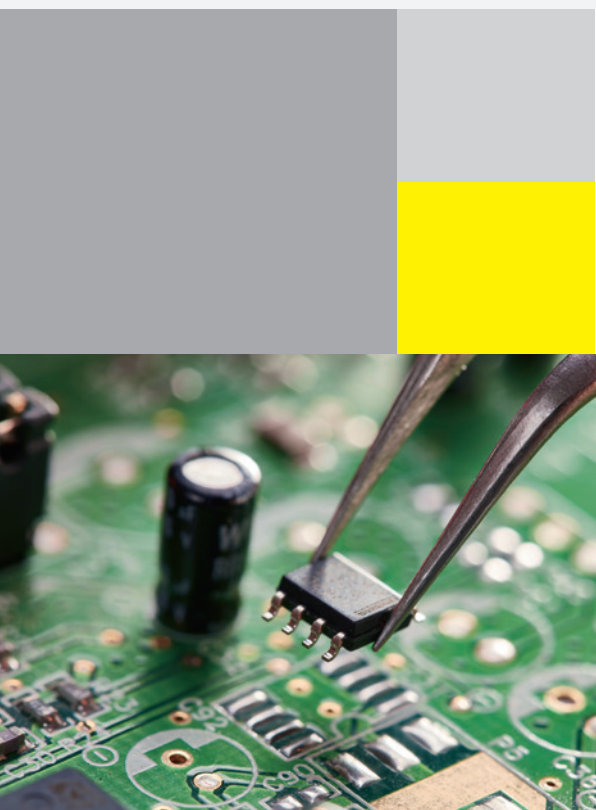


# Precision Starts at the Source

GS200  
DC Voltage/Current Source

Precision Making

Bulletin GS200-01EN



The performance of component designs is primarily influenced by high global sustainability goals and as such there is an increased demand for reliable, precise and stable measurements.

Delivering precision starts at the source, and the development of energy efficient technologies requires the use of high quality voltage/current sources. Yokogawa's GS200 DC voltage and current source offers high accuracy, high resolution and high stability with extremely low noise floor that enables engineers to develop the next generation of electronic components with high precision and confidence.

### The GS200 delivers:

**Performance** – The GS200's outstanding performance delivers extremely low noise DC signals used in a wide range of design processes.

**Versatility** – The GS200 can act not only as a source but also as a constant - load. Its monitoring feature delivers data logging capability.

**Usability** – Individual up/down digit keys enable dynamic and fast change of output. The high resolution display provides a comprehensive view.

# Features

The GS200 generates high accuracy, high stability, high resolution, and extremely low-noise DC voltage and current signals that are required for many applications.

Additionally, the optional monitoring feature turns the GS200 into a voltage and current measuring instrument.

- Voltage source up to  $\pm 32$  V and current source up to  $\pm 200$  mA
- 5 1/2-digit,  $\pm 120000$ -count output resolution
- Voltage and current simple monitoring feature (optional)
- Programmable output up to 10000 points
- Built-in USB mass storage device
- Channel expansion through synchronous operation

## Application Example

### Components and materials

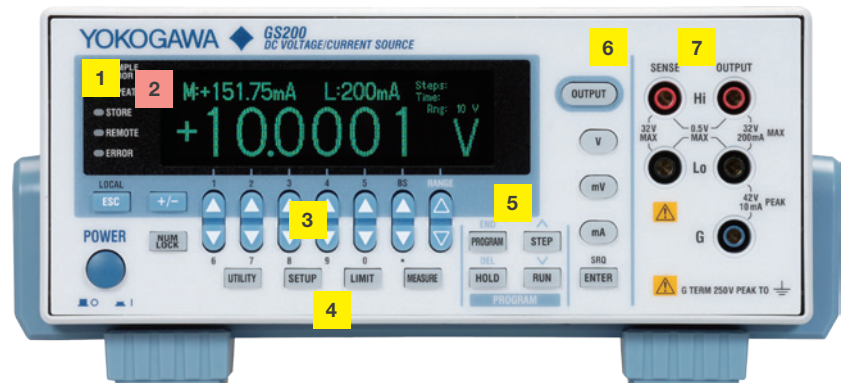
- Pressure sensors
- Temperature sensors
- Optical sensors
- Rechargeable battery control devices
- Power semiconductor devices
- Capacitors
- Resistors
- Small motors

