Eaton 9395XP

1020 kW, 1360 kW and 1700 kW, 400 V

User's and Installation Guide

Powering Business Worldwide

This manual contains important instructions that you should follow during installation and maintenance of the UPS and batteries. Please read all instructions before operating the equipment and save this manual for future reference.

This is a product for commercial and industrial application in the second environment. Installation restrictions may apply or additional measures may be needed to prevent disturbances.

Download the quick installation guide and other 9395XP resources here.

Eaton Electric Oy

Address: Riistakuja 1
FI-01740 Vantaa
FINLAND

Internet: www.eaton.eu

Approvals and version history

REVISION	DATE	DESCRIPTION OF CHANGE	APPROVED BY
001	May 2024	First issue	Jari Eloranta

These are the original instructions.

Contents

1 How to read this manual

1.1 Safety-related signs

These are the safety-related signs used in this document.

DANGER

DANGER indicates a hazard with a high level of risk which, if not avoided, may result in serious injury or death.

WARNING

WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in serious injury or death, or damage to the equipment.

CAUTION

CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury, or damage to the equipment.

NOTE: Notes are used to indicate important information and useful tips.

1.2 Symbols and abbreviations

Hazard symbols

These symbols indicate a hazardous situation or action. Symbols are used to warn of situations, which can cause environmental damage and personal injury.

	General warning sign
	Explosion and fire hazard
	Battery hazard

	Corrosive hazard
	Electrical hazard

Prohibited action symbols

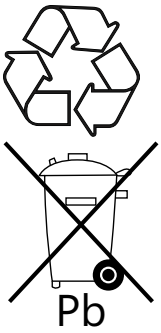
These symbols are used in warnings and notifications to indicate an action that should not be taken. The prohibited action symbols are shown below.

	No smoking
	Limited or restricted access
	General symbol for prohibited action
	Do not touch

Mandatory action symbols

These symbols are used in warnings and notifications to indicate an action that must be taken. The mandatory action symbols are shown below.

	Wear eye protection
	General symbol for mandatory action

	Read the manual or instructions
	Disconnect from power source
	First aid
	Batteries marked with this sign must be recycled

1.3 Conventions used in this document

This document uses the following type conventions:

Bold type highlights important concepts in discussions, key terms in procedures and menu options, or represents a command or option that you type or enter at a prompt.

Italic type highlights notes and new terms when they are defined.

`Screen` type represents information that appears on the screen or LCD.

1.4 Glossary

The following acronyms are used in Eaton documentation to refer to Eaton UPS products or their parts.

Table 1. Glossary of acronyms

ABM	Advanced Battery Management
EPO	Emergency Power-Off
ESS	Energy Saver System
IPM	Intelligent Power Manager

IPP	Intelligent Power Protector
MBS	Maintenance Bypass Switch
MIS	Maintenance Isolation Switch
MOB	Module Output Breaker
SCR	Silicon-Controlled Rectifier
UPM	Uninterruptible Power Module
UPS	Uninterruptible Power Supply
VRLA	Valve Regulated Lead Acid (battery)
ISBM	Integrated System Bypass Module
CSM	Cyber Secured Monitoring
VPM	Visual Power Manager
VCOM	Visual Capacity Optimization Manager

2 Safety instructions

2.1 Safety instructions

DANGER

Important safety instructions!

This document contains important instructions that must be obeyed during the installation, operation and maintenance of the UPS and the batteries. Read all instructions before operating the equipment.

Keep this manual for future reference. These instructions are also available for download at *www.eaton.eu/*

DANGER

Operations inside the UPS must be done by an authorized Eaton Customer Service Engineer or by other qualified service personnel authorized by Eaton. There are no user-serviceable parts inside the UPS.

The UPS operates with mains, battery or bypass power. It contains components that carry high currents and voltage. A properly installed enclosure is earthed and IP20 rated against electric shock and unwanted objects. The UPS is a sophisticated power system and only qualified personnel are allowed to install and service it.

DANGER

This UPS carries lethal voltages. All repairs and service must be done by authorized personnel only. There are no user-serviceable parts inside the UPS.

WARNING

The UPS is powered by its own energy source (batteries). The output terminals could be energized even when the UPS is disconnected from an AC source. To reduce the risk of fire or electric shock, install the UPS in a temperature and humidity controlled, indoor environment that is free of conductive contaminants. See temperature and humidity limits in chapter *Technical data* in this manual.

The ambient temperature limit must not be exceeded. Do not operate the UPS near water or excessive humidity. The system is not intended for outdoor use.

Before you start any installation or service work, make sure that all AC and DC power sources are disconnected. Power can come from multiple sources. Also ensure system grounding / PE continuity.

In a parallel system, the output terminals could be energized even when the UPS is turned off.

WARNING

Batteries present a risk of electrical shock or burn from high short-circuit current. Obey proper precautions.

Electric energy hazard. Do not attempt to alter any battery wiring or connectors. Attempting to alter wiring can cause injury.

Do not open or mutilate batteries. Released electrolyte may be toxic and is harmful to the skin and eyes.

Batteries can contain HIGH VOLTAGES, and CORROSIVE, TOXIC and EXPLOSIVE substances. Because of the battery string the output terminals can carry high voltage even when the AC supply is not connected to the UPS. Read the shutdown instructions carefully.

IMPORTANT: The battery may consist of multiple parallel strings. Make sure that you disconnect all strings before installation.

CAUTION

Only qualified service personnel knowledgeable of batteries and the required precautions are allowed to do the installation or service work on batteries. Keep unauthorized personnel away from the batteries. Before you install or replace batteries, consider all the warnings, cautions, and notes concerning appropriate handling. Do not disconnect the batteries when the UPS is in Battery mode.

Make sure that your replacement batteries are of the same number and type as the battery that was originally installed in the UPS. See more accurate instructions on the UPS.

Before you connect or disconnect battery terminals, disconnect the charging source by opening the corresponding battery circuit breaker.

If the battery is inadvertently grounded, remove the source of the ground. All batteries in all UPS models are ungrounded.

Discard batteries according to your local disposal requirements. Do not dispose of batteries in a fire. When exposed to flame, batteries may explode.

To ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit, keep the UPS door closed and the front panels installed.

Do not install or operate the UPS system close to gas or electric heat sources. Keep the operating environment within the parameters stated in this document.

CAUTION

Keep the surroundings of the UPS uncluttered, clean, and free from excess moisture.

Obey all DANGER, CAUTION, and WARNING notices affixed to the equipment.

2.2 Audience

The intended audience of this document are as follows:

- People who plan and do the installation of the UPS
- People who use the UPS

This document provides guidelines for how to examine the UPS delivery and how to install and operate the UPS.

The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols. This document is written for a global reader.

CAUTION

Read this document before you start to operate or do work on the UPS.

2.3 CE marking

The product has a CE marking in compliance with the following European directives:

- LVD Directive (Safety) 2014/35/EU
- EMC Directive 2014/30/EU
- RoHS Directive 2011/65/EU

Declarations of conformity with UPS harmonized standards and directives EN 62040-1 (Safety), EN 62040-2 (EMC) and EN 63000 (RoHS) are available at www.eaton.eu or by contacting your nearest Eaton office or authorized partner.

2.4 User precautions

The only permitted user operations

- Startup and shutdown of the UPS, excluding the commissioning startup
- Use of the LCD control panel
- Use of optional connectivity modules and their software

Obey the precautions and perform only the described operations. Do not deviate from the instructions. It can be dangerous to you or cause an accidental load loss.

DANGER

Do not open any other screws in the unit than those holding the cover plates of the MiniSlots. Failure to recognize the electrical hazards can prove fatal.

CAUTION

This is a product for commercial and industrial application in the second environment. Installation restrictions may apply or additional measures may be needed to prevent disturbances.

2.5 Environment

The UPS must be installed according to the recommendations in this document. Never install the UPS in an airtight room, in the presence of flammable gases, or in an environment exceeding the specifications.

Excessive amount of dust in the operating environment of the UPS may cause damage or lead to malfunction. Always protect the UPS from the outside weather and sunshine. In order to maximize internal battery service life time, the recommended operating temperature range is from +20 ºC to +25 ºC.

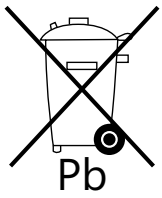
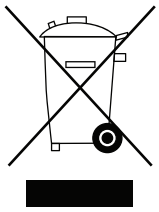
WARNING

During charge, float charge, heavy discharge, and overcharge, hydrogen and oxygen gases are emitted from lead-acid and NiCd batteries into the surrounding atmosphere. Explosive gas mixture may be created if the hydrogen concentration exceeds 4% by volume in air. Ensure the necessary air flow rate for the ventilation of the UPS location.

2.6 Symbols on the UPS and accessories

The following are examples of symbols used on the UPS or its accessories. The symbols are used to alert you of important information.

	RISK OF ELECTRIC SHOCK Indicates that a risk of electric shock is present and the associated warning should be observed.
	CAUTION: REFER TO OPERATOR'S MANUAL Refer to your operator's manual for additional information, such as important operating and maintenance instructions.

	This symbol indicates that you may not discard the UPS or the UPS batteries in the trash. This product involves sealed, lead-acid batteries and they must be disposed of properly. For more information, contact your local recycling / reuse or hazardous waste center.
	This symbol indicates that you may not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling / reuse or hazardous waste center.

2.7 For more information

Address any inquiries about the UPS and the battery cabinet to the local office or an agent authorized by the manufacturer. Quote the type code and the serial number of the equipment.

Contact your local service representative if you need help with any of the following.

- scheduling initial startup
- regional locations and telephone numbers
- a question about any of the information in this manual
- a question that this manual does not answer

3 Introduction to Eaton UPS

3.1 About the Eaton UPS

The Eaton® 9395XP uninterruptible power supply (UPS) is a true online, continuous-duty, transformerless, double-conversion, solid-state, three-phase system that supplies conditioned and uninterruptible AC power to critical load and protects it from power failures.

The Eaton 9395XP online power protection system is used to prevent loss of valuable electronic information, minimize equipment downtime, and minimize the adverse effect on production equipment due to unexpected power problems.

The Eaton 9395XP UPS continually monitors incoming electrical power and removes the surges, spikes, sags, and other irregularities that are inherent in commercial utility power. Working with a building's electrical system, the UPS system supplies clean, consistent power that sensitive electronic equipment requires for reliable operation. During brownouts, blackouts, and other power interruptions, batteries provide emergency power to safeguard operation.

The 9395XP 340-1700 kVA contains a section configured as an integrated system bypass module (ISBM) and Input/Output Module (I/O) and uninterruptible power module (UPM) rated for a maximum of 1700 kVA.

The UPS is housed in a free-standing cabinet, is either factory installed as one piece or divided into two sections to facilitate shipping.

- Integrated System Bypass Module (ISBM) and Input/Output Module (I/O) cabinet
- Uninterrupted Power Module (UPM) cabinet(s)

Two different I/O cabinet size of the 9395XP UPS are included in this manual.

- 9395XP Small I/O, single feed only (S-I/O)
- 9395XP Large I/O, single/dual feed (L-I/O)

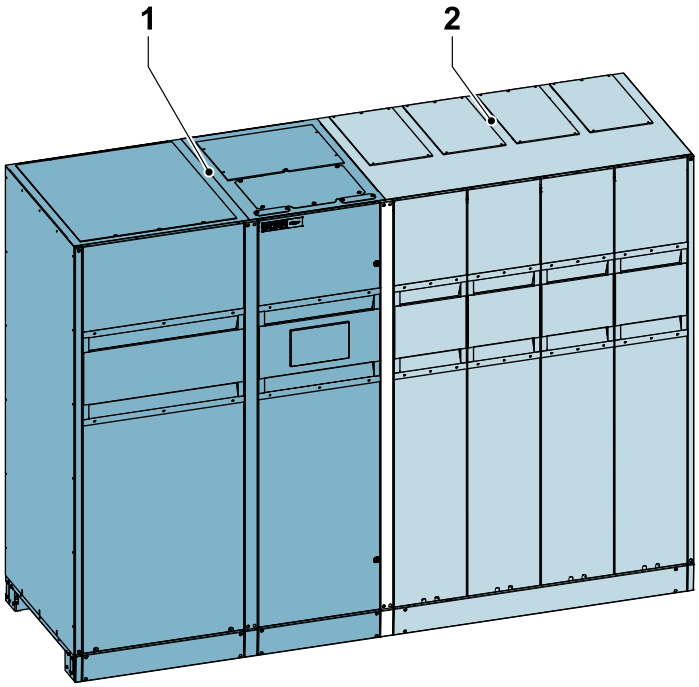
The output power ratings are based on 300 kVA and 340 kVA rated uninterruptible power modules (UPMs) installed in 1360 kVA or 1700 kVA UPS frames. A single UPS cabinet can house from one to four or five UPMs.

NOTE: Access and connections to the S-I/O and L-I/O UPS are identical. Differences in dimensions or specifications are identified where applicable.

The UPS system is housed in a single, free-standing cabinet with safety shields behind the door for hazardous voltage protection. The cabinet matches the battery and distribution cabinets in style and color and can be installed in line-up-and-match or standalone configurations.

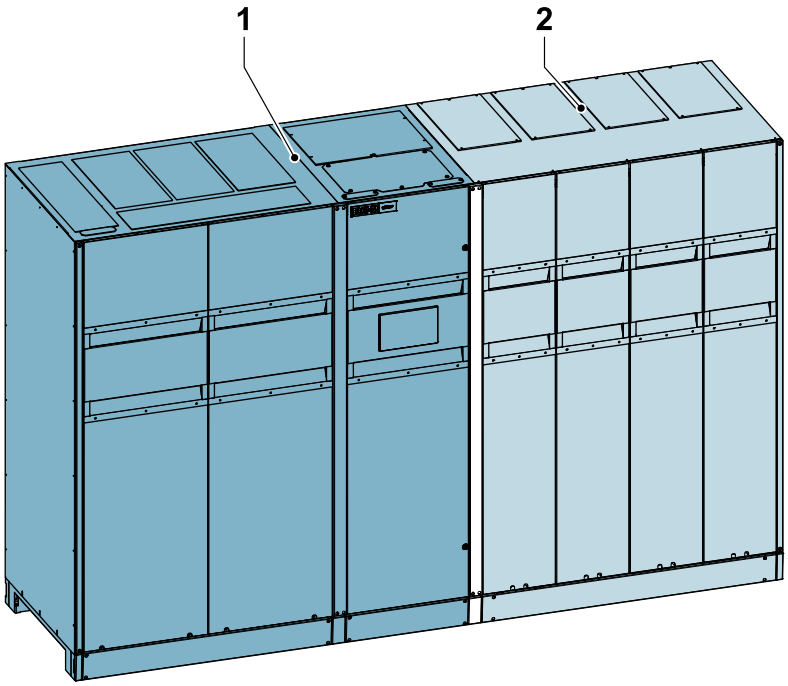
The Eaton 9395XP UPS configurations are shown *Figures 1: Eaton 9395XP with Small I/O* and *2: Eaton 9395XP with Large I/O*.

Figure 1. Eaton 9395XP with Small I/O



The cabinet consists of the ISBM & I/O (1) and the UPM (2) sections.

Figure 2. Eaton 9395XP with Large I/O



The cabinet consists of the ISBM & I/O (1) and the UPM (2) sections.

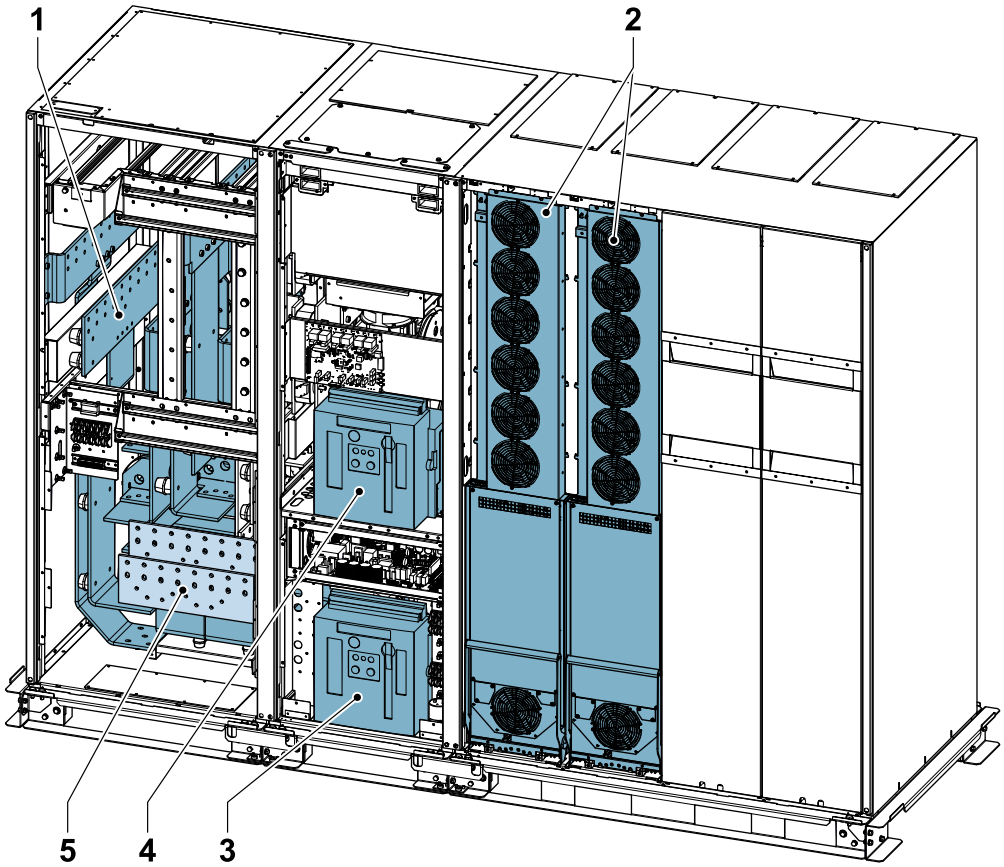
NOTE: Startup and operational checks must be done by an authorized Eaton Customer Service Engineer or by other qualified service personnel authorized by Eaton, or the terms specified in the Warranty (see *10.1 General information about warranty*) become void. This service is offered as part of the sales contract for the UPS. Contact service in advance (usually a two-week notice is required) to reserve a preferred startup date.

3.2 Looking inside the UPS system

The basic system consists of a rectifier, battery converter, inverter, monitoring/operation control panel, integrated communication server, and digital signal processor (DSP) logic.

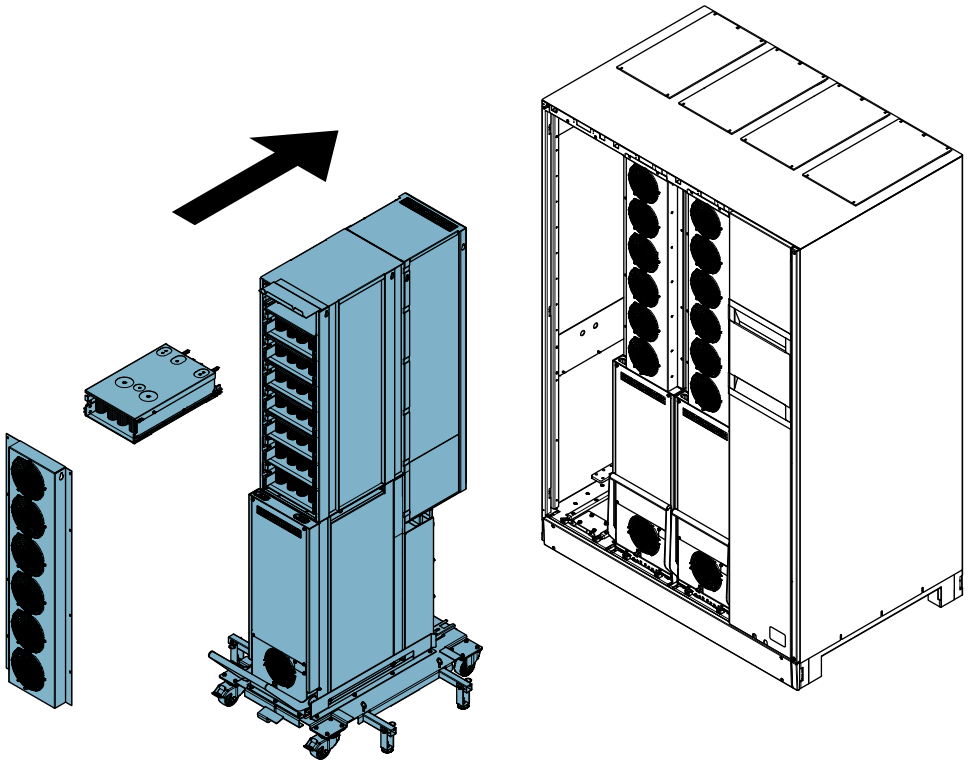
Figure 3: Eaton 9395XP main parts inside (small IO version) shows the main elements of the UPS system. If utility power is interrupted or falls outside the parameters specified in *4.4 Technical data (1020/1360/1700 kVA/kW)*, the UPS uses a backup battery supply to maintain power to the critical load for a specified period of time or until the utility power returns. For extended power outages, the UPS system allows you to either transfer to an alternative power system (such as a generator) or shut down your critical load in an orderly manner.

Figure 3. Eaton 9395XP main parts inside (small IO version)



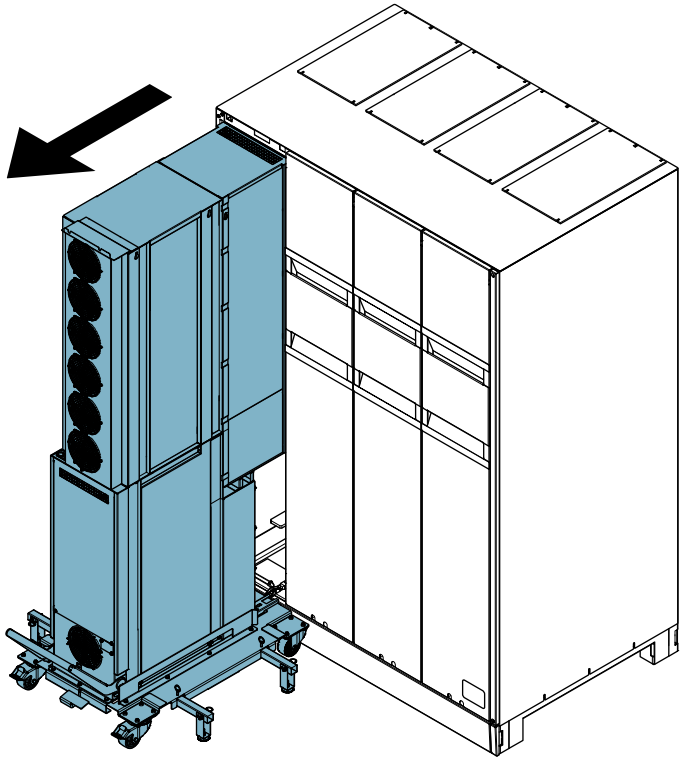
1. Customer connections (neutral busbar)
2. UPMs
3. Rectifier input switch (Optional)
4. Backfeed switch (Optional)
5. Customer connections (Battery -)

Figure 4. Eaton 9395XP cabinet construction, inserting a module



The UPM is slided out for service purpose onto a service dock in front of the UPM.

Figure 5. Eaton 9395XP cabinet construction



3.3 9395XP Frames and system structure

The Eaton 9395XP 900-1700 kVA has three different frame sizes regarding the system's power range.

1. 1020 kVA
2. 1360 kVA
3. 1700 kVA

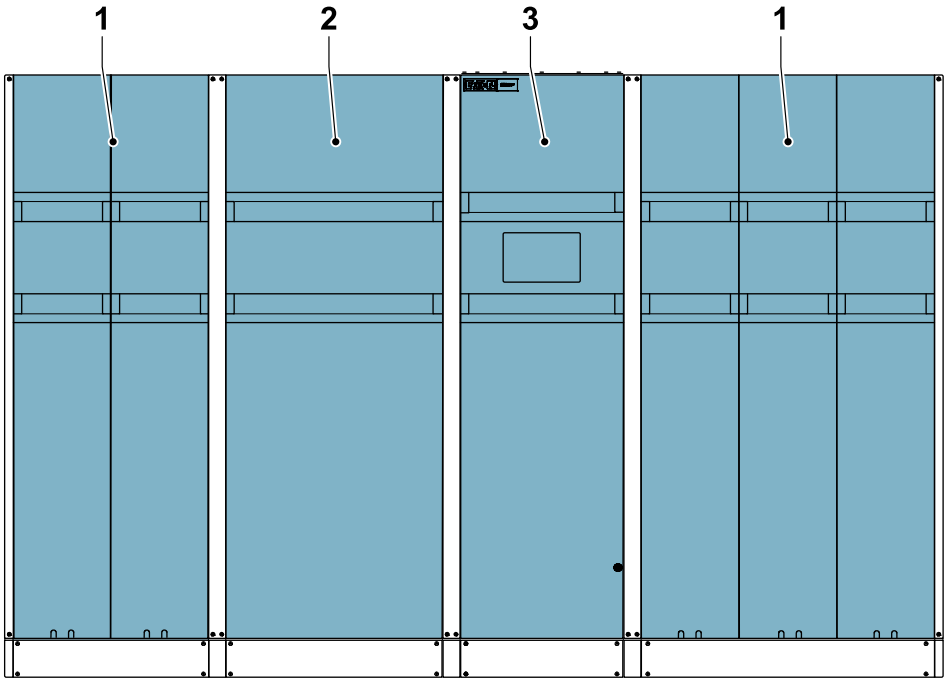
The power rating of a UPM module is from 300 to 340 kVA.

9395XP 900-1700 kVA has two different I/O size options:

1. Small I/O-cabinet: single feed only (S-I/O)
2. Large I/O-cabinet: single or dual feed (L-I/O)

NOTE: Access and connections to the S-I/O and L-I/O UPS are identical. Differences in dimensions or specifications are identified where applicable.

Figure 6. Eaton 9395XP System View



1. Power modules (UPMs)
2. I/O Connection cabinet
3. ISBM (Static Switch + User Interface (Display)

The maximum attainable UPS system power rating is determined by the size of the UPS cabinet frame.

The number of UPM power modules determines the nominal power rating of the UPS. If upgradeability is required, the UPS frame size should be chosen according to the future maximum load rating, and the number of UPMs is chosen according to the capacity requirements on day one.

NOTE: The UPS frames can be connected in parallel to create even larger systems.

- Up to 4 x 1 MW
- Up to 3 x 1.36 MW
- Up to 2 x 1.7 MW

NOTE: The UPM frames can be installed either on the left, on the right, or both sides of the ISBM.

3.4 9395XP module options

The following UPS configurations with different frame sizes and number of UPMs are possible. Eaton 9395XP has standard 300 kW or 340 kW UPM options. The output ratings are dependent on the module selection.

Table 2. 9395XP output ratings

Number of UPMs	Output rating options with 300 kW UPMs	Output rating options with 340 kW UPMs
1	9395XP-300 kW	9395XP-340 kW
2	9395XP-600 kW	9395XP-680 kW
3	9395XP-900 kW	9395XP-1020 kW
4	9395XP-1200 kW	9395XP-1360 kW
5	9395XP-1500 kW	9395XP-1700 kW

UPM options:

- 2 UPM Right
- 2 UPM Right
- 3 UPM Right
- 3 UPM Left
- 4 UPM Right
- 4 UPM Left
- 2 UPM Left + 2 UPM Right
- 2 UPM Left + 3 UPM Right
- 3 UPM Left + 2 UPM Right

UPS System Max Rating enables power extension possibility for more power needs if the system has a slot for an additional UPM.

9395XP UPS System Max rating (type plate rating) options:

- 300 kW
- 340 kW
- 600 kW
- 680 kW
- 900 kW
- 1020 kW
- 1200 kW
- 1360 kW
- 1500 kW
- 1700 kW

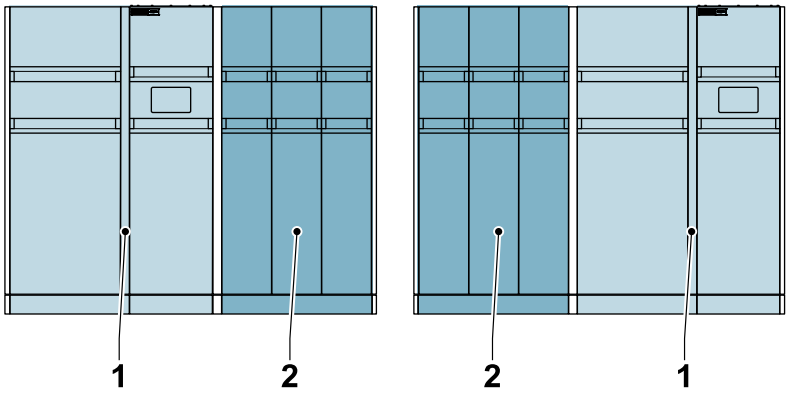
3.5 9395XP Standard models

3.5.1 Eaton 9395XP 1020 kW (1360 kW frame)

The cabinet consists of the ISBM & I/O (1) and the UPM (2) sections.

The UPM frames can be installed either on the left or on the right side of the ISBM.

Figure 7. Eaton 9395XP 1020 kW (1360 kW frame)

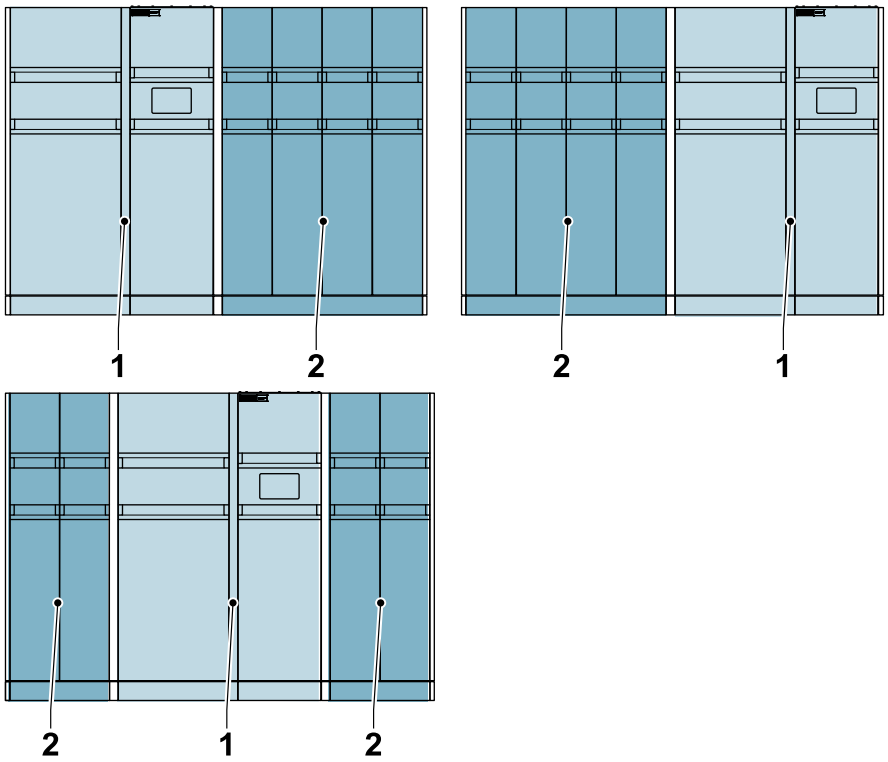


3.5.2 Eaton 9395XP 1360 kW (1360 kW frame)

The cabinet consists of the ISBM & I/O (1) and the UPM (2) sections.

The UPM frames can be installed either on the left, on the right, or both sides of the ISBM.

Figure 8. Eaton 9395XP 1360 kW (1360 kW frame)

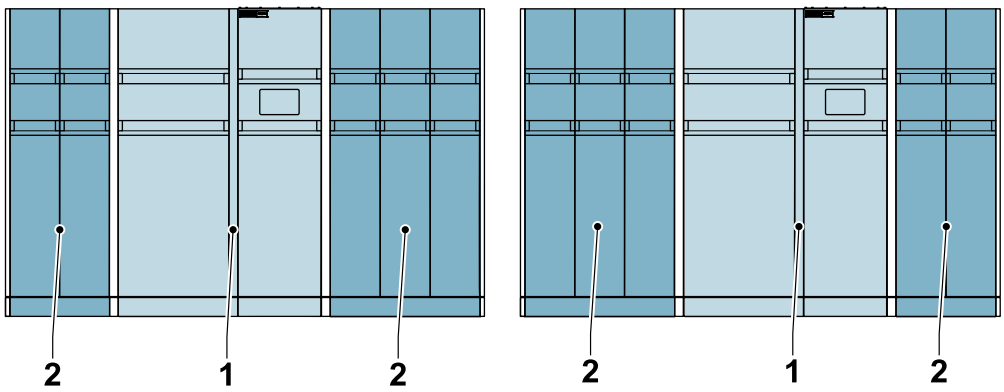


3.5.3 Eaton 9395XP 1700 kW (1700 kW frame)

The cabinet consists of the ISBM & I/O (1) and the UPM (2) sections.

The UPM frames can be installed either on the left, on the right, or both sides of the ISBM.

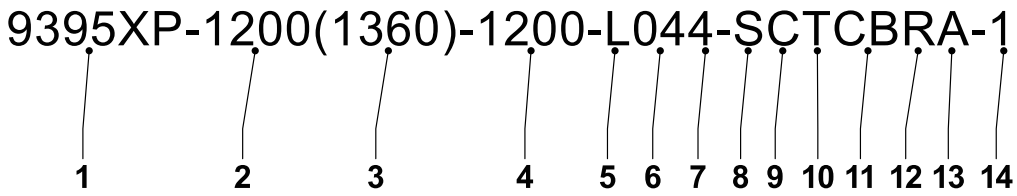
Figure 9. Eaton 9395XP 1700 kW (1700 kW frame)



3.6 Eaton 9395XP model description

This UPS's model description structure is described in *Figure 10: Example model reference*.

Figure 10. Example model reference



Number	Meaning
1	UPS model
2	UPS output rating
3	Static Switch size
4	UPS max rating
5	I/O cabinet size
6	UPM frame configuration
7	Number of UPMs
8	AC input feeds
9	AC connections
10	DC connections
11	Battery configuration
12	Switch configuration
13	Door filter
14	Shipping

3.7 UPS operating modes

A single UPS operates independently to support an applied load from the inverter, providing conditioned and uninterruptible AC power to the critical load from the output of the module. During an outage, the inverter continues to operate, supporting power to the load from the battery supply. If the unit requires service, applied loads are transferred to the internal bypass via the continuous-duty static switch either automatically or manually. Except for a battery cabinet, no other cabinets or equipment are required for the single UPS to successfully support its applied loads.

The 9395XP UPS supports a critical load in different modes of operation.

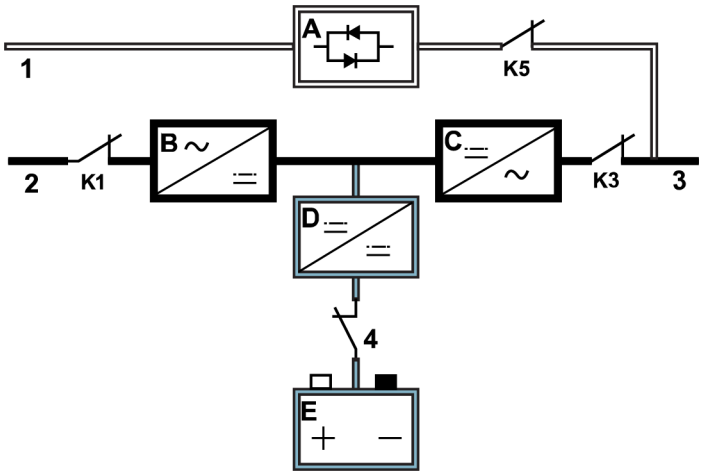
The following paragraphs describe the differences in the five UPS operating modes, using block diagrams to show the power flow during each mode of operation.

3.7.1 Normal mode

Figure 11: Path of current through the UPS in normal mode shows the path of electrical power through the UPS system when the UPS is operating in normal mode.

NOTE: On a UPS configured as an IOM, the bypass input, static switch and K5 are not present.

Figure 11. Path of current through the UPS in normal mode



1. Bypass input
2. Rectifier input
3. Output
4. Battery breaker (closed)

A	Static switch
B	Rectifier
C	Inverter
D	Battery converter
E	Battery

During normal UPS operation, power for the system is derived from a utility input source through the rectifier input contactor K1. The front panel displays Normal, indicating the incoming power is within voltage and frequency acceptance windows. Three-phase AC input power is converted to DC using IGBT devices to produce a regulated DC voltage to the inverter. The battery is charged directly from the regulated rectifier output through a buck or boost DC converter, depending on the system voltage and the size of the battery string attached to the unit.

The battery converter derives its input from the regulated DC output of the rectifier and provides regulated charge current to the battery. The battery is always connected to the UPS and ready to support the inverter should the utility input become unavailable.

The inverter produces a three-phase AC output to a customer's load without the use of a transformer. The inverter derives regulated DC from the rectifier and uses IGBT devices and pulse-width modulation (PWM) to produce a regulated and filtered AC output. The AC output of the inverter is delivered to the system output through the output contactor K3.

If the utility AC power is interrupted or is out of specification, the UPS automatically switches to Battery mode to support the critical load without interruption. When utility power returns, the UPS returns to Normal mode.

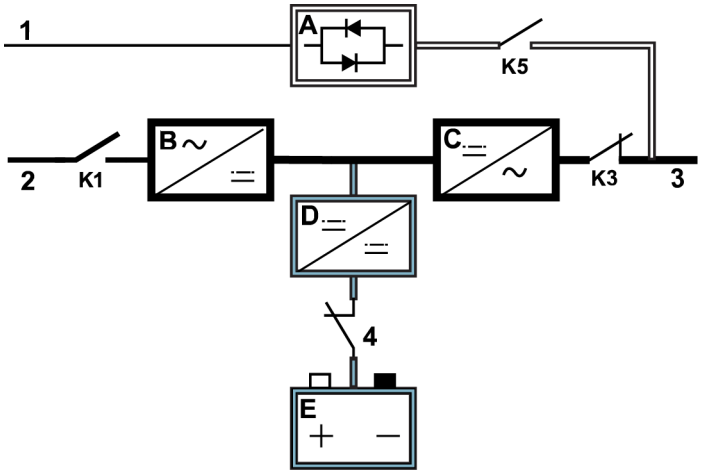
If the UPS becomes overloaded or unavailable, the UPS switches to Bypass mode. The UPS automatically returns to Normal mode when the overload condition is cleared and system operation is restored within specified limits.

If the UPS suffers an internal failure, it switches automatically to Bypass mode and remains in that mode until the failure is corrected and the UPS is back in service.

3.7.2 Double conversion mode

Figure 12: Path of current through the UPS in the double conversion mode shows the path of electrical power through the UPS system when the UPS is operating in the double conversion mode.

Figure 12. Path of current through the UPS in the double conversion mode



A	Static switch	1	Bypass input		Main power flow
B	Rectifier	2	Rectifier input		Energized
C	Inverter	3	Output		De-energized
D	Battery converter	4	External battery breaker		Trickle current
E	Battery		Closed		Open

Three-phase AC input power is converted to DC using a multilevel converter with semiconductor devices to produce a regulated DC voltage to the inverter. The UPS status indicated on the display is `Unit Online` and the UPM status is `Active`.

The DC/DC converter derives its input from the regulated DC output of the rectifier and provides regulated charge current to the battery. The battery is always connected to the UPS and ready to support the inverter should the utility input become unavailable.

The inverter produces a three-phase AC output to the critical load. The inverter uses multilevel converter technology with semiconductor devices and pulse-width modulation (PWM) to produce a regulated and filtered AC output.

If the utility AC power is interrupted or is out of specification, the UPS automatically switches to the battery mode to support the critical load without interruption. When utility power returns, the UPS returns automatically to the double conversion mode.

If the UPS becomes overloaded or unavailable, the UPS seamlessly switches to the bypass mode and continues supplying the load through the static bypass. The UPS automatically returns to the double conversion mode when the abnormal condition, such as an extended time overload, is cleared and the system operation is restored within the specified limits.

If a UPM within the UPS suffers an internal failure, the remaining UPMs continue to support the load in the double conversion mode. The UPS is automatically internally redundant when the UPS is not operating at full load. However, if internal redundancy between the UPMs is not possible due to high load, the UPS switches automatically to the bypass mode and remains in that mode until the failure is corrected and the UPS is back in operation.

In an external parallel redundant system, each UPS can be isolated from the system for service while the remaining UPSs support the load in the double conversion mode.

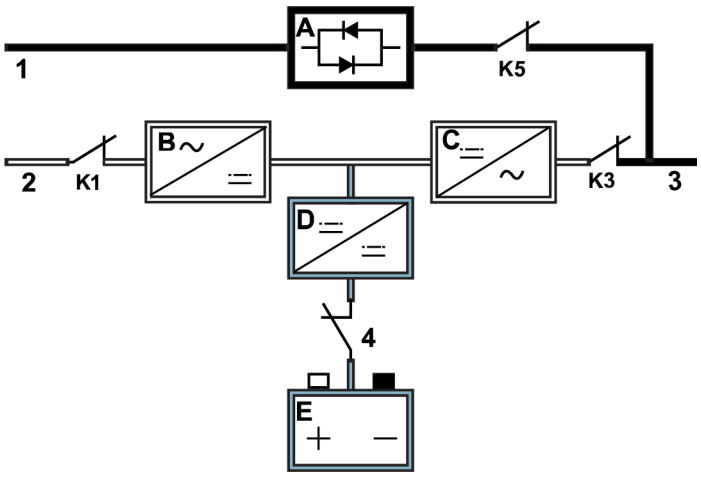
NOTE: Each UPS in an external parallel system must be equipped with a dedicated UPS input feeder circuit breaker, UPS bypass feeder circuit breaker, and UPS Module Output Breaker (MOB) to isolate the UPS under service from the system.

3.7.3 Energy Saver System (ESS) mode

When the UPS is operating in Energy Saver System, the bypass source supplies the commercial AC power to the load directly through the static switch. Some power line filtering and transient protection is provided to the load but no active power conditioning or battery support is available. All power converters are off and are in the ready state (in case a forward transfer is needed). During this mode, the output contactor is closed and the link is maintained through the diode bridge.

Figure shows the path of electrical power through the UPS system when operating in Energy Saver System.

Figure 13. Path of current through the UPS in the Energy Saver System mode



1. Bypass input
2. Rectifier input
3. Output
4. Battery breaker (closed)

A	Static switch		Main power flow
B	Rectifier		Energized
C	Inverter		De-energized
D	Battery converter		Trickle current
E	Battery		Closed
			Open

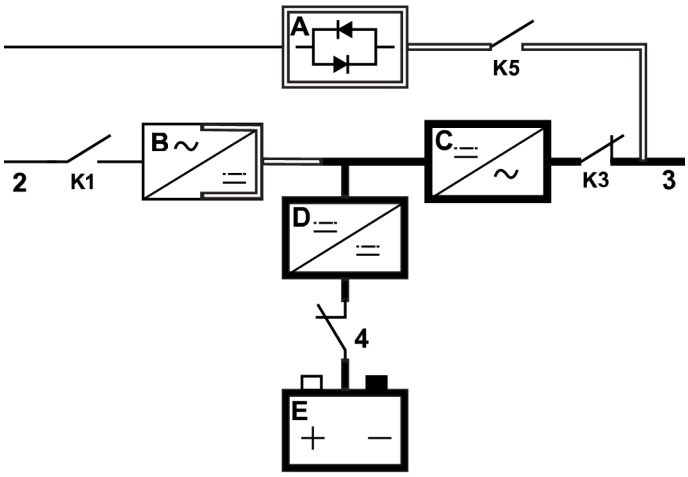
3.7.4 Stored Energy (Battery) mode

The UPS automatically transfers to battery mode if a utility power outage occurs, or if the utility power does not conform to specified parameters. In battery mode, the battery provides emergency DC power which is converted to regulated output power by the inverter.

Figure 14: Path of current through the UPS in the battery mode shows the path of electrical power through the UPS system when operating in the battery mode.

NOTE: On a UPS configured as an IOM, the bypass input, static switch, and K5 are not present.

Figure 14. Path of current through the UPS in the battery mode



1. Bypass input
2. Rectifier input
3. Output
4. Battery breaker (closed)

A	Static switch	▬▬	Main power flow
B	Rectifier	▭▭	Trickle current
C	Inverter	———	Energized
D	Battery converter	⅄	Closed
E	Battery	⅂	Open

During a utility power failure, the rectifier no longer has an AC utility source from which to supply the DC output current required to support the inverter. The input contactor K1 opens and the battery instantaneously supplies energy to the battery converter. The converter either bucks or boosts the voltage so that the inverter can support the customer's load without interruption. If bypass is common with the rectifier input, the backfeed protection contactor K5 also opens. The opening of contactors K1 and K5 prevent system voltages from bleeding backwards through the static switch and rectifier snubber components and re-entering the input source

If the input power fails to return or is not within the acceptance windows required for normal operation, the battery continues discharging until a DC voltage level is reached where the inverter output can no longer support the connected loads. When this event occurs, the UPS issues another set of audible and visual alarms indicating `SHUTDOWN IMMINENT`. Unless the rectifier has a valid AC input soon, the output can be supported for only two minutes before the output of the system shuts down. If the bypass source is available, the UPS transfers to bypass instead of shutting down.

If at any time during the battery discharge the input power becomes available again, contactors K1 and K5 close and the rectifier begins to supply DC current to the converter and inverter. At this point, the unit returns to normal mode. Depending on the total load and the duration of the battery discharge, status `Charging at full current` may be seen for a short time due to the current required to recharge the battery.

3.7.5 Bypass mode

CAUTION

The critical load is not protected while the UPS is in Bypass mode.

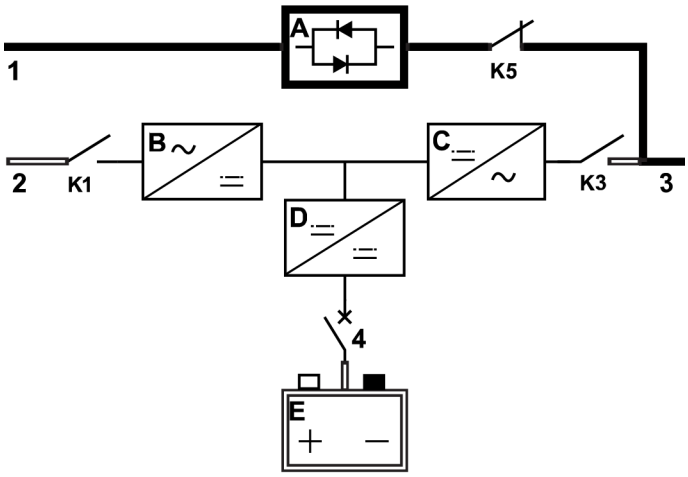
The UPS automatically switches to the bypass mode if it detects an overload, load fault, or internal failure. The bypass source supplies the commercial AC power to the load directly.

The figure below shows the path of electrical power through the UPS system when operating in **Bypass** mode.

CAUTION

The critical load is not protected while the UPS is in Bypass mode

Figure 15. Path of current through the UPS in the bypass mode



1. Bypass input
2. Static switch
3. Output
4. Inverter
5. Rectifier
6. Rectifier input
7. Battery converter
8. Battery breaker (closed)
9. Battery

Main power flow

Trickle current

Energized

	Closed
	Open

NOTE: On a UPS configured as an IOM, the bypass input, static switch and K5 are not present.

In bypass mode, the output of the system is provided with three-phase AC power directly from the system input. While in this mode, the output of the system is not protected from voltage or frequency fluctuations or power outages from the source. Some power line filtering and transient protection is provided to the load but no active power conditioning or battery support is available to the output of the system in the bypass mode of operation.

The internal bypass is comprised of a solid-state, silicon-controlled rectifier (SCR) static switch (SSW) and a backfeed protection contactor K5. The static switch is rated as a continuous-duty device that is used anytime the inverter is unable to support the applied load. The static switch is wired in series with the backfeed protection contactor, and together they are wired in parallel with the rectifier and inverter. The static switch, being an electronically-controlled device, can be turned on immediately to pick up the load from the inverter while the inverter output contactor K3 opens to isolate the inverter. The backfeed protection contactor is normally always closed, ready to support the static switch unless the bypass input source becomes unavailable.

3.8 UPS standard features

The UPS has many standard features that provide cost-effective and consistently reliable power protection. The descriptions in this section provide a brief overview of the UPS standard features.

3.8.1 Advanced Battery Management

The Advanced Battery Management (ABM) technology uses sophisticated sensing circuitry and a three-stage charging technique that extends the useful service life of UPS batteries while optimizing the battery recharge time. The UPS also protects batteries from damage caused by high current charging and inverter ripple currents. Charging at high currents can overheat and damage batteries.

In the charge mode, the batteries are recharged. Charging lasts only as long as it takes to bring the battery system up to a predetermined float level. Once this level is reached, the UPS battery charger enters the float stage and the charger operates in the constant voltage mode.

The rest mode begins at the end of the float charge mode; that is, after 48 hours of float charging (user-adjustable). In the rest mode, the battery charger is completely turned off. The battery system receives no charge current during this rest period of approximately 28 days (user-adjustable). During the rest mode, the open circuit battery voltage is monitored constantly, and battery charging is resumed when necessary.

3.8.2 Powerware Hot Sync

The Eaton Powerware Hot Sync technology is an algorithm that eliminates the single point of failure in a parallel system and therefore enhances system reliability. The Hot Sync technology is incorporated in all three-phase Eaton UPSs, and it is utilized in both multi-module internal parallel and external parallel systems.

The Hot Sync technology enables all UPMs to operate independently in a parallel system, even without inter-module communications. The power modules utilizing the Hot Sync technology are completely autonomous; each module monitors its own output independently to remain in complete synchronization

with the other modules. The UPM power modules share the load perfectly even in changing capacity or load conditions.

The Powerware Hot Sync technology combines digital signal processing and an advanced control algorithm to provide automatic load sharing and selective tripping in a parallel UPS system. The load share control algorithms maintain synchronization and load balance by constantly making minute adjustments to variations in the output power requirements. The modules conform to demand and are not in conflict with each other for the load. The Powerware Hot Sync systems are capable of paralleling for both redundancy and capacity.

3.8.3 ESS (Single & Parallel UPS)

Energy Saver mode allows the UPS to operate in Bypass mode. In this mode, the UPS is operating on bypass, with the UPMs in standby, ready to automatically transfer to Normal mode if a commercial electrical power brownout, blackout, overvoltage, undervoltage or out-of-tolerance frequency condition occurs. In High Alert mode the unit transfers from Energy Saver mode to Normal mode (inverter online or if in Normal mode remains in Normal mode for a default time period of one hour. The High Alert mode time period is configurable by an Eaton Customer Service Engineer. The High Alert mode allows the user to place the unit online with full protection when outside conditions could cause a power disturbance. At the end of the time period, the unit defaults back to Energy Saver mode. If the High Alert mode is reactivated during the time period, the timer is restarted.

Contact your local sales support to verify the availability of the feature.

3.8.4 Add or replace UPMs in Online mode

NOTE: Only an Eaton approved service engineer is allowed to do these procedures!

NOTE: For instructions on how to add or replace UPMs in Online mode, see the *Eaton 9395XP Service manual*.

3.8.5 Automatic UPM firmware update

The UPS automatically updates the firmware of the UPM plugged in a live system. The UPM firmware is updated to the same version that all the other UPMs in the UPS use.

Contact your local sales support to verify the availability of the feature.

3.8.6 Automatic UPS output power configuration

The UPS automatically calculates the output power capacity based on the number of UPMs connected to the device.

3.8.7 Firmware update on Normal or Bypass modes

The UPS automatically updates the firmware on **Normal mode** or on **Bypass mode**. It requires a redundant UPM for firmware update in **Normal mode**.

Contact your local sales support to verify the availability of the feature.

3.8.8 Communication interface

MiniSlot Communication Bays – there are 4 communication bays for MiniSlot connectivity cards. MiniSlot cards are quickly installed and hot-pluggable. See *Section 7.1 About communication interfaces* for additional information.

3.9 Hardware options and accessories

Contact your Eaton sales representative for more information about the available options and accessories.

