## SPECIFICATIONS(PHU-5 kW Series)

| Model | | PHU | 80-170 | 200-70 | 500-30 | 750-20 | 1000-15 | 1500-10 |
|---|---|---|---|---|---|---|---|---|
| Rated output voltage (*1) | | V | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Rated output current (*2) | | A | 170 | 70 | 30 | 20 | 15 | 10 |
| Rated output power | | W | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 |
| Output power ratio | | – | 2.72 | 2.8 | 3 | 3 | 3 | 3 |
| **Constant Voltage Mode** | | | | | | | | |
| Line regulation (*3) [0.01 % of Vo_rated] | | mV | 8 | 20 | 50 | 75 | 100 | 150 |
| Load regulation (*4) [0.02 % of Vo_rated] | | mV | 16 | 40 | 100 | 150 | 200 | 300 |
| Ripple and noise (*5) | p-p (*6) | mV | 200 | 300 | 350 | 800 | 1600 | 2400 |
| | r.m.s. (*7) | mV | 16 | 40 | 70 | 200 | 350 | 400 |
| Temperature coefficient | | ppm/°C | 100 ppm/°C from rated output voltage, following 30 minutes warm-up. | | | | | |
| Remote snese compensation voltage | 5 % of Vo_rated | V | 4 | 10 | 25 | 37.5 | 50 | 75 |
| Rise time (*8) | Rated load | ms | 30 | 30 | 30 | 30 | 30 | 30 |
| | No load | ms | 30 | 30 | 30 | 30 | 30 | 30 |
| Fall time (*9) | Rated load | ms | 80 | 80 | 80 | 80 | 80 | 80 |
| | No load | ms | 1000 | 1000 | 1000 | 1200 | 1000 | 1200 |
| Transient response time (*10) | | ms | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **Constant Current Mode** | | | | | | | | |
| Line regulation (*3) [0.05 % of Io_rated] | | mA | 85 | 35 | 15 | 10 | 7.5 | 5 |
| Load regulation (*11) [0.1 % of Io_rated] | | mA | 170 | 70 | 30 | 20 | 15 | 10 |
| Ripple and noise (*12) | r.m.s.(*7) | mA | 170 | 50 | 16 | 16 | 8 | 8 |
| Temperature coefficient | | ppm/°C | 100 ppm/°C from rated output current, following 30 minutes warm-up. | | | | | |
| **Protection Function** | | | | | | | | |
| Over voltage protection (OVP) | Setting range | V | 5.00 V to 88.00 V | 5.00 V to 220.00 V | 5.00 V to 550.00 V | 5.0 V to 825.0 V | 5.0 V to 1100.0 V | 5.0 V to 1650.0 V |
| | Setting accuracy | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Over current protection (OCP) | Setting range | A | 5.00 A to 187.00 A | 5.00 A to 77.00 A | 3.000 A to 33.000 A | 2.000 A to 22.000 A | 1.500 A to 16.500 A | 1.000 A to 11.000 A |
| | Setting accuracy | mA | 340 | 140 | 60 | 40 | 30 | 20 |
| Over power protection (OPP) | Setting range | W | 100 W to 5500 W | 100 W to 5500 W | 100 W to 5500 W | 100 W to 5500 W | 100 W to 5500 W | 100 W to 5500 W |
| | Setting accuracy | W | 50 | 50 | 50 | 50 | 50 | 50 |
| Over voltage limit (OVL) | Setting range | V | 0.00 V to 84.00 V | 0.00 V to 210.00 V | 0.00 V to 525.00 V | 0.0 V to 787.5 V | 0.0 V to 1050.0 V | 0.0 V to 1575.0 V |
| Under voltage limit (UVL) | Setting range | V | 0.00 V to 84.00 V | 0.00 V to 210.00 V | 0.00 V to 525.00 V | 0.0 V to 787.5 V | 0.0 V to 1050.0 V | 0.0 V to 1575.0 V |
| Over current limit (OCL) | Setting range | A | 0.00 A to 178.50 A | 0.00 A to 73.50 A | 0.000 A to 31.500 A | 0.000 A to 21.000 A | 0.000 A to 15.750 A | 0.000 A to 10.500 A |
| Under cuttent limit (UCL) | Setting range | A | 0.00 A to 178.50 A | 0.00 A to 73.50 A | 0.000 A to 31.500 A | 0.000 A to 21.000 A | 0.000 A to 15.750 A | 0.000 A to 10.500 A |
| Power unit fail (PUF) | Operation | | Turn the output off. | | | | | |
| Incorrect sensing connection protection (SENSE) | Operation | | Turn the output off. | | | | | |
| Low AC input protection (AC-FAIL) | Operation | | Turn the output off. | | | | | |
| Shutdown (SD) | Operation | | Turn the output off. | | | | | |
| Power limit (POWER LIMIT) | Operation | | Over power limit. | | | | | |
| | Value (fixed) | | Approx. 102 % of rated output power | | | | | |
| **Other Functions** | | | | | | | | |
| Voltage Slew Rate | Setting range | V/s | 0.01 to 160.00 | 0.01 to 400.00 | 0.1 to 1000.0 | 0.1 to 1500.0 | 0.1 to 2000.0 | 0.1 to 3000.0 |
| | Resolution | mV | 10 | 10 | 100 | 100 | 100 | 100 |
| Current slew rate | Setting range | A/s | 0.01 to 340.00 | 0.01 to 140.00 | 0.001 to 60.000 | 0.001 to 40.000 | 0.001 to 30.000 | 0.001 to 20.000 |
| | Resolution | mA | 10 | 10 | 1 | 1 | 1 | 1 |
| Internal resistance | Setting range | Ω | 0.000 to 0.471 | 0.000 to 2.857 | 0.00 to 16.67 | 0.00 to 37.50 | 0.0 to 66.7 | 0.0 to 150.0 |
| | Resolution | mΩ | 1 | 1 | 10 | 10 | 100 | 100 |
| **Front Panel** | | | | | | | | |
