112A Light Source



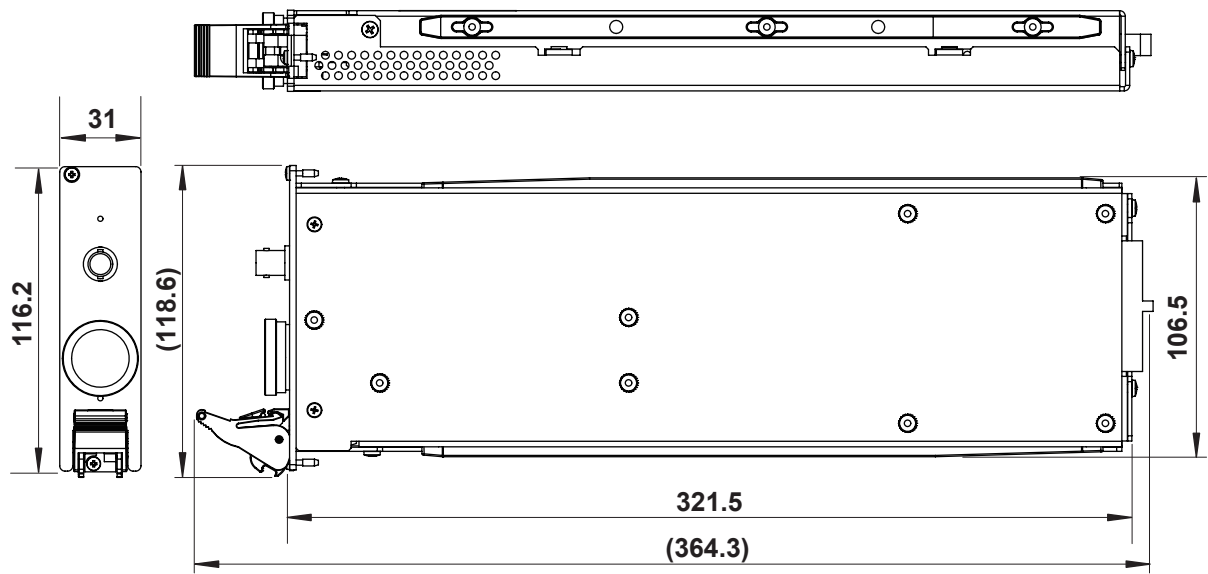
AQ23191A Light Source



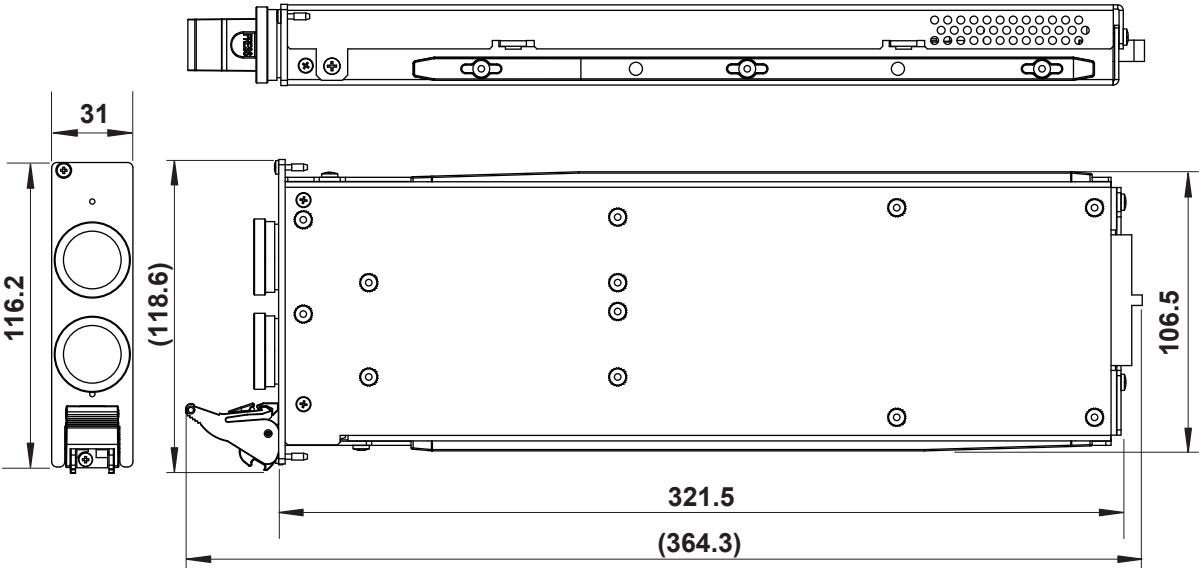
