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# Data Sheet

## UDP5000 Series Programmable DC Power Supplies

REV 2

March 2026

# Product Overview

## Rated Output Voltage: 40 V, 80 V, 160 V, 250 V 800 V

## Total Models: 20

UDP5000 series power supplies feature a compact design, high performance, versatile functionality, a wide output range, user-friendly operation, and flexible usage. The series includes five rated output voltages (40 V, 80 V, 160 V, 250 V,800 V) and five rated output power levels (400 W, 800 W, 1200 W, 2000 W), forming a total of 20 models.

Each model is equipped with:

- USB and LAN communication interfaces
- Output terminals on both the front and rear panels (maximum front panel output current: 10 A)
- Internal variable resistance function
- Discharge circuit control function
- CC/CV mode
- Various protection functions

### Product Specifications

| Model | Voltage Output | Current Output | Output Power |
|---|---|---|---|
| **5040 Model** | | | |
| UDP5040-40 | 0.1-40 V | 0-40 A | 400 W |
| UDP5040-80 | | 0-80 A | 800 W |
| UDP5040-120 | | 0-120 A | 1200 W |
| UDP5040-200 | | 0-200A | 2000 W |
| **5080 Model** | | | |
| UDP5080-20 | 0.1-80 V | 0-20 A | 400 W |
| UDP5080-40 | | 0-40 A | 800 W |
| UDP5080-60 | | 0-60 A | 1200 W |
| UDP5080-100 | | 0-100 A | 2000 W |
| **5160 Model** | | | |
| UDP5160-8 | 0.5-160 V | 0-8 A | 400 W |
| UDP5160-16 | | 0-16 A | 800 W |
| UDP5160-24 | | 0-24 A | 1200 W |
| UDP5160-40 | | 0-40 A | 2000 W |
| **5250 Model** | | | |
| UDP5250-6 | 0.5-250 V | 0-6 A | 400 W |
| UDP5250-12 | | 0-12 A | 800 W |
| UDP5250-18 | | 0-18 A | 1200 W |
| UDP5250-30 | | 0-30 A | 2000 W |
| **5800 Model** | | | |
| UDP5800-2 | 0.5~800V | 0~2A | 400W |
| UDP5800-4 | | 0~4A | 800W |
| UDP5800-6 | | 0~6A | 1200W |
| UDP5800-10 | | 0~10A | 2000W |



# 1 Features

- TFT-LCD Screen

  Provides a richer display with high visibility.

- Intuitive and Concise Interface

  A simple, user-friendly interface allows users to quickly familiarize themselves with the system.

- Wide-Range Output

  A broad variable range of output voltage and current enables various voltage/current combinations.

- Discharge Load Function

  Allows users to set the discharge load state within the power supply based on actual needs.

- List Mode

  Enables presetting multiple sets of output voltages and currents for automatic output.

- Output Terminals on Front and Rear Panels

  Supports output from both the front and rear panels (maximum front panel output current: 10 A).

- Internal Variable Resistance Function

  Allows users to set the internal resistance to simulate a power supply with internal resistance.

- External Analog Voltage Control

  Enables power supply output control using an external circuit.

- USB and LAN (SCPI) Interfaces

  Support communication and remote control with external devices.

- Multi-Unit Series/Parallel Operation

  Allows multiple units to be used together externally to increase output power.

# 2 Desigh Highlights

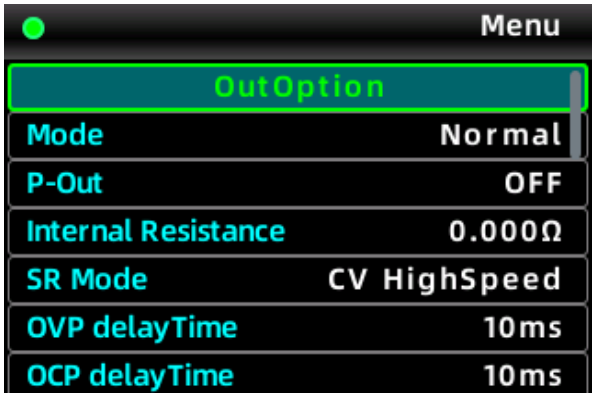
## 2.1 TFT-LCD, Multifunction Buttons

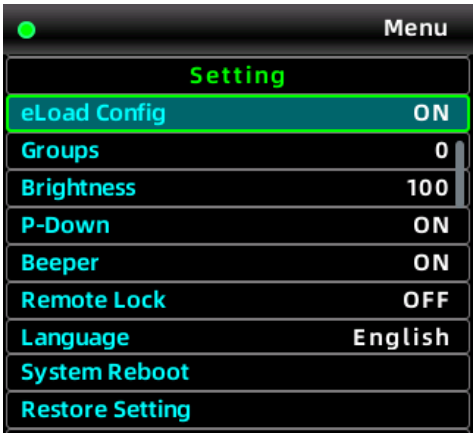


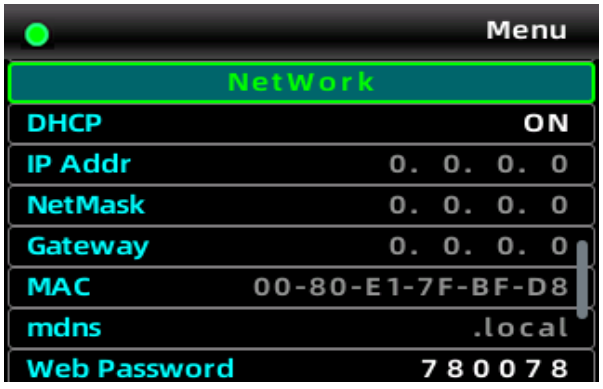

2.4-inch TFT-LCD screen delivers a vibrant color display, offering a comfortable visual experience.

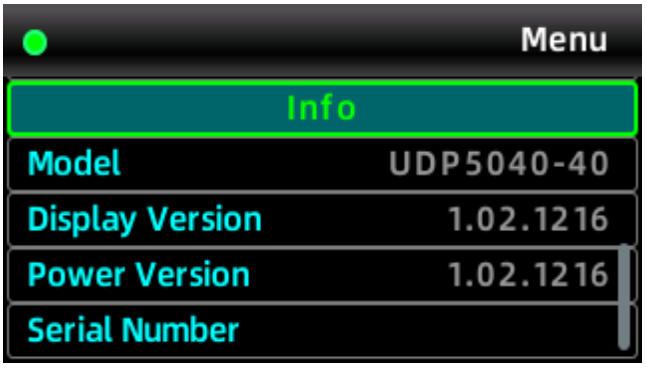
Intuitive multifunction buttons enhance usability, making operation more convenient.

## 2.2 Intuitive Setting Interface




Press the **Menu** key to configure the output, system, and network settings, or to view product information.

# 3 Function Highlights

## Slope Mode Setting

To prevent overshoot when output is enabled:

Constant voltage (CV) mode: Prioritizes voltage control.