| Display | | | TFT-LCD, 5", 800 pt x 480 pt | | | | | |
| Voltage accuracy [0.1 % of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Current accuracy [0.2 % of Io_rated] | | mA | 340 | 140 | 60 | 40 | 30 | 20 |
| Power accuracy [1 % of Po_rated] | | W | 50 | 50 | 50 | 50 | 50 | 50 |
| Voltage resolution | | V | 0.01 | 0.01 | 0.01 | 0.1 | 0.1 | 0.1 |
| Current resolution | | A | 0.01 | 0.01 | 0.001 | 0.001 | 0.001 | 0.001 |
| Power resolution | | W | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Buttons | | | Menu, Local, Exit, Clear, Enter, Lock, Current, Shift Output, Numeric Keypad | | | | | |
| Rotary knob | | | Turn the knob to increase or decrease the value. | | | | | |
| USB port | | | Type A USB connector | | | | | |
| **Programming and Measurement (Digital Interface)** | | | | | | | | |
| Output voltage programming range | 0 % to 105 % | V | 0 to 84 | 0 to 210 | 0 to 525 | 0 to 787.5 | 0 to 1050 | 0 to 1575 |
| Output current programming range | 0 % to 105 % | A | 0 to 178.5 | 0 to 73.5 | 0 to 31.5 | 0 to 21 | 0 to 15.75 | 0 to 10.5 |
| Output power programming range | 0 % to 102 % | W | 0 to 5100 | 0 to 5100 | 0 to 5100 | 0 to 5100 | 0 to 5100 | 0 to 5100 |
| Output voltage programming accuracy [0.1 % of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Output current programming accuracy [0.2 % of Io_rated] | | mA | 340 | 140 | 60 | 40 | 30 | 20 |
| Output power programming accuracy [1 % of Po_rated] | | W | 50 | 50 | 50 | 50 | 50 | 50 |
| Output voltage programming resolution | | mV | 10 | 10 | 10 | 100 | 100 | 100 |
| Output current programming resolution | | mA | 10 | 10 | 1 | 1 | 1 | 1 |
| Output power programming resolution | | W | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Output voltage measurement accuracy [0.1 % of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Output current measurement accuracy [0.2 % of Io_rated] | | mA | 340 | 140 | 60 | 40 | 30 | 20 |
| Output power measurement accuracy [1 % of Po_rated] | | W | 50 | 50 | 50 | 50 | 50 | 50 |
| Output voltage measurement resolution | | mV | 10 | 10 | 10 | 100 | 100 | 100 |
| Output current measurement resolution | | mA | 10 | 10 | 1 | 1 | 1 | 1 |
| Output power measurement resolution | | W | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| **Input Characteristics for PHU-C Series** | | | | | | | | |

| | | | |
|---|---|---|---|
| Norminal input rating | | | Single Phase, 3-Phase, 200 V models: 180 Vac to 265 Vac (Covers 200 Vac / 230 Vac) |
| Input frequency range | | | 47 Hz to 63 Hz |
| Maximum input current | 200 Vac | A | 32 A (L1, L2) |
| Inrush current | 200 Vac | A | Less than 50 A |
| Maximum input power | | VA | 6000 |
| Power factor | Rated Power | | > 0.95 |
| Efficiency (*14) | 200 Vac | % | 86 to 94 |
| Hold-up time | | | 10 ms or greater |
| **Input Characteristics for PHU-D Series** | | | |
| Norminal input rating | | | 3-Phase, 400 V models: 342 Vac to 528 Vac (Covers 380/400/415/440/460/480 Vac) |
| Input frequency range | | | 47 Hz to 63 Hz |
| Maximum input current | 400 Vac | A | 16 A (L1, L2) |
| Inrush current | 400 Vac | A | Less than 25 A |
| Maximum input power | | VA | 6000 |
| Power factor | Rated Power | | > 0.95 |
| Efficiency (*14) | 400 Vac | % | 87 to 94 |
| Hold-up time | | | 10 ms or greater |
| **Interface Capabilities** | | | |
| USB | | | Type A: Host, Type B: Slave, Speed: 1.1/2.0, USB Class: CDC(Communications Device Class) |
| LAN | | | MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask |
| Isolated Analog Control Interface | | | $V_{set}$ / $I_{set}$ = 0 V to 5 V or 0 V to 10 V \| $V_{mon}$ / $I_{mon}$ = 0 V to 5 V or 0 V to 10 V |
| Factory Option | | | RS-232&485 or GPIB or CAN Bus or DeviceNet or Isolated Digital I/O |
| **Isolated Analog Control Interface** | | | |
| Vout voltage programming | | | 0 % to 100 %, 0 V to 5 V Accuracy: ± 1 % of rated $V_{out}$, or 0 V to 10 V Accuracy: ± 1 % of rated $V_{out}$ |
| Iout voltage programming | | | 0 % to 100%, 0 V to 5 V Accuracy: ± 1 % of rated $I_{out}$, or 0 V to 10 V Accuracy: ± 1 % of rated $I_{out}$ |
| Pout voltage programming | | | 0 % to 100%, 0 V to 5 V Accuracy: ± 1 % of rated $P_{out}$, or 0 V to 10 V Accuracy: ± 1 % of rated $P_{out}$ |
