**High-Efficiency, Large-Capacity Switching Power Supply**  
**PAT-T Series**

8 kW type (13 models*) and 4 kW type (4 models): 17 models in total.  
PAT-T Series Smart Rack System 200 V/400 V Input Type: 164 models in total.  
Ambient temperature of 50°C under full load continuous operation (Smart Rack System: 40°C)  
Parallel operation up to five units for increased power. (40 kW)  
Equipped with power factor correction circuit.  
High noise resistance.  
RS232C standard digital interface.  
USB, GPIB, and LAN optional digital interfaces.  
LXI compliant LAN communication interface.  
*PAT1000-8T, PAT1500-5.3T NEW

**Features**
- Power factor: 0.95  
- Equipped with power factor correction circuit.
- DC Power Supply
- High-Efficiency, Large-Capacity
- Switching Power Supply
- PAT-T Series
- 8 kW type (13 models) and 4 kW type (4 models): 17 models in total.
- PAT-T Series Smart Rack System 200 V/400 V Input Type: 164 models in total.
- Ambient temperature of 50°C under full load continuous operation (Smart Rack System: 40°C)
- Parallel operation up to five units for increased power. (40 kW)
- Equipped with power factor correction circuit.
- High noise resistance.
- RS232C standard digital interface.
- USB, GPIB, and LAN optional digital interfaces.
- LXI compliant LAN communication interface.

*NEW Output voltage 1000 V / 1500 V

*NEw lineup

3 kW maximum power output even with single-phase input
(4 kW type)
High-capacity, compact, durable and environmentally friendly.

High-Efficiency, Large-Capacity Switching Power Supply

PAT-T SERIES

Available in 2 types, with rated power outputs of 8 kW and 4 kW: 17 models in total.

Outline

The PAT-T Series is a CV/CC auto-shifting switching DC power supply featuring excellent efficiency and low noise due to a soft switching system design. The PAT-T series is equipped with state-of-the-art high-density packaging technology allowing for extremely high power capacity with a vastly reduce chassis size and weight. A built-in "power factor correction circuit" greatly reduces noise while suppressing harmonic currents for an optimal electronic test environment. Power reception and distribution modules have been simplified resulting in lower power consumption and an overall decreased cost of ownership. Guaranteed continuous operation at ambient temperatures as high as 50°C make the PAT-T the perfect power supplies for extremely demanding environments even under full-load. The PAT-T is equipped with an intuitive, user-friendly display panel supporting standard RS232C digital interface as well as external analog control, monitor output and status output connectors allowing for control via computer or sequencer. USB, GPIB, or LAN (LXI) digital interfaces are also available as a factory option. The PAT-T power supply is an extremely versatile test instrument easily incorporated into any test system or used stand-alone.

Lineup

<table>
<thead>
<tr>
<th>Rated Power</th>
<th>Model</th>
<th>Rated Voltage</th>
<th>Rated Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 kW*</td>
<td>PAT20-400T</td>
<td>0 V to 20 V</td>
<td>0 A to 400 A</td>
</tr>
<tr>
<td></td>
<td>PAT30-266T</td>
<td>0 V to 30 V</td>
<td>0 A to 266 A</td>
</tr>
<tr>
<td></td>
<td>PAT40-200T</td>
<td>0 V to 40 V</td>
<td>0 A to 200 A</td>
</tr>
<tr>
<td></td>
<td>PAT60-133T</td>
<td>0 V to 60 V</td>
<td>0 A to 133 A</td>
</tr>
<tr>
<td></td>
<td>PAT80-100T</td>
<td>0 V to 80 V</td>
<td>0 A to 100 A</td>
</tr>
<tr>
<td></td>
<td>PAT160-50T</td>
<td>0 V to 160 V</td>
<td>0 A to 50 A</td>
</tr>
<tr>
<td></td>
<td>PAT250-32T</td>
<td>0 V to 250 V</td>
<td>0 A to 32 A</td>
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<tr>
<td></td>
<td>PAT350-22.8T</td>
<td>0 V to 350 V</td>
<td>0 A to 22.8 A</td>
</tr>
<tr>
<td></td>
<td>PAT500-16T</td>
<td>0 V to 500 V</td>
<td>0 A to 16 A</td>
</tr>
<tr>
<td></td>
<td>PAT650-12.3T</td>
<td>0 V to 650 V</td>
<td>0 A to 12.3 A</td>
</tr>
<tr>
<td></td>
<td>PAT850-9.4T</td>
<td>0 V to 850 V</td>
<td>0 A to 9.4 A</td>
</tr>
<tr>
<td></td>
<td>PAT1000-8T (SPEC21163)</td>
<td>0 V to 1000 V</td>
<td>0 A to 8.0 A</td>
</tr>
<tr>
<td></td>
<td>PAT1500-5.3T (SPEC21164)</td>
<td>0 V to 1500 V</td>
<td>0 A to 5.3 A</td>
</tr>
</tbody>
</table>

4 kW

<table>
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<tr>
<th>Rated Power</th>
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<th>Rated Voltage</th>
<th>Rated Current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PAT20-200T</td>
<td>0 V to 20 V</td>
<td>0 A to 200 A</td>
</tr>
<tr>
<td></td>
<td>PAT40-100T</td>
<td>0 V to 40 V</td>
<td>0 A to 100 A</td>
</tr>
<tr>
<td></td>
<td>PAT60-67T</td>
<td>0 V to 60 V</td>
<td>0 A to 67 A</td>
</tr>
<tr>
<td></td>
<td>PAT160-25T</td>
<td>0 V to 160 V</td>
<td>0 A to 25 A</td>
</tr>
</tbody>
</table>

*3-phase 400 V/460 V available for 8 kW type models.
RS232C standard digital interface, USB, GPIB and LAN (LXI compliant) options available.