3.9.1 Maintenance Bypass Switch

The Maintenance Bypass Switch (MBS) enables power to completely bypass and isolate the UPS so that the UPS can be safely serviced without interrupting power to critical systems.

The 9395XP UPS does not have an internal maintenance bypass switch. It is possible to have the external maintenance bypass switch as an option.

3.9.2 Dual/single feed

The small I/O supports only a single-feed input.

The large I/O supports both single-feed and double-feed inputs.

3.9.3 Static switch

The static bypass line consists of a static switch, a back feed protection isolation device and fuses designed to protect the static switch. The back feed protection and bypass fuses are located in series with the static switch. In addition, there is a system level control unit that constantly monitors the power delivered through the bypass line or to the input of the UPS. Transfers to static bypass are seamless and performed automatically by the system as needed, for example, in case of an extended system overload.

3.9.4 Sync Control

The Eaton Sync Control is an optional feature that maintains the critical load outputs of two separate single UPS systems in synchronization. Use of the Eaton Fixed Master Sync Control provides uninterrupted transfer of the load from one load bus to another by means of downstream, dual-source, solid-state transfer switches. Without the load sync option, the two system output (critical load) buses can become out of phase with each other.

This condition occurs when suitable bypass sources are not available or when the bypass sources feeding each system are not in sync with each other. Examples of this condition are two systems supplied by separate generator sets, or situation where the bypass sources for the two systems are lost.

3.9.5 Door air filter

The door, the UPM cover panels, and the IO cabinet cover panels are equipped with air filters. The air filters provide additional protection against larger impurity particles.

Examine the condition of the air filters according to the monthly maintenance plan.

3.9.6 Battery options

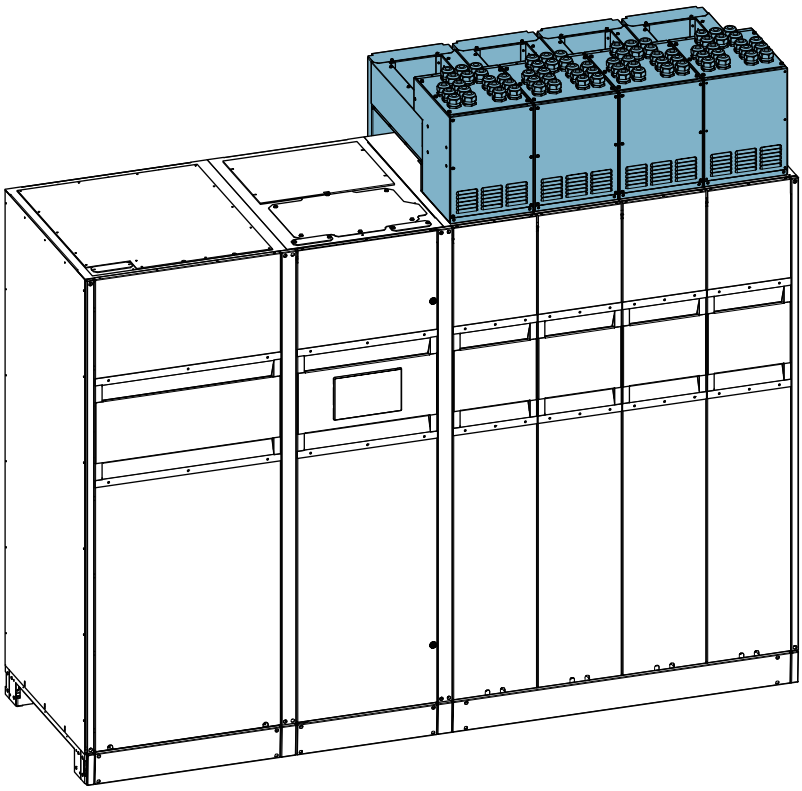
There are two options for the 9395XP's battery system.

- Common battery (standard model)
- Separate battery (optional)

The separate battery input is a factory-installed option. The UPS can be supplied with a separate battery input for each UPM. The separate battery input is ideal for scalable systems: you can increase both the

UPS capacity and the battery capacity in equally sized steps, without the need to size the battery system to full UPS capacity from day one.

Figure 16. Separate battery option



3.10 Battery system

The battery system should be equipped with **lead-acid** or **lithium-ion batteries**. An external battery disconnect switch must be used. UPSs in distributed bypass and parallel systems must use a separate battery system. See the battery related documents located in the system manual for battery cabinet specifics

Eaton offers external battery cabinets to be used together with the Eaton 9395XP UPS.

To configure the batteries or other energy storage means, consult a certified service technician before you proceed with the installation.

3.11 UPM installation and replacement

A new UPM can be installed in the cabinet to accommodate future upgrades in power requirements. This enables the UPS system to grow with the business, thus lowering the initial investment required for the system on day one.

The system needs to have a free slot for an additional UPM. Make sure that the Max Rating of your system has enough space for a new UPM.

CAUTION

UPM can be installed or replaced only by instructed personnel and repairs done by Eaton authorized field service engineer.

3.12 Software and services options and accessories

Contact your Eaton sales representative for more information about the available options and accessories.

3.12.1 Connectivity – Mini-slot cards

Optional Minislot cards support several protocols, such as SNMP, SMTP, HTTP, Modbus®, and TCP/IP. See *Section 7.1 About communication interfaces*, for additional information on monitoring and communication features.

3.12.2 Cyber Secured Monitoring

This feature runs on a secured cloud and allows enabling services such as Remote Monitoring, Health Reports and early anomaly detection that help to mitigate downtime risk associated with the critical components (battery, capacitors, FANs, and more). Eaton Cyber Secured Monitoring runs in any supported Eaton UPS equipped with the Industrial Relay Card or the Industrial Gateway Card. Wireless options are available.

3.12.3 Eaton Brightlayer Suite

The Brightlayer Data Centers suite is a portfolio of digital solutions that enables you to efficiently manage your increasingly complex ecosystem of IT and operational technology (OT) assets. It provides full system visibility into your white space, grey space and/or distributed infrastructure so you can keep your operation running and spend more time on what you need to accomplish.

1. Intelligent Power Manager (IPM)
   Intelligent Power Manager (IPM) disaster avoidance software provides monitoring and management of power equipment in physical or virtual environments to keep IT devices running during a power or environmental event. This innovative software solution ensures system uptime and data integrity by allowing you to remotely monitor, manage and control devices on your network.
2. Visual Power Manager (VPM)
   VPM-distributed infrastructure management software provides IT managers of data centers and distributed IT environments the tools to monitor their power devices - including all UPSs and PDUs. Software is easy-to-deploy, offers simplified day-to-day monitoring and helps maintain business continuity.
3. Visual Capacity Optimization Manager (VCOM)
   VCOM-Data Center Infrastructure Management (DCIM) software to monitor your entire infrastructure from utility to application. It is designed to reduce data center operation expense, improve system reliability and mitigate risk through data analysis.

3.12.4 EnergyAware UPS

Eaton's EnergyAware UPS is the first system that enables data centres to contribute to renewable energy and generate revenues from necessary investments. The system puts data centres in control of their energy, choosing how much capacity to offer, when, and at what price, while helping energy providers balance sustainable energy demands.

The Eaton EnergyAware UPS is an optional feature. A license purchase is required. Contact your local sales support to verify the availability of the feature.

3.13 UPS options and accessories

The following table shows different standard and optional UPS features.

X= Standard

O = Optional

— = Not available

Feature	Status
Touch screen display	X
Battery start	—
Integrated backfeed protection	X
Generator compatibility	X
Static bypass protective fuses	X
Status LED's per UPS and UPM	X
Kick plates	O
Sync control compatibility	X
Door air filter	O
Sync control interface	X
Li-ion battery	O
Dual/Single-feed input	O
Rectifier Input switch	O
Separate Battery	O
Cyber Secured Monitoring	O

Additional options and accessories are also available. These include different software and connectivity options and external switchgear and power distribution options.

4 Technical data

4.1 About technical data

For a complete technical specification, contact your Eaton representative. Due to continuous product improvement programs, specifications are subject to change without notice.

NOTE:
For scalable (non-standard) models, refer to *Technical specification*.

4.2 UPS environmental specifications

Table 3. UPS environmental specifications

Temperature range, storage and transportation	-25 °C ... +60 °C in the protective package
Relative humidity range	5 % - 95 %
Condensation	No condensation allowed
Maximum rate of temperature change *	1.67 °C over 5 min
Operating altitude	1000 m without derating Up to 2000 m with 1% derating per each additional 100 m above 1000 m
Over voltage category	OVC III
Pollution degree	PD 2
Protective class	Protective class I equipment

*) Limit based on ASHRAE 90.1-2013.

For more technical details please refer to the technical specification of the 9395XP.

Table 4. Electrical supply systems supported

Electrical supply system to which the UPS may be connected	TN/TT/IT
Electrical load system to which the UPS may be connected	TN/TT/IT
Electrical supply system supplied to the stored device	IT

4.3 Dimensions and weights

The dimensions and weights of the basic model options are described in this section.

Table 5. Dimensions

	900 kVA/kW 1020 kVA/kW	1200 kVA/kW 1360 kVA/kW	1500 kVA/kW 1700 kVA/kW
Static Switch Size	1360 kW frame	1360 kW frame	1700 kW frame
UPS dimensions (W x D x H) [mm]			
Single feed UPS In Total	2495 x 920 x 2070	2830 x 920 x 2070	3220 x 920 x 2070
Dual feed UPS In Total	2895 x 920 x 2070	3230 x 920 x 2070	3620 x 920 x 2070

Table 6. UPS cabinet weights

UPS model	Weight [kg] Small I/O / Large I/O	Floor loading [kg/m^2) Small I/O / Large I/O
900/1020 kVA/kW	2600 / 2800	1108 / 1194
1200/1360 kVA/kW	2900 / 3100	1106 / 1182
1500/1700 kVA/kW	3400 / 3600	1013 / 1072

Figure 17. Main dimensions

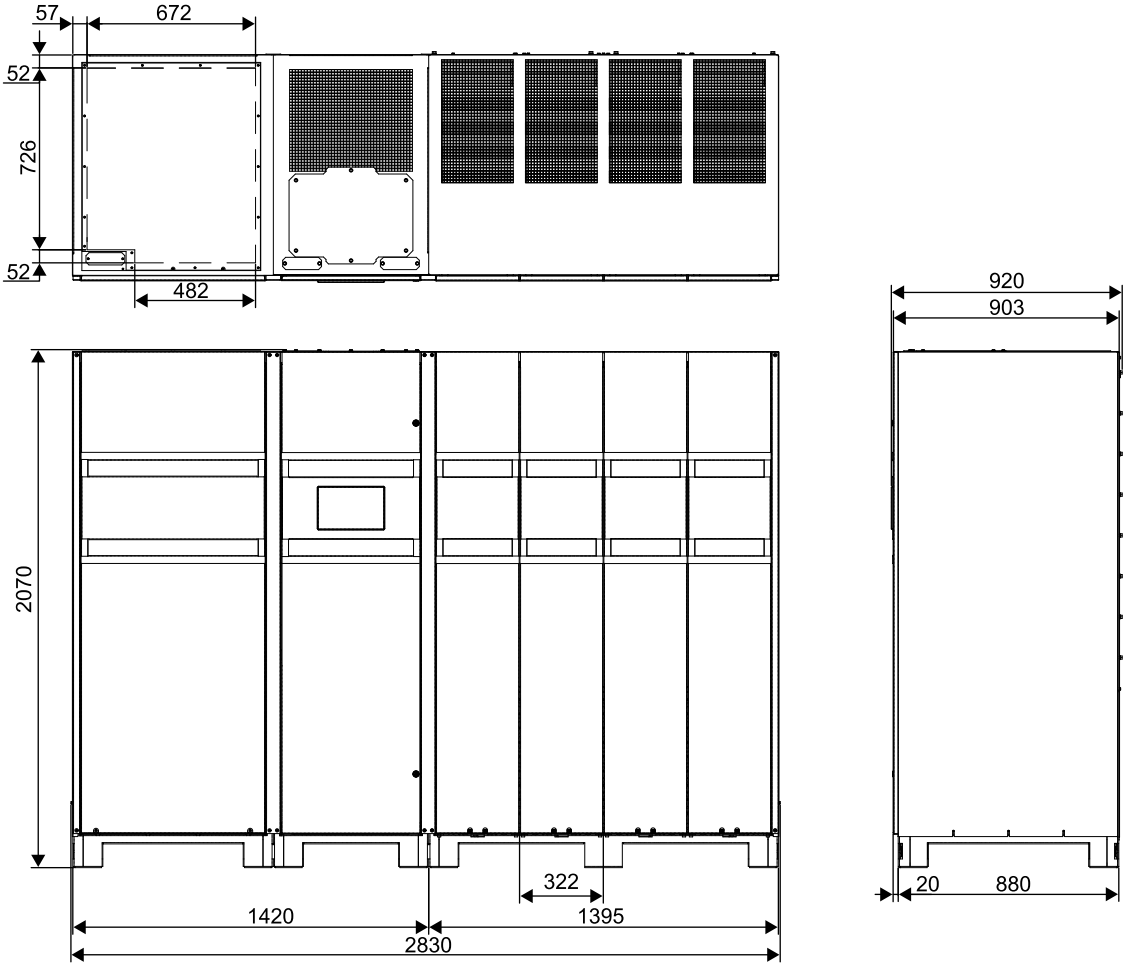
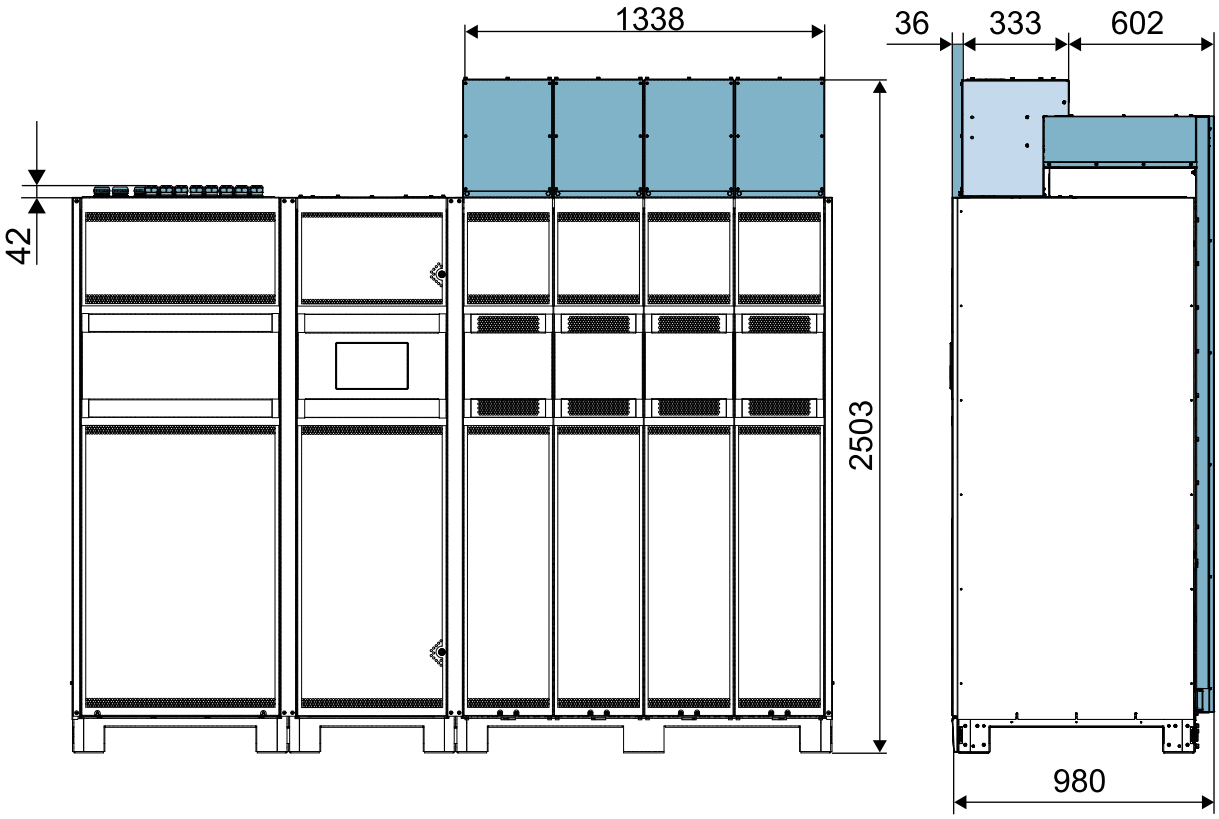


Figure 18. ISBM and I/O dimensions with options



4.4 Technical data (1020/1360/1700 kVA/kW)

Table 7. 900-1020 kVA/kW Technical data

Item		1020 kVA/kW	1360 kVA/kW	1700 kVA/kW
IEC 62040-3 Subclause				
	Model catalogue reference	**9395XP-1020(1360)**	**9395XP-1360(1360)**	**9395XP-1700(1700)**
	UPS topology	Double conversion, SiC technology	Double conversion, SiC technology	Double conversion, SiC technology
	Minimum required prospective short circuit current ratings for AC- and DC-sources	Minimum short circuit, AC ports [A]: 10500	Minimum short circuit, AC ports [A]: 10500	Minimum short circuit, AC ports [A]: 10500
		Minimum short circuit current, DC port [A]: 10 000	Minimum short circuit current, DC port [A]: 10 000	Minimum short circuit current, DC port [A]: 10 000
ENVIRONMENTAL				

Item		1020 kVA/kW	1360 kVA/kW	1700 kVA/kW
	Acoustic noise at 1 m in 25 °C ambient temperature	< 85 dBA in double conversion, full load	< 85 dBA in double conversion, full load	< 85 dBA in double conversion, full load
		< 72 dBA in double conversion, <50% load	< 72 dBA in double conversion, <50% load	< 72 dBA in double conversion, <50% load
	Ambient UPS storage temperature range	-25 °C ... +60 °C in the protective package	-25 °C ... +60 °C in the protective package	-25 °C ... +60 °C in the protective package
	Ambient operating temperature, nominal range	0 °C ... +40 °C	0 °C ... +40 °C	0 °C ... +40 °C
	Ambient operating temperature, recommended	+20 °C ... +25 °C	+20 °C ... +25 °C	+20 °C ... +25 °C
		The maximum rate of temperature change limited to 1.67 °C over 5 minutes (20 °C/ hour), based on the ASHRAE standard 90.1-2013	The maximum rate of temperature change limited to 1.67 °C over 5 minutes (20 °C/ hour), based on the ASHRAE standard 90.1-2013	The maximum rate of temperature change limited to 1.67 °C over 5 minutes (20 °C/ hour), based on the ASHRAE standard 90.1-2013
	External battery	+ 20 °C ... + 25 °C recommended for optimized battery life time	+ 20 °C ... + 25 °C recommended for optimized battery life time	+ 20 °C ... + 25 °C recommended for optimized battery life time
	Relative humidity range	5 to 95%, no condensation allowed.	5 to 95%, no condensation allowed.	5 to 95%, no condensation allowed.
		At least a 1.0 °C difference between the dry bulb temperature and the wet bulb temperature, at all times, to maintain a non-condensing environment.	At least a 1.0 °C difference between the dry bulb temperature and the wet bulb temperature, at all times, to maintain a non-condensing environment.	At least a 1.0 °C difference between the dry bulb temperature and the wet bulb temperature, at all times, to maintain a non-condensing environment.
	Operating altitude	1000 m above sea level at rated maximum ambient temperature	1000 m above sea level at rated maximum ambient temperature	1000 m above sea level at rated maximum ambient temperature
		Maximum 2000 m with 1% de-rating per each additional	Maximum 2000 m with 1% de-rating per each additional	Maximum 2000 m with 1% de-rating per each additional

Item		1020 kVA/kW	1360 kVA/kW	1700 kVA/kW
		100 m above 1000 m	100 m above 1000 m	100 m above 1000 m
	RoHS/WEEE compliancy	Yes	Yes	Yes
INPUT ELECTRICAL CHARACTERISTICS				
	Rated input voltage	220/380 V; 230/400 V; 240/415 V	220/380 V; 230/400 V; 240/415 V	220/380 V; 230/400 V; 240/415 V
	Voltage tolerance	rated voltage -15% / +20%	rated voltage -15% / +20%	rated voltage -15% / +20%
	Rectifier input			
	Bypass input	rated voltage -10% / +10%	rated voltage -10% / +10%	rated voltage -10% / +10%
	Rated input frequency	50 or 60 Hz	50 or 60 Hz	50 or 60 Hz
	Frequency tolerance	45 to 65 Hz	45 to 65 Hz	45 to 65 Hz
	Number of input phases Rectifier input Bypass input	3 phases + PE 3 phases + neutral + PE	3 phases + PE 3 phases + neutral + PE	3 phases + PE 3 phases + neutral + PE
	Input power factor, double conversion mode:			
	25-100% load	> 0,99	> 0,99	> 0,99
	10-25% load	> 0,97	> 0,97	> 0,97
	Rated rectifier input current at 400 V	1530 A	2040 A	2556 A
	Maximum rectifier input current	1800 A	2400 A	3000 A
	Bypass input current, nominal/ maximum	1472 A / 2280 A	1963 A / 2260 A	2454 A / 2850 A
	Input current distortion at rated input current			
	Resistive load	< 3%	< 3%	< 3%
	In-rush current	<100% of rated current	<100% of rated current	<100% of rated current

Item		1020 kVA/kW	1360 kVA/kW	1700 kVA/kW
	AC power distribution system compatibility	TN-S, TN, TT, IT (4-wire)	TN-S, TN, TT, IT (4-wire)	TN-S, TN, TT, IT (4-wire)
	Rectifier ramp-up, rectifier start and load step	Yes	Yes	Yes
	Backfeed protection	Yes, for both rectifier and bypass lines	Yes, for both rectifier and bypass lines	Yes, for both rectifier and bypass lines
OUTPUT ELECTRICAL CHARACTERISTICS				
	Output power rating	1020 kVA/kW	1360 kVA/kW	1700 kVA/kW
	Output power factor	pf 1.0	pf 1.0	pf 1.0
	Number of output phases	3 phase + neutral + PE	3 phase + neutral + PE	3 phase + neutral + PE
	Rated output voltage	220/380 V; 230/400 V; 240/415 V, configurable	220/380 V; 230/400 V; 240/415 V, configurable	220/380 V; 230/400 V; 240/415 V, configurable
	Voltage transient (r. m.s)	0% during transfer from stored energy to normal mode	0% during transfer from stored energy to normal mode	0% during transfer from stored energy to normal mode
	Rated output frequency	50 or 60 Hz, configurable	50 or 60 Hz, configurable	50 or 60 Hz, configurable
	Maximum slew-rate when synchronizing	0,5 Hz/s	0,5 Hz/s	0,5 Hz/s
	Overload capability @ maximum ambient temperature	10 min 110% load	10 min 110% load	10 min 110% load
		30 sec 125% load	30 sec 125% load	30 sec 125% load
	On inverter	10 sec 150% load	10 sec 150% load	10 sec 150% load
		300 ms >150% load	300 ms >150% load	300 ms >150% load
	Overload capability @ maximum ambient temperature – On bypass	Continuous < 115% load	Continuous < 115% load	Continuous < 115% load
		20 ms 1000% load	20 ms 1000% load	20 ms 1000% load
	Output current limitation, short-circuit capability	2850 A, 300 ms	3800 A, 300 ms	4750 A, 300 ms
	Load power factor, permitted range	From 0,7 lagging to 0,9 leading without de-rating	From 0,7 lagging to 0,9 leading without de-rating	From 0,7 lagging to 0,9 leading without de-rating

Item		1020 kVA/kW	1360 kVA/kW	1700 kVA/kW
BYPASS				
	Type of bypass	Static	Static	Static
	Bypass rating	1360 kVA/kW	1360 kVA/kW	1700 kVA/kW
	Bypass voltage range	220/380 V; 230/400 V; 240/415 V	220/380 V; 230/400 V; 240/415 V	220/380 V; 230/400 V; 240/415 V
		tolerance -10% / +10% of rated voltage	tolerance -10% / +10% of rated voltage	tolerance -10% / +10% of rated voltage
	Transfer time break	No break	No break	No break
	Backfeed protection	Backfeed detection. Integrated backfeed breaker is optional	Backfeed detection. Integrated backfeed breaker is optional	Backfeed detection. Integrated backfeed breaker is optional
	Rated conditional short-circuit current, I_{cc} Static bypass	100 kA (internal ultra rapid fusing)	100 kA (internal ultra rapid fusing)	100 kA (internal ultra rapid fusing)
	Internal static bypass ultra-rapid fuse	Bussmann, 170M7085, 3500A 690Vac	Bussmann, 170M7085, 3500A 690Vac	Bussmann, 170M7085, 3500A 690Vac
BATTERY CHARACTERISTICS				
	Battery technology	Compatible with VRLA, Lithium-ion and NiCd batteries	Compatible with VRLA, Lithium-ion and NiCd batteries	Compatible with VRLA, Lithium-ion and NiCd batteries
	Battery quantity (VRLA)	40 - 50 battery blocks,	40 - 50 battery blocks,	40 - 50 battery blocks,
		240 - 300 cells per string	240 - 300 cells per string	240 - 300 cells per string
	Battery voltage range	400-650 Vdc	400-650 Vdc	400-650 Vdc
		Configurable or automatic (load adaptive)	Configurable or automatic (load adaptive)	Configurable or automatic (load adaptive)
COMPLIANCE WITH STANDARDS IEC 62040-1				
	Safety Access	Restricted access	Restricted access	Restricted access
	Degree of protection	IP20; protection against medium sized foreign matter (incl. finger)	IP20; protection against medium sized foreign matter (incl. finger)	IP20; protection against medium sized foreign matter (incl. finger)

Item		1020 kVA/kW	1360 kVA/kW	1700 kVA/kW
COMPLIANCE WITH STANDARDS IEC 62040-2				
	Electromagnetic Compatibility			
	Immunity	EMC Category C3	EMC Category C3	EMC Category C3
	Emissions	EMC Category C3	EMC Category C3	EMC Category C3

4.5 Directives and standards

Table 8. Directives and standards

Safety	IEC 62040-1: Uninterruptible power systems (UPS) - Part 1: General and safety requirements for UPS IEC 62477-1: Safety requirements for power electronic converter systems and equipment - Part 1: General
EMC, emissions	IEC 62040-2: Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements / Ed. 2
EMC, immunity	IEC 61000-2: Electromagnetic compatibility (EMC), IEC 61000-2-2 (Low-frequency conducted), IEC 61000-4-2 (ESD), IEC 61000-4-3 (RF electromagnetic field), IEC 61000-4-4 (Fast transient-burst), IEC 61000-4-5 (Surge), IEC 61000-4-6 (Conducted RF common mode), IEC 61000-4-8 (Power frequency magnetic field)
Performance & tests	IEC 62040-3: Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements
Environmental	IEC62040-4: Uninterruptible Power Systems (UPS) - Part 4: Environmental Aspects - Requirements and Reporting IEC 62430: Environmentally conscious design for electrical and electronic products
RoHS	2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment
WEEE	2012/19/EU on waste electrical and electronic equipment (WEEE)
ECO Design Directive	2009/125/EC establishing a framework for the setting of eco-design requirements for energy-related products

Batteries	2006/66/EC on batteries and accumulators and waste batteries and accumulators
Packaging	94/62/EC on packaging and packaging waste

5 UPS installation plan and unpacking

5.1 About UPS installation

Use the following basic sequence of steps to install the UPS:

1. Create an installation plan for the UPS system.
2. Prepare your site for the UPS system.
3. Inspect and unpack the UPS cabinet.
4. Unload and install the UPS cabinet and wire the system.
5. Complete the installation checklist.
6. Have authorized service personnel perform the preliminary operational checks and startup.

NOTE: Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer or by other qualified service personnel authorized by Eaton, or the terms specified in the Warranty (see *Section 10.1 General information about warranty*) become void. This service is offered as a part of the sales contract for the UPS. Contact service in advance (usually a two-week notice is required) to reserve a preferred startup date.

5.2 Create an installation plan

Before you install the UPS system, read and understand how these instructions apply to the system that you are going to install. Use the procedures and illustrations in *Section 5.4 Site preparations* and *Section 6.1 About UPS system installation* to create a logical plan for installing the system.

5.3 Installation checklist

Action	Yes/No
All packing materials and restraints are removed from each cabinet.	
Each cabinet in the UPS system is placed in its installation location.	
A cabinet grounding kit / mounting kit is installed between any cabinets that are bolted together.	
All conduits and cables are properly routed to the UPS and to any ancillary cabinets.	
Make a hole to the gland plates and install the inlet flange. Then route the cables through it.	
Make sure you have all required installation materials and record that everything is used during installation.	
All power cables are properly sized and terminated.	
Neutral conductors are installed according to the requirements.	
A ground conductor is properly installed.	

Action	Yes/No
If the unit is installed on metal floor, there must be EMC grounding.	
Battery cables are terminated and connected to battery connectors.	
Battery Shunt trip and Aux contact signal wiring is connected from the UPS to the battery breaker.	
LAN drops are installed.	
All LAN connections are completed.	
Air conditioning equipment is installed and operating correctly.	
There is sufficient workspace around the UPS and other cabinets.	
Sufficient lighting is provided around all the UPS equipment.	
A 230 VAC service outlet is located within 7.5 meters of the UPS equipment.	
The Remote Emergency Power-off (REPO) device is properly mounted and its wiring is connected inside the UPS cabinet.	
If EPO is used in the NC configuration, a jumper is installed on the UPS EPO terminals between pins 1 and 2.	
(OPTIONAL) Alarm relays and signal outputs are wired appropriately.	
(OPTIONAL) A remote battery disconnect control is properly mounted and its wiring is terminated inside the UPS and battery cabinet.	
(OPTIONAL) Accessories are properly mounted and their wiring is terminated inside the UPS cabinet.	
Start-up and operational checks are performed by an authorized Eaton Customer Service Engineer.	

5.4 Site preparations

For the UPS system to operate at peak efficiency, the installation site must meet the environmental parameters outlined in these instructions. If the UPS needs to be operated at an altitude higher than 1,000 m, contact your service representative for important information about high altitude operation. The operating environment must meet the height, clearance, and environmental requirements specified.

5.4.1 Environmental considerations

Install the UPS to a temperature and humidity controlled indoor area, free of conductive contaminants. Do not expose the UPS to direct sunlight or install it near a heat source. The environmental requirements specified in *Section 4.2 UPS environmental specifications* are for the air at the intake ports of the UPS, and are the maximum, not to exceed, ratings.

- Do not expose the UPS for overly aggressive environments, like salt mist or corrosive gases. High relative humidity accelerates the effects of contaminants. The UPS should be installed in a G1 environment (based on ANSI/ISA S-71.04 classifications). If the UPS is used in a more aggressive environment, it can cause reduced product life and possibly early failure. If the installation location

does not meet the recommended environment, contact Eaton service representative for further information.

- Do not place the UPS near a source of dust or sand. Excessive amount of dust or sand can cause damage or lead to malfunction.

Observe caution regarding UPS operating environmental conditions. The newer, more energy efficient data center cooling methods (such as air side economizing) can create much wider ranges of temperature and Relative Humidity (RH) in the UPS room and/or data center. There are two aspects of this increased operating environment that can, if ignored, create issues:

- The creation of micro climates, which are persistent variations of temperature and/or RH within a single room; for example one side of the room is always cooler than the other side, no matter what the actual temperature is.
- The rate of change of temperature and/or RH, which can occur during transitions within the cooling system. Examples: changing the mixture ratio of inside versus outside air, or external changes in the outside air when going from night time into day, and back to night.

When ignored, either one of these aspects can create an undesirable micro climate at the UPS location. If the environment created by this micro climate exceeds the UPS operating specification, the UPS reliability is reduced over time. These same environmental extremes create also reliability concerns for any servers that are exposed to them.

5.4.2 Floor leveling

It is imperative that the floor where the UPS cabinets are positioned is absolutely level. Connecting the busbars becomes impossible if the floor is not level.

5.4.3 Installation considerations

The UPS system can be installed to TN, TT, or IT power distribution system.

- Install the system indoors on a level floor suitable for computer or electronic equipment. The floor must be suitable for heavy weight and wheeling.
- Install the system in a temperature and humidity controlled area, where the dew point cannot be reached.
- Install the system in an area that is free of conductive contaminants.
- Install the cabinet either in line-up-and-match or standalone configurations.

If you do not obey these guidelines your warranty may become void.

CAUTION

If the unit is installed in an IT network, the voltage between neutral and protective earth during normal operation must be less than 50 V (AC, RMS), 71 V (AC, peak) or 120 V (DC).

CAUTION

This product can cause a DC current in the PE conductor. Where a residual current-operated protective device (RCD) is used for protection against electrical shock, only an RCD of Type B is allowed on the supply side of this product.

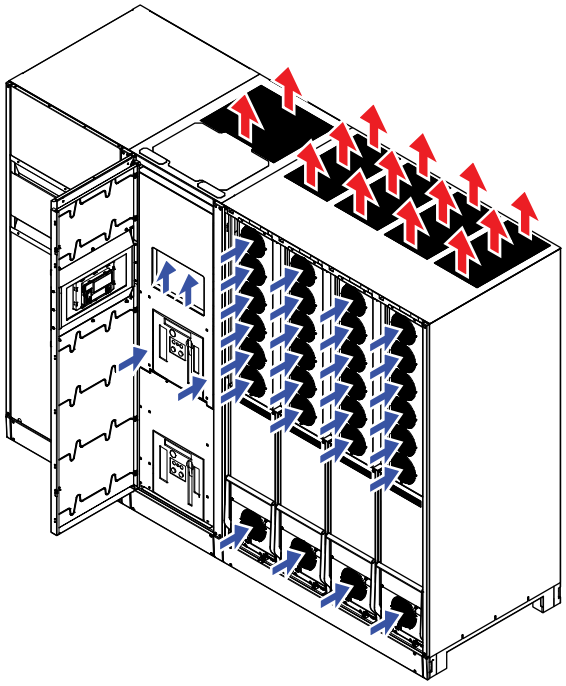
The basic environmental requirements for the operation of the UPS system are described in *4.2 UPS environmental specifications*.

You must arrange ventilation of the UPS room. Sufficient amount of air cooling is needed to keep the maximum room temperature rise at desired level.

- To limit the temperature rise to a maximum of +5 °C, the required airflow is 600 m^3/h per 1 kW of losses.
- To limit the temperature rise to a maximum of +10 °C, the required airflow is 300 m^3/h per 1 kW of losses.

An ambient temperature from +20 to +25 °C is recommended to achieve a long life of the UPS and batteries. The cooling air entering the UPS must not exceed +40 °C. Avoid high ambient temperature, moisture, and humidity.

Figure 19. Air flow



Requirements for weight, size, cabinet clearances and heat rejection

See *Section 4.3 Dimensions and weights* for the cabinet dimensions and weights.

The UPS cabinets use forced air cooling to regulate internal component temperature. By default, air inlets are in the front of the cabinet and outlets are on the top. You must allow clearance in front of and top of each cabinet for proper air circulation. The UPS can be installed against a wall or back-to-back.

Figure 20. Cabinet installation clearances

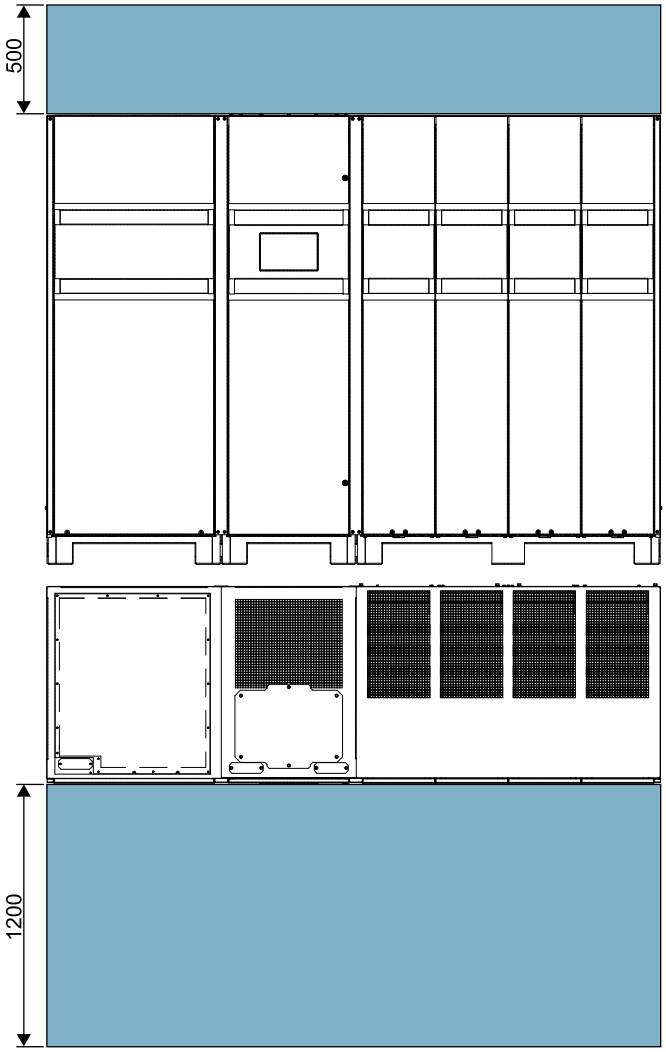


Table 9. UPS cabinet clearances

All models	[mm]
From the top of the cabinet	500
From the front of the cabinet	1200
From the back of the cabinet	0
From the side of the cabinet	0

Table 10. Heat dissipation

UPS model	UPS rating [kVA / kW]	Maximum heat dissipation at 100% load [kW]
1000 kW Large I/O and 1000 kW Small I/O	900/900	33
	1020/1020	41

UPS model	UPS rating [kVA / kW]	Maximum heat dissipation at 100% load [kW]
1360 kW Large I/O and 1360 kW Small I/O	1200/1200	44
	1360/1360	55
1700 kW Large I/O and 1700 kW Small I/O	1500/1500	54
	1700/1700	69

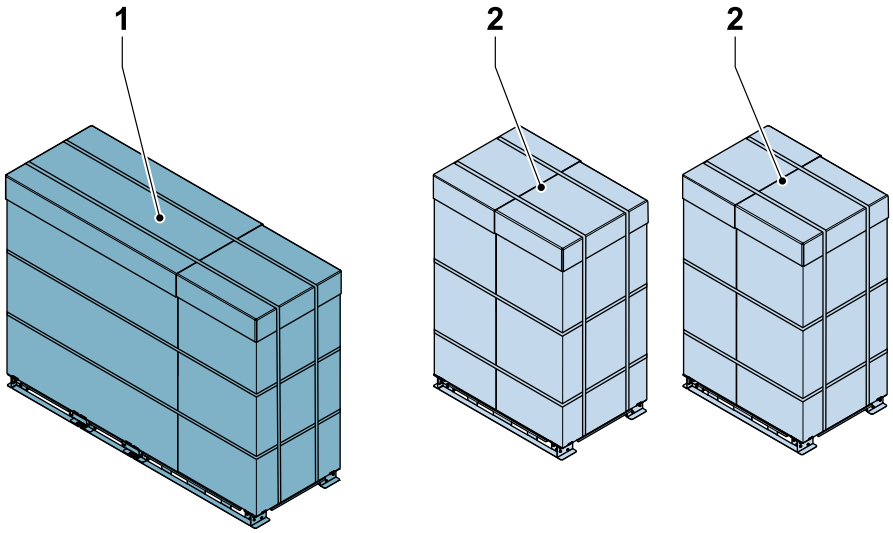
5.5 Installation and delivery options

There are different options for the Eaton 9395XP shipment.

Factory Installed UPS system (UPS delivery as 1 part). The sections are mechanically and electrically joined at the Eaton factory, before the shipment and the system is shipped together and can be permanently bolted to the floor. See *Section 5.5.1 Unpack and unload the UPS (factory installed UPS system, 1 piece delivery)*.

Each UPS section is shipped separately (the UPS shipped in two parts). The sections are mechanically and electrically joined at the installation site and can be permanently bolted to the floor. See *Section 5.5.2 Unpack and unload the UPS (separately shipped)*.

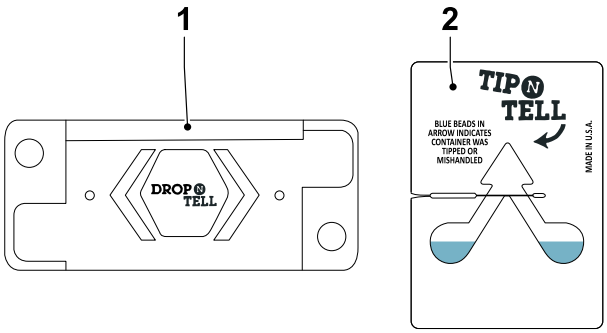
Figure 21. Delivery options



1. UPS delivery as 1 part
2. The UPS shipped in two parts

Before you start to unpack and unload the UPS, check the TipNTell indicator on the package surface and the DropNTell indicator on the UPS after unpacking. If the equipment has been correctly transported in the upright position, the indicator should be intact. If the indicator arrow has turned all blue, contact the appropriate parties to report inappropriate transportation.

Figure 22. Indicators on the package



1. DropNTell indicator
2. TipNTell indicator

The cabinet is shipped bolted to transportation frame and protected with outer protective packaging material.

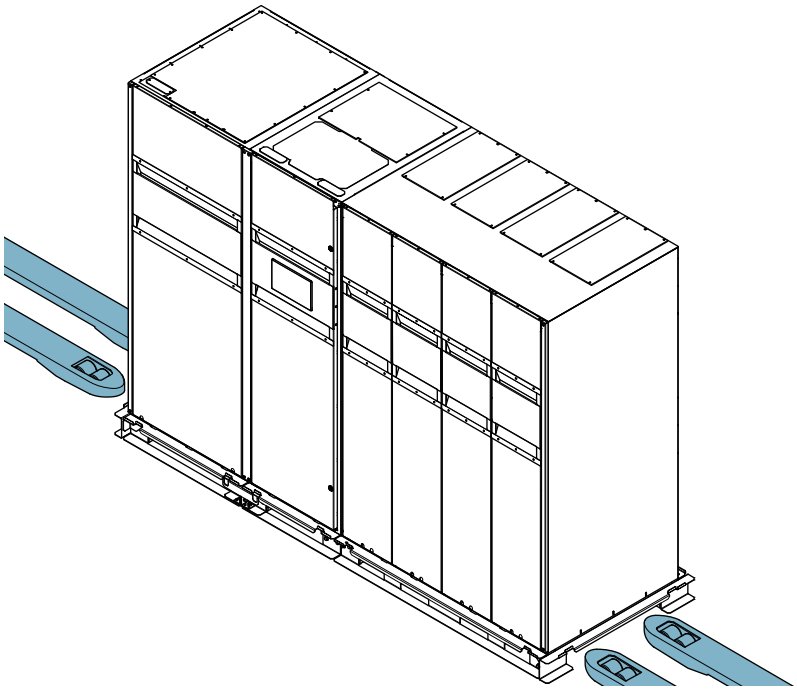
Figure 23. UPS package with transportation frame

WARNING

The UPS cabinet is heavy. If the unpacking instructions are not closely followed, the cabinet may tip over and cause serious injury.

Do not tilt the UPS cabinet more than 10 degrees from the vertical or the cabinet may tip over.

Figure 24. Forklift positions

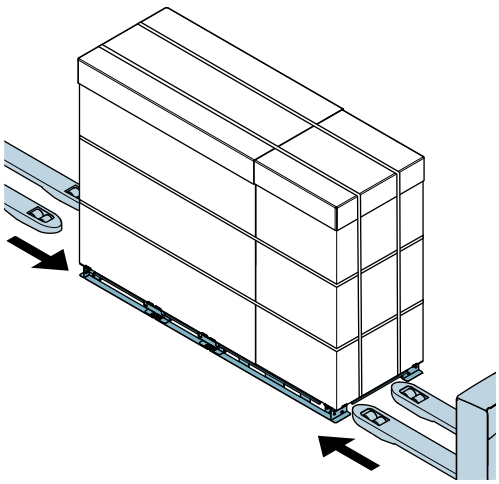


5.5.1 Unpack and unload the UPS (factory installed UPS system, 1 piece delivery)

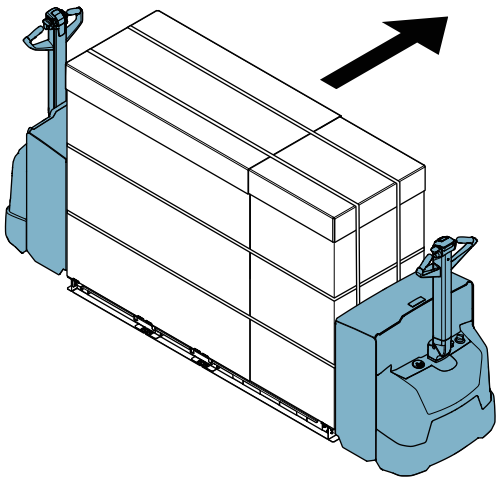
1. Use two forklifts or pallet jacks to move the UPS cabinet. Insert the forklift or pallet jack forks on both ends of the cabinet.

CAUTION

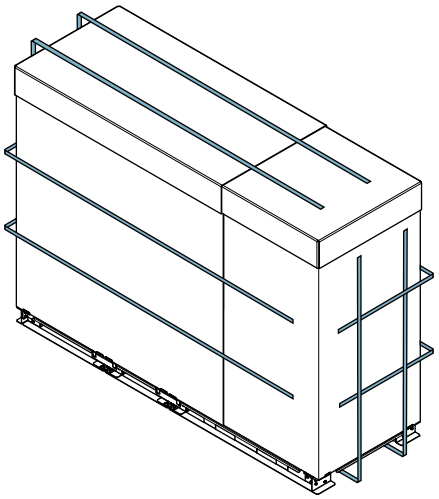
Always keep the transportation frame in place when moving the UPS cabinet. if the transportation frame is removed, there is a risk to damage the fuses and the unit. The UPS needs to be in the final installation location before you remove the transportation frame.



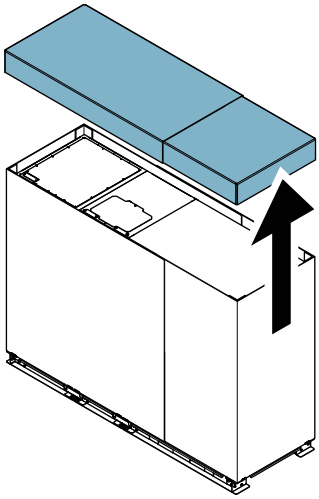
2. Move the UPS cabinet near the final installation location.



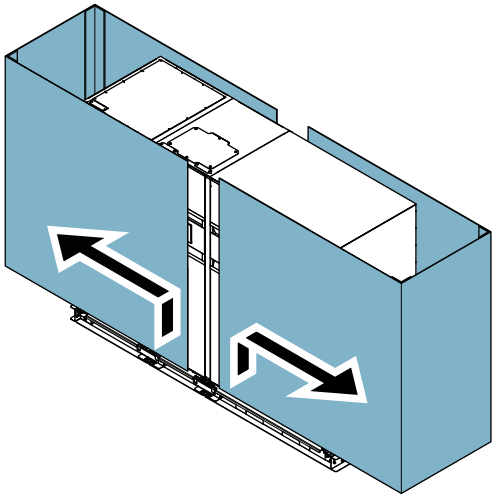
3. Remove the plastic bands surrounding the package.



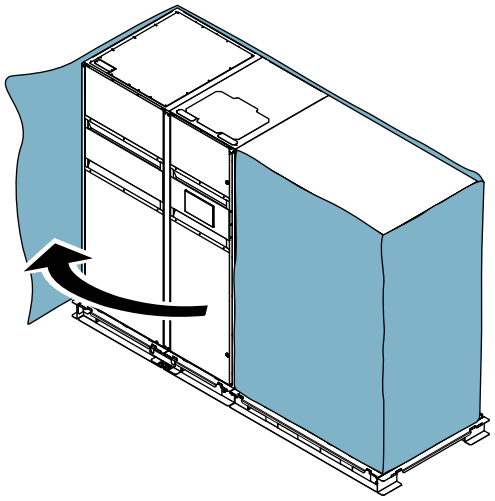
4. Remove the cardboard top cover.



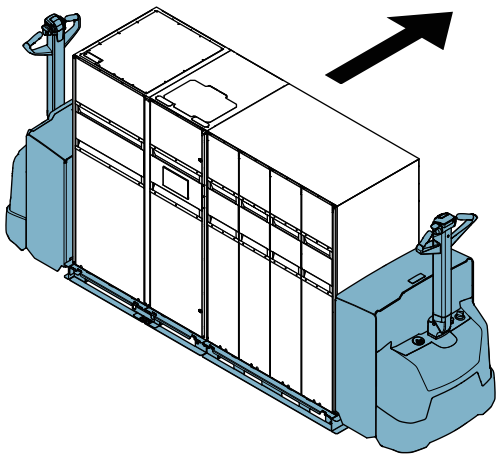
5. Remove the cardboard packaging.



6. Remove the plastic packaging.



7. Move the UPS to the final installation location.



5.5.2 Unpack and unload the UPS (separately shipped)

The UPS cabinet is divided into two sections separately for shipping. The sections are shipped bolted to a transportation frame and protected with outer protective packaging material.

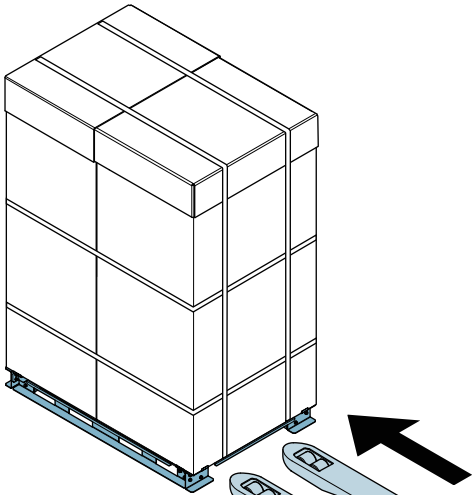
The UPS sections can be installed either from the front (preferred) or the rear.

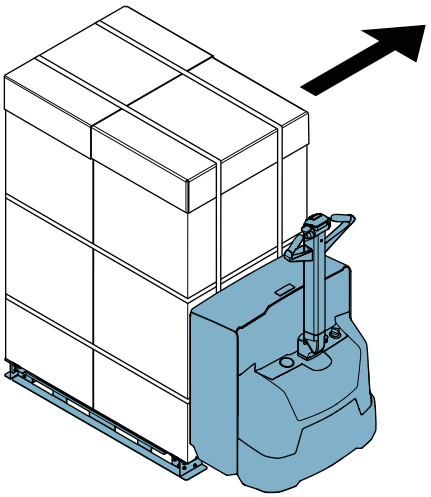
Power wiring can be routed through the top or bottom of the I/O cabinet with connections made to easily accessible terminals. Control wiring is routed between the cabinets and must be installed in accordance with Class 1 wiring methods.

CAUTION

Always keep the transportation frame in place when moving the UPS cabinets. if the transportation frame is removed, there is a risk to damage the fuses and the unit. The UPS needs to be in the final installation location before you remove the transportation frame.

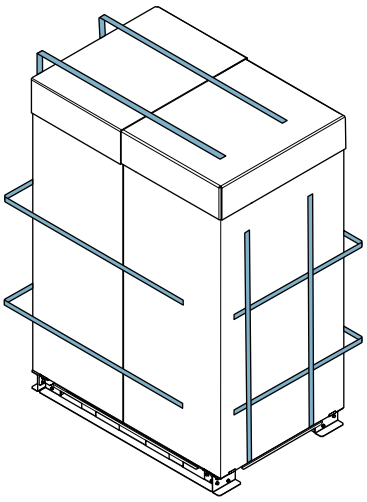
1. Use a forklift or a pallet jack to move the ISBM and UPM sections to the final installation location.
   Insert the forklift or pallet jack forks from the right side of the cabinet, between the supports for the location of the UPS cabinet center of gravity.



