GSM-20H10

Source Measure Unit

FEATURES

- Maximum Output ±210V/±1.05A/22W
- Built-in 4 Sequence Output Modes (Stair, Log, SRC-MEM, Custom), up to 2500 Points
- OVP /OTP Protection Function
- 0.012% Basic Measure Accuracy with 6½-digit Resolution
- Variable Sampling Speed
- SDM (Source Delay Measure) Cycle
- 2-, 4-, and 6-wire Remote V-source and Measure Sensing
- Variable Display Digits
- Built-in Limit Function
- Built-in 5 Calculation Functions
- 4.3" TFT LCD, Digital Number Keyboard
- Built-in RTC Clock
- Interface: RS-232, USBTMC, LAN, GPIB (Optional)

GW INSTEK
Simply Reliable

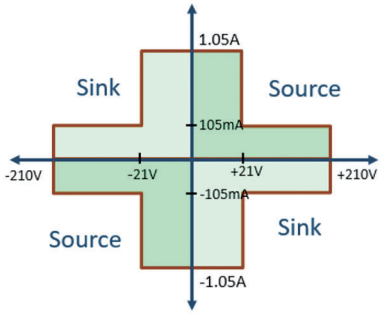
GW Instek GSM-20H10 is a Source Measure Unit that provides highly stable DC power and instrument-grade 6½-digit multimeter measurements. While operating, it can be used as a voltage source, current source, voltmeter, ammeter, and ohmmeter, which is uniquely ideal for the evaluation of component characteristics and the test applications of production, including nanomaterials and components, semiconductor architecture, organic materials, high-efficiency illumination, passive components and material characteristics analysis, etc.

GSM-20H10 provides four-quadrant operation of ±210V/±1.05A/22W. The first and third quadrants operate as power supplies to supply power to the load. The second and fourth quadrants function as loads to consume power internally. Voltage value, current value and resistance value can be measured while operating the power supply or load function with an accuracy of 0.012% and a resolution of 1μV/10pA/10μΩ.

With respect to sampling rate, GSM-20H10 supports a sampling rate of up to 50k points/second, which can accurately analyze the characteristics of the DUT. With the large 4.3-inch screen, all measurement settings, parameters and results can be completely displayed on the screen. The SDM (Source Delay Measure) function is provided to delay sampling when the signal changes so as to prevent the unstable signal from being captured and cause misjudgment. There are four built-in sequence output modes (Stair, Log, SRC-MEM, Custom), which can support up to 2500 points of sequence variation output.

Pertaining to protection, GSM-20H10 provides OVP/OTP modes. The design of OVP allows users to self-define the range of OVP. OTP can effectively prevent errors caused by temperature drift during the test process. For interfaces, this product supports standard SCPI commands and provides RS-232, USBTMC, LAN, GPIB (optional) interfaces to meet users' different interface needs.

A. MAXIMUM OUTPUT: ±210V/±1.05A/22W

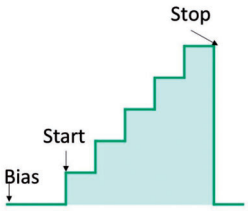


The power source output of the GSM-20H10 has two ranges.

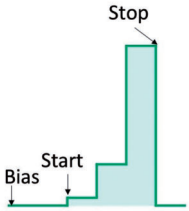
The voltage range is ±21 volts, and the current is ±1.05A.
The voltage range is ±210 volts, and the current range is ±105mA.
The power capacity is 22W.

Provide a full range of four-quadrant measurement without duty cycle limit.

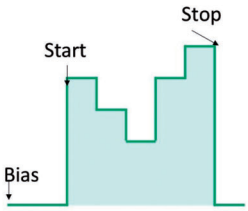
B. BUILT-IN 4 SEQUENCE OUTPUT MODES, UP TO 2500 POINTS



LINEAR STAIRCASE SWEEP



LOG STAIRCASE SWEEP

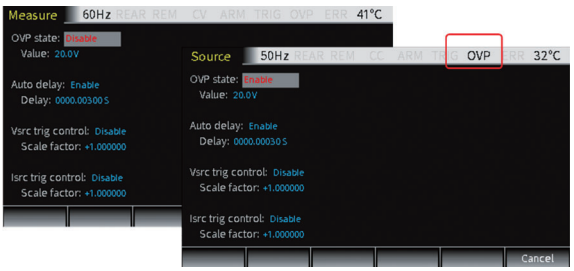


CUSTOM MODE

GSM-20H10 Source Measure Unit provides four sequence output modes: linear staircase, log staircase, SRC-MEM (source memory) and Custom(self-defined).

