Rack Safety Plus, 230/400 V AC

Power Distribution Unit with Emergency Stop

User Manual

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1 Safety

1.1 Intended Use

The nVent SCHROFF power distribution unit described in this manual is a power distribution unit used to supply AC mains power to electrical or electronic devices as a central power switch with emergency stop function.
Intended use includes compliance with the terms and conditions for assembly, disassembly, commissioning, operation and maintenance specified by the manufacturer.
The power distribution unit is only intended for use in dry locations, i.e. indoors and without any pollution, in an industrial environment or for commercial use.

1.2 Not intended use

The use of the power distribution unit as a safety function for a machine is not allowed and can lead to hazards.
If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired

1.3 Safety instructions of the manufacturer

1.3.1 Disclaimer

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1.4 Safety symbols used in this manual

In these original operating instructions, warning notices point out residual risks that cannot be avoided by constructive means when installing or operating the Power Distribution Unit. The warning notices are classified according to the severity of the damage occurring and the probability of its occurrence.

⚠ DANGER	
Symbol	**Short description of the danger** The signal word DANGER indicates an immediate danger. Non-observance will result in severe injuries or death.

⚠ WARNING	
Symbol	**Short description of the danger** The signal word WARNING indicates a possible danger. Non-observance can lead to serious injury or death.

⚠ CAUTION	
Symbol	**Short description of the danger** The signal word CAUTION indicates a possible danger. Non-observance can lead to injuries.

ATTENTION
Short description The signal word ATTENTION indicates possible damages to equipment. Non-observance can lead to damage to the device.

	**Important information**

1.5 Safety Information for the Operator

Only trained specialists are authorized to carry out assembly, commissioning, completion, maintenance and service of the power distribution unit. The nationally applicable health and safety regulations must also be adhered to.

⚠ WARNING	
	**Risk of injury due to insufficient personal protective equipment** If you use the wrong protective equipment or no protective equipment at all, you could be seriously injured. - Wear protective equipment adapted to the work processes. - Check the protective equipment before each use to ensure that it is intact! - Use only approved protective equipment.

1.6 Safety assessment

Before using the power distribution unit in conjunction with a plant/machine, a safety assessment in accordance with the Machinery Directive is required.
The products emergency stop feature is not intended to be used as a safety related function for a machine. Therefore the user has to provide own measures to ensure the required functional safety of the machine is achieved.

2 Power Distribution Unit Overview

2.1 System description

The power distribution unit is intended to supply AC mains power and DC power to electrical or electronic devices as a central power switch with emergency stop function.

The power distribution unit has a modular design and can be configured by the customer.

	Due to the modularity not all possible configurations can be described in this manual. For further technical information and configuration options, please refer to the relevant data sheets and the online configurator at schroff.nvent.com.

Default features

- 19” 3 U aluminum subrack for 16 A / 32 A versions. 19” 4 U for 63 A versions
- Main switch
- Circuit breaker panel
- Emergency stop system
- Status LEDs for phase presence and emergency stop
- ON/OFF switch for switched outputs

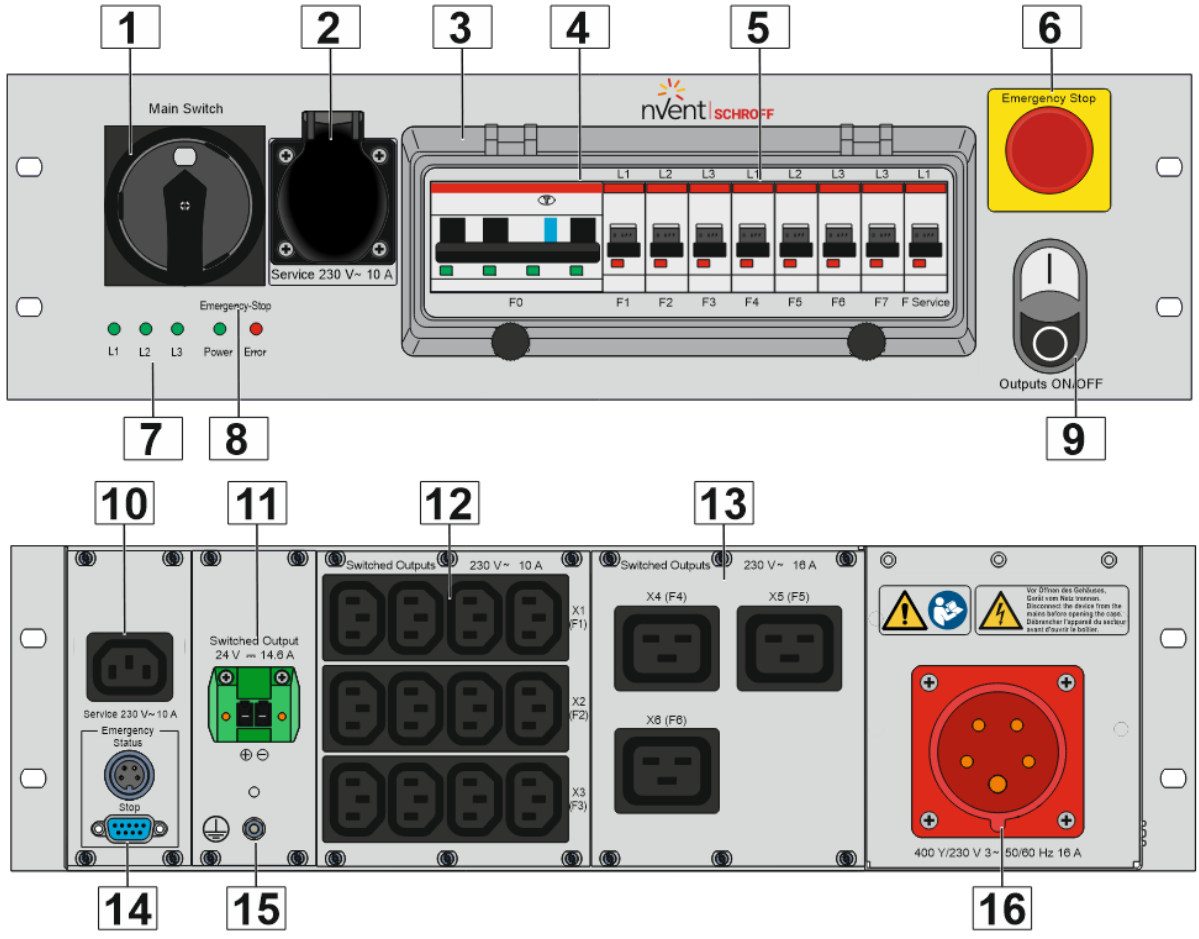
Possible configuration options:

- **Mains input**
  400 V 3-phase or 230 V 1-phase with different connector types such as IEC 60309, IEC 60320-C20, Harting Han 3A/Q5 or cable
- **AC outputs**
  2 rear panels with different connector types such as IEC 60320-C13, IEC 60320-C19 or CEE 7/3 Type F (Schuko).
- **DC Power supply**
  24 V DC, 12V DC and 5V DC power supply with rear output panel
- **Permanent AC Service Outputs**
  IEC 60320-C13 or CEE 7/3 Type F (Schuko) at the front and rear panel
- **RCD circuit breaker**
- **Transparent cover for the circuit breakers**
- **Surge Arrester**
- **Inrush Current Limiter**
- **AC input with EMC filter**

All outputs are protected by circuit breakers.
All outputs except the "Service" outputs can be switched off by the Emergency Stop system.

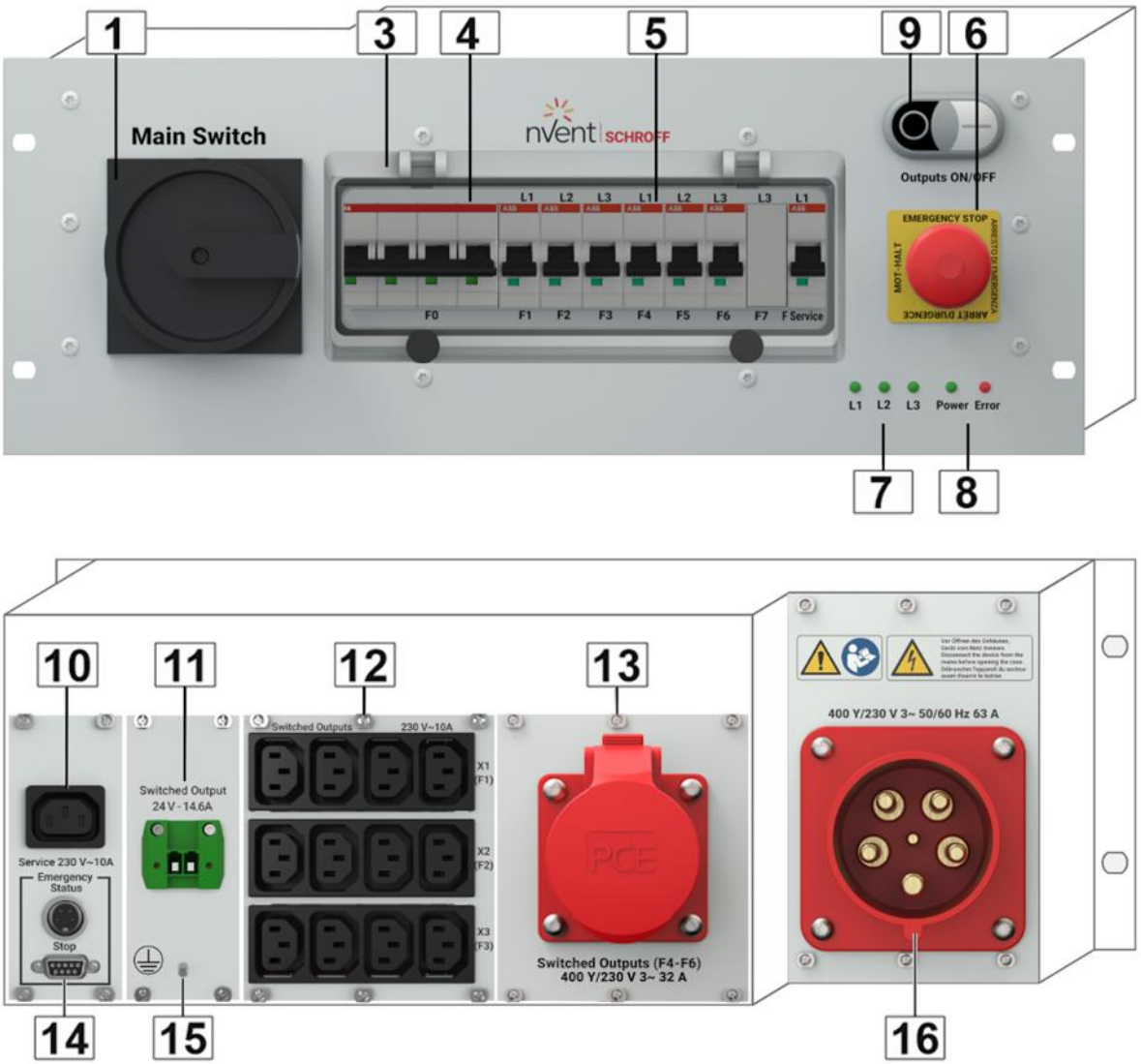
2.2 Front and Rear View

3 U Version, 16/32A Input Current (P/N 21270-001)



1	Main Switch	10	“Service” Output 230 V AC 10 A (option)
2	Service Output 230 V AC 10 A (option)	11	24 V DC Output, switched (option)
3	Transparent Cover for Circuit Breakers (option)	12	Configurable output panel 1 Example: Switched Power Outputs IEC-60320 C13, 230 V AC 10 A
4	Mains Circuit Breaker or Breaker RCD combination (option)	13	Configurable output panel 2 Example: Switched Power Outputs IEC-60320 C19, 230 V AC 16 A
5	Circuit Breakers	14	Emergency Stop Input and Status Output
6	Emergency Stop Push Button	15	Ground Stud
7	Phase Monitor LEDs	16	Configurable input panel Example: IEC 60309 3L+N+PE, 6h, 400 Y/230 V 3~ 50/60 Hz 16 A
8	Emergency Stop Status LEDs		
9	ON/OFF Switch for switched Outputs		

4 U Version, 63A Input Current (P/N 21270-063)

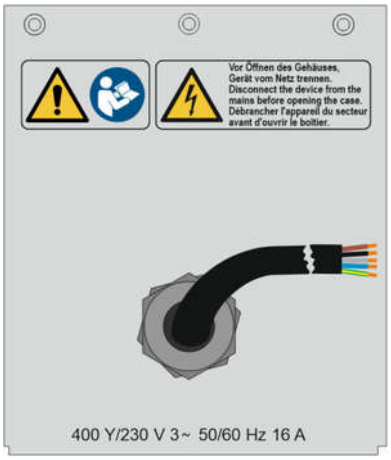