AQ23202A Interface Module



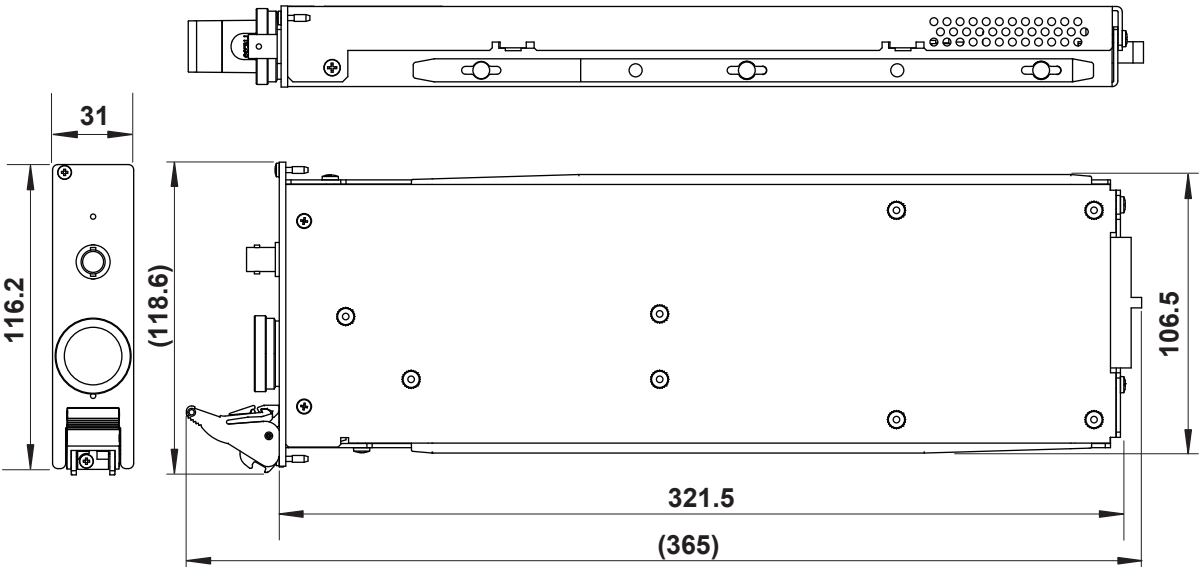
AQ23211A Optical Power Meter



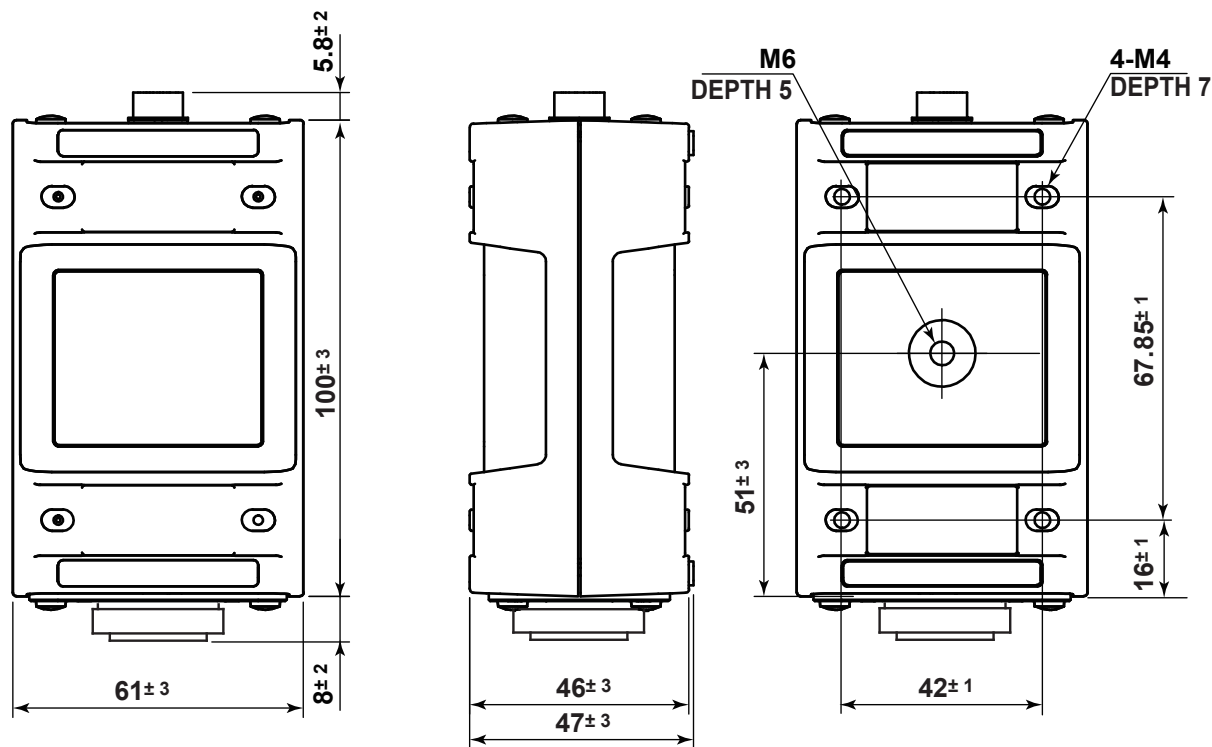