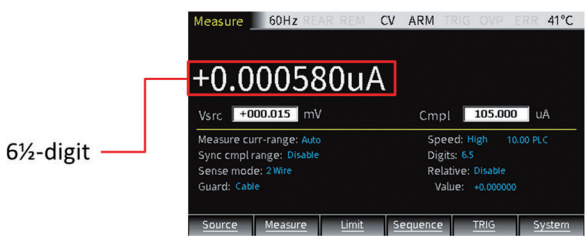
With these output modes, users can quickly generate output as needed. The total number of sequence points is 2,500.

C. OVP /OTP PROTECTION FUNCTION



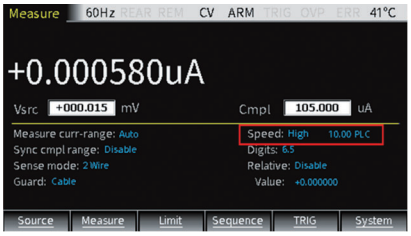
In terms of protection, GSM-20H10 provides OVP/OTP protection modes; in the design of OVP, users can define the range of OVP, and the protection of OTP can effectively prevent errors caused by temperature drift during the test process.

D. 0.012% BASIC MEASURE ACCURACY WITH 6½DIGIT RESOLUTION



GSM-20H10 provides a measurement accuracy of up to 0.012%, and provides a meter display function of up to 6½ digits, allowing users to have more accurate results when measuring small signals...

E. VARIABLE SAMPLING SPEED

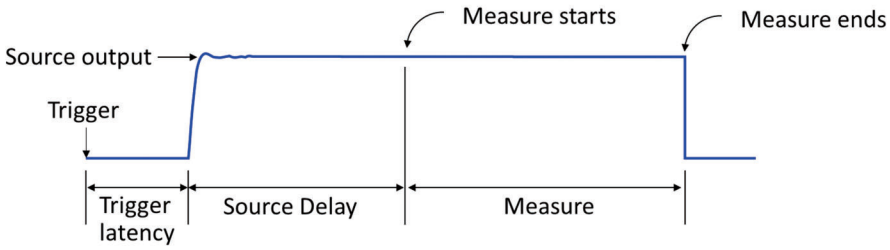


SAMPLING MODE	FAST	MEDIUM	NORMAL	HIGH	OTHER
Speed, NPLC	0.01	0.1	1	10	User defined
Digit	3½	4½	5½	6½	Selectable

The sampling rate of GSM-20H10 is variable. Therefore, users can choose the sampling rate from 0.01 PLC to 10 PLC according to their needs.

Where NPLC represents the number of power line cycles, for example, AC power frequency is 50Hz, 1 PLC means 20ms, 2 PLC means 40ms, and so on.

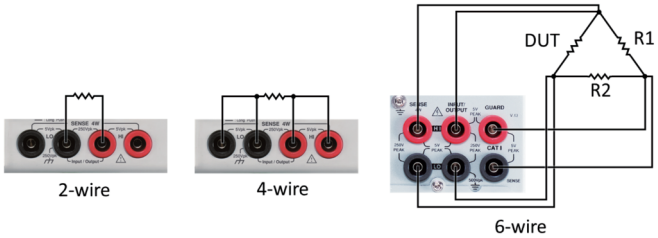
F. SDM (SOURCE DELAY MEASURE) CYCLE



The initial state of the source output may be unstable. If the meter starts measuring after the source is output, users can set the source delay to start the meter measurement after passing the unstable period so as to obtain stable measurement results.

GSM-20H10 Source Measure Unit delay range is 0 to 9999.999 seconds.

G. 2-, 4-, AND 6-WIRE REMOTE V-SOURCE AND MEASURE SENSING

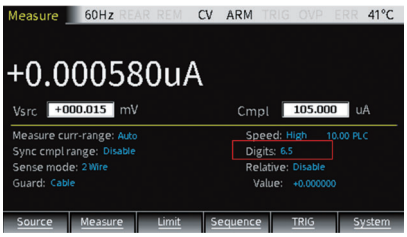


Other than 2-wire, GSM-20H10 also provides 4-wire and 6-wire resistance measurements.

4-wire measurement eliminates the effect of lead resistance, realizing accurate measurement of small resistances below 100ohm at high currents.