| Internal resistance voltage programming | | | 0 % to 100%, 0 V to 5 V Accuracy: ± 1 % of maximum $R_{int}$, or 0 V to 10 V Accuracy: ± 1 % of maximum $R_{int}$ |
| Output voltage monitor | | | 0 V to 5 V or 0 V to 10 V, Accuracy: ± 1 %. |
| Output current monitor | | | 0 V to 5 V or 0 V to 10 V, Accuracy: ± 1 %. |
| Reference voltage | | | Voltage reference for 0 V to 5V or 0 V to 10V. |
| Alarm Input | | | Turn off the PHU output with a High (4.5 V to 5 V) |
| Output on/off control | | | Possible logic selections:<br>Turn the output on using a LOW (0 V to 0.5 V) or short-circuit, turn the output off using a HIGH (4.5 V to 5 V) or open-circuit. |
| Alarm clear control | | | Clear alarms with a High (4.5 V to 5 V) |
| CV/CC/CP/ALM/PWR ON/OUT ON indicator | | | Photocoupler open collector output; Maximum voltage 30 V, maximum sink current 8 mA |
| **Environmental Conditions** | | | |
| Operaing temperature | | | 0 ˚C to 50 ˚C |
| Storage temperature | | | -25 ˚C ~ 70 ˚C |
| Operating humidity | | | 20 % to 85 % RH; No condensation |
| Storage humidity | | | 90 % RH or less; No condensation |
| Altitude | | | Maximum 2000 m |
| **General Specifications** | | | |
| Weight | main unit only | kg | Less than 21 kg |
| Dimensions (W×H×D) | | mm | 442 mm × 130 mm × 675 mm |
| Cooling | | | Forced air cooling by internal fan |
| EMC | | | Complies with the European EMC directive 89/336/EEC for Class A test and measurement products |
| Safety | | | Complies with the European Low Voltage Directive 73/23/EEC and carries the CE-marking |
| Withstand voltage | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: AC 1500 V or DC 2130 V 1 minute |
| Insulation resistance | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: 100 MΩ or more (DC 500 V) |

**Notes:**

***1 Minimum voltage is guaranteed to maximum 0.2 % of the rated output voltage.**
***2 Minimum current is guaranteed to maximum 0.4 % of the rated output current.**
***3 At 180 Vac to 265 Vac or 342 Vac to 528 Vac, constant load.**
***4 From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.**
***5 For 80 V, 200 V models: Measure with JEITA RC-9131B (1:1) probe. For 500 V, 750 V, 1000 V and 1500 V models: Measured with (100:1) probe.**
***6 Measurement frequency bandwidth is 10 Hz to 20 MHz.**
***7 Measurement frequency bandwidth is 5 Hz to 1 MHz.**
***8 From 10 % to 90 % of rated output voltage, with rated resistive load.**
***9 From 90 % to 10 % of rated output voltage, with rated resistive load.**
***10 Time for output voltage to recover within 1 % of its rated output for a load change from 10 % to 90 % of its rated output current.**
**Voltage set point from 10 % to 100 % of rated output.**
***11 For load voltage change, equal to the unit voltage rating, constant input voltage.**
***12 The ripple is measured at 20 % to 100 % output voltage and full output current.**
***13 For output power change from 10 % to 90 %, constant input voltage.**
***14 At rated output power.**

## SPECIFICATIONS(PHU-10 kW Series)

| Model | | PHU | 80-340 | 200-140 | 500-60 | 750-40 | 1000-30 | 1500-20 |
|---|---|---|---|---|---|---|---|---|
| Rated output voltage (*1) | | V | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Rated output current (*2) | | A | 340 | 140 | 60 | 40 | 30 | 20 |
| Rated output power | | W | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 |
| Output power ratio | | – | 2.72 | 2.8 | 3 | 3 | 3 | 3 |
| **Constant Voltage Mode** | | | | | | | | |
| Line regulation (*3) [0.01 % of Vo_rated] | | mV | 8 | 20 | 50 | 75 | 100 | 150 |
| Load regulation (*4) [0.02 % of Vo_rated] | | mV | 16 | 40 | 100 | 150 | 200 | 300 |
| Ripple and noise (*5) | p-p (*6) | mV | 200 | 300 | 350 | 800 | 1600 | 2400 |
| | r.m.s. (*7) | mV | 16 | 40 | 70 | 200 | 350 | 400 |
| Temperature coefficient | | ppm/°C | 100 ppm/°C from rated output voltage, following 30 minutes warm-up. | | | | | |
| Remote snese compensation voltage | 5 % of Vo_rated | V | 4 | 10 | 25 | 37.5 | 50 | 75 |
| Rise time (*8) | Rated load | ms | 30 | 30 | 30 | 30 | 30 | 30 |
| | No load | ms | 30 | 30 | 30 | 30 | 30 | 30 |
| Fall time (*9) | Rated load | ms | 80 | 80 | 80 | 80 | 80 | 80 |
| | No load | ms | 1000 | 1000 | 1000 | 1200 | 1000 | 1200 |
| Transient response time (*10) | | ms | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **Constant Current Mode** | | | | | | | | |
