

## GSM-20H10 Specifications

The specifications apply when the GSM-20H10 is powered on for at least 30 minutes under +20°C~+30°C.



## SPECIFICATIONS

|               |                    |                                              |                                                                               |
|---------------|--------------------|----------------------------------------------|-------------------------------------------------------------------------------|
| Maximum Range | Voltage            |                                              | ±210V                                                                         |
|               | Current            |                                              | ±1.05A                                                                        |
|               | Power              |                                              | 22W                                                                           |
|               | Voltage Resolution |                                              | 1μV                                                                           |
|               | Current Resolution |                                              | 10pA                                                                          |
| Source        | DC Voltage         | Output Voltage                               | ±21V/ ±1.05A, ±210V/ ±105 mA                                                  |
|               |                    | Current Limit                                | Min. 0.1% of range                                                            |
|               |                    | Programming Resolution                       | 1μV, ±200.000mV range                                                         |
|               |                    |                                              | 10μV, ±2.00000V range                                                         |
|               |                    |                                              | 100μV, ±20.0000V range                                                        |
|               |                    |                                              | 1mV, ±200.000V range                                                          |
|               |                    | Programming Accuracy <sup>1</sup>            | ±(0.02%+600μV), ±200.000mV range                                              |
|               |                    |                                              | ±(0.02%+600μV), ±2.00000V range                                               |
|               |                    |                                              | ±(0.02%+2.4mV), ±20.0000V range                                               |
|               |                    |                                              | ±(0.02%+24mV), ±200.000V range                                                |
|               |                    | 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                             | 4mV rms(20Hz~ 1MHz); 10mVpp(20Hz~ 1MHz)                                       |
|               |                    | Temperature Coefficient (0°~18°C & 28°~50°C) | ±(0.15 × accuracy specification)/°C                                           |
|               | DC Current         | Output Current                               | ±1.05A /±21V, ±105 mA /±210V                                                  |
|               |                    | Voltage Limit                                | Min. 0.1% of range                                                            |
|               |                    | Programmed Source Resolution                 | 10pA, ±1.00000μA range                                                        |
|               |                    |                                              | 100pA, ±10.0000μA range                                                       |
|               |                    |                                              | 1nA, ±100.000μA range                                                         |
|               |                    |                                              | 10nA, ±1.00000mA range                                                        |
|               |                    |                                              | 100nA, ±10.00000mA range                                                      |
|               |                    |                                              | 1μA, ±100.000mA range                                                         |
|               |                    |                                              | 10μA, ±1.00000A range                                                         |
|               |                    | Programmed Source Accuracy <sup>1</sup>      | ±(0.035%+600pA), ±1.00000μA range                                             |
|               |                    |                                              | ±(0.033%+2nA), ±10.0000μA range                                               |
|               |                    |                                              | ±(0.031%+20nA), ±100.000μA range                                              |
|               |                    |                                              | ±(0.034%+200nA), ±1.00000mA range                                             |
|               |                    |                                              | ±(0.045%+2μA), ±10.00000mA range                                              |
|               |                    |                                              | ±(0.066%+20μA), ±100.000mA range                                              |
|               |                    |                                              | ±(0.27%+900μA), ±1.00000A range                                               |
|               |                    | 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°~18°C & 28°~50°C) | ±(0.15 × accuracy specification)/°C                                           |
|               | General            | Output Settling Time <sup>2</sup>            | 100μs typical Time                                                            |
|               |                    | Output Rise Time (±30%)                      | 300μs, 200V range, 100mA compliance.<br>150V/μs, 20V range, 100mA compliance. |

