



# GSM-20H10

## Source Measure Unit

### FEATURES

- Maximum Output  $\pm 210V/\pm 1.05A/22W$
- 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  $6\frac{1}{2}$ -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

# Streamline Your Characteristic Analysis

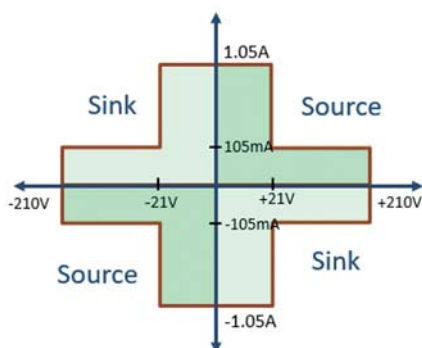
GW Instek GSM-20H10 is a Source Measure Unit that provides highly stable DC power and instrument-grade 6½-digit multimeter measurements. While operating, it can be used as a voltage source, current source, voltmeter, ammeter, and ohmmeter, which is uniquely ideal for the evaluation of component characteristics 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  $\pm 210\text{V}/\pm 1.05\text{A}/22\text{W}$ . 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  $1\mu\text{V}/10\text{pA}/10\mu\Omega$ .

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: $\pm 210\text{V}/\pm 1.05\text{A}/22\text{W}$

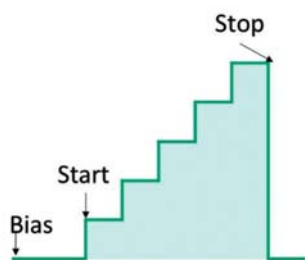


The power source output of the GSM-20H10 has two ranges.

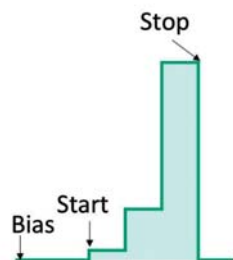
The voltage range is  $\pm 21$  volts, and the current is  $\pm 1.05\text{A}$ .  
The voltage range is  $\pm 210$  volts, and the current range is  $\pm 105\text{mA}$ .  
The power capacity is 22W.

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

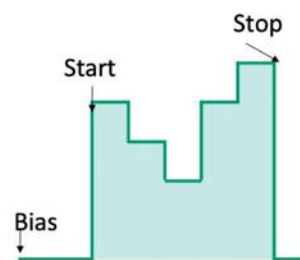
## B. BUILT-IN 4 SEQUENCE OUTPUT MODES, UP TO 2500 POINTS



LINEAR STAIRCASE SWEEP



LOG STAIRCASE SWEEP

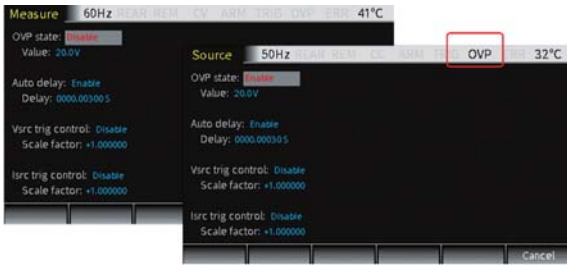


CUSTOM MODE

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

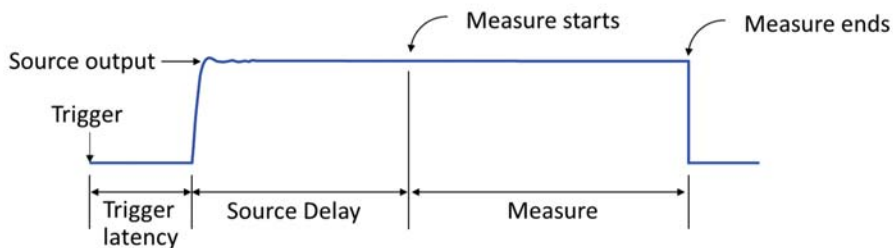


| SAMPLING MODE | FAST | MEDIUM | NORMAL | HIGH | OTHER        |
|---------------|------|--------|--------|------|--------------|
| Speed, NPLC   | 0.01 | 0.1    | 1      | 10   | User defined |
| Digit         | 3½   | 4½     | 5½     | 6½   | Selectable   |

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.