| Line regulation (*3) [0.05 % of Io_rated] | | mA | 170 | 70 | 30 | 20 | 15 | 10 |
| Load regulation (*11) [0.1 % of Io_rated] | | mA | 340 | 140 | 60 | 40 | 30 | 20 |
| Ripple and noise (*12) | r.m.s. (*7) | mA | 340 | 100 | 32 | 32 | 22 | 22 |
| Temperature coefficient | | ppm/°C | 100 ppm/°C from rated output current, following 30 minutes warm-up. | | | | | |
| **Protection Function** | | | | | | | | |
| Over voltage protection (OVP) | Setting range | V | 5.00 V to 88.00 V | 5.00 V to 220.00 V | 5.00 V to 550.00 V | 5.0 V to 825.0 V | 5.0 V to 1100.0 V | 5.0 V to 1650.0 V |
| | Setting accuracy | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Over current protection (OCP) | Setting range | A | 5.00 A to 374.00 A | 5.00 A to 154.00 A | 5.00 A to 66.00 A | 4.000 A to 44.000 A | 3.000 A to 33.000 A | 2.000 A to 22.000 A |
| | Setting accuracy | mA | 680 | 280 | 120 | 80 | 60 | 40 |
| Over power protection (OPP) | Setting range | W | 200 W to 11000 W | 200 W to 11000 W | 200 W to 11000 W | 200 W to 11000 W | 200 W to 11000 W | 200 W to 11000 W |
| | Setting accuracy | W | 100 | 100 | 100 | 100 | 100 | 100 |
| Over voltage limit (OVL) | Setting range | V | 0.00 V to 84.00 V | 0.00 V to 210.00 V | 0.00 V to 525.00 V | 0.0 V to 787.5 V | 0.0 V to 1050.0 V | 0.0 V to 1575.0 V |
| Under voltage limit (UVL) | Setting range | V | 0.00 V to 84.00 V | 0.00 V to 210.00 V | 0.00 V to 525.00 V | 0.0 V to 787.5 V | 0.0 V to 1050.0 V | 0.0 V to 1575.0 V |
| Over current limit (OCL) | Setting range | A | 0.00 A to 357.00 A | 0.00 A to 147.00 A | 0.00 A to 63.00 A | 0.000 A to 42.000 A | 0.000 A to 31.500 A | 0.000 A to 21.000 A |
| Under cuttent limit (UCL) | Setting range | A | 0.00 A to 357.00 A | 0.00 A to 147.00 A | 0.00 A to 63.00 A | 0.000 A to 42.000 A | 0.000 A to 31.500 A | 0.000 A to 21.000 A |
| Power unit fail (PUF) | Operation | | Turn the output off. | | | | | |
| Incorrect sensing connection protection (SENSE) | Operation | | Turn the output off. | | | | | |
| Low AC input protection (AC-FAIL) | Operation | | Turn the output off. | | | | | |
| Shutdown (SD) | Operation | | Turn the output off. | | | | | |
| Power limit (POWER LIMIT) | Operation | | Over power limit. | | | | | |
| | Value (fixed) | | Approx. 102 % of rated output power | | | | | |
| **Other Functions** | | | | | | | | |
| Voltage Slew Rate | Setting range | V/s | 0.01 to 160.00 | 0.01 to 400.00 | 0.1 to 1000.0 | 0.1 to 1500.0 | 0.1 to 2000.0 | 0.1 to 3000.0 |
| | Resolution | mV | 10 | 10 | 100 | 100 | 100 | 100 |
| Current slew rate | Setting range | A/s | 0.1 to 680.0 | 0.01 to 280.00 | 0.01 to 120.00 | 0.01 to 80.00 | 0.001 to 60.000 | 0.001 to 40.000 |
| | Resolution | mA | 100 | 10 | 10 | 10 | 1 | 1 |
| Internal resistance | Setting range | Ω | 0.000 to 0.235 | 0.000 to 1.428 | 0.00 to 8.33 | 0.00 to 18.75 | 0.00 to 33.33 | 0.0 to 75.0 |
| | Resolution | mΩ | 1 | 1 | 10 | 10 | 10 | 100 |
| **Front Panel** | | | | | | | | |
| Display | | | TFT-LCD, 5", 800 pt x 480 pt | | | | | |
| Voltage accuracy [0.1 % of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Current accuracy [0.2 % of Io_rated] | | mA | 680 | 280 | 120 | 80 | 60 | 40 |
| Power accuracy [1 % of Po_rated] | | W | 100 | 100 | 100 | 100 | 100 | 100 |
| Voltage resolution | | V | 0.01 | 0.01 | 0.01 | 0.1 | 0.1 | 0.1 |
| Current resolution | | A | 0.01 | 0.01 | 0.001 | 0.001 | 0.001 | 0.001 |
| Power resolution | | W | 1 | 1 | 1 | 1 | 1 | 1 |
| Buttons | | | Menu, Local, Exit, Clear, Enter, Lock, Current, Shift Output, Numeric Keypad | | | | | |
| Rotary knob | | | Turn the knob to increase or decrease the value | | | | | |
| USB port | | | Type A USB connector | | | | | |
| **Programming and Measurement (Digital Interface)** | | | | | | | | |
| Output voltage programming range | 0 % to 105 % | V | 0 to 84 | 0 to 210 | 0 to 525 | 0 to 787.5 | 0 to 1050 | 0 to 1575 |
| Output current programming range | 0 % to 105 % | A | 0 to 357 | 0 to 147 | 0 to 63 | 0 to 42 | 0 to 31.5 | 0 to 21 |
| Output power programming range | 0 % to 102 % | W | 0 to 10200 | 0 to 10200 | 0 to 10200 | 0 to 10200 | 0 to 10200 | 0 to 10200 |
| Output voltage programming accuracy [0.1 % of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Output current programming accuracy [0.2 % of Io_rated] | | mA | 680 | 280 | 120 | 80 | 60 | 40 |