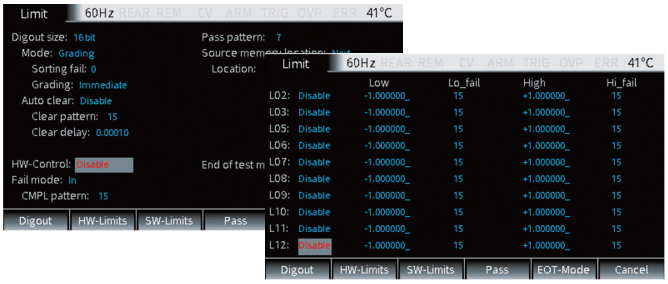
6-wire combining 4-wire connection and the protection of ohm characteristics eliminate the effects of internal parallel resistance, realizing the resistance measurement of a tiny wire.

H. VARIABLE DISPLAY DIGITS



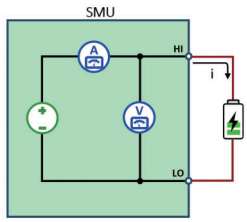
The display bits of GSM-20H10 are variable. Therefore, users can choose the number of display bits among 3.5, 4.5, 5.5, and 6.5 bits according to their needs.

I. BUILT-IN LIMIT FUNCTION

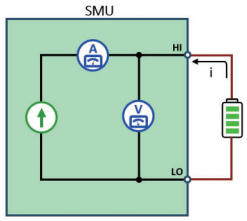


GSM-20H10 has three built-in Pass/Fail limit line tests with a total of 11 sets.

J. BATTERY CHARGING/DISCHARGING TEST



Battery Charging Test

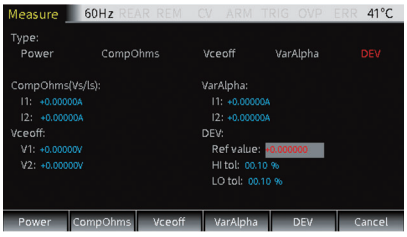


Battery Discharging Test

During charging, the GSM-20H10 acts as a source with voltage higher than the battery, causing current to flow from the SMU to the battery. During discharging, it acts as a load with voltage lower than the battery, so current flows from the battery to the SMU.

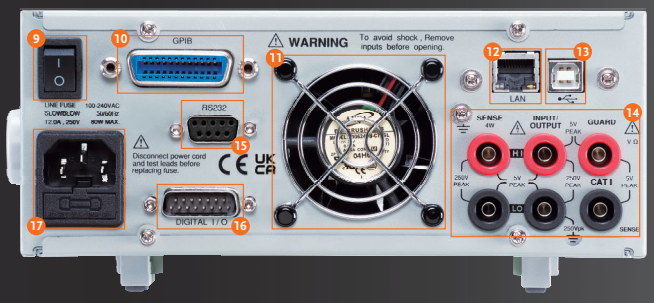
K. BUILT-IN 5 CALCULATION FUNCTIONS

- Power = V∗I
- CompOhms $= \frac{(V2-V1)}{(I2-I1)}$
- Vceoff(%) $= \left[\frac{\Delta R}{\{R2*\Delta V\}}\right] * 100\%$
- VarAlpha , $\alpha = \frac{log(I2 \div I1)}{log(v2 \div V1)}$
- Dev $= \left[\frac{(X-Y)}{Y}\right] * 100\%$



GSM-20H10 provides five built-in calculation functions: Power, Offset Compensation Ohms, Voltage Coefficient, Varistor Alpha, and Percent Deviation.

PANEL INTRODUCTION



CE | RS-232 | USB Host | USB Device | LAN | Digit I/O | GPIB

1. LCD Display
2. USB Host
3. Number Pad/ Secondary Function Key
4. Power On/Off Button
5. Direction Keys And Enter Key
6. Function Key
7. Front Panel Input/Output Terminals
8. Auxiliary Function Key
9. AC Power Switch
10. GPIB Port (Option)
11. Heat Sink Fan
12. LAN
13. USB Device
14. Real Panel Inputs/Outputs
15. RS-232
16. Digital I/O
17. AC Power Socket and Fuse

SPECIFICATIONS

MAXIMUM RANGE

Voltage	± 210 V
Current	± 1.05 A
Power	22 W
Voltage Resolution	1 µV
Current Resolution	10 pA

SOURCE

DC Voltage	**Output Voltage**	± 21 V / ± 1.05 A, ± 210 V / ± 105 mA
	Current Limit	Min. 0.1 % of range
	Programming Resolution & Accuracy *1	