|             |            |                                              |                                                                           |                   |                                                                                     |
|-------------|------------|----------------------------------------------|---------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------|
| Measurement | Voltage    | DC Floating Voltage                          | Output can be floated up to $\pm 250\text{VDC}$                           |                   |                                                                                     |
|             |            | Remote Sense                                 | Up to 1V drop per load lead.                                              |                   |                                                                                     |
|             |            | Compliance Accuracy                          | Add 0.3% of range and $\pm 0.02\%$ of reading to base specification.      |                   |                                                                                     |
|             |            | Range Change Overshoot <sup>3</sup>          | Adjacent range changes between 200mV, 2V and 20V ranges, 100mV typical.   |                   |                                                                                     |
|             |            | Minimum Compliance Value                     | 0.1% of range                                                             |                   |                                                                                     |
|             |            | Command Processing Time <sup>4</sup>         | Autorange On:10ms; Autorange Off:7ms.                                     |                   |                                                                                     |
|             |            | Input Resistance                             | $>10\text{ G}\Omega$                                                      |                   |                                                                                     |
|             | Current    | Measurement Resolution                       | 1 $\mu\text{V}$ , $\pm 200.000\text{mV}$ range                            |                   |                                                                                     |
|             |            |                                              | 10 $\mu\text{V}$ , $\pm 2.00000\text{V}$ range                            |                   |                                                                                     |
|             |            |                                              | 100 $\mu\text{V}$ , $\pm 20.0000\text{V}$ range                           |                   |                                                                                     |
|             |            |                                              | 1mV, $\pm 200.000\text{V}$ range                                          |                   |                                                                                     |
|             |            | Measurement Accuracy                         | $\pm(0.012\%+300\mu\text{V})$ , $\pm 200.000\text{mV}$ range              |                   |                                                                                     |
|             |            |                                              | $\pm(0.012\%+300\mu\text{V})$ , $\pm 2.00000\text{V}$ range               |                   |                                                                                     |
|             |            |                                              | $\pm(0.015\%+1.5\text{mV})$ , $\pm 20.0000\text{V}$ range                 |                   |                                                                                     |
|             |            |                                              | $\pm(0.015\%+10\text{mV})$ , $\pm 200.000\text{V}$ range                  |                   |                                                                                     |
|             |            | Temperature Coefficient (0°–18°C & 28°–50°C) | $\pm(0.15 \times \text{accuracy specification})/^{\circ}\text{C}$         |                   |                                                                                     |
|             |            | Voltage Burden (4-wire mode)                 | $<1\text{mV}$                                                             |                   |                                                                                     |
|             |            |                                              | 10pA, $\pm 1.00000\mu\text{A}$ range                                      |                   |                                                                                     |
|             |            |                                              | 100pA, $\pm 10.0000\mu\text{A}$ range                                     |                   |                                                                                     |
|             |            |                                              | 1nA, $\pm 100.000\mu\text{A}$ range                                       |                   |                                                                                     |
|             |            |                                              | 10nA, $\pm 1.00000\text{mA}$ range                                        |                   |                                                                                     |
|             |            |                                              | 100nA, $\pm 10.0000\text{mA}$ range                                       |                   |                                                                                     |