AQ23212A Optical Power Meter



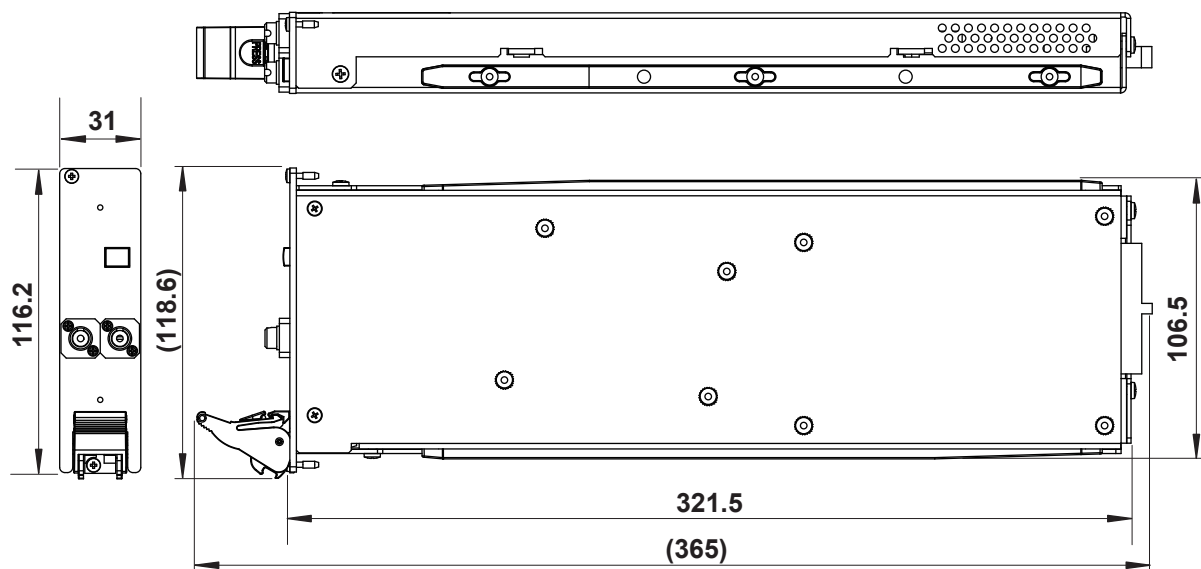
AQ23221A Optical Power Meter



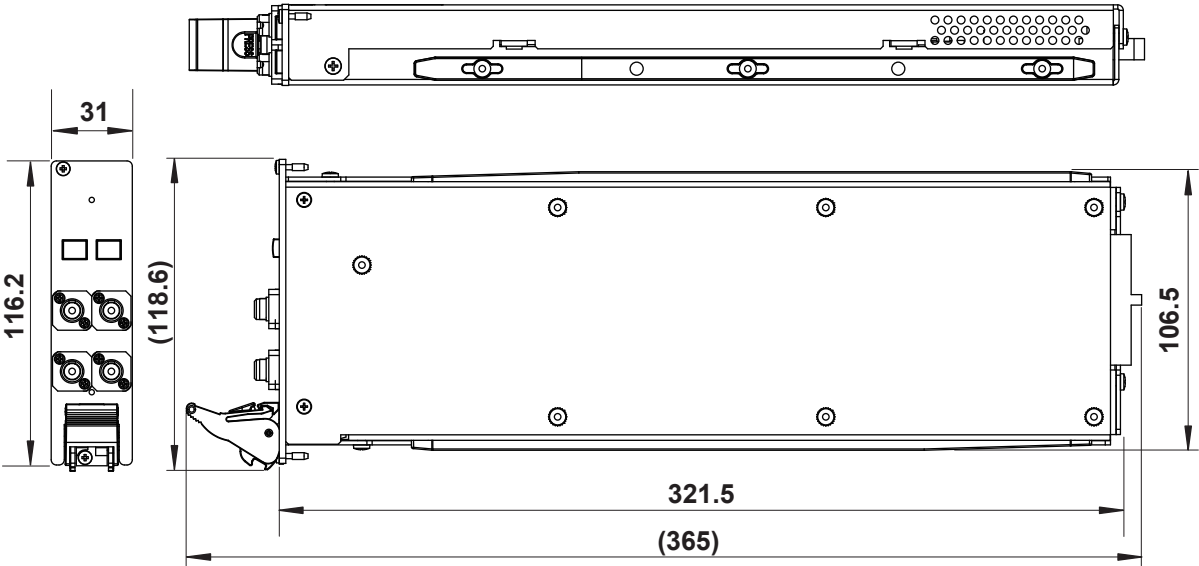
