



# StageSmarts smartPDU

## User Manual

smartPDU 36

smartPDU 48

smartPDU 72

*StageSmarts*

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*smartPDU User Manual Revision A*

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# Safety information

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**Warning! Read the following important safety information before connecting or using the smartPDU. If you are in any doubt about how to use the unit safely or about the information in this user manual, contact StageSmarts for advice before applying power to the unit.**

The following symbols are used to identify important safety information in this user manual:



**Warning!** Safety hazard. Risk of severe injury or death.



**Warning!** Hazardous voltage. Risk of lethal or severe electric shock.



**Warning!** See user manual for important safety information.



**Warning!** Fire hazard.

Follow the safety precautions listed below and observe all warnings in this user manual and printed on the smartPDU. Keep this manual for future use. Before connecting or using the smartPDU, visit the StageSmarts website at <http://www.stagesmarts.com> and make sure that you have the latest user documentation for the unit.

The smartPDU must be used only by professional persons with technical training and a thorough understanding of power distribution systems and their potential hazards. The unit presents risks of severe or lethal electric shock, physical injury or fire.

Respect all locally applicable laws, codes and regulations when operating the smartPDU.

Do not attempt to carry out any repairs on the smartPDU. Refer all repairs and any service operation not described in this manual to StageSmarts or one of its authorized service partners. Do not try to carry out any repairs or unauthorized service yourself, as doing so may involve serious or lethal safety hazards. It may also cause damage or malfunction and may void your product warranty.

Do not try to modify the smartPDU in any way not described in this user manual. Connect and operate the smartPDU only as directed in this user manual, or you may create a serious or lethal safety hazard. You may also cause damage that is not covered by product warranties.



## Electrical safety

- Make sure that the Emergency Stop button on the smartPDU is easily accessible at all times so that it is possible to shut down power to the installation immediately in an emergency. Check that all professionals working on site know where the Emergency Stop button is located and that they can access the button.
- Do not expose the smartPDU to moisture or allow it to become wet. Do not use or store the smartPDU outdoors or in wet conditions.
- Use the smartPDU only in a location that is inaccessible to members of the public.

- Display notices with recognized warning symbols such as the ones used in this user manual around the smartPDU and the rest of the installation to give sufficient warning of the presence of high-voltage electrical hazards.
- Isolate the smartPDU from power before replacing the air filter and when it is not in use.
- Ensure that the smartPDU is electrically connected as described in this user manual to a protective earth (ground) that has been tested and complies with BS 7909 or the local equivalent standard for temporary electrical installations.
- Use only a source of AC power that complies with local electrical codes and has both overload and ground-fault (earth-fault) protection.
- Make sure that all cables used for power input, throughput and output are of a suitable type for their application and have suitable electrical ratings for their load. Use only power cables that comply with BS 7909 or the local equivalent standard for temporary electrical installations.
- Protect the smartPDU and all power cables from the possibility of damage. Locate them inside protective enclosures if necessary.
- Use only connectors of the types specified in this user manual.
- Before using the smartPDU, check that all connectors are correctly engaged. If connectors have a locking mechanism, check that they are correctly locked.
- Before using the smartPDU – and at regular intervals – check that all power distribution equipment and cables are in perfect condition. Isolate the fixture from power immediately if any circuit breaker, cable, connector or other component appears to be damaged, defective, deformed, wet or showing signs of overheating. Contact StageSmarts for advice on having repairs carried out. Do not reapply power until repairs have been completed.
- Test all temporary electrical installations on site immediately after assembly on site. Test installations at shows, exhibitions and similar events in accordance with IEC 60364-6-61.



### Fire safety

- Ensure that there is free and unobstructed airflow around the smartPDU. Provide a minimum clearance of 100 mm (4 in.) around all air vents.
- Do not use the smartPDU if the ambient temperature exceeds 40° C.
- Inspect the air filter behind the air vent at the bottom of the rear panel at regular intervals. Replace the filter with a new item when becomes dirty.
- Keep flammable materials well away from the unit.
- Do not modify the smartPDU in any way that is not described in this user manual.
- Do not install any parts in the smartPDU that are not supplied or authorized by StageSmarts.



### Physical safety

- Observe all locally applicable workplace safety regulations.
- The smartPDU can cause injury if it falls. Make sure that the unit is supported on a stable surface.
- Do not attempt to lift the smartPDU alone.

# Introduction

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The smartPDU series from StageSmarts represents the latest in event power distribution and is designed and manufactured to meet the latest EN norms and highest standards.

The unit uses industrial grade (EN 60947) circuit breakers, designed to withstand dusty and humid conditions. All circuit breaker (MCBs, RCBOs) are of the magnetic-hydraulic type, offering temperature-stable operation and superior reliability.

All internal circuits use halogen-free wiring and crimped or screwed connections. There is no soldering of high-current connections.

An embedded webserver allows remote monitoring of all operating parameters, giving advance warning if any parameter is beginning to approach its limit. This lets technicians and operators achieve optimum configuration of the installation and take steps to prevent tripping at inconvenient times

Four different models of consumer-type mains power outlet, two connections with dimming control for low-voltage desk lamps or work lamps and two USB bus charger sockets are provided for the convenience of professionals working at the site.

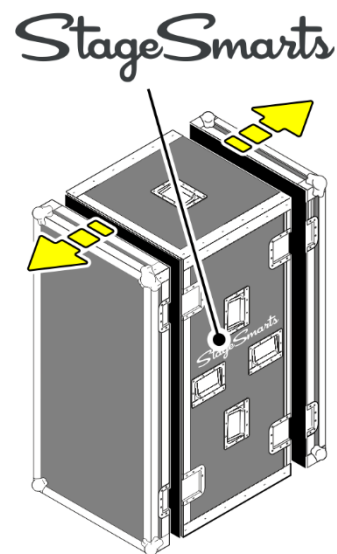
The smartPDU is supplied as standard in a rugged flightcase.