Communication interface

Commands are compatible with both SCPI and IEEE 488.2 standards. Free measurement instrument drivers (available on website) are available for control via Excel VBA and LabView alongside proprietary Kikusui sequence creation software, "Wavy for PAT-T," allowing for easy creation and editing of customization of user-defined waveforms. The digital LAN interface is compliant with LXI (LAN eXtensions for Instrumentation), meaning that the PAT-T can easily be controlled and monitored from a remote browser.

USB, GPIB, and LAN (LXI compliant) factory option.
*One optional interface per power supply unit.

"Wavy" sequence creation software

Wavy series

Waveform generation software further enhancing the PAT-T Series potential.
Wavy software allows the user to easily create and edit sequences with the click of a mouse.

- Sequence creation and test condition data editing made easy.
- Test data can be stored as a data file for easy management of standard test conditions.
- Easy monitoring of test sequence progress on graph alongside real-time setting values.
- Monitor graph plots values during sequence execution for intuitive monitoring of actual output power.
- Capable of saving acquired monitor data as test results.
- "Waveform image" window has been added for easy monitoring of AC signals.
- Arbitrary waveforms can be easily created and edited.
- Once created, arbitrary waveforms can immediately be written and output.
- Easily select and de-select steps within sequence. The pause function, trigger function, AC waveform and other functions allow for maximum customization.

Free trial available on our website!!
TOUGH & ECO-FRIENDLY

High Power in Compact Chassis!

Save precious testing laboratory space!

[Size comparison]
Comparison between PAT-T (8 kW) and previous Kikusui product (7 kW)

Optional vertical stand!

Optional vertical stand for easy transportation and table side operation. Compatible with all PAT-T series models. Caster-equipped frame and handle kit included.

Soft switching system

The PAT-T power supply circuit system skillfully utilizes resonance when executing power device switching when the voltage or current is at zero. This allows the unit to operate without switching loss or transient crossover of voltage and current. Switching that occurs at 0V is known as “zero voltage switching” (ZVS), while switching at zero current is referred to as “zero current switching” (ZCS). With conventional power supply circuits, problems such as increased power loss and diminishing efficiency occur when switching speed increases. However, a soft-switching system utilizes highly efficient power supply circuits that reduce heat loss and allow for smaller circuitry, resulting in compact chassis size as well as minimal noise generation.

Power factor correction circuit

The power factor (PF) values indicates the efficiency of an AC circuit, referring to the ratio of effective power to apparent power. The closer the power factor is to 1, the more efficient the equipment (circuit) is in its electrical power usage. Incorporating a power factor correction circuit corrects AC voltage and current phase differences (waveform deviations causing reactive power), improving electrical power efficiency. Specific advantages include the following:

● Increased energy efficiency.
● Downsizing of power reception and distribution modules.
● Improved power supply environment.
● Reduces transmission loss.
● Vastly reduces noise emissions.

[Input Power Comparison (Apparent Power)]

<table>
<thead>
<tr>
<th>Power factor</th>
<th>0.6</th>
<th>0.95</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.7 kVA</td>
<td>(45.3 A)</td>
<td></td>
</tr>
<tr>
<td>9.9 kVA</td>
<td>(28.6 A)</td>
<td></td>
</tr>
</tbody>
</table>

40 V, 200 A DC at full-load with 85% efficiency.

Improving the power factor from 0.6 to 0.95 reduces required input power by approximately 40%. A high power factor saves energy!
Parallel operation up to five units of the same model!
Up to five units (two units for PAT850-9.4T, PAT1000-8T and PAT1500-5.3T) can be configured in a master-slave parallel connection. This allows you to control the whole system via the master unit front panel with full display of the current sum (max. output current: rated output current of single unit x number of parallel units). Furthermore, the output current of each slave unit can be monitored by pressing the STORE button of each slave unit*. For parallel connection, parallel operation cable PC01-PAT is required for each slave unit.

Series operation up to two units of the same model!
Up to two units can be connected in series for 8 kW (PAT20-400T, PAT30-266T, PAT40-200T, PAT60-133T, PAT80-100T, and PAT160-50T) and 4 kW types. However, master-slave operation is not supported. The sum of the output voltage between the two units is supplied to the load.

Increased Capacity via Parallel Operation: Max. 40 kW, 2000 A

Convenient, Intuitive, and Safe

4 kW types operable with single-phase 200 V input.
The current is limited to approximately 75% of the rated value with a power limit of 3 kW.