Constant current (CC) mode: Prioritizes current control.

| Slope Mode | Description |
|---|---|
| CV High-Speed Priority (VHS) | Default to high-speed rise and fall rates |
| CC High-Speed Priority (IHS) | |
| CV Slope Priority (VSR) | Rise and fall rates can be set as needed |
| CC Slope Priority (ISR) | |

## OVP/OCP Settings

Set upper limits for output voltage and current.

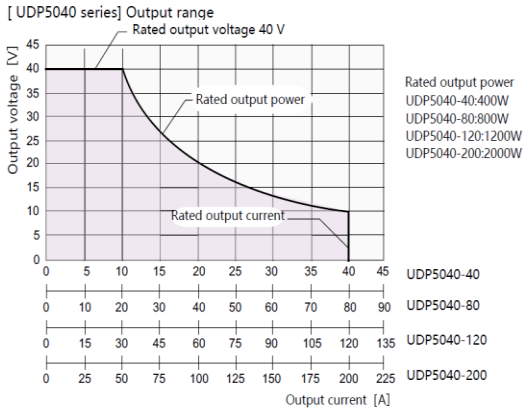
The output set value cannot exceed 95% of the protection value.

The protection value must be at least 105% of the output set value.

Configure a delay time for protection activation, adjustable between 10 ms and 10,000 ms.

## Auto Rage Function

UDP5000 series limits output voltage and current based on the rated power. As a result, voltage and current automatically adjust proportionally.




## List Mode

Users can configure 128 groups of output voltage, current, and output time data combinations. Additionally, the number of cycles and stop status can be configured.

Up to 32 data sets can be stored in the power supply's local memory or exported to external devices.

Once the list is configured and output is activated, the power supply will automatically execute the programmed combinations.

## Discharge Load Function

In the UDP5000 power supplies, a capacitor is connected to the output terminal, and the power supply is equipped with an internal discharge load that discharges the capacitor when the output is turned off.

When the discharge load is disabled, a residual voltage that decreases slowly will remain on the output terminals after the output stops. Conversely, when the discharge load is enabled, the residual voltage will disappear rapidly.

## 3.1 Internal Variable Resistance

The internal variable resistance function can adjust the power supply's internal resistance, simulating real power sources such as secondary batteries, solar cells, and fuel cells.

The internal varaiable resistance can only be set in constant voltage mode.

### Power Internal Resistance Settings

| | Model | Vrtg[V] | Irtg[A] | Rint[Ω] | Resolution*1 | Power |
|---|---|---|---|---|---|---|
| 5040 Model | UDP5040-40 | 40 | 40 | 0.000-1.000 | 0.001 | 400 W |
| | UDP5040-80 | 40 | 80 | 0.000-0.500 | 0.001 | 800 W |
| | UDP5040-120 | 40 | 120 | 0.000-0.333 | 0.001 | 1200 W |
| | UDP5040-200 | 40 | 200 | 0.000-0.200 | 0.001 | 2000 W |
| 5080 Model | UDP5080-20 | 80 | 20 | 0.000-4.000 | 0.001 | 400 W |
| | UDP5080-40 | 80 | 40 | 0.000-2.000 | 0.001 | 800 W |
| | UDP5080-60 | 80 | 60 | 0.000-1.333 | 0.001 | 1200 W |
| | UDP5080-100 | 80 | 100 | 0.000-0.800 | 0.001 | 2000 W |
| 5160 Model | UDP5160-8 | 160 | 8 | 0.000-15.000 | 0.001 | 400 W |
| | UDP5160-16 | 160 | 16 | 0.000-7.500 | 0.001 | 800 W |
| | UDP5160-24 | 160 | 24 | 0.000-5.000 | 0.001 | 1200 W |
| | UDP5160-40 | 160 | 40 | 0.000-3.000 | 0.001 | 2000 W |
| 5250 Model | UDP5250-6 | 250 | 6 | 0.000-31.250 | 0.001 | 400 W |
| | UDP5250-12 | 250 | 12 | 0.000-15.625 | 0.001 | 800 W |
| | UDP5250-18 | 250 | 18 | 0.000-10.416 | 0.001 | 1200 W |
| | UDP5250-30 | 250 | 30 | 0.000-6.250 | 0.001 | 2000 W |
| 5800 Model | UDP5800-2 | 800 | 2 | 0.000~300.0 | 0.001 | 400W |
| | UDP5800-4 | 800 | 4 | 0.000~150.0 | 0.001 | 800W |
| | UDP5800-6 | 800 | 6 | 0.000~100.0 | 0.001 | 1200W |
| | UDP5800-10 | 800 | 10 | 0.000~60.00 | 0.001 | 2000W |

Vrtg[V]: Rated voltage

Irtg[A]: Rated current

Rint[Ω]: Internal resistance

0 < Rint[min]≤ Rint[MAX]

40 V, 80 V model: Rint[Ω]= Vrtg[V]/ Irtg[A]

160 V, 250 V model: Rint[Ω]= Vrtg[V]/ Irtg[A]*0.75

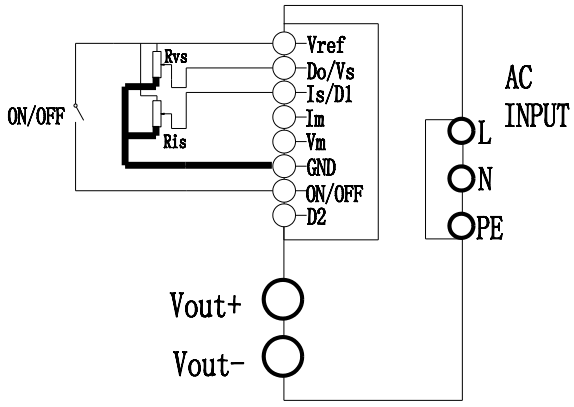
*1. Setting resolution for the power supply's internal resistance.

## 3.2 External Voltage Control

All UDP5000 series models support external analog control and multi-unit combined operation. When using the external analog interface, ensure that the appropriate cable is used for wiring.

For external voltage control, the power supply's operation mode must be set to External Voltage Control.

For detailed instructions, refer to the *UDP5000 Series Programmable DC Power Supply-User Manual*.




Circuit Connection Diagram

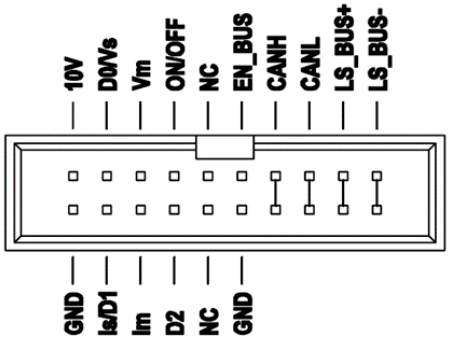
### Using an external switch to control power output ON/OFF

By adjusting the ON/OFF state, the power supply output is regulated accordingly.