## Preparing for use

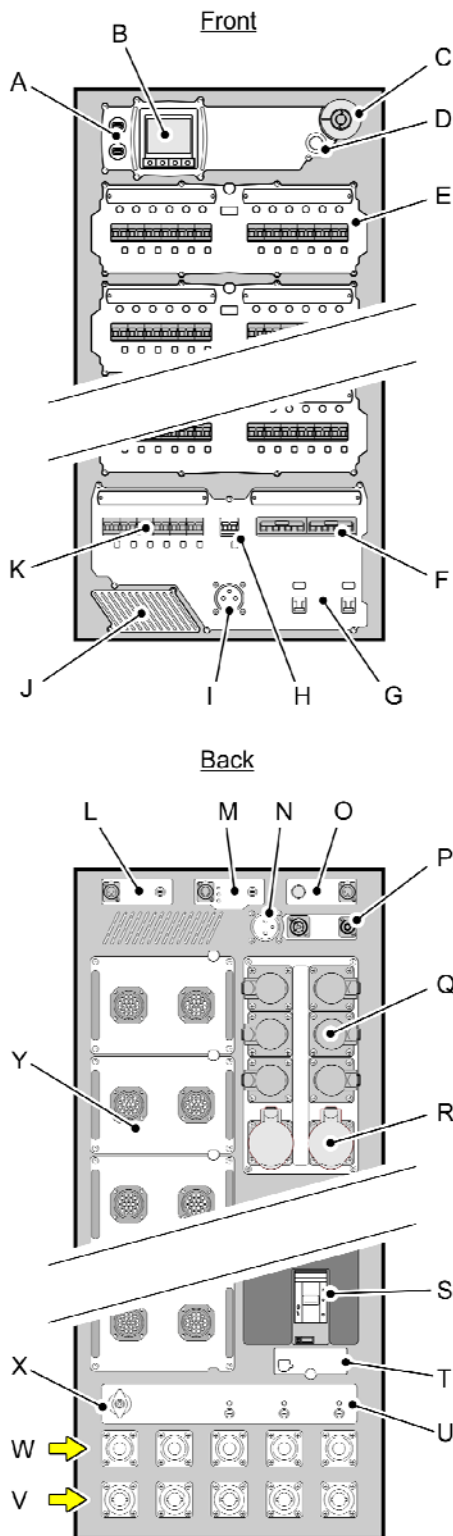
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Before you begin using the smartPDU:

- Read the Safety information section of this user manual starting on page 4.
- See illustration on right. Stand the smartPDU upright – with the StageSmarts logo on the side of the flightcase the right way up – on a level, stable surface in a location that will remain dry and that is not accessible to the public.
- Remove the front and rear covers from the flightcase and store them for re-use.
- Make sure that professionals working at the site will have good access, especially to the Emergency Stop button on the front panel.



# Overview



- A USB charging sockets: see page 14
- B Main meter: see page 13
- C Emergency Stop: see page 8
- D Main output ID strip backlight dimmer: see page 14
- E Main output monitoring and breaker group: see page 16
- F Three-phase auxiliary output breakers: see page 18
- G Three-phase auxiliary output RCD test buttons: see page 18
- H Convenience output sockets X7 breaker: see page 14 14
- I Convenience output socket X7 (BS 1363): see page 14
- J Inlet air vent: see page 15
- K Single-phase auxiliary output breakers and RCD test buttons: see page 18
- L Worklight power socket and fuse: see page 15
- M Network port: see page 22
- N Convenience output socket X7 (Schuko): see page 14
- O Worklight power socket and dimmer: see page 15
- P Convenience output sockets X7 (PowerCON, TRUE1): see page 14
- Q 16 A single-phase auxiliary power outputs: see page 18
- R 16 A and 32 A three-phase auxiliary power outputs: see page 18
- S Main breaker: see page 11
- T Main breaker settings DIP-switches: see page 11
- U Input line status LEDs and fuses: see page 20
- V Panel drain connectors: see page 19
- W Panel source connectors: see page 20
- X Protective earth (ground) bonding terminal: see page 8
- Y Main output connector modules: see page 15

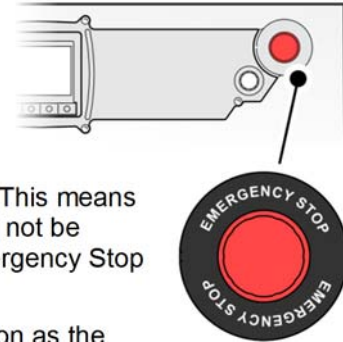
# Emergency Stop

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**Caution! Activating the Emergency Stop does NOT shut down power at the panel source connectors.**

The smartPDU has an Emergency Stop button on the top right of the front panel (see illustration on right). Pressing the button trips the main breaker immediately, shutting down power to all of the smartPDU's outputs.



Note that pressing the Emergency Stop button does not shut down power to the smartPDU's panel source throughput connectors. This means that power to any other PDUs that are supplied via the smartPDU will not be disrupted if it is necessary to shut down the smartPDU using the Emergency Stop button.

The smartPDU's sensor system will identify the Emergency Stop button as the reason why the main breaker has tripped.

To reapply power after an emergency stop:

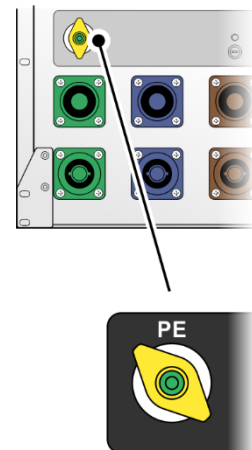
1. Make sure that the installation is in a safe condition and that reapplying power presents no hazard.
2. Twist the Emergency Stop button clockwise to reset it.
3. Finally, move the main breaker to the ON position.

# Protective Earth bonding

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The smartPDU has a PE (Protective Earth) terminal with a yellow handscrew above and to the left of the panel source connectors (see illustration on right). The PE terminal is tied directly to the panel drain and panel source PE connectors.

- Connect this terminal to an electrical earth (ground) that has been tested and complies with BS 7909 or the local equivalent.
- Connect this terminal to the equipotential bonding link that interconnects conductive materials in the installation (equipotential bonding is a legal requirement in some regions and is recommended in all cases to reduce the risk of electric shock).



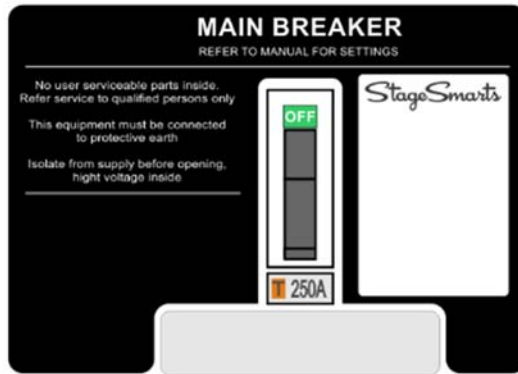


# Master MCCB (main breaker)

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The smartPDU has a 4-pole (three Phases + Neutral) main circuit breaker. The main breaker trips in the following situations:

- Current overload condition.
- Loss of Neutral line at the panel drain input connectors.
- Activation of the Emergency Stop.



**Figure 1. Main circuit breaker**

Main breakers are pre-configured at the factory but their settings can be adjusted to take into account specific conditions such as power source capacity, feeder cable length and wire gauge.

*For information on the main circuit breakers fitted to smartPDU 36 and smartPDU 48 units, see immediately below. For information on the main circuit breakers fitted to smartPDU 72 units, see 'smartPDU 72 main breaker' starting on page 11.*

## smartPDU 36 and smartPDU 48 main breakers

---

The following main circuit breaker types are fitted as standard to the smartPDU 36 and smartPDU 48:

### *smartPDU 36*

- NM8S-250 main circuit breaker, 4-pole MCCB type
- Rated current per phase at 20°-70° C = 250A
- Breaking capacity = 50 kA

### *smartPDU 48*

- NM8S-250 main circuit breaker, 4-pole MCCB type
- Rated current per phase at 20°-70° C = 250 A
- Breaking capacity = 50 kA

## smartPDU 36 and smartPDU 48 main breaker settings

A settings panel immediately below the main breaker (see Figure 2.) gives status information and lets you adjust the main breaker's settings. Do not change these settings unless you are 100% certain that you understand the implications of doing so. Under most circumstances, the default settings are preferable.