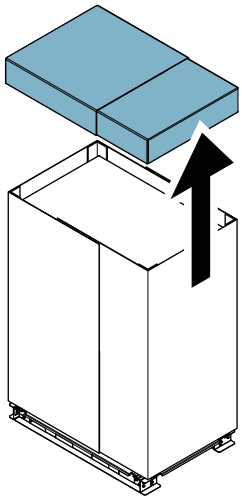


2. Carefully lower the UPS cabinet until the cabinet base contacts the floor.

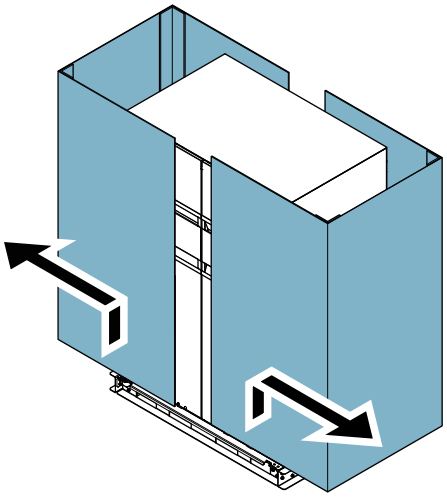
3. Remove the bands surrounding the package.



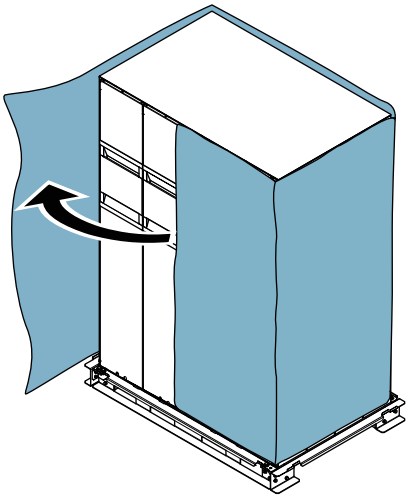
4. Remove the cardboard top.



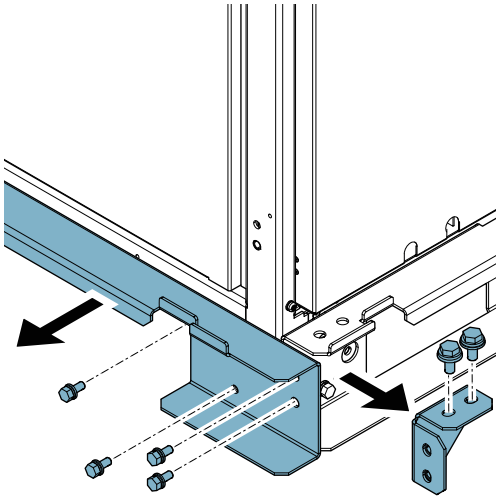
5. Remove the cardboard packaging.

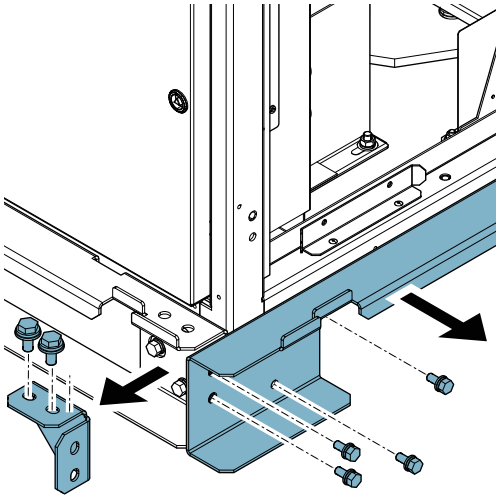


6. Remove the plastic sheet cover.

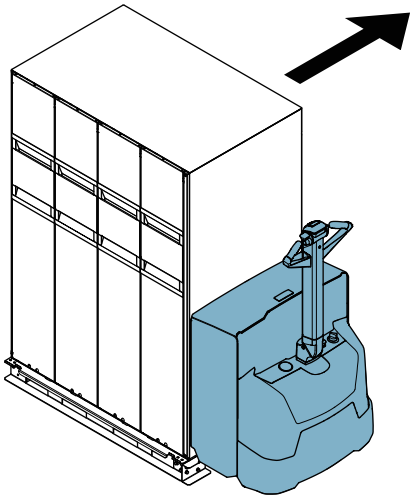


7. Remove the transportation frame from the end of the cabinet so that you can connect the two sections.

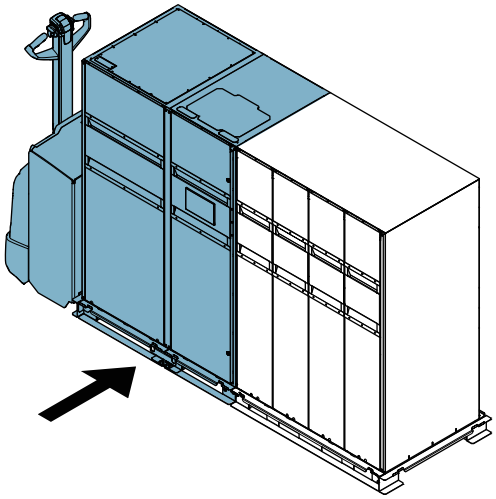




8. Move the cabinet to the final installation location.



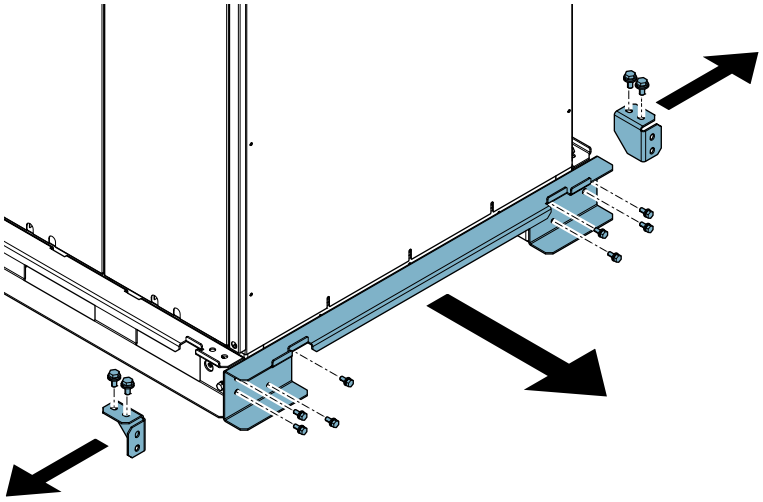
9. Repeat the steps for the other section.
10. Place the sections next to each other.



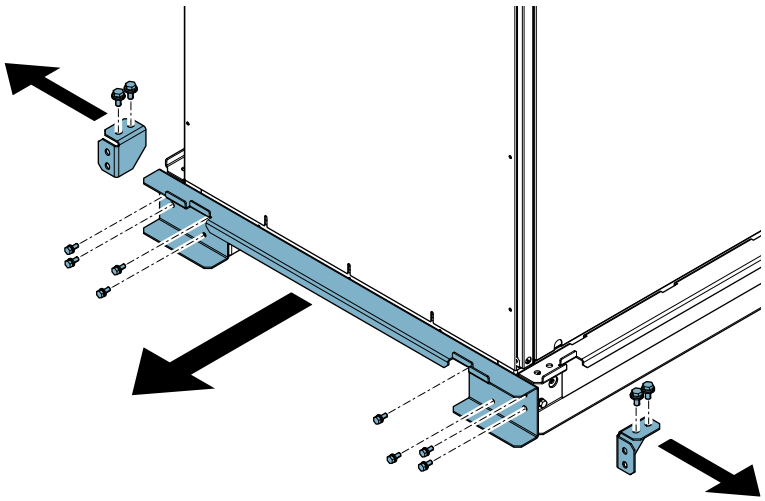
5.5.3 Remove the transportation frame

You need to remove the transportation frame before you can install the kick plates.

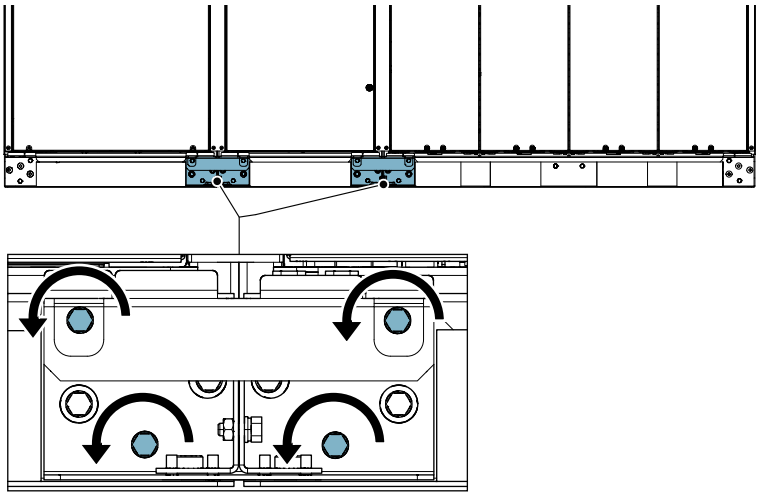
1. Remove the transportation frame from one end of the cabinet.



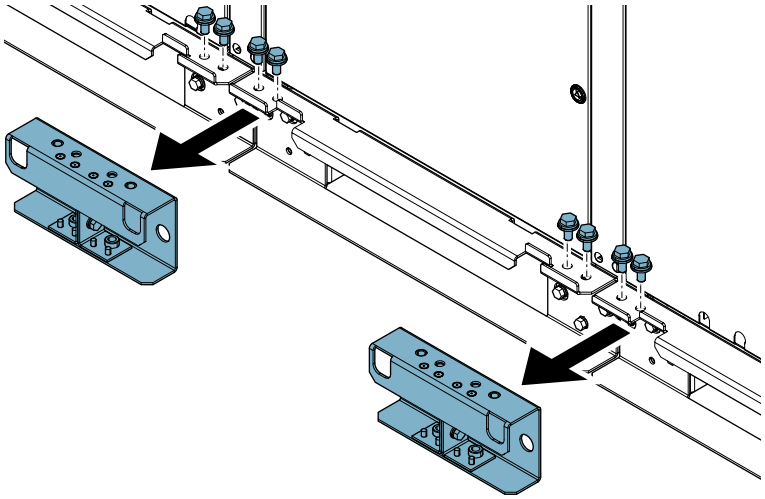
2. Remove the transportation frame from another end of the cabinet.



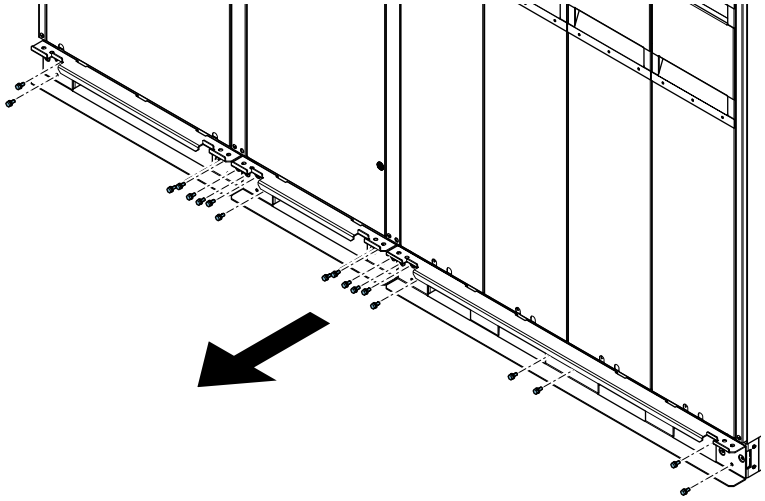
3. Remove 8 screws from both sides of the cabinet.



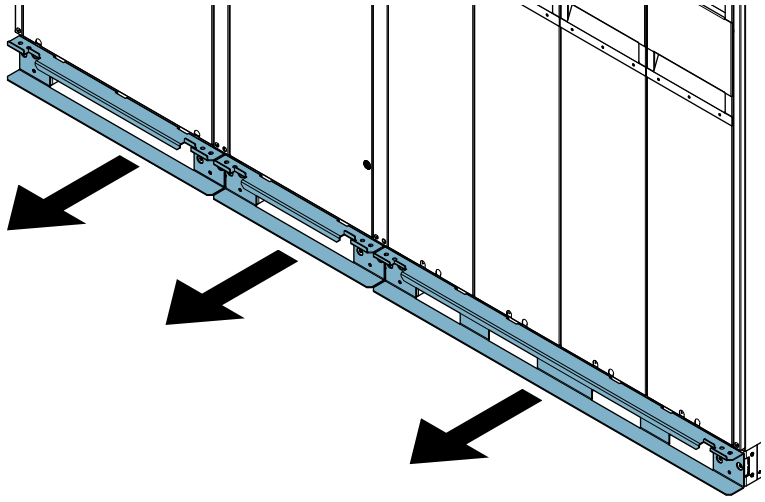
4. Remove the connecting pieces.



5. Remove all the remaining screws (18 pcs on either side).

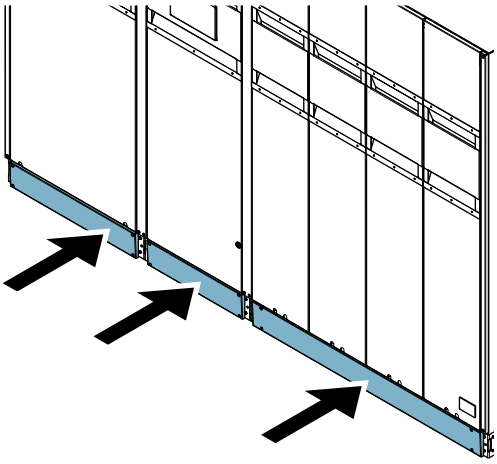


6. Pull out the transportation frames.
   There are three frames on either side.

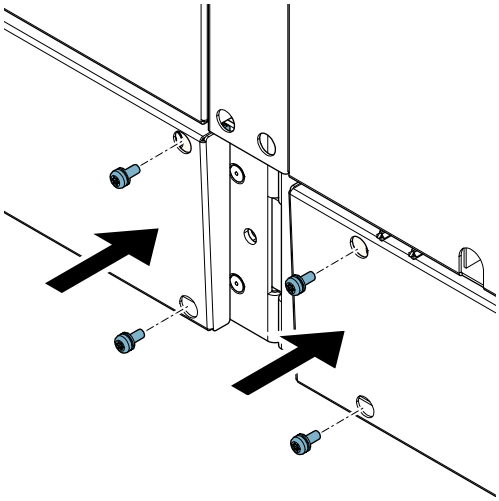


5.5.4 Install the kick plates

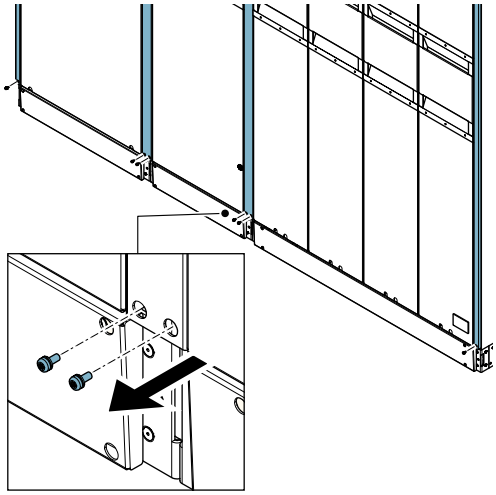
1. Place the three large kick plates under the cabinet.



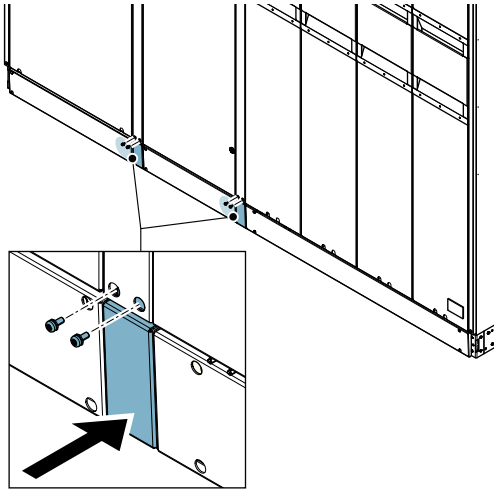
2. Insert 4 screws for every plate and tighten.



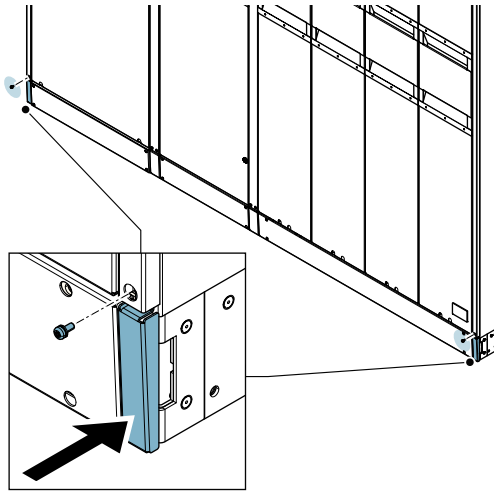
3. Remove the side plate screws.



4. Insert two small kick plates in the middle of the cabinet frame.
   Connect with two screws for each plate.



5. Insert the small kick plates to each end of the cabinet frame.
   Connect with one screw for each plate.



6 UPS system installation

6.1 About UPS system installation

The operator has to supply the wiring to connect the UPS to the local power source. The installation of the UPS must be made by a locally qualified electrician. The electrical installation procedure is described in the following section. The installation inspection and the initial start-up of the UPS and installing an extra battery cabinet must be carried out by an authorized Eaton Customer Service Engineer or by other qualified service personnel authorized by Eaton.

CAUTION

To avoid physical injury or death, or damage to the UPS or the load equipment, follow these instructions during the UPS system installation.

CAUTION

In case of condensed moisture inside the UPS cabinet, dry the cabinet with a blower before starting up the system.

6.1.1 Required tools

This is a list of tools required for successful installation of the UPS.

- Digital multimeter (DMM)
- Flat screwdrivers
- Phillips screwdrivers
- Hex screwdrivers T-25
- Diagonal cutters
- Tie wraps
- Socket wrench set with extensions
- Wrenches: 8 mm, 11 mm, 13 mm, 17 mm, 19 mm
- Nut drivers: 7 mm, 8 mm, 10 mm
- Sockets: 11 mm, 13 mm

6.1.2 Electrostatic Discharge (ESD) procedure and equipment requirements

This section provides guidelines on handling electrostatic-sensitive materials.

6.1.2.1 Definitions

Table 11. ESD definitions

Term	Definition
Antistatic material	Material that neither generates static electricity nor does it provide protection against a static field, and typically has a surface resistance of 109 to 1014 ohm/cm.
Conductive material	Material that provides a Faraday cage effect and protects against static generation and a static field with a surface resistance of <105 Ω per cm.
Dissipative material	Material that provides some protection against a static field and typically has a surface resistance of 105 to 109 Ω per cm.
Faraday Cage or Faraday Shield	A conductive enclosure that is capable of protecting its contents from any outside static charge or electrostatic field. An example would be an ESD bag that is closed.
Frame ground	Any unpainted surface of a unit or subassembly to which a wrist strap may be firmly connected.
Ground	Building/earth ground.
Static safeguard stations	Any area with provisions for controlling electrostatic discharge.
Static sensitive material	Any static sensitive component/device (semiconductors, film resistors and capacitors, and so on) or boards with such components/devices mounted on them.
Static shield	Must be capable of providing a Faraday cage (protective from static discharge as well as electrostatic fields).
Static protective equipment / tools	Must include as a minimum, but not be limited to, a wrist strap with a 1 MΩ resistor, a conductive table mat or grounded work surface, and dissipative mats for field engineers.

CAUTION

Total ESD prevention requires removal of all power from the UPS (that is, input, bypass, and load) causing a load interruption. The following recommendations are made to ensure that the boards and other static sensitive components are not damaged.

6.1.2.2 Procedure

1. Pack all static-sensitive material in approved antistatic protective packaging.
2. When you handle static-sensitive material, use wrist straps, grounded mats, or a grounded table (with grounding that is equivalent to or better than the surface of the mat).
3. When you remove or install boards in a unit or subassembly, use a wrist strap and connect it to the frame of the unit or subassembly.
4. Rejected boards (returned to the factory or rework center) are just as sensitive to electrostatic discharge and must be handled with the same protection as good/ accepted boards.

5. Store all static-sensitive devices and boards with such devices in their static-protected tubes and bags. Tubes and bags provide a complete Faraday cage, which is necessary protection for static-sensitive devices and required at all times.
6. All sales and field engineering personnel are required to use a portable static-controlled field service kit when handling static-sensitive material.

6.2 Install and connect the UPS sections

CAUTION

If the separate battery option is used, the separate battery needs to be installed simultaneously during the cabinet mechanical installation!

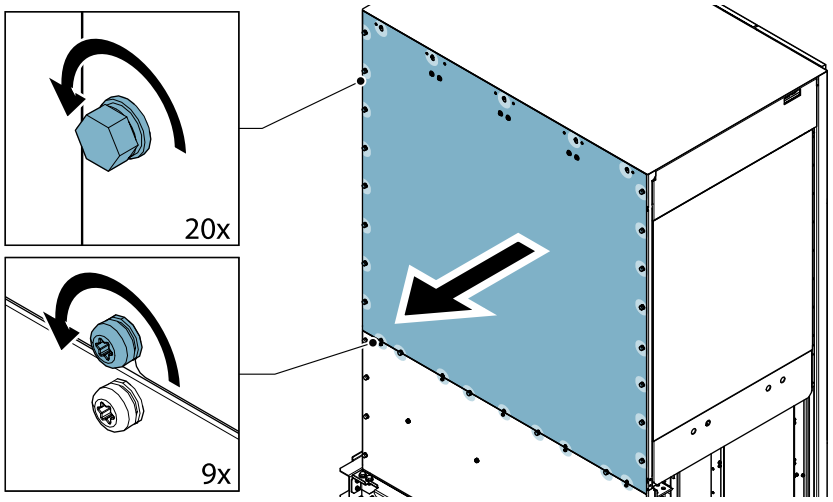
CAUTION

The UPS cabinet is shipped with a debris shield covering the ventilation grill on top of the unit. Do not remove the debris shield until installation is complete.

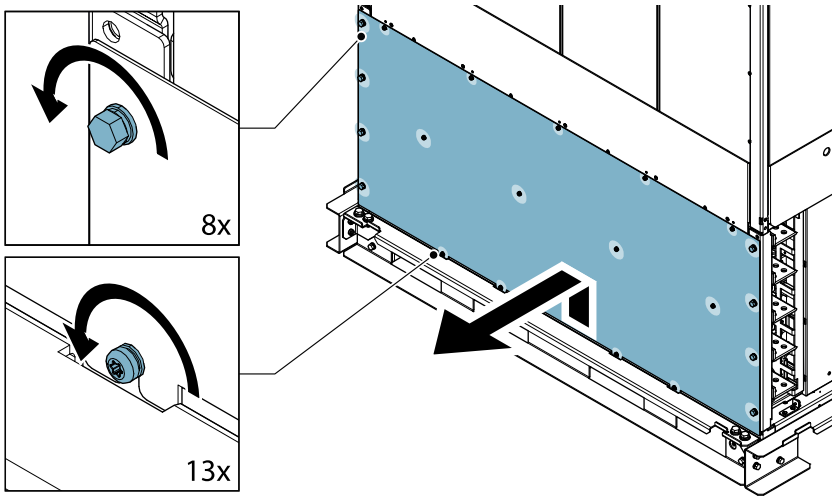
However, remove the shield before operating the UPS. Once the debris shield is removed, do not place objects on the ventilation grill.

6.2.1 Connecting the cabinets - back installation

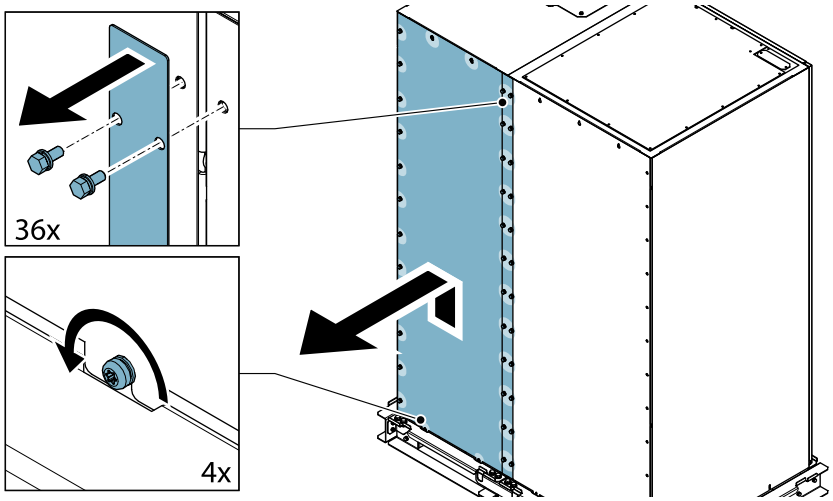
1. Remove the upper back plate of the UPM cabinet.



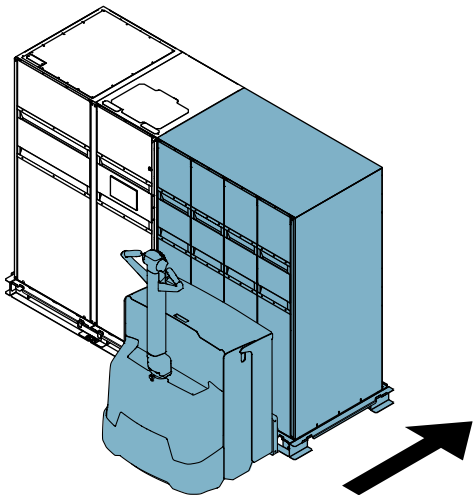
2. Remove the lower back plate.



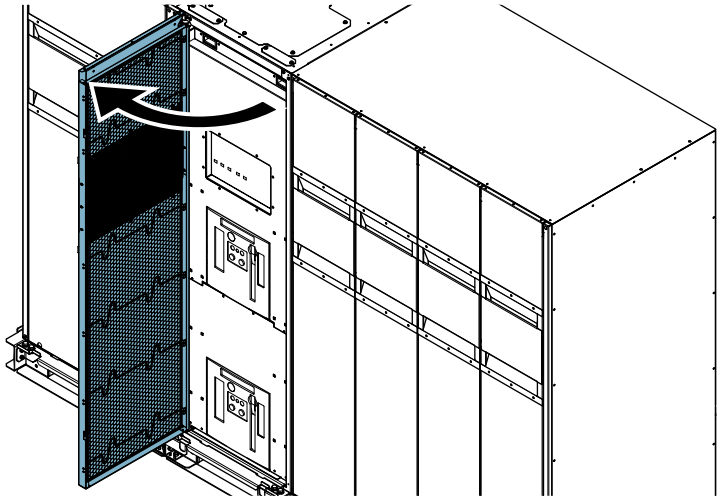
3. Remove the back plates of the cabinet it is to be connected to, in order to expose the M6 threaded holes on the corner poles.



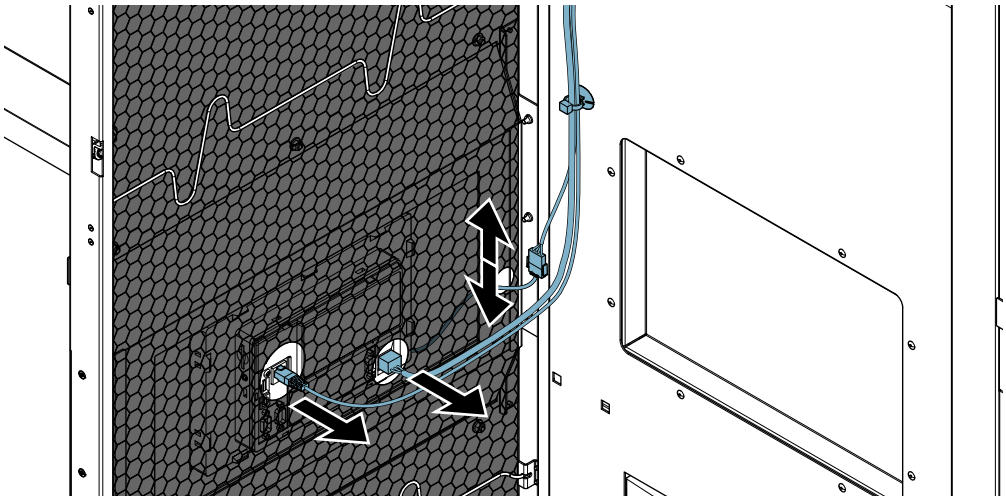
4. Place the UPM cabinet in position, next to the ISBM or IO cabinet, depending on which side it is to be installed on.



5. Open the door.

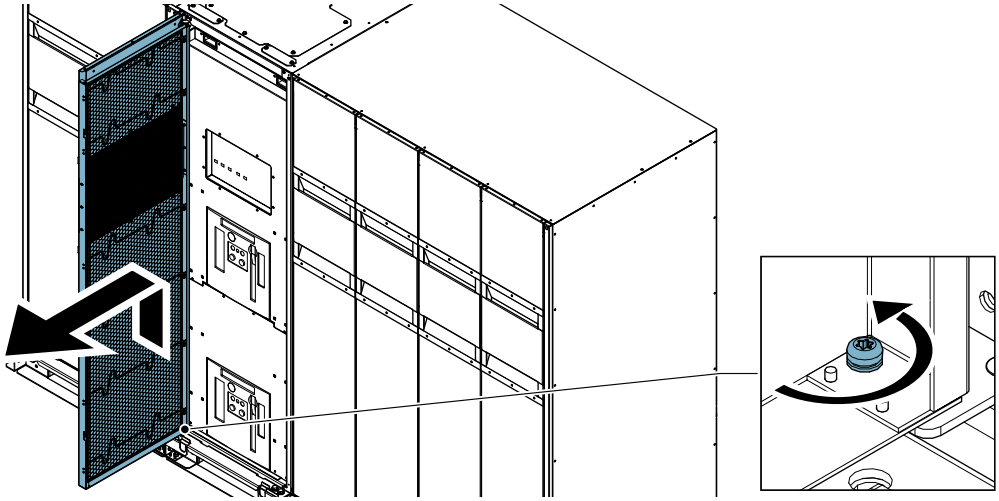


6. Disconnect the HMI, LED port signal, and LED cables.

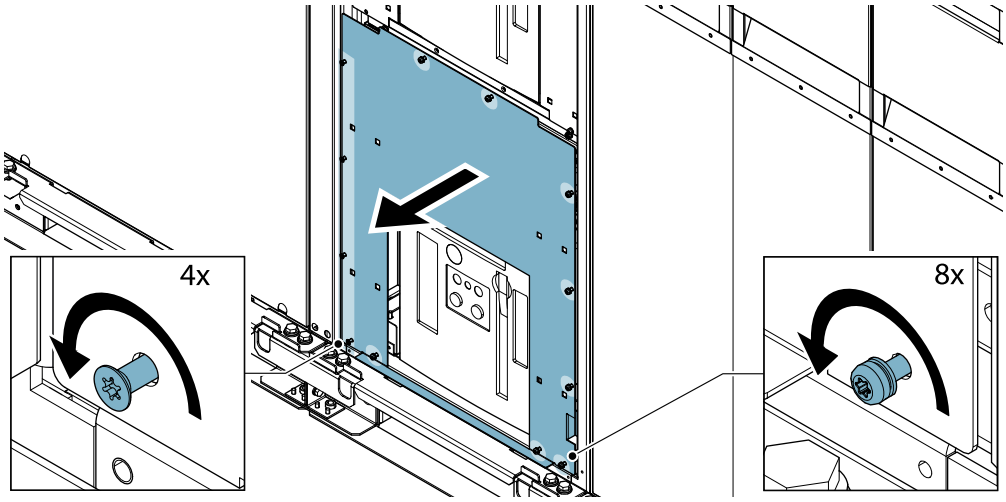


7. Remove the door.

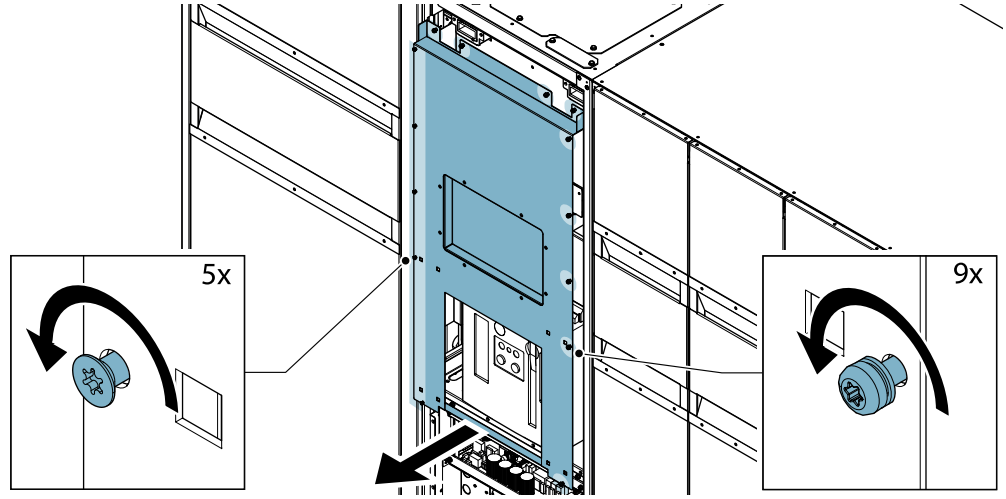
   Expose the M8 threaded holes.



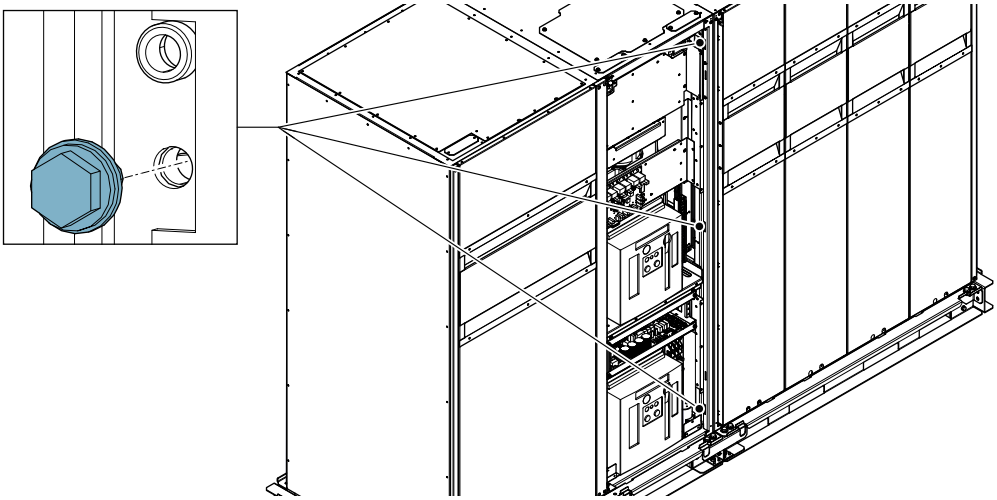
8. Remove the lower front panel.



9. Remove the upper front panel.



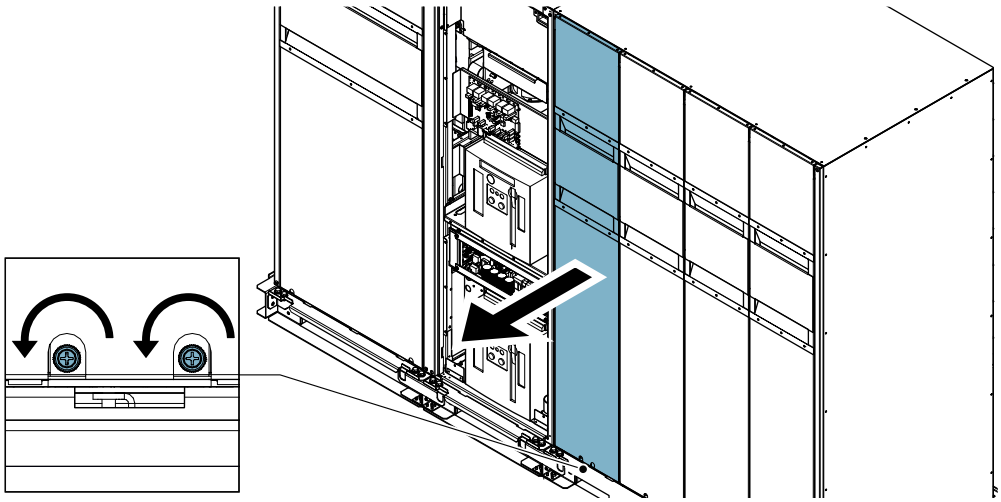
10. Connect the screws.



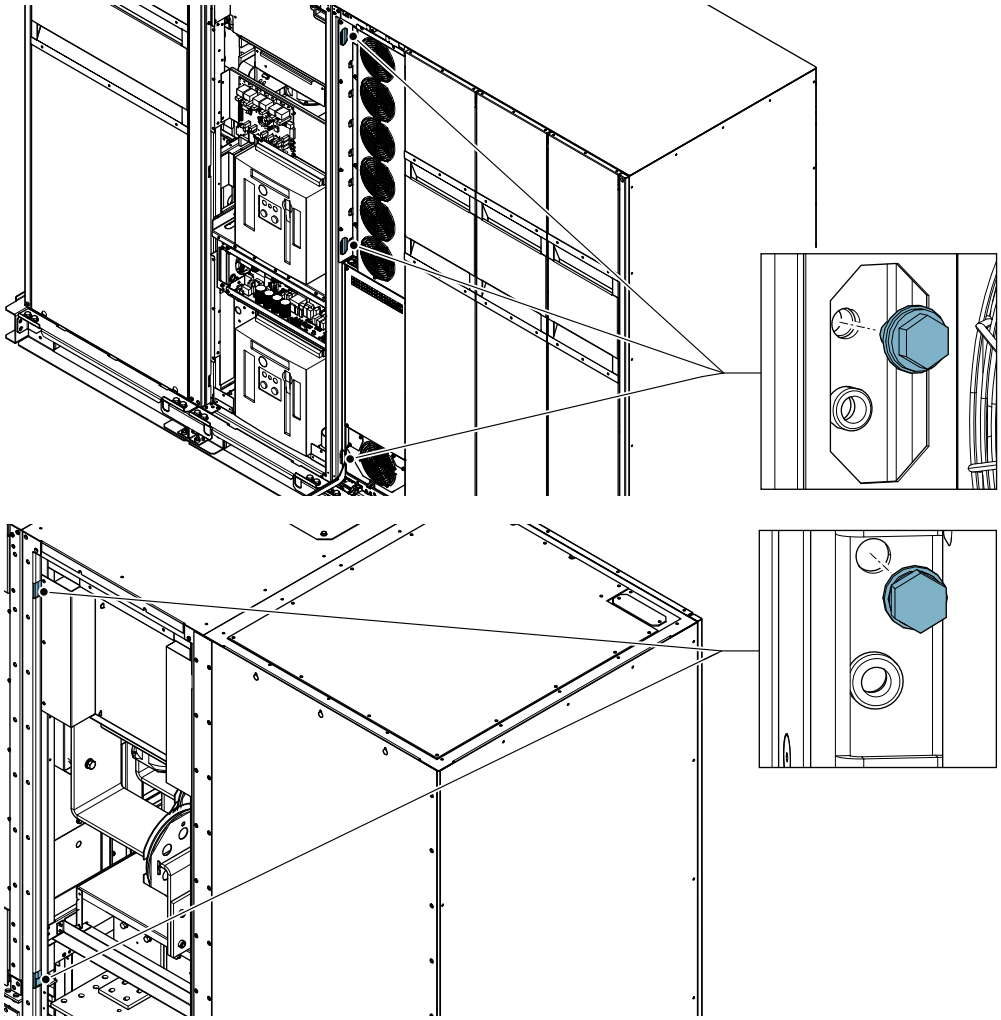
11. Remove the UPM cover plate.

WARNING

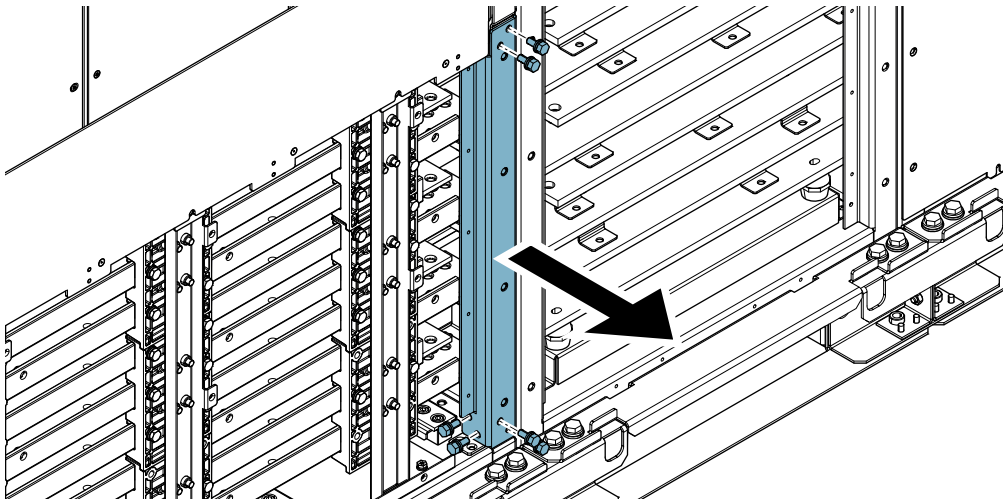
The LED cables are exposed when the UPM cover plate is removed.



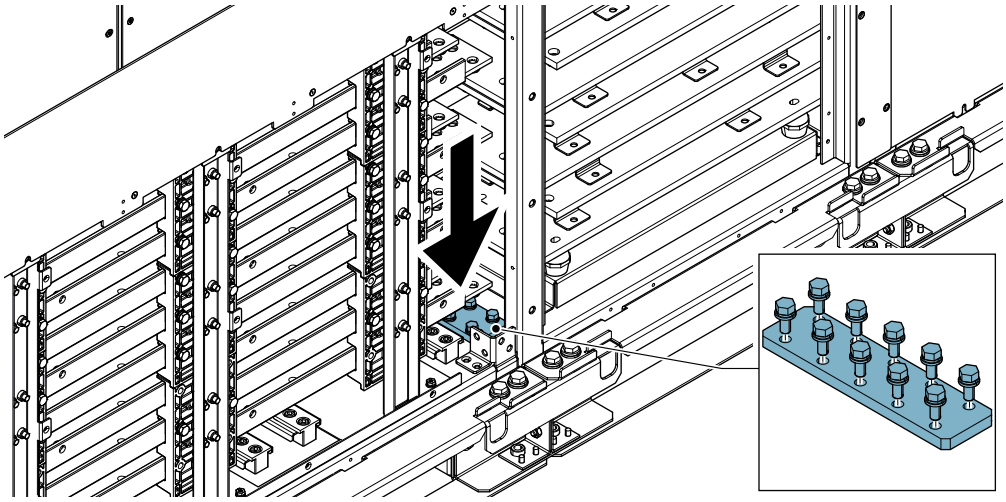
12. Connect the cabinets together using the M6 connections on the front (one bolt per connection place) and the M8 connection on the back (one bolt per connection place).



13. Remove the lower part of the UPM cabinet corner pole, where the busbar connections are to be made. The corner pole is connected with 4 M8 bolts on the lower side and 2 M8 bolts on the top side. Remove the plugs which hold insulation sheet on the inside.

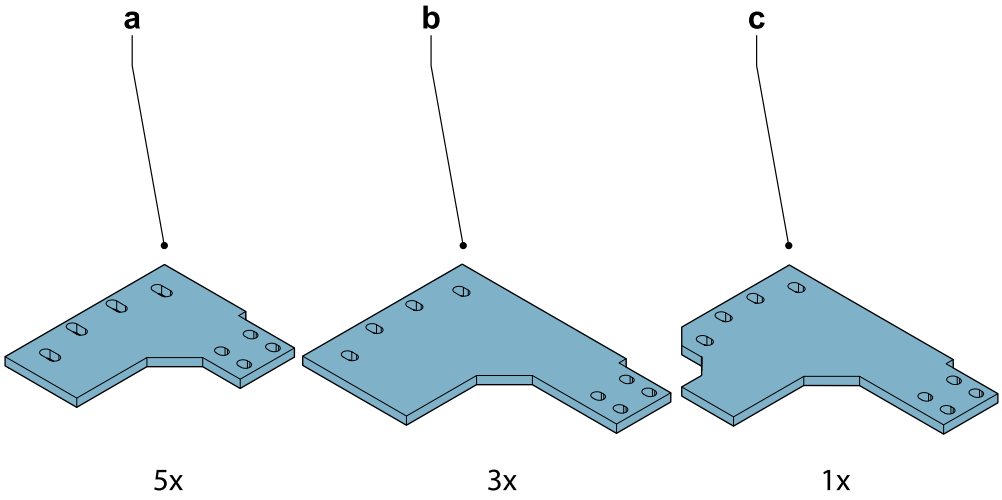


14. Connect the grounding busbar on the bottom of the cabinet with M8 bolts.

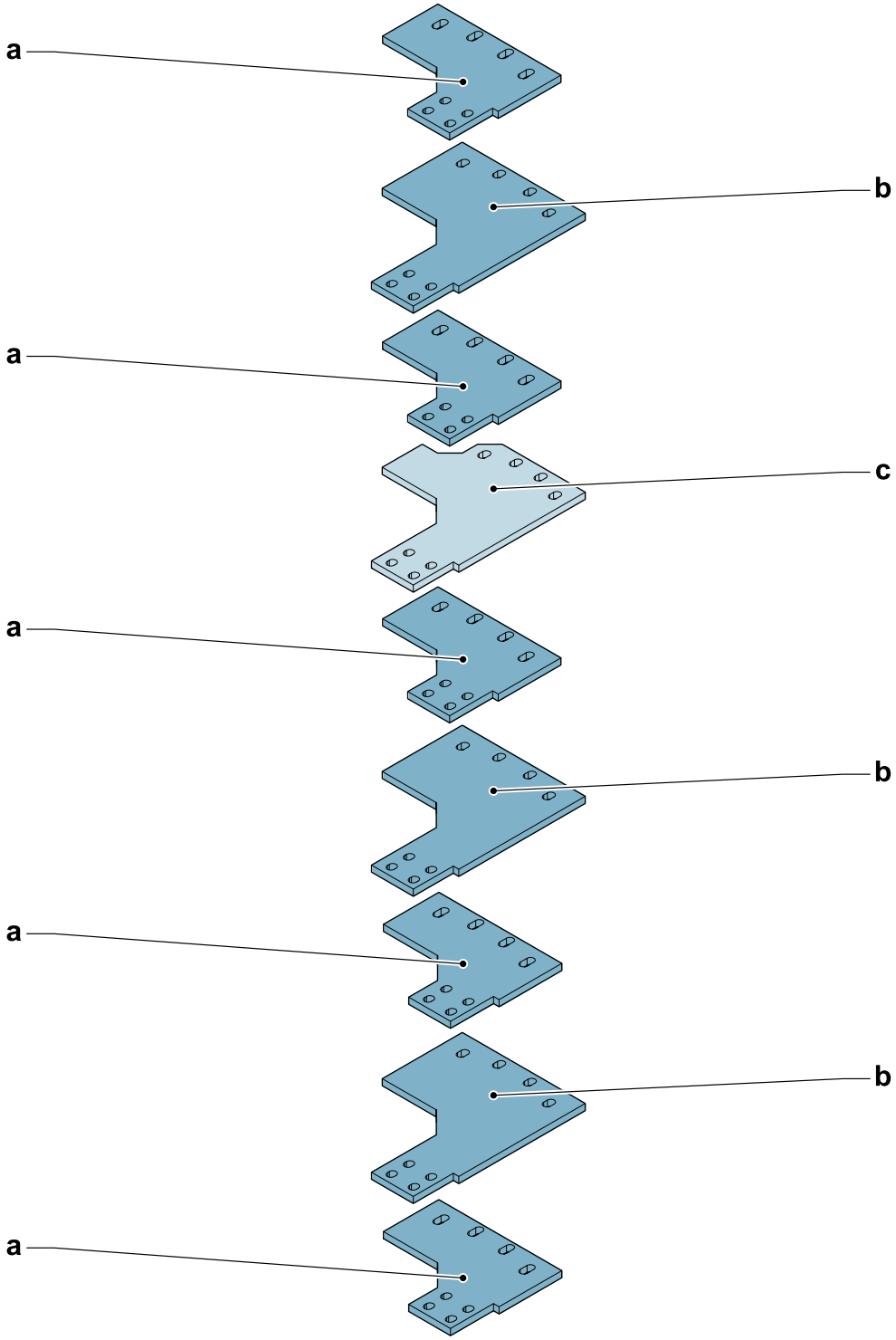


15. If the connecting busbars are not attached to ISBM busbars, place them in such a pattern that the bolt holes are correctly aligned with all connecting holes.

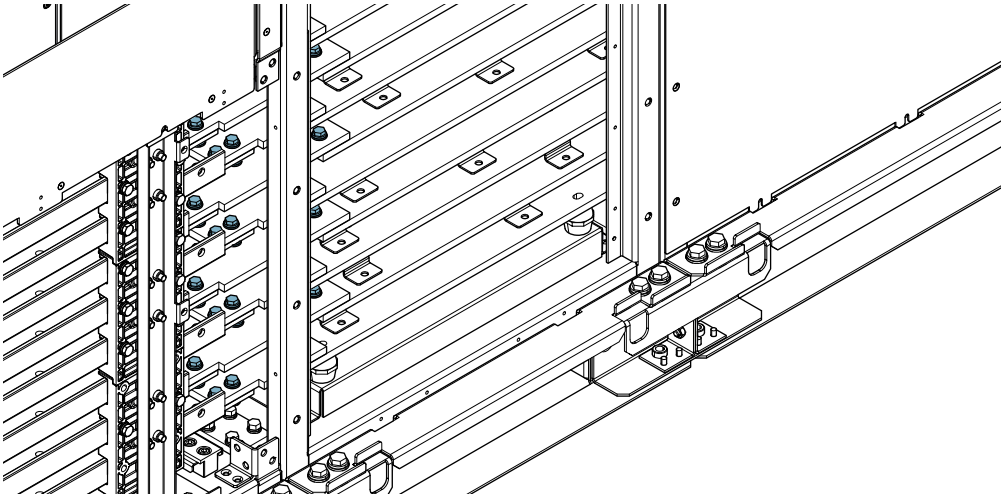
    There are three variants of connecting busbars.



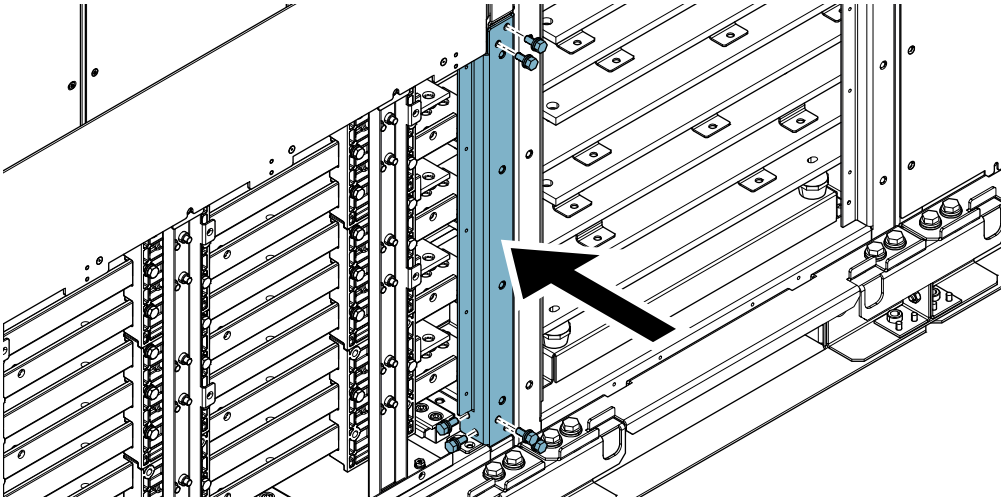
16. Place the busbars in an alternating pattern, starting with smallest variant on the bottom busbars.