AQ23291A, AQ23295A Optical Sensor Head



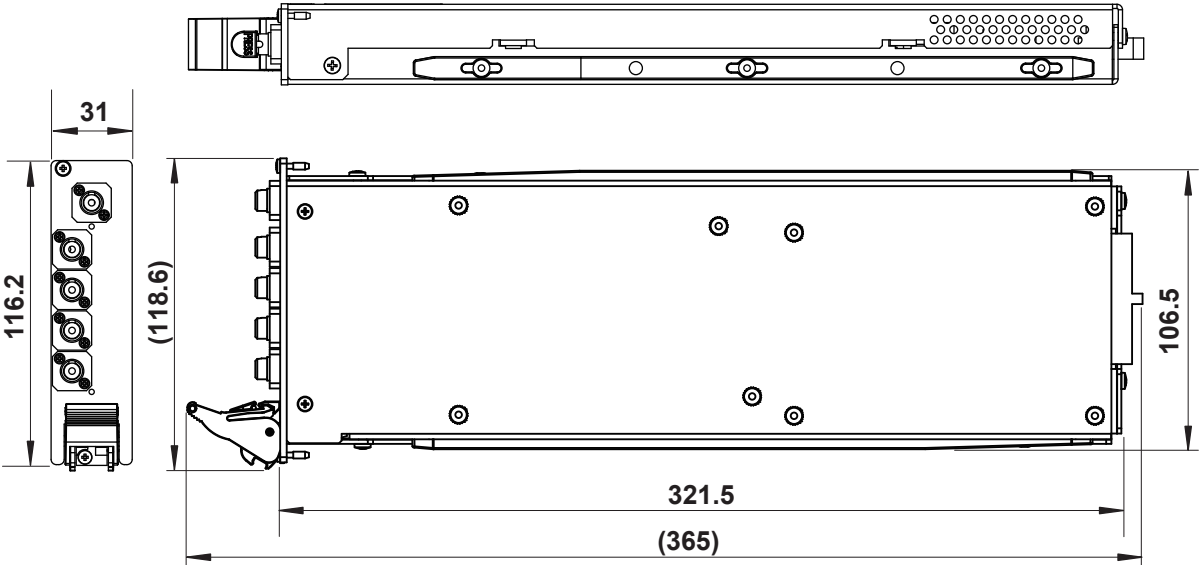
AQ23311A, AQ23321A Variable Optical Attenuator