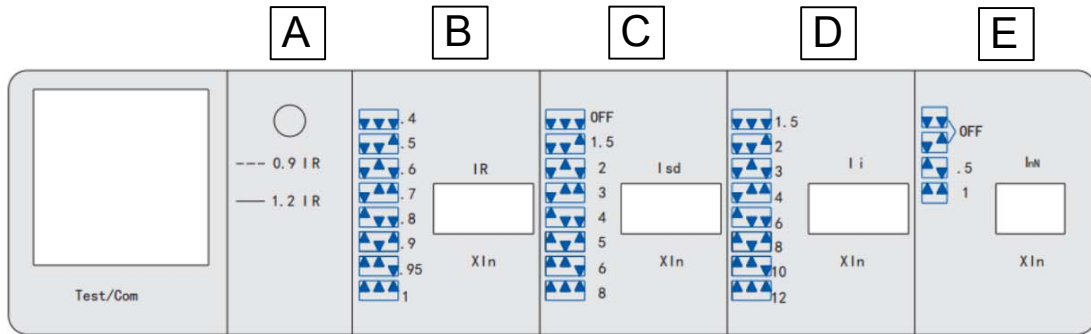


Figure 2. smartPDU 36 and 48 main breaker settings panel

### Status indicator

The status LED **A** in Figure 2 indicates the single-phase operating current relative to  $I_R$  (continuous trip current) as follows:

- LED flashes: Single-phase operational current is  $\leq 90\% I_R$
- LED lights constantly: Single-phase operational current is  $\geq 120\% I_R$

### Trip current settings

You can configure the smartPDU 36 or smartPDU 48 main breaker by adjusting the levels of the various current conditions that will trip the breaker. Current levels are set as multiples of the main breaker's *nominal current rating per phase* ( $I_n$ ).

To adjust the trip current level settings, slide open the transparent cover below the breaker and set the pins in the DIP-switches shown in Figure 2 as follows:

#### Continuous current

DIP-switches **B** in Figure 2 set the level of continuous current ( $I_R$ ) that will trip the breaker.

- The following levels can be set: 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95 or  $1 \times I_n$ .
- The factory default setting is  $1 \times I_n$ .

#### Short-time current

DIP-switches **C** in Figure 2 set the level of short-time current: ( $I_{sd}$ ) that will trip the breaker.

- The following levels can be set: OFF, 1.5, 2, 3, 4, 5, 6 or  $8 \times I_n$ .
- The factory default setting is  $6 \times I_n$ .

#### Instantaneous current

DIP-switches **D** in Figure 2 set the level of instantaneous current: ( $I_i$ ) that will trip the breaker.

- The following levels can be set: 1.5, 2, 3, 4, 6, 8, 10 or  $12 \times I_n$ .
- The factory default setting is  $10 \times I_n$ .

### Neutral line current

DIP-switches **E** in Figure 2 set the level of current on the Neutral line ( $I_{nN}$ ) that will trip the breaker.

- The following levels can be set: OFF, 0.5 or 1 x  $I_n$ .
- The factory default setting is OFF.

## smartPDU 72 main breaker

The following main circuit breaker type is fitted as standard to the smartPDU 72:

- NM8S-400 main circuit breaker, 4-pole MCCB type
- Rated current per phase at 20°-70° C = 400 A
- Breaking capacity = 50 kA

### smartPDU 72 main breaker settings

A settings panel immediately below the main breaker (see Figure 3) gives status information and lets you adjust the main breaker's settings. Do not change these settings unless you are 100% certain that you understand the implications of doing so. Under most circumstances, the default settings are preferable.

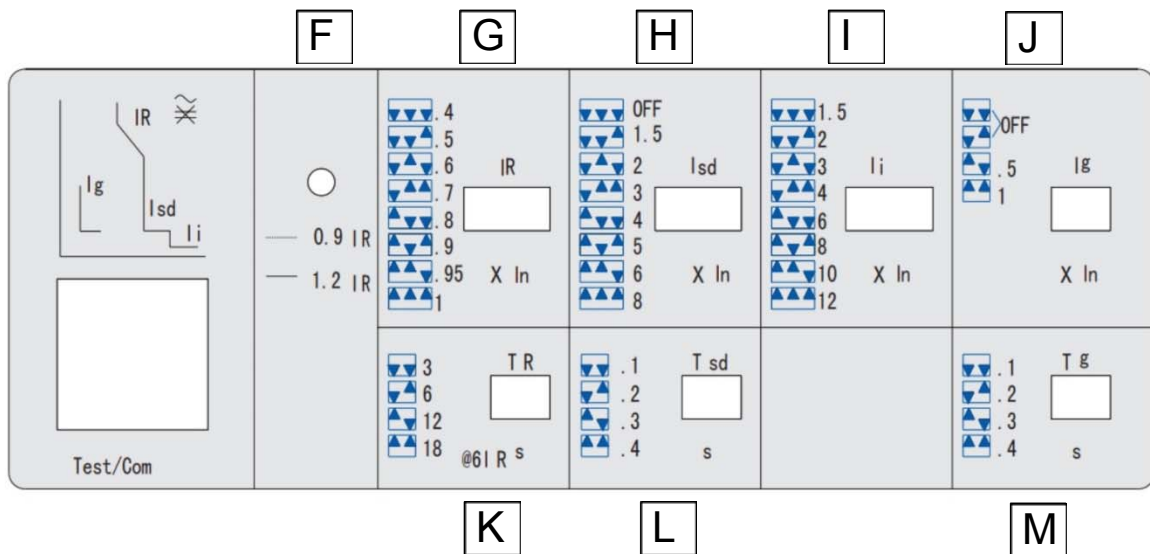


Figure 3. smartPDU 72 main breaker settings panel

### Status indicator LED

The status LED **F** in Figure 3 indicates the single-phase operating current relative to  $I_R$  (continuous trip current) as follows:

- LED flashes: Single-phase operational current is  $\leq 90\% I_R$
- LED lights constantly: Single-phase operational current is  $\geq 120\% I_R$

## *Trip current settings*

You can configure the smartPDU 72 main breaker by adjusting the levels of the various current conditions that will trip the breaker. Current levels are set as multiples of the main breaker's *nominal current rating per phase* ( $I_n$ ).

To adjust the trip current settings, slide open the transparent cover below the breaker and set the pins in the DIP-switches shown in Figure 3 as follows:

### *Continuous current*

DIP-switches **G** in Figure 3 set the level of continuous current ( $I_R$ ) that will trip the breaker.

- The following levels can be set: 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95 or  $1 \times I_n$ .
- The factory default setting is  $1 \times I_n$ .

### *Short-time current*

DIP-switches **H** in Figure 3 set the level of short-time current: ( $I_{sd}$ ) that will trip the breaker.