|             |            |                                              | 1 $\mu\text{A}$ , $\pm 100.000\text{mA}$ range                            |                   |                                                                                     |
|             |            |                                              | 10 $\mu\text{A}$ , $\pm 1.00000\text{A}$ range                            |                   |                                                                                     |
|             |            | Programmed Source Accuracy <sup>1</sup>      | $\pm(0.029\%+300\text{pA})$ , $\pm 1.00000\mu\text{A}$ range              |                   |                                                                                     |
|             |            |                                              | $\pm(0.027\%+700\text{pA})$ , $\pm 10.0000\mu\text{A}$ range              |                   |                                                                                     |
|             |            |                                              | $\pm(0.025\%+6\text{nA})$ , $\pm 100.000\mu\text{A}$ range                |                   |                                                                                     |
|             |            |                                              | $\pm(0.027\%+60\text{nA})$ , $\pm 1.00000\text{mA}$ range                 |                   |                                                                                     |
|             |            |                                              | $\pm(0.035\%+600\text{nA})$ , $\pm 10.0000\text{mA}$ range                |                   |                                                                                     |
|             |            |                                              | $\pm(0.055\%+6\mu\text{A})$ , $\pm 100.000\text{mA}$ range                |                   |                                                                                     |
|             |            | Temperature Coefficient (0°–18°C & 28°–50°C) | $\pm(0.22\%+570\mu\text{A})$ , $\pm 1.00000\text{A}$ range                |                   |                                                                                     |
|             |            |                                              | $\pm(0.1 \times \text{accuracy specification})/^{\circ}\text{C}$          |                   |                                                                                     |
|             | Resistance | Range                                        | Resolution                                                                | Test current      | Accuracy                                                                            |
|             |            |                                              | $<2.00000\Omega$                                                          | ---               | Source IACC+Meas.VACC                                                               |
|             |            | 2.00000 $\Omega$                             | 10 $\mu\Omega$                                                            | ---               | Source IACC+Meas.VACC                                                               |
|             |            | 20.0000 $\Omega$                             | 100 $\mu\Omega$                                                           | 100mA             | $\pm(0.1\%+0.003\Omega)$ , Normal<br>$\pm(0.07\%+0.001\Omega)$ , Enhanced           |
|             |            | 200.000 $\Omega$                             | 1m $\Omega$                                                               | 10mA              | $\pm(0.08\%+0.03\Omega)$ , Normal<br>$\pm(0.05\%+0.01\Omega)$ , Enhanced            |
|             |            | 2.00000k $\Omega$                            | 10m $\Omega$                                                              | 1mA               | $\pm(0.07\%+0.3\Omega)$ , Normal<br>$\pm(0.05\%+0.1\Omega)$ , Enhanced              |
|             |            | 20.0000k $\Omega$                            | 100m $\Omega$                                                             | 100 $\mu\text{A}$ | $\pm(0.06\%+3\Omega)$ , Normal<br>$\pm(0.04\%+1\Omega)$ , Enhanced                  |
|             |            | 200.000k $\Omega$                            | 1 $\Omega$                                                                | 10 $\mu\text{A}$  | $\pm(0.07\%+30\Omega)$ , Normal<br>$\pm(0.05\%+10\Omega)$ , Enhanced                |
|             |            | 2.00000M $\Omega$                            | 10 $\Omega$                                                               | 5 $\mu\text{A}$   | $\pm(0.11\%+300\Omega)$ , Normal<br>$\pm(0.05\%+100\Omega)$ , Enhanced              |
|             |            | 20.0000M $\Omega$                            | 100 $\Omega$                                                              | 0.5 $\mu\text{A}$ | $\pm(0.11\%+1\text{k}\Omega)$ , Normal<br>$\pm(0.05\%+500\Omega)$ , Enhanced        |
|             |            | 200.000M $\Omega$                            | 1k $\Omega$                                                               | 100nA             | $\pm(0.66\%+10\text{k}\Omega)$ , Normal<br>$\pm(0.35\%+5\text{k}\Omega)$ , Enhanced |
|             |            | $>200.000\text{M}\Omega$                     | ---                                                                       | ---               | Source IACC+Meas.VACC                                                               |
|             |            | Temperature Coefficient (0°–18°C & 28°–50°C) | $\pm(0.15 \times \text{accuracy specification})/^{\circ}\text{C}$         |                   |                                                                                     |
|             |            | Source I mode,                               | Total uncertainty = I source accuracy + V measure accuracy (4-wire remote |                   |                                                                                     |