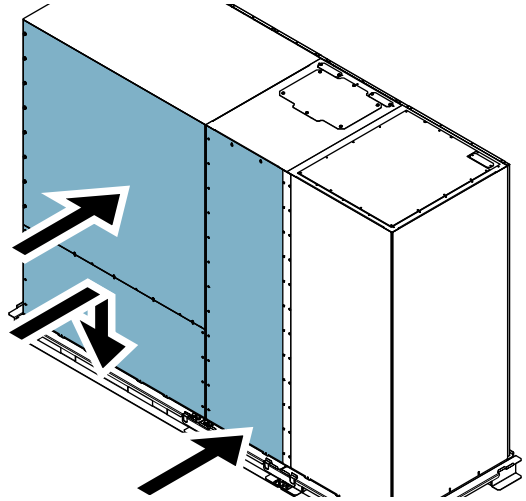
17. Connect the connecting busbars to the UPM cabinet busbars and the ISBM busbars using M10 bolts.



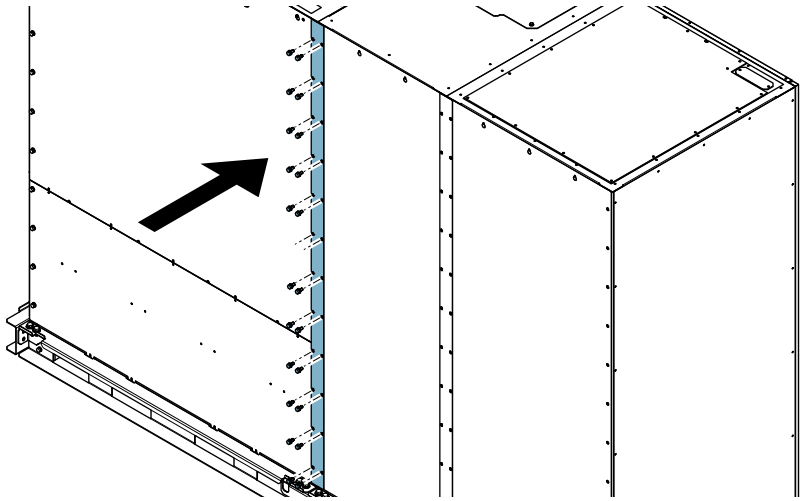
18. Place the lower part of the UPM cabinet corner pole in its original position.
    Attach the insulation sheet with the previously removed plastic plugs and fasten the pole at the top and bottom with the M8 bolts.



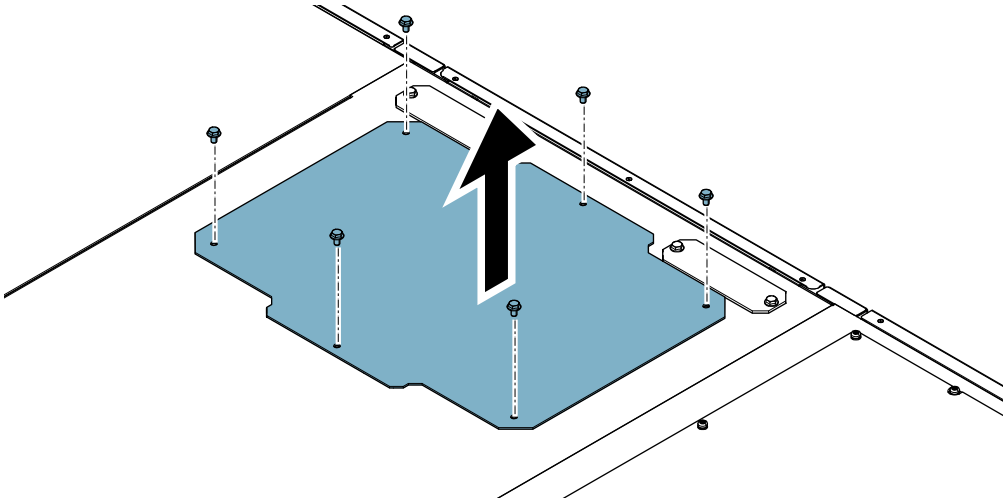
19. Place the UPM cabinet lower back plate into place, as well as the back plate of the other cabinet.



20. To fasten the back plates, you need to also place the thin vertical plate on top of both plates and fasten the plates through its holes.



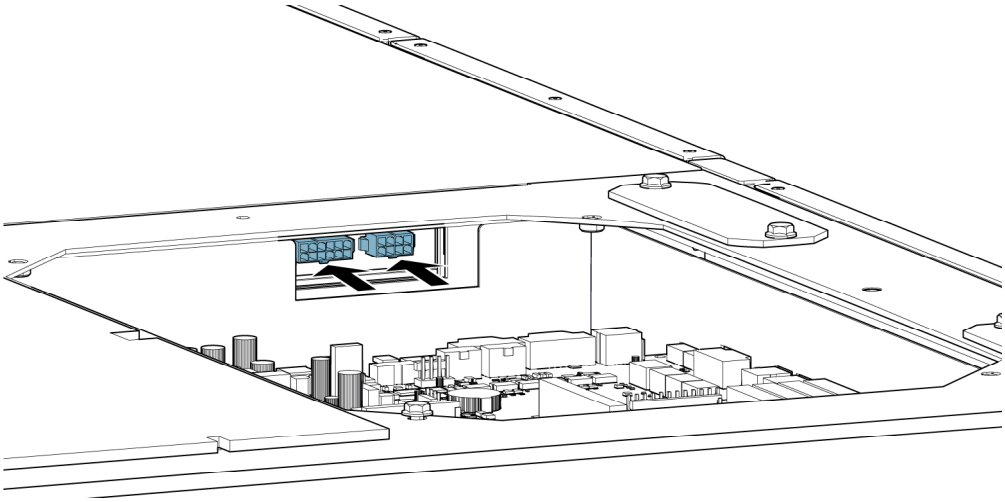
21. Open the roof opening on the ISBM cabinet.



22. Attach the CAN bus cable from the ISBM into the closest CAN bus terminal in the UPM cabinet.

CAUTION

Electrical hazard.
Use the ESD procedure during this step!



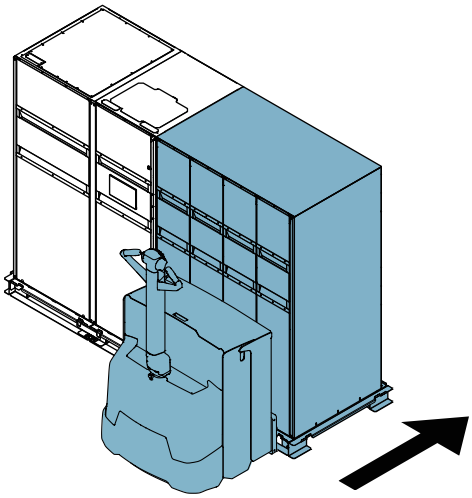
23. Install the roof opening.

NOTE:

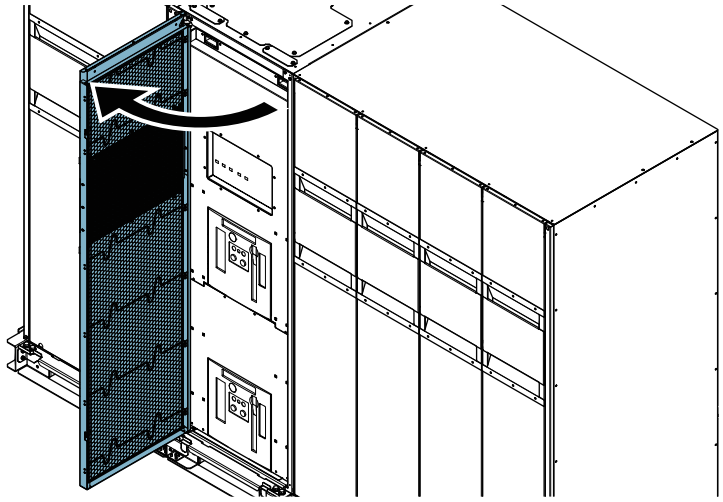
Proceed directly to *Sections 6.3 Electrical installation* and *6.3.1 Electrically connect the UPS* .

6.2.2 Connecting the cabinets - front installation

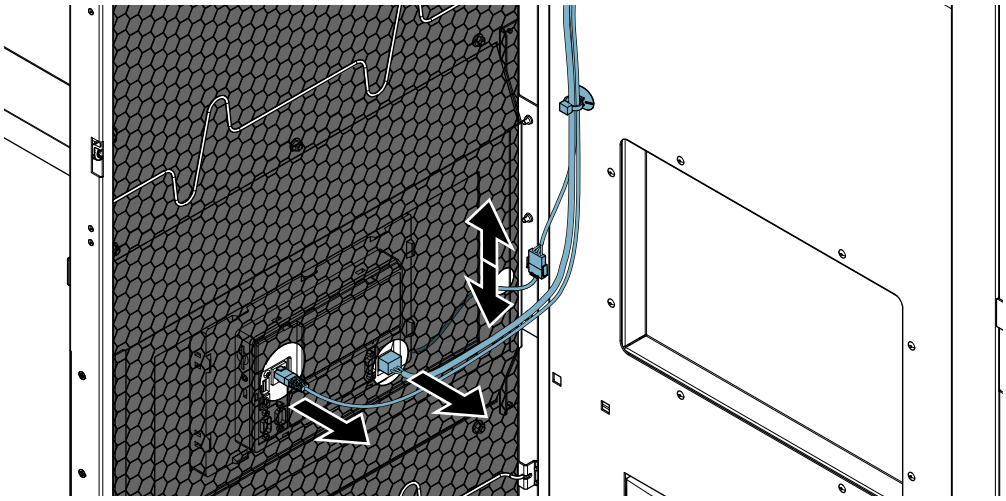
1. Place the UPM cabinet in position, next to the ISBM or IO cabinet, depending on which side it is to be installed on.



2. Open the cabinet door.

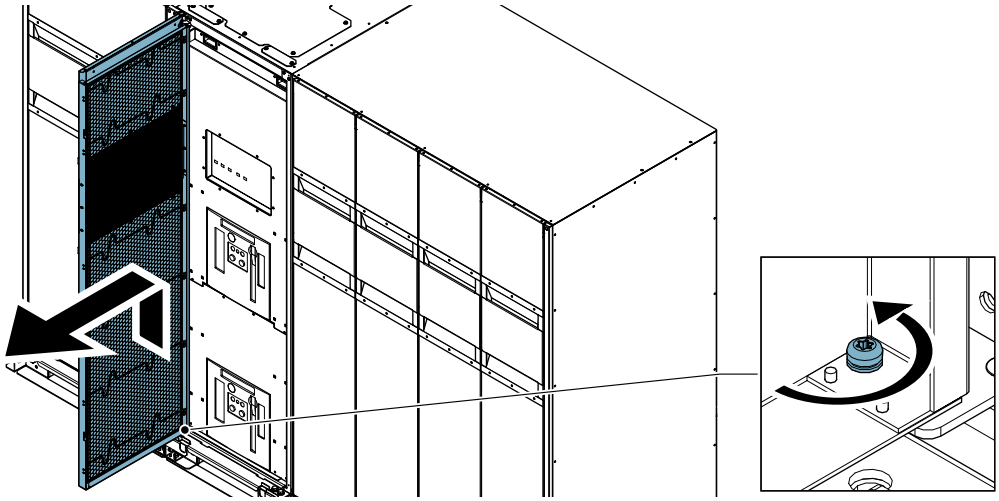


3. Disconnect the HMI, LED port signal, and LED cables.

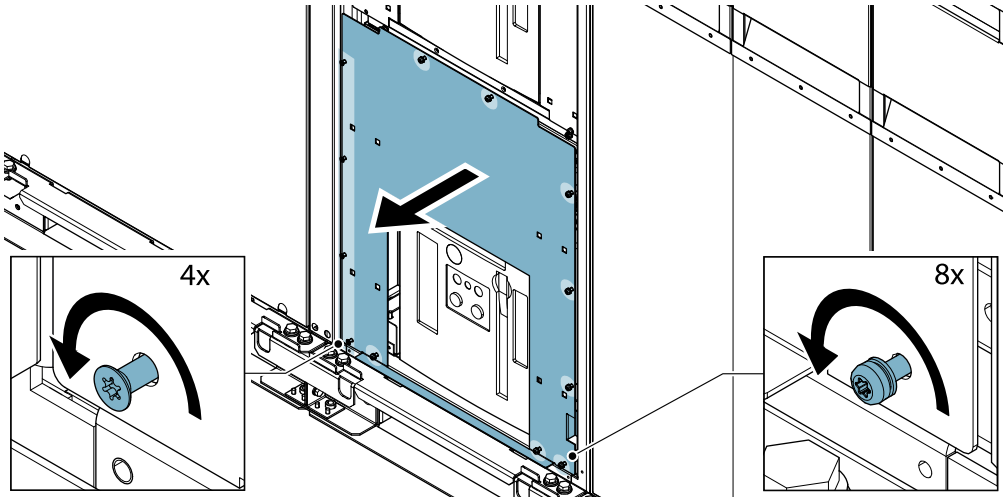


4. Remove the cabinet door.

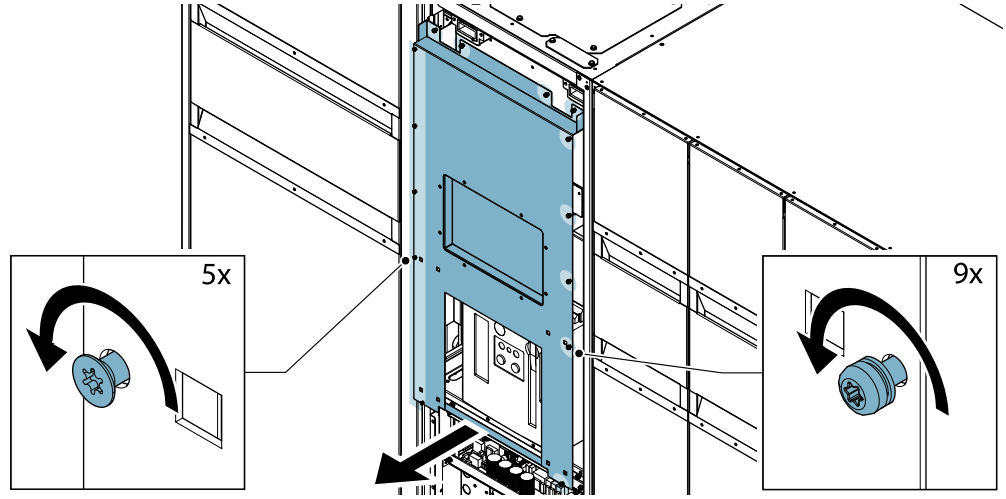
   Expose the M8 threaded holes.



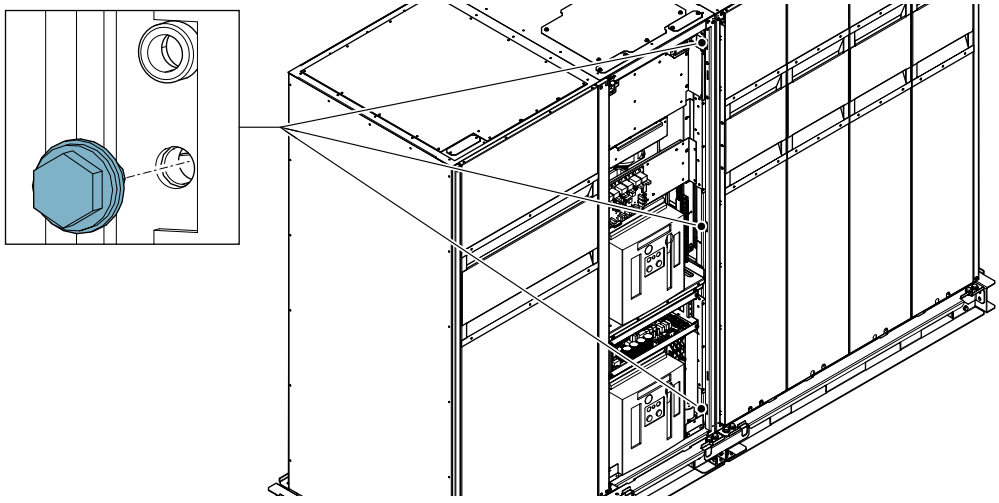
5. Remove the lower front panel.



6. Remove the upper front panel.

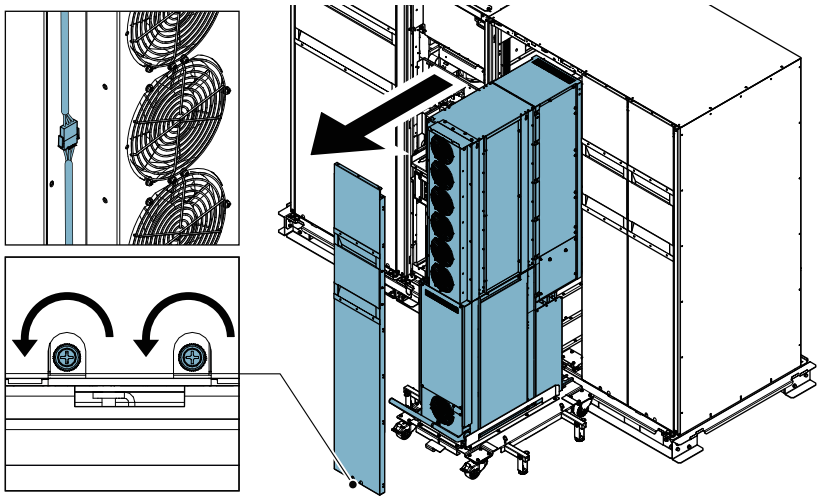


7. Connect the screws.



8. Remove the cable connection to the CAN bus card above the UPM.

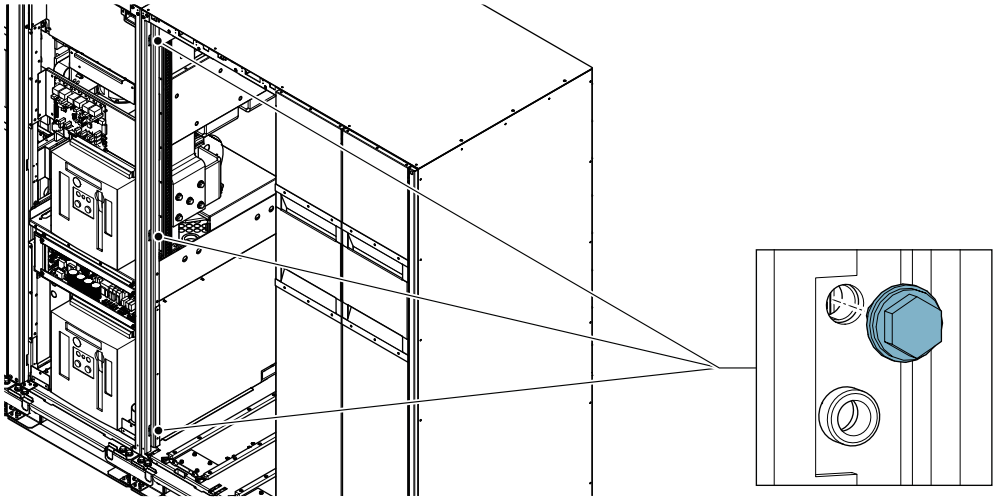
9. Temporarily remove the 2 UPMs closest to the ISBM using the service dock.



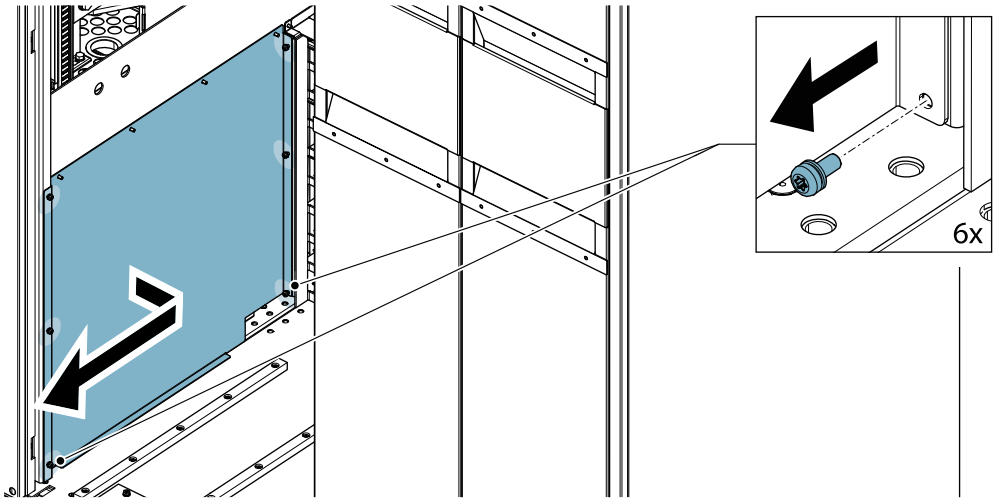
WARNING

The LED cables are exposed when the UPM cover plate is removed.

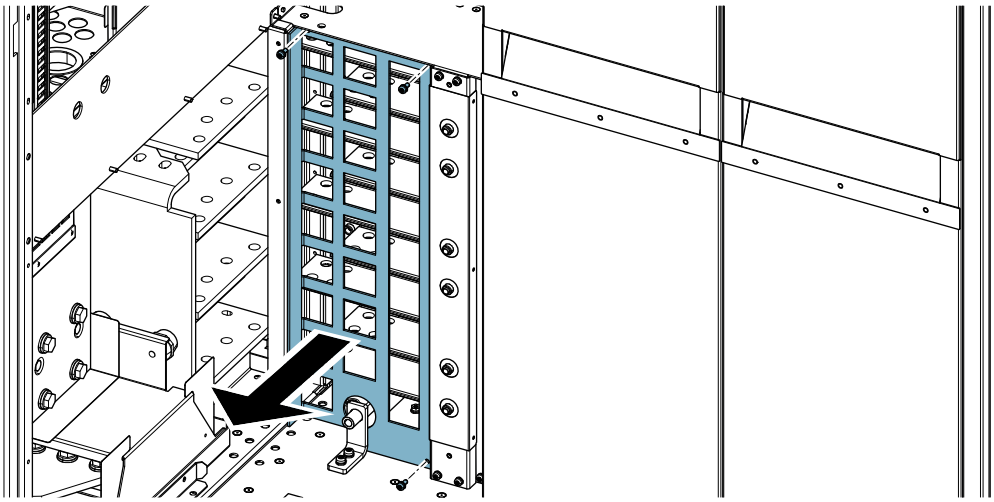
10. Utilize the bolt connection locations on the corner poles to connect the frames together.
11. Put one bolt per connection location for all bolt connections available from the UPM cabinet.



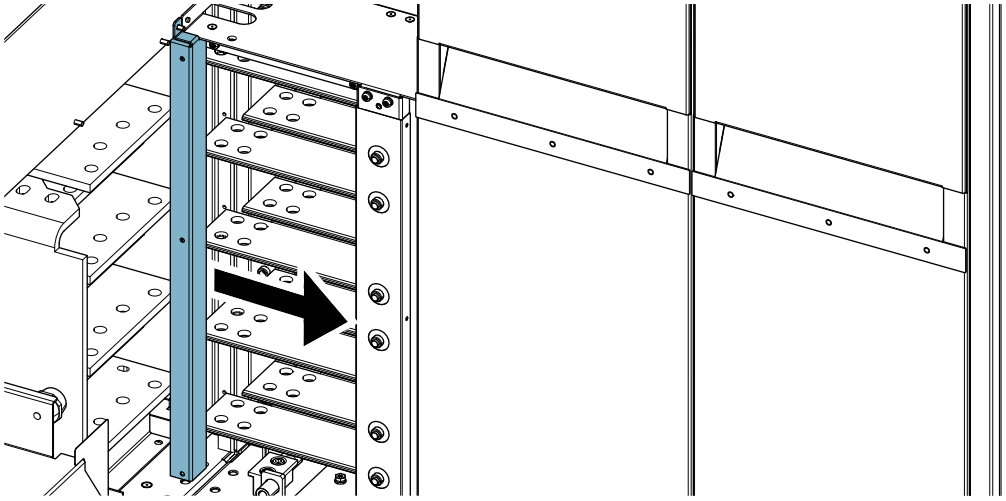
12. Remove the screws and remove the cover.



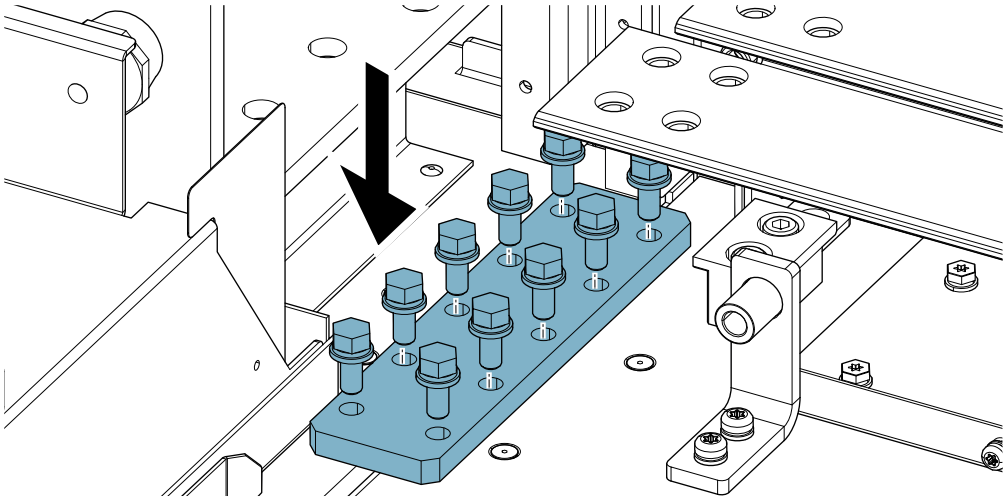
13. Remove screws to remove the acrylic touch cover to access the busbar connecting positions.



14. Remove the side bar.

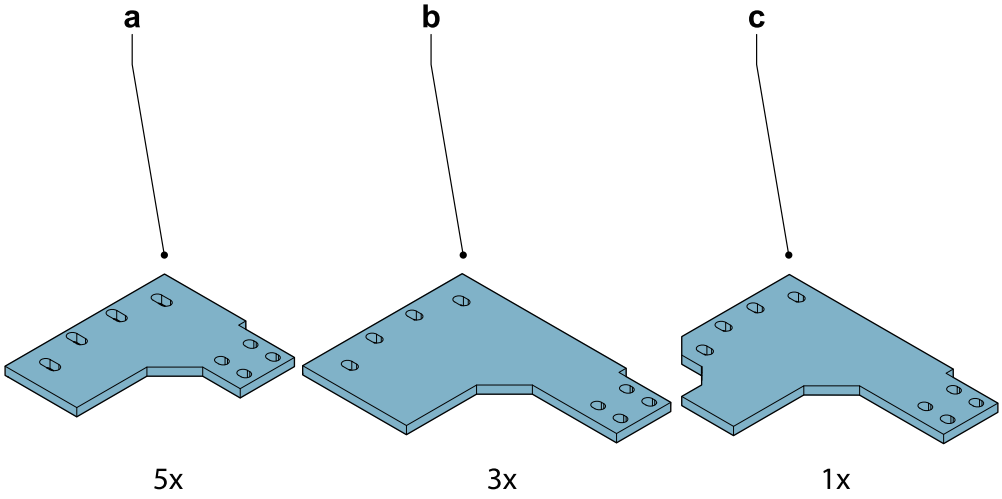


15. Connect the grounding busbar on the floor between the frames, using M8 bolts.

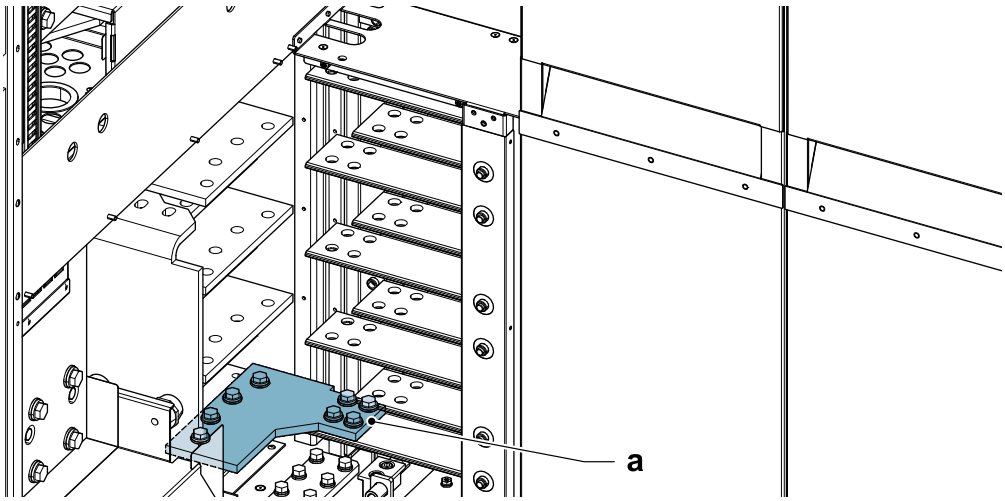


16. If connecting busbars are not attached to ISBM busbars, then they are to be placed in such a pattern that the bolt holes are correctly aligned with all connecting holes.

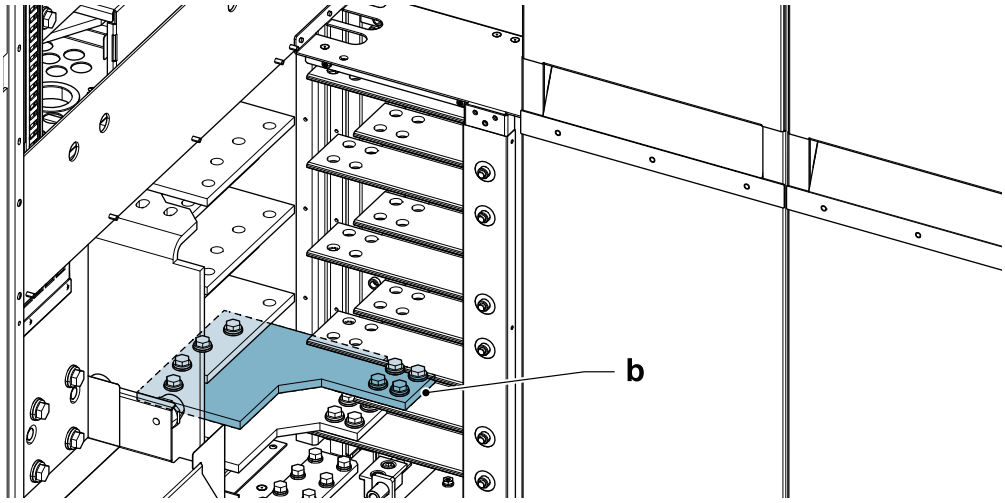
    There are three variants of connecting busbars and are to be placed in an alternating pattern, starting with smallest variant on the bottom busbars.



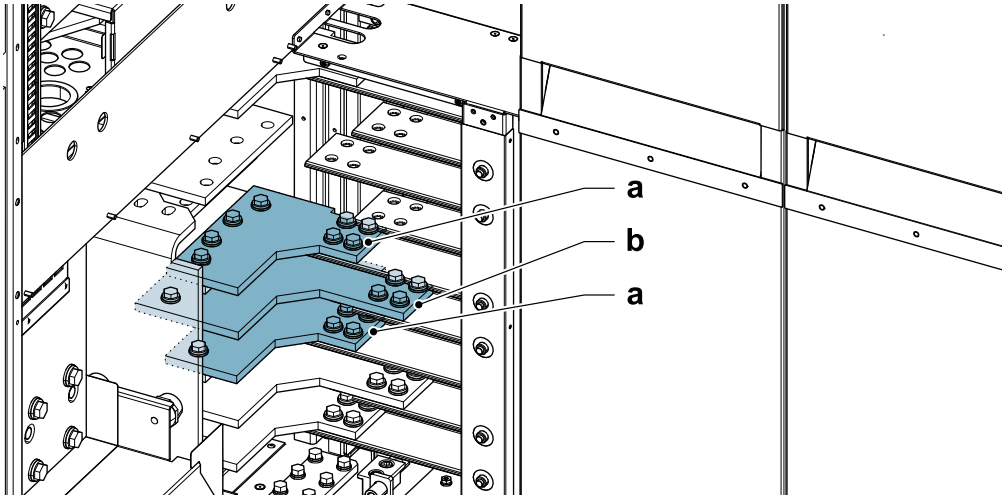
17. Start with the “a” variant.



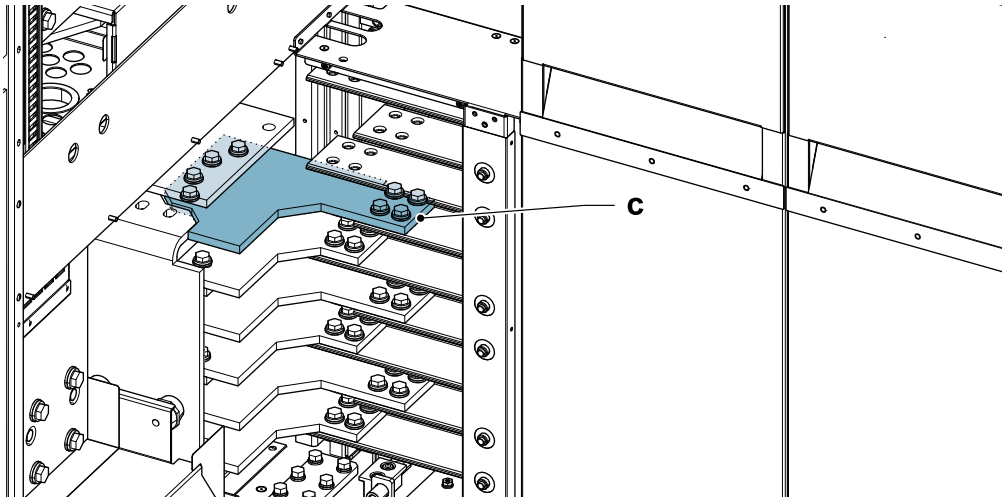
18. Place the “b” variant next.



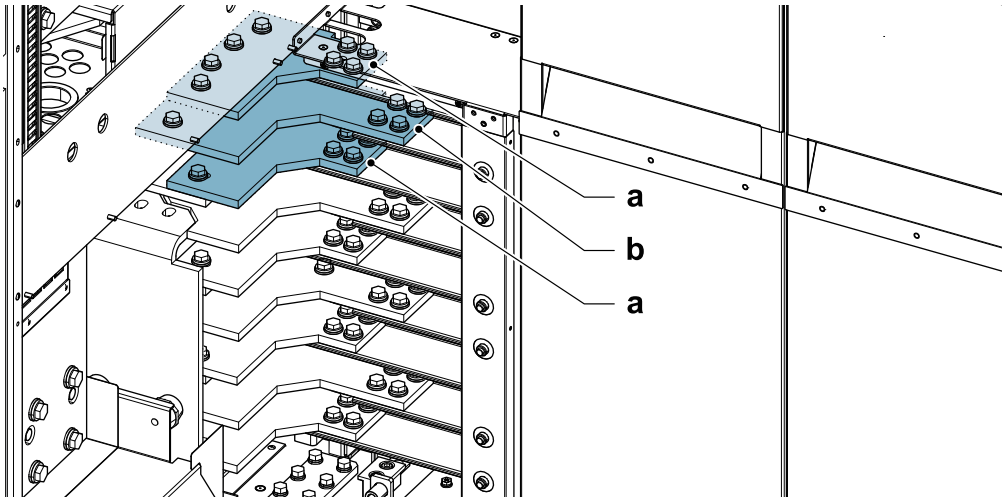
19. Continue in this pattern.



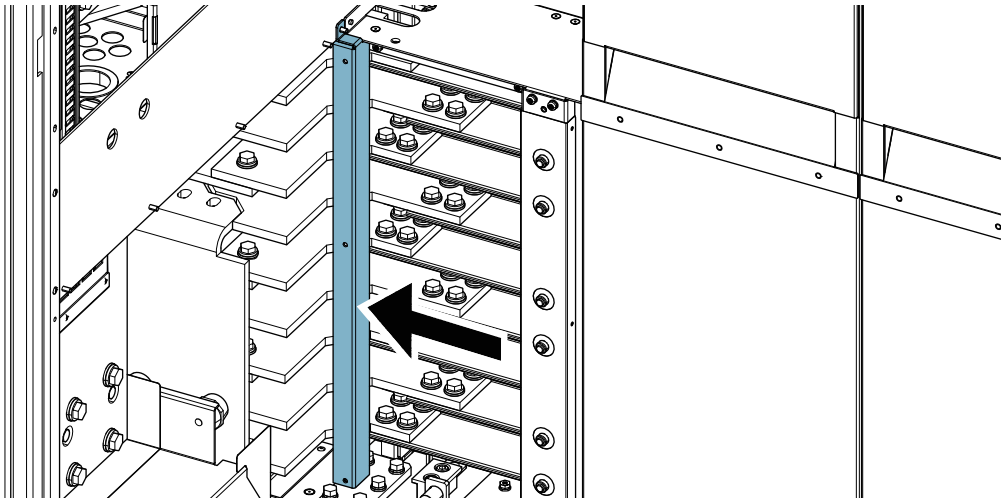
20. For a UPM cabinet placed on the right side, the 6th connecting busbar from the bottom needs to be variant “c”.



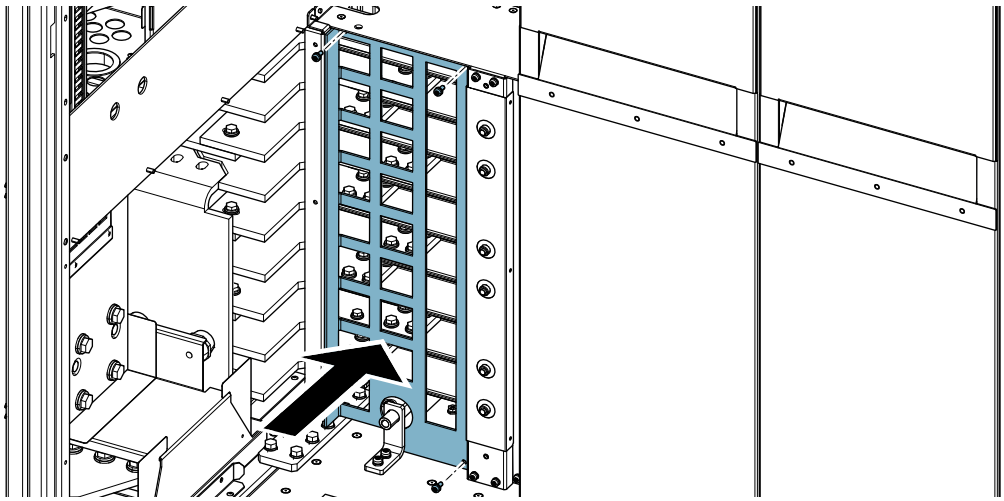
21. Place the connecting busbars into place one by one and connect them with M10 bolts.



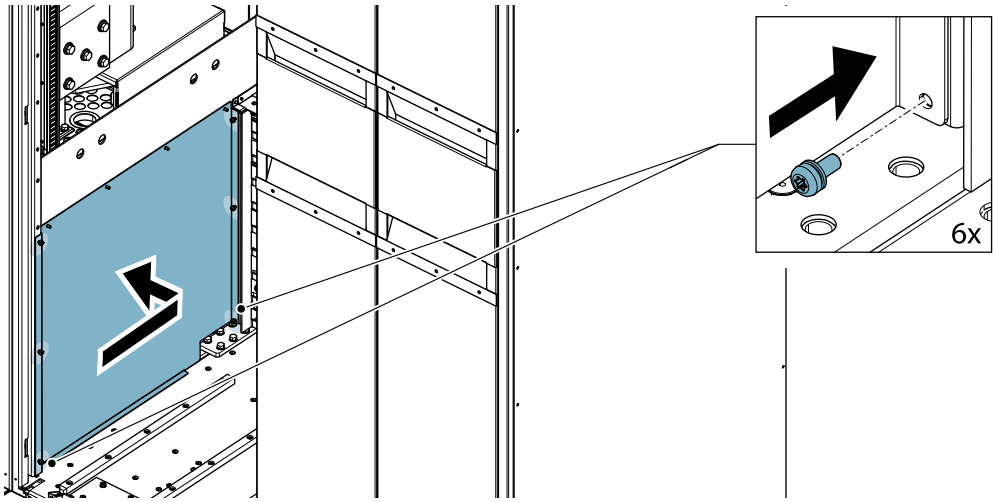
22. Insert the side bar.



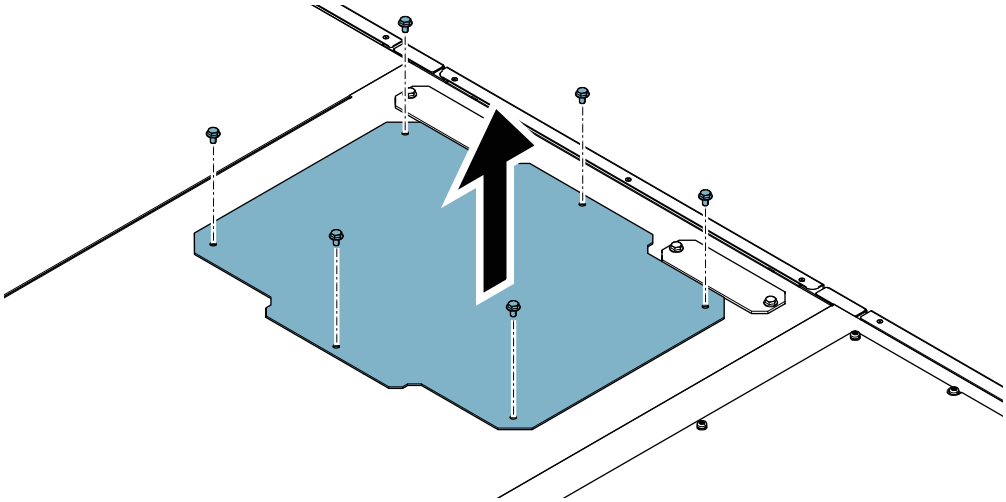
23. Place the acrylic touch cover back into place.



24. Insert the cover and connect the screws.



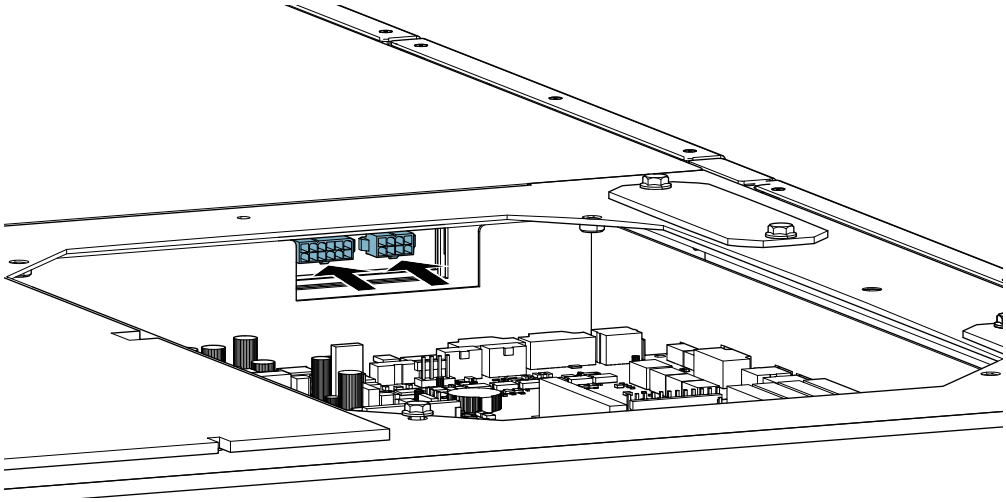
25. Open the roof opening on the ISBM cabinet.



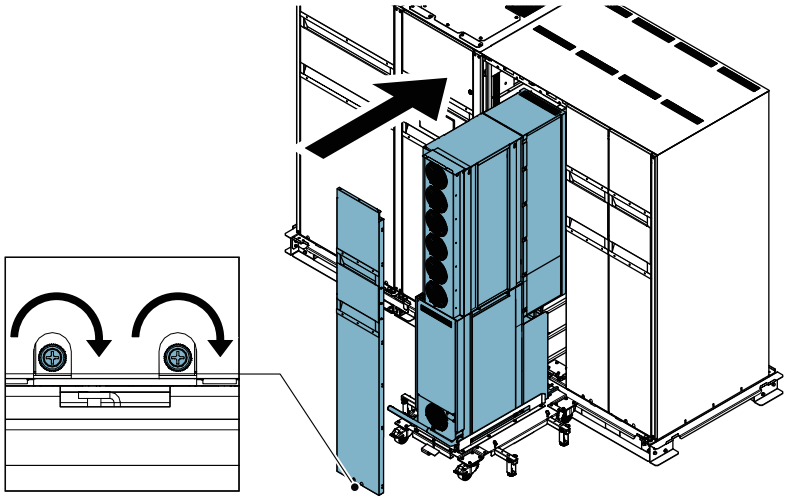
26. Attach the CAN bus cable from the ISBM into the closest CAN bus terminal in the UPM cabinet.

CAUTION

Electrical hazard.
Use the ESD procedure during this step!

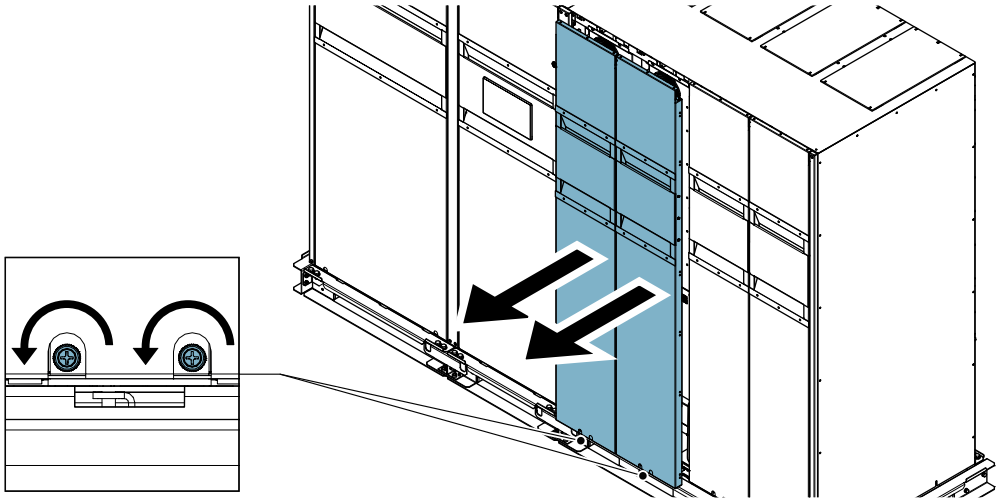


27. Insert the removed UPMs back into the UPM cabinet.
See *Section 6.2.3 Remove the UPM*.

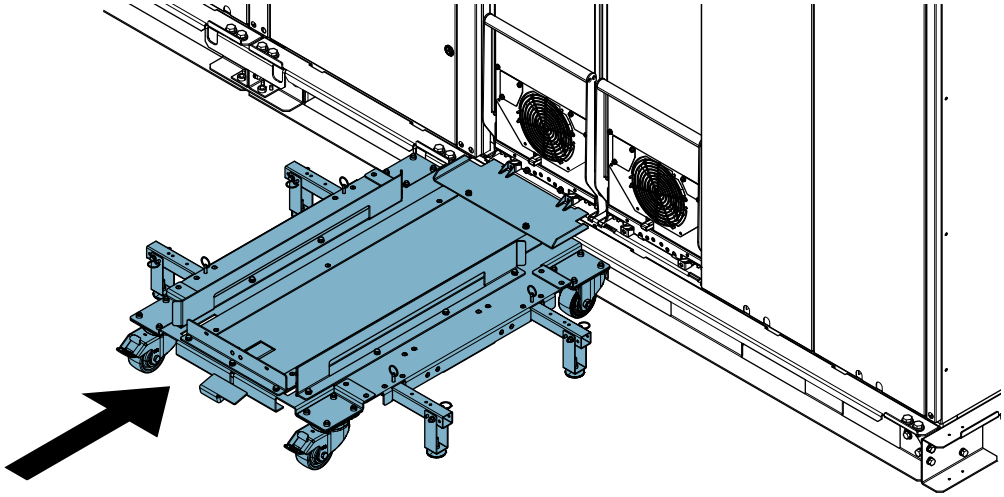


6.2.3 Remove the UPM

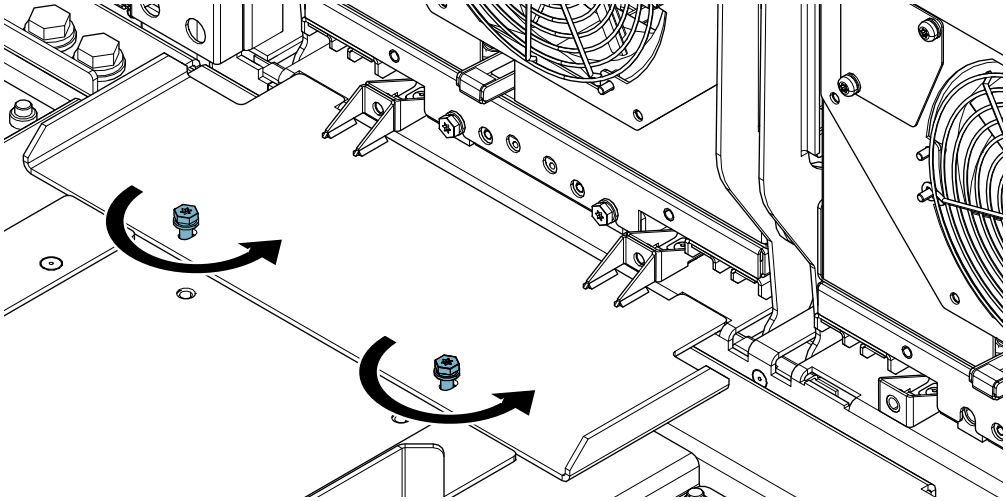
1. Disconnect the LED connector and remove the UPM plate (and adjacent plates).



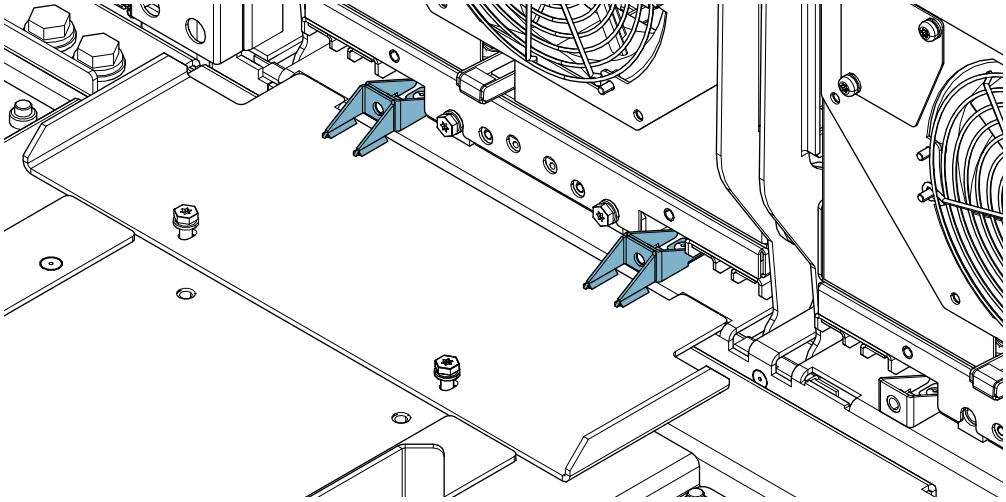
2. Place the service dock in front of the UPM cabinet.