### IoT and vehicle equipment

- Smart appliances
- Wearable equipment
- Smart phone
- LED lighting
- Organic EIs
- Optical interface modules
- Aircraft related equipment
- Future generation computing systems

### Energy

- Rechargeable batteries
- Fuel cells
- Photovoltaics
- Maintenance and inspection
  - Nuclear and thermal power generation
  - Factories



1 VFD display

2 Measured voltage and current monitoring display (option)

3 Soft keys,  $\Delta$  and  $\nabla$  keys, and the key pad

4 Set up and execution keys

5 Output program keys

6 Output control key

7 Output terminals (only on the GS210)

## High Accuracy and High Resolution Output

Each DC voltage/current source in the GS200 series uses two DACs to generate highly accurate voltage and current at a high resolution. It is highly stable whether it is used for a short or long period of time and features superb linearity over all the ranges. Moreover, it produces extremely low noise.

### High accuracy

- $\pm 0.016\%$  of setting + 240  $\mu\text{V}$  (at 10 V range for one year)
- $\pm 0.03\%$  of setting + 5  $\mu\text{A}$  (at 100 mA range for one year)

### High stability

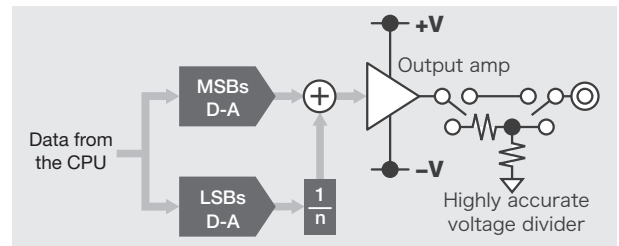
- $\pm 0.001\%$  of setting + 20  $\mu\text{V}$  (at 10 V range for one day)
- $\pm 0.004\%$  of setting + 3  $\mu\text{A}$  (at 100 mA range for one day)

### High resolution

- 100 nV (VDC, 10 mV range), 10 nA (1 mA range)

### Low noise

- 100  $\mu\text{Vp-p}$  (10 V range, DC to 10 kHz)
- 3  $\mu\text{Ap-p}$  (100 mA range, DC to 10 kHz)



Multiplicative dual D/A conversion



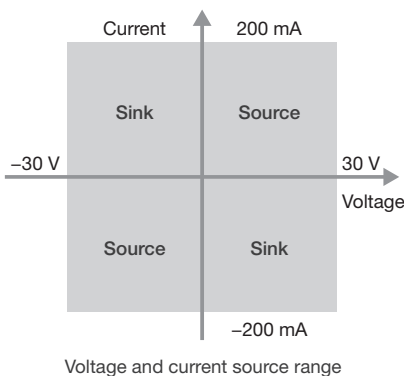
High resolution output with  $\pm 120000$  display counts and 100 nV steps minimum

The GS200 features 5 1/2-digit,  $\pm 120000$ -count output resolution for both voltage and current sources. At the 100 mV and 10 mV source ranges, the GS200 uses its highly accurate voltage divider to achieve extremely low noise levels, in the order of  $\mu\text{V}$ . The minimum output resolution of 100 nV and low noise output enable you to make extremely small changes to the signal level.

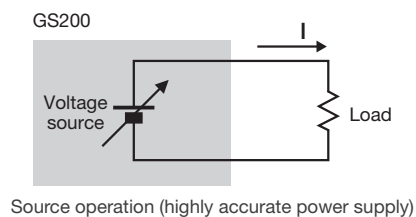
## Source and Sink Operations

The GS200 can perform four-quadrant operation by operating as a current source or a current sink in the range of  $\pm 30\text{ V}$  and  $\pm 200\text{ mA}$ .

