

StageSmarts C24 Series User Manual



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StageSmarts AB, Köpingsvägen 12, 732 31 Arboga, Sweden info@stagesmarts.com +46 70 292 00 22
C24 Series User Manual Revision A

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Safety information

Warning! Read the following important safety information before connecting or using the StageSmarts C24. 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 StageSmarts C24. Keep this manual for future use. Before connecting or using the C24, visit the StageSmarts website at http://www.stagesmarts.com and make sure that you have the latest user documentation for the unit.

The C24 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 C24.

Do not attempt to carry out any repairs on the C24. 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 C24 in any way not described in this user manual. Connect and operate the C24 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 C24 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 C24 to moisture or allow it to become wet. Do not use or store the C24 outdoors or in wet conditions.
- Use the C24 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 C24 and the rest of the installation to give sufficient warning of the presence of high-voltage electrical hazards.
- Ensure that the C24 is electrically connected as described in this user manual to a protective earth (ground) that has been tested and complies with BS 7909, XXXX XXXX XXXX or the local equivalent standard for temporary electrical installations.
- Use only a source of AC power that complies with local electrical codes and has overload 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 C24 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 C24, check that all connectors are correctly engaged. If connectors have a locking mechanism, check that they are correctly locked.
- Before using the C24 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 the earth leakage protection on all outputs at least once per month as a scheduled safety routine.
- 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 C24. Provide a minimum clearance of 100 mm (4 in.) around all air vents.
- Do not use the C24 if the ambient temperature exceeds 45° C.
- Keep flammable materials well away from the unit.
- Do not modify the C24 in any way that is not described in this user manual.
- Do not install any parts in the C24 that are not supplied or authorized by StageSmarts.



Physical safety

- Observe all locally applicable workplace safety regulations.
- Use the C24 only when securely mounted in a 19-inch rack.

Introduction

The C24 from StageSmarts is a 19-inch rackmount (6U) power distribution unit that represents the latest in event power distribution and is designed and manufactured to meet the latest EN norms and the highest standards.

The C24 uses industrial grade (EN 60947-2) circuit breakers and is designed to withstand dusty and humid conditions. All circuit breakers (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.

C24 range

The C24 range consists of the following models:

Output sockets
4 x 19-pin Socapex-type, 6 channels per connector
4 x 16-pin Harting-type, 6 channels per connector
3 x 16-pin Harting-type, 8 channels per connector
3 x 24-pin Harting-type, 8 channels per connector
24 x Neutrik powerCON TRUE1
24 x Neutrik powerCON (grey)

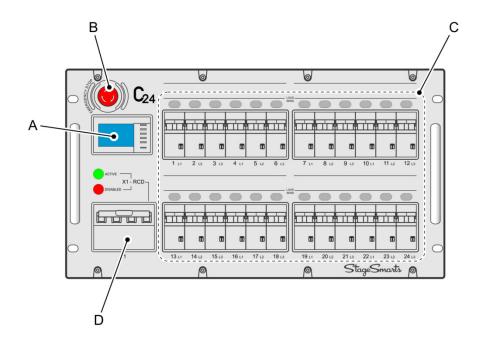
In the list of model names above, # indicates the type of auxiliary connector used for output 24 as follows:

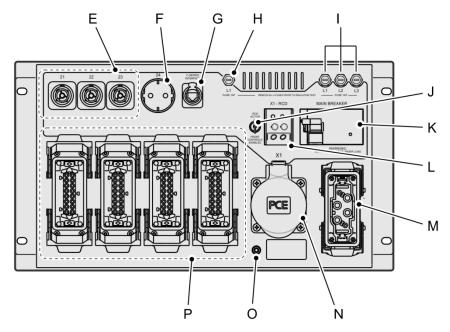
- 1 = German Schuko
- 2 = French Schuko (Type E)
- 3 = UK 13 A (BS 1363)
- 4 = Australian GPO
- 5 = Swiss (SEV 1011)

Preparing for use

Before you begin using the C24:

- Read the Safety information section of this user manual starting on page 5.
- Make sure that professionals working at the site will have good access, especially to the Emergency Stop button on the front panel.