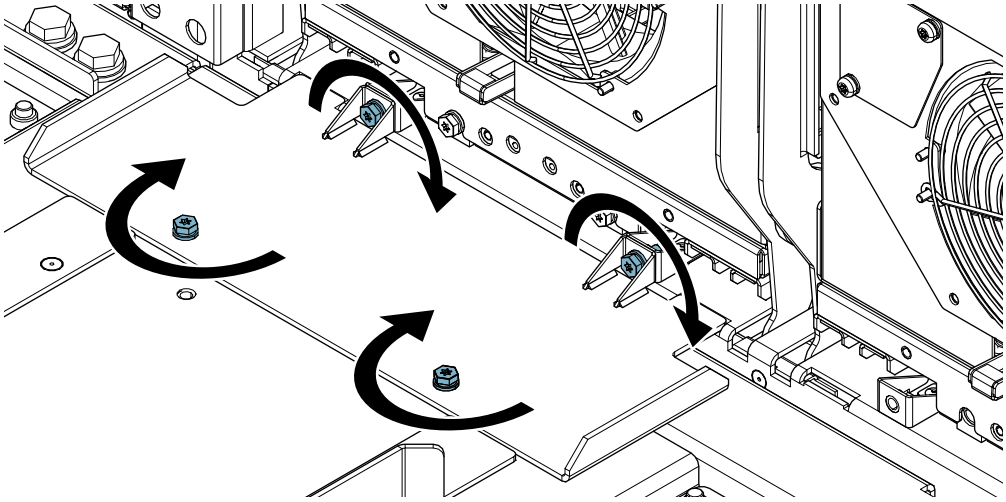
3. Loosen the bolts on dock-bridge connection so that the bridge can be angled easier.



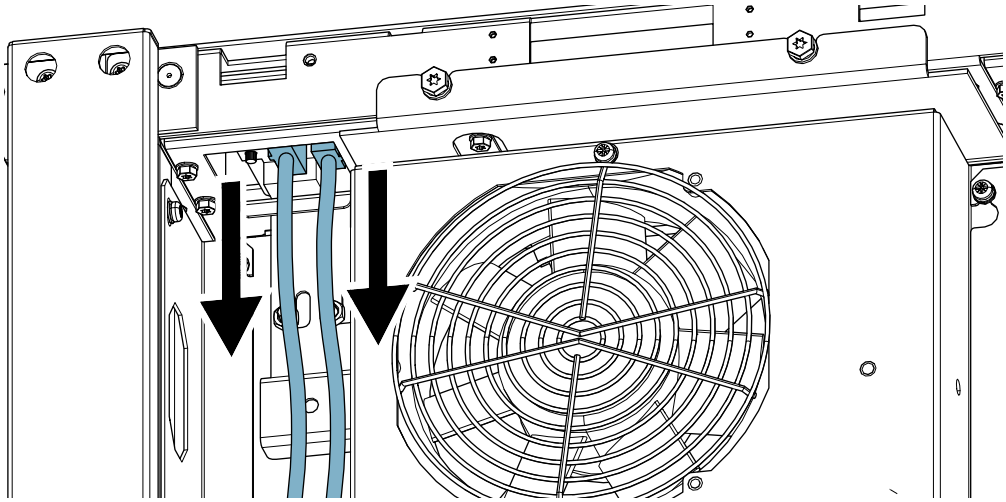
4. Place the bridge in such a way that the fastening pieces are against the similar fastening pieces in the UPS.



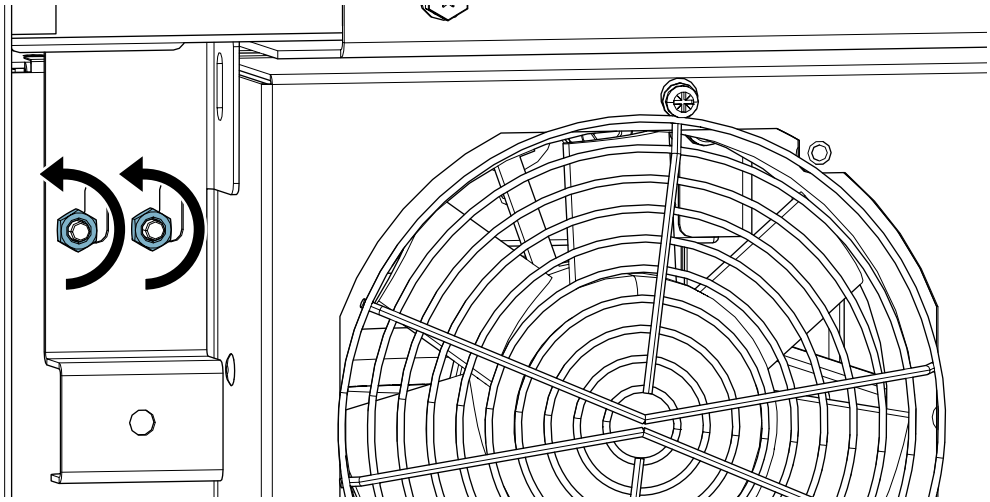
5. Fasten M6 screws to the fasteners (2 pcs) and fasten the screws on the bridge (2 pcs).



6. Remove the CAN bus cable from the CAN bus PCB above.



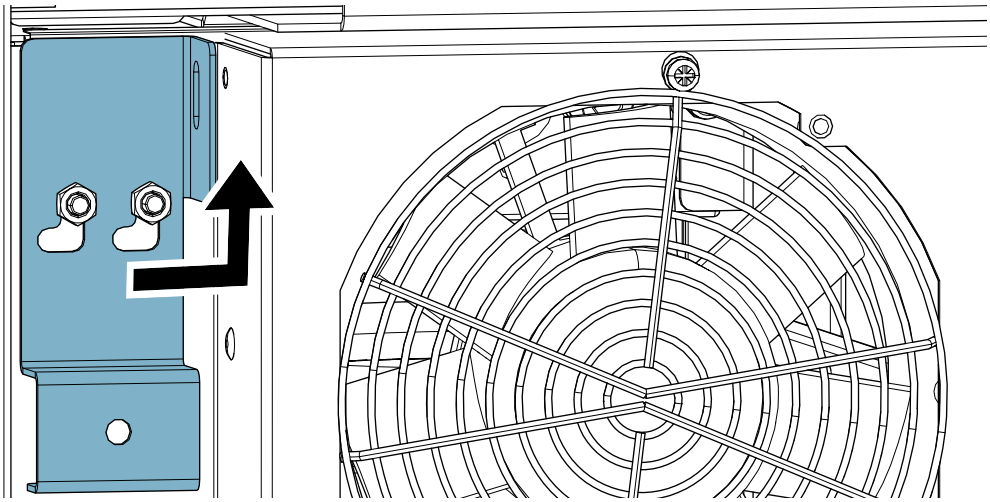
7. Loosen the nuts (2 pcs).



8. Move the lock into open position to pull the UPM out.

WARNING

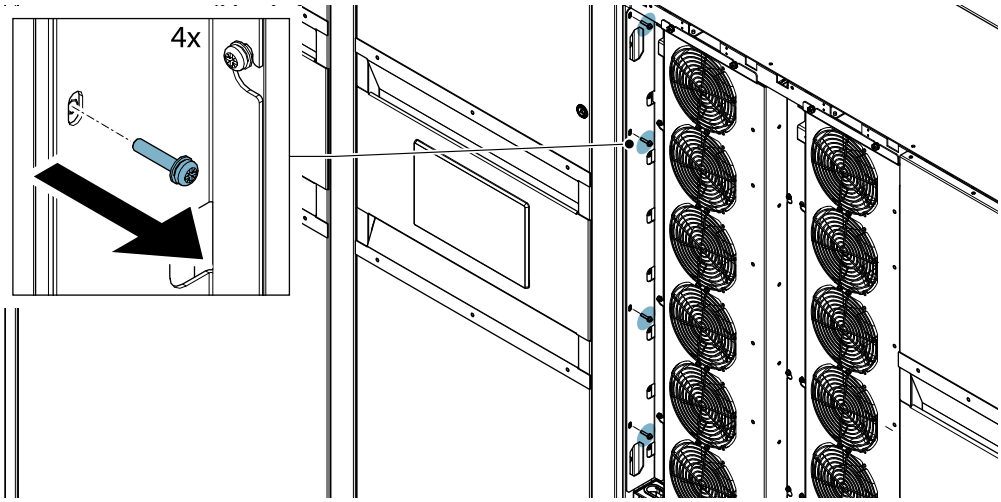
MAJOR SAFETY RISK!
MAKE SURE THAT THE CAN BUS CABLE IS DISCONNECTED AT THIS TIME, OR AT THE LATEST BEFORE PULLING THE UPM OUT!



9. Remove the side screws (4 pcs).

CAUTION

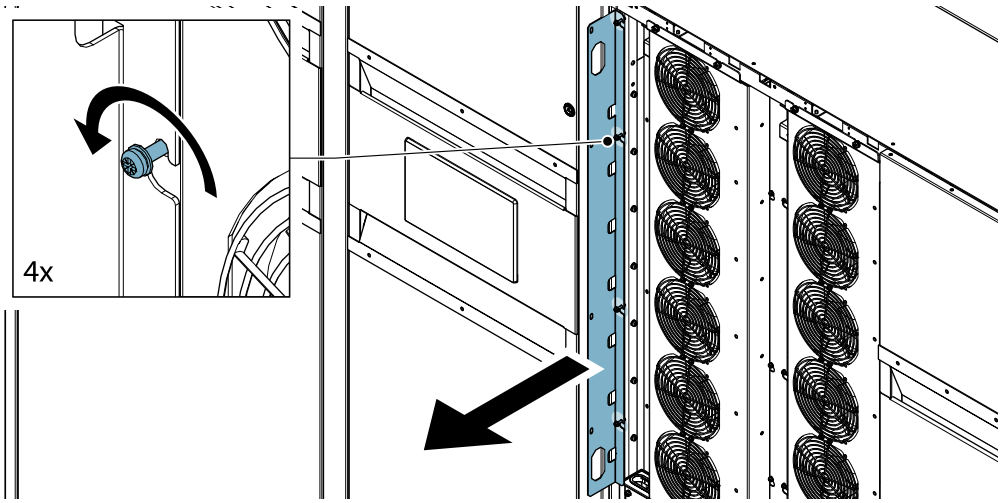
THE SCREWS CAN FALL INTO THE HOLE ON THE UPM FROM WHERE THE CABLES COME, MAKE SURE THAT DOES NOT HAPPEN!



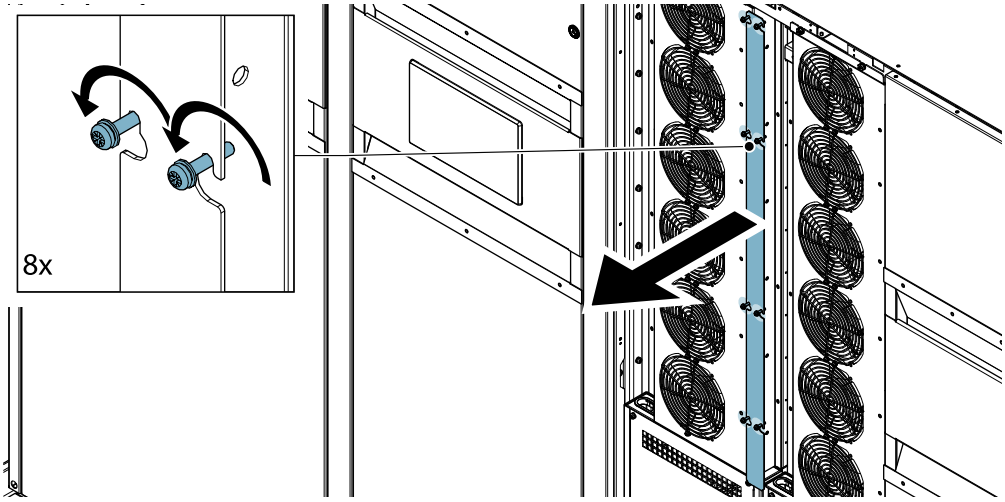
10. Loosen up the screws (4 pcs) and remove the relevant EMI shield.

CAUTION

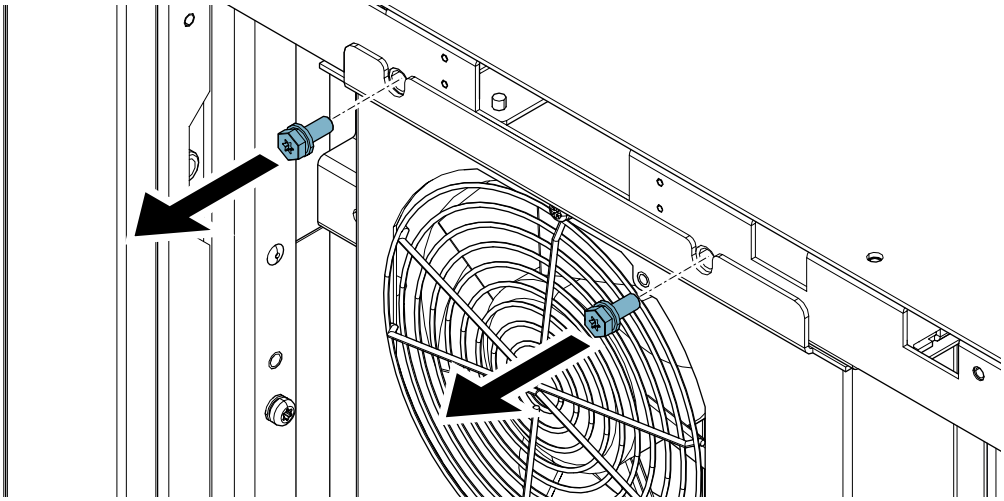
THE SCREWS CAN FALL INTO THE HOLE ON THE UPM FROM WHERE THE CABLES COME, MAKE SURE THAT DOES NOT HAPPEN!



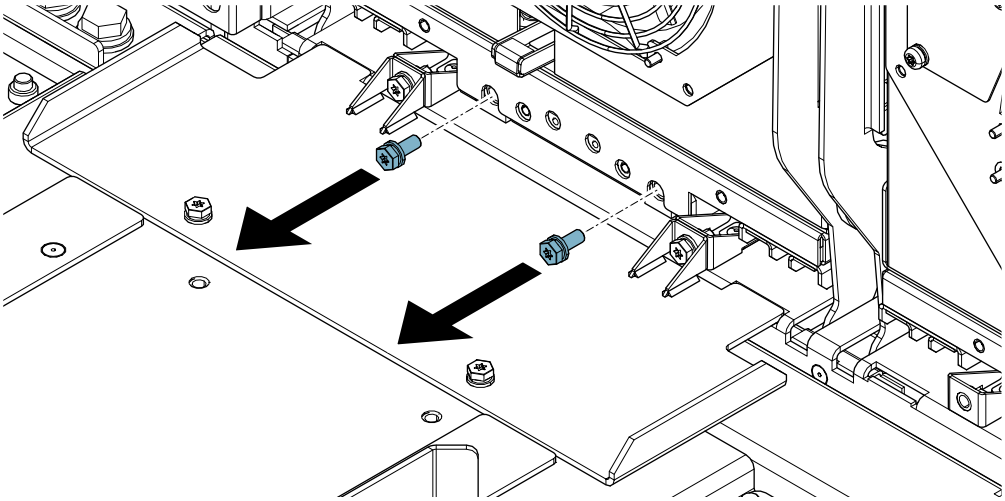
11. Loosen the screws (4 pcs) and remove the UPM-to-UPM EMI shield.
    If the UPM is in the middle of two UPMs, then this procedure is relevant for both sides.



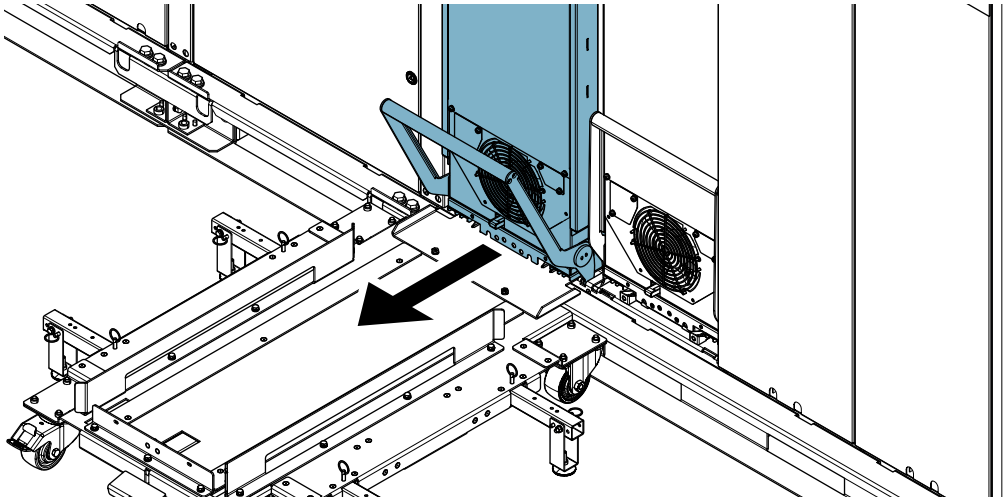
12. Remove the screws, which lock the UPM in place.



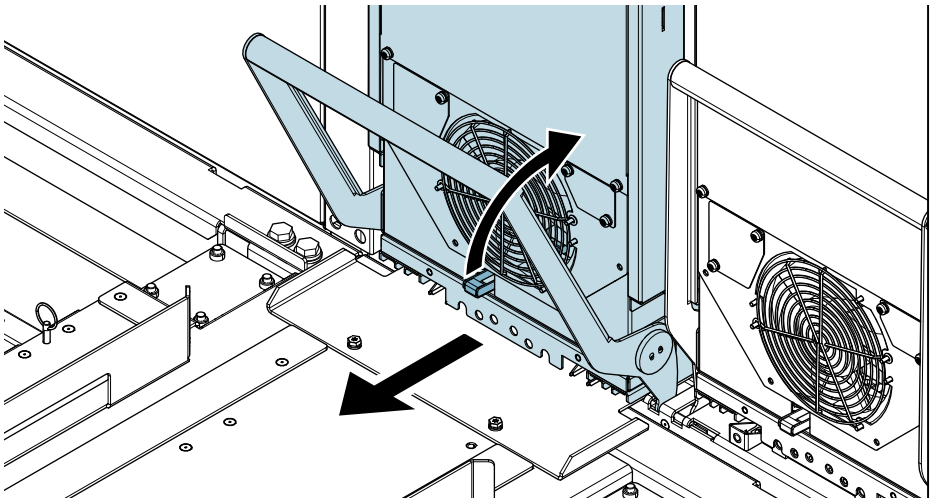
13. Remove the screws, which lock the UPM in place.



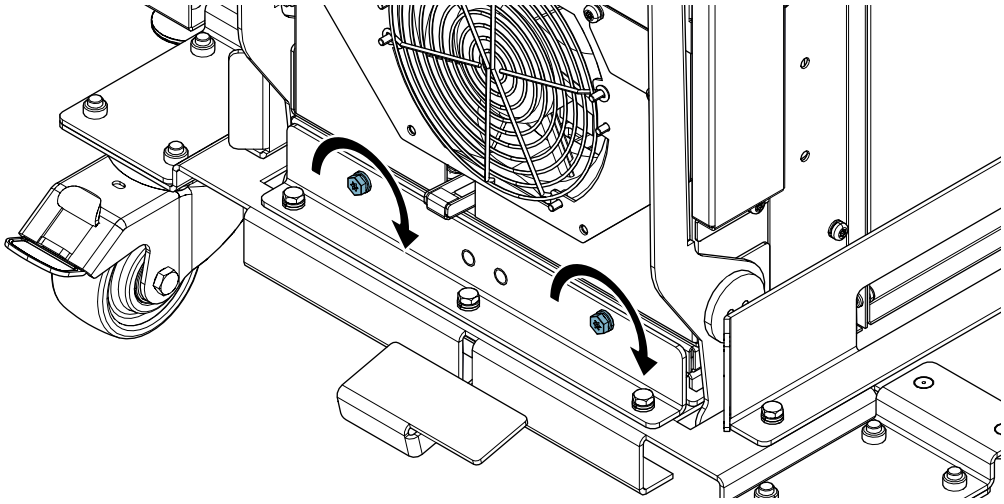
14. Pull the UPM out into service position (approximately 49 mm forward).
    The service lock engages automatically.



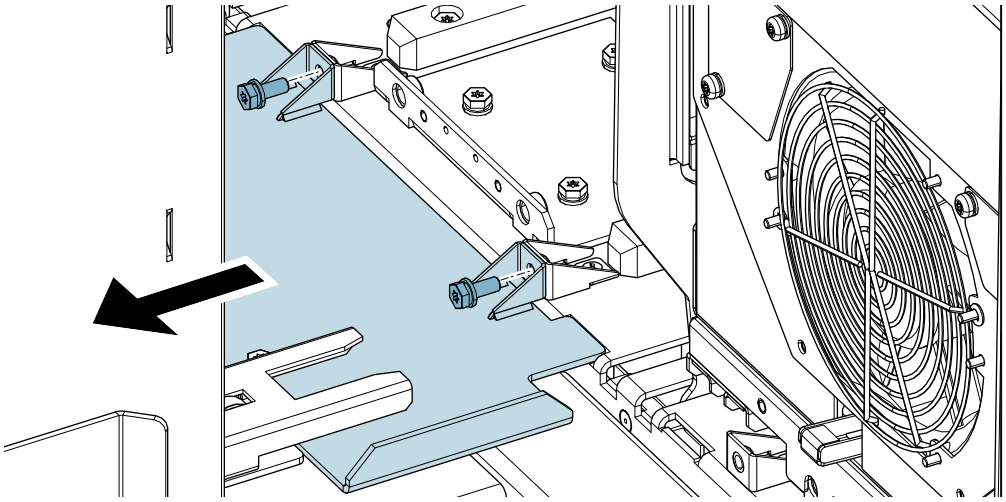
15. Lift the handle at the bottom to disengage the lock and pull the UPM out all the way.



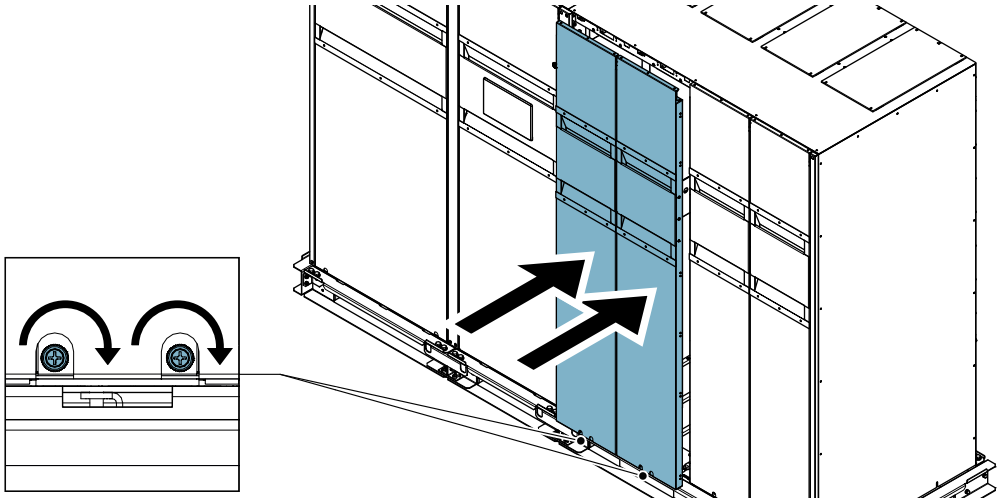
16. Fasten the UPM by M5 screws at the front.
    Add the support on the back.



17. Remove the dock bridge from the UPS.

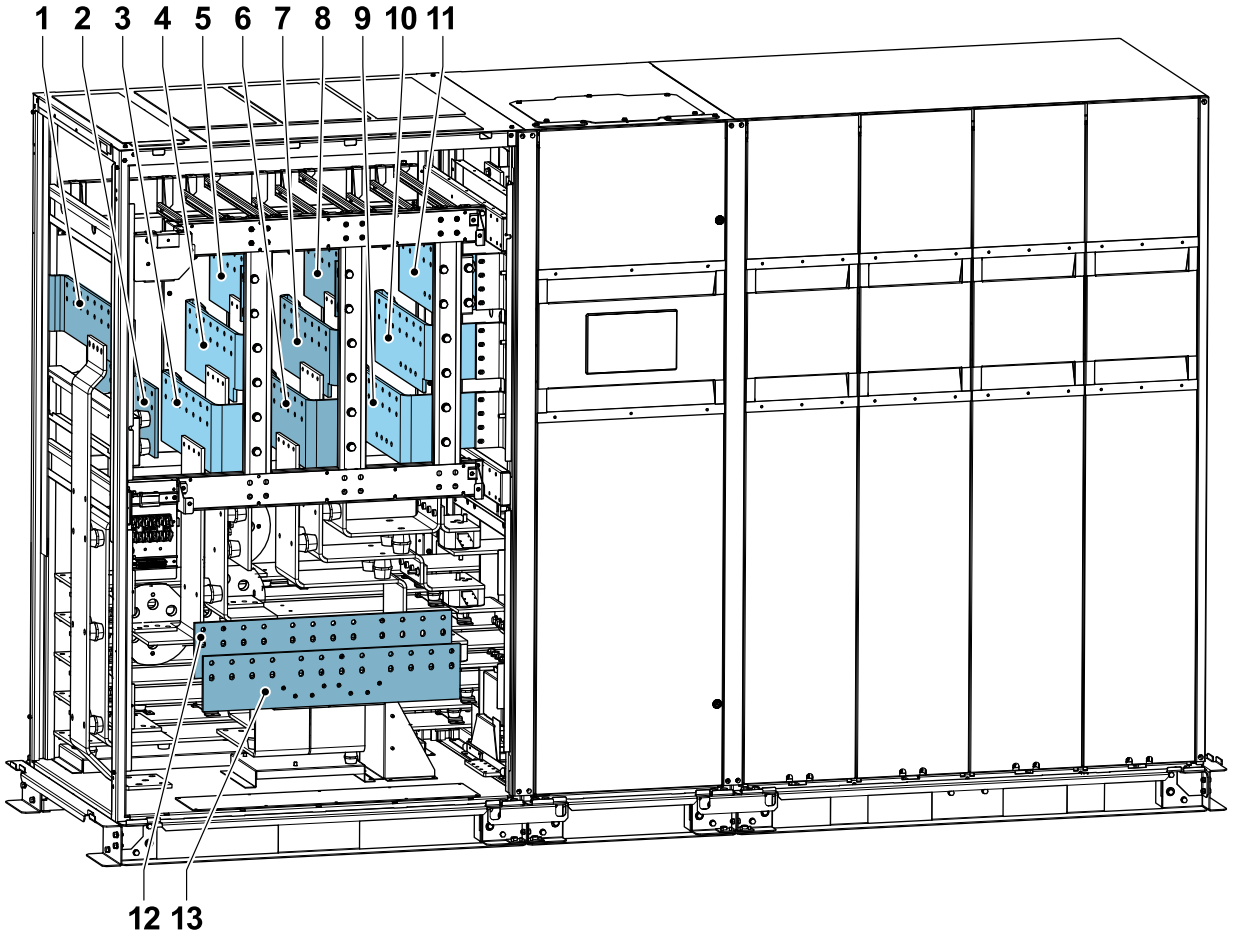


18. Replace the bridge with a locking plate.
19. Insert the UPM plates.



6.3 Electrical installation

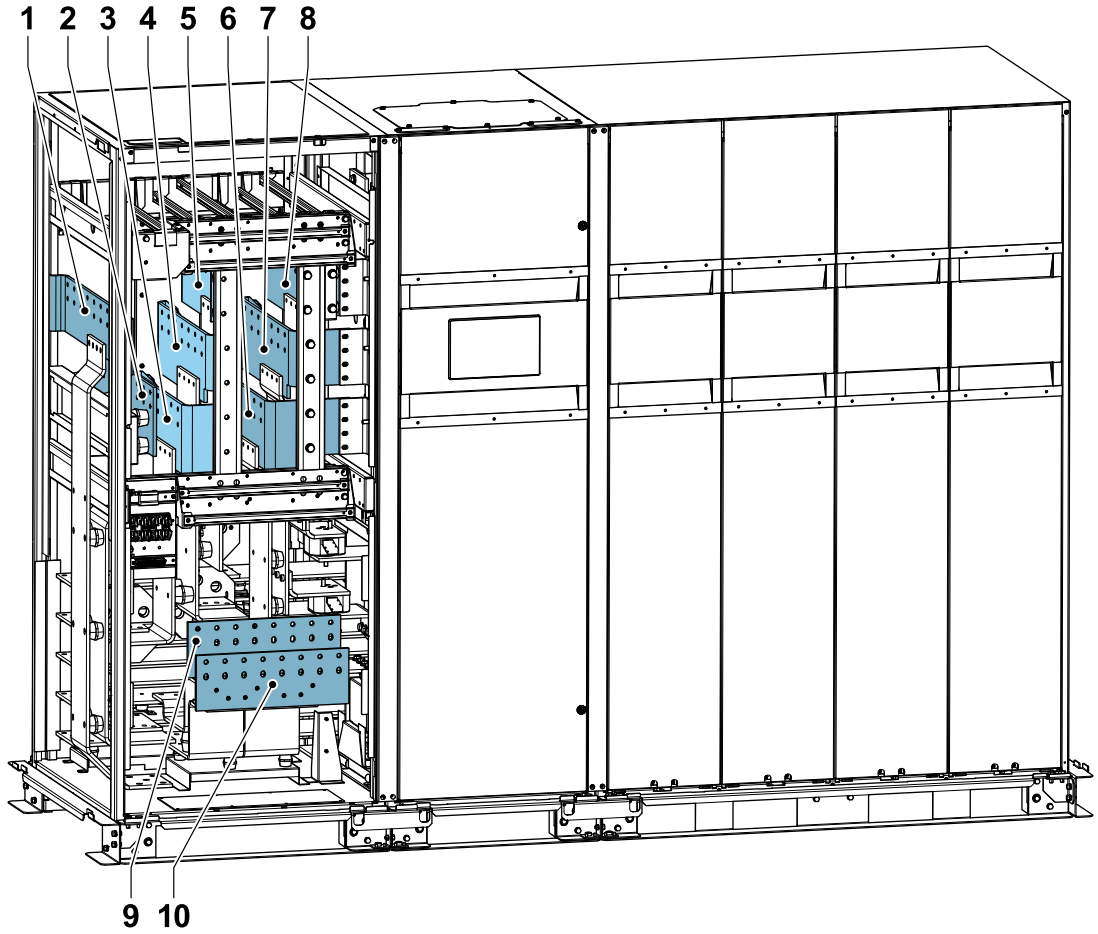
Figure 25. Electrical installation overview – Large frame



1. Protective Earth
2. Neutral (E12)
3. UPS output L3 (E11)
4. UPS output L2 (E10)
5. UPS output L1 (E9)
6. REC input L3 (E3)
7. REC input L2 (E2)
8. REC input L1 (E1)
9. Bypass L3 (E8)
10. Bypass L2 (E7)
11. Bypass L1 (E6)
12. Battery connection (+) (E4)
13. Battery connection (-) (E5)

NOTE: When single feed is used, the REC inputs are called AC inputs L3-L1. This applies to both large and small frames.

Figure 26. Electrical installation overview – Small frame

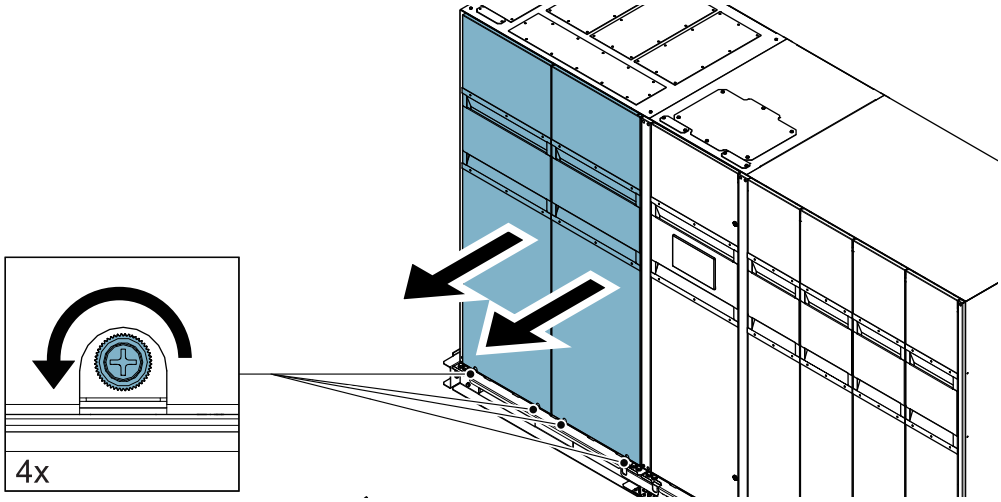


1. Protective Earth
2. Neutral (E12)
3. UPS output L3 (E11)
4. UPS output L2 (E10)
5. UPS output L1 (E9)
6. AC input L3 (E3)
7. AC input L2 (E2)
8. AC input L1 (E1)
9. Battery connection (+) (E4)
10. Battery connection (-) (E5)

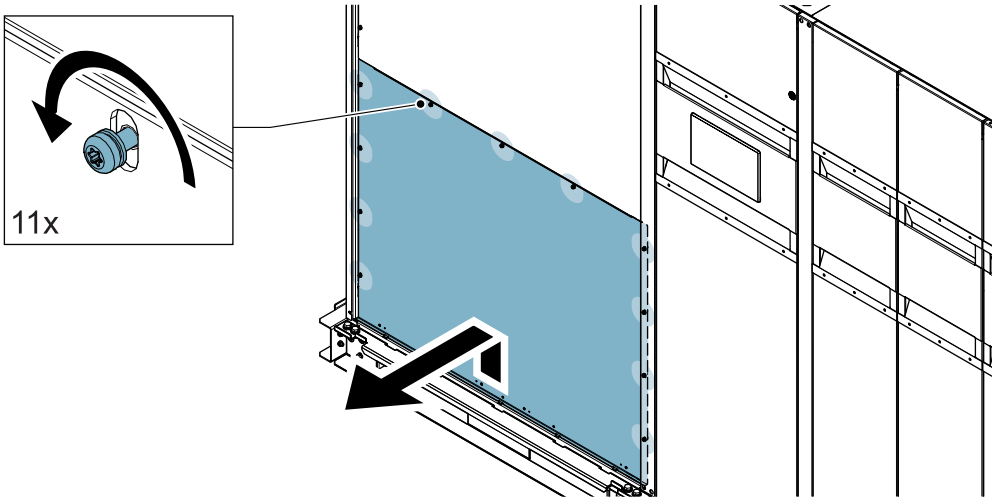
6.3.1 Electrically connect the UPS

Do this procedure before you connect the AC and DC cables.

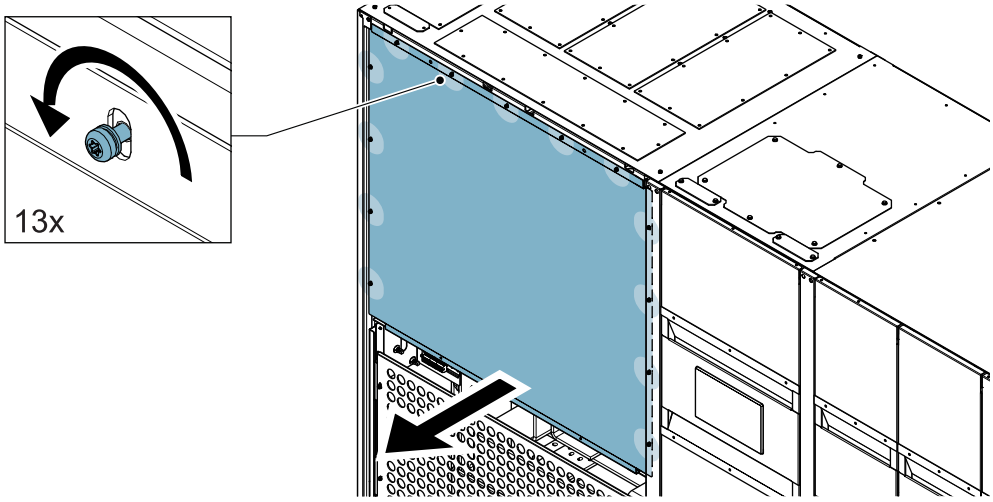
1. Remove the I/O cabinet doors.



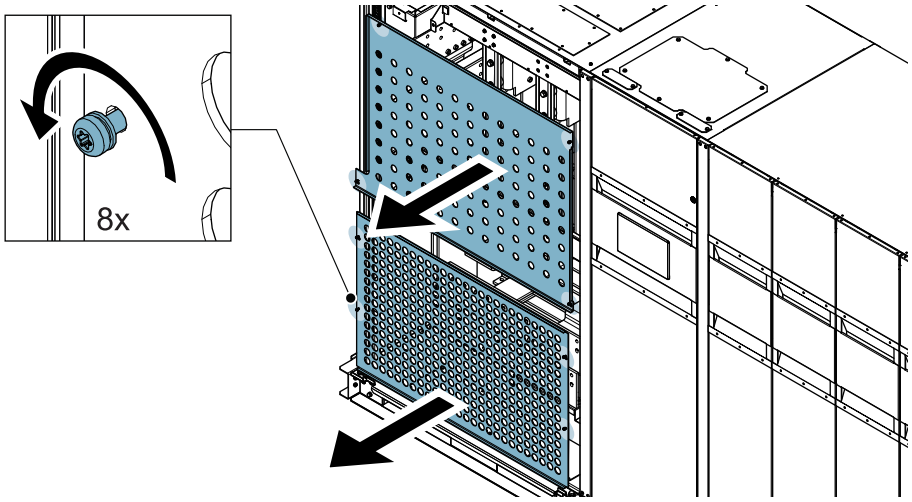
2. Open the screws to remove the lower cover plate.
   Lift the plate upwards and then pull it out.



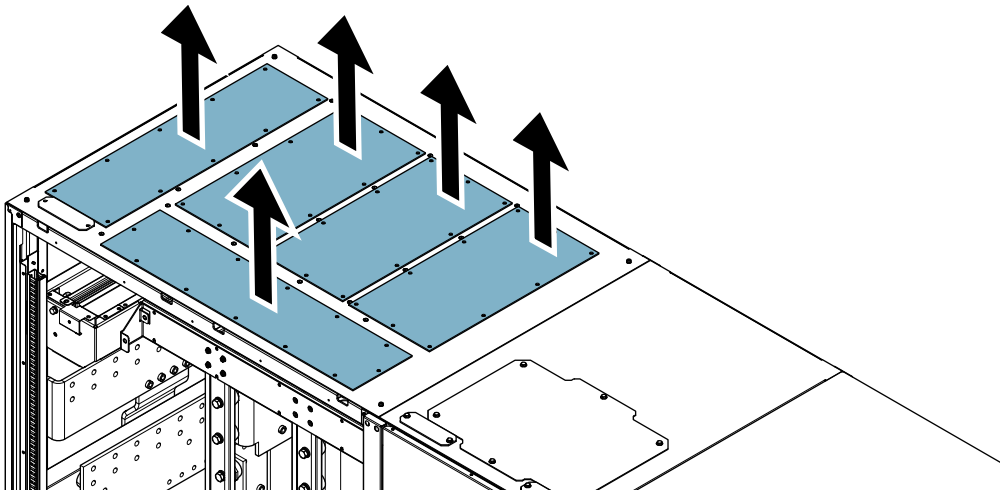
3. Remove the upper cover plate.



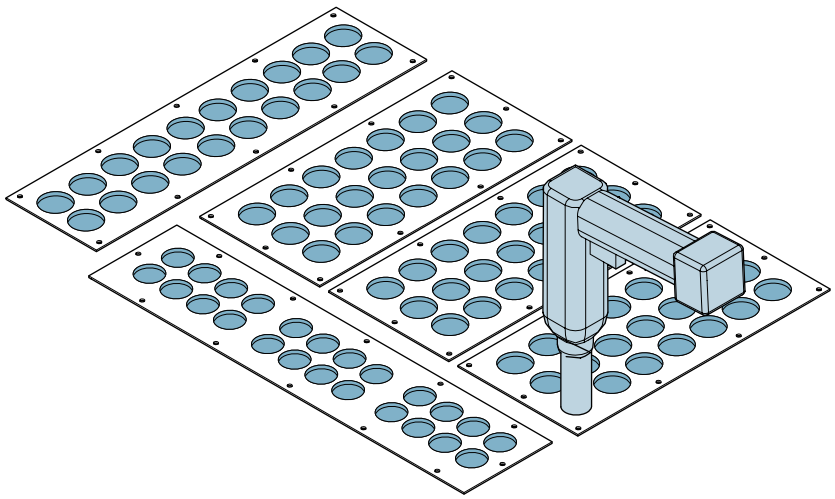
4. Remove the plastic covers.



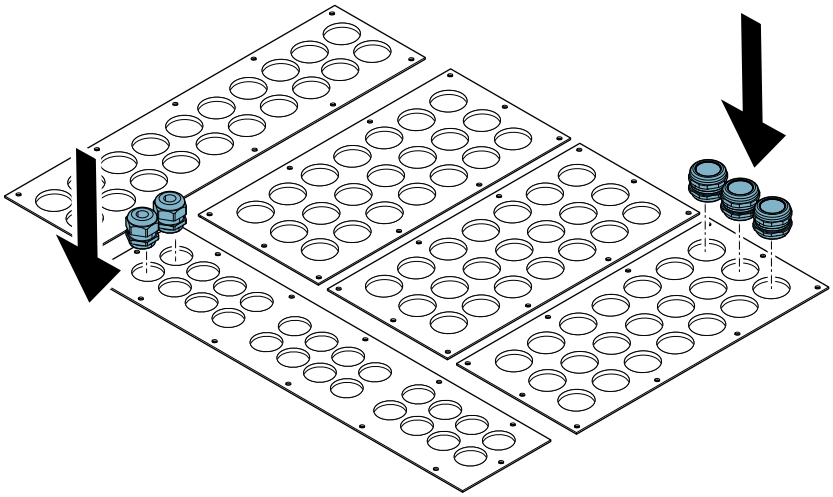
5. Remove the gland plates and place them away from the UPS for drilling the holes.
   Make sure no debris falls into the UPS.



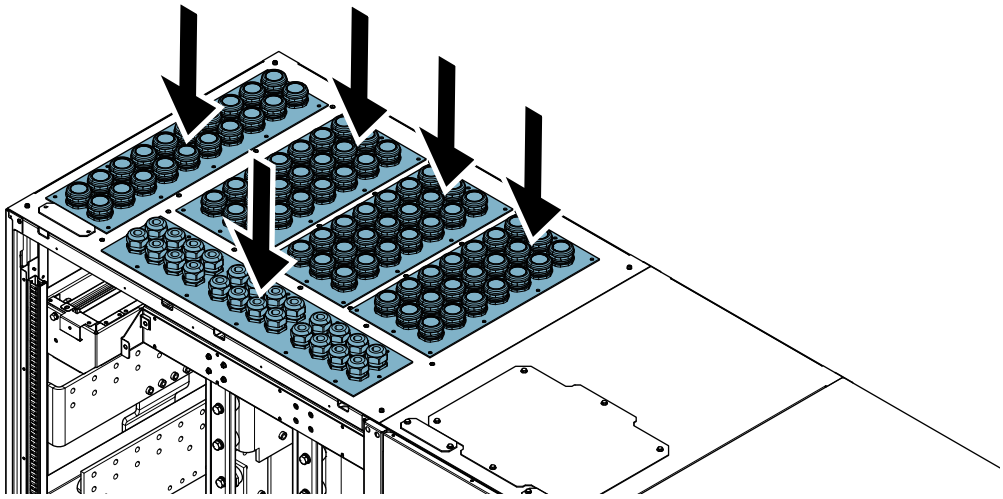
6. Drill holes in the gland plates for the cables.
   Depending on the cable sizes, the number of holes may vary.



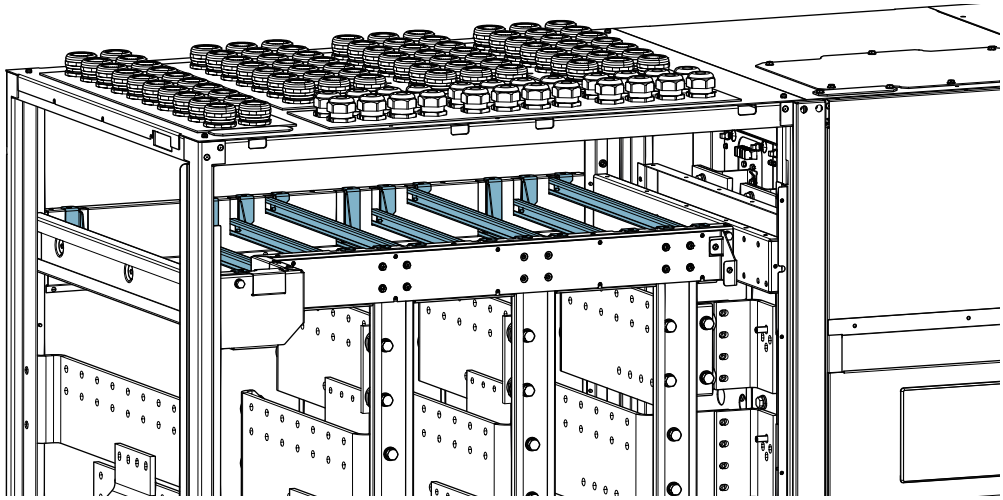
7. Install the cable glands.



8. Install the cable gland plates.



9. Use the cable support beams for the power wiring.

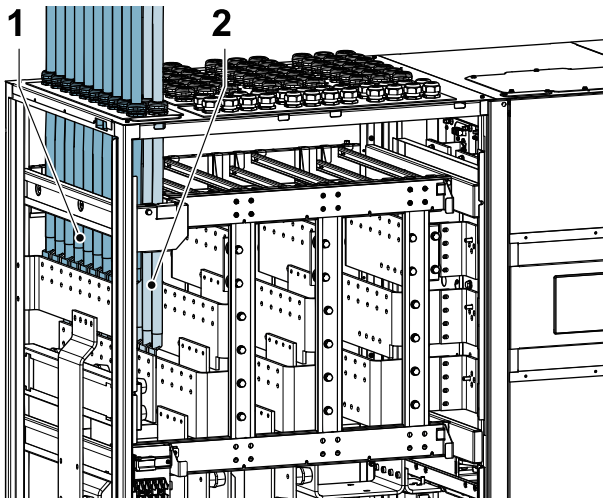


Proceed with *Sections 6.3.1.1 Connect AC cabling* and *6.3.1.2 Connect DC cabling*.

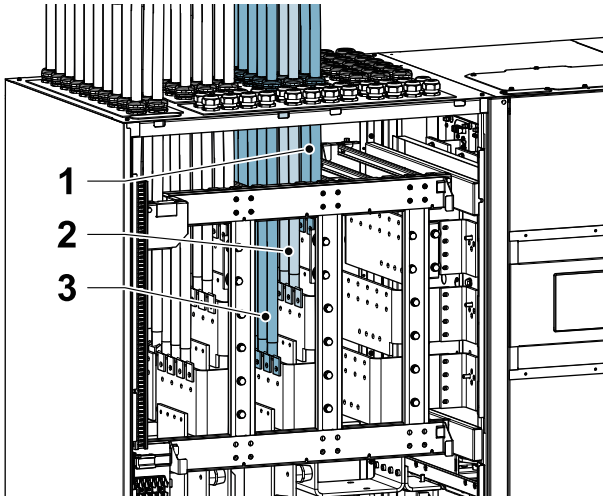
6.3.1.1 Connect AC cabling

Continue the installation from *Section 6.3.1 Electrically connect the UPS* .

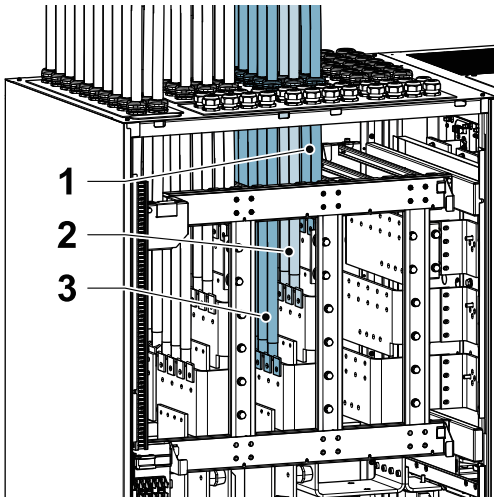
1. Connect the cables to Protective Earth (PE) and Neutral (E12) (N).
   Connect PE cable connections (1) first, then Neutral (E12) (2).



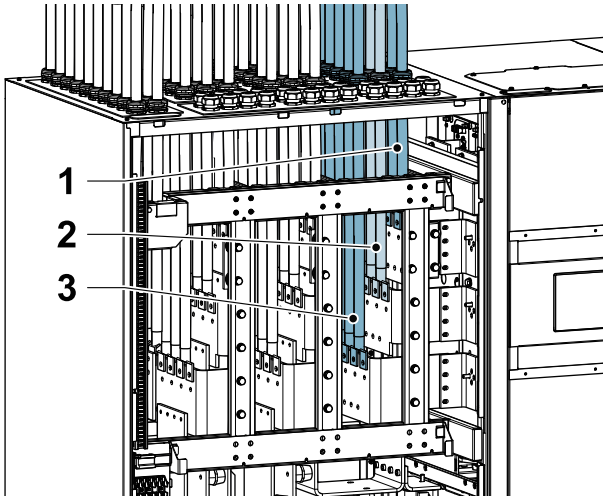
2. Connect the cables to UPS Output (E9, E10, E11) (L1, L2, L3). See the numbering in the image for the order of connecting the cables.



3. Connect the cables to REC Input (E1, E2, E3) (L1, L2, L3).



4. In Large cabinet type, connect the cables to Bypass Input (E6, E7, E8) (L1, L2, L3).

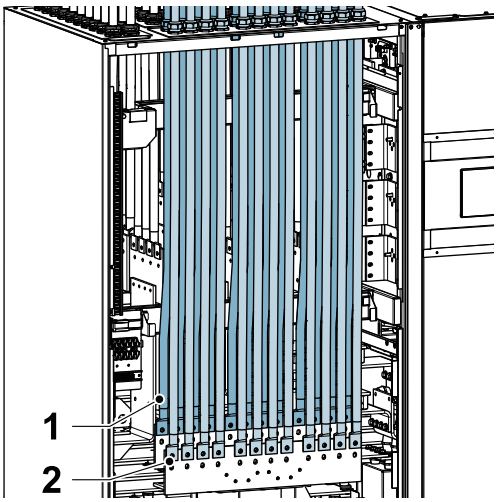


Continue with *Section 6.3.1.2 Connect DC cabling*.

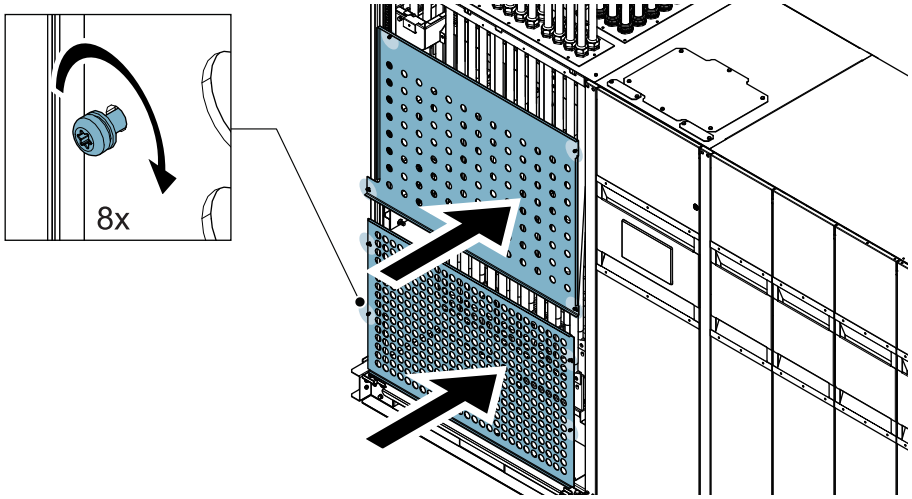
6.3.1.2 Connect DC cabling

Continue the electrical installation from *Section 6.3.1.1 Connect AC cabling*.