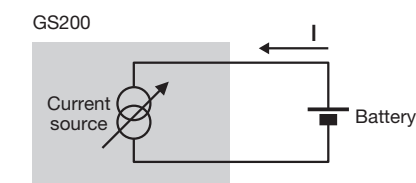
When the GS200 is sinking current, it can operate over the exact same range as when it is operating as a current source. You can use the GS200 not just as a highly accurate voltage source but also as a highly accurate constant-current electronic load.



Voltage and current source range



Source operation (highly accurate power supply)



Sink operation (highly accurate load)

### Voltage ranges

- 10 mV, 100 mV, 1 V, 10 V, and 30 V

### Maximum output current

- $\pm 200\text{ mA}$  (at 1 V, 10 V, and 30 V ranges)
- (A highly accurate voltage divider is used at the 10 mV and 100 mV ranges.)

### Current ranges

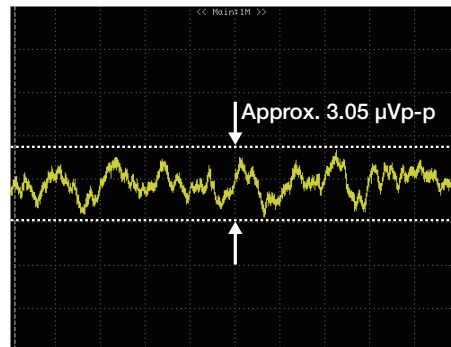
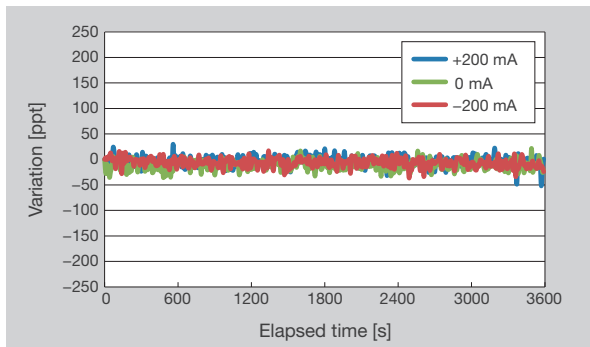
- 1 mA, 10 mA, 100 mA, and 200 mA

### Maximum output voltage

- $\pm 30\text{ V}$

## High stability, low noise characteristics

The GS200 is widely used in various fields such as state-of-the-art academic research and next-generation equipment development because it can provide highly stable, low noise and reliable power supply to devices that require accurate and stable operation.



Noise waveform example at 0 V output in 10 V output range (Observed using a 1000 times amplifier with a 10 kHz band-limiting filter)

Example of 1 hour stability in output 200 mA range (As reference data)

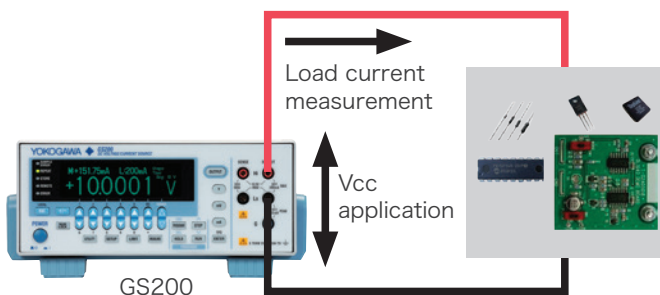
## Simple Voltage and Current Monitoring Feature (Optional)

In addition to the GS200's high accuracy voltage and current source features, it can also be equipped with an optional simple voltage and current monitoring feature. With this option, the GS200 can function as a current monitor when it is generating voltage and as a voltage monitor when it is generating current. The display resolution is 4 1/2 digits. The measured values can be stored along with the source values in the internal memory (USB mass storage device).