| Output power programming accuracy [1 % of Po_rated] | | W | 100 | 100 | 100 | 100 | 100 | 100 |
| Output voltage programming resolution | | mV | 10 | 10 | 10 | 100 | 100 | 100 |
| Output current programming resolution | | mA | 10 | 10 | 1 | 1 | 1 | 1 |
| Output power programming resolution | | W | 1 | 1 | 1 | 1 | 1 | 1 |
| Output voltage measurement accuracy [0.1 % of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Output current measurement accuracy [0.2 % of Io_rated] | | mA | 680 | 280 | 120 | 80 | 60 | 40 |
| Output power measurement accuracy [1 % of Po_rated] | | W | 100 | 100 | 100 | 100 | 100 | 100 |
| Output voltage measurement resolution | | mV | 10 | 10 | 10 | 100 | 100 | 100 |
| Output current measurement resolution | | mA | 10 | 10 | 1 | 1 | 1 | 1 |
| Output power measurement resolution | | W | 1 | 1 | 1 | 1 | 1 | 1 |

| | | | |
|---|---|---|---|
| **Input Characteristics for PHU-C Series** | | | |
| Norminal input rating | | | 3-Phase, 200 V models: 180 Vac to 265 Vac (Covers 200 Vac / 230 Vac) |
| Input frequency range | | | 47 Hz to 63 Hz |
| Maximum input current | 200 Vac | A | 56 A (L1), 32 A (L2, L3) |
| Inrush current | 200 Vac | A | Less than 100 A |
| Maximum input power | | VA | 12000 |
| Power factor | Rated Power | | > 0.95 |
| Efficiency (*14) | 200 Vac | % | 86 to 94 |
| Hold-up time | | | 10 ms or greater |
| **Input Characteristics for PHU-D Series** | | | |
| Norminal input rating | | | 3-Phase, 400 V models: 342 Vac to 528 Vac (Covers 380/400/415/440/460/480 Vac) |
| Input frequency range | | | 47 Hz to 63 Hz |
| Maximum input current | 400 Vac | A | 28 A (L1), 16 A (L2, L3) |
| Inrush current | 400 Vac | A | Less than 50 A |
| Maximum input power | | VA | 12000 |
| Power factor | Rated Power | | > 0.95 |
| Efficiency (*14) | 400 Vac | % | 87 to 94 |
| Hold-up time | | | 10 ms or greater |
| **Interface Capabilities** | | | |
| USB | | | Type A: Host, Type B: Slave, Speed: 1.1/2.0, USB Class: CDC(Communications Device Class) |
| LAN | | | MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask |
| Isolated Analog Control Interface | | | $V_{set}$ / $I_{set}$ = 0 V to 5 V or 0 V to 10 V \| $V_{mon}$ / $I_{mon}$ = 0 V to 5 V or 0 V to 10 V |
| Factory Option | | | RS-232&485 or GPIB or CAN Bus or DeviceNet or Isolated Digital I/O |
| **Isolated Analog Control Interface** | | | |
| Vout voltage programming | | | 0 % to 100 %, 0V to 5 V Accuracy: ± 1 % of rated $V_{out}$, or 0 V to 10 V Accuracy: ± 1 % of rated $V_{out}$ |
| Iout voltage programming | | | 0 % to 100 %, 0 V to 5 V Accuracy: ± 1 % of rated $I_{out}$, or 0 V to 10 V Accuracy: ± 1 % of rated $I_{out}$ |
| Pout voltage programming | | | 0 % to 100 %, 0 V to 5 V Accuracy: ± 1 % of rated $P_{out}$, or 0 V to 10 V Accuracy: ± 1 % of rated $P_{out}$ |
| Internal resistance voltage programming | | | 0 % to 100 %, 0 V to 5 V Accuracy: ± 1 % of maximum $R_{int}$, or 0 V to 10 V Accuracy: ± 1 % of maximum $R_{int}$ |
| Output voltage monitor | | | 0 V to 5 V or 0 V to 10 V, Accuracy: ± 1 %. |
| Output current monitor | | | 0 V to 5 V or 0 V to 10 V, Accuracy: ± 1 %. |
| Reference voltage | | | Voltage reference for 0 V to 5V or 0 V to 10V. |
| Alarm Input | | | Turn off the PHU output with a High (4.5 V to 5 V) |
| Output on/off control | | | Possible logic selections:<br>Turn the output on using a LOW (0 V to 0.5 V) or short-circuit, turn the output off using a HIGH (4.5 V to 5 V) or open-circuit. |
| Alarm clear control | | | Clear alarms with a High (4.5 V to 5 V) |
| CV/CC/CP/ALM/PWR ON/OUT ON indicator | | | Photocoupler open collector output; Maximum voltage 30 V, maximum sink current 8 mA. |
| **Environmental Conditions** | | | |
| Operaing temperature | | | 0 ˚C to 50 ˚C |
| Storage temperature | | | -25 ˚C to 70 ˚C |
| Operating humidity | | | 20 % to 85 % RH; No condensation |
| Storage humidity | | | 90 % RH or less; No condensation |
| Altitude | | | Maximum 2000 m |
| **General Specifications** | | | |
| Weight | main unit only | kg | Less than 30.5 kg |
| Dimensions (W×H×D) | | mm | 442 mm × 130 mm × 675 mm |
| Cooling | | | Forced air cooling by internal fan |
| EMC | | | Complies with the European EMC directive 89/336/EEC for Class A test and measurement products |
| Safety | | | Complies with the European Low Voltage Directive 73/23/EEC and carries the CE-marking |