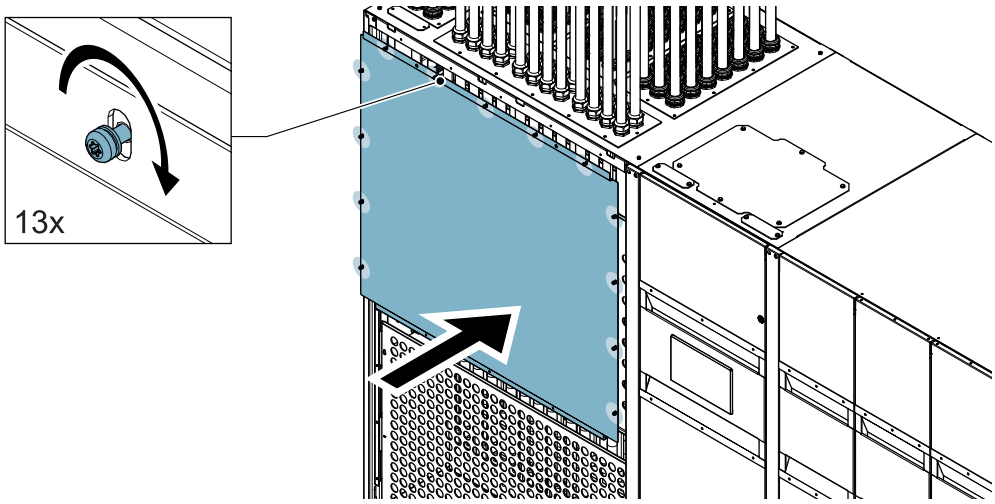
1. Connect the Battery connection (+ and –) cables.
    1. Battery connection + (E4)
    2. Battery connection - (E5)



2. Continue with *Section 6.3.2.2 Battery trip wiring*.
    See *Figures 29: TB6 and TB7 cable routing* and *30: Sync Control interface TB6 location (1–10) and battery trip wiring TB7 (11–14)* for reference.
3. Insert the plastic covers.



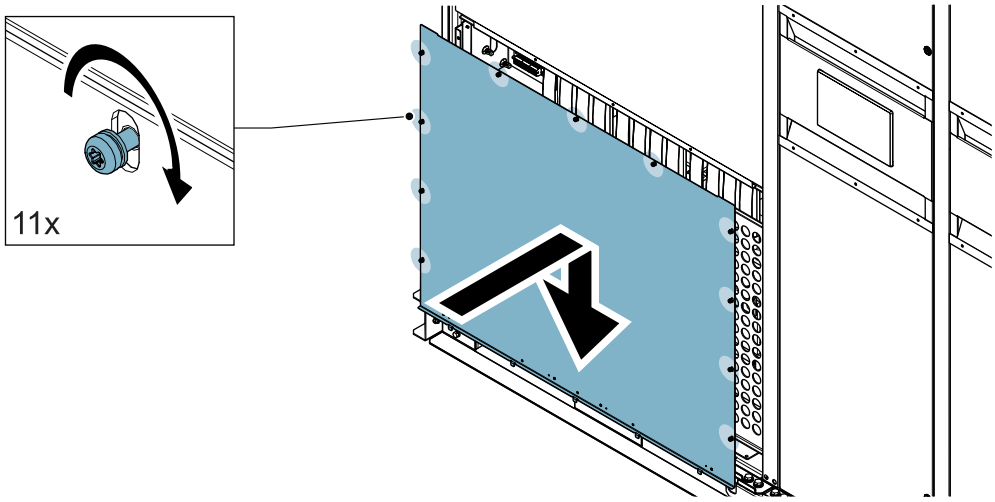
4. Insert the upper cover plate.



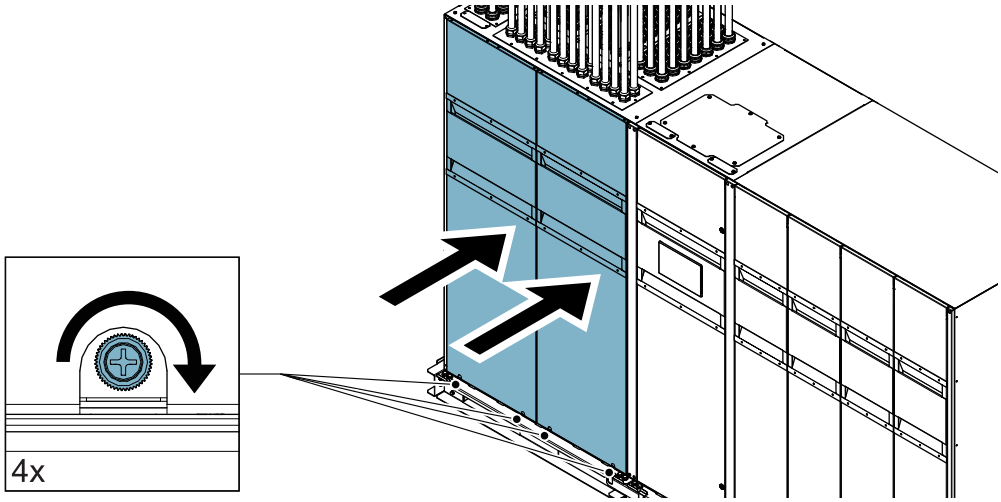
CAUTION

The plate is heavy. Wear safety shoes.

5. Insert the lower cover plate.



6. Install the I/O cabinet doors.



6.3.2 External battery system

DANGER

Electrical hazard.
This UPS has external batteries. The batteries are designed to deliver a large amount of energy and an incorrect connection may lead to a short circuit and cause serious injuries to the personnel or damages to the equipment. In order to avoid damages to the equipment or injuries to personnel, only commissioning personnel are allowed to perform the connection of these batteries.

If you are installing a customer-supplied battery system, install the battery system according to the battery and battery system manufacturer's instructions and all the applicable national codes and regulations.

Only qualified personnel can install the battery system.

Battery cables must be protected against current and thermal overload, that is, the battery system must include proper fuses or breaker with protection function. Ground the frame of the external battery cabinet to the UPS.

The default battery settings of the UPS are for 12 V VRLA batteries. If you need to use any other type of batteries, contact your Eaton representative.

There is a vast offering of different Eaton external battery cabinets available for the 9395XP UPSs. Refer to the three-phase accessories offering for further details. See *Section 6.3.2.4 Install external battery power wiring* as well as the *Eaton Battery Cabinet* documentation on how to install Eaton external battery cabinets. If you are using a UPS model with separate battery option, the external battery cabinet is connected to the roof box.

NOTE: Earth the customer-supplied battery system to the PE terminal 1 (common battery). Connect the separate battery to Separate battery PE terminal. See Step 8 in *Section 6.3.2.1 Install the separate battery and DC cabling*.

NOTE: Do not connect battery strings with different battery quantity and voltage in parallel.

NOTE: UPS common battery terminals support installation up to 6 battery strings. The separate battery terminals support 3 battery strings.

Cable entry to the UPS is always on the top, the bottom or the rear of the cabinet.

NOTE: Obey the installation instructions given in *Section 6.5 UPS system power wiring preparations*.

6.3.2.1 Install the separate battery and DC cabling

Figure 27. External battery cabinet connection to the roof box

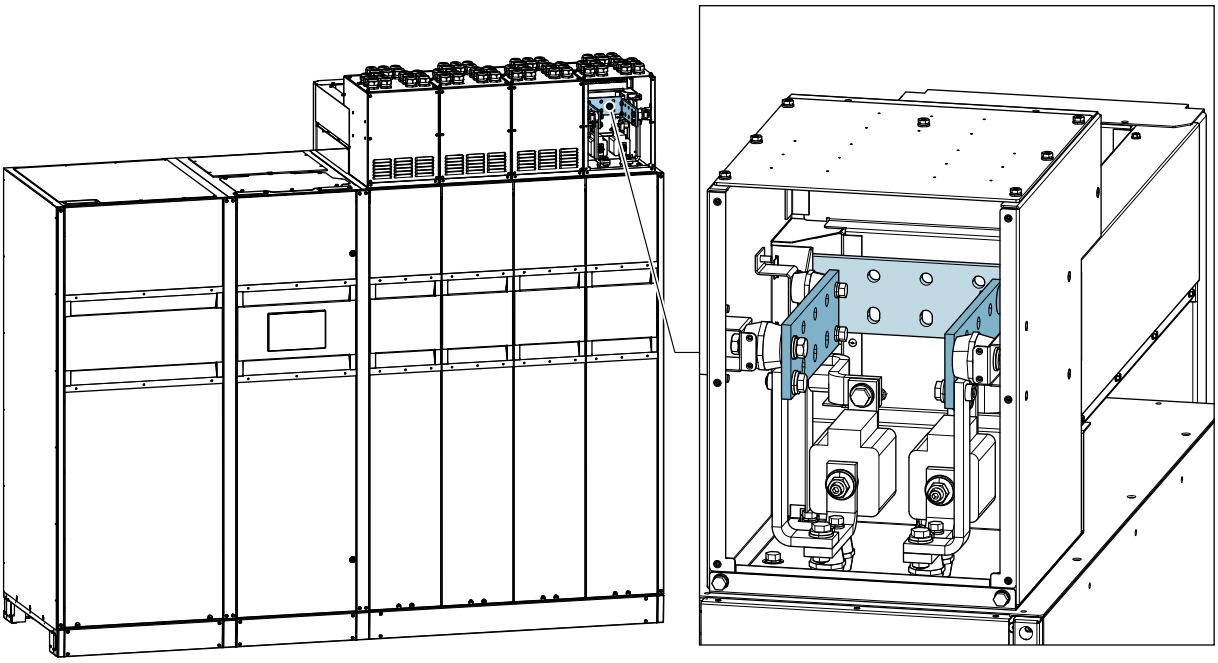
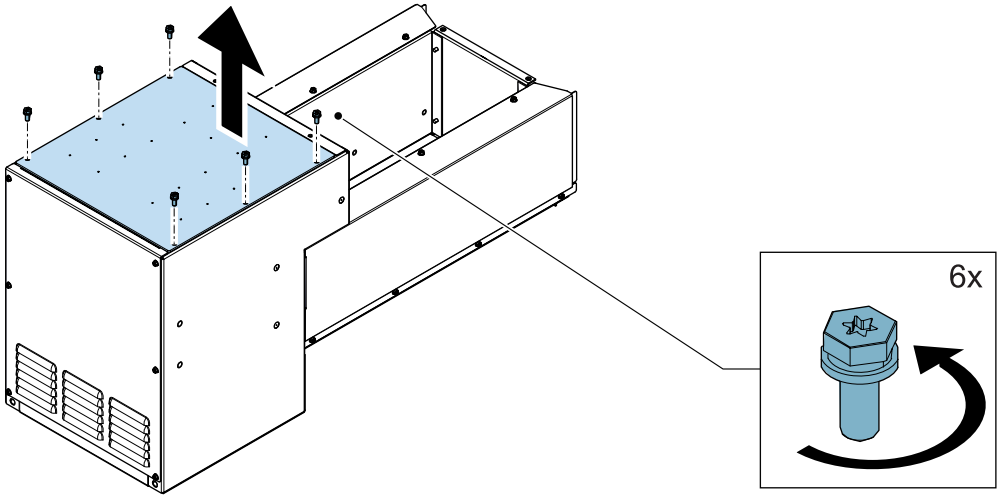


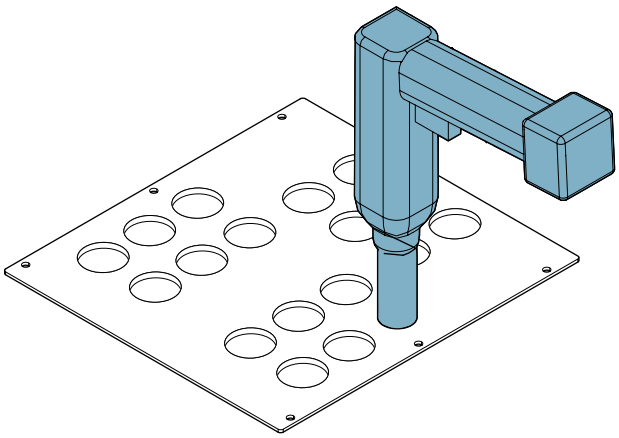
Table 12. Screws for 3 UPMs

Type	Amount
M10x35 kombi	23
M8x20 kombi	21
M10x 50	6
M5x 12	4

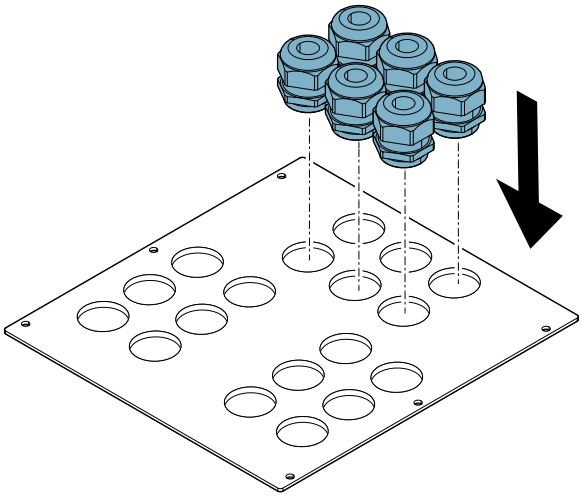
1. Remove the UPM top roof plate by removing the screws.



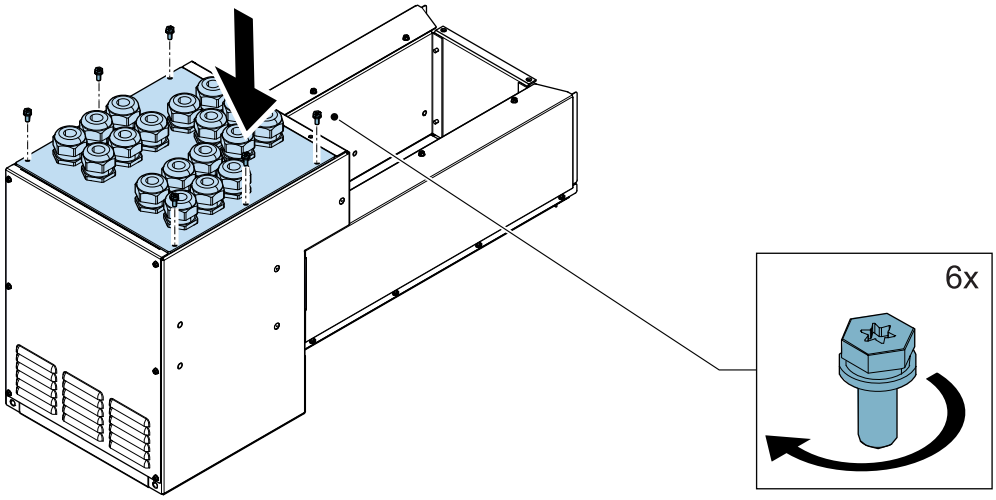
2. Drill holes for the cable glands.
   Place the gland plate away from the UPS, so that no debris falls into the UPS.



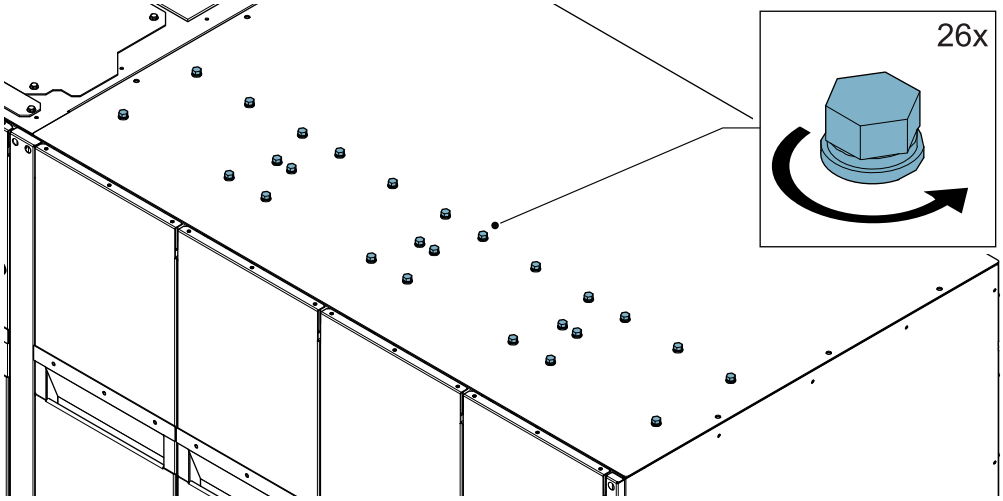
3. Insert the cable glands.



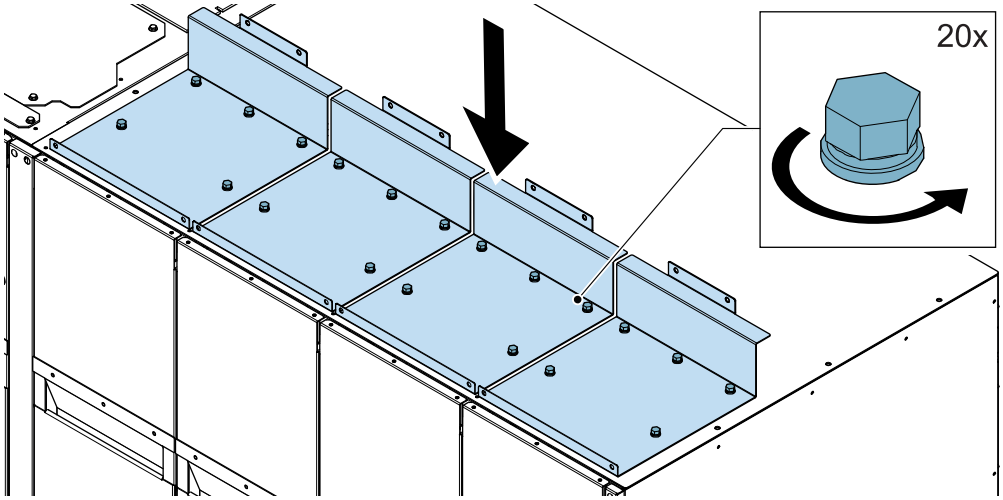
4. Place the gland plates on the roof boxes and connect with screws.



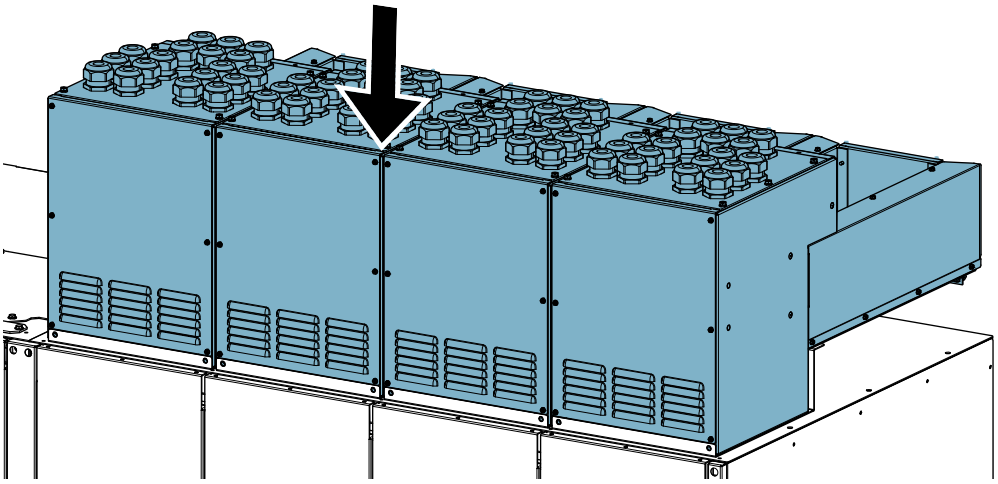
5. Remove UPM top roof screws.



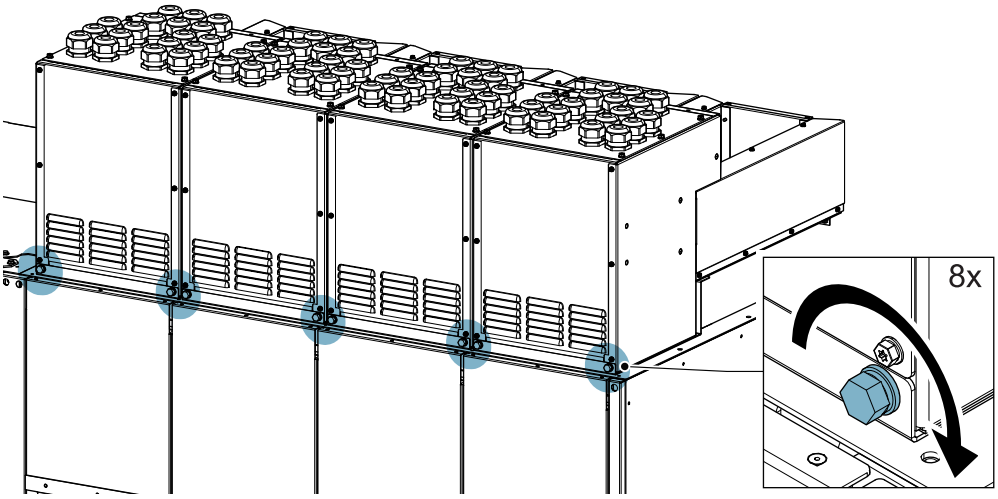
6. Install the bottom plates and tighten the M8 screws to 15 Nm.



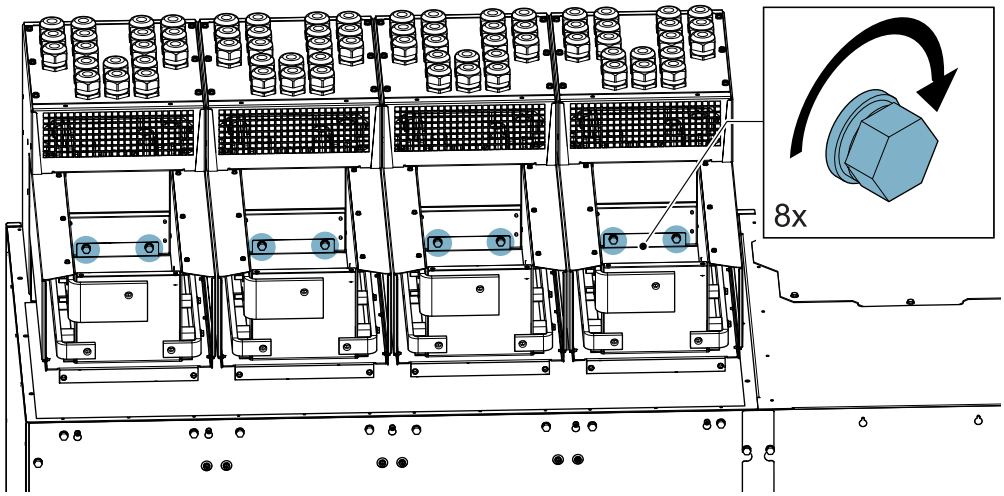
7. Lift all connection boxes on to the bottom plates.



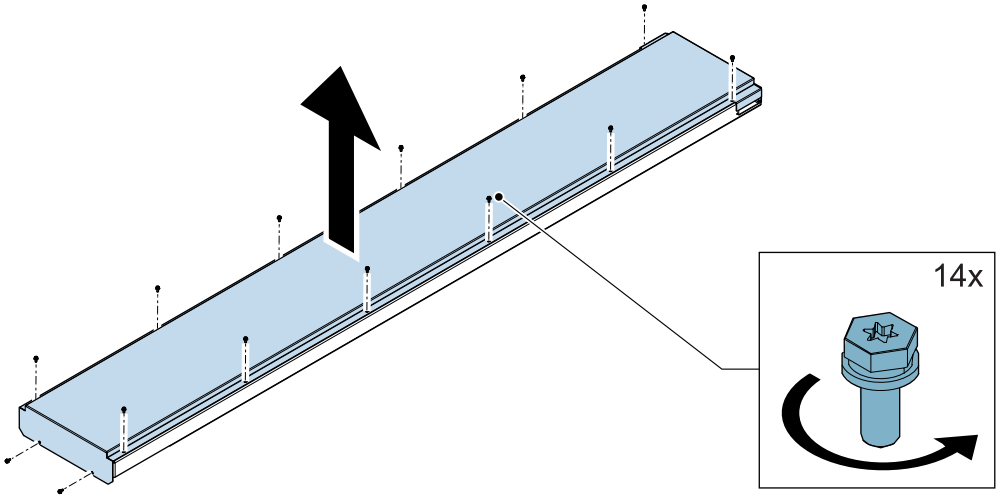
8. Connect the front screws (12x M8) on the connection boxes but do not tighten.



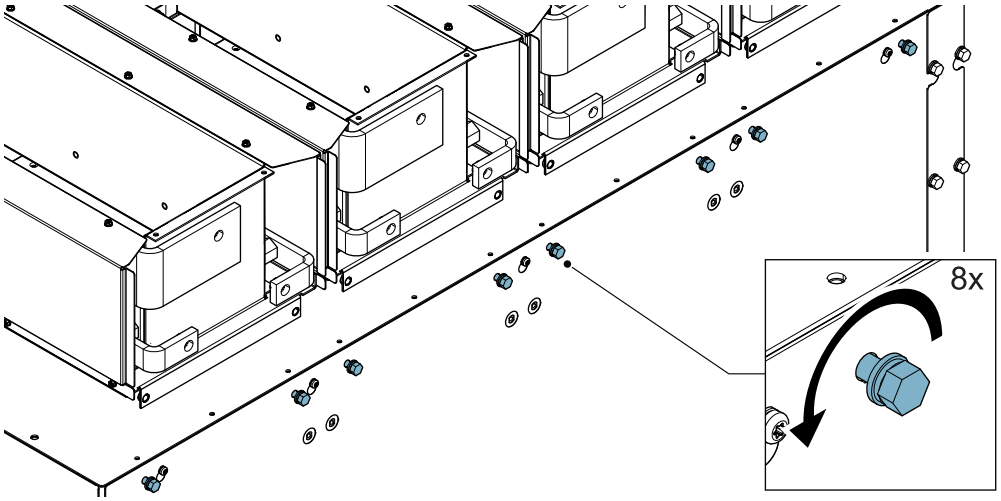
9. Connect the back screws (12x M8) on the connection boxes but do not tighten.



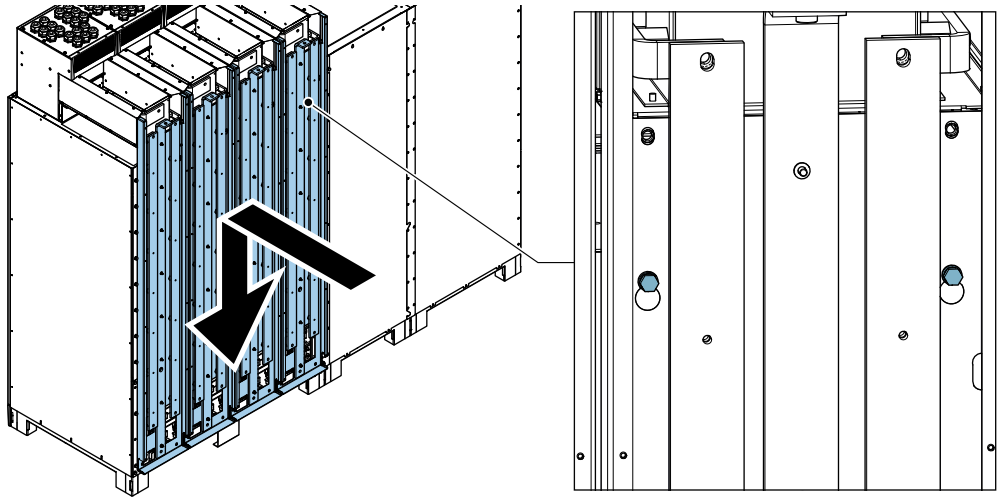
10. Remove busbar box cover plates screws.
    14 pcs/box M4x10 (black screws).



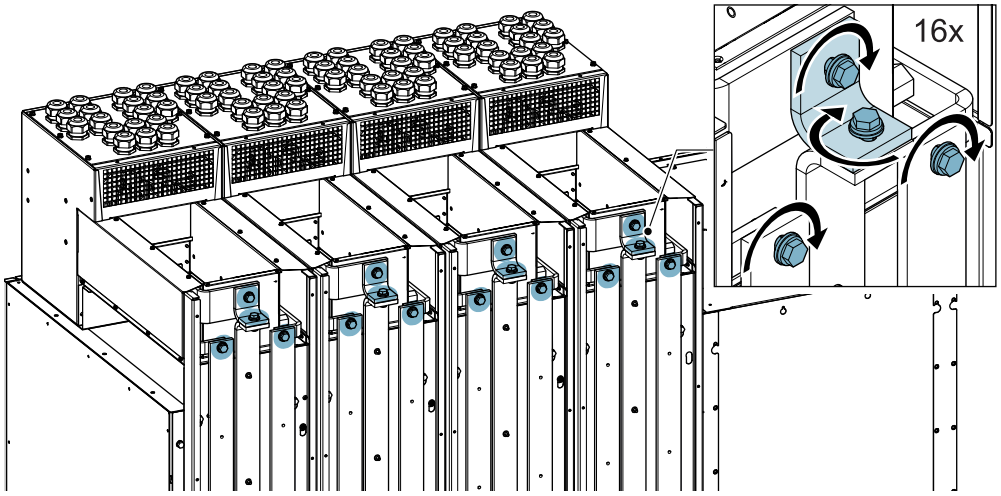
11. Loosen the top screws on the UPM rear plate (6x M8).
    Make sure that all other screws in the middle of the UPM rear plate are removed.



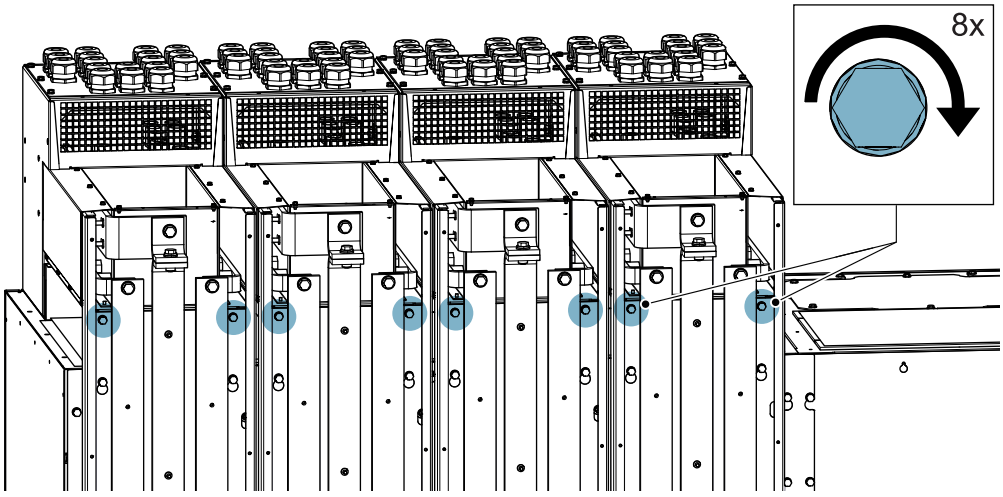
12. Lift all busbar boxes on to the back plate top screws.



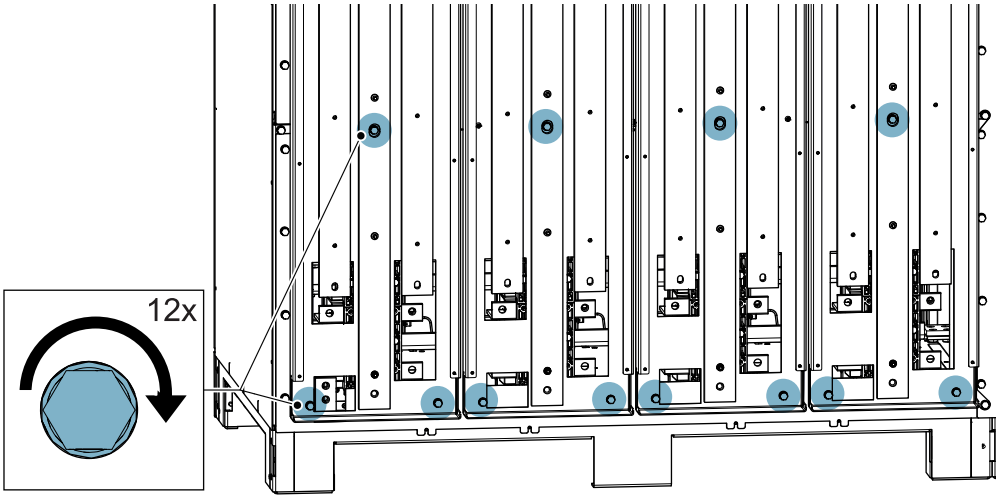
13. Connect the top bus bars and ground extensions to the connection box busbars 12 x M10x35 (leave screws loose).



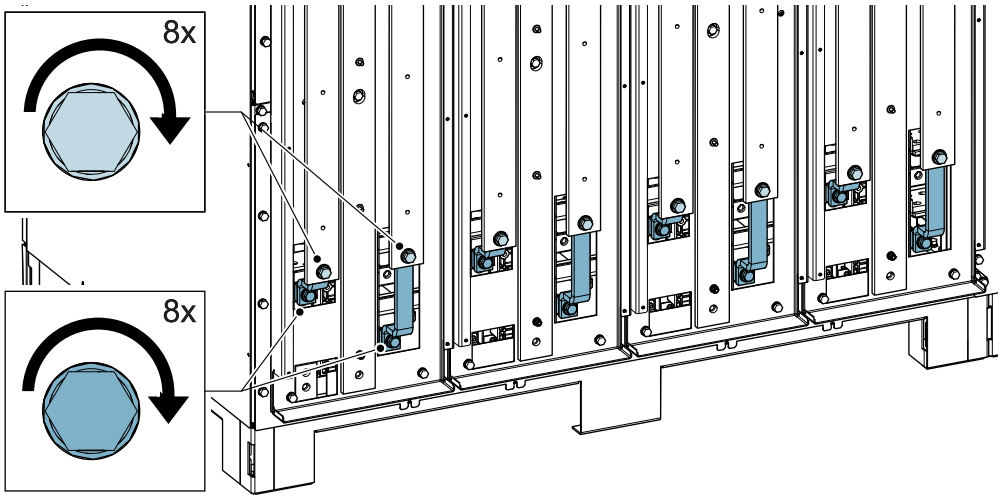
14. Connect upper busbar boxes screws 8x M8 (leave screws loose).



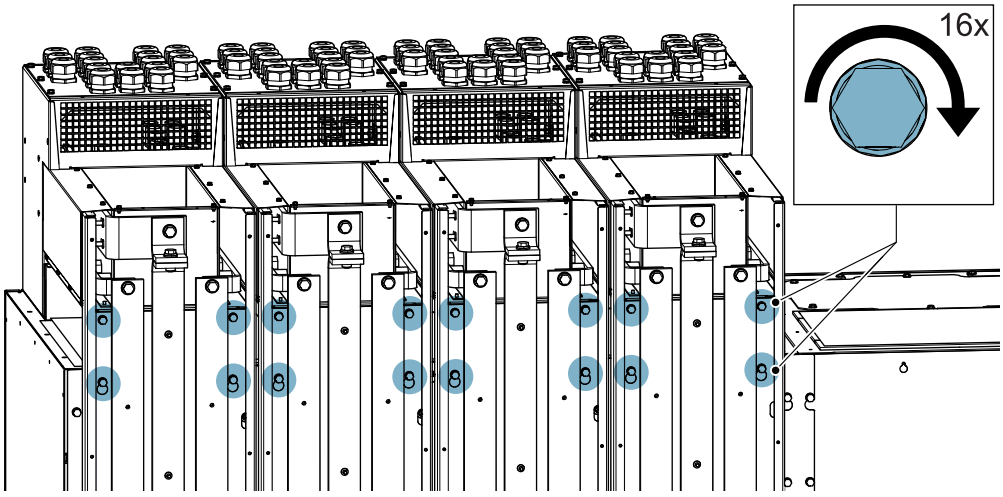
15. Connect all lower busbar boxes screws 12x M8 (leave screws loose).



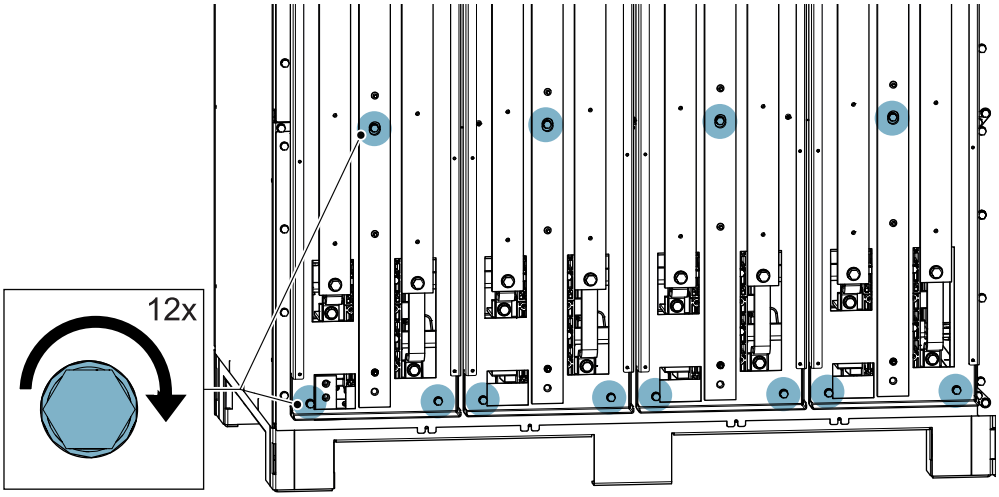
16. Connect all bottom battery busbars and extensions. 6 x M10x 35 (RED) and 6 x M10x 50 (BLUE) with extension busbar (leave screws loose).



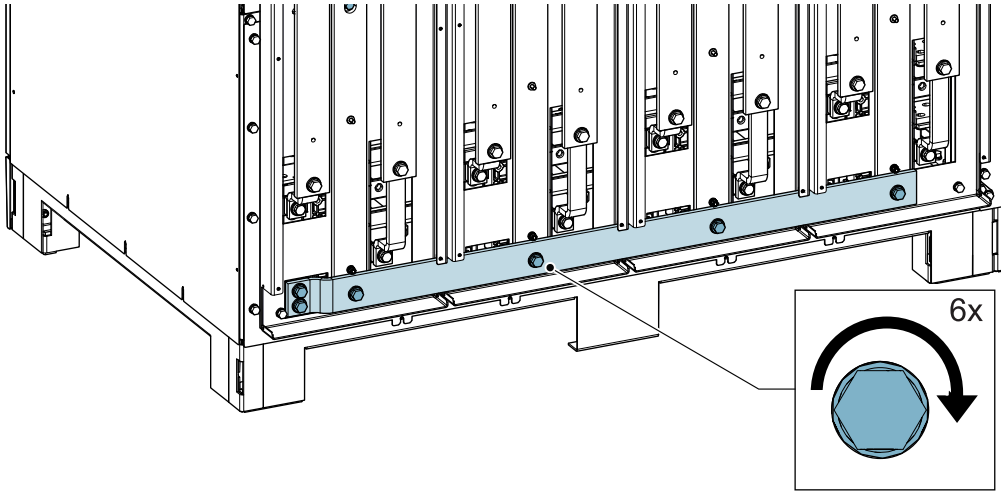
17. Tighten the upper busbar boxes' screws 16x M8 to 15 Nm.



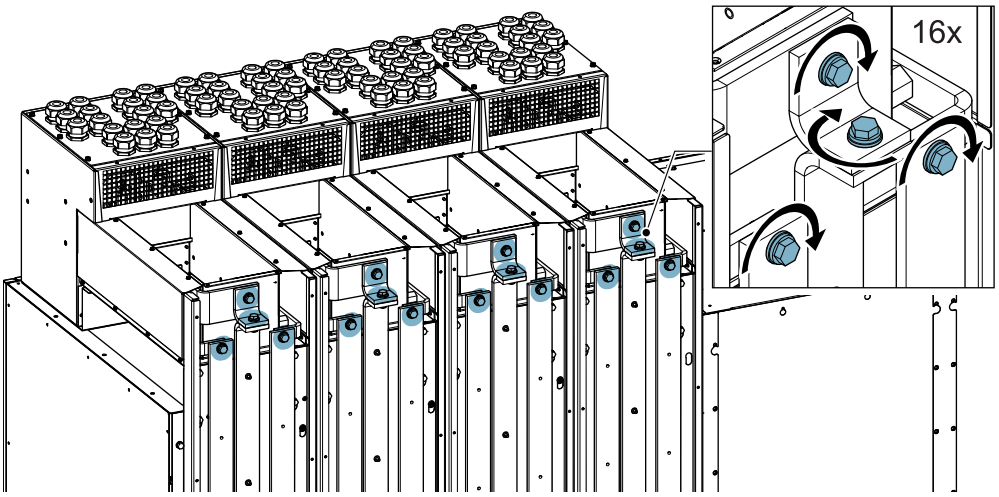
18. Tighten the lower busbar boxes' screws 16x M8 to 15 Nm.



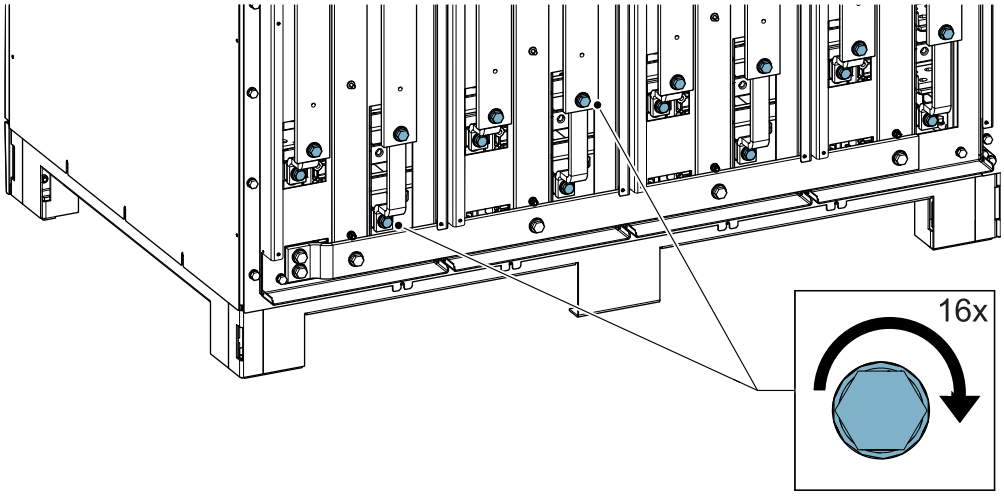
19. **Grounding busbar**: Install ground busbar screws 5x M10x35.
Tighten to 41 Nm,



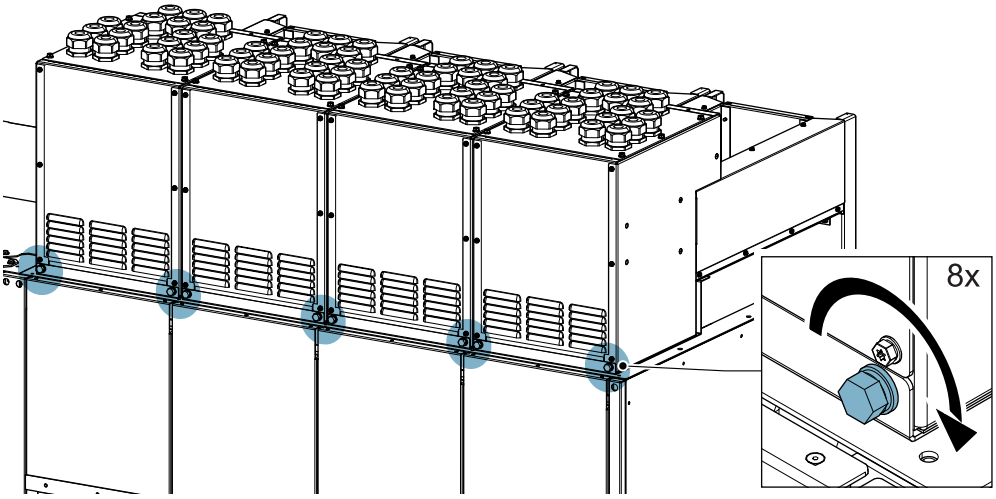
20. Tighten all top busbar M10 screws to 41 Nm.



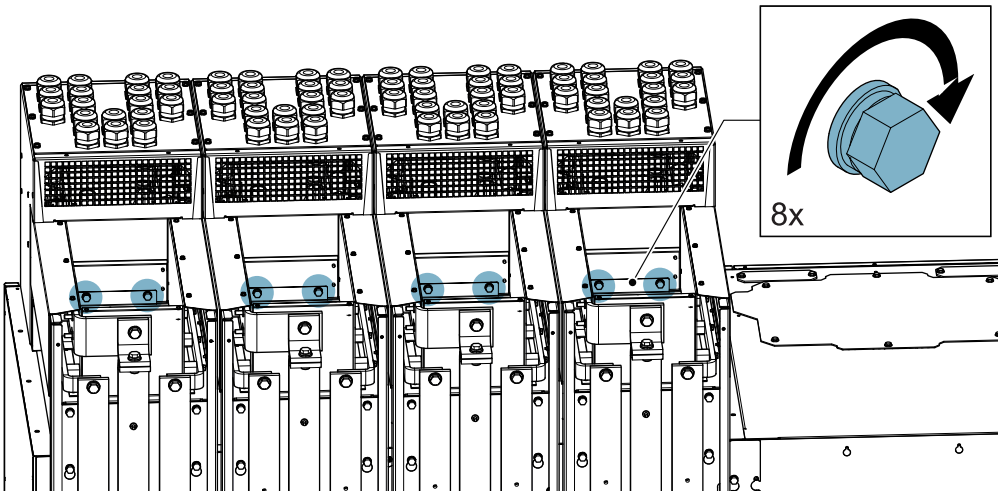
21. Tighten all bottom busbar M10 screws to 41 Nm.



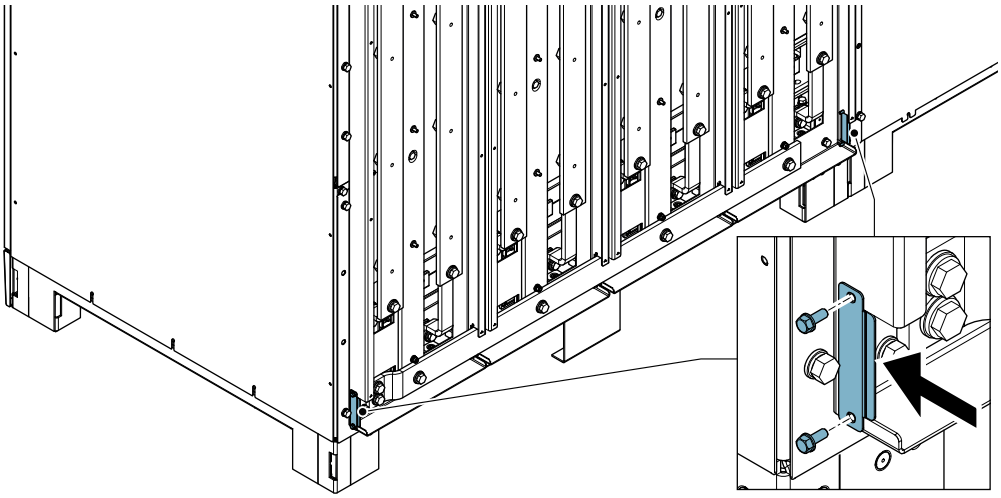
22. Tighten all connection boxes front M8 screws to 15 Nm.



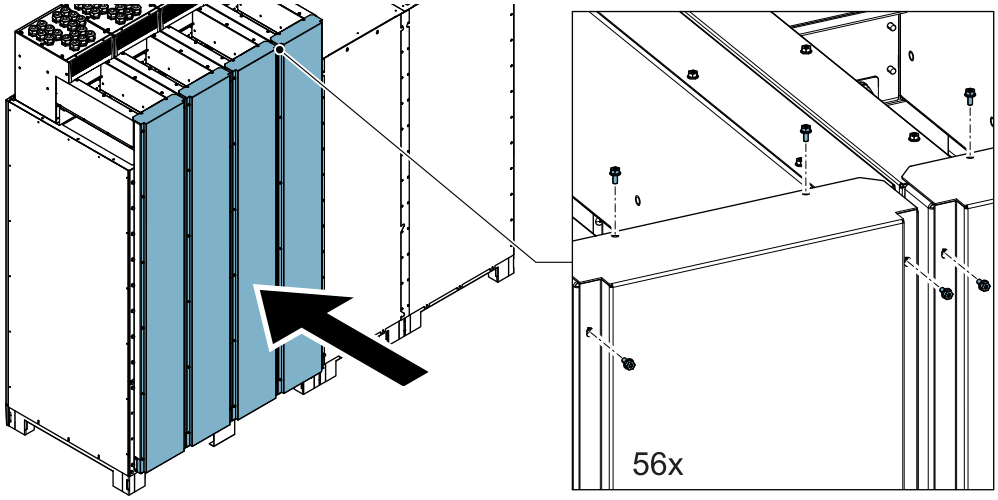
23. Tighten all connection boxes back M8 screws to 15 Nm.



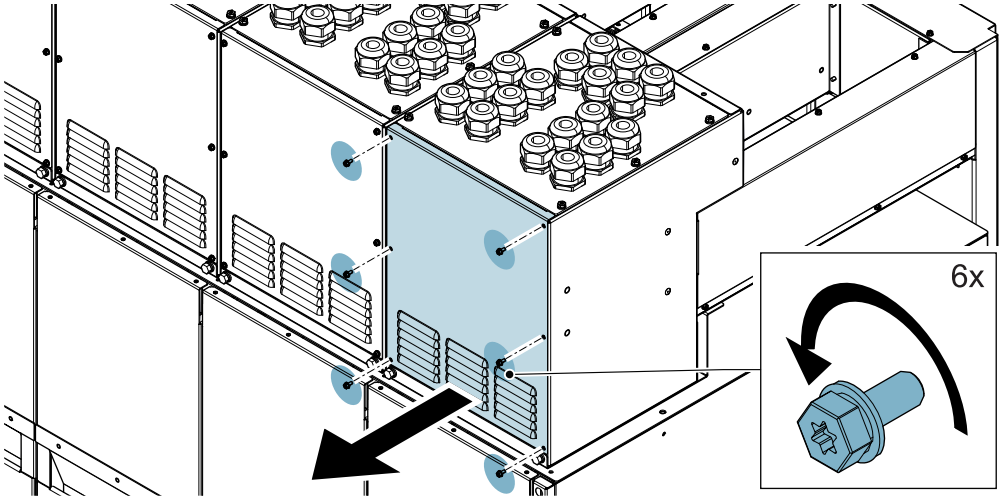
24. Install 2 small cover plates to right and left side bottom corners.
4x M5x12.



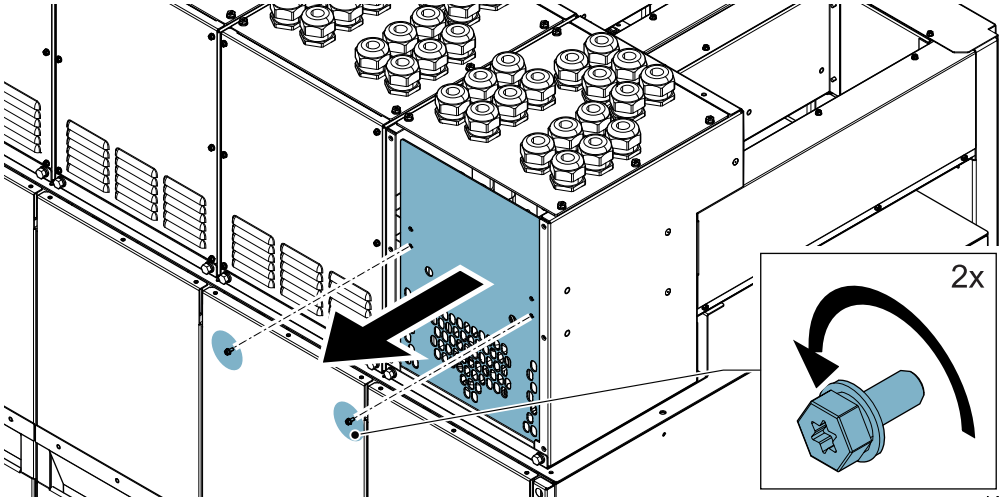
25. Install the back box cover plates.
42x M4x10 (black screw).