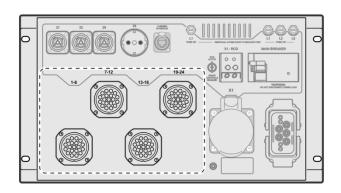




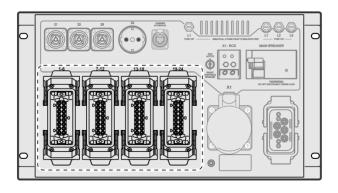
Key

- A Main meter (backlit LCD display): see page 12
- B Emergency stop: see page 11
- C Main output monitoring and breaker group: see page 14
- D Three-phase output X1 breaker: see page 17
- E Channels 21-23 auxiliary output sockets (Neutrik powerCON TRUE1): see page 17
- F Channel 24 direct output socket (type depends on model): see page 17
- G C-Series Interface communication port: see page 20
- H Electronics fuse: see page 20
- I Meter fuses: see page 20
- J Output X1 RCM enable/disable lockswitch: see page 17
- K Switch disconnector: see page 12
- L Output X1 RCM: see page 17
- M Power input connector: see page 19
- N Three-phase auxiliary output X1: see page 17
- P Multi-pin 24-output connector modules (various types available): see page 14
- O Protective earth (ground) bonding terminal: see page 11

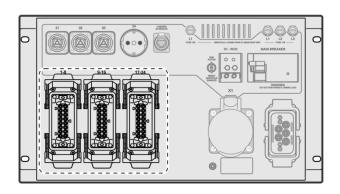
C24A 11 (4 x 19-pin Socapex-type main output connectors)



C24A 21 (4 x 16-pin Harting-type main output connectors)



C24A 31 (3 x 16-pin Harting-type main output connectors)



Emergency Stop



Warning! Make sure that the Emergency Stop button is easily accessible at all times.

The C24 has an Emergency Stop button on the top left of the front panel (see illustration on right). Pressing the button trips the switch disconnector immediately, shutting down power to all of the C24's outputs.

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.
- Twist the Emergency Stop button clockwise to reset it.
- 3. Move the main switch disconnector to the ON position.



Protective Earth bonding

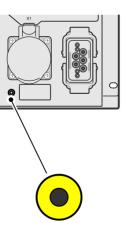


Warning! Connect the PE bonding terminal as directed below before applying power to the C24.

The C24 has a PE (Protective Earth) bonding terminal at the bottom of the rear panel (see illustration on right). The PE terminal is tied directly to the input and output PE connectors.

Before applying power to the C24, make the following connections to the PE bonding terminal:

- Connect the PE bonding terminal to an electrical earth (ground) that has been tested and complies with BS 7909 or the local equivalent.
- Connect the PE bonding 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).



Switch disconnector

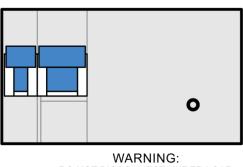
The C24 has a 4-pole (three Phases + Neutral) switch disconnector that can be used as a power ON/OFF switch to shut down power at all of the outputs.

Important! Check that all loads are switched off before shutting down or applying power at the switch disconnector.

The switch disconnector trips automatically in the following situations:

- Loss of Neutral line at the power input connector.
- Activation of the Emergency Stop.

MAIN BREAKER



DO NOT DISCONNECT UNDER LOAD

Figure 1. Main circuit breaker

Protection in case of loss of Neutral

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

The C24 has a protection device that immediately trips the switch disconnector in case of a lost Neutral line.