1	Main Switch	10	“Service” Output 230 V AC 10 A (option)
3	Transparent Cover for Circuit Breakers (option)	11	24 V DC Output, switched (option)
4	Mains Circuit Breaker	12	Configurable output panel 1 Example: Switched Power Outputs IEC-60320 C13, 230 V AC 10 A
5	Circuit Breakers	13	Output panel 2 Power Outputs IEC-60309 3L+N+PE, 6h, 400 Y/230 V 3~ 32 A
6	Emergency Stop Push Button	14	Emergency Stop Input and Status Output
7	Phase Monitor LEDs	15	Ground Stud
8	Emergency Stop Status LEDs	16	Configurable input panel Example: IEC 60309 3L+N+PE, 6h, 400 Y/230 V 3~ 50/60 Hz 63 A
9	ON/OFF Switch for switched Outputs		

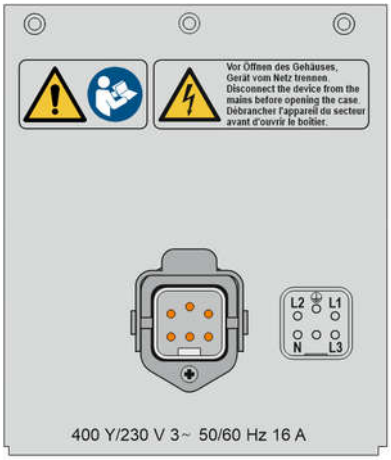
2.3 Mains inlets

Different power inlet modules for 400 V AC and 230 V AC with Input Currents 16 A, 32 A and 63 A are available for the Power Distribution Unit.
The following overview represents the availability at the time of publication of this manual.
For the current availability visit schroff.nvent.com

400 V AC Inputs



Cable (2.5 m)



Harting Han 3A with Han Q 5/0 (16 A Input Current only)

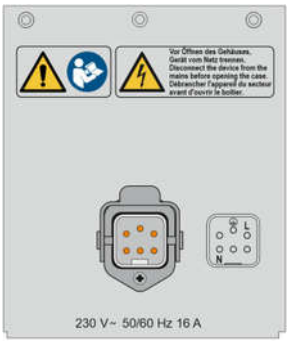


IEC 60309 3L+N+PE, 6h

230 V AC Inputs (16 A Input Current only)



Cable (2.5 m)



Harting Han 3A with Han Q 5/0



IEC 60309 L+N+PE, 6h



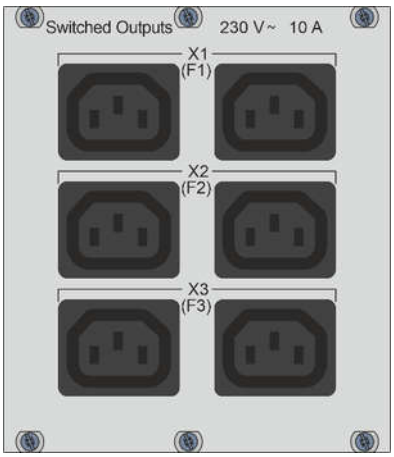
IEC 60320-C20

Terminal assignment for cable Input:
Protective Earth = green/yellow
Neutral Conductor = blue
Phase 1 = brown
Phase 2 = black
Phase 3 = grey

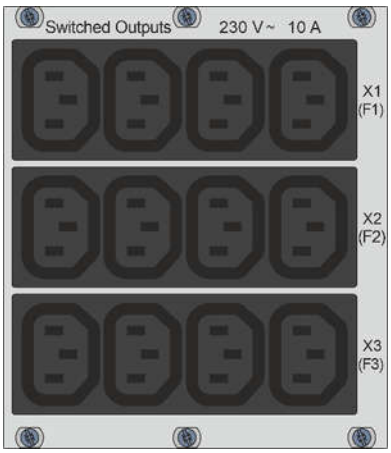
2.4 AC Outlets

Different power outlet modules for 230 V AC 10 A, 16 A and 32 A are available.
The following overview represents the availability at the time of publication of this manual.
For the current availability visit schroff.nvent.com