CV, CC priority starting function*
The PAT-T can be set to start up as either a constant voltage (CV) power supply or constant current (CC) power supply when the output is turned ON. CV priority mode is used during constant voltage, while CC priority mode is used during constant current for smooth startup without overshoot.

Output current rise waveform comparison during constant current operation

External analog control function
Output voltage can be controlled by an external voltage (Vext) of 0 V to 10 V or an external resistance (Rext) of 0 kΩ to 10 kΩ. FAST mode* allows for direct control of external voltage (without passing through CPU), removing any delay between Vext and changes in output voltage.

Other functions
- RS232C standard digital interface
- USB/GPIB/LAN optional digital interfaces
- Reliable output ON/OFF delay function for sequence output
- Memory function (three sets of voltage/current)
- Voltage/current monitor output
- Status signal output
- Remote sensing function
- Protection functions
  - Protections against shutdown, overvoltage, overcurrent, overheating, input phase interruption, fan malfunction, sensing, and bleeder circuit overheating available
  - High noise resistance
    (for reassurance during car electronics testing)
- Easy maintenance with quick fan replacement

*Not available with 8 kW-type 400 V input models (20 V, 40 V, 60 V, and 160 V types) and 4 kW types.
**APPLICATION**

**Purpose and Application Examples/Various Functions**

Output voltage lineup ranging from 20 V to 1500 V. Highly versatile power supply for a wide range of tests and evaluations.

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**Car electronics applications**

- Automotive headlight lifetime testing
- High-capacity air conditioner inverters and motor performance/endurance testing
- Brushless motor (for EPS and MG unit) performance/endurance testing
- IPM, IGBT and other power module performance testing
- Starter motor performance evaluation
- EV/HEV electrical component performance testing

**DC-DC converter and related devices**

- **Simple Voltage Variation Tests**
  Medium-speed voltage variation in a battery can be simulated by connecting a high voltage DC power supply and DC electronic load in parallel. Voltage variation waveforms can be created with the optional Wavy sequence creation software.

- **Brushless Motor Surge Protection**
  Protect the power supply and ECU from regenerative current from the motor during brushless motor performance tests with a DC electronic load.

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Output voltage lineup ranging from 20 V to 1500 V. Highly versatile power supply for a wide range of tests and evaluations.
Crest Factor Function
The PCZ1000A is equipped with a Crest Factor function for peak and harmonic currents during load tests. Crest factor value programmable from 1.4 to 4.0.

Parallel Operation Function
Up to 5 units can be configured in master-slave parallel connection. (Max. 5 kW, 50 Arms)

Tracking Operation Function
Synchronized setting values between master and slave units for convenient use as a single-phase 3-wire AC electronic load.

*Please refer to our product catalog or home page for further details on the PCZ1000A.

Solar Power Generation

Simplified Power Conditioner Evaluation System
Easily simulate changes over time by sequentially controlling solar panels, in-home loads and AC loads simultaneously.
V2H/L EV Simulator

There is always the risk of breakdown or failure to comply with various charging standards (CHAdEMO, Combo, GB, etc.) when using an actual EV in quick charger and V2H/L power conditioner R&D testing. Using an EV simulator makes it possible to closely evaluate charging devices in accordance with various charging standards without requiring an actual vehicle.

DC-DC Converter Evaluation Test System

By utilizing a combination of programmable DC power supplies, electronic loads, and dedicated application software, performance tests for automotive DC-DC converters has never been easier.

Power Semiconductor Evaluation System

Temperature changes caused by rapid increases in current are often measured in transient thermal tests for semiconductors. Utilizing the PAT-T series DC power supply and PLZ-5WH series electronic load, rapid changes in current from a few hundred A to several thousands A can easily be realized in a matter of milliseconds.
Battery Evaluation Test

Although high-speed operation cannot be achieved using only the PAT-T high-capacity switching power supply, the fast-response unipolar power supply system can be supplemented by connecting with the PLZ-5W series electronic load in series and parallel. This makes it possible to flow current while synchronizing the charge and discharge current patterns for a battery at high speeds.

Fuse Rupture Test

For fuse rupture tests, DC power supplies with high speed CC control is absolutely vital. Although it is normally quite difficult to achieve such high speed control with only a DC power supply, the addition of a PLZ-5W electronic load makes high speed current control possible. With the PLZ-5W, fuse rupture tests that adhering to standards such as the JASO D612 are made possible. These tests include voltage drop tests, transient current cut-off tests, rupture time tests, step energization tests, and breaker capacity tests.

Current Sensor Evaluation

Accurate current sensor evaluation possible when combined with a high-precision CC DC power supply. Additionally, 3-level range settings allow you to select your desired current setting resolution in accordance with your test requirements.
Smart Rack System (PAT-TX/TMX)

Maximum output of 40 kW, 2000 A!