| Withstand voltage | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: AC 1500 V or DC 2130 V 1 minute |
| Insulation resistance | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: 100 MΩ or more (DC 500 V) |

**Notes:**

***1 Minimum voltage is guaranteed to maximum 0.2 % of the rated output voltage.**
***2 Minimum current is guaranteed to maximum 0.4 % of the rated output current.**
***3 At 180 Vac to 265 Vac or 342 Vac to 528 Vac, constant load.**
***4 From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.**
***5 For 80 V, 200 V models: Measure with JEITA RC-9131B (1:1) probe. For 500 V, 750 V, 1000 V and 1500 V models: Measured with (100:1) probe.**
***6 Measurement frequency bandwidth is 10 Hz to 20 MHz.**
***7 Measurement frequency bandwidth is 5 Hz to 1 MHz.**
***8 From 10 % to 90 % of rated output voltage, with rated resistive load.**
***9 From 90 % to 10 % of rated output voltage, with rated resistive load.**
***10 Time for output voltage to recover within 1 % of its rated output for a load change from 10 % to 90 % of its rated output current.**
**Voltage set point from 10 % to 100 % of rated output.**
***11 For load voltage change, equal to the unit voltage rating, constant input voltage.**
***12 The ripple is measured at 20 % to 100 % output voltage and full output current.**
***13 For output power change from 10 % to 90 %, constant input voltage.**
***14 At rated output power.**

## SPECIFICATIONS(PHU-15 kW Series)

| Model | | PHU | 80-510 | 200-210 | 500-90 | 750-60 | 1000-45 | 1500-30 |
|---|---|---|---|---|---|---|---|---|
| Rated output voltage (*1) | | V | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Rated output current (*2) | | A | 510 | 210 | 90 | 60 | 45 | 30 |
| Rated output power | | W | 15000 | 15000 | 15000 | 15000 | 15000 | 15000 |
| Output power ratio | | – | 2.72 | 2.8 | 3 | 3 | 3 | 3 |
| **Constant Voltage Mode** | | | | | | | | |
| Line regulation (*3) [0.01 % of Vo_rated] | | mV | 8 | 20 | 50 | 75 | 100 | 150 |
| Load regulation (*4) [0.02 % of Vo_rated] | | mV | 16 | 40 | 100 | 150 | 200 | 300 |
| Ripple and noise (*5) | p-p (*6) | mV | 200 | 300 | 350 | 800 | 1600 | 2400 |
| | r.m.s. (*7) | mV | 16 | 40 | 70 | 200 | 350 | 400 |
| Temperature coefficient | | ppm/°C | 100 ppm/°C from rated output voltage, following 30 minutes warm-up. | | | | | |
| Remote snese compensation voltage | 5 % of Vo_rated | V | 4 | 10 | 25 | 37.5 | 50 | 75 |
| Rise time (*8) | Rated load | ms | 30 | 30 | 30 | 30 | 30 | 30 |
| | No load | ms | 30 | 30 | 30 | 30 | 30 | 30 |
| Fall time (*9) | Rated load | ms | 80 | 80 | 80 | 80 | 80 | 80 |
| | No load | ms | 1000 | 1000 | 1000 | 1200 | 1000 | 1200 |
| Transient response time (*10) | | ms | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **Constant Current Mode** | | | | | | | | |
| Line regulation (*3) [0.05 % of Io_rated] | | mA | 255 | 105 | 45 | 30 | 22.5 | 15 |
| Load regulation (*11) [0.1 % of Io_rated] | | mA | 510 | 210 | 90 | 60 | 45 | 30 |
| Ripple and noise (*12) | r.m.s. | mA | 510 | 150 | 48 | 48 | 26 | 26 |
| Temperature coefficient | | ppm/°C | 100 ppm/°C from rated output current, following 30 minutes warm-up. | | | | | |
| **Protection Function** | | | | | | | | |
| Over voltage protection (OVP) | Setting range | V | 5.00 V to 88.00 V | 5.00 V to 220.00 V | 5.00 V to 550.00 V | 5.0 V to 825.0 V | 5.0 V to 1100.0 V | 5.0 V to 1650.0 V |
| | Setting accuracy | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Over current protection (OCP) | Setting range | A | 5.00 A to 561.00 A | 5.00 A to 231.00 A | 5.00 A to 99.00 A | 5.00 A to 66.00 A | 4.5 A to 49.500 A | 3 A to 33.000 A |
| | Setting accuracy | mA | 1020 | 420 | 180 | 120 | 90 | 60 |
| Over power protection (OPP) | Setting range | W | 300 W to 16500 W | 300 W to 16500 W | 300 W to 16500 W | 300 W to 16500 W | 300 W to 16500 W | 300 W to 16500 W |
| | Setting accuracy | W | 150 | 150 | 150 | 150 | 150 | 150 |
| Over voltage limit (OVL) | Setting range | V | 0.00 V to 84.00 V | 0.00 V to 210.00 V | 0.00 V to 525.00 V | 0.0 V to 787.5 V | 0.0 V to 1050.0 V | 0.0 V to 1575.0 V |
| Under voltage limit (UVL) | Setting range | V | 0.00 V to 84.00 V | 0.00 V to 210.00 V | 0.00 V to 525.00 V | 0.0 V to 787.5 V | 0.0 V to 1050.0 V | 0.0 V to 1575.0 V |
