Generation Section

■ DC voltage generation

Range	Generation Range	Resolution	Max. Load Current	Accuracy (One Year) ±(% of setting + V + V*Io/f.s of the limiter range)	Temperature Coefficient ±(% of setting + V + V*Io/f.s of the limiter range)/°C
200 mV	±205.000 mV	1 µV	±3.2 A	0.02 + 200 µV + 80 µV (400 µV)	0.002 + 20 µV + 8 µV (40 µV)
2 V	±2.05000 V	10 µV	±3.2 A	0.02 + 300 µV + 100 µV (500 µV)	0.002 + 30 µV + 10 µV (50 µV)
12 V	±12.0000 V	100 µV	±3.2 A	0.02 + 2 mV + 800 µV (3 mV)	0.002 + 200 µV + 80 µV (300 µV)
20 V	±20.5000 V	100 µV	±2 A	0.02 + 2 mV + 800 µV (5 mV)	0.002 + 200 µV + 80 µV (500 µV)
30 V	±30.000 V	1 mV	±2 A	0.02 + 20 mV + 5 mV (30 mV)	0.002 + 2 mV + 500 µV (3 mV)
60 V	±60.000 V	1 mV	±1 A	0.02 + 20 mV + 6 mV (40 mV)	0.002 + 2 mV + 600 µV (4 mV)
110 V	±110.000 V	1 mV	±0.5 A	0.02 + 20 mV + 8 mV (70 mV)	0.002 + 2 mV + 800 µV (7 mV)

The values inside the parentheses are those when the limiter range is 3 A.

■ DC current generation

Range	Max. Output	Resolution	Max. Load Voltage	Accuracy (One Year) ±(% of setting + A)	Temperature Coefficient ±(% of setting + A)/°C
20 µA	±20.5000 µA	100 pA	±110 V	0.03 + 50 nA	0.003 + 5 nA
200 µA	±205.000 µA	1 nA	±110 V	0.03 + 300 nA	0.003 + 30 nA
2 mA	±2.05000 mA	10 nA	±110 V	0.03 + 3 µA	0.003 + 300 nA
20 mA	±20.5000 mA	100 nA	±110 V	0.03 + 30 µA	0.003 + 3 µA
200 mA	±205.000 mA	1 µA	±110 V	0.03 + 300 µA	0.003 + 30 µA
0.5 A	±0.50000 A	10 µA	±110 V	0.03 + 5 mA	0.003 + 500 µA
1 A	±1.00000 A	10 µA	±60 V	0.03 + 5 mA	0.003 + 500 µA
2 A	±2.00000 A	10 µA	±30 V	0.03 + 5 mA	0.003 + 500 µA
3 A	±3.20000 A	10 µA	±12 V	0.03 + 5 mA	0.003 + 500 µA

Accuracy: One year accuracy at 23±5 °C
Temperature coefficient: Add the temperature coefficient at 5 to 18 °C and 28 to 40 °C.

■ Current limiter

|Setting|*1	Range	Resolution	Min. Setting
0.10 µA ~ 20.000 µA	20 µA	10 nA	10 nA
20.1 µA ~ 200.0 µA	200 µA	100 nA	100 nA
0.201 mA ~ 2.000 mA	2mA	1 µA	1 µA
2.01 mA ~ 20.00 mA	20mA	10 µA	10 µA
20.1 mA ~ 200.0 mA	200mA	100 µA	100 µA
0.201 A ~ 3.20 A	3.2A	1 mA	1 mA

*1 Larger of the two values |Hi| and |Lo| when |Hi limiter| ≠ |Lo limiter|

■ Voltage limiter

|Setting|*1	Range	Resolution	Min. Setting
1.0 mV ~ 200.0 mV	200 mV	100 µV	100 µV
0.201 V ~ 2.000 V	2 V	1 mV	1 mV
2.01 V ~ 20.00 V	20 V	10 mV	10 mV
20.1 V ~ 110.0 V	110 V	100 mV	100 mV

■ Transient response time (Typical)

Voltage generation

100 µs:Time to reach ±0.1% of final value *1

at 20 V range with the generation and limiter settings at maximum values and under the 25% pure resistive load

*1: In condition of zero voltage base pulse mode, measure delay time to reach ±0.1% of final value
Integration time 250 µs

Current generation

400 µs:Time to reach ±1% of final value *2

at 20 mA range with the generation and limiter settings at maximum values and under the pure resistive load

*2: In condition of zero current base pulse mode, measure delay time to reach ±1% of final value
Integration time 250 µs

■ Output Noise (Typical)

8 mVp-p (DC to 20 MHz)
(with generation at 2 V range and limiter at 1 A range)

Measurement Section

DC Voltage measurement

Range	Integration time 16.6ms/20ms,100ms,200ms				Integration time 4ms,1ms,250 µs			
	Measurement Range	Resolution	Accuracy (One Year) ±(% of reading + V)	Temperature Coefficient ±(% of reading + V) / °C	Measurement Range	Resolution	Accuracy (One Year) ±(% of reading + V)	Temperature Coefficient ±(% of reading + V) / °C
200 mV	±205.000 mV	1 µV	0.02 + 100 µV	0.002 + 10 µV	±205.00 mV	10 µV	0.02 + 200 µV (300 µV)	0.002 + 20 µV (30 µV)
2V	±2.05000 V	10 µV	0.02 + 200 µV	0.002 + 20 µV	±2.0500 V	100 µV	0.02 + 300 µV (500 µV)	0.002 + 30 µV (50 µV)
20 V	±20.5000 V	100 µV	0.02 + 1 mV	0.002 + 100 µV	±20.500 V	1 mV	0.02 + 3 mV (5 mV)	0.002 + 300 µV (500 µV)
110 V	±110.000 V	1 mV	0.02 + 10 mV	0.002 + 1 mV	±110.00 V	10 mV	0.02 + 30 mV (50 mV)	0.002 + 3 mV (5 mV)