This high-current model consists of multiple PAT-T Series units configured in a special cabinet rack.
- High power: 16 kW to 40 kW, 4 types
- Built-in power factor correction (PFC) circuit for harmonic current control and energy efficiency!
- Optional built-in circuit breaker (“X” models)
- 3-Phase 200 V and 3-Phase 400 V input specifications available
- RS232C standard digital interface. USB, GPIB, and LAN (LXI) available as factory options.
- Lineup: 164 models in total (82 models in table below are 3-phase 200 V input type)

<table>
<thead>
<tr>
<th>Output rating</th>
<th>16 kW</th>
<th>24 kW</th>
<th>32 kW</th>
<th>40 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 V type</td>
<td>PAT20-800TM</td>
<td>PAT20-1200TM</td>
<td>PAT20-1600TM</td>
<td>PAT20-2000TM</td>
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<tr>
<td></td>
<td>PAT20-800TMX</td>
<td>PAT20-1200TMX</td>
<td>PAT20-1600TMX</td>
<td>PAT20-2000TMX</td>
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<tr>
<td>30 V type</td>
<td>PAT30-532TM</td>
<td>PAT30-798TM</td>
<td>PAT30-1064TM</td>
<td>PAT30-1330TM</td>
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<tr>
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<td>PAT30-532TMX</td>
<td>PAT30-798TMX</td>
<td>PAT30-1064TMX</td>
<td>PAT30-1330TMX</td>
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<tr>
<td>40 V type</td>
<td>PAT40-400TM</td>
<td>PAT40-600TM</td>
<td>PAT40-800TM</td>
<td>PAT40-1000TM</td>
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<tr>
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<td>PAT40-400TMX</td>
<td>PAT40-600TMX</td>
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<td>PAT40-1000TMX</td>
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<tr>
<td>60 V type</td>
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<td>PAT60-665TM</td>
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<td>PAT60-665TMX</td>
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<tr>
<td>80 V type</td>
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<td>PAT80-400TM</td>
<td>PAT80-500TM</td>
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<td>PAT250-128TM</td>
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<td>PAT650-49.2TMX</td>
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<td>PAT850-18.8TM</td>
<td>PAT850-18.8TM</td>
<td>PAT850-18.8TM</td>
</tr>
</tbody>
</table>

*First number indicates rated voltage, second number indicates rated current.
[Example] PAT20-2000TM = 0 V to 20 V rated voltage, 0 A to 2,000 A rated current. “X” models are equipped with an optional breaker.
Dimensions (Maximum)/Weight

- **PAT-TM Series 16 kW System**
  432.6(445)×17.03(17.52")W×336.9(425)H×223.25(27.76")D mm (inch) / Approx. 80 kg (176.37 lb) (PAT-TM: with no breaker)

- **PAT-TM Series 24 kW System**
  432.6(445)×17.03(17.52")W×469.6(555)H×223.25(27.76")D mm (inch) / Approx. 120 kg (264.55 lb) (PAT-TM: with no breaker)

- **PAT-TM Series 32 kW System**
  432.6(445)×17.03(17.52")W×602.3(705)H×223.25(27.76")D mm (inch) / Approx. 150 kg (330.69 lb) (PAT-TM: with no breaker)

- **PAT-TM Series 40 kW System**
  432.6(445)×17.03(17.52")W×735(835)H×223.25(27.76")D mm (inch) / Approx. 180 kg (396.83 lb) (PAT-TM: with no breaker)

- **PAT-TMX Series 16 kW System**
  432.6(445)×17.03(17.52")W×486.7(575)H×223.25(27.76")D mm (inch) / Approx. 90 kg (198.42 lb) (PAT-TMX: with breaker)

- **PAT-TMX Series 24 kW System**
  432.6(445)×17.03(17.52")W×619.4(705)H×223.25(27.76")D mm (inch) / Approx. 130 kg (286.60 lb) (PAT-TMX: with breaker)

- **PAT-TMX Series 32 kW System**
  432.6(445)×17.03(17.52")W×752.1(855)H×223.25(27.76")D mm (inch) / Approx. 160 kg (352.74 lb) (PAT-TMX: with breaker)

- **PAT-TMX Series 40 kW System**
  432.6(445)×17.03(17.52")W×974.8(1075)H×223.25(27.76")D mm (inch) / Approx. 200 kg (440.92 lb) (PAT-TMX: with breaker)

**Accessories**

Instruction manual, protective cover, connecting screws

- **Rear panel (24 kW example)**
  *Protective cover was removed for photograph.

- **Breaker included**
- **Breaker not included**

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11
## 8 kW Type Specifications

### Input
- **Nominal input rated voltage**: Three-phase 200 V to 240 V, 50 Hz to 60 Hz
- **Efficiency**: 85% (TYP) [at input voltage of 200 VAC and rated load]
- **Power factor**: 0.95 (TYP) [at input voltage of 200 VAC and rated load]
- **Input current**: 32 A (MAX) [rated load]
- **Input current**: 100 A peak (MAX)
- **Input power**: 10 kVA (MAX)