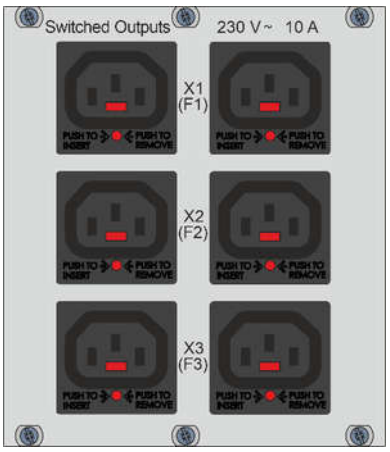
Switched 230 V AC Outlets



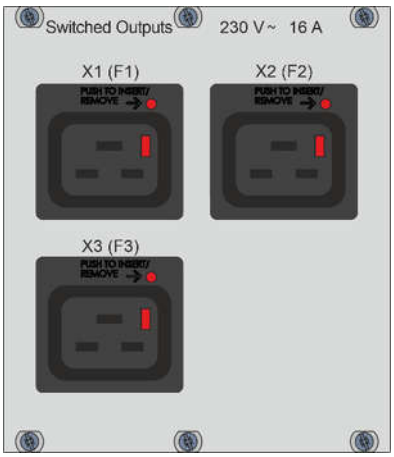
IEC 60320-C13



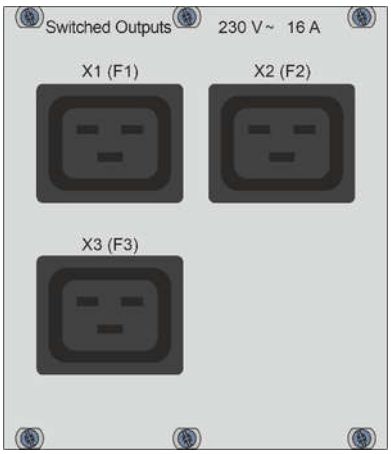
IEC 60320-C13



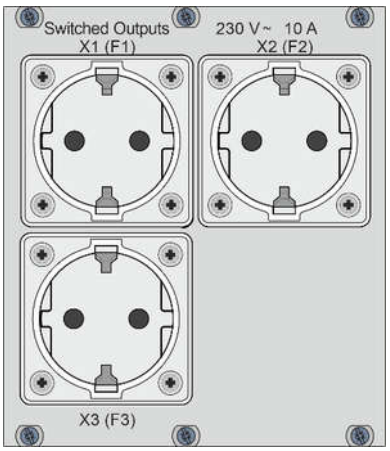
IEC 60320-C13 locking outlets



IEC 60320-C19locking outlets



IEC 60320-C19



CEE 7/3 Type F (Schuko)



IEC 60309 3L+N+PE,6h, 16A
(16/32 A Input Current only)



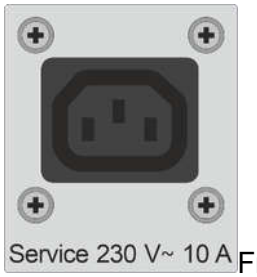
IEC 60309 3L+N+PE,6h, 32A
(32/63 A Input Current only)

Permanent 230 V AC Service Outlets



Front

CEE 7/3 Type F (Schuko)
3 U Version only



Front

IEC 60320-C13

3 U Version only



Rear

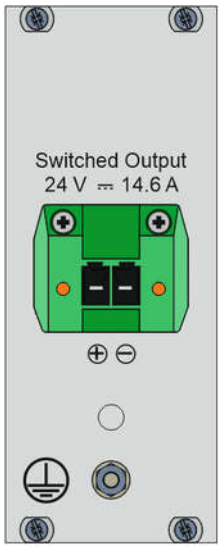
IEC 60320-C13



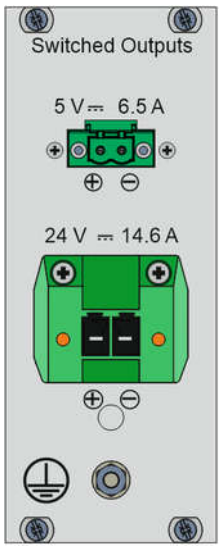
Rear

CEE 7/3 Type F (Schuko)