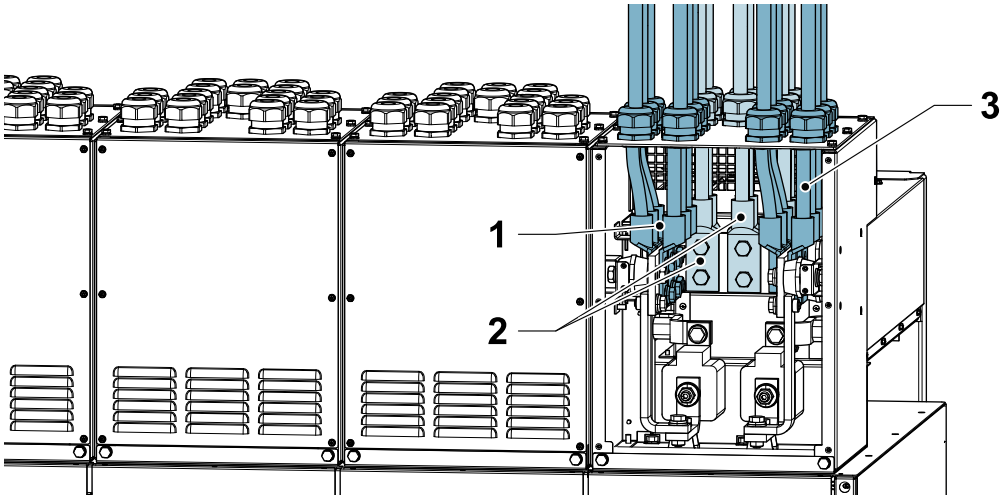
26. Remove the plate (6 screws).



27. Remove the touch shield (2 screws).

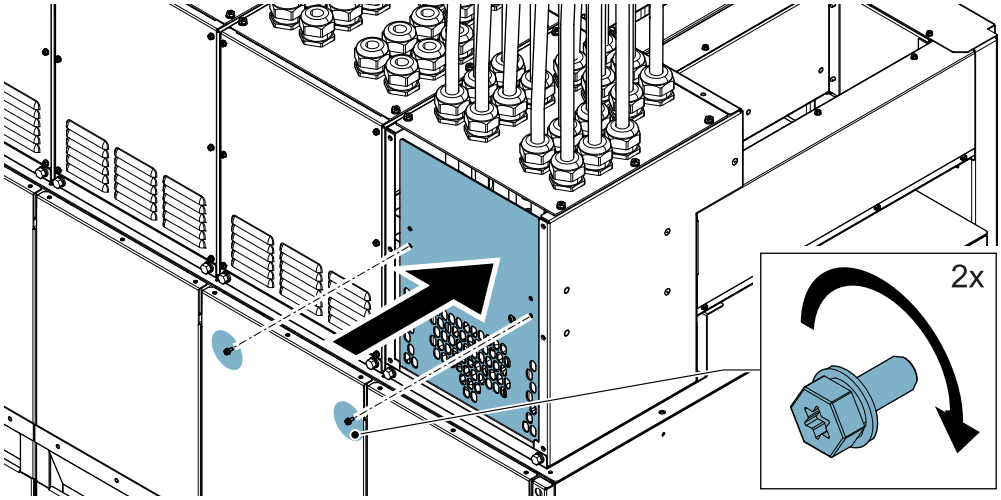


28. Connect the cables.

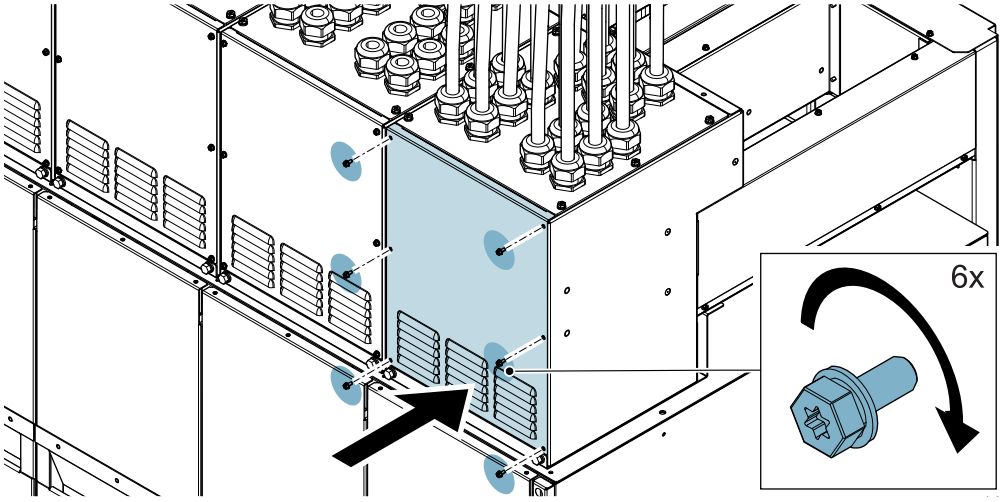


1. Separate battery - (E13)2. Separate battery (PE)3. Separate battery + (E14)

29. Install the touch shield with 2 screws.



30. Install the plate with 6 screws.



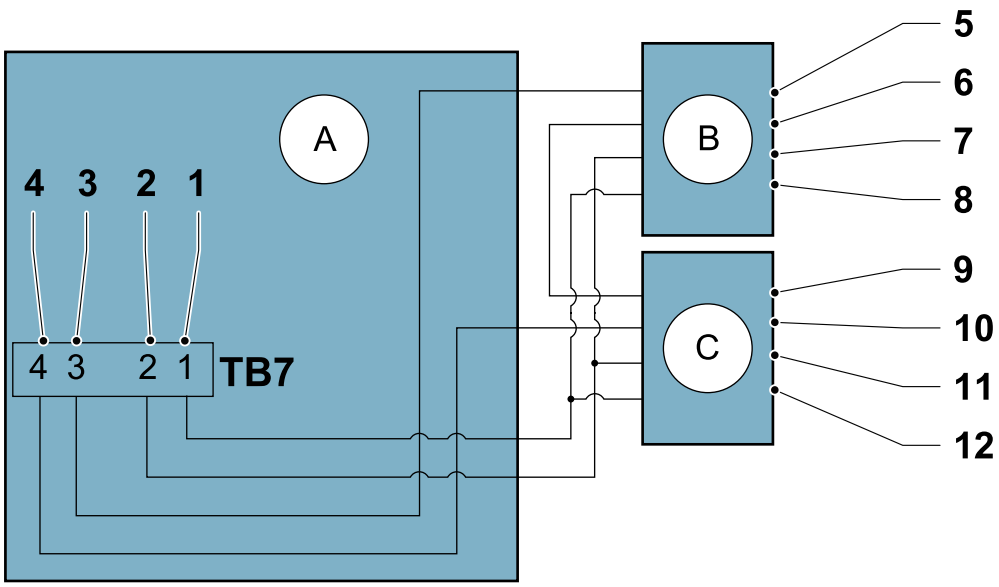
6.3.2.2 Battery trip wiring

The external battery breakers can be tripped (switched off) by energizing its shunt trip coil. The shunt trip coils are energized (controlled) through connector TB7. The status signal of the external battery breaker is also connected to connector TB7. Status contacts of the Eaton battery breakers are open if the breaker itself is open.

NOTE: The default voltage of the battery breaker shunt trip coil is 48 Vdc.

NOTE: When using an external battery system, Eaton recommends you to connect external signal wiring.

Figure 28. Battery trip wiring



A	UPS	5	Shunt trip coil -
B	External battery breaker	6	Shunt trip coil +
C	External battery breaker	7	Aux contact return
1	BAT_Shunt_DET	8	Aux contact
2	GND	9	Shunt trip coil -
3	Aux contact return	10	Shunt trip coil +
4	Aux contact		

6.3.2.3 Battery breaker wiring interface

When the original accessory battery cabinet from the manufacturer is used, the battery breaker interface wiring is provided with the cabinet. The wiring is connected to the TB7 terminal in the UPS.

Figure 29. TB6 and TB7 cable routing

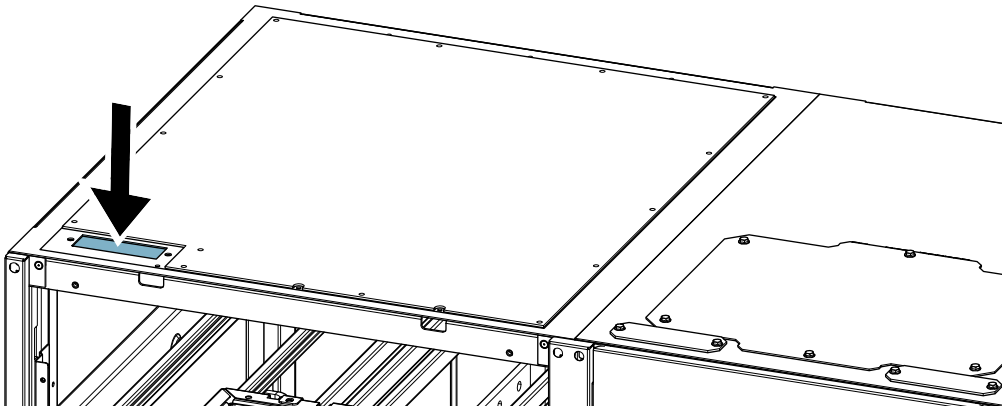
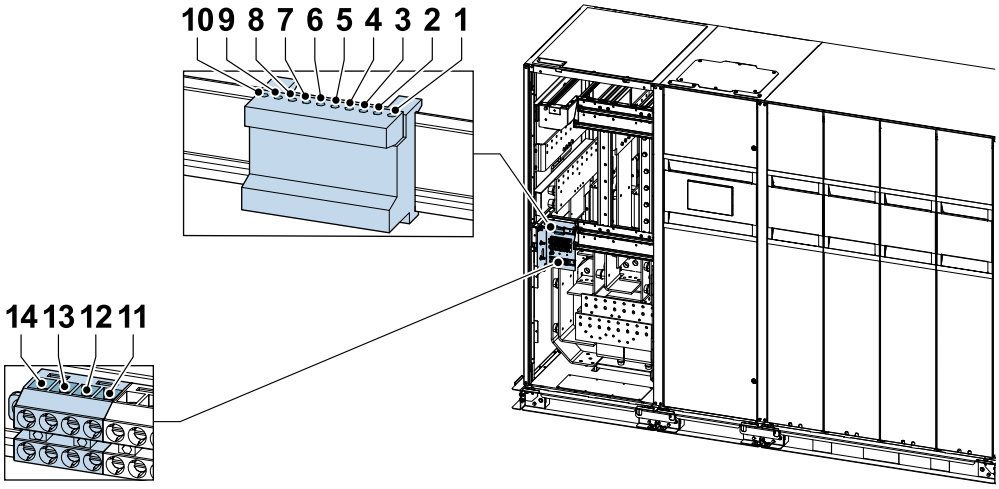


Figure 30. Sync Control interface TB6 location (1–10) and battery trip wiring TB7 (11–14)



1. Sync L3
2. Sync L2
3. Sync L1
4. Output L3
5. Output L2
6. Output L1
7. Bypass N
8. Bypass L3
9. Bypass L2
10. Bypass L1
11. Shunt trip
12. Shunt trip return
13. Status signal
14. Status signal return

When a third-party battery system is used, the breaker must be equipped with auxiliary signal and should have a 48 Vdc shunt trip for remote opening of the breaker, when needed.

See *Section 6.3.2.2 Battery trip wiring* for installation instructions.

6.3.2.4 Install external battery power wiring

To install wiring to connections:

NOTE: Drill the holes after you have removed the plate to prevent conductive particles.

1. Remove the I/O front panel if it is still in place.

2. Route the input and output cables through either the top or bottom of the cabinet to the UPS terminals.
   - **Top Access Wiring**. Remove the top conduit plate from the top of the UPS. Identify all conduit requirements and mark their location. Drill and punch all conduit holes in the top conduit plate prior to mounting on the UPS. Install the conduit plate and install all conduit runs into the plate. Pull the wiring through the conduit into the wiring area. **Applicable for AC wiring and DC wiring**
   - **Bottom Access Wiring**. Identify all conduit requirements and mark their location. Drill and punch all conduit holes in the bottom conduit plate prior to mounting on the UPS. Install the conduit plate and install all conduit runs into the plate. Pull the wiring through conduit into the wiring area. Retain all panel hardware. **Only applicable for DC wiring**.
3. Locate the external wiring terminal hardware kit packed on the I/O section.
4. Using hardware from the external wiring terminal hardware kit, connect phase L1, L2, L3 rectifier input power wiring from the utility source to the rectifier input terminals (E1, E2, E3) in the I/O section. See *Section 6.5 UPS system power wiring preparations* for wiring and termination requirements.

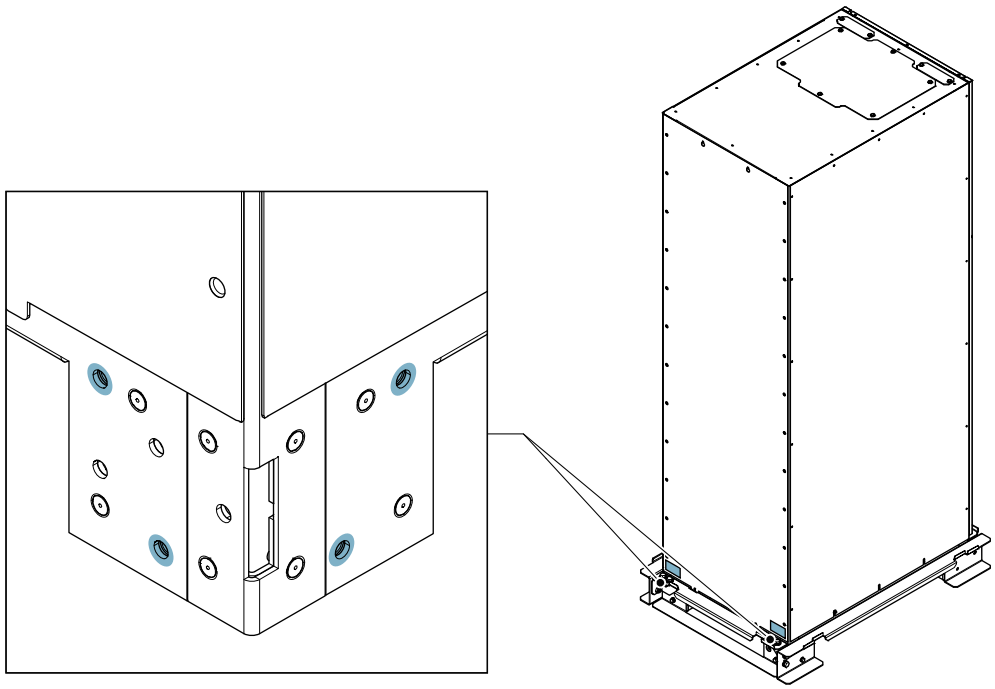
NOTE: If the unit is dual feed, also a bypass connection step is required.

5. Using hardware from the external wiring terminal hardware kit, connect phase E9, E10, E11 wiring from the output terminals the UPS unit to the customer-supplied tie cabinet or load distribution panel. See *Section 6.5 UPS system power wiring preparations* for wiring and termination requirements.
6. Proceed to *Section 6.3.2.2 Battery trip wiring*.

6.3.2.5 EMI grounding

The frame of the external battery cabinet must be grounded to the UPS. If the distance between the UPS and external battery cabinet is less than 500 mm, a separate EMI grounding between the two cabinets is needed. The shipping/fixing bracket mounted to the front side of the UPS has two alternative grounding cable fixing points for this purpose. Other end of the cable is connected to the closest available point in the chassis of the external battery cabinet. The connection point must be unpainted, and provide reliable mechanical and electrical contact to the chassis. For the cable size, refer to *Section 6.5 UPS system power wiring preparations*.

Figure 31. EMI grounding points to external battery cabinet



6.4 Install interface connections

The UPS contains a total of five (5) customer input connectors, which can be used for giving remote control commands to the UPS. The alarm relay (TB3) can be used for these purposes. Each input is a dry relay contact input and requires two wire signaling. None of the inputs are pre-programmed but need to be separately programmed by qualified service personnel.

There is also one general alarm relay output on the front panel. This output is either normally open (NO) or normally closed (NC). Polarity selection is made with wiring connection. By default, the general alarm relay activates when a system alarm is active, that is, any ALARM condition in the system is active. Alternatively, it can be activated with any particular event but this must be programmed separately by qualified service personnel. The alarm relay is designed for signal level (ELV or SELV) voltages only, not for utility use. For higher signaling circuit voltage requirements, please use Industrial Relay Card in MiniSlot.

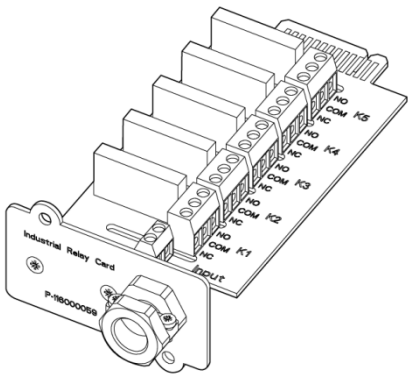
6.4.1 Industrial Relay Card interface connections

Relays K1 through K5 are identical in function. Each output contact function can be assigned by the user. The UPS information may also be configurable.

To install the industrial relay card (INDRELAY-MS):

1. Make sure that the ancillary equipment system is turned off and all the power sources are removed. Refer to the appropriate operation manual of any ancillary equipment for shutdown instructions.
2. Install wiring from the card to the monitoring equipment using appropriate cable with double insulation through the cable exit opening in the card.
3. Connect wiring between the card's terminal blocks and the monitoring equipment using terminations. Connect one wire to COM (Common) and another to either NC or NO to select the Normally Open or Normally Closed option.
4. Install the card into an open MiniSlot communication bay in the UPS cabinet.

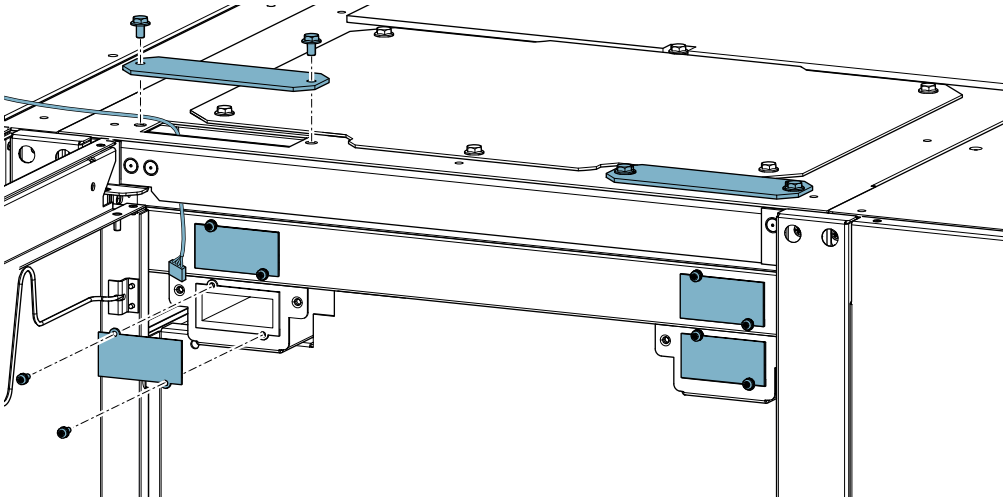
Figure 32. Industrial Relay Card



6.4.2 MiniSlot interface connections

For MiniSlot accessories and communication devices selection, see *Section 7.1 About communication interfaces*. For installation and setup of a MiniSlot card, please contact your Eaton representative.

Figure 33. MiniSlot covers overview



1. If not already installed, install the LAN drops.
2. Open the door of the I/O cabinet.
3. Remove the cover plate or drill hole to the hatch.
   To remove the MiniSlot cover plate, remove the 2 screws securing the plate.
4. To install the MiniSlot communication device, push it all the way in.
5. Secure the MiniSlot communication device with 2 screws.
6. Route and install the LAN and other cables to the appropriate MiniSlot cards.
7. For operator instructions, refer to the manual supplied with the MiniSlot card.
8. When all the wiring is completed, close the front door.

6.4.3 Install signal interface connections in a parallel system

Obey the instructions mentioned earlier when you install the signal interface connections in a parallel system. Signal inputs can be paralleled between the units, that is, the same contact can be used for several units' signal input signaling. This concerns also the EPO signal.

6.5 UPS system power wiring preparations

CAUTION

This product can cause a DC current in the PE conductor. Where a residual current-operated protective device (RCD) is used for protection against electrical shock, only an RCD of Type B is allowed on the supply side of this product.

NOTE: Make sure that multiple parallel cable installation meets the requirements of IEC 60364-5-52:2009, 523.7.

For external wiring requirements, including the minimum size of external wiring, see the following tables.

Read and understand the following notes when you plan and do the installation:

- Refer to national and local electrical codes for acceptable external wiring/busbar practices.
- To allow for future kVA upgrades, consider using conductors sized for non-derated units to wire derated units.
- Material and labor for external wiring/busbar requirements are to be provided by designated personnel.
- The bypass feed into this equipment uses three or four wires. The rectifier feed into this equipment uses three wires. The phases must be symmetrical about ground (from a Wye source) for proper equipment operation.
- If the load requires a neutral, a bypass source neutral must be provided. If the load does not require a neutral and there is no neutral conductor connected at the bypass input, a neutral must be installed to source star point the UPS must be factory configured for 3-wire input/output operation (UPS type designator contains "-3W").
- This UPS system can be installed to the TN, TT or IT power distribution systems.

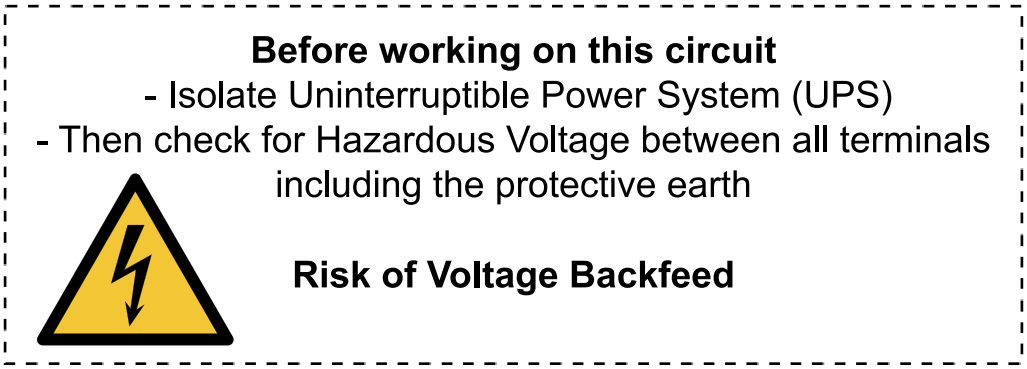
NOTE: Install additional warning labels at the UPS input terminals and all primary power isolators used to isolate the UPS unit if:

- the UPS system is installed to an IT power distribution system
- or the UPS input is connected through external isolators that, when opened, isolate the neutral connection.

These warning labels can be obtained from your local service representative.

The UPS cabinet is shipped with a debris shield covering the ventilation grill on top of the unit. Do not remove the debris shield until installation is complete. However, remove the shield before operating the UPS. Once the debris shield is removed, do not place objects on the ventilation grill.

Figure 34. Warning label



In a common battery system, single and multiple UPMs are powered from one common battery source. In a separate battery system, multiple UPMs are each powered from separate battery sources.

Terminals E1 through E12 are bus bar mountings. See *Table 13: UPS cabinet power cable/busbar terminations* for power cable terminations.

Table 13. UPS cabinet power cable/busbar terminations

Terminal function	Terminal	Function
AC input to UPS rectifier	E1	Phase L1
	E2	Phase L2

Terminal function	Terminal	Function
	E3	Phase L3
AC input to bypass	E6	Phase L1
	E7	Phase L2
	E8	Phase L3
AC output to critical load	E9	Phase L1
	E10	Phase L2
	E11	Phase L3
DC input from external battery to UPS	E4	Battery (+)
	E5	Battery (-)
Input and output neutral	E12	Neutral
Customer ground	PE	PE

The tightening torque for all above is 80 (47) Nm and the bolt size is M12 (M10).

NOTE: Bypass terminations are not applicable to small IO-configurations. In this configuration, there is common rectifier input and bypass terminals E1 to E3.

External overcurrent protection is not provided by this product but is required by codes. If an output lockable disconnect is required, it is to be supplied by the user.

CAUTION

To reduce the risk of fire, connect only to a circuit provided with maximum input circuit breaker current ratings listed in the tables below in accordance with the NEC, ANSI/NFPA 70.

The line-to-line unbalanced output capability of the UPS is limited only by the full load per phase current values for AC output to critical load. The recommended line-to-line load unbalance is 50% or less.

Bypass and output overcurrent protection and bypass and output disconnect switches are to be provided by the user.

Table 14. Maximum recommended AC-mains breaker setting for used conductor type (1.02 MW)

1.02 MW									
Conductor Material	Conductor Size		Conductor temperature	Breaker Long-time pickup (Ir) setting	Max Long-time delay setting in seconds (Tr) (1.5 x Ir)	Max Long-time delay setting in seconds (Tr) (6 x Ir)	Max Long-time delay setting in seconds (Tr) (7.2 x Ir)	MAX Short-time pickup (Isd) setting	MAX Short-time delay at MAX Isd in seconds (Tsd)
Alumi-num	185	mm^2	90 °C	1850	20	2	1	24500	0,3

1.02 MW									
Conductor Material	Conductor Size		Conductor temperature	Breaker Long-time pickup (Ir) setting	Max Long-time delay setting in seconds (Tr) (1.5 x Ir)	Max Long-time delay setting in seconds (Tr) (6 x Ir)	Max Long-time delay setting in seconds (Tr) (7.2 x Ir)	MAX Short-time pickup (Isd) setting	MAX Short-time delay at MAX Isd in seconds (Tsd)
	240		70 °C	1850	44	3	2	30000	0,4
			90 °C	1850	33	3	2	30000	0,3
	300		70 °C	1850	68	5	3	40000	0,4
			90 °C	1850	51	4	3	40000	0,3
	400		70 °C	1850	97	7	5	50000	0,3
			90 °C	1850	68	5	3	50000	0,3
Copper	120		90 °C	1850	19	2	1	25000	0,3
	150		70 °C	1850	39	3	2	30000	0,4
			90 °C	1850	30	2	2	30000	0,3
	185		70 °C	1850	59	4	3	35000	0,4
			90 °C	1850	45	3	2	30000	0,4
	240		70 °C	1850	99	7	5	45000	0,4
			90 °C	1850	75	5	4	40000	0,4
	300		70 °C	1850	155	10	7	55000	0,4
			90 °C	1850	117	8	6	50000	0,4
	400		70 °C	1850	221	14	10	65000	0,5
			90 °C	1850	154	10	7	60000	0,4

Table 15. Maximum recommended AC-mains breaker setting for used conductor type (1.36 MW)

1.36 MW									
Conductor Material	Conductor Size		Conductor temperature	Breaker Long-time pickup (Ir) setting	Max Long-time delay setting in seconds (Tr) (1.5 x Ir)	Max Long-time delay setting in seconds (Tr) (6 x Ir)	Max Long-time delay setting in seconds (Tr) (7.2 x Ir)	MAX Short-time pickup (Isd) setting	MAX Short-time delay at MAX Isd in seconds (Tsd)
Aluminum	240	mm^2	90 °C	2450	19	2	1	30000	0,3
	300		70 °C	2450	39	3	2	40000	0,4

1.36 MW									
Conductor Material	Conductor Size		Conductor temperature	Breaker Long-time pickup (Ir) setting	Max Long-time delay setting in seconds (Tr) (1.5 x Ir)	Max Long-time delay setting in seconds (Tr) (6 x Ir)	Max Long-time delay setting in seconds (Tr) (7.2 x Ir)	MAX Short-time pickup (Isd) setting	MAX Short-time delay at MAX Isd in seconds (Tsd)
			90 °C	2450	30	2	2	40000	0,3
	400		70 °C	2450	55	4	3	50000	0,3
			90 °C	2450	39	3	2	50000	0,3
Copper	185		90 °C	2450	26	2	2	30000	0,4
	240		90 °C	2450	43	3	2	40000	0,4
	300		70 °C	2450	89	6	4	55000	0,4
			90 °C	2450	67	5	3	50000	0,4
	400		70 °C	2450	126	8	6	65000	0,5
			90 °C	2450	88	6	4	60000	0,4

Table 16. Maximum recommended AC-mains breaker setting for used conductor type (1.7 MW)

1.7 MW									
Conductor Material	Conductor Size		Conductor temperature	Breaker Long-time pickup (Ir) setting	Max Long-time delay setting in seconds (Tr) (1.5 x Ir)	Max Long-time delay setting in seconds (Tr)(6 x Ir)	Max Long-time delay setting in seconds (Tr) (7.2 x Ir)	MAX Short-time pickup (Isd) setting	MAX Short-time delay at MAX Isd in seconds (Tsd)
Aluminum	400	$m\text{-}m^2$	90 °C	3050	25	2	2	50000	0,3
Copper	240		90 °C	3050	28	2	2	40000	0,4
	300		90 °C	3050	43	3	2	50000	0,4
	400		70 °C	3050	82	6	4	65000	0,5
			90 °C	3050	57	4	3	60000	0,4

There is no DC disconnect device within the UPS. A battery disconnect switch is recommended, and may be required by local codes when batteries are remotely located. The battery disconnect switch should be installed between the battery and the UPS.

External DC input overcurrent protection and disconnect switch for the remote battery location is to be provided by the user.

Rated battery current is computed at 2 volts per cell. The battery wiring/busbar used between the battery and the UPS should not allow a voltage drop of more than 1% of nominal DC voltage at rated battery current.

6.5.1 AC ports, 1.02 MW Cable sizes

Table 17. AC ports, 1.02 MW Cable sizes

1.02 MW	Cable sizes and amount of needed cables					AC-breaker setting
Material	**Size**	**Cable insulation rating**	**Phase and Neutral cables needed (pcs)**	**PE cables needed**		**Long-time pickup (Ir) setting**
AL conductor	185 mm²	70 °C	Not recommended			
		90 °C	5	3	pcs	1850
	240 mm²	70 °C	5	3	pcs	1850
		90 °C	4	2	pcs	1850
	300 mm²	70 °C	5	3	pcs	1850
		90 °C	4	2	pcs	1850
	400 mm²	70 °C	4	2	pcs	1850
		90 °C	3	2	pcs	1850
CU conductor	120 mm²	70 °C	Not recommended			
		90 °C	5	3	pcs	1850
	150 mm²	70 °C	Not recommended			
		90 °C	4	2	pcs	1850
	185 mm²	70 °C	5	3	pcs	1850
		90 °C	4	2	pcs	1850
	240 mm²	70 °C	4	2	pcs	1850
		90 °C	3	2	pcs	1850
	300 mm²	70 °C	4	2	pcs	1850
		90 °C	3	2	pcs	1850
	400 mm²	70 °C	3	2	pcs	1850
		90 °C	2	1	pcs	1850

6.5.2 DC ports, 1.02 MW Cable sizes

Table 18. DC ports, 1.02 MW Cable sizes

1.02 MW	Cable sizes and amount of needed cables				DC-breaker setting
Material	**Size**	**Cable insulation rating**	**Cables needed (pcs)**	**PE Cables needed (pcs)**	**Long-time pickup (Ir) setting**
AL conductor	185 mm²	70 °C	8	4	2510
		90 °C	6	3	2510
	240 mm²	70 °C	7	4	2510
		90 °C	5	3	2510
	300 mm²	70 °C	6	3	2510
		90 °C	4	2	2510
	400 mm²	70 °C	5	3	2510
		90 °C	4	2	2510
CU conductor	185 mm²	70 °C	6	3	2510
		90 °C	5	3	2510
	240 mm²	70 °C	5	3	2510
		90 °C	4	2	2510
	300 mm²	70 °C	5	3	2510
		90 °C	4	2	2510
	400 mm²	70 °C	4	2	2510
		90 °C	3	2	2510

6.5.3 AC ports, 1.36 MW Cable sizes

Table 19. AC ports, 1.36 MW Cable sizes

1.36 MW	Cable sizes and amount of needed cables				Input breaker setting
Material	**Size**	**Cable insulation rating**	**Phase and Neutral cables needed (pcs)**	**PE Cables needed** (pcs)	**Long-time pickup (Ir) setting**
AL conductor	240 mm²	70 °C	Not recommended		
		90 °C	5	3	2450
	300 mm²	70 °C	Not recommended		
		90 °C	5	3	2450

1.36 MW	Cable sizes and amount of needed cables				Input breaker setting
	400 mm²	70 °C	5	3	2450
		90 °C	4	2	2450
CU conductor	185 mm²	70 °C	Not recommended		
		90 °C	5	3	2450
	240 mm²	70 °C	Not recommended		
		90 °C	4	2	2450
	300 mm²	70 °C	5	3	2450
		90 °C	4	2	2450
	400 mm²	70 °C	4	2	2450
		90 °C	3	2	2450

6.5.4 DC ports, 1.36 MW Cable sizes

Table 20. DC ports, 1.36 MW Cable sizes

1.36 MW	Cable sizes and amount of needed cables				DC-breaker setting
Material	**Size**	**Cable insulation rating**	**Cables needed (pcs)**	**PE Cables needed (pcs)**	**Long-time pickup (Ir) setting**
AL conductor	185 mm²	70 °C	Not recommended		
		90 °C	8	4	3330
	240 mm²	70 °C	Not recommended		
		90 °C	7	4	3330
	300 mm²	70 °C	8	4	3330
		90 °C	6	3	3330
	400 mm²	70 °C	6	3	3330
		90 °C	5	3	3330
CU conductor	185 mm²	70 °C	8	4	3330
		90 °C	6	3	3330
	240 mm²	70 °C	7	4	3330
		90 °C	5	3	3330
	300 mm²	70 °C	6	3	3330
		90 °C	5	3	3330

1.36 MW	Cable sizes and amount of needed cables				DC-breaker setting
	400 mm²	70 °C	5	3	3330
		90 °C	4	2	3330

6.5.5 AC ports, 1.7 MW Cable sizes

Table 21. AC ports, 1.7 MW Cable sizes

1.7 MW	Cable sizes and amount of needed cables				Input breaker setting
Material	**Size**	**Cable insulation rating**	**Phase and Neutral cables needed (pcs)**	**PE cables needed (pcs)**	**Long-time pickup (Ir) setting**
AL conductor	400 mm²	70 °C	Not recommended		
		90 °C	5	3	3050
CU conductor	240 mm²	70 °C	Not recommended		
		90 °C	5	3	3050
	300 mm²	70 °C	6	3	3050
		90 °C	5	3	3050
	400 mm²	70 °C	5	3	3050
		90 °C	4	2	3050

6.5.6 DC ports, 1.7 MW Cable sizes

Table 22. DC ports, 1.7 MW Cable sizes

1.7 MW	Cable sizes and amount of needed cables				DC-breaker setting
Material	**Size**	**Cable insulation rating**	**Cables needed (pcs)**	**PE Cables needed (pcs)**	**Long-time pickup (Ir) setting**
AL conductor	300 mm²	70 °C	Not recommended		
		90 °C	7	4	4150
	400 mm²	70 °C	8	4	4150
		90 °C	6	3	4150
CU conductor	185 mm²	70 °C	Not recommended		
		90 °C	8	4	4150
	240 mm²	70 °C	Not recommended		
		90 °C	7	4	4150

1.7 MW	Cable sizes and amount of needed cables				DC-breaker setting
	300 mm²	70 °C	8	4	4150
		90 °C	6	3	4150
	400 mm²	70 °C	6	3	4150
		90 °C	5	3	4150

6.5.7 UPS system interface wiring preparation

Control wiring for features and options should be connected at the customer interface terminal blocks located inside the UPS.

WARNING

Do not connect relay contacts directly to the mains-related circuits. Reinforced insulation to the mains is required.

Read and understand the following notes while planning and performing the installation:

- Install the interface wiring (for example, building alarm, relay output, battery breaker trip and MiniSlot separate from the power wiring). The wiring should have double insulation and rated at Uo/U = 300/ 500 Volts.
- All interface wiring is to be provided by the customer.
- When you install internal interface wiring to MiniSlot terminals, route the wiring through the internal opening in the MiniSlot communication bay.
- All signal inputs or remote features require an isolated normally-open contact or switch (rated at 12 Vdc, 20 mA minimum) connected between the alarm input and common terminal. All control wiring and relay and switch contacts are customer-supplied. Use twisted-pair wires for each alarm input and common.
- The building alarms can be programmed to display the alarm functional name.
- LAN and telephone drops for use with MiniSlot cards must be provided by facility planners or the customer.
- The UPS Battery Aux and 48 Vdc Shunt Trip signal wiring from the UPS must be connected to the DC source disconnect device.
- Battery Aux and Shunt Trip wiring should be a minimum of 1.5 mm².
- The Remote EPO feature opens all switchgear in the UPS cabinet and isolates power from your critical load. Local electrical codes may also require tripping upstream protective devices to the UPS.
- The Remote EPO switch must be a dedicated switch not tied to any other circuits.
- A jumper wire must be connected between pins 4 and 2 on TB2, if the normally-closed (NC) Remote EPO contact is not used.
- Remote EPO wiring should be a minimum of 0.75 mm² and a maximum of 2.5 mm².
- The distance between the Remote EPO and the UPS cannot exceed 150 meters.
- Alarm relay contacts have a maximum current rating of 5 A and a switched voltage rating of 30 VAC (RMS) and 30 Vdc.
- Alarm relay wiring should be a minimum of 0.75 mm².

6.5.8 Notes on planning and performing the installation

Read and understand the following notes while planning and performing the installation:

- Use Class 1 wiring methods (as defined by the NEC) for interface wiring from 30V to 600V. The wire should be rated at 600V, 1A minimum and 12 AWG maximum.
- Use Class 2 wiring methods (as defined by the NEC) for interface wiring up to 30V. The wire should be rated at 24V, 1A minimum. When Class 2 circuit wiring must be mixed with Class 1 wiring, use Class 1 wire and wiring methods.
- All interface wiring and conduit is to be provided by the customer.
- When installing external interface wiring (for example, building alarm, relay output, battery breaker trip, and Minislot) to the UPS interface terminals, conduit must be installed between each device and the UPS cabinet.
- Install the interface wiring in separate conduit from the power wiring.
- When installing internal interface wiring to Minislot terminals, route the wiring from the interface entry conduit landing panels through the internal opening in the Minislot communication bay.
- All building alarm inputs or remote features require an isolated normally-open contact or switch (rated at 12 Vdc, 20 mA minimum) connected between the alarm input and common terminal. All control wiring and relay and switch contacts are customer-supplied and may need to use Class 1 wiring, see above.
- The building alarms can be programmed to display the alarm functional name.
- LAN drops for use with Minislot connectivity cards must be provided by the customer and may need to use Class 1 wiring, see above.
- The UPS battery aux signal wiring from the UPS must be connected to the battery disconnect device.
- A supplemental 48 Vdc UVR signal for the battery disconnect device is provided, but is not required for normal operation.
- Battery aux and 48 Vdc UVR wiring should be a minimum of 18 AWG.
- The EPO feature opens all contactors in the UPS cabinet and isolates power from your critical load. Local electrical codes may also require tripping upstream protective devices to the UPS.
- The EPO switch must be a latching-type switch not tied to any other circuits.
- A jumper wire must be connected on the TB2 MCU Board between pins 2 and 4 if the normally-closed REPO contact is not used.
- EPO wiring should be a minimum of 22 AWG and a maximum of 14 AWG.
- The EPO switch wiring must be in accordance with NEC Article 725 Class 2 requirements.
- The maximum distance between the EPO and the UPS cannot exceed 150 meters (500 feet).
- Alarm relay contacts have a maximum current rating of 5A and a switched voltage rating of 30 Vac and 28 Vdc.
- Alarm relay wiring should be a minimum of 22 AWG.

NOTE: On all 9395XP models that will be fed by a site generator at any time it is recommended to have an “On Generator” sensing input connected and proven functional. This allows the UPS to optimize its operation with the generator. This function includes reduced input current and battery current limits, and slower walk-in to ease the load step on the generator initially.

6.6 Wiring parallel UPS systems

The outputs of multiple UPS systems can be connected in parallel. Up to six units can be paralleled. The UPS static bypass power rating needs to be identical among all the paralleled units. However, paralleled UPS cabinets can be populated with a different number of UPM power modules.

The outputs are paralleled to increase the load capacity of the power system and for redundancy. The system is paralleled for (N+1) redundancy, as long as there is always one or more UPS online than required to support the load. The system is paralleled for capacity if all UPSs in a system are required to support the load.

Communication between the UPSs is required for system metering and mode control. The system level communication and control are accomplished using a Controller Area Network (CAN). A pull-chain signal in each UPS, connected to the other UPSs in parallel and tied to the bypass status relay in each UPS, is used for a secondary communication path. This arrangement ensures bypass control even if the CAN bus is lost.

6.6.1 Power wiring overview

See *Section 6.5 UPS system power wiring preparations* for the recommended cable and external fuse sizes and installation practices.

Input feed

The input feed is defined as the power source connected to the UPS rectifier. The feed to all UPS's inputs must be derived from the same source.

Bypass feed

The bypass feed is defined as the power source connected to the UPS bypass. The feed to all UPS's bypass must be derived from the same source. The shortest length of power wire from the source to the UPS must be a minimum of 95% of the length of the longest wire.

Output

The neutrals of all the UPSs must be connected. The shortest length of wire from the source to the UPS must be a minimum of 95% of the length of the longest wire. The measurement is with respect to where the UPS's outputs are tied.

Dual source

The input feed and bypass feed may be separate sources. The sources must share a common neutral.

Battery connection

A separate battery is connected to each UPS, and the battery capacity for each UPS must be identical.

MOBs

Module Output Breakers (MOBs) allow the output of a UPS to be disconnected from other UPSs and the system load for maintenance and service. Design considerations assume that each UPS has a Module Output Breaker (MOB). The breaker should also disconnect the neutral for improved safety during maintenance.

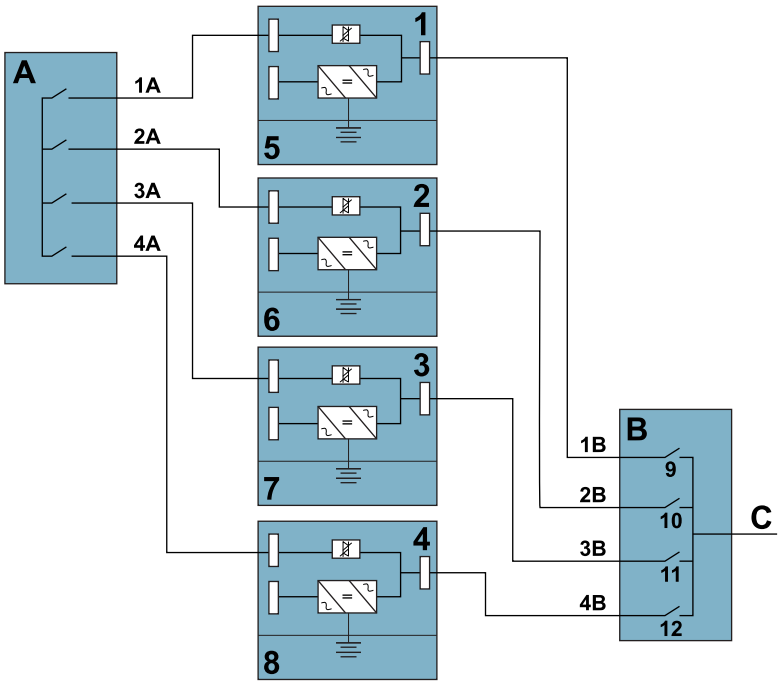
The MOB must have a Form "C" auxiliary contact. The NO contact is connected to the corresponding UPS's input used for signal input. The NC contact is used to disconnect the bypass pull-chain when the MOB is open. *Figure 35: Principle of paralleled UPS systems* shows the principles of paralleled UPS systems including MOBs and outputs from UPSs.

Mob override

Users without MOBs installed can simply leave the MOB signal input disabled. The user should be aware that systems without MOB have limited maintenance capability.

Parallel system cabling

Figure 35. Principle of paralleled UPS systems



A	Bypass inputs to UPSs	1	UPS 1	7	Battery
B	Outputs from UPSs	2	UPS 2	8	Battery
C	Load	3	UPS 3	9	MOB1
		4	UPS 4	10	MOB2
		5	Battery	11	MOB3
		6	Battery	12	MOB4

The required parallel system wiring length must be equal to ensure approximately equal current sharing when in the bypass mode.

For proper operation, the following must be true: 1A+1B=2A+2B=3A+3B=4A+4B.

Any differences in wire length result in decreased capacity and improper operation of the UPS system while in the bypass mode.

6.6.2 Control signals overview

Two control signals (External CAN Network, Bypass Pull-Chain) are required for external paralleling. Both of these control signals are fault-tolerant and alarmed when disconnected.

External CAN (ECAN)

ECAN provides a means for communication between the UPSs in a parallel system. The system will continue to share load and protect the load when this network fails.

Bypass Pull-Chain

Bypass Pull-Chain is an open collector signal that goes low when the bypass static switch of any UPS is active. When External CAN (ECAN) is down and the pull-chain goes low while the UPS is online, the UPS transfers and locks to the bypass mode. Service personnel can manually short this signal in some rare failure modes to force the system transfer to bypass.

Signal Inputs Actions

Each UPS has a maximum of 9 signal inputs, 5 native and 1 in each MiniSlot when using a suitable connectivity device. These inputs can be configured with action items. The following action items affect all the UPSs in the system. When an action item is active on a UPS and the MOB is closed, the action item is transmitted on the ECAN to all the UPSs. All the UPSs react in the same manner as if the action item was active on that UPS.

Wiring the EPO switch in parallel

It is recommended to use separate EPO circuits for each parallel unit.

6.6.3 External parallel system control wiring

For detailed drawings, see the *Site Planning Data* document.

- During the installation, obey all the safety instructions given in this document.
- Two terminal blocks, one with 4 pins and another with 2 pins, for external parallel control signals are accessible on the communication interface, located on the top section of the UPS (see *Figure 36: X9 External parallel interface*).

Figure 36. X9 External parallel interface

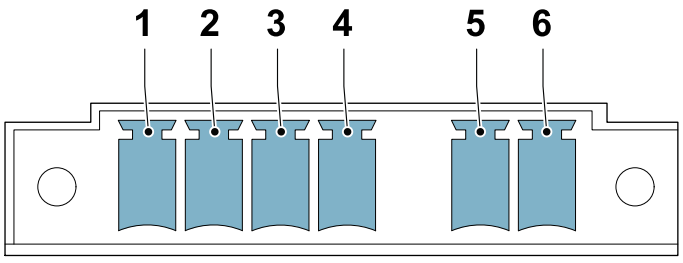
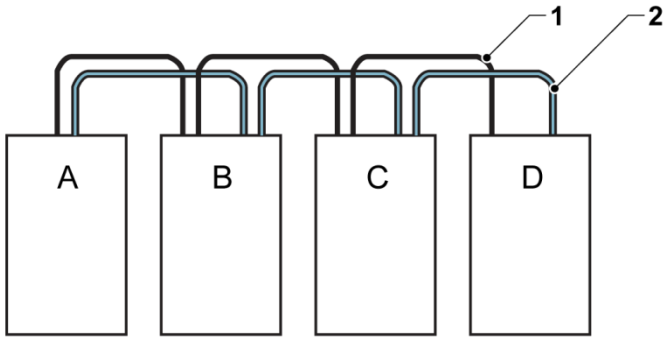


Figure 37. Simplified CAN and Pull-Chain wiring for parallel UPS system



A	UPS 1	1	CAN
B	UPS 2	2	Pull chain
C	UPS 3 (if installed)		
D	UPS 4 (if installed)		

NOTE: NC and NO designations on MOB AUX contacts are defined with the breaker in the OFF (open) position. If the MOB contacts have pigtail leads, use the same wire gauge to connect to the UPS and use the correct crimp connections for the wire gauge. External CAN connections between the UPS cabinets require shielded twisted pair wire. Use twisted pair wiring between the UPS and MOB AUX contacts. Always confirm contact operation prior to wiring.

7 Communication interfaces

7.1 About communication interfaces

This section describes the communication features of the Eaton UPS.

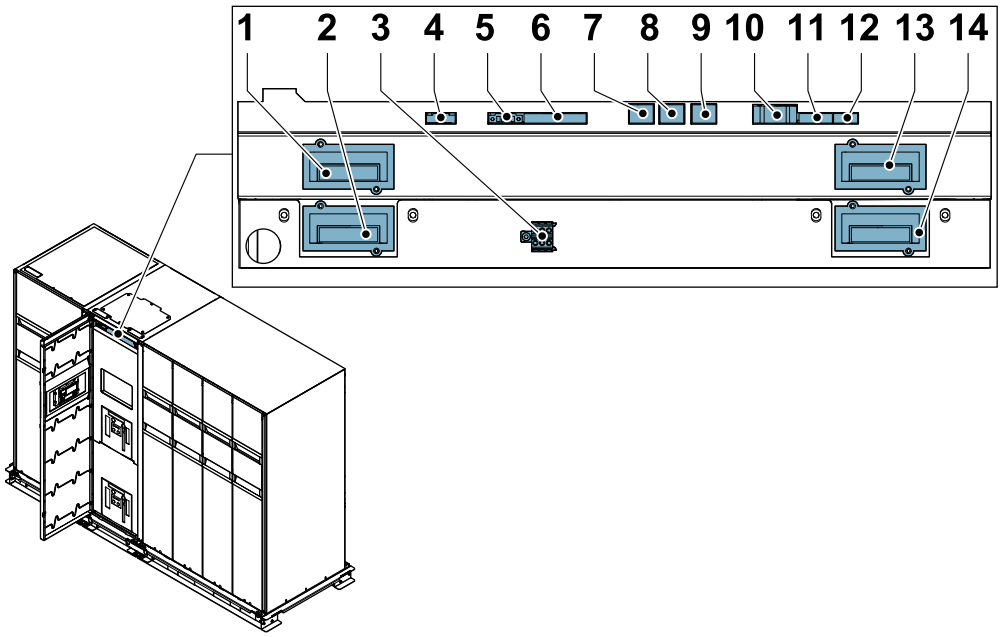
NOTE: For information about to how to securely deploy and configure Eaton products, read *Appendix A Eaton Product Secure Configuration Guidelines* .

CAUTION

All communication interfaces are SELV circuits. When connecting to other equipment, make sure that you maintain this characteristic.

The UPS has the following communication interfaces:

Figure 38. Communication interfaces



1. MiniSlot 1
2. MiniSlot 2
3. Pull chain
4. Alarm relay
5. Emergency Power Off (EPO)
6. Building alarms
7. Service port
8. Reserved
9. Reserved
10. Reserved (RS485)
11. External CAN
12. External CAN Termination
13. MiniSlot 3
14. MiniSlot 4

7.1.1 MiniSlot cards

The Eaton 9395 XP UPS has four MiniSlot communication bays. For instructions on how to install a MiniSlot card, refer to *Section 6.4.2 MiniSlot interface connections*.

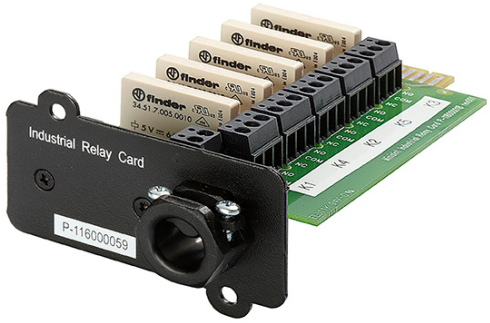
The UPS is compatible with the following MiniSlot cards:

- **Industrial Gateway Card (INDGW-M2)**
  Enhances the capabilities and protection provided by the UPS by enabling Web and SNMP based remote monitoring and e-mail alarms. The card also enables shutdown of servers and migration of virtual machines through IPM and IPP software. Supports 10/100 Mbit and Gigabit Ethernet. In addition, it also provides direct integration of system level UPS information (meters and status) to a Building Management System (BMS) using the Modbus RTU and Modbus/TCP.