If the switch disconnector trips because of a lost Neutral line, a full inspection of the wiring from the power source to the C24 must be performed and the fault must be corrected before the switch disconnector is moved to the ON position. Inspection and repair must be undertaken by a qualified electrician only. If no fault is found in the power source or source wiring but the switch disconnector still trips, contact StageSmarts for assistance.

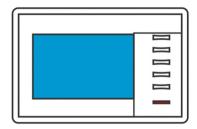
Main meter

The main meter on the front panel displays all incoming voltages, currents (including Neutral current), main frequency, power factor etc.

When you connect the C24 to a power source, we strongly recommended that you check all voltages before you move the switch disconnector to ON. The meter allows you to carry out a voltage check before powering on, because voltage metering takes place prior to the switch disconnector.

Display readouts

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



See illustration above. The buttons on the control planel next to the display have the following functions:

Button I

- Press once to display the line currents on the three phases
- Press again to display the neutral current
- Press again to display the maximum currents on the three phases recorded since the C24 was last powered up
- Press again to display the maximum neutral current recorded since the C24 was last powered up
- Press again to display the average %THD (percent total harmonic distortion) of the currents on the three phases recorded since the C24 was last powered up
- Press again to exit

Button V F

- Press once to display the line voltages on the three phases
- Press again to display the AC frequency of the power at the input connector in Hz
- Press again to display the average %THD (percent total harmonic distortion) of the voltage on all three phases recorded since the C24 was last powered up
- Press again to exit

Button P PF

- 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 exit

Button © °C

- Press once to XXXX
- Press again to display XXXX
- Press again to exit

The meter logs power consumption and displays a running total in kWh at the bottom row of the display. Disconnecting the C24 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.

Output monitoring and breakers on the front panel

See Figure 2. Each one of Outputs 1-24 is protected by a 2-pole RCBO (combined overcurrent and earth leakage circuit breaker) on the front panel. The breakers are labelled 1-24 to match the outputs.

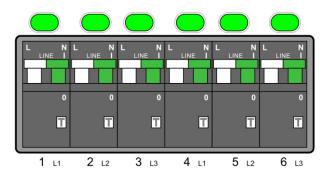


Figure 2. Output circuit breakers group

Breakers 1-20 monitor Main Outputs 1-20. Each breaker has a trip current of 16 A. Breaker 1 will trip if the current draw at Main Output 1 exceeds 16 A, and so on.

Breakers 21-24 monitor Main Outputs 21-24 and Auxiliary Outputs 21-24. Each of these four breakers has a trip current of 16 A, but each breaker monitors two outputs: one Main Output and one Auxiliary Output with the same number. For example, Breaker 21 will trip if the combined current draw at Main Output 21 and at Auxiliary Output 21 exceeds 16 A in total.

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.

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

Main outputs (supervised)

The C24 has 20 monitored main outputs labelled 1-20. Each output is rated 16 A.

The main output connectors are situated on the rear panel. The output connector type fitted depends on model as follows:

Model	Output connectors
C24A – 1#	4 x 19-pin Socapex-type, 6 channels per connector
C24A – 2#	4 x 16-pin Harting-type, 6 channels per connector
C24A – 3#	3 x 16-pin Harting-type, 8 channels per connector
C24A – 4#	3 x 24-pin Harting-type, 8 channels per connector
C24A – 5#	24 x Neutrik powerCON TRUE1
C24A – 6#	24 x Neutrik powerCON (grey)

Main output load sensor LEDs

See Figure 2. Above each breaker on the front panel is an indicator LED. The LEDs light to indicate the presence of a connected load on that breaker's output:

- If the load is within the 16 A rating for the output, the LED lights green.
- If a slight overload is detected, the LED flashes red slowly.
- If a serious overload is detected, the LED flashes red quickly.

If the overload exceeds the safety limit for that 16 A output, the breaker trips.