### Adjust an external potentiometer to control the output voltage/current

Adjust Rvs and Ris to regulate the output voltage and current levels.

### Rear Panel Analog Interface




| Interface | Definition |
|---|---|
| GND | Ground terminal |
| VREF_V | The power supply internally provides a 10 V reference voltage for external voltage control output. |
| Vs/D0 | Voltage analog control:<br>Analog voltage setting (0-10 V) corresponds to 0-VoutMax. |
| Is/D1 | Current analog control:<br>Current voltage setting (0-10 V) corresponds to 0-IoutMax. |
| D2 | External digital control |
| ON/OFF | External Digital/Analog Control for Power Output ON/OFF<br>High level: Enables the output<br>Low level: Disables the output |
| Vm | Voltage output analog channel (0-10 V) corresponds to 0-VoutMax. |
| Im | Current output analog channel (0-10 V) corresponds to 0-IoutMax. |
| NC | Not connected (not in use) |
| EN_BUS | Coordinates and synchronizes start/stop, protection, and operation modes in multi-unit series/parallel operation, ensuring stable and reliable collaboration between units.<br>Connects to RS485-B (-). |

| | |
|---|---|
| CANH | Enables CAN communication between power supplies, providing a stable and reliable communication foundation for multi-unit operation. |
| CANL | |
| LS_BUS+ | Facilitates synchronized control of multiple units during series/parallel operation, allowing centralized adjustment and output balancing across all power supplies. |
| LS_BUS- | |

## 3.3 Series/Parallel Operation

UDP5000 series power supplies support external multi-unit combined operation with identical models to increase output power. This includes both external multi-unit parallel and external multi-unit series connections.

Before use, select and configure a master unit and slave units, then connect the analog interfaces using the appropriate cables.

Single-control operation refers to setting one instrument as the master unit, while other identical models function as slave units. The entire system can then be controlled through operations on the master unit.

### Single-Control Parallel Operation

Single-control parallel operation increases the output current.

Maximum output current (IoutMax) = Rated output current of power supply x Number of parallel-connected unit.

For example, if three UDP5040-40 models are paralleled, the output current can reach 40 A × 3 = 120 A. The difference in output current between the master unit and slave units must remain within approximately 5% of the rated value.

For single-control parallel operation, the maximum number of identical models that can be paralleled (including the master unit) is as shown in the following table:

| Model | Maximum Parallel-Connected Units |
|---|---|
| 400 W | 4 Units |
| 800 W | 4 Units |
| 1200 W | 4 Units |
| 2000 W | 2 Units |

### Single-Control Series Operation

Single-control series operation increases the output voltage.

Maximum output voltage (Voutmax)= Rated output voltage of power supply x Number of series-connected unit.

For example, if two UDP5250-6 models are series-connected, the maximum voltage can reach 250 V x 2=500 V.

Maximum Series-Connected Units: 2

The voltage setting accuracy is equivalent to the single-unit accuracy of the master unit. The difference in output voltage between the master unit and slave units must remain within approximately 5% of the rated value.

| Model | Maximum Series-Connected Units |
|---|---|
| 400 W | 2 Units |
| 800 W | |
| 1200 W | |
| 2000 W | |

**Note:** The UDP5800 model does not support series connection

# 4 Technical Specifications

## Specification Conditions

This section outlines the technical specifications for the 400 W, 800 W, 1200 W, and 2000 W models of the UDP5000 series. It includes detailed information on input/output specifications, voltage and current specifications, output characteristics, noise and ripple, and display characteristics.

Unless otherwise specified, technical specifications are based on the following settings and conditions (applicable to all models):

- Load Type: Purely resistive load
- Preheating Time: 30 minutes
- Post-Preheating Calibration: The product must be properly calibrated in an environment of 23°C ±5°C following the appropriate calibration procedures.

## Technical Terminology

- Typical value (Typ.): These represent typical values when the product operates at an ambient temperature of 23°C (73.4°F). These values do not guarantee the product's performance.
- Rated value: The specified nominal value.
- Reading: The measured value displayed.
- Rated load and no-load:
  Constant voltage mode (when the output current is set to ≥ the maximum output current at the rated output voltage):
  Rated load: Using a purely resistive load, the output current reaches 95% to 100% of the maximum output current when the rated output voltage is applied.
  No-load: No output current flows through the load (i.e., an open-circuit state).
  Constant current mode (when the output voltage is set to ≥ the maximum output voltage at the rated output current)
  Rated load: Using a purely resistive load, the output voltage drops to 95% to 100% of the maximum output voltage when the rated output current is applied. Including the voltage drop in the load cable, the UDP5000 series power supply output voltage must not exceed the maximum output voltage at the rated output current.
  No-load: Using a purely resistive load, the output voltage drops to 10% of the maximum output voltage or 1 V (whichever is higher) when the rated output current is applied.
- Rise time: The time taken for the output voltage or current to increase from 10% to 90% of the rated value when the power supply output is turned on.
- Fall time: The time taken for the output voltage or current to decrease from 90% to 10% of the rated value when the power supply output is turned off.

UDP5000 series power supply operates within the rated output power range for both voltage and current. However, the available current at the rated output voltage and the available voltage at the specified rated output current are limited by the rated output power:

- Maximum output current at the rated output voltage = Rated output power ÷ Rated output voltage
- Maximum output voltage at the rated output current = Rated output power ÷ Rated output current

## 400 W Model

### AC Input Characteristics

| Specification/Model | | UDP5040-40 | UDP5080-20 | UDP5160-8 | UDP5250-6 | UDP5800-2 |
|---|---|---|---|---|---|---|
| AC Input | | | | | | |
| Nominal input rating | | 100 Vac - 240 Vac, 50Hz - 60Hz, single-phase | | | | |
| Input Voltage Range | | 85 Vac to 265 Vac | | | | |
| Input Voltage Frequency Range | | 47 Hz to 63 Hz | | | | |
| Current (Typ.)*1 | 100 Vac | 5.6 A | | | | |
| | 200 Vac | 2.8 A | | | | |
| Surge Current (MAX) *2 | | Below 25 Apeak | | | | |
| Power (MAX)*3 | | 560 W | | | | |
| Power Factor (Typ.)*1 | | 0.97 (Input voltage: 100 V), 0.95 (Input voltage: 200 V) | | | | |
| Efficiency (MIN)*1 | | 75% (Typ.) | | | | |
| Output Hold Time (MIN)*3 | | Above 20 ms | | | | |

*1. Rated output current at output rated power.

*2. After the power switch is turned on (within approximately 1 ms), the charge current component that flows through the internal EMC filter circuit capacitor is not included.

*3. At output rated power.