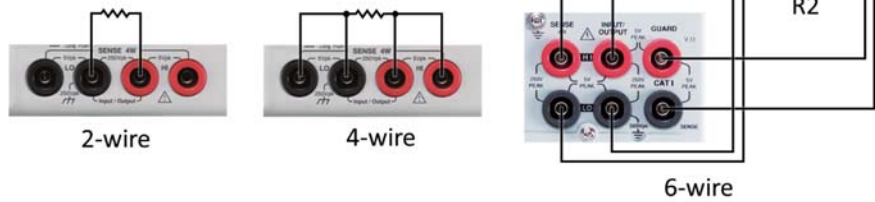
### F. SDM (SOURCE DELAY MEASURE) CYCLE



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 eliminates 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.

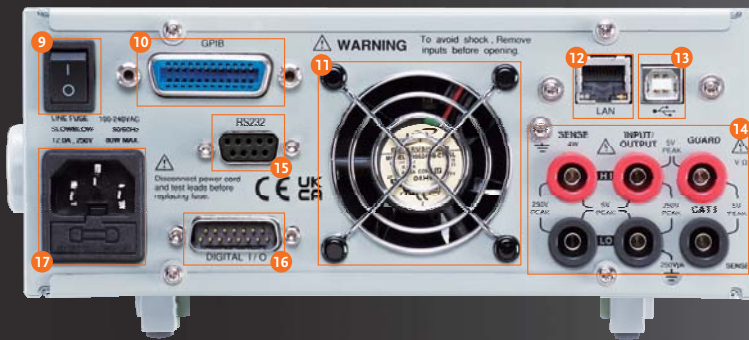
## J. BUILT-IN 5 CALCULATION FUNCTIONS

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



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

## PANEL INTRODUCTION



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   | ±210V   |                 |                |                |                 |                |                |
|                         | Current   | ±1.05A  |                 |                |                |                 |                |                |
|                         | Power   | 22W   |                 |                |                |                 |                |                |
|                         | Voltage Resolution  | 1µV   |                 |                |                |                 |                |                |
|                         | Current Resolution  | 10µA  |                 |                |                |                 |                |                |
| DC Voltage              | Output Voltage  | ±21V / ±1.05A, ±210V / ±105 mA  |                 |                |                |                 |                |                |
|                         | Current Limit   | Min. 0.1% of range  |                 |                |                |                 |                |                |
|                         | Programming Resolution & Accuracy *1                                    | Range   | ±200.000mV      | ±2.00000V      | ±20.0000V      | ±200.000V       | ±200.000V      | ±200.000V      |
|                         |   | Resolution  | 1µV             | 10µV           | 100µV          | 100µV           | 100µV          | 1mV            |
|                         |   | Accuracy  | ±(0.02%+600µV)  | ±(0.02%+600µV) | ±(0.02%+2.4mV) | ±(0.02%+2.4mV)  | ±(0.02%+2.4mV) | ±(0.02%+24mV)  |
|                         | Load Regulation   | 0.01% of range + 100µV  |                 |                |                |                 |                |                |
|                         | Line Regulation   | 0.01% of range  |                 |                |                |                 |                |                |
|                         | Overshoot   | <0.1% typical (full scale step, resistive load, 10mA range)               |                 |                |                |                 |                |                |
|                         | Recovery Time (1000% Load Change)                                       | <250µs (within 0.1% plus load regulation errors, 1A and 100mA compliance) |                 |                |                |                 |                |                |
|                         | Ripple and Noise  | 4mVrms(20Hz~1MHz) / 10mVpp(20Hz~1MHz)                                     |                 |                |                |                 |                |                |
| Temperature Coefficient | ±(0.15 × accuracy specification)/°C (0°~18°C & 28°~50°C)                |   |                 |                |                |                 |                |                |