2.5 DC Outlet (Option)

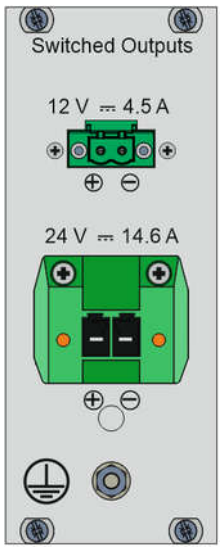


24 V DC, 14.6 A



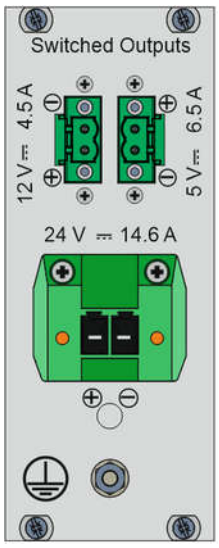
24 V DC, 14.6 A
5 V DC, 6.5 A

3 U Version only



24 V DC, 14.6 A
12 V DC, 4.5 A

3 U Version only



24 V DC, 14.6 A
5 V DC, 6.5 A
12 V DC, 4.5 A
3 U Version only

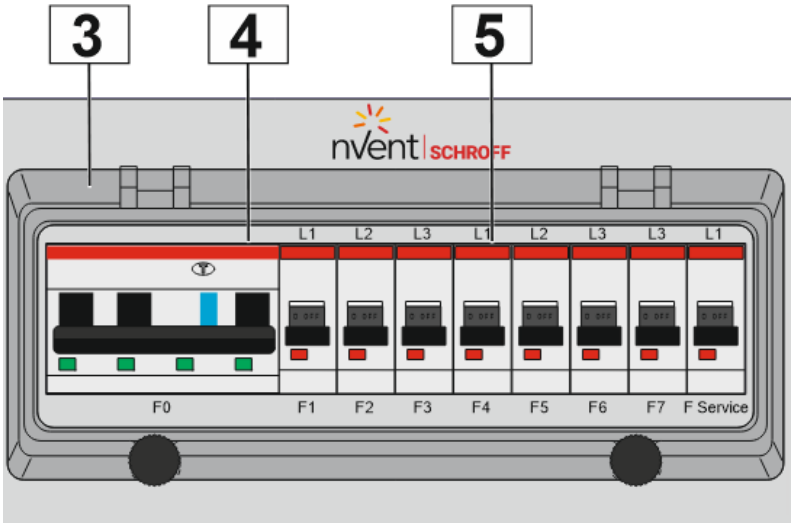
The connector for 24 V is Phoenix Contact P/N: 1840557
The mating connector is Phoenix Contact P/N: 1828249

The connector for 5/12 V is Phoenix Contact P/N: 1096152
The mating connector is Phoenix Contact P/N: 1777989

2.6 Circuit Breakers

The outputs are protected by circuit breakers (5) with trigger characteristic C. The number of the circuit breaker corresponds to the number of the output, for example, X1 is connected to F1, X2 is connected to F2 and so on.
The total current consumption of all outputs must not exceed the Rated Input Current 16 A, 32 A or 63 A per phase under the condition of a non-inductive or weakly inductive load (category of use AC1).
For inductive loads (AC-3) current consumption per phase should not exceed 9 A for 16A Input Current, 22A for 32 A Input Current or 53A for 100A Input Current.

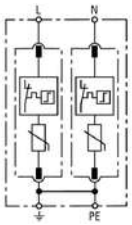
The Mains Breaker F0 (4) are 1P+N or 3P+N with characteristic K. Optional an RCD functionality can be added (32/63 A Input Current only). Therefore for the Mains Breaker F0 (4), a combination element with breaker and included RCD is used. The RCD triggers on a residual current of 30 mA without delay.
A transparent cover (3) for circuit breaker and RCD is available as an option.



2.7 Surge Arrester (Option, 32/63 A Input Current only)

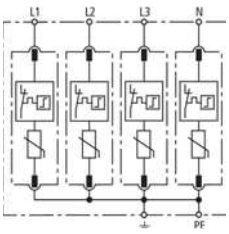
The Power Distribution Unit can be equipped with a surge arrester.





1 phase





3 phase

Technical Data Surge Arrester	
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment (≤ 10 m)	type 2 + type 3
Nominal voltage (a.c.) (U_N)	230 / 400 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) (U_C)	275 V (50 / 60 Hz)
Nominal discharge current (8/20 µs) (I_n)	20 kA
Max. discharge current (8/20 µs) (I_{max})	40 kA
Voltage protection level [L-PE]/[N-PE] (U_P)	≤ 1.5 / ≤ 1.5 kV
Voltage protection level [L-PE] / [N-PE] at 5 kA (U_P)	≤ 1 / ≤ 1 kV
Response time (t_A)	≤ 25 ns
Max. mains-side overcurrent protection	125 A gG
Short-circuit withstand capability for max. mains-side overcurrent protection (I_{SCCR})	50 kA_{rms}
Temporary overvoltage (TOV) (U_T) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) (U_T) – Characteristic	440 V / 120 min. – safe failure

Please take the Surge Arrester for planning of high voltage insulation tests of the device into account. The presence of a surge arrester is indicated with a label on the Rack Safety Plus chassis.

2.8 Inrush Current Limiter (Option, 16 A Input Current Only)

The Power Distribution Unit provides an inrush current limiter for each phase as an option. The inrush current limiter is designed for capacitive loads. In the moment of switching-on the system the inrush current of the connected load will be limited for the defined time T_{on}. Independent from the previous inrush level, the current limiting is always strict. After T_{on} elapses the current limiting circuit of the inrush current limiter will be bypassed. Then the load is directly connected to the AC. If an AC dump overshoots the defined time T_{off}, it will be detected by the inrush current limiter. As soon as the AC recovers the inrush will be limited, again. The inrush current limiter provides an internal temperature control. In case of a failure the device shuts down to safely prevent from overheating or fire.

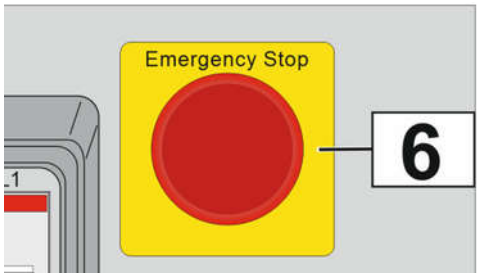
Technical Data Inrush Current Limiter		
Device Type	3 phase	1 phase
RMS Current Limiting ±6 %	48 A	48 A
Maximum Capacity Load	6000 µF	6000 µF
Limiting Time	350 ms (±50 ms)	300 ms (±50 ms)
Release Time	800 ms (±50 ms)	550 ms (±50 ms)
Limiting Cycle	3 cycles/minute	3 cycles/minute



For reliable operation of the optional inrush current limiter, a type B or C circuit breaker in the electrical feed to the Rack Safety Plus Unit is required. Faster circuit breakers are not recommended.