- The following levels can be set: OFF, 1.5, 2, 3, 4, 5, 6 or  $8 \times I_n$ .
- The factory default setting is  $6 \times I_n$ .

### *Instantaneous current*

DIP-switches **I** in Figure 3 set the level of instantaneous current: ( $I_i$ ) that will trip the breaker.

- The following levels can be set: 1.5, 2, 3, 4, 6, 8, 10 or  $12 \times I_n$ .
- The factory default setting is  $10 \times I_n$ .

### *Neutral line current*

DIP-switches **J** in Figure 3 set the level of continuous current on the Neutral line ( $I_g$ ) that will trip the breaker.

- The following levels can be set: OFF, 0.5 or  $1 \times I_n$ .
- The factory default setting is OFF.

### *Continuous current tripping response time*

DIP-switches **I** in Figure 3 set the duration in seconds (T) of continuous current ( $I_R$ ) that will trip the breaker.

- The following levels can be set: 3, 6, 12 or 18 seconds.
- The factory default setting is 6 seconds.

### *Short-time current tripping response time*

DIP-switches **J** in Figure 3 set the duration in seconds (T) of short-time current ( $I_{sd}$ ) that will trip the breaker.

- The following levels can be set: 0.1, 0.2, 0.3 or 0.4 seconds.
- The factory default setting is 0.3 seconds.

### *Neutral line current tripping response time*

DIP-switches **K** in Figure 3 set the duration in seconds (T) of current on the Neutral line ( $I_g$ ) that will trip the breaker.

- The following levels can be set: 0.1, 0.2, 0.3 or 0.4 seconds.
- The factory default setting is 0.4 seconds.

# Protection against loss of Neutral

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Loss of the Neutral line at the power input connectors is a potentially disastrous situation since it causes Phase line voltages to move away rapidly from their nominal 230 V. This can result in serious damage to a large portion of the connected equipment.

The smartPDU has a protection device that immediately trips the main breaker in case of a lost Neutral line. The sensor system of the smartPDU will identify loss of Neutral as the reason for the tripped breaker.

If the main breaker trips because of a lost Neutral line, a full inspection of the wiring from the power source to the smartPDU must be performed and the fault must be rectified before the main breaker is re-engaged. This job must be undertaken by a qualified electrician only. If no fault is found in the power source or source wiring but the main breaker trips and the sensor system reports that the cause is a lost Neutral line, contact StageSmarts for assistance.

## Main meter

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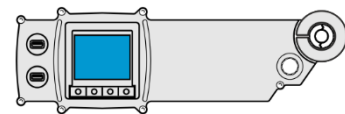
The main meter on the top left side of the front panel measures all incoming voltages, currents (including Neutral current) as well as main frequency, power factor etc.

When you connect the smartPDU to a power source, we strongly recommended that you check all voltages *before* you switch on the main breaker. The meter allows you to carry out a voltage check before powering on because voltage metering takes place prior to the main breaker.

## Display readouts

The readouts in the meter's backlit LCD display are constantly updated.

See illustration on right. The buttons below the display call up the following readouts:



### Button I

- Press once to display line currents on all three phases
- Press again to display neutral current
- Press again to display current demand
- Press again to display current maximum demand
- Press again to return the display to its original state

### Button V/Hz

- Press once to display phase voltages on all three phases
- Press again to display line voltages
- Press again to display frequencies
- Press again to return the display to its original state

### Button P

- Press once to display power in W/VAr/VA
- Press again to display average Power Factor
- Press again to display power demand in W/VA
- Press again to display power maximum demand in W/VA

- Press again to return the display to its original state

#### *Button E*

- Press once to display import energy at the panel drain input connectors
- Press again to display import reactive energy at the panel drain input connectors
- Press again to return the display to its original state

The meter logs power consumption and displays a running total in kWh at the bottom row of the display. Disconnecting the smartPDU from power resets the power consumption counter to zero.

Besides having a display on the front panel, the meter is connected to the remote management system. This allows the status of all currents, voltages, mains frequencies and power factor to be viewed remotely.

The meter is capable of handling up to 500 V so it will not be damaged by an incorrect connection.

The meter itself draws its power from the L1 phase line.

## Other meter settings

### *Display brightness*

You can adjust the display brightness so that you can read the display in direct sunlight or keep the display low-key in a backstage environment, for example.

To adjust the display brightness:

1. Press the two center buttons (V/Hz and P) simultaneously.
2. Holding the two buttons pressed down varies the brightness level. Pressing the buttons once and releasing steps to the next level of brightness.

## Convenience power sockets (X7)

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The smartPDU has four mains-voltage convenience power sockets that can be used to supply power to battery chargers, power tools, mains power work lamps, etc. The power sockets share one circuit and are all labelled X7. The power sockets can supply a total combined current of 16 A maximum.

- An earthed socket (type as specified – see page 18) is located at the bottom of the front panel.
- An earthed socket (type as specified – see page 18) is provided near the top of the rear panel.
- An earthed Neutrik PowerCON NAC3MPB socket and an earthed Neutrik TRUE1 NAC3FPX socket are located immediately to the right of the Schuko socket.

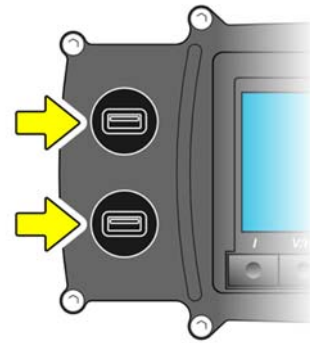
### Convenience power sockets (X7) breaker

The convenience power sockets (X7) circuit is protected by a breaker located above the convenience power socket at the bottom of the front panel.

## USB charging sockets

---

See illustration on right. The smartPDU is fitted with two USB sockets that can be used to charge USB bus-powered devices only. Each socket is compliant with USB specs and will communicate with and supply the correct current for a connected load up to 2.1 A.



## Work light

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Two 3-pin locking XLR sockets are provided at the top of the rear panel, one at each side. The sockets provide dimmable power for 12 volt working lamps of up to 15 W each.

To dim the work lights, turn the knob next to the work light socket on the right-hand side of the rear panel.

The work light circuit is protected by a 1 A slow-blow fuse in a fuseholder next to the socket on the left-hand side of the rear panel.

## Backlighting

---

Backlit ID strips with adjustable brightness are fitted above all the output breakers so that you can label output channels. The backlighting is bright enough to shine through standard write-on tape or masking tape.

To adjust backlighting intensity, turn the BACKLIGHT DIM knob next to the Emergency Stop button.

## Cooling

---

The smartPDU has forced-air cooling. Airflow is from the inlet vent at the bottom of the front panel to the outlet vent near the top of the rear panel. Make sure that there is free and unrestricted airflow around these two vents.

The air inlet vent on the front panel has an air filter that must be replaced if airflow becomes restricted by dirt and dust (see 'Replacing the air filter' on page 26). Inspect the filter visually through the grills in the inlet vent at regular intervals and replace it if it shows signs of significant dirt and dust buildup.