The monitoring feature can be used to:

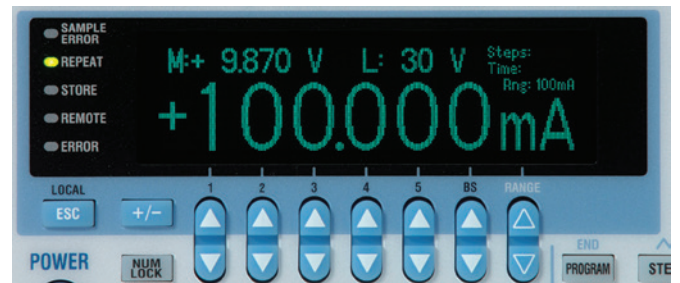
- Check that current is flowing.
- Check and inspect current consumption.
- Log fluctuations in the load current.
- Record I-V characteristics.



## Easy to use

An up/down key has been provided below each of the 5 1/2 digits for setting the source so that any digit can be readily changed.

Changing the source value is easy, and increment/decrement resolution can also be set freely. This feature is invaluable during threshold level detection of the DUT and during measurements of I-V characteristics. In addition, the GS200's high-resolution dot matrix VFD enables a large amount of information to be displayed. The GS200 also offers freely adjustable font sizes for improved readability and productivity. The GS200 has soft key menus for easy operation.



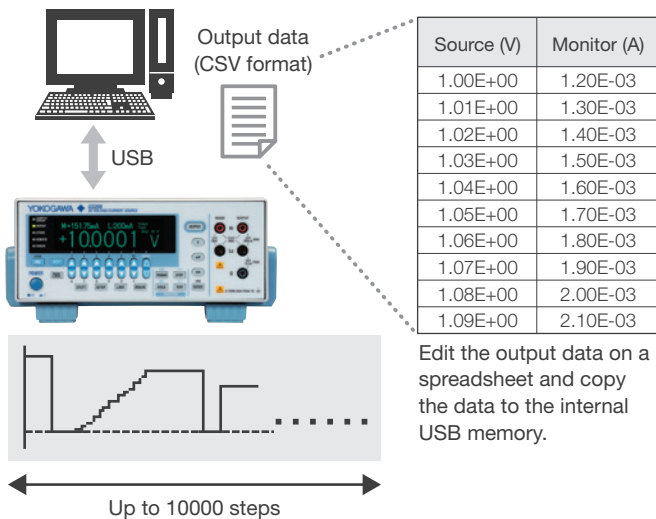
GS200 display and key layout



Seven segment display on conventional models

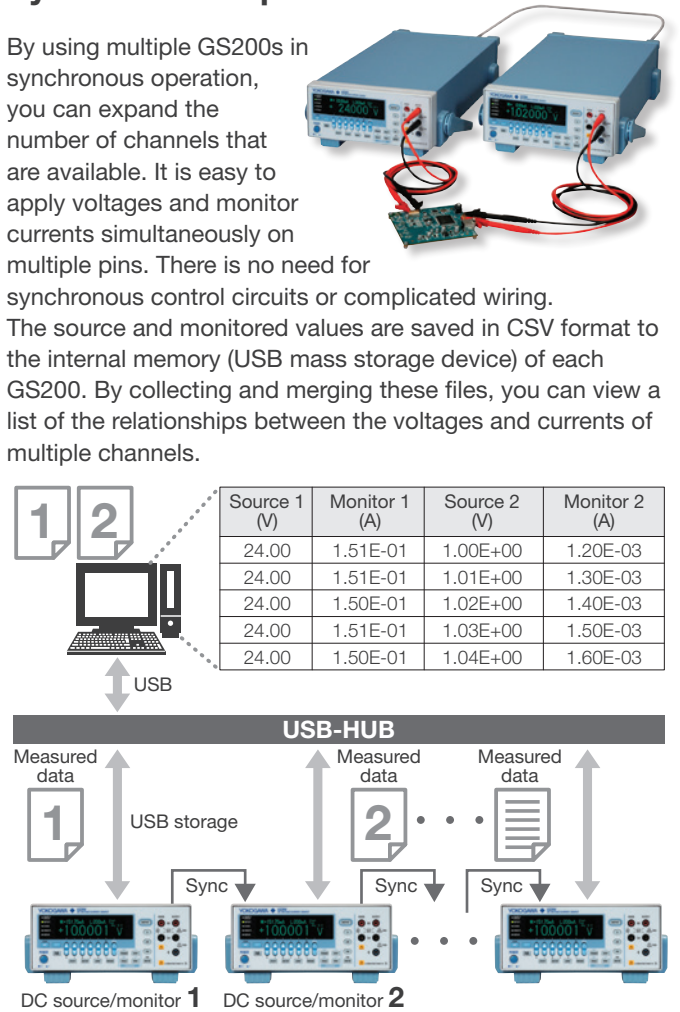
## Easy Programming Using the Mass Storage Feature