3 Emergency Stop System

The device is equipped with an emergency stop button (6).
Pressing the emergency stop button disconnects the switched AC and DC outputs from the mains.
The button is mechanically latching. Emergency stop is deactivated by pulling the button.
The switched AC and DC outputs can be turned on again by pressing the Outputs ON/OFF switch.



⚠ DANGER	
	**Danger of electric shock** The “Service” AC outputs are **not** switched off via the Emergency Stop System.

3.1 Emergency Stop safety features

The Emergency Stop function of the nVent SCHROFF power distribution unit is controlled and monitored by a safety relay.
The safety relay provides a safety-related interruption of the switched outputs. The safety relay meets the requirements of EN 60947-5-1 and EN 60204-1 in applications with E-STOP push buttons.
The emergency stop push button is vandalism-proof. If the emergency stop is sheared off during operation, the emergency stop function is also triggered.

The safety relay meets the following safety requirements:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The correct opening and closing of the safety function relays is tested automatically in each on-off cycle.
- Two emergency stop input circuits with cross-circuit detection.
- Emergency stop function is triggered when either one of the two emergency stop input circuits is interrupted or a cross-circuit between the circuits is detected.

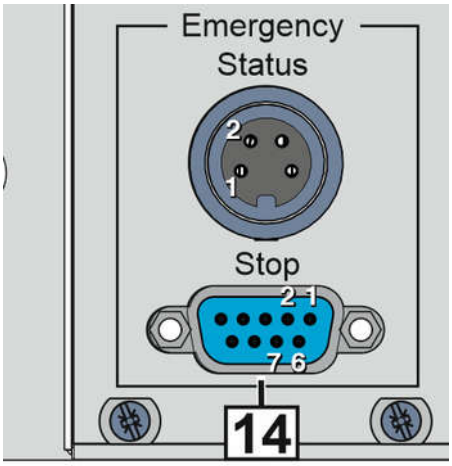
	The safety relay drives two power contactors responsible for switching the outputs. The power contractors are monitored by auxiliary contacts within a feedback loop of the safety relay. In case of one power contactor failing by a stuck contact the system cannot be turned on again. The red ERROR LED on front panel signals if one of the power contactors got stuck.

3.2 Emergency Stop Input and Output

An additional emergency stop push button can be connected to the system at the "Emergency Stop" input (14).
If no additional emergency stop switch is connected, the socket must be terminated with a jumper plug. (Scope of delivery)
The "Emergency Status" connector can be used to transfer status signals to other devices. The Emergency Status plug connector provides a relay output of the status of the safety relay. If the AC and DC outputs are enabled, the relay output (pin 1+2) is closed. If the emergency stop function is triggered, the safety relay interrupts the relay contact.
If the outputs are not enabled via the Output ON/OFF switch, the relay output is permanently open.

Emergency Status (Lumberg KFV 40)
Pin 1&2 Relay output status safety relay
Max. voltage = 30 Vrms; 42 Vpeak
Max. current = 2.5 A
The connected circuit has to be Class 2

Emergency Stop (DSUB9)
Pin 1&6 Emergency stop input circuit 1
Pin 2&7 Emergency stop input circuit 2
Max. current = 50 mA



3.2.1 Emergency Stop Status LEDs

The emergency stop system is powered by a dedicated power supply. The presence of the supply voltage for the emergency stop system is signaled by the green “Power” LED.

The red “Error” LED signals if one of the power contactors got stuck.



4 Installation and Commissioning

⚠ WARNING



Risk of injury and accidents due to insufficiently qualified personnel!

- The installation may only be carried out by qualified personnel who are authorized to do so according to the valid safety regulations, e.g. by authorized specialized companies or authorized departments of the company.

⚠ WARNING



Power cable rating

If the system was not supplied with AC power cables, purchase AC power cables approved for use in your country. The AC power cables must be rated for the product and for the voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cable should be greater than the ratings marked on the product.

⚠ WARNING



Protective earth/GND connection

The power distribution unit must be operated with protective earth/GND connection. Use only a three conductor AC power cable with a protective earth conductor that meets the IEC safety standards!

ATTENTION

Incorrect mains voltage or overload can lead to component damage!

The device has a 400 V 3-phase or a 230 V 1-phase power input. The total current consumption of all outputs must **not exceed 16 A per phase**.

4.1 Installation

⚠ DANGER



Danger of electric shock

The EMERGENCY STOP button must be easy to access and not be blocked by any objects.

The device is designed to be installed indoors in dry environment without pollution, in 19” rack systems with access to the front panel and rear panel.

4.2 Rack mounting

⚠ WARNING

Risk of injury and accidents due to insufficiently qualified personnel!

- The installation may only be carried out by qualified personnel who are authorized to do so according to the valid safety regulations, e.g. by authorized specialized companies or authorized departments of the company.
- It is mandatory to mount the power distribution unit with slide rails (A).