Main output RCBO test buttons

See Figure 2. Each breaker on the front panel has a test button labelled \mathbf{T} that lets you test earth leakage protection on that breaker's output. Pressing the button momentarily should immediately trip the breaker. Use the 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 a breaker's test button while power is applied to the breaker and the breaker does not trip immediately, stop using that output. Have the C24 inspected and serviced by

StageSmarts or an authorized StageSmarts service agent as soon as possible. Do not use the output until the problem has been resolved

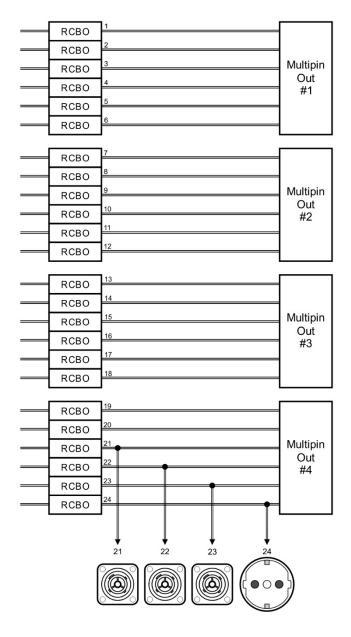
RCBO circuit layout

The C24's 16 amp rated RCBOs on the front panel protect the main outputs on the rear panel as shown in Figure 3 when four output connectors with six channels each are fitted.

Where three output connectors with eight channels each are fitted:

- RCBOs 1-8 protect the channels in Multipin Output 1
- RCBOs 9-16 protect the channels in Multipin Output 2, and
- RCBOs 17-24 protect the channels in Multipin Output 3.

In all models, RCBOs 21-24 protect both the last four main output channels and auxiliary outputs 21-24. Each auxiliary output combined with the corresponding main output can supply a maximum total current of 16 A. In other words, the current at auxiliary output 21 must be added to the current at main output 21: RCBO 21 will trip if the combined total current exceeds 16 A, and likewise for RCBOs 22-24.



Page 16

Figure 3. RCBO circuit layout

Single-phase auxiliary outputs (unsupervised)

The C24 has four mains-voltage single-phase auxiliary power outputs at the top of the rear panel.

See Figure 3 on page 16. Auxiliary output 21 shares RCBO 21 with main output 21, and likewise for auxiliary outputs 22-24 and main outputs 22-24.

The outputs have the following connectors:

- Three earthed Neutrik powerCON TRUE1 NAC3FPX sockets labelled 21-23
- One consumer-type earthed socket labelled 24. Various socket types are fitted to the different models in the C24 range. The types available comprise German Schuko, French Schuko Type E, UK 13 amp BS 1363, Australian GPO and Swiss SEV 1011 (see 'Output channels' on page 23).

These outputs are provided for phone chargers, power tools, work lamps, etc.

Auxiliary outputs 21-24 are not monitored by the meter on the front panel.

Three-phase auxiliary output X1 (unsupervised)

The C24 has a 32 A three-phase auxiliary output labelled X1 on the rear panel. The output uses a 32 A CEE socket.

Output X1 is protected by two devices:

- A 4-pole MCB (magnetic-hydraulic circuit breaker) on the bottom left of the front panel
- An adjustable RCM (Residual Current Monitor) on the rear panel immediately above Output X1. See the next section for details.

The MCB provides overcurrent protection and the RCM monitors earth leakage and will trip the MCB if a current to earth exceeds the threshold set on the front of the RCM (see below).

As with the main outputs, the use of a magnetic-hydraulic breaker means that the output X1 can be loaded to full capacity indefinitely at all permissible operating temperatures.

RCM protection for Output X1



Warning! It is the responsibility of the user of the C24 to ensure that the overall level of earth leakage protection meets all applicable legal and safety requirements at all times.

The RCM above Output X1 on the rear panel conforms to EN 62020 and provides earth leakage protection for this output. The RCM is fitted with two pushbuttons: a Test button marked 'T' for testing correct tripping of the RCM and a Reset button marked 'R' to reset the RCM after it has tripped.