You can define up to 10000 steps of output values and stored these steps to USB memory. You can also set the output interval, settling time, and other settings. If you connect the GS200 to a PC, the PC will detect the GS200 internal memory as an external storage medium (USB mass storage device). You can easily drag data from the PC to the GS200 internal memory. In addition, you can enter and edit output data using the GS200 keys. On models with the monitoring option, the measured data is stored to the internal memory along with the output data. You can easily drag the measured data from the GS200 to the PC. You can use the GS200 as a simple I-V curve tracer or data logger.

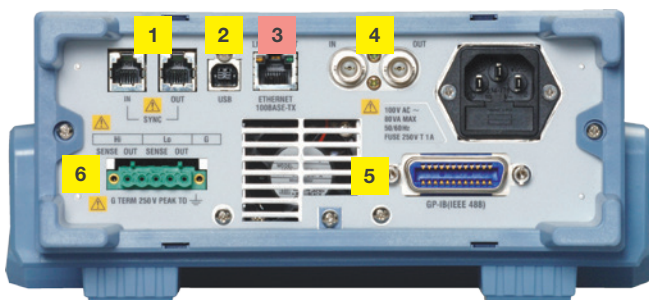


## Channel Expansion through Synchronous Operation

By using multiple GS200s in synchronous operation, you can expand the number of channels that are available. It is easy to apply voltages and monitor currents simultaneously on multiple pins. There is no need for synchronous control circuits or complicated wiring. The source and monitored values are saved in CSV format to the internal memory (USB mass storage device) of each GS200. By collecting and merging these files, you can view a list of the relationships between the voltages and currents of multiple channels.



## Rear Panel



- 1** I/O terminals for synchronous operation
- 2** USB port
- 3** Ethernet port (option)
- 4** BNC I/O terminals
- 5** GP-IB  
Yokogawa 7651 model compatible mode is equipped.
- 6** Output terminals (only on the GS211)  
On GS211 models, the I/O terminals are on the rear panel (no terminals are provided on the front panel). Choose front panel terminals or rear panel terminals depending on your situation.

# Specifications

## Voltage Source Section

Range	Source Range	Resolution	24-Hour Stability ±(% of setting + $\mu\text{V}$ )	90-Day Stability ±(% of setting + $\mu\text{V}$ )	90-Day Accuracy ±(% of setting + $\mu\text{V}$ )	1-Year Accuracy ±(% of setting + $\mu\text{V}$ )	Temperature Coefficient ±(% of setting + $\mu\text{V}$ )/°C
10 mV	±12.0000 mV	100 nV	0.002 + 3	0.014 + 4	0.018 + 4	0.025 + 5	0.0018 + 0.7
100 mV	±120.000 mV	1 $\mu\text{V}$	0.003 + 3	0.014 + 5	0.018 + 10	0.025 + 10	0.0018 + 0.7
1 V	±1.20000 V	10 $\mu\text{V}$	0.001 + 10	0.008 + 50	0.010 + 100	0.016 + 120	0.0009 + 7
10 V	±12.0000 V	100 $\mu\text{V}$	0.001 + 20	0.008 + 100	0.010 + 200	0.016 + 240	0.0008 + 10
30 V	±32.000 V	1 mV	0.001 + 50	0.008 + 200	0.010 + 500	0.016 + 600	0.0008 + 30

24-hour stability values are for 23°C ±1°C and power fluctuation within ±5%.