| Over current limit (OCL) | Setting range | A | 0.00 A to 535.50 A | 0.00 A to 220.50 A | 0.00 A to 94.50 A | 0.00 A to 63.00 A | 0.000 A to 47.250 A | 0.000 A to 31.500 A |
| Under cuttent limit (UCL) | Setting range | A | 0.00 A to 535.50 A | 0.00 A to 220.50 A | 0.00 A to 94.50 A | 0.00 A to 63.00 A | 0.000 A to 47.250 A | 0.000 A to 31.500 A |
| Power unit fail (PUF) | Operation | | Turn the output off. | | | | | |
| Incorrect sensing connection protection (SENSE) | Operation | | Turn the output off. | | | | | |
| Low AC input protection (AC-FAIL) | Operation | | Turn the output off. | | | | | |
| Shutdown (SD) | Operation | | Turn the output off. | | | | | |
| Power limit (POWER LIMIT) | Operation | | Over power limit. | | | | | |
| | Value (fixed) | | Approx. 102 % of rated output power | | | | | |
| **Other Functions** | | | | | | | | |
| Voltage Slew Rate | Setting range | V/s | 0.01 to 160.00 | 0.01 to 400.00 | 0.1 to 1000.0 | 0.1 to 1500.0 | 0.1 to 2000.0 | 0.1 to 3000.0 |
| | Resolution | mV | 10 | 10 | 100 | 100 | 100 | 100 |
| Current slew rate | Setting range | A/s | 0.1 to 1020.0 | 0.01 to 420.00 | 0.01 to 180.00 | 0.01 to 120.00 | 0.01 to 90.00 | 0.001 to 60.000 |
| | Resolution | mA | 100 | 10 | 10 | 10 | 10 | 1 |
| Internal resistance | Setting range | Ω | 0.000 to 0.157 | 0.00 to 0.95 | 0.00 to 5.56 | 0.00 to 12.50 | 0.00 to 22.22 | 0.0 to 50.0 |
| | Resolution | mΩ | 1 | 10 | 10 | 10 | 10 | 100 |
| **Front Panel** | | | | | | | | |
| Display | | | TFT-LCD, 5", 800 pt x 480 pt | | | | | |
| Voltage accuracy [0.1% of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Current accuracy [0.2% of Io_rated] | | mA | 1020 | 420 | 180 | 120 | 90 | 60 |
| Power accuracy [1% of Po_rated] | | W | 150 | 150 | 150 | 150 | 150 | 150 |
| Voltage resolution | | V | 0.01 | 0.01 | 0.01 | 0.1 | 0.1 | 0.1 |
| Current resolution | | A | 0.01 | 0.01 | 0.01 | 0.001 | 0.001 | 0.001 |
| Power resolution | | W | 1 | 1 | 1 | 1 | 1 | 1 |
| Buttons | | | Menu, Local, Exit, Clear, Enter, Lock, Current, Shift Output, Numeric Keypad | | | | | |
| Rotary knob | | | Turn the knob to increase or decrease the value. | | | | | |
| USB port | | | Type A USB connector | | | | | |
| **Programming and Measurement (Digital Interface)** | | | | | | | | |
| Output voltage programming range | 0 % to 105 % | V | 0 to 84 | 0 to 210 | 0 to 525 | 0 to 787.5 | 0 to 1050 | 0 to 1575 |
| Output current programming range | 0 % to 105 % | A | 0 to 535.5 | 0 to 220.5 | 0 to 94.5 | 0 to 63 | 0 to 47.25 | 0 to 31.5 |
| Output power programming range | 0 % to 102 % | W | 0 to 15300 | 0 to 15300 | 0 to 15300 | 0 to 15300 | 0 to 15300 | 0 to 15300 |
| Output voltage programming accuracy [0.1 % of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Output current programming accuracy [0.2 % of Io_rated] | | mA | 1020 | 420 | 180 | 120 | 90 | 60 |
| Output power programming accuracy [1 % of Po_rated] | | W | 150 | 150 | 150 | 150 | 150 | 150 |
| Output voltage programming resolution | | mV | 10 | 10 | 10 | 100 | 100 | 100 |
| Output current programming resolution | | mA | 10 | 10 | 10 | 1 | 1 | 1 |
| Output power programming resolution | | W | 1 | 1 | 1 | 1 | 1 | 1 |
| Output voltage measurement accuracy [0.1 % of Vo_rated] | | mV | 80 | 200 | 500 | 750 | 1000 | 1500 |
| Output current measurement accuracy [0.2 % of Io_rated] | | mA | 1020 | 420 | 180 | 120 | 90 | 60 |
| Output power measurement accuracy [1 % of Po_rated] | | W | 150 | 150 | 150 | 150 | 150 | 150 |
| Output voltage measurement resolution | | mV | 10 | 10 | 10 | 100 | 100 | 100 |
| Output current measurement resolution | | mA | 10 | 10 | 10 | 1 | 1 | 1 |
| Output power measurement resolution | | W | 1 | 1 | 1 | 1 | 1 | 1 |

| | | | |
|---|---|---|---|
| **Input Characteristics for PHU-C Series** | | | |
| Norminal input rating | | | 3-Phase, 200 V models: 180 Vac to 265 Vac (Covers 200 Vac / 230 Vac) |
| Input frequency range | | | 47 Hz to 63 Hz |
| Maximum input current | 200 Vac | A | 56 A (L1, L2, L3) |
| Inrush current | 200 Vac | A | Less than 100 A |
| Maximum input power | | VA | 18000 |
| Power factor | Rated Power | | > 0.95 |
| Efficiency (*14) | 200 Vac | % | 86 to 94 |
| Hold-up time | | | 10 ms or greater |
| **Input Characteristics for PHU-D Series** | | | |