Include a monthly test of this RCM in your safety check schedule. Press the RCM's Test button and check that the RCM trips. If it does not trip, stop using Output X1. Have the C24 inspected and serviced as soon as possible by StageSmarts or one of its authorized service agents.

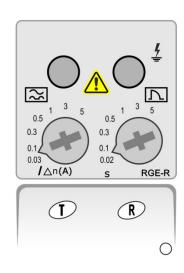


Figure 4. RCM on Output X1

Adjusting the RCM

The Output X1 RCM has two adjustments: One sets trip current. The other sets the delay before the RCM trips. The RCM's default setting is 30 mA trip current and 300 ms delay in accordance with the requirements of EN61008.

Disabling and re-enabling RCM protection for output X1

In normal circumstances, it is a necessary safety precaution and a legal requirement that the RCM that protects output X1 is enabled at all times. However, in certain circumstances it may be necessary to bypass the RCM. For example:

- When the X1 outlet feeds a secondary distribution unit where RCDs or RCBOs are fitted.
 Having multiple RCDs with the same trip current is not recommended.
- When the X1 outlet feeds a secondary distribution unit that powers devices with very high harmonic currents (variable speed motor controllers, for example). Such distribution units have special RCDs for that purpose.



Warning! If you disable the RCM because of special circumstances such as the ones described above, re-enable the RCM as soon as those special circumstances are no longer present. Keep the RCM at the ACTIVATED setting by default.

The RCM setting (ACTIVATED or DISABLED) is not changed or reset if the C24 is disconnected from power. Check the RCM's status and settings every time you apply power to the C24.

To bypass the RCM and disable earth leakage protection at output X1:

- 1. Turn the keyswitch next to the RCM to the ENABLE position.
- 2. Push and hold for 2 seconds the button marked DISABLED.

The green indicator light in the ACTIVATED button will go out and the red indicator light in the DISABLED button will light up.

To re-enable the RCM and restore earth leakage protection at output X1:

- 1. Turn the keyswitch next to the RCM to the ENABLE position.
- 2. Push and hold for 2 seconds the button marked ACTIVATED.

The red indicator light in the DISABLED button will go out and the green indicator light in the ACTIVATED button will light up.

Connecting to incoming power

See **Error! Reference source not found.**. The C24 uses 63 A-rated Harting-type connectors for power input.

You can obtain a suitable 2 meter power cable with CEE and Harting-type connectors or a loose Harting-type connector from StageSmarts distributors and retailers (or directly from StageSmarts) if you order the following items:

- C-CAB-63-2m Power input cable, CEE 63A 5-pin male to Harting 63A, length 2m
- C-CON-F63A Harting 63A connector, body, insert and M40 cable gland

Installing a connector

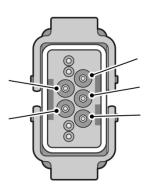
If you need to install a cable-mount 63 A female Harting-type connector on power cable, follow the XXXXXXXXXXX instructions and respect the following pinout:

Pin	Conductor		
Pin 1	L1 (Phase 1)		
Pin 2	L2 (Phase 2)		
Pin 3	L3 (Phase 3)		
Pin 4	Neutral		
Ground	Earth / ground		

The four smaller, additional pins in the Harting-type connector are not used.

Making power input connections

Before you make connections, visually inspect the connectors 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 heat buildup.



Meter and electronics fuses

Important! Remove the three meter fuses L1, L2 and L3 and the electronics fuse L1 at the top of the rear panel before performing a high-voltage insulation test.

See 'Overview' on page 8. Three 1 AT (slow-blow) fuses L1, L2 and L3 are located in fuseholders at the top of the rear panel. Each fuse protects one of the three phases in the wiring to the master meter.

A single 1 AT (slow-blow) fuse is also located in a fuseholder at the top of the rear panel. This fuse protects the unit's electronic systems.