| SOURCE                  | Output Current  | ±1.05A / ±21V, ±105 mA / ±210V  |                 |                |                |                 |                |                |
|                         | Voltage Limit   | Min. 0.1% of range  |                 |                |                |                 |                |                |
|                         | Programmed Source Resolution & Accuracy *1                              | Range   | ±1.00000µA      | ±10.0000µA     | ±100.000µA     | ±1.00000mA      | ±10.00000mA    | ±100.000mA     |
|                         |   | Resolution  | 10pA            | 100pA          | 1nA            | 10nA            | 100nA          | 1µA            |
|                         |   | Accuracy  | ±(0.035%+600pA) | ±(0.033%+2nA)  | ±(0.031%+20nA) | ±(0.034%+200nA) | ±(0.045%+2µA)  | ±(0.066%+20µA) |
|                         | Load Regulation   | 0.01% of range + 100pA  |                 |                |                |                 |                |                |
|                         | Line Regulation   | 0.01% of range  |                 |                |                |                 |                |                |
|                         | Overshoot   | <0.1% typical (1mA step, RL = 10kΩ, 20V range)                            |                 |                |                |                 |                |                |
|                         | Temperature Coefficient   | ±(0.15 × accuracy specification)/°C (0°~18°C & 28°~50°C)                  |                 |                |                |                 |                |                |
|                         | Output Settling Time *2   | 100µs typical time  |                 |                |                |                 |                |                |
| Output Rise Time (±30%) | 300µs, 200V range, 100mA compliance; 150µs, 20V range, 100mA compliance |   |                 |                |                |                 |                |                |
| DC Floating Voltage     | Output can be floated up to ±250VDC                                     |   |                 |                |                |                 |                |                |
| General                 | Remote Sense  | Up to 1V drop per load lead   |                 |                |                |                 |                |                |
|                         | Compliance Accuracy   | Add 0.3% of range and ±0.02% of reading to base specification             |                 |                |                |                 |                |                |
|                         | Range Change Overshoot *3   | Adjacent range changes between 200mV, 2V and 20V ranges, 100mV typical    |                 |                |                |                 |                |                |
|                         | Minimum Compliance Value  | 0.1% of range   |                 |                |                |                 |                |                |
|                         | Command Processing Time *4  | Autorange On: 10ms. Autorange Off: 7ms                                    |                 |                |                |                 |                |                |