## Main outputs (supervised)

Depending on model, the smartPDU has 36, 48 or 72 main outputs, each rated at 16 A.

The main outputs are divided into groups (**A**, **B**, **C** etc.). Each group has its own set of output connectors on the rear panel and its own monitoring area with its own breakers on the front panel.

### Main output monitoring areas on the front panel

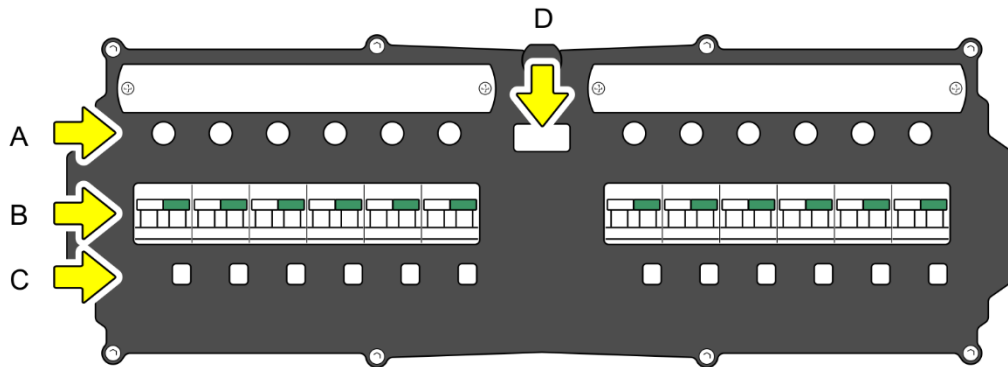


Figure 4. Output circuit breakers group

See **B** in Figure 4. Each main output is protected with a 2-pole RCBO – a combined overcurrent and residual current (earth leakage) circuit breaker.

Any issues with earth leakage currents will only affect the output where there is earth leakage, not a group of outputs.

Because all the breakers are magnetic-hydraulic type, the outputs can be loaded at full (16 A) capacity indefinitely and at all permissible operating temperatures. You do not need to factor in ambient temperature etc. and add a 'safety margin' to avoid nuisance tripping.

#### *Main output monitor buttons*

See **A** in Figure 4. Each main output has monitor buttons numbered 1-12. Each button lights to indicate the presence of a connected load on that output:

- If the load is within the 16 A rating for the output, the button will light green.
- If a slight overload is detected, the button will flash red slowly.
- If a serious overload is detected, the button will flash red rapidly.

If the overload exceeds the safety limit for that 16 A output, the RCBO will trip.

Pressing an output monitor button will send data from that output to the group's LOAD CURRENT meter (**D** in Figure 4). The meter will display a digital readout of the load current on that output. When an output is selected and its current is being displayed on the meter, its monitor button turns blue.



### *Main output label strips*

Backlit label strips are provided above the main output monitor buttons for you to label outputs. The backlighting is powerful enough to let you see notes written on masking tape or write-on tape that is stuck onto the label strips.

The label strip backlighting intensity can be adjusted using the knob marked BACKLIGHT DIM beside the Emergency Stop button.

### *Main output RCD test buttons*

See **C** in Figure 4. Each output has an RCD test button that lets you test earth leakage protection on that output. Pressing the button momentarily while an output is under power diverts a small current to earth: that output's breaker should trip immediately when the button is pressed. Use RCD test buttons to make sure that earth leakage protection operates correctly each time you connect a load to an output. Test earth leakage protection on all outputs frequently – we recommend a check at least once per month – as a scheduled safety routine.

If at any time you press an output's RCD test button while that output is under power and the output's breaker does not trip, stop using that output. Have the smartPDU inspected and serviced by a qualified electrician immediately. Do not use that output until the problem has been solved.

## Main output connections on the rear panel

The main outputs are situated on the back of the smartPDU. They consist of user-exchangeable modules. Standard modules are available in either 2 x Socapex, 2 x Harting 16 or 12 x PowerCON types. In addition to allowing quick output connector swapping, the modular construction makes it easy to service output connectors.

The output modules are 'hot swappable', meaning that you can remove and insert them while the smartPDU is running. However, we recommend that you switch off the output breakers associated with the module in question while changing modules in order to minimize connector wear.

## Auxiliary outputs (unsupervised)

---

The smartPDU has several auxiliary outputs on the rear panel that are not managed or monitored from the front panel.

As with the main outputs, the use of magnetic-hydraulic breakers means that the outputs can be loaded at full capacity indefinitely at all permissible operating temperatures.

### Single-phase auxiliary outputs X1-X6

The smartPDU has six single-phase auxiliary outputs rated 16 A. These outputs are numbered X1-X6 and are located to the right of the main outputs on the rear panel. Outputs X1-X6 use 16 A female CEE connectors.

Each of the auxiliary outputs X1-X6 is protected by a 2-pole RCBO (combined overcurrent and residual current breaker) located below the main output breakers on the front panel.

#### *RCD protection*

An RCD test button that lets you test for correct earth leakage protection is provided for each of the auxiliary output X1-X6 breakers. The RCD test buttons are located immediately below the breakers.

### Three-phase auxiliary outputs X8 and X9

The smartPDU has two 3-phase auxiliary outputs, one rated 16 A and one 32 A per phase. These outputs are labelled X8 and X9 and are located on the rear panel. They use 16 A and 32 A female CEE connectors.

Each of the two auxiliary outputs X8 and X9 is protected by a 4-pole MCCB and a 4-pole RCD.

#### *RCD protection*

RCD trip switches and RCD test buttons for the 3-phase auxiliary outputs X8 and X9 are located immediately under the X8 and X9 breakers at the bottom right of the front panel.

### Auxiliary output connections

Auxiliary outputs X1-X6 (16 A single-phase) together with auxiliary outputs X8 and X9 (16 A and 32 A 3-phase) are situated at the rear of the smartPDU.

Auxiliary output X7 has four outlet sockets:

- a 16 amp consumer-type Schuko or 13 amp UK consumer-type BS 1363 socket (depending on option) at the bottom of the front panel
- a 16 amp consumer-type Schuko or 13 amp UK consumer-type BS 1363 socket (depending on option) near the top of the rear panel
- a Neutrik PowerCON connector and a Neutrik TRUE1 connector, both near the top of the rear panel.

These outlets are provided to allow equipment with matching cable connector types to be connected for testing or configuring at the smartPDU before they are installed. They can of course also be used to supply mains power to battery chargers, power tools, mains power work lighting and other convenience equipment.

## Connecting to incoming power



**Warning!** Switching the main breaker to the OFF position does not shut down power at the panel source connectors.

**Caution!** When calculating the total current draw at the smartPDU's panel drain connectors, you must add the current draw of all loads connected to the smartPDU's panel source connectors to the current draw of all loads connected to the smartPDU's outputs.

**Important!** Do not connect or disconnect Powerlock connectors under load.

The smartPDU uses 500 A-rated Powerlock-type connectors for power input and throughput.