ATTENTION

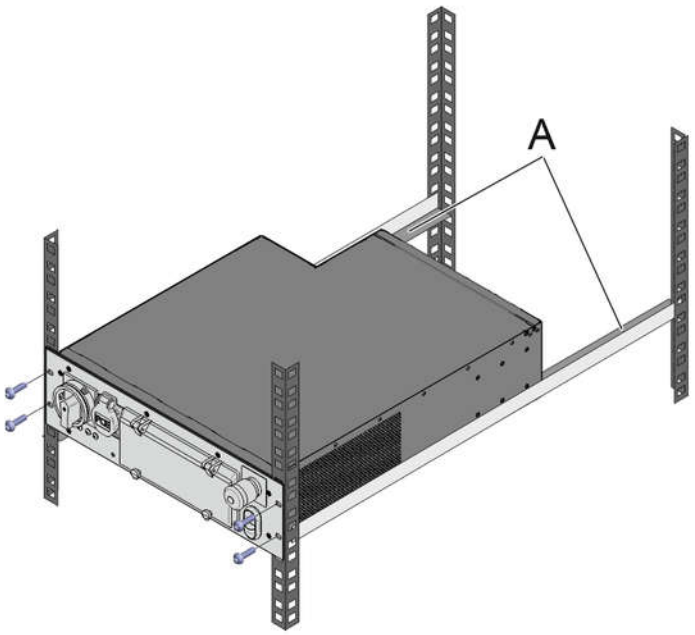
Insufficient air flow can lead to overheating and component damage!

When installing the system, make sure that the ventilation opening on the sides of the system remain completely free and there is a distance of at least 50 mm to any object.

When mounted inside a Rack, please make sure that the air path from and to the ventilation openings are not blocked by any objects. Additional Units are allowed to mount directly above or below, without any additional distance.

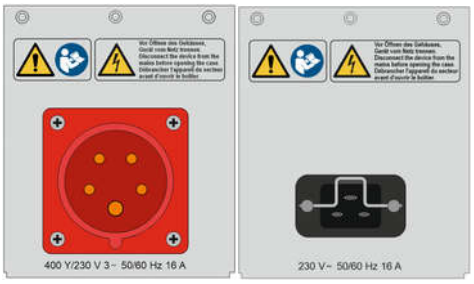
The power distribution unit can be installed into the 19" plane of electronics cabinets.

1. Install slide rails (A) at the corresponding position
2. Install cage nuts at the 19” posts
3. Slide in the power distribution unit
4. Fix the power distribution unit with 4 screws at the 19” posts



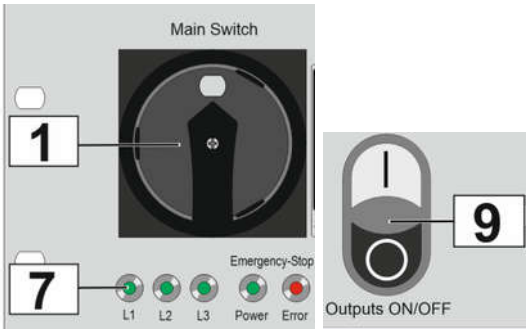
4.3 Mains connection and system start-up

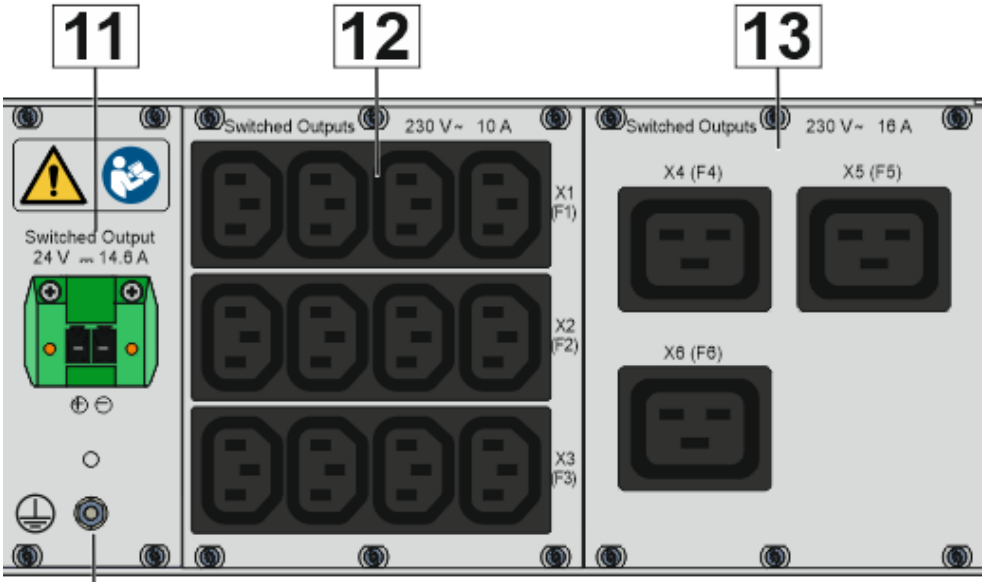
Connect the system to the 400 Y/230 V 3~ or the 230 V~ mains input.
Note: Input and connector type depends on the configuration



Switch the system on via the main switch (1). The AC “Service” outputs will be switched on. Power LED lights up and presence of phases is indicated with the LEDs L1-L3 (7).

Turn on the switched AC outputs (12,13) and DC output (11) with the ON button (9). The white LED within the Outputs ON/OFF switch indicates that switched outputs are active.





The picture shows a possible output configuration

Switched Outputs (11-13) can also be turned off with the Outputs ON/OFF switch (9). Therefore make sure to push the OFF button completely trough and hold it for at least one second.

5 Maintenance

The device is maintenance-free. Depending on the operating conditions, the emergency stop and RCD function should be tested regularly at intervals specified by the operator. The emergency stop function should at least be tested once a year. RCD functionality should at least be tested every 6 months with the test button at the front of the device. For a triple phase system, it is mandatory that all three phases L1 - L3 are present for the RCD test.