90-day stability and 90-day and 1-year accuracy values are for 23°C ±5°C.

Add the temperature coefficient for 90-day and 1-year accuracy values for 5°C to 18°C and for 28°C to 40°C.

Range	Maximum Output Current	Output Resistance	Output Noise		CMRR (50/60 Hz)
			DC to 10 Hz	DC to 10 kHz (Reference)	
10 mV	—	App. 2 $\Omega$	3 $\mu\text{Vp-p}$	30 $\mu\text{Vp-p}$	≥120 dB
100 mV	—	App. 2 $\Omega$	5 $\mu\text{Vp-p}$	30 $\mu\text{Vp-p}$	
1 V	±200 mA	≤2 m $\Omega$	15 $\mu\text{Vp-p}$	60 $\mu\text{Vp-p}$	
10 V	±200 mA	≤2 m $\Omega$	50 $\mu\text{Vp-p}$	100 $\mu\text{Vp-p}$	
30 V	±200 mA	≤2 m $\Omega$	150 $\mu\text{Vp-p}$	200 $\mu\text{Vp-p}$	≥100 dB

## Current Source Section

Range	Source Range	Resolution	24-Hour Stability ±(% of setting + $\mu\text{A}$ )	90-Day Stability ±(% of setting + $\mu\text{A}$ )	90-Day Accuracy ±(% of setting + $\mu\text{A}$ )	1-Year Accuracy ±(% of setting + $\mu\text{A}$ )	Temperature Coefficient ±(% of setting + $\mu\text{A}$ )/°C
1 mA	±1.20000 mA	10 nA	0.0015 + 0.03	0.016 + 0.1	0.02 + 0.1	0.03 + 0.1	0.0015 + 0.01
10 mA	±12.0000 mA	100 nA	0.0015 + 0.3	0.016 + 0.5	0.02 + 0.5	0.03 + 0.5	0.0015 + 0.1
100 mA	±120.000 mA	1 $\mu\text{A}$	0.004 + 3	0.016 + 5	0.02 + 5	0.03 + 5	0.002 + 1
200 mA	±200.000 mA	1 $\mu\text{A}$	0.004 + 20	0.016 + 30	0.02 + 30	0.03 + 30	0.002 + 5

24-hour stability values are for 23°C ±1°C and power fluctuation within ±5%.

90-day stability and 90-day and 1-year accuracy values are for 23°C ±5°C.

Add the temperature coefficient for 90-day and 1-year accuracy values for 5°C to 18°C and for 28°C to 40°C.

Range	Maximum Output Voltage	Output Resistance	Output Noise		CMRR (50/60 Hz)
			DC to 10 Hz	DC to 10 kHz (Reference)	
1 mA	±30 V	≥100 M $\Omega$	0.02 $\mu\text{Ap-p}$	0.1 $\mu\text{Ap-p}$	≥100 nA/V
10 mA	±30 V	≥100 M $\Omega$	0.2 $\mu\text{Ap-p}$	0.3 $\mu\text{Ap-p}$	
100 mA	±30 V	≥10 M $\Omega$	2 $\mu\text{Ap-p}$	3 $\mu\text{Ap-p}$	
200 mA	±30 V	≥10 M $\Omega$	10 $\mu\text{Ap-p}$	15 $\mu\text{Ap-p}$	

## Limiter Section

Setting	Range	Resolution
Current limiter (only during voltage generation)	1 mA to 200 mA	1 mA
Voltage limiter (only during current generation)	1 V to 30 V	1 V

## Response Time (Typical)

10 ms or less for all voltage source and current source ranges.

(Response time is the time from the point when the source begins to change until it reaches within 0.1% of the final value at maximum output, maximum load (pure resistive load), and with no limiter operation.)