Before you make connections, visually inspect the connector surfaces for wear or damage. While the connectors are designed for harsh use, they can be damaged due to misuse or overloading. A damaged connector can create a fire hazard due to the heat buildup that can result.

The Powerlock-type connectors are keyed to ensure correct connection and colour-coded in accordance with the relevant EN norms.

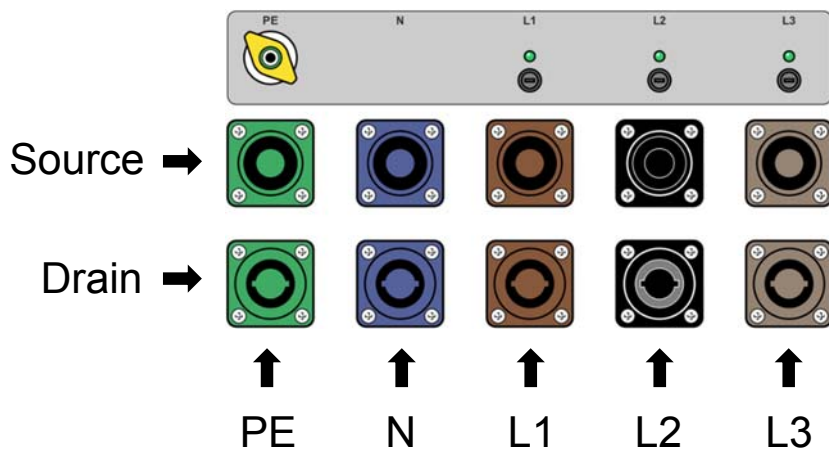


Figure 5. Power input and throughput connectors

See Figure 5. The bottom row of connectors are panel drain connectors that accept power input from the external power source. The upper row of connectors are panel source connectors that supply power throughput taken directly from the panel drain connectors.

## Connecting and disconnecting

Do not connect or disconnect Powerlock-type connectors under load, as this may cause arcing that will damage the connector contact surfaces.

To connect a Powerlock connector to the smartPDU, insert it in the correct port as directed below and turn the connector 45° clockwise to lock.

Connect the Powerlock connectors from the external power source to the smartPDU in sequence from left to right as follows:

- First, lock the Protective Earth (green) connector into the green PE port on the left.
- Then lock the Neutral (blue) connector into the blue N port.
- Finally, lock the L1 (brown), L2 (black) and L3 (grey) line (phase) connectors into the brown L1, black L2 and grey L3 ports on the right.

To disconnect a Powerlock connector, push in the connector's locking pin with a suitable connector key to unlock the connector, turn the connector 45° counter-clockwise to disengage, then remove the connector from the port.

Disconnect Powerlock connectors from the smartPDU in sequence from right to left as follows:

- First, disconnect the L3 (grey), L2 (black) and L1 (brown) line (phase) connectors from the grey L3, black L2 and brown L1 ports on the right.
- Then disconnect the Neutral (blue) connector from the blue N port.
- Finally, disconnect Protective Earth (green) connector from the green PE port on the left.

## Relaying power to other PDUs

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It is possible to connect suitable high-voltage power cables to the panel source connectors (see Figure 5) for power throughput to other power distribution units. If you do this, note that the current draw at the panel source connectors is added to the current draw at the panel drain connectors.

Before connecting a load to the panel source connectors, calculate the total current draw of that load and add it to the current draw of all the loads connected to the smartPDU. Make sure that the installation respects the following safety rules:

- The total current draw of all the loads connected to (a) all the smartPDU's outputs and (b) the smartPDU's panel source connectors must not exceed the current rating of the smartPDU's panel drain connectors.
- Cables and connectors used to supply power to the smartPDU must be correctly dimensioned for the total current draw of all the equipment that is connected to the smartPDU, regardless of whether that equipment is connected directly to the smartPDU or connected to other power distribution units via the smartPDU's panel source connectors.

Throughputs at the panel source connectors are direct and do not run through breakers. This means that switching off the smartPDU using the master MCCB (main breaker) will NOT shut down power to any other PDUs that are connected to the throughputs.

## Line status LEDs

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See Figure 5. Each L1, L2 and L3 input connection has a green status LED located above the throughput connectors to indicate the presence of voltage. The status LEDs are fitted prior to the master MCCB (main breaker), so they will indicate live voltage even if the master MCCB is set to OFF.

## Status LED / meter fuses

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***Important! Remove the three status LED / meter fuses – and remove the work light fuse and the electronics fuse at the top of the rear panel – before performing a high-voltage insulation test.***

Three 1 AT (slow-blow) fuses in fuseholders are located immediately below the Line status LEDs. Each fuse protects the status LED above it as well as the wiring to the LED and to the master meter.

If a status LED goes out but you know that a live voltage is present at the Line input connector concerned, its fuse may have blown. The status LEDs are important safety indicators, so try to restore correct operation as follows:

1. Set the master MCCB to OFF and then open the fuseholder cap with a flat-bladed screwdriver.

2. Replace the fuse with a new one of the same type and rating.
3. Reinstall the fuseholder cap and then set the master MCBB to ON.

If the LED still does not light, the new fuse that you have just installed may have blown. Remove the fuse and test it for continuity to confirm whether it has blown again. A fuse that blows repeatedly indicates a problem. There may be overvoltage at a power input connector, or there may be a wiring fault. Disconnect the smartPDU from power and Investigate the problem. If you suspect that a smartPDU may be faulty, stop using it immediately and contact StageSmarts for assistance.

# Remote monitoring

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A unique aspect of the smartPDU is the ability to remotely monitor all the main channels as well as incoming voltages, currents, etc. The smartPDU contains an embedded webserver. Any device that can connect to a network and that has a web browser installed can be used for monitoring. No special software, plug-ins or apps are necessary.

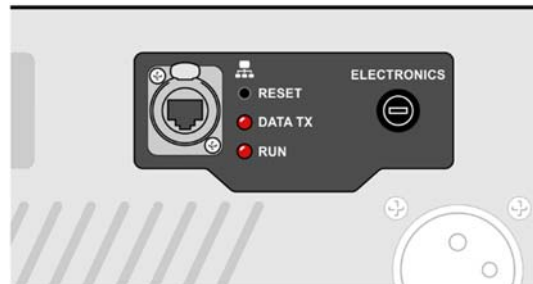
Note – the remote monitoring system is completely separated from the power distribution. It does not control the circuit breakers, and it cannot modify the distribution of power in any way. Even if the remote monitoring system crashes or is damaged, power distribution will continue unaffected.

## Connecting to the smartPDU

See illustration on right. An RJ45 port is provided on the front panel of the smartPDU for connection either directly to a PC or to a LAN using an Ethernet cable.

The embedded webserver and its wiring is protected by a 2 A slow-blow fuse marked ELECTRONICS close to the RJ45 port.

- A button marked RESET can be pushed with a ballpoint pen or small screwdriver to reset the webserver.
- A status LED marked DATA TX lights when the webserver is transmitting data.
- A status LED marked RUN flashes a 'heartbeat' when the webserver is operational.