## Output Characteristics

| Specification/Model | | | UDP5040-40 | UDP5080-20 | UDP5160-8 | UDP5250-6 | UDP5800-2 |
|---|---|---|---|---|---|---|---|
| Output | | | | | | | |
| Rated Value | Output Voltage*1 | | 40 V | 80 V | 160 V | 250 V | 800V |
| | Output Current*1 | | 40 A | 20 A | 8 A | 6 A | 2A |
| | Output Power | | 400 W | | | | |
| Voltage | Maximum Adjustable Voltage*2 | | 42 V | 84 V | 168 V | 262.5 V | 840 V |
| | Output Accuracy*3 | | ±(0.05% of the set value + 0.05% of the rated value) | | | | |
| | Setting Resolution | | 1 mV | | 10 mV | | |
| | Display Resolution | | 1 mV | | 1 mV (<100 V)<br>10 mV (≥100 V) | | |
| | Power Regulation*4 | | ±6 mV | ±10 mV | ±12.2 mV | ±26 mV | ±403mV |
| | Load Regulation*5 | | ±6 mV | ±10 mV | ±12.2 mV | ±26 mV | ±405mV |
| | Ripple and Noise*6 | p-p*7 | 50 mV | | 100 mV | | 200mV |
| | | rms*7 | 5 mV | | 12 mV | 20 mV | 30mV |
| | Rise Time | Rated Load | Below 50 ms | | Below 100 ms | | Below 250 ms |
| | | No Load | Below 50 ms | | Below 100 ms | | Below 150 ms |
| | Fall Time | Rated Load | Below 50 ms | | 150 ms | 250 ms | 150ms |
| | | No Load | Below 500 ms | | 1200 ms | 2000 ms | |
| | Maximum Remote Sense Compensation Voltage (MAX) | | 1.5 V | 4 V | 5 V | | |
| | Temperature Coefficient*8 | | 100 ppm/°C | | | | |
| Current | Maximum Adjustable Current*2 | | 42 A | 21 A | 8.4 A | 6.3 A | 2.1A |
| | Output Accuracy*9 | | ±(0.5% of the set value + 0.1% of the rated value) | | | | |
| | Setting Resolution | | 1 mA | | | | |
| | Display Resolution | | 1 mA | | | | |
| | Power Regulation*4 | | ±6 mA | ±4 mA | ±3 mA | ±2.5 mA | ±6.44mA |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Load Regulation | | ±13 mA | ±9 mA | ±7 mA | ±6 mA | ±6.44mA |
| | Ripple and Noise*6 | rms*7 | 80 mA | 40 mA | 30 mA | 12mA | 6mA |
| | Rise Time (Typ.) | Rated Load | 50 ms | | 100 ms | | |
| | Fall Time (Typ.) | Rated Load | 50 ms | | 100 ms | | |
| | Temperature Coefficient*8 | | 100 ppm/°C | | | | |
| Maximum Adjustable Internal Resistance | | | 1.000 Ω | 4.000 Ω | 15 Ω | 31.25 Ω | 300 Ω |

*1. The maximum output voltage and maximum output current are constrained by the maximum output power.

*2. OVP and OCP limits are set at approximately 95%.

*3. Applies to a 1% to 100% range of the rated voltage.

*4. For input voltages of 90 VAC to 121 VAC or 198 VAC to 242 VAC under constant load.

*5. When the power supply outputs the rated voltage and operates from no-load to rated load (i.e., outputs the rated current), voltage regulation is calculated as: Output Voltage Regulation= (Load Voltage at No-Load Current - Load Voltage at Rated Load Current) ÷ Load Voltage at Full Load Current ×100%

*6. In constant voltage mode, with the power supply delivering the rated current at rated power, measure the ripple and noise at the output using an oscilloscope

*7. Measurement bandwidth: 20 MHz.

*8. Ambient temperature range: 0°C to 50°C.

*9. Applies to a 1% to 100% range of the rated current. For 0% to 1%, values are typical (Typ.)

## Display Characteristics

| Specification/Model | | UDP5040-40 | UDP5080-20 | UDP5160-8 | UDP5250-6 | UDP5800-2 |
|---|---|---|---|---|---|---|
| Voltage Display | Maximum Display | 99.999 | | 999.99 | | |
| | Minimum Display*1 | 0.100 | | 0.500 | | |
| | Display resolution | 1mV | | 1mV(<100V)<br>10mV(≥100V) | | |
| Current Display | Maximum Display | 99.999 | | 9.999 | | |
| | Display resolution | 1mA | | 1mA | | |
| | Maximum | 999.99 | | | | |

| | | |
|---|---|---|
| Power Display | Display | |
| | Display resolution | 1mW(<100W)<br>10mW(≥100W) |

*1. For the 5040 and 5080 models, the output voltage is 0.1 V, while for the 5160 ,5250 models and 5800 models, the output voltage is 0.5 V.

# 800 W Model

## AC Input Characteristics

| Specification/Model | | UDP5040-80 | UDP5080-40 | UDP5160-16 | UDP5250-12 | UDP5800-4 |
|---|---|---|---|---|---|---|
| AC Input | | | | | | |
| Nominal input rating | | 100 Vac - 240 Vac, 50Hz - 60Hz, single-phase | | | | |
| Input Voltage | | 85 Vac to 265 Vac | | | | |
| Input Voltage Frequency Range | | 47 Hz to 63 Hz | | | | |
| Current (Typ.)*1 | 100 Vac | 11.2 A | | | | |
| | 200 Vac | 5.6 A | | | | |
| Surge Current (MAX) *2 | | Below 50 Apeak | | | | |
| Power (MAX)*3 | | 1120 W | | | | |
| Power Factor (Typ.)*1 | | 0.97 (Input voltage: 100 V), 0.95 (Input voltage: 200 V) | | | | |
| Efficiency (MIN)*1 | | 75% (Typ.) | | | | |
| Output Hold Time (MIN)*3 | | Above 20 ms | | | | |

*1. Rated output current at output rated power.

*2. After the power switch is turned on (within approximately 1 ms), the charge current component that flows through the internal EMC filter circuit capacitor is not included.

*3. At output rated power.