Range	Resolution	Accuracy
± 200.000 mV	1 µV	± (0.02 % + 600 µV)
± 2.00000 V	10 µV	± (0.02 % + 600 µV)
± 20.0000 V	100 µV	± (0.02 % + 2.4 mV)
± 200.000 V	1 mV	± (0.02 % + 24 mV)

	Load Regulation	0.01 % of range + 100 µV
	Line Regulation	0.01 % of range
	Overshoot	< 0.1 % typical (full scale step, resistive load, 10 mA range)
	Recovery Time (1000% Load Change)	< 250 µs (within 0.1 % plus load regulation errors, 1 A and 100 mA compliance.)
	Ripple and Noise	4 mVrms (20 Hz to 1 MHz) / 10 mVpp (20 Hz to 1 MHz)
	Temperature Coefficient	± (0.15 × accuracy specification)/ °C (0 °C to 18 °C & 28 °C to 50 °C)
DC Current	**Output Current**	± 1.05 A / ± 21 V, ± 105 mA / ± 210 V
	Voltage Limit	Min. 0.1 % of range
	Programmed Source Resolution & Accuracy	

Range	Resolution	Accuracy
± 1.00000 µA	10 pA	± (0.035 % + 600 pA)
± 10.0000 µA	100 pA	± (0.033 % + 2 nA)
± 100.000 µA	1 nA	± (0.031 % + 20 nA)
± 1.00000 mA	10 nA	± (0.034 % + 200 nA)
± 10.0000 mA	100 nA	± (0.045 % + 2 µA)
± 100.000 mA	1 µA	± (0.066 % + 20 µA)
± 1.00000 A	10 µA	± (0.27 % + 900 µA)

	Load Regulation	0.01 % of range + 100 pA
	Line Regulation	0.01 % of range
	Overshoot	< 0.1 % typical (1 mA step, RL = 10 kΩ, 20 V range).
	Temperature Coefficient	± (0.15 × accuracy specification)/ °C (0 °C to 18 °C & 28 °C to 50 °C)
General	**Output Settling Time *1**	100 µs typical time
	Output Rise Time (± 30 %)	300 µs, 200 V range, 100 mA compliance ; 150 V/µs, 20 V range, 100 mA compliance.
	DC Floating Voltage	Output can be floated up to ± 250 VDC
	Remote Sense	Up to 1 V drop per load lead.
	Compliance Accuracy	Add 0.3 % of range and ± 0.02 % of reading to base specification.
	Range Change Overshoot *2	Adjacent range changes between 200 mV, 2 V and 20 V ranges, 100 mV typical.
	Minimum Compliance Value	0.1 % of range
	Command Processing Time *3	Autorange On:10 ms. Autorange Off: 7 ms.

MEASUREMENT

Voltage	**Input Resistance**	>10 GΩ
	Measurement Resolution & Accuracy	

Range	Resolution	Accuracy
± 200.000 mV	1 µV	± (0.012 % + 300 µV)
± 2.00000 V	10 µV	± (0.012 % + 300 µV)
± 20.0000 V	100 µV	± (0.015 % + 1.5 mV)
± 200.000 V	1 mV	± (0.015 % + 10 mV)

	Temperature Coefficient	± (0.15 × accuracy specification)/ °C (0 °C to 18 °C & 28 °C to 50 °C)
Current	**Voltage Burden (4-wire Mode)**	< 1 mV
	Programmed Source Resolution & Accuracy *4	

Range	Resolution	Accuracy
± 1.00000 µA	10 pA	± (0.029 % + 300 pA)
± 10.0000 µA	100 pA	± (0.027 % + 700 pA)
± 100.000 µA	1 nA	± (0.025 % + 6 nA)
± 1.00000 mA	10 nA	± (0.027 % + 60 nA)
± 10.0000 mA	100 nA	± (0.035 % + 600 nA)
± 100.000 mA	1 µA	± (0.055 % + 6 µA)
± 1.00000 A	10 µA	± (0.22 % + 570 µA)

	Temperature Coefficient	± (0.15 × accuracy specification)/ °C (0 °C to 18 °C & 28 °C to 50 °C)
Resistance	**Range**	