|                                                |                                                                   |                            |                                                                                                                                                         |                                              |                             |                             |                                               |
|------------------------------------------------|-------------------------------------------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------|-----------------------------|-----------------------------------------------|
|                                                |                                                                   | Manual OHMS                | 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 <sup>5</sup>                      | Maximum Measure Auto Range Time                                   |                            | 40ms (fixed source) <sup>6</sup>                                                                                                                        |                                              |                             |                             |                                               |
|                                                | Sequence reading rates <sup>7</sup> (rdg./second) for 60Hz (50Hz) | Speed                      | NPLC/ Trig Origin                                                                                                                                       | Measure                                      |                             | Source-Measure <sup>9</sup> |                                               |
|                                                |                                                                   |                            |                                                                                                                                                         | TO MEM.                                      | TO GPIB                     | TO MEM.                     | TO GPIB                                       |
|                                                |                                                                   | Fast                       | 0.01 / internal                                                                                                                                         | 2081 (2030)                                  | 1198 (1210)                 | 1551 (1515)                 | 1000 (900)                                    |
|                                                |                                                                   | 488.2                      | 0.01 / external                                                                                                                                         | 1239 (1200)                                  | 1079 (1050)                 | 1018 (990)                  | 916 (835)                                     |
|                                                |                                                                   | Medium                     | 0.1 / internal                                                                                                                                          | 510 (433)                                    | 509 (433)                   | 470 (405)                   | 470 (410)                                     |
|                                                |                                                                   | 488.2                      | 0.1 / external                                                                                                                                          | 438 (380)                                    | 438 (380)                   | 409 (360)                   | 409 (365)                                     |
|                                                |                                                                   | Normal                     | 1 / internal                                                                                                                                            | 59 (49)                                      | 59 (49)                     | 58 (48)                     | 58 (48)                                       |
|                                                |                                                                   | 488.2                      | 1 / external                                                                                                                                            | 57 (48)                                      | 57 (48)                     | 57 (48)                     | 57 (47)                                       |
|                                                |                                                                   | Speed                      | NPLC/ Trig Origin                                                                                                                                       | Source-Measure Pass/Fail test <sup>8,9</sup> |                             | Measure Memory <sup>9</sup> |                                               |
|                                                |                                                                   |                            |                                                                                                                                                         | TO MEM.                                      | TO GPIB                     | TO MEM.                     | TO GPIB                                       |
|                                                |                                                                   | Fast                       | 0.01 / internal                                                                                                                                         | 902 (900)                                    | 809 (840)                   | 165 (162)                   | 164 (162)                                     |
|                                                |                                                                   | 488.2                      | 0.01 / external                                                                                                                                         | 830 (830)                                    | 756 (780)                   | 163 (160)                   | 162 (160)                                     |
|                                                |                                                                   | Medium                     | 0.1 / internal                                                                                                                                          | 389 (343)                                    | 388 (343)                   | 133 (126)                   | 132 (126)                                     |
|                                                |                                                                   | 488.2                      | 0.1 / external                                                                                                                                          | 374 (333)                                    | 374 (333)                   | 131 (125)                   | 131 (125)                                     |
|                                                |                                                                   | Normal                     | 1 / internal                                                                                                                                            | 56 (47)                                      | 56 (47)                     | 44 (38)                     | 44 (38)                                       |
|                                                |                                                                   | 488.2                      | 1 / external                                                                                                                                            | 56 (47)                                      | 56 (47)                     | 44 (38)                     | 44 (38)                                       |
|                                                | Single Reading Operation Rates (rdg./second) for 60Hz (50Hz)      | Speed                      | NPLC/ Trig Origin                                                                                                                                       | Measure                                      | Source-Measure <sup>9</sup> |                             | Source-Measure Pass/Fail test <sup>8,9</sup>  |
|                                                |                                                                   |                            |                                                                                                                                                         | TO GPIB                                      | TO GPIB                     | TO GPIB                     |                                               |
|                                                |                                                                   | 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) <sup>8,10</sup>  | Speed                      | NPLC/ Trig Origin                                                                                                                                       | Measure                                      | Source Pass/Fail test       |                             | Source-Measure Pass/Fail test <sup>9,11</sup> |
|                                                |                                                                   |                            |                                                                                                                                                         | TO GPIB                                      | TO GPIB                     | TO GPIB                     |                                               |
|                                                |                                                                   | 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                                         |                            | 250 Vpk                                                                                                                                                 |                                              |                             |                             |                                               |
|                                                | Common mode Voltage                                               |                            | 250 VDC                                                                                                                                                 |                                              |                             |                             |                                               |
|                                                | Common mode Isolation                                             |                            | >10GΩ, <1000pF                                                                                                                                          |                                              |                             |                             |                                               |
|                                                | Over Range                                                        |                            | 105% of range, source and measure.                                                                                                                      |                                              |                             |                             |                                               |
|                                                | Max. Voltage drop                                                 |                            | 5V                                                                                                                                                      |                                              |                             |                             |                                               |
|                                                | Max. Sense lead Resistance                                        |                            | 1MΩ                                                                                                                                                     |                                              |                             |                             |                                               |
|                                                | Sense input Impedance                                             |                            | >100G Ω                                                                                                                                                 |                                              |                             |                             |                                               |
|                                                | 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)                                                                                                                                       |                                              |                             |                             |                                               |
|                                                |                                                                   |                            | 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/LAN/RS-232/GPIB(Optional)                                                                                                                           |                                              |                             |                             |                                               |
|                                                | 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        | 214 (W) x 86 (H) x 356.5 (D) mm |
|  | Weight            | Approx. 4.8kg                   |

**Remarks**

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