## Output Characteristics

| Specification/Model | | | UDP5040-80 | UDP5080-40 | UDP5160-16 | UDP5250-12 | UDP5800-4 |
|---|---|---|---|---|---|---|---|
| Output | | | | | | | |
| Rated Value | Output Voltage*1 | | 40V | 80V | 160V | 250V | 800V |
| | Output Current*1 | | 80A | 40A | 16A | 12A | 4A |
| | Output Power | | 800W | | | | |
| Voltage | Maximum Adjustable Voltage*2 | | 42V | 84V | 168V | 262.5V | 840V |
| | Output Accuracy*3 | | ±(0.05% of the set value + 0.05% of the rated value) | | | | |
| | Setting Resolution | | 1mV | 1mV | 10mV | 10mV | 10mV |
| | Display Resolution | | 1mV | 1mV | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) |
| | Power Regulation*4 | | ±6mV | ±10mV | ±20mV | ±26mV | ±403mV |
| | Load Regulation*5 | | ±6mV | ±10mV | ±20mV | ±26mV | ±405mV |
| | Ripple and Noise*6 | p-p*7 | 50mV | | 100mV | | 200mV |
| | | rms*7 | 5mV | | 12mV | 20mV | 50mV |
| | Rise Time | Rated Load | Below 50 ms | | Below 100 ms | | Below 250 ms |
| | | No Load | Below 50 ms | | Below 100 ms | | Below 150 ms |
| | Fall Time | Rated Load | Below 50 ms | | 150ms | 250ms | 150ms |
| | | No Load | Below 500 ms | | 1200ms | 2000ms | 2000ms |
| | Maximum Remote Sense Compensation Voltage (MAX) | | 1.5V | 4V | 5V | 5V | 5V |
| | Temperature Coefficient*8 | | 100ppm/°C | | | | |
| Current | Maximum Adjustable Current*2 | | 84A | 42A | 16.8A | 12.6A | 4.2A |
| | Output Accuracy*9 | | ±(0.5% of the set value + 0.1% of the rated value) | | | | |
| | Setting Resolution | | 1mA | 1mA | 1mA | 1mA | 1mA |
| | Display Resolution | | 1mA | 1mA | 1mA | 1mA | 1mA |
| | Power Regulation*4 | | ±6mA | ±4mA | ±3mA | ±2.5mA | ±6.44mA |
| | Load Regulation | | ±13mA | ±9mA | ±7mA | ±6mA | ±6.44mA |
| | Ripple and Noise*6 | rms*7 | 80mA | 40mA | 30mA | 12mA | 6mA |
| | Rise Time (Typ.) | Rated Load | 50ms | | 100ms | | |
| | Fall Time (Typ.) | Rated Load | 50ms | | 100ms | | |
| | Temperature Coefficient*8 | | 100ppm/°C | | | | |
| Maximum Adjustable Internal Resistance | | | 0.500Ω | 2.000Ω | 7.5Ω | 15.625Ω | 150Ω |

*1. The maximum output voltage and maximum output current are constrained by the maximum output power.

*2. OVP and OCP limits are set at approximately 95%.

*3. Applies to a 1% to 100% range of the rated voltage.

*4. For input voltages of 90 VAC to 121 VAC or 198 VAC to 242 VAC under constant load.

*5. When the power supply outputs the rated voltage and operates from no-load to rated load (i.e., outputs the rated current), voltage regulation is calculated as: Output Voltage Regulation= (Load Voltage at No-Load Current - Load Voltage at Rated Load Current) ÷ Load Voltage at Full Load Current ×100%

*6. In constant voltage mode, with the power supply delivering the rated current at rated power, measure the ripple and noise at the output using an oscilloscope

*7. Measurement bandwidth: 20 MHz.

*8. Ambient temperature range: 0°C to 50°C.

*9. Applies to a 1% to 100% range of the rated current. For 0% to 1%, values are typical (Typ.)

## Display Characteristics

| Specification/Model | | UDP5040-80 | UDP5080-40 | UDP5160-16 | UDP5250-12 | UDP5800-4 |
|---|---|---|---|---|---|---|
| Voltage Display | Maximum Display | 99.999 | 99.999 | 999.99 | 999.99 | 999.99 |
| | Minimum Display*1 | 0.100 | 0.100 | 0.500 | 0.500 | 0.500 |
| | Display resolution | 1mV | 1mV | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) |
| Current Display | Maximum Display | 99.999 | 99.999 | 99.999 | 99.999 | 9.999 |
| | Display resolution | 1mA | 1mA | 1mA | 1mA | 1mA |
| Power Display | Maximum Display | 999.99 | | | | |
| | Display resolution | 1mW(<100W)<br>10mW(≥100W) | | | | |

*1. For the 5040 and 5080 models, the output voltage is 0.1 V, while for the 5160 ,5250 models and 5800 models,, the output voltage is 0.5 V.

# 1200 W Model

## AC Input Characteristics

| Specification/Model | | UDP5040-120 | UDP5080-60 | UDP5160-24 | UDP5250-18 | UDP5800-6 |
|---|---|---|---|---|---|---|
| AC Input | | | | | | |
| Nominal input rating | | 100 Vac - 240 Vac, 50Hz - 60Hz, single-phase | | | | |
| Input Voltage | | 85 Vac to 265 Vac | | | | |
| Input Voltage Frequency Range | | 47 Hz to 63 Hz | | | | |
| Current (Typ.)*1 | 100 Vac | 16.8 A | | | | |
| | 200 Vac | 8.4 A | | | | |
| Surge Current (MAX) *2 | | Below 75 Apeak | | | | |
| Power (MAX)*3 | | 1680 W | | | | |
| Power Factor (Typ.)*1 | | 0.97 (Input voltage: 100 V), 0.95 (Input voltage: 200 V) | | | | |
| Efficiency (MIN)*1 | | 75% (Typ.) | | | | |
| Output Hold Time (MIN)*3 | | Above 20 ms | | | | |

*1. Rated output current at output rated power.

*2. After the power switch is turned on (within approximately 1 ms), the charge current component that flows through the internal EMC filter circuit capacitor is not included.

*3. At output rated power.

## Output Characteristics

| Specification/Model | | | UDP5040-120 | UDP5080-60 | UDP5160-24 | UDP5250-18 | UDP5800-6 |
|---|---|---|---|---|---|---|---|
| Output | | | | | | | |
| Rated Value | Output Voltage[*1] | | 40V | 80V | 160V | 250V | 800V |
| | Output Current[*1] | | 120A | 60A | 24A | 18A | 6A |
| | Output Power | | 1200W | | | | |
| Voltage | Maximum Adjustable Voltage[*2] | | 42V | 84V | 168V | 262.5V | 840V |
| | Output Accuracy[*3] | | ±(0.05% of the set value + 0.05% of the rated value) | | | | |
| | Setting Resolution | | 1mV | 1mV | 10mV | 10mV | 10mV |
| | Display Resolution | | 1mV | 1mV | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) |
| | Power Regulation[*4] | | ±6mV | ±10mV | ±20mV | ±26mV | ±403mV |
| | Load Regulation[*5] | | ±6mV | ±10mV | ±20mV | ±26mV | ±405mV |
| | Ripple and Noise[*6] | p-p[*7] | 50mV | | 100mV | | 200mV |
| | | rms[*7] | 5mV | | 12mV | 20mV | 50mV |
| | Rise Time | Rated Load | Below 50 ms | | Below 100 ms | | Below 250 ms |
| | | No Load | Below 50 ms | | Below 100 ms | | Below 150 ms |
| | Fall Time | Rated Load | Below 50 ms | | 150ms | 250ms | 150ms |
| | | No Load | Below 500 ms | | 1200ms | 2000ms | 2000ms |
| | Maximum Remote Sense Compensation Voltage (MAX) | | 1.5V | 4V | 5V | 5V | 5V |
| | Temperature Coefficient[*8] | | 100ppm/°C | | | | |
| Current | Maximum Adjustable Current[*2] | | 126A | 63A | 25.2A | 18.9A | 6.3A |
| | Output Accuracy[*9] | | ±(0.5% of the set value + 0.1% of the rated value) | | | | |
| | Setting Resolution | | 1mA | 1mA | 1mA | 1mA | 1mA |
| | Display Resolution | | 1mA(<100A)<br>10mA(≥100A) | 1mA | 1mA | 1mA | 1mA |
| | Power Regulation[*4] | | ±14mA | ±8mA | ±6mA | ±3.5mA | ±9.32mA |
| | Load Regulation | | ±29mA | ±17mA | ±12mA | ±8mA | ±9.32mA |
| | Ripple and Noise[*6] | rms[*7] | 80mA | 40mA | 30mA | 12mA | 18mA |
| | Rise Time (Typ.) | Rated Load | 50ms | | 100ms | | |
| | Fall Time (Typ.) | Rated Load | 50ms | | 100ms | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Temperature Coefficient*8 | 100ppm/°C | | | | |
| Maximum Adjustable Internal Resistance | | 0.333Ω | 1.333Ω | 5.00Ω | 10.416Ω | 100Ω |