## Maximum Capacitive and Inductive Loads

Capacitive load: 10  $\mu\text{F}$

Inductive load: 1 mH

## Voltage and Current Monitoring Feature (Optional)

### Voltage monitoring feature (only during current generation)

Range	Measurement Range	Resolution	Input Resistance	1-Year Accuracy (1 PLC) ±(% of reading + mV)	Temperature Coefficient ±(% of reading + mV)/°C
30 V	±30.000 V	1 mV	≥10 MΩ	0.02 + 2	0.002 + 0.1

### Current monitoring feature (only during voltage generation)

Range	Measurement Range	Resolution	Input Resistance	1-Year Accuracy (1 PLC) ±(% of reading + μA)	Temperature Coefficient ±(% of reading + μA)/°C
200 mA	±200.00 mA	10 μA	≤2 mΩ	0.03 + 300	0.003 + 30

Integration time	1 to 25 PLC
Trigger source*	Internal timer (0.1 s to 3600.0 s), READY, communication, and immediate
Measurement delay (the delay from the trigger point)	0 to 999999 ms (1 ms resolution)
Other features	Auto zero, NULL computation, and data storage
	*Measurement trigger source
	Internal timer For monitoring. 0.1 s to 3600.0 s (0.1 s resolution)
	READY For curve tracing during program operation. The timing when READY signals are produced.
	Comm. For controlling the GS200 from a PC. Trigger generation through the *TRG command.
	Immediate Trigger generation at the end of measurement.

## Programming Feature

Maximum number of steps	10000
Trigger	External, internal timer, step input, measurement end
Slope	0 s to 3600.0 s (0.1 s resolution)

## External Input and Output

BNC input/output	IN: TRIG IN, OUTPUT IN OUT: TRIG OUT, OUTPUT OUT, READY OUT																					
External synchronization I/O	<table border="1"> <thead> <tr> <th>PIN No.</th> <th>SYNC IN</th> <th>SYNC OUT</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>OUTPUT IN</td> <td>OUTPUT OUT</td> </tr> <tr> <td>2</td> <td>N.C.</td> <td>N.C.</td> </tr> <tr> <td>3</td> <td>TRIG IN</td> <td>TRIG OUT</td> </tr> <tr> <td>4</td> <td>GND</td> <td>GND</td> </tr> <tr> <td>5</td> <td>N.C.</td> <td>READY OUT</td> </tr> <tr> <td>6</td> <td>N.C.</td> <td>N.C.</td> </tr> </tbody> </table>	PIN No.	SYNC IN	SYNC OUT	1	OUTPUT IN	OUTPUT OUT	2	N.C.	N.C.	3	TRIG IN	TRIG OUT	4	GND	GND	5	N.C.	READY OUT	6	N.C.	N.C.
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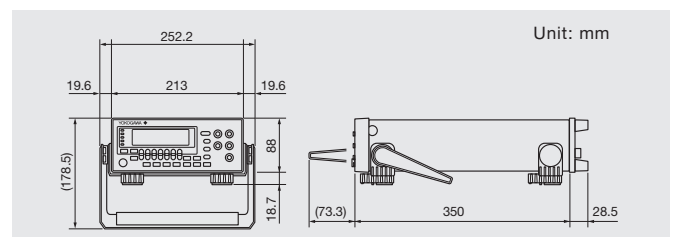
## Communication Interface

GP-IB	Electrical and mechanical specifications Conforms to IEEE Standard 488.2-1978
	Functional specifications SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
	Protocol Conforms to IEEE Standard 488.2-1992
	Addresses 0 to 30 7651-command-compatible mode available
USB interface	Ports 1
	Connector Type B
	Electrical and mechanical specifications Conforms to USB 2.0
Ethernet (optional)	Ports 1
	Connector RJ-45
	Electrical and mechanical specifications Conforms to IEEE 802.3
	Transmission system 100BASE-TX/10BASE-T
	Protocol FTP server, HTTP server, VXI-11 server, DHCP client, command socket