### Output
- **Rated output power**: 8 kW
- **Rated output voltage**: 20.00 V, 30.00 V, 40.00 V, 60.0 V, 80.0 V, 160.0 V, 250.0 V
- **Rated output current**: 400.0 A, 266.0 A, 200.0 A, 133.0 A, 100.0 A, 50.0 A, 32.00 A
- **Setting accuracy**: ± (0.2% of rating + 50 mV)
- **Max setting voltage**: 105% of rating
- **Line regulation**: ± (0.05% of rating + 5 mV)
- **Load regulation**: ± (0.1% of rating + 5 mV)
- **Transient response time**: 5 ms (with sensing at external output, at an instantaneous change in the load current from 50% to 100%)
- **Ripple noise**:
  - 100 mVp-p when the measurement frequency band is 10 Hz to 20 MHz
  - 10 mVrms when the measurement frequency band is 5 Hz to 1 MHz
- **Temperature coefficient**: 100 ppm/˚C (MAX) [with external analog control]

### Constant current *
- **Setting accuracy**: ± (0.5% of rating + 50 mA)
- **Max setting current**: 105% of rating
- **Line regulation**: ± (0.1% of rating + 30 mA)
- **Load regulation**: ± (0.2% of rating + 30 mA)
- **Ripple noise**: 500 mArms, 400 mArms, 400 mArms, 350 mArms, 300 mArms, 200 mArms, 200 mArms
- **Temperature coefficient**: 200 ppm/˚C (Typ) [with external analog control]

### Output ON/OFF delay
- **OFF. 0.1 to 10.0 s (resolution: 0.1 s)

### Voltage display
- **Maximum display**: 99.99
- **Error**: ± (0.2% of reading + 5 digits) at 23˚C ± 5˚C

### Current display
- **Maximum display**: 999.9
- **Error**: ± (0.5% of reading + 5 digits) at 23˚C ± 5˚C

### Protection function
- **Overvoltage protection (OVP) / Overcurrent protection (OCP) / Overheat protection (OHP) / Input open phase protection (PHASE) / Fan error protection (FAN) / Mis-connection protection (SENSE) / Breeder circuit overheating protection (BOHP) / Shutdown (SD)

### External analog control
- **OUTPUT ON/OFF control, etc.**: OUTPUT ON/OFF, SHUTDOWN
- **Constant voltage, external voltage control**: 0% to 100% of the rated output voltage at 0 to 10 V
- **Constant voltage, external resistance control**: 0% to 100% or 100% to 0% of the rated output voltage at 0 Ω to 10 kΩ
- **Constant current, external voltage control**: 0% to 100% or 100% to 0% of the rated output current at 0 Ω to 10 V
- **Constant current, external resistance control**: 0% to 100% or 100% to 0% of the rated output current at 0 Ω to 10 kΩ

### Monitor output
- **Output voltage**: 10.00 V ± 0.25 V at rated voltage output
- **Output current**: 0.00 V ± 0.25 V at 0 A current

### Status output
- **OUT ON, CV, CC, ALARM, POWER ON, POWER OFF, insulated open collector

### Remote control
- **Equipped with RS232C interface as standard. SCPI commands, up to 38,400 bps

### Operating temperature/humidity range
- **0˚C to 50˚C, 20% to 85% rh

### Storage temperature/humidity range
- **-25˚C to 70˚C, 90% rh or less (non-condensing)

### Dimensions (maximum)
- **430 (440)(16.93''(17.32'')) W × 129.2 (155)(5.09''(6.10'')) H × 550 (620)(21.65''(24.41'')) D mm(\inch)

### Weight
- **Approx. 26 kg (57.32 lb)
- **Approx. 27 kg (59.52 lb)
- **Approx. 25 kg (55.12 lb)
- **Approx. 24 kg (52.91 lb)
- **Approx. 23 kg (50.71 lb)

*During constant current operation (set the output voltage at the rated output current greater than equal to the rated output voltage)

**Rated load**: Refers to a load with a resistance that makes the voltage drop when the rated output current is supplied to be 95% to 100% of the maximum output voltage at the rated output current. The output voltage of the PAT including the voltage drop in the load cable must not exceed the maximum output voltage at the rated output current.

**No load**: Refers to a load with a resistance that makes the voltage drop when the rated output current is supplied to be 10% of the maximum output voltage or 1 V, whichever is greater, at the rated output current.
## 8 kW Type Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>PAT350-22.8T</th>
<th>PAT500-16T</th>
<th>PAT650-12.3T</th>
<th>PAT850-9.4T</th>
<th>PAT1000-8T</th>
<th>PAT1500-5.3T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal input rated voltage</td>
<td>Three-phase 200 V to 240 V, 50 Hz to 60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage range/ Input frequency range</td>
<td>180 V to 250 V / 47 Hz to 63 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>85% (min) [at input voltage of 200 VAC and rated load]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power factor</td>
<td>0.95 (typical) [at input voltage of 200 VAC and rated load]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input current</td>
<td>32 A (max) [rated load]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intush current</td>
<td>100 A (peak)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input power</td>
<td>10 kVA (max)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Rating**                        |              |            |              |             |            |              |
| Rating                            | 8 kW         |            |              |             |            |              |
| Rated output power                |              |            |              |             |            |              |
| Rated output voltage              | 350.0 V      | 500.0 V    | 650.0 V      | 850.0 V     | 1000.0 V   | 1500.0 V     |
| Rated output current              | 22.80 A      | 16.00 A    | 12.30 A      | 9.40 A      | 8.00 A     | 5.30 A       |