| Norminal input rating | | | 3-Phase, 400 V models: 342 Vac to 528 Vac (Covers 380/400/415/440/460/480 Vac) |
| Input frequency range | | | 47 Hz to 63 Hz |
| Maximum input current | 400 Vac | A | 28 A (L1, L2, L3) |
| Inrush current | 400 Vac | A | Less than 50 A |
| Maximum input power | | VA | 18000 |
| Power factor | Rated Power | | > 0.95 |
| Efficiency (*14) | 400 Vac | % | 87 to 94 |
| Hold-up time | | | 10 ms or greater |
| **Interface Capabilities** | | | |
| USB | | | Type A: Host, Type B: Slave, Speed: 1.1/2.0, USB Class: CDC(Communications Device Class) |
| LAN | | | MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask |
| Isolated Analog Control Interface | | | $V_{set}$ / $I_{set}$ = 0 V to 5 V or 0 V to 10 V \| $V_{mon}$ / $I_{mon}$ = 0 V to 5 V or 0 V to 10 V |
| Factory Option | | | RS-232&485 or GPIB or CAN Bus or DeviceNet or Isolated Digital I/O |
| **Isolated Analog Control Interface** | | | |
| Vout voltage programming | | | 0 % to 100%, 0 V to 5 V Accuracy: ± 1 % of rated $V_{out}$, or 0~10 V Accuracy: ± 1 % of rated $V_{out}$ |
| Iout voltage programming | | | 0 % to 100 %, 0 V to 5 V Accuracy: ± 1 % of rated $I_{out}$, or 0 V to 10 V Accuracy: ± 1 % of rated $I_{out}$ |
| Pout voltage programming | | | 0 % to 100 %, 0 V to 5 V Accuracy: ± 1 % of rated $P_{out}$, or 0 V to 10 V Accuracy: ± 1 % of rated $P_{out}$ |
| Internal resistance voltage programming | | | 0 % to 100 %, 0 V to 5 V Accuracy: ± 1 % of maximum $R_{int}$, or 0 V to 10 V Accuracy: ± 1 % of maximum $R_{int}$ |
| Output voltage monitor | | | 0 V to 5 V or 0 V to 10 V, Accuracy: ± 1 %. |
| Output current monitor | | | 0 V to 5 V or 0 to 10 V, Accuracy: ± 1 %. |
| Reference voltage | | | Voltage reference for 0 V to 5 V or 0 V to 10 V. |
| Alarm Input | | | Turn off the PHU output with a High (4.5 V to 5 V) |
| Output on/off control | | | Possible logic selections:<br>Turn the output on using a LOW (0 V to 0.5 V) or short-circuit, turn the output off using a HIGH (4.5 V to 5 V) or open-circuit. |
| Alarm clear control | | | Clear alarms with a High (4.5V to 5V) |
| CV/CC/CP/ALM/PWR ON/OUT ON indicator | | | Photocoupler open collector output; Maximum voltage 30 V, maximum sink current 8 mA. |
| **Environmental Conditions** | | | |
| Operaing temperature | | | 0 ˚C to 50 ˚C |
| Storage temperature | | | -25 ˚C to 70 ˚C |
| Operating humidity | | | 20 % to 85 % RH; No condensation |
| Storage humidity | | | 90 % RH or less; No condensation |
| Altitude | | | Maximum 2000 m |
| **General Specifications** | | | |
| Weight | main unit only | kg | Less than 40 kg |
| Dimensions (W×H×D) | | mm | 442 mm × 130 mm × 675 mm |
| Cooling | | | Forced air cooling by internal fan |
| EMC | | | Complies with the European EMC directive 89/336/EEC for Class A test and measurement products. |
| Safety | | | Complies with the European Low Voltage Directive 73/23/EEC and carries the CE-marking. |
| Withstand voltage | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: AC 1500 V or DC 2130 V 1 minute |
| Insulation resistance | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: 100 MΩ or more (DC 500 V) |

**Notes:**

***1 Minimum voltage is guaranteed to maximum 0.2 % of the rated output voltage.**
***2 Minimum current is guaranteed to maximum 0.4 % of the rated output current.**
***3 At 180 Vac to 265 Vac or 342 Vac to 528 Vac, constant load.**
***4 From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.**
***5 For 80 V, 200 V models: Measure with JEITA RC-9131B (1:1) probe. For 500 V, 750 V, 1000 V and 1500 V models: Measured with (100:1) probe.**
***6 Measurement frequency bandwidth is 10 Hz to 20 MHz.**
***7 Measurement frequency bandwidth is 5 Hz to 1 MHz.**
***8 From 10 % to 90 % of rated output voltage, with rated resistive load.**
***9 From 90 % to 10 % of rated output voltage, with rated resistive load.**
***10 Time for output voltage to recover within 1 % of its rated output for a load change from 10 % to 90 % of its rated output current. Voltage set point from 10 % to 100 % of rated output.**
***11 For load voltage change, equal to the unit voltage rating, constant input voltage.**
***12 The ripple is measured at 20 % to 100 % output voltage and full output current.**
***13 For output power change from 10 % to 90 %, constant input voltage.**
***14 At rated output power.**