Range	Resolution	Test current	Accuracy	
< 2.00000 Ω	---	---	Source IACC+Meas.VACC	
2.00000 Ω	10 µΩ	---	Source IACC+Meas.VACC	
20.0000 Ω	100 µΩ	100 mA	± (0.1 % + 0.003 Ω), Normal	± (0.07 % + 0.001 Ω), Enhanced *5
200.000 Ω	1 mΩ	10 mA	± (0.08 % + 0.03 Ω), Normal	± (0.05 % + 0.01 Ω), Enhanced
2.00000 kΩ	10 mΩ	1 mA	± (0.07 % + 0.3 Ω), Normal	± (0.05 % + 0.1 Ω), Enhanced
20.0000 kΩ	100 mΩ	100 µA	± (0.06 % + 3 Ω), Normal	± (0.04 % + 1 Ω), Enhanced
200.000 kΩ	1 Ω	10 µA	± (0.07 % + 30 Ω), Normal	± (0.05 % + 10 Ω), Enhanced
2.00000 MΩ	10 Ω	5 µA	± (0.11 % + 300 Ω), Normal	± (0.05 % + 100 Ω), Enhanced
20.0000 MΩ	100 Ω	0.5 µA	± (0.11 % + 1 kΩ), Normal	± (0.05 % + 500 Ω), Enhanced
200.000 MΩ	1 kΩ	100 nA	± (0.66 % + 10 kΩ), Normal	± (0.35 % + 5 kΩ), Enhanced
> 200.000 MΩ	---	---	Source IACC+Meas.VACC	

	Temperature Coefficient	± (0.15 × accuracy specification)/ °C (0 °C to 18 °C & 28 °C to 50 °C)
	Source I Mode, Manual OHMS	Total uncertainty = I source accuracy + V measure accuracy (4-wire remote sense).
	Source V Mode, Manual OHMS	Total uncertainty = V source accuracy + I measure accuracy (4-wire remote sense).
	6-wire OHMS Mode	Available using active ohms guard and guard sense. Max. Guard Output Current: 50 mA (except 1 A range). Accuracy is load dependent.
	Guard Output Impedance	< 0.1 Ω in ohms mode

SPECIFICATIONS

SYSTEM SPEED *6

Maximum Measure Auto Range Time		40 ms (fixed source) *7					
Sequence Reading Rates (rdg./second) for 60 Hz (50 Hz) *8	Speed	Fast	488.2	Medium	488.2	Normal	488.2
	NPLC/ Trig Origin	0.01 / internal	0.01 / external	0.1 / internal	0.1 / external	1 / internal	1 / external
Measure	TO MEMORY	2081 (2030)	1239 (1200)	510 (433)	438 (380)	59 (49)	57 (48)
	TO GPIB	1198 (1210)	1079 (1050)	509 (433)	438 (380)	59 (49)	57 (48)
Source-Measure *10	TO MEMORY	1551 (1515)	1018 (990)	470 (405)	409 (360)	58 (48)	57 (48)
	TO GPIB	1000 (900)	916 (835)	470 (410)	409 (365)	58 (48)	57 (47)
Source-Measure Pass/Fail test *9, *10	TO MEMORY	902 (900)	830 (830)	389 (343)	374 (333)	56 (47)	56 (47)
	TO GPIB	809 (840)	756 (780)	388 (343)	374 (333)	56 (47)	56 (47)
Measure Memory *9, *10	TO MEMORY	165 (162)	163 (160)	133 (126)	131 (125)	44 (38)	44 (38)
	TO GPIB	164 (162)	162 (160)	132 (126)	131 (125)	44 (38)	44 (38)

Single Reading Operation Rates (rdg./second) for 60 Hz (50 Hz)	Speed	488.2	488.2	488.2
	NPLC/ Trig Origin	0.01 / external	0.1 / external	1 / external
Measure	TO GPIB	256 (256)	167 (166)	49 (42)
Source-Measure	TO GPIB *10	79 (83)	72 (70)	34 (31)
Source-Measure Pass/Fail Test *9, *10	TO GPIB	79 (83)	69 (70)	35 (30)

Component Interface Handler Time for 60 Hz (50 Hz): *9, *11	Speed	Fast	Medium	Normal
	NPLC/ Trig Origin	0.01 / internal	0.1 / internal	1 / internal
Measure	TO GPIB	1.04 ms (1.08 ms)	2.55 ms (2.9 ms)	17.53 ms (20.9 ms)
Source Pass/Fail Test	TO GPIB	0.5 ms (0.5 ms)	0.5 ms (0.5 ms)	0.5 ms (0.5 ms)
Source-Measure Pass/Fail Test *10, *12	TO GPIB	4.82 ms (5.3 ms)	6.27 ms (7.1 ms)	21.31 ms (25.0 ms)