| **Output**                        |              |            |              |             |            |              |
| **Constant voltage**              |              |            |              |             |            |              |
| Setting accuracy                  | ± (0.2% of rating + 50 mV) | ± (0.5% of rating + 50 mA) | ± (0.5% of rating + 50 mA) | ± (0.2% of rating + 30 mA) | ± (0.1% of rating + 30 mA) | ± (0.1% of rating + 50 mV) |
| Max setting voltage               | 105% of rating |              |              |             |            |              |
| Line regulation                   | ± (0.05% of rating + 5 mV) | ± (0.2% of rating + 50 mV) | ± (0.2% of rating + 50 mV) | ± (0.2% of rating + 30 mA) | ± (0.2% of rating + 30 mA) | ± (0.05% of rating + 5 mV) |
| Load regulation                   | ± (0.1% of rating + 5 mV) |              |              |             |            |              |
| Transient response time           | 5 ms (with sensing at external output, at an instantaneous change in the load current from 50% to 100%) | 5 ms (with sensing at external output, at an instantaneous change in the load current from 50% to 100%) | 5 ms (with sensing at external output, at an instantaneous change in the load current from 50% to 100%) | 5 ms (with sensing at external output, at an instantaneous change in the load current from 50% to 100%) | 5 ms (with sensing at external output, at an instantaneous change in the load current from 50% to 100%) | 5 ms (with sensing at external output, at an instantaneous change in the load current from 50% to 100%) |
| Ripple noise                      | 450 mVp-p    | 600 mVp-p   | 600 mVp-p    | 600 mVp-p   | 800 mVp-p  | 1200 mVp-p   |
| Max setting current               | 100%         |            |              |             |            |              |
| Line regulation                   | ± (0.2% of rating + 30 mA) | ± (0.2% of rating + 30 mA) | ± (0.2% of rating + 30 mA) | ± (0.2% of rating + 30 mA) | ± (0.2% of rating + 30 mA) | ± (0.2% of rating + 30 mA) |
| Load regulation                   | ± (0.1% of rating + 30 mA) | ± (0.1% of rating + 30 mA) | ± (0.1% of rating + 30 mA) | ± (0.1% of rating + 30 mA) | ± (0.1% of rating + 30 mA) | ± (0.1% of rating + 30 mA) |
| Ripple noise                      | 200 mArms    | 200 mArms   | 200 mArms    | 200 mArms   | 200 mArms  | 200 mArms    |
| **Constant current**             |              |            |              |             |            |              |
| Setting accuracy                  | ± (0.5% of rating + 50 mA) | ± (1% of rating + 100 mA) | ± (1% of rating + 100 mA) | ± (0.2% of rating + 30 mA) | ± (1% of rating + 100 mA) | ± (0.2% of rating + 30 mA) |
| Max setting current               | 105%         |            |              |             |            |              |
| Line regulation                   | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) |
| Load regulation                   | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) | ± (0.5% of rating + 50 mV) |
| Temperature coefficient           | 100 ppm/°C (max) [with external analog control] | 100 ppm/°C (max) [with external analog control] | 100 ppm/°C (max) [with external analog control] | 100 ppm/°C (max) [with external analog control] | 100 ppm/°C (max) [with external analog control] | 100 ppm/°C (max) [with external analog control] |

### External analog control

**Output ON/OFF control, etc.**
- Overvoltage protection (OVP) / Overcurrent protection (OCP) / Overheat protection (OHP) / Input open phase protection (PHASE) / Fan error protection (FAN) / Mis-connection protection (SENSE) / Breeder circuit overheat protection (BOHP) / Shutdown (SD)
- OUTPUT ON/OFF, SHUTDOWN

**Constant voltage, external resistance control**
- 0% to 100% or 100% to 0% of the rated output voltage at 0 Ω to 10 kΩ

**Constant current, external voltage control**
- 0% to 100% of the rated output voltage at 0 V to 10 V

**Constant current, external resistance control**
- 0% to 100% or 100% to 0% of the rated output current at 0 Ω to 10 kΩ

- 0% to 100% or 100% to 0% of the rated output current at 0 V to 10 kΩ
- 0% to 100% or 100% to 0% of the rated output current at 0 Ω to 10 kΩ

### Protection function

**Output voltage**
- 10.00 V ±0.25 V at rated voltage output
- 0.00 V ±0.25 V at 0 V output
- 0.00 V ±0.25 V at 0 V output
- 10.00 V ±0.25 V at rated current output
- 0.00 V ±0.25 V at 0 A current

### Status output

- OUTPUT ON, CV, CC, ALARM, POWER ON, POWER OFF, insulated open collector

### Remote control

- Equipped with RS232C interface as standard. SCPI commands, up to 38,400 bps

### Operating temperature/humidity range

- 0°C to 50°C, 20% to 85% rh

### Storage temperature/humidity range

- -25°C to 70°C, 90% rh or less (non-condensing)

### Dimensions (maximum)

- 430 (440) (16.93” (17.32”)): W x 129.2 (155) (5.09” (6.10”)): H x 550 (620) (21.65” (24.41”)): D mm (inch)