Figure 39. Industrial Gateway Card

- **Industrial Relay Card (INDRELAY-MS)**
  The MiniSlot Industrial Relay Card provides a way of connecting the UPS to industrial and electrical monitoring systems. It also enables a wide range of control applications by allowing up to 250 volts and 5 Amperes through its 5 relay connections. By connecting wires to the corresponding places in its terminal blocks, you can choose Normally Open or Normally Closed setup for each output.
  For information on how to configure Industrial Relay Card, see *Section 7.1.3.1 Configuring relays*.

Figure 40. Industrial Relay Card



7.1.2 Signal input monitoring

This standard feature lets you connect smoke detectors or over-temperature alarms to your signal inputs. The user interface terminals for external connections are located inside the UPS. Use twisted-pair wires for each alarm input and common.

The signal inputs can be programmed to display the alarm functional name. See list of Signal input functions in *Appendix* .

7.1.3 General purpose relay contact

One general purpose relay contact is provided as a standard feature on the UPS. An alarm contact is also provided.

You can use a normally-closed (NC) or normally-open (NO) contact. If the state of the contact changes from the state you specify as normal, a signal is issued. You can connect this contact to equipment at your facility (such as a light or an alarm bell) to let you know when an alarm is active on the UPS. This feature is useful if the UPS is located in a remote area where the UPS horn may not be heard immediately.

NOTE: Do not operate the contacts in excess of 30 VAC (RMS) and 30 VDC at 5 A maximum.

7.1.3.1 Configuring relays

9395XP offers one native relay output. Additionally, each of the 4 MiniSlots can be equipped with a 5-relay adapter for additional relay outputs. These instructions guide you through the relay configuration.

The relay configuration can be done via the display.

The maximum voltage of the relay is 30 V. Examine the voltage and current specifications of the other cards from the previous sections.

The process for relay configuration:

1. In the home screen of the display, click the lock icon in the top right corner to type in the service password.
2. In the sign in window, click the password field containing the 4 dots.

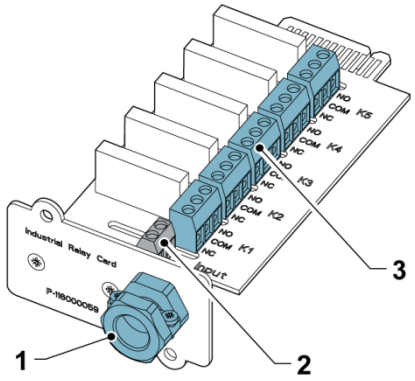
Figure 41. Sign in window with the password field

3. Enter the password 1212 and press ↵.
4. Click the **Settings** menu on the bottom right corner and press **Input & Output Settings**.
5. Select **Continue**.
6. Select **Relays Outputs**.
7. Select from these options:
   - Native (Alarm) relay
     It is possible to set 8 different events for the native relay. If any of the set events occurs, the relay is activated
   - MiniSlot 1
   - MiniSlot 2
   - MIniSlot3
   - MIniSlot4

Figure 42. Options for relay outputs configuration

8. Alternatively, you can configure the relays with any event you want.

Figure 43. Relays



1. Cable exit opening for up to 12 mm (½”) conduit
2. Signal input connector with voltage supply
3. K1 thru K5 terminal connections for relay contacts to operator's monitoring equipment

8 UPS operating instructions

8.1 About UPS operating instructions

This section describes how to operate the UPS.

CAUTION

Before you operate the UPS, make sure that all the installation tasks are completed and a preliminary startup has been performed by authorized service personnel. The preliminary startup verifies all the electrical interconnections to make sure that the installation was successful and the system operates properly.

Before you operate any of the controls, read these instructions and have a thorough understanding of the UPS operation.

The UPS is configured to operate with one of the following nominal voltages: 380, 400, or 415 VAC. Before you start to operate the UPS, confirm the UPS nominal voltage and frequency from the display by selecting **Settings→Information**. If the UPS need to be operated with another voltage or frequency, contact your closest Eaton office or Eaton authorized partner.

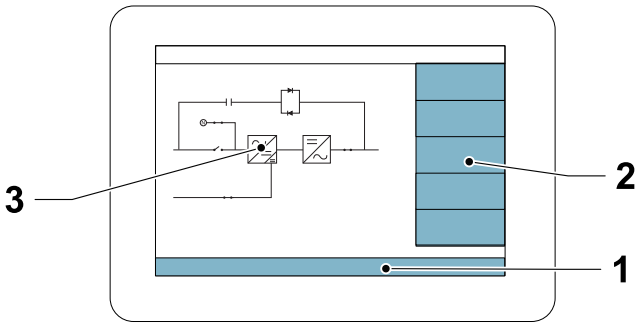
NOTE: The UPS is not a measuring device. All the displayed measurements are approximate values only.

8.2 UPS controls and indicators

8.2.1 Control panel

The control panel contains a color touch screen display. It is used to display the status of the UPS system and control the operation of the UPS.

Figure 44. Parts of the display



The display consists of the following parts:

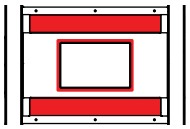
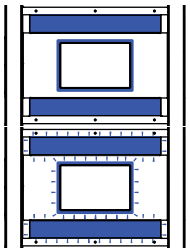
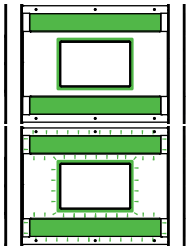
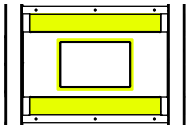
1. Status bar. The status bar on the bottom of the screen displays Overview, System, Timeline, Meters, Controls and Settings touch buttons. It also shows any active alarms and warnings.
2. Main navigation. Select a screen by tapping on its name.
3. Content area. This is the main area for showing information on the UPS status and operations.

8.2.2 UPS door color LED indicator

The LED indicators consist of two rows of LEDs located behind the plates of the UPS cabinet door. The LEDs are blue, red, and yellow (RGY). The color of the LED is used to indicate the condition of the UPS. The most urgent condition is always the one shown. Only one color is shown at a time. The table below defines which color is shown.

- The default color is blue. However, you can select between green and blue.
- By default, the LED status reflects state changes. You can select to disable the LED status and then LEDs are blue.

Table 23. Color LED indicators (screen and door)

Color LED indicators (screen and door)	UPS status
	Alarm in UPS and UPM.
	Blinking default color (MCU), static default color (UPM). Online/Double conversion mode - default color (MCU), default color (UPM).
	Optional: You can change the default color from blue to green.
	Bypass: Yellow (MCU). UPM is yellow in case if it is Ready, otherwise Off.
-	Stand-by and Shutdown: Off.

8.2.3 UPM status color LED indicator

Each UPM has a status LED indicator. It is located in the middle of the UPM front panel. The LEDs are red, yellow and blue (RGB). The color of the LED shows the state of the UPM. The most urgent state is always the one shown. Only one color is shown at a time. The table below defines the color coding.

Table 24. Color LED indicators

Color LED indicators (UPM)	UPM status
	UPM in online or double conversion mode
	UPM is in Ready state
	UPM in alarm state
—	Standby and shutdown

8.2.4 System events

When the UPS system is running in the double conversion mode, it continually monitors itself and the incoming utility power. In the battery or bypass mode, the UPS may issue alarms to let you know exactly what event caused the change from the double conversion mode. System events on the UPS can be indicated by horns, lights, messages, or all three.

Select Logs in the home screen to look at any currently active events.

- **System event horn**
  The system event horn beeps to alert the user that an event requiring attention is taking place.
- **System event indicators**
  The status indicators on the UPS control panel and the event horn let you know when the UPS system is operating in any mode other than the double conversion mode. Only the green indicator for normal operation is visible during normal UPS system operation. The other indicators illuminate to indicate alarms or events. When an alarm occurs, first examine these indicators to see what type of event has taken place.
- **System event messages**
  When a system event occurs, a message appears in the status bar of the display. This message is also written to the Active Events log. Some notices and alarms may be accompanied by an audible horn. To silence the horn, press any button once.

8.2.5 Menu structure of the 9395XP UPS

The following table shows the menu structure of the 9395XP UPS.

Table 25. Menu structure of the 9395XP UPS

Main menu	Submenu	Functions
Overview	-	An overview of the UPS operation, including information on load, efficiency, battery and consumption.
Meters	Meters summary	A summary of the UPS or system meters.
	Input meters	Detailed information on UPS or system input meters.

Main menu	Submenu	Functions
	Bypass meters	Detailed information on UPS or system bypass meters.
	Output meters	Detailed information on UPS or system output meters. UPM Power
	Battery meters	Detailed information on UPS or system battery meters.
Controls	System controls	Go Online Go to bypass Turn off Charger Load Off
	UPS controls	Run battery test Shut down UPS
	Module controls	Start charger Run battery test Shut down module / Start module UPMs: • Charger • Battery test • UPM status
	EAA controls	ESS: • Enable • Disable • Configure ABM: • Enable • Disable • Configure Clear Alarms Clear Logs
		An overview of the UPS operation, including information on load, efficiency and consumption. If there is an error, an error indicator is displayed next to the affected part. Active events log can be opened by tapping the error indicator.
	UPS module map	Module map shows the status of each UPM.
	System overview	System overview shows the status and meters summary for each UPS.
	ABM	The screen shows ABM mode details.

Main menu	Submenu	Functions
Timelines		All active events are displayed.
	System log	A log of all system events.
	Service log	A detailed log of UPS operations.
	Change log	A log of all changed settings and their values.
Settings	User Configuration Service	Configurable user settings. For details, see *Section 8.2.6 User settings*.

8.2.6 User settings

The UPS includes information for the user. You can modify the **User** settings. In the Home screen, select **Settings**.

Table 26. User settings

Setting	Description
Information	Information on the UPS model, including part number and serial number. Automatically updated information about UPS output kVA rating and the amount of redundant UPMs.
Unit Name	Change the Name and Number of the Unit
Clock and Time Preferences	Change the date and time, change the clock format or enable/disable NTP clock setup.
Input & Output Settings	Signal Input: Select signal input name and function or change contact polarity. Relay Outputs :Configure the relay outputs.
Legal	End User License Agreement Software Licenses

You need to sign in to modify the **Read Write Parameters** settings.

Table 27. Read Write Parameters settings

Setting	Description
Language	Change the user interface language.
GSM	GSM modem.
Call Service	Send automatic e-mail to the service center in case of a failure.
Battery test	Change the power level and duration for battery test.
Bypass Limits	Change the bypass voltage or bypass frequency.
Screen Saver Timeout	Change the screen saver timeout.
Meters	Change the meters format.

Setting	Description
Lamp Test	Enable the lamp test.
HMI backlight	Adjust the backlight brightness.
Reset statistics	Reset all statistics.
Minimum required kVa	Change the minimum required kVa.
User kVa	Configure UPS output kVA rating.
Redundant level	Configure UPS internal redundancy level.

Table 28. Levels and password settings

Control P/W level 1	Change the level 1 password, or remove the password on level 1. The default value is 1111.
Control P/W level 2	Change the level 2 password. The default value is 0101.
Control P/W level 3	Service Level

8.3 Signing in

If the level 1 password is enabled, you need to sign in.

1. Press the lock icon in the top right corner of the screen.
2. Type in your password and press **OK**.
   You are signed in.
3. Press **Continue** to return to the previous screen.

You have 3 attempts to type in the password. If an incorrect password is given more than 3 times, you need to wait for 30 minutes before trying again.

Table 29. Default passwords

Level	Name	Password	Description
1	USER	1111	USER
2	CONTROL	0101	USER + CONTROL
3	CONFIGURATION	1212	USER + CONTROL + CONFIGURATION
4	SERVICE	Note: The password for service is changed monthly.	USER + CONTROL + CONFIGURATION + SERVICE

To modify the user settings, you need to enter the level 2 password.

8.4 System control instructions

8.4.1 Start the UPS system in the double conversion mode

The UPS system can consist of a single UPS or several parallel UPSs. UPSs with their MOB open are not considered as part of the system.

To start the UPS system.

1. Close the UPS input feeder circuit breaker.
2. Close the UPS bypass input feeder circuit breaker.
3. Wait for the UPS control panel display to become active and to indicate logic power.
4. Repeat steps 1-3 for each individual UPS in the system.
5. In the home screen, press **Controls**.
   The System controls screen appears.
6. In the System controls screen, make sure that the system status is `SHUTDOWN`.
7. In the System controls screen, press the **Go online** button.
   If Auto Bypass is enabled (factory default), the critical load is immediately supplied by the bypass source, in the bypass mode, until the inverter turns on and the UPS transfers to the double conversion mode. The status indicator on the UPS control panel indicates that the UPS is in the bypass mode. If auto bypass is not enabled, the UPS output remains off until the UPS system transfers to double conversion mode.
8. Wait for the following messages to appear sequentially on the System controls screen:
   `STARTING`
   `ONLINE`
   The rectifier and inverter turn on. The DC voltage continues to ramp up to full voltage. Once the DC link reaches full voltage and the battery breaker is closed, the UPS output contactor K3 closes and the static switch turns off. Power is now supplied to the critical load in the double conversion mode.

The UPS system now operates in the double conversion mode. The blue status indicator for normal operation is lit in all the UPSs and UPMs in the system. The system status is shown as `UNIT ONLINE`. The UPM status is shown as `ACTIVE`.

8.4.2 Start the UPS system in the bypass mode

CAUTION

In the bypass mode, the critical load is not protected from mains power interruptions and abnormalities.

If the inverter output of the UPS is not available and the critical load needs to be energized, do the following procedure:

1. Close the UPS input feeder circuit breaker.
2. Close the UPS bypass input feeder circuit breaker.
3. Wait for the UPS control panel to become active and indicate logic power.
4. Repeat steps 1-3 for each single UPS in the system.
5. In the home screen, press **Controls**.
   The System controls screen appears.

6. In the System Controls screen, make sure that the system status is SHUTDOWN.
7. In the System controls screen, press the **Go to bypass** button.
   The critical load is immediately supplied by the bypass source, in the bypass mode.

The UPS system is now operating in the bypass mode. The yellow bypass status indicator is lit.

8.4.3 Transfer from the bypass mode to the double conversion mode

To transfer the critical load to the double conversion mode:

1. In the home screen, press **Controls**.
   The System controls screen appears.
2. In the System controls screen, press the **Go online** button.
   The UPS system transfers to the double conversion mode. If there is not enough UPM capacity available, the system remains in the bypass mode and an alarm sounds.The UPS now operates in the double conversion mode. The blue status indicator for normal operation is lit in all the UPSs and UPMs in the system. The system status is shown as `UNIT ONLINE`. The UPM status is shown as `ACTIVE`.

8.4.4 Transfer from the double conversion mode to the bypass mode

CAUTION

In the bypass mode, the critical load is not protected from mains power interruptions and abnormalities.

To transfer the critical load to the bypass mode.

1. In the home screen, press **Controls**.
   The System controls screen appears.
2. In the System controls screen, press the **Go to bypass** button.
   The UPS system transfers to the bypass mode and the critical load is immediately supplied by the bypass source. If the bypass source is not available, the power processor remains on and an alarm sounds.

The UPS system now operates in the bypass mode and the yellow bypass status indicator is lit. The UPM status is shown as **Ready**. The system status is shown as `ON BYPASS`.

8.4.5 Shut down the UPS system and critical load

To do maintenance or service on the critical load, shut down the power to the load:

1. Turn off all the equipment that is powered by the UPS system.
2. Do the SHUT DOWN procedure (see *Section*).
   The input, output, and bypass backfeed contactors open, the battery breaker or disconnect is tripped, and the power module is turned off.
3. Open the UPS input and bypass feeder circuit breakers.
4. Repeat the steps for all the UPSs in the system.

DANGER

Power is still present inside each UPS cabinet until the upstream feeder circuit breaker is opened, and in case of a parallel system, the output is isolated or parallel units are shut down as well.

8.4.6 De-energize the critical load

Initiate a UPS system Load Off by pressing the **Shut Down** button in the **Controls** screen. This button can be pressed to control the UPS output. The Shut Down button de-energizes the critical load and shuts down the UPS system. The UPS system (including bypass) remains off until it is restarted.

1. Press **Shut Down**.
   The shutdown screen appears, providing a choice to proceed or abort the shutdown.
2. To shut down the UPS, press **Shut Down**. To abort the shutdown, press **Cancel**.

NOTE: All power to the critical load is lost when Shut Down is selected. Only use this feature when you want to de-energize the critical load.

When Shut Down is selected, the input, output, and bypass backfeed switch open, the battery breaker or disconnect is tripped, and all the UPSs in the system are turned off.

To restart the UPS system, do the procedure in *Section 8.4.1 Start the UPS system in the double conversion mode*.

CAUTION

Do not attempt to restart the system after Shut Down until you have identified and cleared the cause of the shutdown.

8.5 Control a single UPS in a parallel system

8.5.1 Start a single UPS

Make sure that the load level does not exceed the single UPS capacity.

To start the UPS.

1. Close the UPS input feeder circuit breaker.
2. Close the UPS bypass input feeder circuit breaker.
3. Wait for the UPS control panel display to become active and indicate logic power.
4. In the home screen, press **Controls**.
5. Press the UPS controls button.
   In the UPS controls screen, the system status is shown as `SHUTDOWN`.
6. In the UPS controls screen, press the **Go online** button.
   If Auto Bypass is enabled (factory default), the critical load is immediately supplied by the bypass source in the bypass mode, until the inverter turns on and the UPS transfers to the double conversion mode. The yellow status indicator on the UPS control panel indicates that the UPS is in the bypass mode. If auto bypass is not enabled, the UPS output remains off until the UPS system transfers to the double conversion mode.
7. In the UPS control screen, press the **Go online** button.

8. Wait for the following messages to appear sequentially on the UPS status line:
   `STARTING`
   `ONLINE`
   The rectifier and inverter turn on. The DC voltage continues to ramp up to full voltage. Once the DC link reaches full voltage and the battery breaker is closed, the UPS output contactor K3 closes. Power is now supplied to the critical load in the double conversion mode. It takes approximately 20 seconds for the UPS system to achieve the double conversion mode.

The UPS system is now operating in the double conversion mode and the green status indicator for normal operation is lit in the UPS and all the UPMs.

8.5.2 Shut down a single UPS

A single UPS in the system can be shut down only if it is redundant. In practice, this means that a UPS is not allowed to be shut down if doing so would lead to an overload condition in the remaining UPSs in the system.

To shut down a single UPS.

1. In the home screen, press **Controls**.
   The system controls screen is displayed.
2. In the System controls screen, press **UPS controls**.
3. In the UPS control screen, select **Shut down UPS**.

8.5.3 Enable and disable the battery charger

To turn the battery charger on or off.

1. In the home screen, press **Controls**.
   The System controls screen appears.
2. In the System controls screen, press **UPS controls**.
3. Press the **Turn on / Turn off** button.

8.6 UPM control instructions

8.6.1 Start the UPMs

Make sure that the load level does not exceed the single UPM capacity.

To start an individual power module in the double conversion mode.

1. Close the UPS input feeder circuit breaker.
2. Close the UPS bypass input feeder circuit breaker.
3. Wait for the UPS control panel to become active and indicate logic power.
4. In the home screen, press **Controls**.
   The System controls screen is displayed.
5. In the System controls screen, check that the UPS status is shown as `SHUTDOWN`.
6. Make sure that there are no active alarms.
7. In the System controls screen, press **Modules**.
   The Select module screen is displayed.

8. Select the UPM you want to start.
   The UPM control screen is displayed. The UPM status is shown as `SHUTDOWN`.
9. In the UPM control screen, select **Go Online**.
10. Wait for the following messages to appear sequentially on the UPM status line:
    `READY`
    `ACTIVE`
    The UPM rectifier and inverter turn on and the UPM transfers to the double conversion mode and supplies the critical load. The green status indicator for normal operation is lit in the front panel of the UPM .

8.6.2 Shut down the UPMs

A single UPM in the system can be shut down only if it is redundant. In practice, this means that a UPM is not allowed to be shut down if doing so would lead to an overload condition in the remaining UPMs or UPSs in the system.

To shut down a single UPM.

1. In the home screen, press **Controls**.
   The System controls screen is displayed.
2. In the System controls screen, press **Modules**.
   The Select module screen is displayed.
3. Select the UPM you want to shut down.
4. In the UPM control screen, select **Shut down** module.

CAUTION

The UPM must be in the shutdown state before it can be removed from the UPS. The UPM will suffer serious damage if it is removed from the UPS under loading.

8.7 Use the Emergency Power-off switch

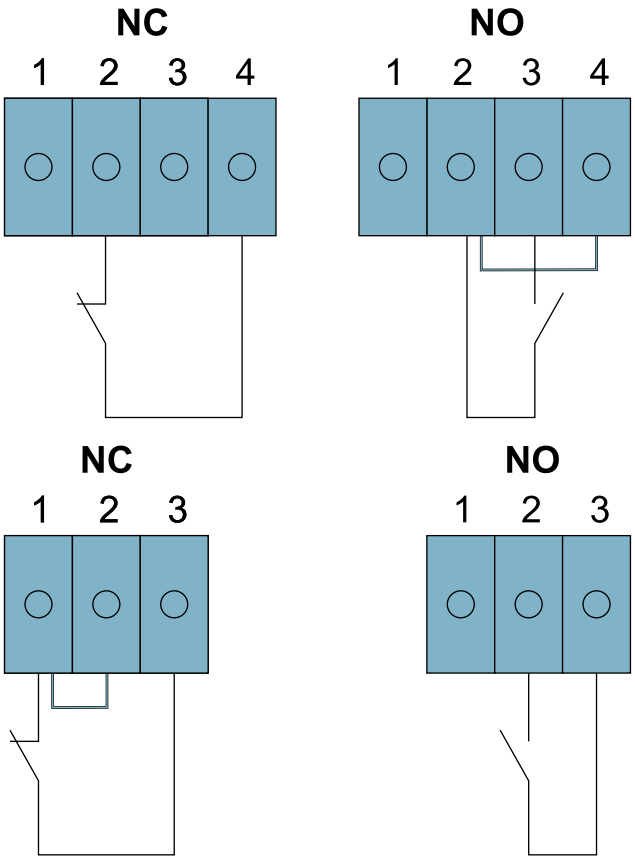
A UPS emergency power-off is initiated by the EPO push button switch. In case of an emergency, you can use this switch to control the UPS output. The EPO switch de-energizes the critical load and powers down the UPS immediately without asking for verification. The UPS, including the static bypass switch, remains off until it is restarted.

CAUTION

When the EPO switch is activated, all power to the critical load is lost. Use this feature only in case of emergency.

NOTE: The following instructions are for the EPO switch supplied by Eaton Corporation. If you are using a customer-supplied EPO switch, it may not activate in the same way. For operating instructions, see the documentation provided with the switch.

Figure 45. Output relay configurations



To use the EPO switch.

1. Press the EPO push button switch.
   The input, output, and bypass backfeed contactors open, the battery breaker or disconnect is tripped, and the power module is turned off immediately, without asking for verification.

To restart the UPS after using the EPO pushbutton, reset the EPO switch and then follow the procedure in *Section 8.4.1 Start the UPS system in the double conversion mode*.

WARNING

Do not attempt to restart the system after using the EPO switch until the conditions for safe start-up have been confirmed.

9 UPS maintenance

9.1 Introduction to UPS maintenance

The components inside the UPS cabinet are secured to a sturdy metal frame. All repairable parts and assemblies are located for easy removal with very little disassembly. This design allows authorized service personnel to perform routine maintenance and servicing quickly. Schedule periodic performance checks of your UPS system to keep it running properly. Regular routine checks of the operation and system parameters enable your system to function efficiently for many trouble-free years.

9.2 Important safety instructions

Remember that your UPS system is designed to supply power **EVEN WHEN IT IS DISCONNECTED FROM THE UTILITY POWER**. The UPS module interiors are unsafe until the DC power source is disconnected and the electrolytic capacitors are discharged.

After disconnecting the utility power and the DC power, authorized service personnel must wait at least 5 minutes for capacitor bleed-off before attempting internal access to the UPS module.

DANGER

LETHAL VOLTAGE. Do not operate the UPS system without the cabinet doors or protective panels secured. Do not make any assumptions about the electrical state of any cabinet in the UPS system.

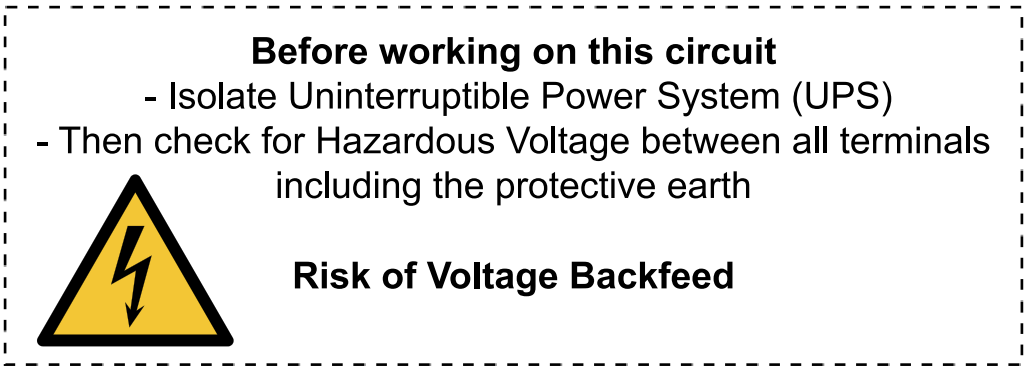
WARNING

All service and maintenance work must be done only by service personnel qualified and authorized by Eaton.

CAUTION

A warning label, shown in Figure *46: Warning label*, must be installed at the UPS input terminals and all the primary power isolators used to isolate the UPS unit if the UPS is connected to an IT earthed supply, or if the UPS input is connected through external isolators that, when opened, isolate the neutral. You can get these warning labels from your local service representative.

Figure 46. Warning label



Since each battery string is an energy source in itself, opening the battery circuit breaker does not de-energize the voltage within the battery string.

DANGER

Do not attempt to access any internal area of the battery string. Voltages are always present in the battery strings. If you suspect that a battery string needs service, contact your service representative.

Obey these precautions when working on or around batteries:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries or battery cabinets.
- Before you connect or disconnect a terminal, first disconnect the charging source.
- Determine if the battery is inadvertently grounded. If it is, remove the source of the ground. Contact with any part of a grounded battery can result in an electrical shock. The likelihood of such a shock is reduced if such grounds are removed during installation and maintenance.
- When you replace batteries, use the same number of sealed, lead-acid batteries.
- Discard batteries according to your local codes for disposal requirements.

9.3 Preventive maintenance

The UPS system requires very little preventive maintenance. However, inspect the system periodically to verify that the units are operating normally and that the batteries are in good condition.

The majority of the service and maintenance work must be performed by service personnel qualified by Eaton. Only the actions described in *Section9.3.1 Daily maintenance* and *Section 9.3.2 Monthly maintenance* are allowed to be done by the user.

9.3.1 Daily maintenance

Do this daily.

1. Examine the area surrounding the UPS system. Make sure that the area is not cluttered, allowing free access to the unit.
2. Examine that the air intakes (vents on the front door of the UPS cabinet) and the exhaust openings (at the rear of the UPS cabinet) are not blocked.
3. Make sure that the operating environment is within the parameters specified in *Section 5.4.3 Installation considerations* and *4.1 About technical data*.
4. Make sure that the UPS is in the normal mode (the normal mode status indicator is illuminated). If an alarm lamp is lit or the normal mode status indicator is not lit, contact an Eaton service representative.

9.3.2 Monthly maintenance

Do this once a month.

1. Examine the system parameters on the control panel (see *Section 8.2.5 Menu structure of the 9395XP UPS*).
2. If the optional air filters are installed, examine them (located behind the front doors) and wash or replace them, if needed. Contact your service representative for replacement filters. To replace the filters:
   a. Open the UPS front door.
   b. Replace the filters.
   c. Remove the UPM door.
   d. Replace the filters.
   e. Install the UPM door.
   f. Close the UPS front door.
3. Record the check results and any corrective actions in a service log.

9.3.3 Periodic maintenance

Inspect the UPS periodically to determine if components, wiring, and connections exhibit evidence of overheating. Pay particular attention to bolted connections. Bolted connections must be re-torqued periodically.

9.3.4 Annual maintenance

CAUTION

Only authorized personnel that are familiar with the maintenance and servicing of the UPS system are allowed to do annual preventive maintenance. Contact your service representative for more information about service offerings.

9.3.5 Battery maintenance

CAUTION

Only authorized personnel are allowed to do battery replacement and maintenance. Contact your service representative for battery maintenance.

9.4 Recycling the used UPS or batteries

Remove the battery bank before you discard the UPS or its battery cabinet. Obey the local requirements regarding battery recycling or disposal.

WARNING

Only authorized personnel are allowed to remove the batteries due to the risk caused by high energy and voltage.

Do not discard waste electrical or electronic equipment in the trash. For proper disposal, contact your local collecting/recycling/reuse or hazardous waste center and follow the local legislation.

The following symbols indicate a product requiring special handling:

Figure 47. WEEE symbol

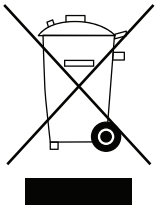
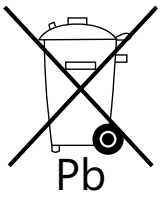


Figure 48. Recycling batteries symbol



When handling waste from electrical and electronic equipment, use proper local collecting centers that meet local legislation.

WARNING

HAZARDOUS MATERIALS.

Batteries may contain high voltages and caustic, toxic and flammable substances. If used improperly, batteries can injure or kill people and damage equipment.

Do not discard unwanted batteries or battery material in the public waste disposal system. Obey all the applicable local regulations regarding the storage, handling and disposal of batteries and battery materials.

9.5 Maintenance training

For more information about training and other services, contact your Eaton representative.

10 Warranty

10.1 General information about warranty

The product is warranted against defects in materials and workmanship for a period of twelve (12) months from its original date of purchase. The local office or distributor may grant a warranty period different to the above. Please refer to local terms of liability as defined in the supply contract.

The UPS manufacturer is not responsible for:

- Any costs resulting from a failure if the installation, commissioning, repair, alternation, or ambient conditions of the equipment do not fulfill the requirements specified in the documentation delivered with the unit and other relevant documentation.
- Equipment subjected to misuse, negligence or accident.
- Equipment comprised of materials provided or designs stipulated by the purchaser.

The warranty is only valid if the installation inspection and initial startup of the UPS unit is carried out by an authorized Eaton Field Service Engineer or by other qualified service personnel authorized by Eaton. Service and maintenance of the UPS shall also be performed only by an authorized Eaton Field Service Engineer or by other qualified service personnel authorized by Eaton. Otherwise the warranty will be voided.

If the product fails to meet its published specifications due to a defect in material and workmanship, covered by this warranty, the seller will repair or replace the warranted product. Such repair or replacement will be made by Eaton or by a service provider approved by Eaton. Repair or replacement during the warranty period does not extend the original warranty. Warranty does not cover taxes, which will be due in connection with replacement or repair of the product.

Batteries are warranted against failures in material and workmanship, not against the normal aging and reduction of ampere-hour capacity. The product storage environment has to meet manufacturer's specifications, failure to do this will cause the warranty to be voided.

Under no circumstances shall the manufacturer, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, losses or penalties.

The technical data, information and specifications are valid at the time of printing. The UPS manufacturer reserves the right to modifications without prior notice.

10.2 Whom to contact in case of Warranty

In case of Warranty, or while unsure if the unit in question is covered by warranty, contact the respective sales organization where the unit was purchased. Have the following information available:

- Purchase order number and purchase order date
- Installation date

  OR
- Serial number and part number of the unit (information available on the unit's label)

APPENDIX A: Eaton Product Secure Configuration Guidelines

Documentation to securely deploy and configure Eaton products

Eaton 9395XP UPS has been designed with cybersecurity as an important consideration. A number of features are offered in the product to address cybersecurity risks. These Cybersecurity Recommendations provide information to help users to deploy and maintain the product in a manner that minimizes the cybersecurity risks. These Cybersecurity Recommendations are not intended to provide a comprehensive guide to cybersecurity, but rather to complement customers' existing cybersecurity programs.

Eaton is committed to minimizing the cybersecurity risk in its products and deploying cybersecurity best practices in its products and solutions, making them more secure, reliable and competitive for customers.

The following whitepapers are available for more information on general cybersecurity best practices and guidelines:

Cybersecurity Considerations for Electrical Distribution Systems (WP152002EN):

http://www.eaton.com/ecm/groups/public/@pub/@eaton/@corp/documents/content/pct_1603172.pdf

Cybersecurity Best Practices Checklist Reminder (WP910003EN):

http://www.cooperindustries.com/content/dam/public/powersystems/resources/library/1100_EAS/WP910003EN.pdf

Cybersecurity Best Practices for Modern Vehicles - NHTSA:

https://www.nhtsa.gov/staticfiles/nvs/pdf/812333_CybersecurityForModernVehicles.pdf

Category	Description
Intended Use & Deployment Context	**Eaton 9395XP UPS** is a large three-phase uninterruptible power supply (UPS) for commercial and industrial settings. It should be handled only by authorized personnel with adequate training. The product is meant to be located in a secure area that only authorized personnel have access to.
Asset Management	Keeping track of software and hardware assets in your environment is a pre-requisite for effectively managing cybersecurity. Eaton recommends that you maintain an asset inventory that uniquely identifies each important component. To facilitate this, Eaton 9395XP UPS supports the following identifying information: Hardware: Manufacturer, Type, Serial number, f/w version number, and location. Software: Eaton 9395XP UPS has no user-installed software. CTO, serial number, and all firmware versions can be seen from the HMI or Communication card.(e.g : Industrial Gateway Card) under Settings -> Information
Risk Assessment	Eaton recommends conducting a risk assessment to identify and assess reasonably foreseeable internal and external risks to the confidentiality, availability and integrity of the system | device and its environment. This exercise should be conducted in accordance

Category	Description
	with applicable technical and regulatory frameworks such as IEC 62443 The risk assessment should be repeated periodically.
Physical Security	An attacker with unauthorized physical access can cause serious disruption to system/device functionality. Additionally, Industrial Control Protocols don't offer cryptographic protections, making ICS and SCADA communications especially vulnerable to threats to their confidentiality. Physical security is an important layer of defense in such cases. **Eaton 9395XP UPS** is designed to be deployed and operated in a physically secure location. Following are some best practices that Eaton recommends to physically secure your system/device: • Secure the facility and equipment rooms or closets with access control mechanisms such as locks, entry card readers, guards, man traps, CCTV, etc. as appropriate. • Restrict physical access to cabinets and/or enclosures containing **Eaton 9395XP UPS**and the associated system. Monitor and log the access at all times. • Physical access to the telecommunication lines and network cabling should be restricted to protect against attempts to intercept or sabotage communications. It's a best practice to use metal conduits for the network cabling running between equipment cabinets. • **Eaton 9395XP UPS** supports the following physical access ports. Access to these ports should be restricted. • Do not connect removable media (e.g., USB devices, SD cards, etc.) for any operation (e.g., firmware upgrade, configuration change, or boot application change) unless the origin of the media is known and trusted. • Before connecting any portable device through a USB port or SD card slot, scan the device for malware and viruses. *The product has a keyed locking front door that restricts access to the physical ports. The key should be available to authorized personnel only.*
COTS Platform Security	Eaton recommends that customers harden third-party commercial off-the-shelf (COTS) operating systems or platforms that are used to run Eaton applications / products (e.g., third party hardware, operating systems and hypervisors, such as those made available by Dell, Microsoft, VMware, Cisco, etc.). • Eaton recommends that customers refer to the COTS vendor's documentation for guidance on how to harden these components. • Vendor-neutral guidance is made available by the Center for Internet Security *https://www.cisecurity.org/* Irrespective of the platform, customers should consider the following best practices: • Install all security updates made available by the COTS manufacturer. • Change default credentials upon first login. • Disable or lock unused built-in accounts. • Limit use of privileged generic accounts (e.g., disable interactive login). • Change default SNMP community strings.

Category	Description
	• Restrict SNMP access using access control lists. • Disable unneeded ports & services.
Account Management	Logical access to the system | device should be restricted to legitimate users, who should be assigned only the privileges necessary to complete their job roles/functions. Some of the following best practices may need to be implemented by incorporating them into the organization's written policies: • Ensure default credentials are changed upon first login **Eaton 9395XP UPS** should not be deployed in production environments with default credentials, as default credentials are publicly known. • No account sharing – Each user should be provisioned a unique account instead of sharing accounts and passwords. Security monitoring/logging features in the product are designed based on each user having a unique account. Allowing users to share credentials weakens security. • Restrict administrative privileges - Attackers seek to gain control of legitimate credentials, especially those for highly privileged accounts. Administrative privileges should be assigned only to accounts specifically designated for administrative duties and not for regular use. • Leverage the roles / access privileges (Control/Config/Service-level logins supported by the product HMI) to provide tiered access to the users as per the business /operational need. Follow the principle of least privilege (allocate the minimum authority level and access to system resources required for the role). • Perform periodic account maintenance (remove unused accounts). • Ensure password length, complexity and expiration requirements are appropriately set, particularly for all administrative accounts (e.g., minimum 10 characters, mix of upper- and lower-case and special characters, and expire every 90 days, or otherwise in accordance with your organization's policies). • Enforce session time-out after a period of inactivity. • Password protected three different user levels(priorities). Level 1 : Basic changes such as operating modes. Level 2 : Minor set up changes available such as output rate, frequency etc. Level 3 : Service level
Time Synchronization	Many operations in power grids and IT networks heavily depend on precise timing information. Ensure the system clock is synchronized with an authoritative time source (using manual configuration, NTP, SNTP, or IEEE 1588). The time can be configured on the HMI under Settings -> Clock and Time Preferences
Network Security	**Eaton 9395XP UPS** supports network communication with other devices in the environment. This capability can present risks if it's not configured securely. Following are Eaton recommended best practices to help secure the network. Additional information about

Category	Description
	various network protection strategies is available in *Eaton Cybersecurity Considerations for Electrical Distribution Systems [R1]*. Eaton recommends segmentation of networks into logical enclaves, denying traffic between segments except that which is specifically allowed, and restricting communication to host-to-host paths (for example, using router ACLs and firewall rules). This helps to protect sensitive information and critical services and creates additional barriers in the event of a network perimeter breach. At a minimum, a utility Industrial Control Systems network should be segmented into a three-tiered architecture (as recommended by NIST SP 800-82[R3]) for better security control. Communication Protection: **Eaton 9395XP UPS** provides the option to encrypt its network communications. Please ensure that encryption options are enabled. You can secure the product's communication capabilities by taking the following steps: At initial product launch the product does not support network access. Therefore, HTTP/HTTPS, TLS/SSL, Certificate management, and TLS are not supported. Eaton recommends opening only those ports that are **required** for operations and protect the network communication using network protection systems like firewalls and intrusion detection systems / intrusion prevention systems. Use the information below to configure your firewall rules to allow access needed for 9395XP to operate smoothly The UPS needs the following ports open: • TCP 443 • TCP 80
Remote Access	Remote access to devices/systems creates another entry point into the network. Strict management and validation of termination of such access is vital for maintaining control over overall ICS security. Remote access is not supported by the product. All interaction is through the HMI
Logging and Event Management	• Eaton recommends logging all relevant system and application events, including all administrative and maintenance activities. • Logs should be protected from tampering and other risks to their integrity (for example, by restricting permissions to access and modify logs, transmitting logs to a security information and event management system, etc.). • Ensure that logs are retained for a reasonable and appropriate length of time. • Review the logs regularly. The frequency of review should be reasonable, taking into account the sensitivity and criticality of the system | device and any data it processes. Event logging is enabled by default. No configuration is necessary. Logged events include UPS alarms/notices/statuses; and UPS commands. HMI logins and configuration changes are not logged. Logs can be downloaded by an Eaton authorized service person.
Vulnerability Scanning	It is possible to install and use third-party software with **Eaton 9395XP UPS**. Any known critical or high severity vulnerabilities on

Category	Description
	third party component/libraries used to run software /applications should be remediated before putting the device | system into production. • Eaton recommends running a vulnerability scan to identify known vulnerabilities for software used with the product. For COTS components (e.g., applications running on Windows), vulnerabilities can be tracked on the National Vulnerability Database (NVD), available at *https://nvd.nist.gov/*. • Keep software updated by monitoring security patches made available by COTS vendors and installing them as soon as possible. Note: Many compliance frameworks and security best practices require a monthly vulnerability review. For many non-COTS products vulnerabilities will be communicated directly through the vendor site.
Malware Defenses	Eaton recommends deploying adequate malware defenses to protect the product or the platforms used to run the Eaton product.
Secure Maintenance	The device includes a REST API accessible through the 10/100 Ethernet service port to allow a service engineer with help from site administrator to trouble shoot the device functionality. This API allows service engineer to perform following tasks – Read meters and logs from the device for debugging Update firmware Change configuration settings Note: Enabling of REST API is provided for diagnostic purposes only and shall not be left enabled. It is intended to be used only by Eaton authorized service personnel. Best Practices Update device firmware prior to putting the device into production. Thereafter, apply firmware updates and software patches regularly. Eaton publishes patches and updates for its products to protect them against vulnerabilities that are discovered. Eaton encourages customers to maintain a consistent process to promptly monitor for and install new firmware updates. • An authorized Eaton service person can update the firmware on the product. Contact information for Eaton service can be found at: *lEngineering services | Electrical training | Power system analysis | Eaton* Please check Eaton's cybersecurity website for information bulletins about available firmware and software updates : https://www.eaton.com/gb/en-gb/company/news-insights/cybersecurity.html
Business Continuity / Cybersecurity Disaster Recovery	Plan for Business Continuity / Cybersecurity Disaster Recovery Eaton recommends incorporating **Eaton 9395XP UPS** into the organization's business continuity and disaster recovery plans. Organizations should establish a Business Continuity Plan and a Disaster Recovery Plan and should periodically review and, where possible, exercise these plans. As part of the plan, important system | device data should be backed up and securely stored, including: • The current configuration.

Category	Description
	• Documentation of the current permissions / access controls, if not backed up as part of the configuration. The following section describes the details of failures states and backup functions: • The UPS has various modes of failure that are reported through alarms on the HMI and in the logs. For detailed information on what a particular alarm means, please contact an Eaton authorized service person. • The current power status (Online, Shutdown, etc.) is displayed on the HMI in the top left corner. • An Eaton authorized service person can download the device configuration as a backup using the service port of the UPS.
Customer Application Security	**Eaton 9395XP UPS** provides a platform on which customers can customize and host applications according to their requirements. Security vulnerabilities in these applications may expose the underlying device to attack. Eaton recommends observing best practices for secure system development when customers develop and host an application on the device: • Privacy and Security by Design: The application should take security and privacy into consideration from the outset, including at the stage of defining requirements and assessing the associated risks. • Communication Protection: If the application communicates over the network, Eaton recommends encrypting the communications in accordance with the applicable level described by the FIPS 140-2 standard. • Access Enforcement: The application should provide the ability to enforce access controls to protect the application against unauthorized access and to protect accounts against unauthorized authentication attempts (for example, through account lockout). • Least Privilege: Any application developed by the customers should not run with root account privileges. The root account has full control over and access to the operating system. Therefore, if an application that requires root privileges has any security vulnerability, it endangers the entire system. • Input Checking: All input to the application should be sanitized before storing and processing by the application to protect against malicious code injection. • Output Handling: Data output by the application for user consumption, including error messages, should be appropriately handled to avoid revealing important information about the application and the underlying system. • Password Management: The application should securely store and transmit credentials (for example, encrypting authentication traffic, and salting and hashing passwords in transit and at rest). Password complexity should be implemented, and password should be masked when entered on-screen. • Secure Coding Practices: Follow secure coding practice while developing applications for the device (for example, implementing multiple security layers, verifying authorization for all requests, conducting code reviews, etc.).

Category	Description
	• Administration Interface: The interface for administering the application should be separated from the end-user interface. • Session Controls: All application sessions should be encrypted, logged and monitored. • Event Log Generation: The application should have the capability to log security related events at a minimum, including the time, date, and user.
Sensitive Information Disclosure	Eaton recommends that sensitive information (i.e. connectivity, log data, personal information) that may be stored by **Eaton 9395XP UPS** be adequately protected through the deployment of organizational security practices. The product does not store any sensitive information.
Decommissioning or Zeroization	It is a best practice to purge data before disposing of any device containing data. Guidelines for decommissioning are provided in NIST SP 800-88. Eaton recommends that products containing embedded flash memory be securely destroyed to ensure data is unrecoverable. * Figure and data from NIST SP800-88 • **Embedded Flash Memory on Boards and Devices** • Eaton recommends the following methods for disposing of motherboards, peripheral cards such as network adapters, or any other adapter containing non-volatile flash memory. • **Clear**: If supported by the device, reset the state to original factory settings The settings can be reset to factory defaults through the HMI Settings -> Reset Settings. • **Purge**: If the flash memory can be easily identified and removed from the board, the flash memory may be destroyed independently of the board that contained the flash memory. Otherwise, the whole board should be destroyed. Log information is stored on a microSD card on the MCU board internal to the product. Customers should not attempt to access this without an authorized service person, as it is behind the safety dead fronts of the product. • **Destroy**: Shred, disintegrate, pulverize, or incinerate by burning the device in a licensed incinerator.

APPENDIX B: Alarms and notices

This section describes the alarms, notices, status notifications, and commands in the 9395XP.

B.1 Event types

Four types of events are defined for the UPS. The events are categorized to provide consistent notification of event types.

- An **alarm** is a condition that requires immediate attention.
- A **sticky alarm** is an alarm that will not reset until the user chooses "Reset Alarms" or issues a command from the HMI.
- A **notice** is a minor alarm condition that does not require immediate attention. Many notices are encountered during normal operation.
- A **status condition** represents the state of the UPS and the status of UPS components, such as breakers. An active condition means ON or CLOSED. Status conditions are used by the HMI.
- A **command** is a request to change the state of the system, whether entered by the user or through a serial communications port.

The following table describes the characteristics of each event type.

Table 30. Event characteristics

Characteristic	Event type			
	Alarm	Notice	Status	Command
Displayed on header	Yes	Optional	No	No
Causes alarm LED to light	Yes	No	No	No
Sounds horn	Yes	No	No	No
User alarms	Always shown on Active Alarms screen; always shown when viewing system history log.			
Service alarms	Always shown on Active Alarms screen; only shown in Service log.			

B.2 Event logging

Different alternatives are available for logging the event.

- All: The event is logged whenever it goes active or inactive.
- Activated: The event is logged when activated.
- None: The event is not logged.
- UPM only: The event is logged only internally in the UPM. The event cannot be seen 011 the screen.
- MCU only: The event is logged only internally in the MCU. The event cannot be seen on the screen.
- Activation text: The text shown in the history log when the event goes active.
- Deactivation text: The text shown in the history log when the event goes inactive.

NOTE: The text strings defined in this chapter refer to individual UPMs and MCU.

B.3 Event numbers and error codes

- Event number: Each event has its own number defined in the firmware.

- Error code: In some cases, there may be several reasons for a particular event. In these cases, an error code is provided to indicate which type of error has occurred. This number is seen in the history log and can help in identifying the problem. Only part of the events uses error codes.

B.4 Relay Alarms

These alarms are for 9395XP Modular UPSs.

Table 31. 9395XP alarms

Alarm
Bypass Over Voltage
Bypass Under Voltage
Bypass Under Over Frequency
Output Under Voltage
Output Over Voltage
Output Under Over Frequency
Bypass Not Available
Bypass Switchgear Closed
Bypass Hot
Bypass Installed
UPS On Bypass
UPS Shutdown
ESS Active
UPS System Online
UPS On Battery
Pull Chain
Output Hot
UPS Ready
EEPROM Failure
5V Power Supply Failure
Battery LED
Bypass LED
Online LED
MIS Installed
MIS Closed

Alarm
UPS Starting
System On Bypass
UPS Not Redundant
UPMs Not Redundant
Remote Emergency Power Off
Site Wiring Fault
Ground Fault
UPM Requesting Battery Breaker Trip
K5 Stuck Open
K5 Stuck Closed
MCU Trip Battery Breaker
Maintenance Bypass Installed
On Manual Maintenance Bypass
MOB Open
Output Voltage Abnormal
STS Fan Fail
UPM Shutdown Command
UPM Standby Command
UPM Online Command
UPM Energize Output Command
AnyUPMreqs Standby
AnyUPMreqs_Online
Bypass Command
UPMs Starting
UPMs Ready
All Commanded UPMs Ready
Minimum Required UPMs Ready
Local UPMs Online
Input AC Under Voltage

Alarm
Inverter Matched To Bypass
Inverter Match Bypass Command
Bypass Load Dump
12V Power Supply Failure
15V Power Supply Failure
Bypass Communication Failure
Input Under Over Frequency
Output Bus Dead
Eep Offset Invalid
Bypass On
Static Switch Short
Bypass Phase Rotation
ESS Enabled
ESS Installed
UPM Suspend Command
Local UPMs Suspend
PhaseA OverLoad Level 1
PhaseB OverLoad Level 1
PhaseC OverLoad Level 1
PhaseA OverLoad Level 2
PhaseB OverLoad Level 2
PhaseC OverLoad Level 2
PhaseA OverLoad Level 3
PhaseB OverLoad Level 3
PhaseC OverLoad Level 3
PhaseA OverLoad Level 4
PhaseB OverLoad Level 4
PhaseC OverLoad Level 4
Output OverLoad Trip
Shutdown Imminent

Alarm
UPM Shutdown Imminent
Bypass Window Comparator Under Voltage
Bypass Window Comparator Over Voltage
Too Many Inverter Transfers
Disable Charger BA
Remote Bypass Cmd BA
Remote ESS on BA
Remote Online BA
On Generator BA
External Synchronise
Power Module Off BA
Force Maintenance Bypass BA
Batt Disconnected BA
Remote Rectifier Off BA
Reset Sticky Alarm BA
Remote Load Off BA
Disable Battery BA
Remote Ess Vmms Off BA
Check Pull Chain
Mcu Pull Chain Active
Output Energize
Start ECT
UPM Ect Command
UPMs ECT Mode
Ect Failure
Exit EctMode
Bypass Sync Out Of Range
Output Sync Out Of Range
Local UPM Tripped
UPS Rectifier On

Alarm
Inverter Contactor Installed
DC Link Precharged
Precharge DC Link Command
Local UPMs Standby
Bypass Zero Cross
Backfeed Contactor Installed
Ext Byp Brk Shunt Trip Installed
Auto Zero Hall sensor offsets
Inverter Inhibit Counter
Post ESS Mode
ESS Storm Detection
Dc Converter Ready
ESS Charge Current Over
Configuration Error
Alarm Relay 0 Closed
Software Incompatible
Emergency Transfer To Bypass
Air Circuit Breaker Installed
Battery DCUV Trip
No Sync To Bypass BA
Backup Energy Depleted BA
Native Input 1
Native Input 2
Native Input 3
Native Input 4
Native Input 5
Manual Battery Test
Disable Charger
State Change Timeout

Alarm
KVA Upgraded
Minislots Configured
Local UPMs Shutdown
Output Under Voltage Wide
Output Over Voltage Wide
Minislot 1 Input
Minislot 2 Input
Minislot 3 Input
Minislot 4 Input
UPM Can ID Error
Not enough power capacity (UPMs)
Cooling fan speed error
Output Not In Sync With Bypass
AnyUPMreqs Shutdown
External Can Fail
Any UPS Ready
System Bypass Available
Local UPM Inverter Contactor is Stuck
Battery Ground Fault BA
Not enough bypass capacity
ParallelETB
Parallel System Overload
Parallel Setup Error
Upm Lost from CAN
Distributed Parallel System
Internal Redundant System
Single UPS System
Input hot
UPM rectifier switchgear closed

Alarm
Inverter abnormal
Rectifier abnormal
UPS inverter on
DC link voltage abnormal
Battery installed
Charger failed
UPS charging
Battery test in progress
Battery contactor installed
Battery switchgear closed
Batteries disconnected
External battery breaker open
Battery voltage abnormal
ABM in Rest
UPM inverter switchgear closed
Output and Ext Sync out of sync
System Not Redundant
General alarm

Index

S

T

U

W

Powering Business Worldwide

Eaton Electric Oy
Riistakuja 1
FI-01740 Vantaa, Finland
www.eaton.eu