## General Specifications

Display	256 × 64 dot vacuum fluorescent display
Internal memory	4 MB (non-volatile; stores setup files and output pattern files)
Warm-up time	At least 60 minutes
Operating environment	5 to 40°C, 20 to 80% RH
Rated supply voltage	100 VAC, 120 VAC, 230 VAC (±10% of each rated voltage, 50/60 Hz)
Rated supply frequency	50/60 Hz
Maximum power consumption	Approx. 80 VA
Allowable input voltage	32 V between the high and low terminals 42 V <sub>peak</sub> between the low and ground terminals 0.5 V between the output and sense terminals 250 V <sub>peak</sub> between the ground terminal and the case
Weight	Approx. 5 kg
External dimensions	Approx. 213 (W) × 88 (H) × 350 (D) mm (excluding protrusions)

## External dimensions



## Model and Suffix code

Model	Suffix code	Description
GS210		DC voltage/current source (front panel output terminals)
GS211		DC voltage/current source (rear panel output terminals)
Supply Voltage	-1	100 VAC, 50/60 Hz
	-4	120 VAC, 50/60 Hz
	-7	230 VAC, 50/60 Hz
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
Options	/MON	Voltage and current monitoring
	/C10	Ethernet interface

## Standard Accessories

GS210, GS211	Power cord, rubber feet (2 pieces), user's manuals (1 set), fuse
GS210 only	Measurement leads 758933 (1 set of red and black leads), small alligator clip adapters 758922 (1 set of red and black leads)
GS211 only	Terminal plug

## Rack Mount Kits

Model	Product	Description
751533-E2	Rack mount kit	For EIA single mount
751533-J2	Rack mount kit	For JIS single mount
751534-E2	Rack mount kit	For EIA dual mount
751534-J2	Rack mount kit	For JIS dual mount

## Related product

### GS610

#### Source Measure Unit

Wide-range source and measurement function  
Source and measurement range:  
±110 V, ±3.2 A



### GS820

#### Multi Channel Source Measure Unit

2-channel source & sink operation  
Source and measurement range:  
±18 V, ±3.2 A (18 V range model)  
±50 V, ±1.2 A (50 V range model)



## Accessories

Model	Name	Description	
758933	Measurement lead	1 m safety terminal cable with 2 leads (red and black) in a set	
758917	Measurement lead	0.75 m safety terminal cable with 2 leads (red and black) in a set	
758922	Small alligator clip adapter	Safety terminal-alligator clip adapter, containing 2 pieces (red and black) in a set	
758929	Large alligator clip adapter	Safety terminal-alligator clip adapter, containing 2 pieces (red and black) in a set	
758921	Fork terminal adapter	Safety terminal-fork terminal adapter, containing 2 pieces (red and black) in a set	
758924	Conversion adapter	BNC-binding post adapter	
366924	BNC cable	BNC-BNC cable 1 m	
366925	BNC cable	BNC-BNC cable 2 m	
758923*	Safety terminal adapter	Spring clamp type 2 adapters (red and black) in a set	
758931*	Safety terminal adapter	Screw-in type 2 adapters (red and black) in a set	
751512	Conversion adapter	Banana male to binding post adapter	
758960	Synchronization operation cable	RJ11 6-pin, 1 m	

Due to the nature of this product, it is possible to touch its metal parts. Therefore, there is a risk of electric shock, so the product must be used with caution.

\*Wire diameter of cables that can connect to the adapter  
758923 Core wire diameter: 2.5 mm or less, covering diameter: 5.0 mm or less  
758931 Core wire diameter: 1.8 mm or less, covering diameter: 3.9 mm or less

### NOTICE

- Before operating the product, read the user's manual thoroughly for proper and safe operation.

■ Any company's names and product names mentioned in this document are trade names, trademarks or registered trademarks of their respective companies.

### Yokogawa's Approach to Preserving the Global Environment

- Yokogawa's electrical products are developed and produced in facilities that have received ISO14001 approval.
- In order to protect the global environment, Yokogawa's electrical products are designed in accordance with Yokogawa's Environmentally Friendly Product Design Guidelines and Product Design Assessment Criteria.

This is a Class A instrument based on Emission standards EN61326-1 and EN55011, and is designed for an industrial environment.  
Operation of this equipment in a residential area may cause radio interference, in which case users will be responsible for any interference which they cause.

# YOKOGAWA

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

YMI-KS-MI-SE07

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