*1. The maximum output voltage and maximum output current are constrained by the maximum output power.

*2. OVP and OCP limits are set at approximately 95%.

*3. Applies to a 1% to 100% range of the rated voltage.

*4. For input voltages of 90 VAC to 121 VAC or 198 VAC to 242 VAC under constant load.

*5. When the power supply outputs the rated voltage and operates from no-load to rated load (i.e., outputs the rated current), voltage regulation is calculated as: Output Voltage Regulation= (Load Voltage at No-Load Current - Load Voltage at Rated Load Current) ÷ Load Voltage at Full Load Current ×100%

*6. In constant voltage mode, with the power supply delivering the rated current at rated power, measure the ripple and noise at the output using an oscilloscope

*7. Measurement bandwidth: 20 MHz.

*8. Ambient temperature range: 0°C to 50°C.

*9. Applies to a 1% to 100% range of the rated current. For 0% to 1%, values are typical (Typ.)

## Display Characteristics

| Specification/Model | | UDP5040-120 | UDP5080-60 | UDP5160-24 | UDP5250-18 | UDP5800-6 |
|---|---|---|---|---|---|---|
| Voltage Display | Maximum Display | 99.999 | 99.999 | 999.99 | 999.99 | 999.99 |
| | Minimum Display*1 | 0.100 | 0.100 | 0.500 | 0.500 | 0.500 |
| | Display resolution | 1mV | 1mV | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) |
| Current Display | Maximum Display | 999.99 | 99.999 | 99.999 | 99.999 | 9.999 |
| | Display resolution | 1mA(<100A)<br>10mA(≥100A) | 1mA | 1mA | 1mA | 1mA |
| Power Display | Maximum Display | 9999.9 | | | | |
| | Display resolution | 1mW(<100W)<br>10mW(≥100W)<br>100mW(≥1000W) | | | | |

* 1. For the 5040 and 5080 models, the output voltage is 0.1 V, while for the 5160 ,5250 models and 5800 models, the output voltage is 0.5 V.

# 2000 W Model

## AC Input Characteristics

| Specification/Model | | UDP5040-200 | UDP5080-100 | UDP5160-40 | UDP5250-30 | UDP5800-10 |
|---|---|---|---|---|---|---|
| AC Input | | | | | | |
| Nominal input rating | | 100 Vac - 240 Vac, 50Hz - 60Hz, single-phase | | | | |
| Input Voltage | | 85 Vac to 265 Vac | | | | |
| Input Voltage Frequency Range | | 47 Hz to 63 Hz | | | | |
| Current (Typ.)*1 | 100 Vac | 28 A | | | | |
| | 200 Vac | 14 A | | | | |
| Surge Current (MAX) *2 | | Below 125 Apeak | | | | |
| Power (MAX)*3 | | 2800 W | | | | |
| Power Factor (Typ.)*1 | | 0.97 (Input voltage: 100 V), 0.95 (Input voltage: 200 V) | | | | |
| Efficiency (MIN)*1 | | 75% (Typ.) | | | | |
| Output Hold Time (MIN)*3 | | Above 20 ms | | | | |

*1. Rated output current at output rated power.

*2. After the power switch is turned on (within approximately 1 ms), the charge current component that flows through the internal EMC filter circuit capacitor is not included.

*3. At output rated power.

## Output Characteristics

| Specification/Model | | | UDP5040-200 | UDP5080-100 | UDP5160-40 | UDP5250-30 | UDP5800-10 |
|---|---|---|---|---|---|---|---|
| Output | | | | | | | |
| Rated Value | Output Voltage*1 | | 40V | 80V | 160V | 250V | 800V |
| | Output Current*1 | | 200A | 100A | 40A | 30A | 10A |
| | Output Power | | 2000W | | | | |
| Voltage | Maximum Adjustable Voltage*2 | | 42V | 84V | 168V | 262.5V | 840V |
| | Output Accuracy*3 | | ±(0.05% of the set value + 0.05% of the rated value) | | | | |
| | Setting Resolution | | 1mV | 1mV | 10mV | 10mV | 10mV |
| | Display Resolution | | 1mV | 1mV | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) |
| | Power Regulation*4 | | ±6mV | ±10mV | ±20mV | ±26mV | ±403mV |
| | Load Regulation*5 | | ±6mV | ±10mV | ±20mV | ±26mV | ±405mV |
| | Ripple and Noise*6 | p-p*7 | 50mV | | 100mV | | 250mV |
| | | rms*7 | 5mV | | 12mV | 20mV | 50mV |
| | Rise Time | Rated Load | Below 50 ms | | Below 100 ms | | Below 250 ms |
| | | No Load | Below 50 ms | | Below 100 ms | | Below 150 ms |
| | Fall Time | Rated Load | Below 50 ms | | 150ms | 250ms | 150ms |
| | | No Load | Below 500 ms | | 1200ms | 2000ms | 2000ms |
| | Maximum Remote Sense Compensation Voltage (MAX) | | 1.5V | 4V | 5V | 5V | 5V |
| | Temperature Coefficient*8 | | 100ppm/°C | | | | |
| Current | Maximum Adjustable Current*2 | | 210A | 105A | 42A | 31.5A | 10.5A |
| | Output Accuracy*9 | | ±(0.5% of the set value + 0.1% of the rated value) | | | | |
| | Setting Resolution | | 10mA | 10mA | 1mA | 1mA | 1mA |
| | Display Resolution | | 1mA(<100A)<br>10mA(≥100A) | 1mA(<100A)<br>10mA(≥100A) | 1mA | 1mA | 1mA |
| | Power Regulation*4 | | ±22mA | ±12mA | ±6mA | ±4.5mA | ±9.32mA |
| | Load Regulation | | ±45mA | ±25mA | ±18mA | ±10mA | ±9.32mA |
| | Ripple and Noise*6 | rms*7 | 400mA | 200mA | 100mA | 60mA | 30mA |
| | Rise Time (Typ.) | Rated Load | 50ms | | 100ms | | |
| | Fall Time (Typ.) | Rated Load | 50ms | | 100ms | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Temperature Coefficient*8 | 100ppm/°C | | | | |
| Maximum Adjustable Internal Resistance | | 0.200Ω | 0.800Ω | 3.00Ω | 6.250Ω | 60Ω |

*1. The maximum output voltage and maximum output current are constrained by the maximum output power.