### Weight

- Approx. 23 kg (50.71 lb)
- Approx. 22 kg (48.50 lb)
- Approx. 23 kg (50.71 lb)

● Rear panel (8 kW type PAT40-200T rear panel)

● Dimensions (same for each model)
### 4 kW Type Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>PAT20-200T</th>
<th>PAT40-100T</th>
<th>PAT60-67T</th>
<th>PAT160-25T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal input rated voltage</td>
<td>Single-phase/three-phase 200 to 240 VAC, 50-60 Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage range/Input frequency range</td>
<td>180 V to 250 V / 47 Hz to 63 Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>84% (min)</td>
<td>85% (min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power factor</td>
<td>0.95 (typical)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input current</td>
<td>Single-phase 22 A (max)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input current</td>
<td>Single-phase 22 A (max)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input power</td>
<td>Single-phase 4 kW (max)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated output power</td>
<td>4 kW (three-phase input mode) / 3 kW (single-phase input mode)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated output voltage</td>
<td>20.00 V</td>
<td>40.00 V</td>
<td>60.00 V</td>
<td>160.0 V</td>
</tr>
<tr>
<td>Rated output current</td>
<td>200.0 A</td>
<td>100.0 A</td>
<td>67.00 A</td>
<td>25.00 A</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting accuracy</td>
<td>± (0.2% of reading +50 mV)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max setting voltage</td>
<td>105% of rating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line regulation</td>
<td>± (0.05% of range +5 mV)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load regulation</td>
<td>± (0.1% of range +5 mV)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transient response time</td>
<td>5 ms (at instantaneous change in load current from 50% to 100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ripple noise</td>
<td>100 mVp-p</td>
<td>300 mVp-p</td>
<td>350 mVp-p</td>
<td>350 mVp-p</td>
</tr>
<tr>
<td>Rise time</td>
<td>100 ms (rated load)/100 ms (no load)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>100 ms (rated load)/2000 ms (no load)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>± (0.5% of range +50 mA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max setting current</td>
<td>105% of rating + 75% (with single-phase input) / 105% of rating (with three-phase input)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line regulation</td>
<td>± (0.1% of range +30 mA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load regulation</td>
<td>± (0.2% of range +30 mA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ripple noise</td>
<td>100 mVrms</td>
<td>30 mVrms</td>
<td>30 mVrms</td>
<td>30 mVrms</td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>200 ppm/˚C (max)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Protection function</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overvoltage protection (OVP) / Overcurrent protection (OCP) / Overheat protection (OHP) / Mis-connection protection (SENSE) / Breeder circuit overheat protection (BOHP) / Shutdown (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>External analog control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUTPUT ON/OFF control, etc.</td>
<td>OUTPUT ON/OFF, SHUTDOWN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant voltage, external voltage control</td>
<td>0% to 100% of the rated output voltage at 0 to 10 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant voltage, external resistance control</td>
<td>0% to 100% or 100% to 0% of the rated output voltage at 0 to 10 kΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant current, external voltage control</td>
<td>0% to 100% or 100% to 0% of the rated output current at 0 to 10 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant current, external resistance control</td>
<td>0% to 100% or 100% to 0% of the rated output current at 0 to 10 kΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Monitor output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output voltage</td>
<td>10.00 V ±0.25 V at rated voltage output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>0.00 V ±0.25 V at 0 V output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output current</td>
<td>10.00 V ±0.25 V at rated current output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.00 V ±0.25 V at 0 A current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Status output</strong></td>
<td>OUT ON, CV, CC, ALARM, POWER ON, POWER OFF, insulated open collector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Remote control</strong></td>
<td>Equipped with RS232C interface as standard. SCPI commands, up to 38,400 bps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating temperature/humidity range</strong></td>
<td>0˚C to 50˚C, 20% to 85% rh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage temperature/humidity range</strong></td>
<td>-25˚C to 70˚C, 90% rh or less (non-condensing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions (maximum)</td>
<td>430 (440)(16.93’’(17.32’’)) W × 129.2 (155)(5.09’’(6.10’’)) H × 550 (620)(21.65’’(24.41’’)) D mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 20 kg(44.09 lb)</td>
<td>Approx. 19 kg(41.89 lb)</td>
<td>Approx. 18 kg(39.68 lb)</td>
<td></td>
</tr>
</tbody>
</table>

*During constant current operation (set the output voltage at the rated output current greater than equal to the rated output voltage) Rated load: Refers to a load with a resistance that makes the voltage drop when the rated output current is supplied to be 95 % to 100% of the maximum output voltage at the rated output current. The output voltage of the PAT Type can include the voltage drop in the load cable must not exceed the maximum output voltage at the rated output current. No load: Refers to a load with a resistance that makes the voltage drop when the rated output current is supplied to be 10 % of the maximum output voltage or 1 V, whichever is greater, at the rated output current.*

*Only one of these can be built in the power supply unit optionally.*

**Communication Interface (Each Model is the Same)**

- **RS232C**
  - Conforms to EIA232D specifications. D-SUB 9-pin connector
  - Baud rate: 1200, 2400, 4800, 9600, 19200, 38400 bps
  - Data length: 7 or 8 bits, Stop bit length: 1 or 2 bits, Parity: None, flow control