5.1 Cleaning

⚠ WARNING	
	**Electrical shock when cleaning** To prevent electrical shock, disconnect the device from mains power before cleaning with dampened cloth!

Use a dry cloth or a cloth slightly dampened with clean water or soapy water to clean the case.
Do not use chemical cleaning agents.

6 Disposal

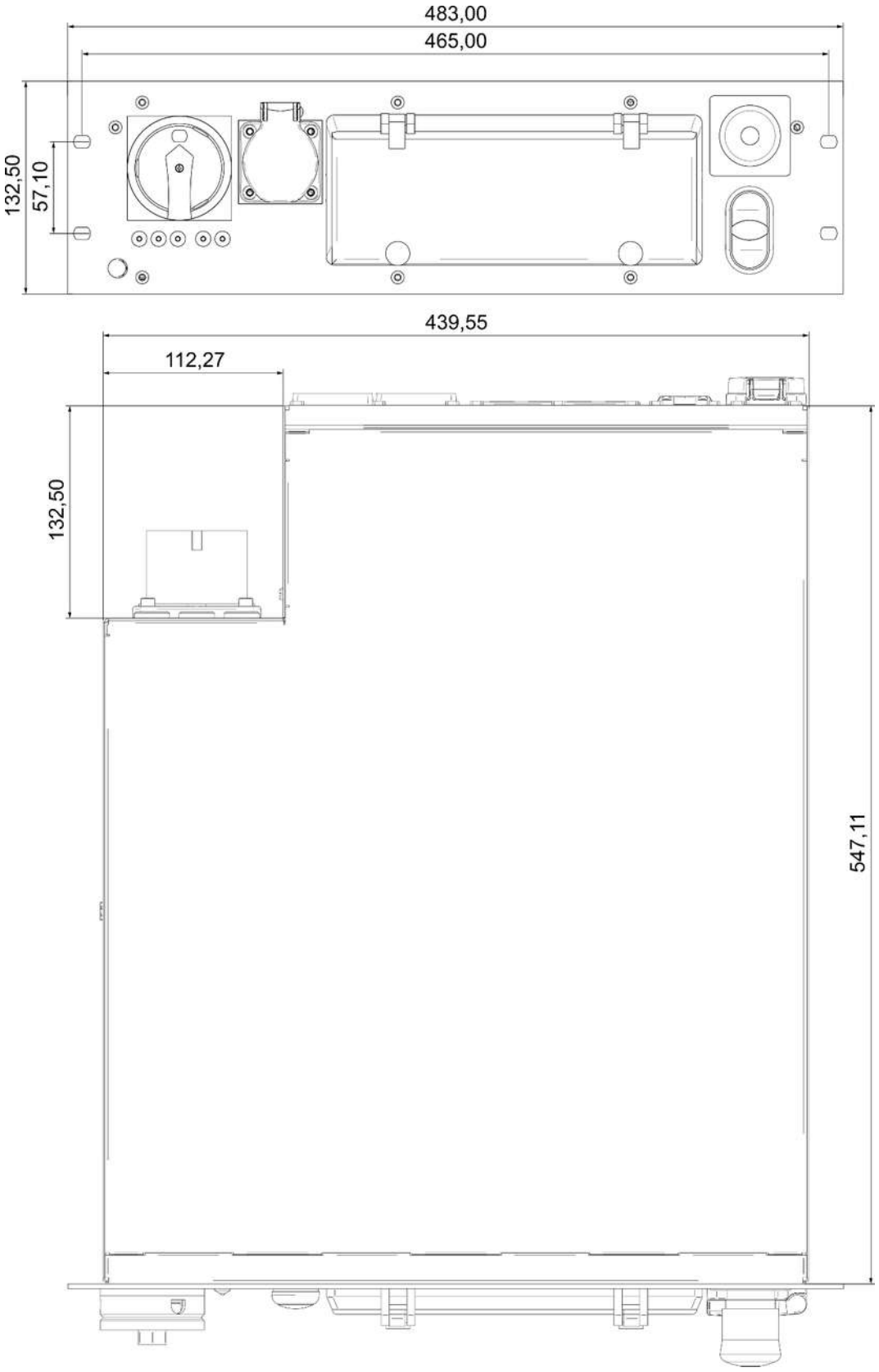


The devices described in this manual must be recycled. In accordance with the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE), they may not be disposed of in the municipal waste disposal services. To ensure environmentally friendly recycling the devices can be returned to a locally approved disposal center. Make sure that you observe the regulations applicable in your country.

7 Technical data

Type	Rack Safety Plus
Electrical data	
Supply voltage, single phase	230 V AC, 50/60 Hz 16 A
Supply voltage, 3 phase	400 Y/230 V 3~ 50/60 Hz 16/32/63 A
Mains supply voltage fluctuations	10 %
Overvoltage category	II
Environment	
Ambient temperature operation	5….40 °C
Ambient temperature transport/storage	-25…..65 °C
Maximum operational altitude	2000 meters
Pollution degree	2
Max. relative humidity level	85 %, non condensing
Weight	Up to 15 kg
Degree of Protection	IP 20
Safety	
Protection class	1
Safety	DIN EN 61010-1
Dimensions 3U Version	
Height	3 U / 132,5 mm
Width	19” / 483 mm
Depth	547,11 mm
Dimensions 4U Version	
Height	4 U / 177 mm
Width	19” / 483 mm
Depth	466,20 mm

7.1 Dimensions 3U Version



7.2 Dimensions 4U Version