*2. OVP and OCP limits are set at approximately 95%.

*3. Applies to a 1% to 100% range of the rated voltage.

*4. For input voltages of 90 VAC to 121 VAC or 198 VAC to 242 VAC under constant load.

*5. When the power supply outputs the rated voltage and operates from no-load to rated load (i.e., outputs the rated current), voltage regulation is calculated as: Output Voltage Regulation= (Load Voltage at No-Load Current - Load Voltage at Rated Load Current) ÷ Load Voltage at Full Load Current ×100%

*6. In constant voltage mode, with the power supply delivering the rated current at rated power, measure the ripple and noise at the output using an oscilloscope

*7. Measurement bandwidth: 20 MHz.

*8. Ambient temperature range: 0°C to 50°C.

*9. Applies to a 1% to 100% range of the rated current. For 0% to 1%, values are typical (Typ.)

## Display Characteristics

| Specification/Model | | UDP5040-200 | UDP5080-100 | UDP5160-40 | UDP5250-30 | UDP5800-10 |
|---|---|---|---|---|---|---|
| Voltage Display | Maximum Display | 99.999 | 99.999 | 999.99 | 999.99 | 999.99 |
| | Minimum Display*1 | 0.100 | 0.100 | 0.500 | 0.500 | 0.500 |
| | Display resolution | 1mV | 1mV | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) | 1mV(<100V)<br>10mV(≥100V) |
| Current Display | Maximum Display | 999.99 | 999.99 | 99.999 | 99.999 | 99.999 |
| | Display resolution | 1mA(<100A)<br>10mA(≥100A) | 1mA(<100A)<br>10mA(≥100A) | 1mA | 1mA | 1mA |
| Power Display | Maximum Display | 9999.9 | | | | |
| | Display resolution | 1mW(<100W)<br>10mW(≥100W)<br>100mW(≥1000W) | | | | |

*1. For the 5040 and 5080 models, the output voltage is 0.1 V, while for the 5160,5250 and 5800 models, the output voltage is 0.5 V.

# Common Specifications

## Protection Function

| Specification/Model | | 400 W Model | 800 W Model | 1200 W Model | 2000 W Model |
|---|---|---|---|---|---|
| Protection Function | | | | | |
| Over-Voltage Protection (OVP) | | Automatically turns off*1 when triggered, and a window display: "OVP is triggered, the output will be turned off." | | | |
| | Setting Range | 0% to 105% of the rated output voltage. | | | |
| | Setting Accuracy | 1 mV (for single-unit rated values < 100 V)<br>10 mV (for single-unit rated values ≥ 100 V) | | | |
| Over-Current Protection (OCP)*2 | | Automatically turns off*1 when triggered, and a window display: "OCP is triggered, the output will be turned off." | | | |
| | Adjustable Range | 0% to 105% of the rated output current. | | | |
| | Adjustable Accuracy | 1 mA (for single-unit rated values < 100 A)<br>10 mA (for single-unit rated values ≥ 100 A | | | |
| Front Output Terminal Over-Current Protection (FOCP)*3 | | Automatically turns off*1 when triggered, and a window display: "FOCP is triggered, the output will be turned off." | | | |
| | Value (fixed) | > 10A (Typ.) | | | |
| Over-Temperature Protection (OTP) | | Automatically turns off*1 when triggered, and a window display: "OTP is triggered, the output will be turned off." | | | |
| Shutdown (SD) | | Turn off the power supply | | | |
| Power Limit | | Automatically turns off*1 when triggered, and a window display: "Power limit is triggered, the output will be turned off." | | | |
| | Value (fixed) | Close to 105% of the rated output power. | | | |
| Communication Monitoring (Watchdog) | | Restarts automatically, and a window display: "The watchdog failed. It will automatically restart." | | | |
| Single-Control Series/Parallel Operation Protection (PRL ALM) | | Automatically turns off the output, and a window display: "Master/slave failed, the output will be turned off." | | | |

*1. For 2000 W models, this may result in output disconnection or circuit breaker tripping.

*2. This does not prevent peak discharge currents in the internal capacitors of the UDP5000 power supply's output section during sudden load changes.

*3. The front-panel output current is limited to a maximum of 10 A. Values exceeding 10 A will trigger protection. If the OCP (Over-Current Protection) threshold is lower than the FOCP (Fast Over-Current Protection) threshold, OCP takes precedence.

## Signal Input/Output

| Specification/Model | | 400 W Model | 800 W Model | 1200 W Model | 2000 W Model |
|---|---|---|---|---|---|
| Signal Input/Output | | | | | |
| Monitoring Signal Output | Voltage Monitor (VMON) | Voltage Monitor Range: 0 V to 10 V | | | |
| | Current Monitor (IMON)*1 | Voltage Monitor Range: 0 V to 10 V | | | |
| State Output | Output State | This function is enabled when the power supply output is active. | | | |
| | CV Mode | This function is enabled when the power supply operates in constant voltage (CV) mode. | | | |
| | CC Mode | This function is enabled when the power supply operates in constant current (CC) mode. | | | |
| | Alarm State | This function is enabled when an alarm is triggered. | | | |
| | Power State | Power State: The power is on when the switch is turned on. | | | |
| Trigger Signal | Input (Trigger Input) | Logic: Low level (0 V to 1.5 V), high level (3.5 V to 5 V)<br>Input resistance: 10 kΩ (Typ.) | | | |
| | Output (Trigger Output) | Logic: Low level (0 V to 0.6 V), high level (4.2 V to 5 V)<br>Pulse Width: 100 μs (Typ.) | | | |

*1. Control the voltage on the current sampling path to regulate the output current.