- **GPIB**
  - Conforms to IEEE Std 488.1-1987 specifications.
  - Conforms to IEEE Std 488.2-1992, SCPI Specification

- **USB**
  - Conforms to USB2.0 specifications. Communication speed: 12 Mbps (full speed)

- **LAN**
  - Conforms to the protocol VXI-11
  - IEEE 802.3 100Base-TX/10Base-T Ethernet IPv4, RJ-45 connector

- **Common**
  - Conforms to the messaging protocol IEEE Std 488.2-1992, SCPI Specification 1999.0

Note: An input power cable is not included with the PAT-T series. Customers should either provide an input cable themselves or request an input cable (AC8-4P4M-M6C) sold optionally by Kikusui.
### Smart Rack Model Specifications

Unless otherwise stated, the specifications shall conform to the settings and conditions indicated hereinafter. Loads shall be purely resistance. If warm-up time shall be 30 minutes (condition with current flowing). After warm-up is completed, it will be necessary to calibrate correctly in a 23°C±5°C environment and in accordance with instruction manual procedures. "Typ" values or standard values do not guarantee performance. "% of reading" indicates % of the output voltage or output current. "% of rating" indicates % of the rated output voltage or rated output current.

#### Specifications

<table>
<thead>
<tr>
<th>Model Name *1</th>
<th>Output</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CV</td>
<td>CC</td>
</tr>
<tr>
<td>PAT20-800TM (X)</td>
<td>0 to 20</td>
<td>0 to 800</td>
</tr>
<tr>
<td>PAT20-1200TM (X)</td>
<td>0 to 40</td>
<td>0 to 1200</td>
</tr>
<tr>
<td>PAT20-1600TM (X)</td>
<td>0 to 60</td>
<td>0 to 1600</td>
</tr>
<tr>
<td>PAT20-2000TM (X)</td>
<td>0 to 1000</td>
<td></td>
</tr>
<tr>
<td>PAT40-400TM (X)</td>
<td>0 to 20</td>
<td>0 to 400</td>
</tr>
<tr>
<td>PAT40-600TM (X)</td>
<td>0 to 60</td>
<td>0 to 600</td>
</tr>
<tr>
<td>PAT40-800TM (X)</td>
<td>0 to 800</td>
<td></td>
</tr>
<tr>
<td>PAT40-1000TM (X)</td>
<td>0 to 1000</td>
<td></td>
</tr>
<tr>
<td>PAT60-266TM (X)</td>
<td>0 to 266</td>
<td></td>
</tr>
<tr>
<td>PAT60-399TM (X)</td>
<td>0 to 399</td>
<td></td>
</tr>
<tr>
<td>PAT60-532TM (X)</td>
<td>0 to 532</td>
<td></td>
</tr>
<tr>
<td>PAT60-655TM (X)</td>
<td>0 to 655</td>
<td></td>
</tr>
<tr>
<td>PAT160-250TM (X)</td>
<td>0 to 250</td>
<td></td>
</tr>
</tbody>
</table>

**Common specifications and general specifications**

- **Voltage display** : Maximum display: 99.99 (model with less than 100 V rating)
- **Current display** : Maximum display: 9999 (model with less than 1000 A rating)
- **Display error** : ±(0.2% of reading + 5 digits)
- **Dimensions (mm)** : Model without breaker
  - 16 kW type: W433(445) × H337(425) × D765(945)
  - 24 kW type: W433(445) × H470(555) × D765(945)
  - 32 kW type: W433(445) × H602(705) × D765(945)
  - 40 kW type: W433(445) × H735(835) × D765(945)
- **Model with breaker**
  - 16 kW type: W433(445) × H487(575) × D765(945)
  - 24 kW type: W433(445) × H620(705) × D765(945)
  - 32 kW type: W433(445) × H752(855) × D765(945)
- **Value appearing in ( )** : Maximum that includes protruding portion.

**Environment specifications**

- **Operating temperature** : 0 °C to 40 °C
- **Operating humidity** : 20% to 85% (no condensation)
- **Storage temperature** : -25 °C to 70 °C
- **Ground polarity** : Negative or positive ground possible
- **Ground voltage** : +250 Vmax ( models less than 100 V )
- **+500 Vmax (models from 100 V to less than 500 V)**

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*1: Breaker-equipped models have an "X" attached at the end of the model name. *2: Models appearing in ( ) are breaker-equipped models.
Options

- **Vertical stand**
  - VS01

- **Rack mount bracket**
  - KRB3-TOS (inch size)
  - KRB150-TOS (millimeter size)

- **Input power cable**
  - AC8-4P4M-M6C

- **Parallel operation cable**
  - PC01-PAT
  - (Flat cable: 250 mm)

- **Power switch guard**
  - OP01-PAT

*PAT-T series main unit is not included.*

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3625 Del Amo Blvd, Suite 160, Torrance, CA 90503
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**KIKUSUI TRADING (SHANGHAI) Co., Ltd.**
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For our local sales distributors and representatives, please refer to “sales network” of our website.

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