**SPECIFICATIONS**

|                            |  |  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|----------------------------|--|--|-----------------------|-----------------------|-----------------------|------------------------|------------------------|---------------------------------------|---------------------|-------------------|-----------|
| MEASUREMENT                | Voltage  | Input Resistance   | >10 GΩ                |                       |                       |                        |                        |                                       |                     |                   |           |
|                            |  | Measurement Resolution & Accuracy  | Range                 | ±200.000mV            |                       | ±2.00000V              |                        | ±20.0000V                             |                     | ±200.000V         |           |
|                            |  |  | Resolution            | 1μV                   |                       | 10μV                   |                        | 100μV                                 |                     | 1mV               |           |
|                            | Accuracy   | ±(0.012%+300μV)  |                       | ±(0.012%+300μV)       |                       | ±(0.015%+1.5mV)        |                        | ±(0.015%+10mV)                        |                     |                   |           |
|                            | Temperature Coefficient  | ±(0.15 × accuracy specification) / °C (0°-18°C & 28°-50°C)   |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Current  | Voltage Burden (4-wire mode)   | < 1mV                 |                       |                       |                        |                        |                                       |                     |                   |           |
|                            |  | Programmed Source Resolution & Accuracy *1   | Range                 | ±1.00000μA            | ±10.0000μA            | ±100.000μA             | ±1.00000mA             | ±10.00000mA                           | ±100.000mA          | ±1.00000A         |           |
|                            |  |  | Resolution            | 10pA                  | 100pA                 | 1nA                    | 10nA                   | 100nA                                 | 1μA                 | 10μA              |           |
|                            | Accuracy   | ±(0.029%+300pA)  | ±(0.027%+700pA)       | ±(0.025%+6nA)         | ±(0.027%+60nA)        | ±(0.035%+600nA)        | ±(0.055%+6μA)          | ±(0.22%+570μA)                        |                     |                   |           |
|                            | Temperature Coefficient  | ±(0.1 × accuracy specification) / °C (0°-18°C & 28°-50°C)  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Resistance   | Range  | Resolution            | <2.00000Ω             | 2.00000Ω              | 20.0000Ω               | 200.000Ω               | 2.00000kΩ                             | 20.0000kΩ           |                   |           |
|                            |  |  | Test current          | ---                   | ---                   | 100μA                  | 10mA                   | 10mΩ                                  | 100mΩ               |                   |           |
|                            |  |  | Accuracy              | Source IACC+Meas.VACC | Source IACC+Meas.VACC | ±(0.1%+0.003Ω), Normal | ±(0.08%+0.03Ω), Normal | ±(0.07%+0.3Ω), Normal                 | ±(0.06%+3Ω), Normal |                   |           |
|                            |  |  | Resolution            | 200.000kΩ             | 2.00000MΩ             | 20.0000MΩ              | 200.000MΩ              | >200.000MΩ                            |                     |                   |           |
|                            |  |  | Test current          | 1Ω                    | 10Ω                   | 100Ω                   | 1kΩ                    | ---                                   |                     |                   |           |
| Accuracy                   |  | ±(0.07%+30Ω), Normal   | ±(0.11%+300Ω), Normal | ±(0.11%+1kΩ), Normal  | ±(0.66%+10kΩ), Normal | Source IACC+Meas.VACC  |                        |                                       |                     |                   |           |
| Temperature Coefficient    |  | ±(0.15 × accuracy specification) / °C (0°-18°C & 28°-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: 50mA (except 1A range). Accuracy is load dependent                     |                       |                       |                       |                        |                        |                                       |                     |                   |           |
| Guard Output Impedance     | <0.1Ω in ohms mode   |  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
| SYSTEM SPEED *5            | Maximum Range Change Rate  | 75/second  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Maximum Measure Auto Range Time  | 40ms (fixed source) *6   |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Sequence Reading Rates *7 (rdg./second) for 60Hz (50Hz)  | Speed  | NPLC / Trig Origin    | Measure               |                       | Source-Measure *9      |                        | Source-Measure Pass/Fail test *8, *9  |                     | Measure Memory *9 |           |
|                            |  | Fast   | 0.01 / internal       | 2081 (2030)           | 1198 (1210)           | 1551 (1515)            | 1000 (900)             | 902 (900)                             | 809 (840)           | 165 (162)         | 164 (162) |
|                            |  | 488.2  | 0.01 / external       | 1239 (1200)           | 1079 (1050)           | 1018 (990)             | 916 (835)              | 830 (830)                             | 756 (780)           | 163 (160)         | 162 (160) |
|                            |  | Medium   | 0.1 / internal        | 510 (433)             | 509 (433)             | 470 (405)              | 470 (410)              | 389 (343)                             | 388 (343)           | 133 (126)         | 132 (126) |