DC Current measurement

Range	Integration time 16.6ms/20ms,100ms,200ms				Integration time 4ms,1ms, 250 µs			
	Measurement Range	Resolution	Accuracy (One Year) ±(% of reading + A)	Temperature Coefficient ±(% of reading + A) / °C	Measurement Range	Resolution	Accuracy (One Year) ±(% of reading + A)	Temperature Coefficient ±(% of reading + A) / °C
20 µA	±20.5000 µA	100 pA	0.03 + 50 nA	0.003 + 5 nA	±20.500 µA	1 nA	0.03 + 70 nA (80 nA)	0.003 + 7 nA (8 nA)
200 µA	±205.000 µA	1 nA	0.03 + 300 nA	0.003 + 30 nA	±205.00 µA	10 nA	0.03 + 350 nA (400 nA)	0.003 + 35 nA (40 nA)
2 mA	±2.05000 mA	10 nA	0.03 + 3 µA	0.003 + 300 nA	±2.0500 mA	100 nA	0.03 + 3.5 µA (4 µA)	0.003 + 350 nA (400 nA)
20 mA	±20.5000 mA	100 nA	0.03 + 30 µA	0.003 + 3 µA	±20.500 mA	1 µA	0.03 + 35 µA (40 µA)	0.003 + 3.5 µA (4 µA)
200 mA	±205.000 mA	1 µA	0.03 + 300 µA	0.003 + 30 µA	±205.00 mA	10 µA	0.03 + 350 µA (400 µA)	0.003 + 35 µA (40 µA)
3 A	±3.20000 A	10 µA	0.03 + 5 mA	0.003 + 500 µA	±3.2000 A	100 µA	0.03 + 5.5 mA (6 mA)	0.003 + 550 µA (600 µA)

Accuracy: One year accuracy at 23±5 °C Auto zero ON.
Temperature coefficient: Add the temperature coefficient at 5 to 18 °C and 28 to 40 °C.
Values inside the parentheses are those when the integration time is 1 ms or 250 µs.

Function

■Generation

Generation function: Voltage or current
Generation mode: DC or pulse
Sweep mode: Linear, logarithmic, or program (up to 65535 steps)

■Measurement

Measurement function: Voltage, current, and resistance
Measurement data storage: Up to 65535 data points
Average: Block average or moving average
(Specified count: 2 to 256)

■Trigger

Trigger mode: Internal, external, and immediate

■Time setting

Pulse width:	100 µs to 3600 s	1 µs resolution
Period time:	1 ms to 3600 s (during source and measure operation)	1 µs resolution
	100 µs to 3600 s (during source-only operation)	1 µs resolution
Source delay:	1 µs to 3600 s	1 µs resolution
Measurement delay:	1 µs to 3600 s	1 µs resolution
Integration time:	250 µs, 1 ms, 4 ms, 16.6 ms/20 ms,100 ms, 200 ms (auto detect from the power supply frequency when the power is turned ON for 16.6 ms/20 ms)	

■Computation function

Operators: +[addition], -[subtraction], *[multiplication], / [division], and ^ [exponentiation]
Functions: ABS(), EXP(), LN(), LOG(), SQRT(), SIN(), COS(), TAN(), ASIN(), ACOS(), ATAN(), SINH(), COSH(), TANH(), RAND()

■Resistance calculation

Calculated from measured voltage/generated current or generated voltage/ measured current.

External Input/Output

Synchronization signal input/output section (TRIG/SWEEP/CTRL IN and OUT)

Connector type: BNC connector
I/O level: TTL
I/O logic format: Negative logic, falling edge
Minimum pulse width: 10 µs or greater

External input/output section

Connector type: D-Sub 15-pin
I/O level: TTL
I/O logic format: Negative logic, falling edge
Minimum pulse width: 10 µs or greater

GP-IB interface

Electrical and mechanical specifications: Conforms to IEEE St'd 488-1978
Functional specifications: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
Protocol: Conforms to IEEE St'd 488.2-1992
Address: 0 to 30

RS-232 interface

Connector type: D-Sub 9-pin
Electrical specifications: Conforms to EIA RS-232
Connection format: Point-to-point
Transmission mode: Full-duplex
Synchronization mode: Start-stop synchronization
Baud rate 9600, 14400, 19200, 38400, 57600, or 115200 bps

USB interface

Number of ports: 1
Connector type: Type B connector (receptacle)
Electrical and mechanical specifications: Conforms to USB Rev. 1.1

Ethernet interface (optional)

Number of communication ports: 1
Connector type: RJ-45 connector
Electrical and mechanical specifications: Conforms to IEEE 802.3.
Transmission system: 100BASE-TX/10BASE-T
Data rate: 100 Mbps/10 Mbps

General Specifications

Display: 256 x 64 dots vacuum fluorescent display
Internal memory:
ROM: 4MB Area for storing setup and output pattern files
RAM: 4MB Area for storing the measured results (cleared when the power is turned OFF)
Warm-up time: At least 60 minutes
Operating conditions: 5 to 40 °C, 20 to 80% RH
Rated supply voltage:
100 to 120 VAC or 220 to 240 VAC (automatic switching)
Rated supply frequency: 50/60 Hz
Maximum power consumption: Approx. 200 VA
Max. common-mode voltage: ±250 Vpeak between the generation (measurement) terminal and case
Max. Output/ input voltage: 110 V between High and Low terminal. 1 V between Output and Sense terminal.
Weight: Approx. 7 kg
External dimensions: Approx. 213 (W) × 132 (H) × 400 (D) mm (excluding projections)