GENERAL SPECIFICATIONS

System General	Load Impedance	Stable into 20,000 pF typical
	Differential Mode Voltage	250 VPk
	Common Mode Voltage	250 VDC
	Common Mode Isolation	> 10 GΩ, < 1000 pF
	Over Range	105 % of range, source and measure.
	Max. Voltage Drop	5 V
	Max. Sense Lead Resistance	1 MΩ
	Sense Input Impedance	> 100 GΩ
	Guard Offset Voltage	< 150 µV, typical
	Source Output Modes	Fixed DC level, Memory List (mixed function), Stair (linear and log)
	Source Memory List	100 points max.
	Memory Buffer	5,000 readings @ 5 digits (two 2,500 point buffers). Includes selected measured value(s) and time stamp. Lithium battery backup(3 yr+ battery life).
	Power on Settings	5 user-definable power-up states plus factory default and *RST.
	Digital I/O Connector	Active low input. Start of test, end of test, 3 category bits. ; +5V@ 300 mA supply. ; 1 trigger input, 4 TTL/Relay Drive outputs (33V @ 500 mA, diode)
	Remote Interface	USB, GPIB, LAN, RS-232
Insulation		Chassis and terminal: 20 MΩ or above (DC 500V); Chassis and AC cord: 30 MΩ or above (DC 500V)
Operation Environment		Indoor use, Altitude: ≤ 2000 m Ambient temperature: 0 °C to 40 °C Relative humidity: ≤ 80 %; Installation category: II, Pollution degree: 2
Storage Environment		Temperature: -20 °C to 70 °C; Humidity: < 80 %
Input Power		AC 100 V to AC 240 V, 50 Hz or 60 Hz
Power Consumption		80 W
Dimensions & Weight		214 mm x 86 mm x 356.5 mm (W x H x D), Approx. 4.8 kg

Specifications subject to change without notice. GSM-20H10_E_BH2

NOTE:
1. Required to reach 0.1 % of final value after Command is processed. Resistive load. 10 µA to 100 mA range.
2. Overshoot into a fully resistive 100 kΩ load, 10 Hz to 1 MHz BW, adjacent ranges: 100 mV typical, except 20 V / 200 V.
3. Maximum time required for the output to begin to change following the receipt of : SOURce : VOLTage | CURRent <nrf> Command
4. Speed = Normal (1 PLC). For 0.1 PLC, add 0.005 % of range to offset specifications, except 200 mV, 1 A ranges, add 0.05 %. For 0.01 PLC, add 0.05 % of range to offset specifications, except 200 mV, 1 A ranges, add 0.5 %.
5. Enhanced mode is Source readback ON, offset compensation ON, add system noise but don't include offsets.
6. Reading rates applicable for voltage or current measurements, autorange off, filter off, display off, trigger delay = 0, and binary reading forma.
7. Purely resistive lead. 1 µA and 10 µA ranges < 65 ms.
8. 1000 point sweep was characterized with the source on a fixed rang.
9. Pass/Fail test performed using one high limit and one low math limit.
10. Includes time to re-program source to a new level before making measurement.
11. Time from falling edge of START OF TEST signal to falling edge of END OF TEST signal.
12. Command processing time of : SOURce : VOLTage | CURRent : TRIGgered <nrf> Command not included.

SM-01/SM-02 Digital I/O Adapter

ORDERING INFORMATION

GSM-20H10 (GPIB)	Precision Source Measure Unit with GPIB
GSM-20H10	Precision Source Measure Unit

ACCESSORIES

Power Cord x 1, GTL-207A Test Lead x 1, Alligator Clip x 2

OPTIONAL ACCESSORIES

SM-01	Digital I/O Adapter, Convert DB15 to DB9 + 8-pin micro-DIN	**GTL-248**	GPIB Cable (25 pin Micro-D Connector)
SM-02	Digital I/O Adapter, Convert DB15 to DB37 + 8-pin micro-DIN	**GRA-450-J**	Rack Mount Kit for JIS type
GTL-207A	Test Lead, Banana to Probe Test Lead, 800 mm	**GRA-450-E**	Rack Mount Kit for EIA type
GTL-246	USB Cable (USB 2.0 A-B Type, approx. 1200 mm)		

FREE DOWNLOAD

PC Software, LabVIEW Driver

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