|                            |  | 488.2  | 0.1 / external        | 438 (380)             | 438 (380)             | 409 (360)              | 409 (365)              | 374 (333)                             | 374 (333)           | 131 (125)         | 131 (125) |
|                            | Normal   | 1 / internal   | 59 (49)               | 59 (49)               | 58 (48)               | 58 (48)                | 56 (47)                | 56 (47)                               | 44 (38)             | 44 (38)           |           |
|                            | 488.2  | 1 / external   | 57 (48)               | 57 (48)               | 57 (48)               | 57 (47)                | 56 (47)                | 56 (47)                               | 44 (38)             | 44 (38)           |           |
|                            | Single Reading Operation Rates (rdg./second) for 60Hz (50Hz)   | Speed  | NPLC / Trig Origin    | Measure               |                       | Source-Measure *9      |                        | Source-Measure Pass/Fail test *8, *9  |                     |                   |           |
|                            |  | Fast(488.2)  | 0.01 / internal       | 256 (256)             |                       | 79 (83)                |                        | 79 (83)                               |                     |                   |           |
|                            |  | Medium(488.2)  | 0.1 / internal        | 167 (166)             |                       | 72 (70)                |                        | 69 (70)                               |                     |                   |           |
|                            |  | Normal(488.2)  | 1 / internal          | 49 (42)               |                       | 34 (31)                |                        | 35 (30)                               |                     |                   |           |
|                            | Component Interface Handler Time for 60Hz (50Hz) *8, *10   | Speed  | NPLC / Trig Origin    | Measure               |                       | Source Pass/Fail test  |                        | Source-Measure Pass/Fail test *9, *11 |                     |                   |           |
|                            |  | Fast   | 0.01 / internal       | 1.04 ms (1.08 ms)     |                       | 0.5 ms (0.5 ms)        |                        | 4.82 ms (5.3 ms)                      |                     |                   |           |
| Medium                     |  | 0.1 / internal   | 2.55 ms (2.9 ms)      |                       | 0.5 ms (0.5 ms)       |                        | 6.27 ms (7.1 ms)       |                                       |                     |                   |           |
| Normal                     |  | 1 / internal   | 17.53 ms (20.9 ms)    |                       | 0.5 ms (0.5 ms)       |                        | 21.31 ms (25.0 ms)     |                                       |                     |                   |           |
| SYSTEM GENERAL             | Load Impedance   | Stable into 20,000pF typical   |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Differential Mode Voltage  | 250VPk   |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Common Mode Voltage  | 250VDC   |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Common Mode Isolation  | >10CΩ, <1000pF   |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Over Range   | 105% of range, source and measure  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Max. Voltage Drop  | 5V   |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Max. Sense lead Resistance   | 1MΩ  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Sense Input Impedance  | >100CΩ   |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Guard Offset Voltage   | <150μV, 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) |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Programmability  | IEEE-488.2 (SCPI), RS-232 ; 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 @ 300mA supply. ; 1 trigger input, 4 TTL/Relay Drive outputs (33V@500mA, diode) |                       |                       |                       |                        |                        |                                       |                     |                   |           |
|                            | Remote Interface   | USB/GPIB/LAN/RS-232  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
| Insulation                 | Chassis and terminal : 20MΩ or above (DC 500V) ; Chassis and AC cord : 30MΩ or above (DC 500V)                                       |  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
| Operation Environment      | Indoor use, Altitude: ≤ 2000m Ambient temperature: 0 ~ 40°C Relative humidity: ≤ 80%, Installation category: II, Pollution degree: 2 |  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
| Storage Environment        | Temperature: 20°C ~ 70°C; Humidity: < 80%  |  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
| Input Power                | 100-240VAC, 50-60Hz  |  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
| Power Consumption          | 80W  |  |                       |                       |                       |                        |                        |                                       |                     |                   |           |
| Dimensions & Weight        | 214 (W) x 86 (H) x 356.5 (D) mm, Approx. 4.8kg   |  |                       |                       |                       |                        |                        |                                       |                     |                   |           |

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

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



Specifications subject to change without notice. GSM-20H10\_E\_D1BH

**ORDERING INFORMATION**

**GSM-20H10** with GPIB **Source Measure Unit**  
**GSM-20H10** **Source Measure Unit**

**ACCESSORIES**

CD User manual x 1, Quick Start manual x 1, Test Lead GTL-207A 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, 2000mm  
**SM-02** Digital I/O Adapter, Convert DB15 to DB37 + 8-pin micro-DIN  
**GTL-246** USB Cable (USB 2.0 A-B Type, approx.. 1200mm)