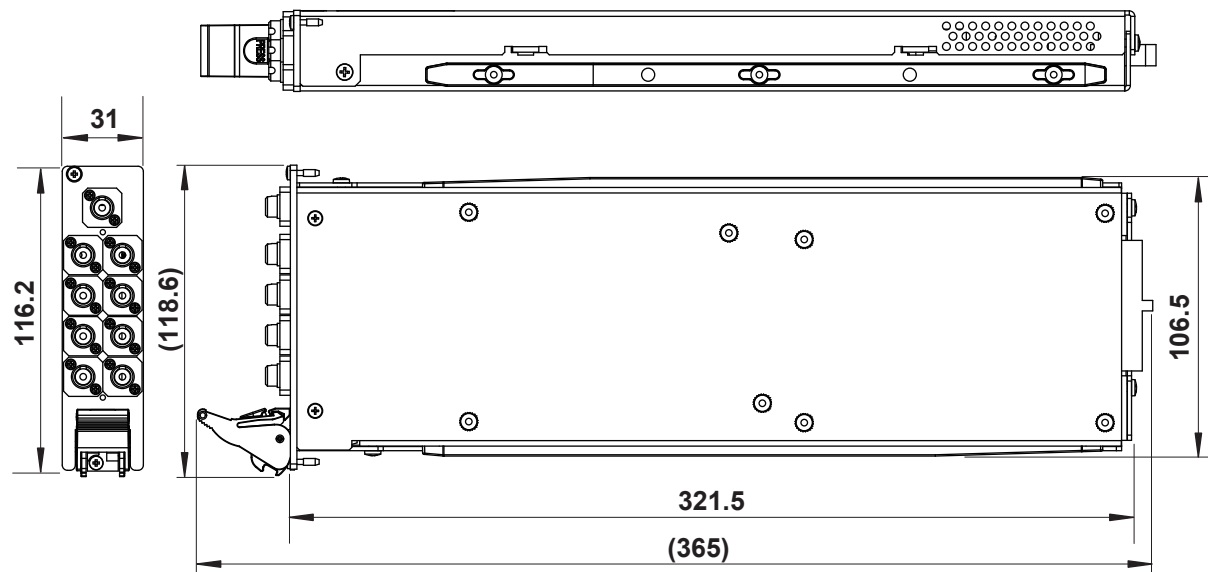
AQ23332A Variable Optical Attenuator



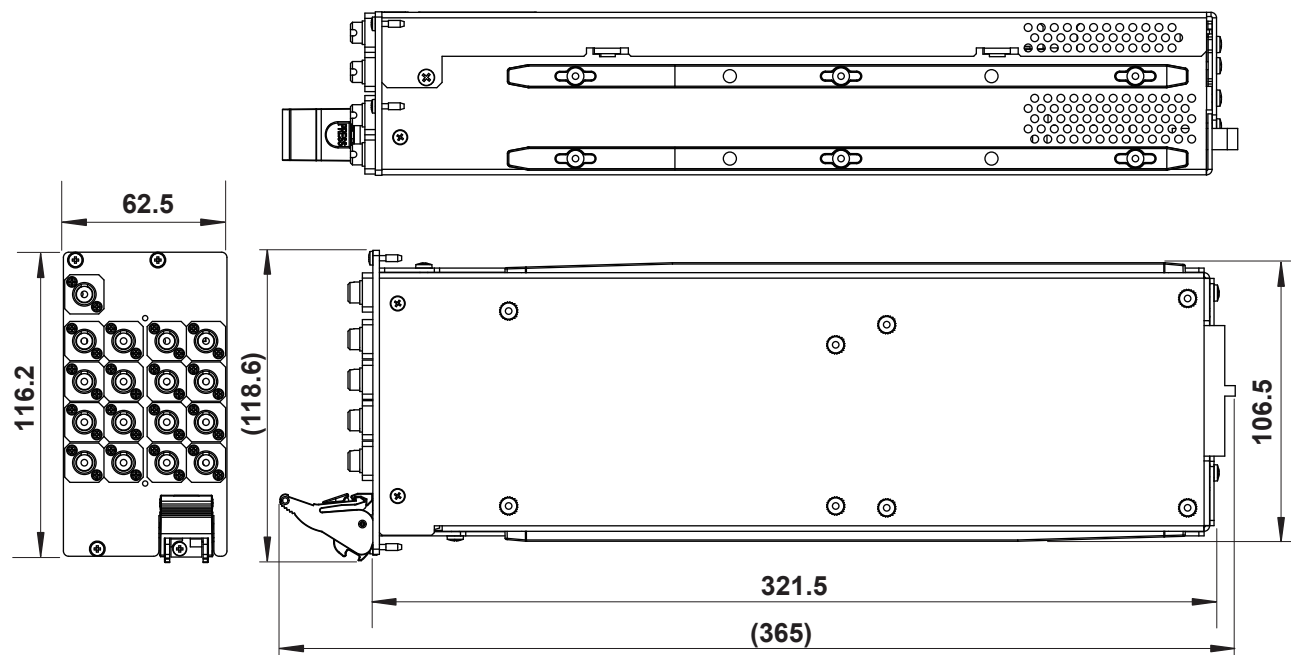
AQ23411A Optical Switch



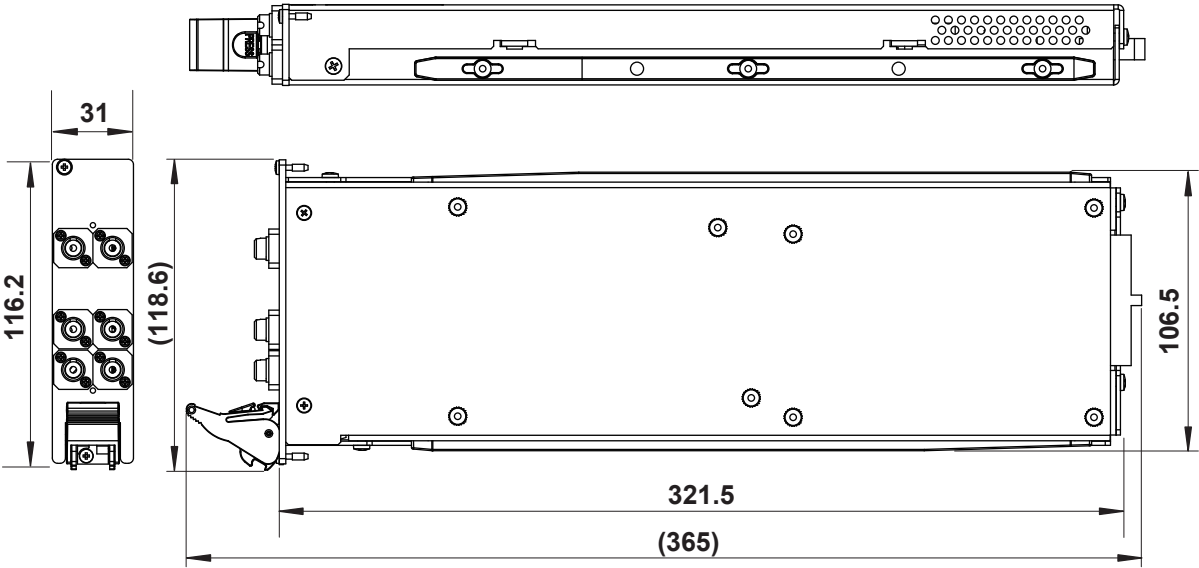
AQ23412A Optical Switch



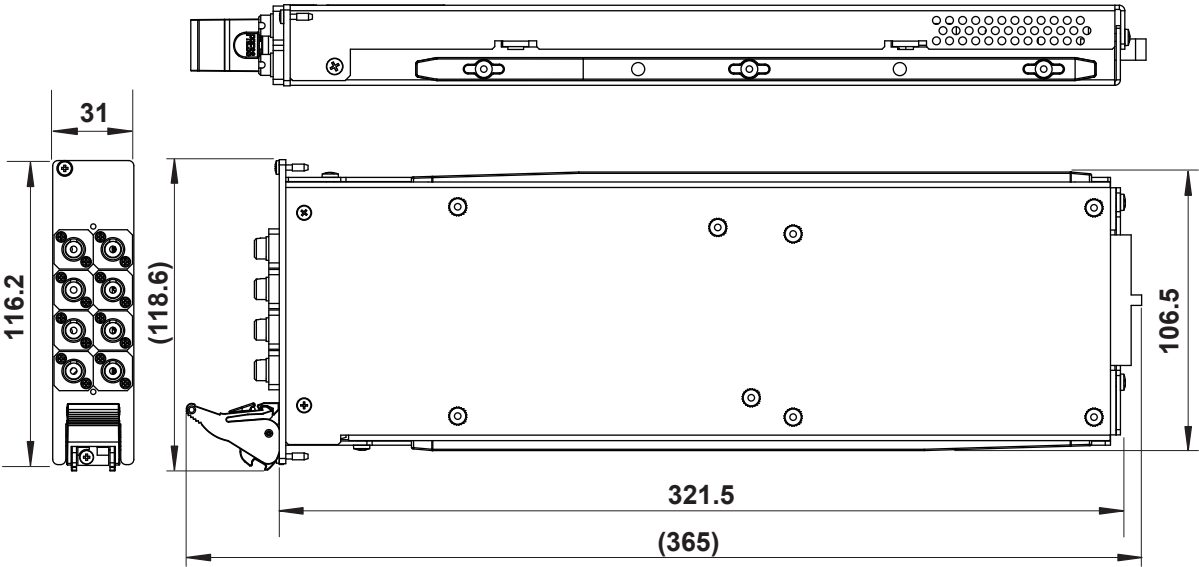
AQ23413A Optical Switch



AQ23421A Optical Switch



AQ23422A Optical Switch



This document describes changes to the Getting Started Guide IM AQ23011A-03EN. Please review them before using the manual.

## ■ Page xxxv Regulations and Sales in Various Countries and Regions

### 光辐射安全通用要求

This section is valid only in China. A general indication of the optical radiation safety risk level is provided.

型号

AQ23191A

| 光辐射安全风险等级 |     |
|-----------|-----|
| 高风险级      | 本产品 |
| 中风险级      |     |
| 低风险级      |     |
| 免险级       |     |