### *Connecting directly to a PC*

You can connect a single smartPDU directly to a PC without running a signal through a server on a network. To do this, connect an Ethernet cable from the smartPDU directly to an RJ45 network port on the PC.

Be aware that direct connection to a PC may take some time to set up depending on computer settings. Differences in some network cards may also cause difficulties in creating a direct connection from the smartPDU to a PC.

### *Connecting to a network*

You can connect one or more smartPDUs to a LAN. To do this, connect an Ethernet cable from each smartPDU to a router or wireless access point (for example) that is linked to the network.

## smartPDU discovery

Before you can view data from the smartPDU's webserver, the smartPDU must be discovered by the connected device and web browser.

If a network is connected to the smartPDU's Ethernet socket, the smartPDU looks for a DHCP server on the network when it powers up. If it establishes communication with the DHCP server, it receives an IP address dynamically from that server. If the smartPDU does not detect a DHCP server on the network, it automatically assigns itself a dynamic IP address.

Note that IP addresses of smartPDU units are always set dynamically to make sure that they will work on any network. You cannot set a smartPDU's IP address manually.

Every smartPDU unit has a unique name (printed on the label next to the main breaker) and connects via WINS/Bonjour services depending on what computer type it is physically connected to.

On certain Android devices, the connection protocols may not always work as intended. The only solution available at the moment is to connect to a different device.

An alternative method of ensuring that the smartPDU is discovered is to use a LAN scan application. Connected smartPDUs will show their names (smartPDUxxxxxx, smartPDUxxxxxx and so on), and they will be listed as "Raspberry PI" on the list where you also will find the IP number of the units.

You can connect to any one of the connected smartPDUs on the network because the PDUs will find each other on the network automatically and share the address list internally. You will be able to see all connected smartPDU's on the network by connecting to just one of them.

If you 'hot-connect' a new unit to an existing set of smartPDUs, it will give the existing units a notification of its presence and the list will be updated across all the connected units.

Discovery time depends on the network but typically it only takes a few seconds.

On a Mac you can use the LAN SCAN app, which is available from the Apple app store free of charge. The paid version of LAN SCAN gives you more information, but it is not really needed for the purposes of discovering smartPDUs.

Several other free LAN scanning apps are available. You can also connect to your DHCP server (router) and access a list of hosted units.

# The smartPDU monitoring interface

The smartPDU's embedded webserver provides a clear interface for monitoring the performance of the smartPDU

## Main window

See Figure 6. The top pane **A** gives an overview of all the smartPDUs that are connected to the network and indicates the current measured at each smartPDU's L1, L2, L3 and N panel drain connectors. Click on a smartPDU in the list to select it and display detailed data from that smartPDU in panes B, C and D below.

Pane **B** displays the name of the smartPDU selected in pane A. By default, smartPDUs are assigned numbers in the order that they are detected. Clicking on the pen icon next to a smartPDU lets you give it a name in the interface.

Pane **C** displays detailed overall status information for the smartPDU selected in pane A.

Pane **D** displays the current drawn at each of the 12 output channels in each main output group.

- Clicking on the pen icon next to a channel number opens a pop-up window where you can edit the label attached to any individual channel. See 'Editing channel names' on page 25.
- Clicking on the eye icon next to a channel number opens a pop-up window where you can set up channel supervision. See 'Channel supervision' on page 25.



Figure 6. Remote monitoring – main window



## Editing channel names



Figure 7. Editing a channel name

To assign a custom name to an output channel, click on the pen icon next to the existing channel number or name in the main window. A pop-up window will open (see Figure 7). Enter your new text in the **Name** field and click on **Set name** to confirm.

## Channel supervision

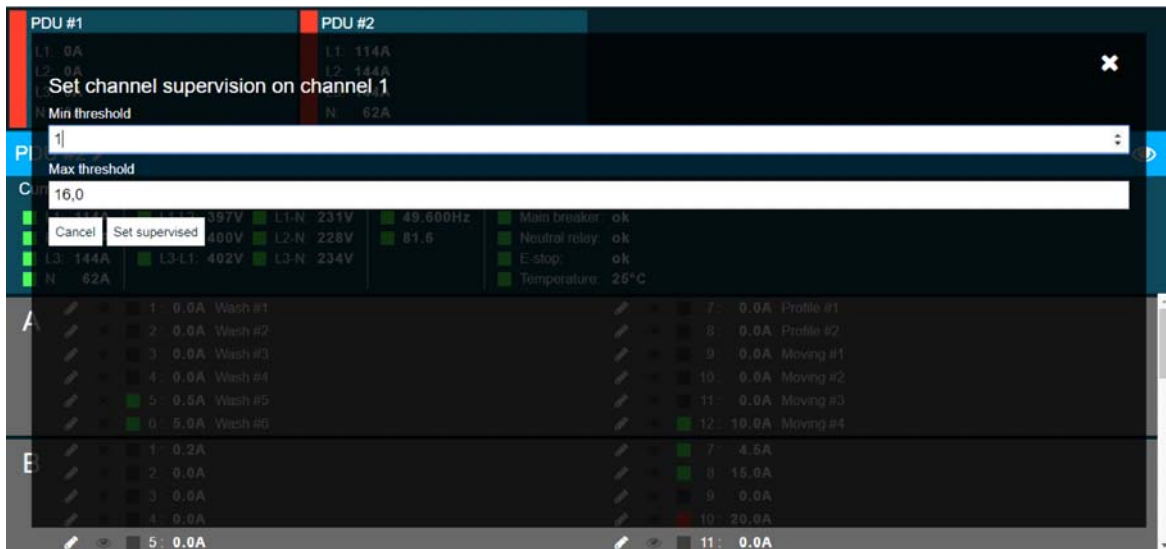


Figure 8. Setting channel supervision

To set up channel supervision, enter minimum and maximum current values for that channel. If the current draw measured at that channel's main output moves below the minimum or above the maximum values that you set, a warning triangle will appear next to that channel's smartPDU in Pane A, informing you of the need to investigate.

# Maintenance and service

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## Replacing main output blocks

The main output connector blocks on the rear panel are modular and can be removed and installed in seconds. This makes it easy to replace the supplied main output connectors with other connector types. Contact StageSmarts if you are interested in alternative connector options.

To replace a main output connector block:

1. Disconnect the smartPDU from power.
2. Remove the four screws from the corners of the connector block.
3. See illustration on right. Holding the connector block by the two handles provided, pull it back towards you in a straight line to release it from its internal connectors (arrowed). Then lift the connector out of the smartPDU.



4. Line up the replacement connector block with the internal connectors (arrowed) inside the smartPDU, then lift the connector block into the smartPDU and push it into position to engage the internal connectors. The connector block is correctly in position when the block is correctly lined up in its aperture and the face of the block is flush with the surface of the front panel.

If you feel strong resistance when you try to push the connector block into position, the internal connectors may not be correctly aligned. Pull the connector block back towards you and try again.