If the meter stops working but you know that the C24 is connected to power, its fuse may have blown. To replace the meter fuse:

- 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.

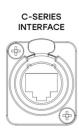
NEED TO EXPLAIN THE ELECTRONICS FUSE

If the meter still does not work, 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 C24 from power and Investigate the problem. If you suspect that a C24 may be faulty, stop using it immediately and contact StageSmarts for assistance.

C-series Interface

The C24 has a communications port labelled **C-SERIES INTERFACE** on the rear panel. The purpose of the C-series interface is to relay essential data (channel load status, main meter information, main breaker status) to a separate and optional multi-port server (scheduled for Q4, 2019) that can provide a common web server for multiple C24's.

The port's connector type is the common RJ45 network type, but the signal is not compatible with Ethernet LAN protocol. The signal can be run on normal Cat5/6 Ethernet cable but will not work with Ethernet equipment.



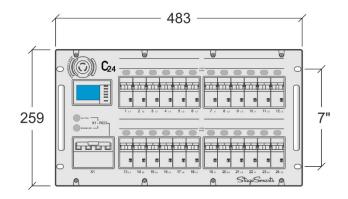
Safety checks and maintenance

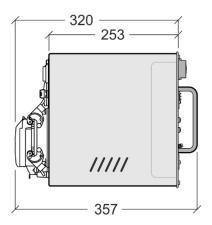
Carry out the following scheduled safety tasks at these suggested intervals:

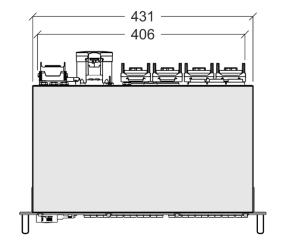
- Monthly: Check the correct operation of the RCBOs for Outputs 1-24 on the front panel and the RCM for Output X1 on the rear panel by pressing their Test buttons while power is applied to the C24. Check that pressing the Test button causes the breakers to trip immediately.
- Regularly: Check all components, connectors and cables for signs of damage or overheating.

Inspect the air vents XXXXXX at regular intervals. If you see signs of dirt or dust buildup, clean the vents with a soft brush and vacuum cleaner.

Dimensions







Dimensions given in millimetres

Specifications

Power input / throughput connectors

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

Main circuit breaker

MCCB 4-pole, 400 V, 500 A

Overvoltage 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

Main output channels 1 - 20

C24A – 1#: 4 x 19-pin Socapex-type, 6 channels per connector C24A – 2#: 4 x 16-pin Harting-type, 6 channels per connector C24A – 3#: 3 x 16-pin Harting-type, 8 channels per connector C24A – 4#: 3 x 24-pin Harting-type, 8 channels per connector C24A – 5#: 24 x Neutrik powerCON TRUE1 C24A – 6#: 24 x Neutrik powerCON (grey)

The # in the model name above indicates the type of the auxiliary connector installed at Output 24 as follows:

1 = German Schuko

2 = French Schuko (Type E)

3 = United Kingdom 13 amp (BS 1363)

4 = Australian GPO

5 = Swiss (SEV 1011)

Convenience output channel, single-phase

One output channel with:

- 3 x Neutrik TRUE1 NAC3FPX power out sockets
- 1 x consumer-type mains socket (German Schuko, French Schuko Type E, UK
 13 amp BS 1363, Australian GPO or Swiss SEV 1011 depending on model)

Auxiliary output channel, three-phase

MCB breaker, 4-pole, 32 A*
CEE connector, 5-pin
RCM, 50 A, 30 mA earth leakage current

Thermal

Maximum ambient temperature: 45° 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

Accessories

C-CAB-63-2m Connection cable, CEE 63A 5-pole to Harting 63A, length 2m C-CON-F63A Harting 63A connector, body, insert and M40 cable gland

Dimensions and weight

Dimensions: 19-inch rack, 6U x 553 mm

All specifications are subject to change without notice.