## Control Function

| Specification/Model | | | 400 W Model | 800 W Model | 1200 W Model | 2000 W Model |
|---|---|---|---|---|---|---|
| Control Functions | | | | | | |
| External Voltage Control | Output Voltage Control (VPGM) | | 0 % to 100 % of the rated output voltage<br>Voltage Control Range: 0 V to 10 V | | | |
| | | Accuracy | ±5% | | | |
| | Output Current Control (IPGM) | | 0 % to 100 % of the rated output voltage<br>Voltage Control Range: 0 V to 10 V | | | |
| | | Accuracy | ±5% | | | |
| | Output ON/OFF Control | | When the switch is closed, a high-level signal enables the output.<br>When the switch is open, a low-level signal disables the output. | | | |

## Other Functions

| Specification/Model | | 400 W Model | 800 W Model | 1200 W Model | 2000 W Model |
|---|---|---|---|---|---|
| Other Functions | | | | | |
| Output ON/OFF Delayer | | Setting Range: 0.1 s to 9999.9 s[*1]<br>Resolution: 0.1 s, 1 s, 10 s, 100 s, 1000 s, 10000 s | | | |
| OVP/OCP Enable Delayer[*2] | | Setting Range: 10 ms to 10000 ms<br>Resolution: 10 ms, 100 ms | | | |
| Preset Value | | Group Number: 32*3 groups | | | |
| Keypad Lock | | Unlocks all keys except the Output key | | | |
| List Mode | | Setting Group: 0 to 128 groups<br>Cycle Count: 1 to 9,999, infinite[*3]<br>Step Time: 0.1 s to 99,999.9 s | | | |
| Synchronous Operation Mode | | Synchronizes voltage and current settings, recovery steps, and sequence execution in a P-sequence program. | | | |
| Multi-Unit External Parallel Operation Mode[*4] | | Supports up to three parallel-connected units (same model), including the master unit. | | | Supports up to two parallel-connected units (same model), including the master unit. |
| Multi-Unit External Series Mode | | Except for the 5800 model, Supports up to two series-connected units (same model). | | | |
| Multi-Communication (VMCB) | Master Connects to PC | Ethernet, USB | | | |
| | Master Connects to Slave | CAN | | | |

*1. Factory default setting is 0.1 s.

*2. Factory default setting is 10 ms.

*3. Set it to 0 for infinite loop.

*4. The difference between the master and slave is 5% (Typ.)

## Operation Display

| Specification/Model | 400 W Model | 800 W Model | 1200 W Model | 2000 W Model |
|---|---|---|---|---|
| Operation Display | | | | |
| Output ON/OFF | The Output button lights up green when the output is active. | | | |
| CV Operation | The display shows "CV" in green when in constant voltage mode. | | | |
| CC Operation | The display shows "CC" in red when in constant current mode. | | | |
| Alarm | When a protective function is activated, a window displays detailed error information and automatically turns off the output | | | |
| Key Lock | The Lock button lights up green when locked. | | | |
| Remote Control | The operation mode is displayed as "External Control." | | | |

## Interface

| Specification/Model | | 400 W Model | 800 W Model | 1200 W Model | 2000 W Model |
|---|---|---|---|---|---|
| Interface | | | | | |
| General Specification | Software Protocol | IEEE Std 488.2-1992 | | | |
| | Command | SCPI Specification 1999.0 | | | |
| USB | Hardware | USB 2.0<br>Data Rate: 480 Mbps (high speed) | | | |
| | | B-type outlet | | | |
| | Program Message Terminator | Receiving: The program message terminator is LF (Line Feed) or EOM.<br>Sending: The program message terminator is LF and +EOM. | | | |
| | Device Category | USBTMC-USB48 | | | |
| LAN | Hardware | IEEE 802.3 100Base-TX/ 10Base-T<br>LXI 2011 Ver.1.4<br>LXI HiSLIP Rev.1.01 | | | |
| | | IPv4, RJ-45 connector | | | |
| | Communication Protocol | VXI-11, SCPI-RAW, HiSLIP | | | |
| | Program Message Terminator | For VXI-11 and HiSLIP: When receiving, the message terminator can be LF or END.<br>For SCPI-RAW: When receiving, the terminator is a low-level signal. When transmitting, the terminator is also a low-level signal. | | | |

## General Specifications

| Specification/Model | | 400 W Model | 800 W Model | 1200 W Model | 2000 W Model |
|---|---|---|---|---|---|
| Weight (Main Unit Only) | | Approx. 3 kg | Approx. 5.5 kg | Approx. 7.5 kg | Approx.13 kg |
| Dimensions | | Refer to the outline dimension drawing. | | | |
| Environmental Conditions | Operating Environment | Indoor use, Overvoltage Category II | | | |
| | Operating Temperature | 0°C to +50°C | | | |
| | Operating Humidity | 20% R.H to 85% R.H (non-condensing) | | | |
| | Storage Temperature | -20°C to +60°C | | | |
| | Storage Humidity | 90% R.H or below (non-condensing) | | | |
| | Altitude | Below 2000 meters | | | |
| Cooling Method | | Fan-forced air cooling | | | |
| Grounding Polarity | | Both positive ground and negative ground | | | |
| Grounding Voltage | | Applicable models: UDP5040, UDP5080, UDP5160, UDP5250and UDP5800<br>Maximum: ±500 Vmax | | | |
| Voltage Withstand | Through Main Circuit and Chassis | 1500 VAC applied for 1 minute with no abnormalities. | | | |
| | Through Main Circuit and Secondary Circuit | UDP5040, UDP5080, UDP5160, and UDP5250 models: 1650 VAC applied for 1 minute with no abnormalities.<br>UDP5800 models: 1900 VAC applied for 1 minute with no abnormalities. | | | |
| Insulation Resistance | Through Main Circuit and Chassis | 100 MΩ or more (at ≤70% R.H), measured at 500 VDC. | | | |
| | Through Main Circuit and Secondary Circuit | UDP5040, UDP5080, UDP5160, and UDP5250 models:100 MΩ or more (at ≤70% R.H), measured at 500 VDC.<br>UDP5800 models:100 MΩ or more (at ≤70% R.H), measured at 1000 VDC. | | | |
| | Across Secondary Circuit and Chassis | UDP5040, UDP5080, UDP5160, and UDP5250 models: 40 MΩ or more (at ≤70% R.H), measured at 500 VDC.<br>UDP5800 models:100 MΩ or more (at ≤70% R.H), measured at 1000 VDC. | | | |
| Electro Magnetic Compatibility (EMC)[*1*2] | | EMC 2014/30/EU<br>EN61326-1(Class A[*3])<br>EN55011(Class A[*3], Group I)<br>EN61000-3-2<br>EN61000-3-3<br>Applicable Conditions:<br>Cables and wires connected to this product must be ≤3 meters in length. | | | |
| Safety[*1] | | Low Voltage Directive 2014/35/EU[*2]<br>EN61010-1(Class I[*4], Pollution degree 2[*5]) | | | |

*1. Not applicable to customized or modified products.

*2. Applies only to products with the CE marking.

*3. Class A device: Designed for industrial environments. Operation in residential areas may cause interference. To prevent radio/TV signal disruption, users should implement measures to reduce electromagnetic emissions if necessary.

*4.Class I device: Requires proper grounding of the protective earth terminal. Proper grounding is essential for safety compliance.

*5. Pollution Degree 2: Defined as non-conductive pollution (e.g., dust, oil mist) that may temporarily become conductive due to condensation, reducing insulation withstand capacity and surface resistivity.

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