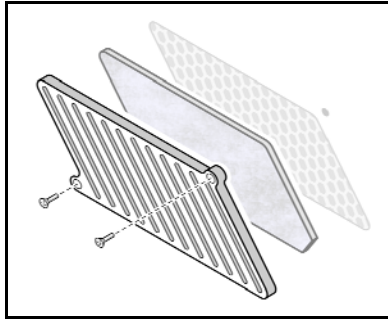
5. Reinstall the four screws at the corners of the connector block and check that all service work has been completed before reapplying power to the smartPDU.

## Replacing the air filter

An air filter behind the air vent on the left at the bottom of the rear panel reduces the buildup of dirt and dust inside the smartPDU. The filter cannot be cleaned and must be replaced with a new item when it becomes dirty.

Precise replacement intervals are impossible to specify because they depend on the amount of airborne particles in the installation environment. Inspect the filter visually through the slots in the air vent at the bottom of the front panel at regular intervals and have a new, clean filter available for easy replacement. If the smartPDU is operating in a dusty environment, pay special attention to this task.

Replacement air filters can be ordered from your StageSmarts supplier.

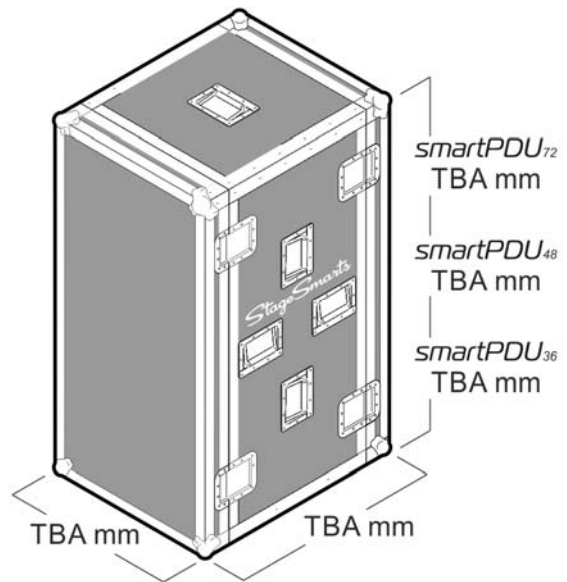
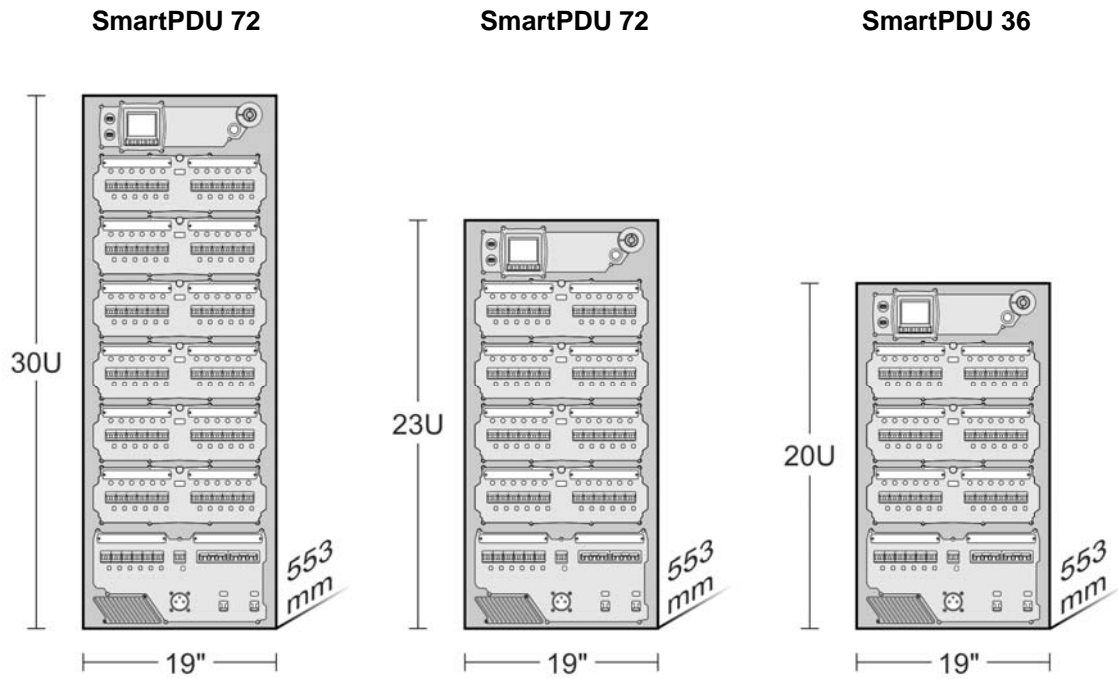


**Figure 9. Air filter**

To replace the air filter:

1. Shut down power to all loads and disconnect the smartPDU from power.
2. See Figure 9. Remove the screws from the air inlet vent at the bottom of the front panel. Remove the vent and clean it thoroughly.
3. Remove the dirty filter and install the new filter in its place, making sure that the new filter completely covers the honeycomb grill inside the air vent.
4. Reinstall the air inlet vent with its screws.

# Dimensions



# Specifications

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## **Power input / throughput connectors**

Powerlock 500 A, 5-wire (TN-S) 230/400 V

## **Main circuit breaker**

MCCB 4-pole, 400 V, 500 A

Overtoltage protected

Immediate disconnect in case of lost Neutral connection

## **Master metering**

Input voltage and current

All output voltages, currents (including Neutral), power factor and frequency

## **Output channels**

Connector options: Socapex 19, Harting 16 multipin, Neutrik PowerCON

### ***Main output channels***

smartPDU 72: 72 outputs

smartPDU 48: 48 outputs

smartPDU 36: 36 outputs

### ***Auxiliary output channels, single-phase***

All units: 6 outputs

RCBO breakers, 3-pole, 16 A, 30 mA earth leakage current

CEE connectors, 3-pin

### ***Convenience output channel, single-phase***

All units: one output channel with

- 2 x consumer-type UK (BS 1363) or Schuko sockets
- 1 x Neutrik PowerCON NAC3MPB power out socket
- 1 x Neutrik TRUE1 NAC3FPX power out socket

### ***Auxiliary output channels, three-phase***

All units: 2 outputs

MCB breakers, 4-pole, 16/32 A\*

CEE connectors, 5-pin

RCD, 50 A, 30 mA earth leakage current

*\*63 A MCB breakers available as option on smartPDU72 and smartPDU48*

## **Thermal**

Maximum ambient temperature: 40° C

Minimum ambient temperature: 0° C

## Certifications and compliance



EN 61439-1, EN 62368-1:2014, EN 61000-6-1:2007, EN 55015:2006+A2:2009, BS7671, BS7909

## Dimensions and weight

### ***smartPDU 72***

Dimensions: 19-inch rack, 30U x 553 mm

Weight: 107 kg

### ***smartPDU 48***

Dimensions: 19-inch rack, 23U x 553 mm

Weight: 82 kg

### ***smartPDU 36***

Dimensions: 19-inch rack, 20U x 553 mm

Weight: 70 kg

*All specifications are subject to change without notice.*



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*StageSmarts*