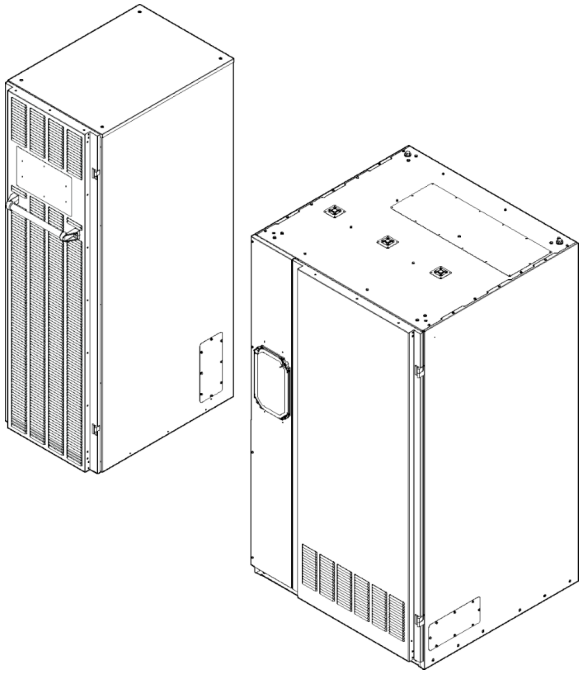
Powering Business Worldwide

User's and installation guide

Eaton 9PHD Accessory Cabinets

P-164000538



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 or additional measures may be needed to prevent disturbances.

Eaton Power Quality Oy

Address: Koskelontie 13
FI-02920 Espoo
FINLAND

Internet: www.eaton.eu

Approvals and version history

Revision	Date	Description of change	Approved by
1	28.01.2016	First issue	Heikki Vilkman

Original instructions _X_ / Translation of the original instructions __

Contents

1 How to read this manual

1.1 Safety-related signs

The following table explains the safety-related signs used in this document.

⚠ DANGER	**DANGER** indicates a hazard with a high level of risk which, if not avoided, will 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, o damage to your machine.
⚠ 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 your machine.

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

1.2 Safety symbols

1.2.1 Hazard symbols

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

	General warning sign		Explosion and fire hazard
	Electrical hazard		Corrosive hazard
	Battery hazard		

1.2.2 Prohibited action symbols

These symbols are used to indicate an action that should not be taken.

	General symbol for prohibited action		No smoking
	Limited or restricted access		

1.2.3 Mandatory action symbols

These symbols are used to indicate an action that must be taken.

	General symbol for mandatory action		Disconnect from power source
	Read the manual or instructions		

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

This document uses the following acronyms to refer to Eaton UPS products or their parts:

Table 1: Glossary of acronyms

ABM	Advanced Battery Management
EBC	External Battery Cabinet
EPO	Emergency Power-off
ESS	Energy Saver System

FI-UPM	Field Installed UPM
IPM	Intelligent Power Manager
IPP	Intelligent Power Protector
MBS	Maintenance Bypass Switch
MCB	Miniature Circuit Breaker
MOB	Module Output Breaker
REPO	Remote Emergency Power-off
SCR	Silicon-controlled Rectifier
STSW	Static Switch
UPM	Uninterruptible Power Module
UPS	Uninterruptible Power Supply
VMMS	Variable Module Management System

2 Safety instructions

DANGER

Important safety instructions!

Save these instructions!

This document contains important instructions that must be followed during the installation, operation and maintenance of the accessory cabinets. Read all of the instructions before operating the equipment. Keep this manual for future reference.

In this manual, the term UPS refers only to the UPS cabinet and its internal elements. The term UPS system refers to the entire power protection system – the UPS cabinet, the battery cabinet, and options or accessories installed.

The accessory cabinets contain components that carry high currents and voltage. A properly installed enclosure is earthed and is protected against electrical shock. An enclosure is protected against ingress of foreign objects and water with an IP23 rating at the minimum. The accessory cabinets are sophisticated power systems and only qualified personnel are allowed to install and service them.

DANGER

The accessory cabinets carry lethal voltages. All repairs and service must be performed by authorized personnel only. There are no user-serviceable parts inside the cabinets.

DANGER

Operations inside the cabinets must be performed by an Eaton authorized Customer Service Engineer or by a qualified service officer authorized by Eaton.

WARNING

To reduce the risk of fire or electric shock, install the battery cabinet in a temperature and humidity controlled, indoor environment that is free of conductive contaminants.

The ambient temperature must not exceed 40 °C (104 °F). Do not operate the UPS near water or excessive humidity (95% maximum). 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 may come from multiple sources. Also ensure system grounding / PE continuity.

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

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

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.

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 perform 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 the Battery mode.

Make sure that your replacement batteries are of the same number and type as the battery that was originally installed.

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

Check if the battery is inadvertently grounded. If it is, remove the source of the ground. Contacting any part of a grounded battery can cause a risk of electric shock. If you disconnect the grounding connection before you work on the batteries, the risk of an electric shock is less likely.

Dispose of 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.

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

Observe all DANGER, CAUTION, and WARNING notices affixed to the inside and outside of the equipment.

2.1 Audience

The intended audience of this document is as follows:

- People who plan and perform the installation of the UPS system
- People who use the UPS system

This document provides guidelines for how to check the delivery of the accessory cabinets as well as how to install and operate them.

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 perform work on the UPS system.

2.2 CE marking

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

- LV Directive (Safety) 2006/95/EY (applicable until 19 April 2016)
- LV Directive (Safety) 2014/35/EU (applicable from 20 April 2016)
- EMC Directive 2004/108/EY (applicable until 19 April 2016)
- EMC Directive 2014/30/EU (applicable from 20 April 2016)

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

2.3 User precautions

For the external battery cabinet, the only permitted user operation is to turn the battery circuit breaker on or off. There are no permitted user operations for the transformer cabinet.

Follow the precautions and only perform the described operations. Any deviation from the instructions can be dangerous to the user or cause accidental load loss.

DANGER

Do not open any screws in the unit. Failure to recognize the electrical hazards can prove fatal.

2.4 Environment

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

Ensure sufficient amount of ventilation air flow preferably by natural ventilation. Otherwise, forced (artificial) ventilation must be implemented. Where forced ventilation is used, the air extracted from the battery room must be exhausted to the atmosphere outside the building.

The air inlet and outlet must be located at the best possible location to create ideal conditions for the exchange of air. The following conditions are recommended:

- Position openings on opposite walls.
- Leave a minimum separation distance of 2 meters when openings are on the same wall.
- Locate the air inlet at the floor level and the air outlet close to the ceiling level.
- Create an airflow scheme, if you are installing multiple UPSs.
- Configure the installation layout with cold aisles and hot aisles due to the UPS front-to-rear airflow protocol.
- Do not exceed the product specifications. For the free cooling applications, a cooling plan based on a psychometric chart is highly recommended.

Excessive amount of dust in the operating environment of the battery cabinet may cause damage or lead to malfunction. Always protect the battery cabinet 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. Battery lifetime will be reduced, if the cabinets are used in a temperature higher than +25 ºC.

WARNING

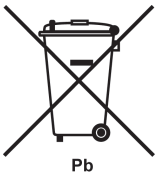
During charge, float charge, heavy discharge, and overcharge, hydrogen and oxygen gases are emitted from lead-acid and NiCd batteries into the surrounding atmosphere. Explosive gas mixture may be created if the hydrogen concentration exceeds 4% by volume in air. Ensure the necessary air flow rate for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

Ensure adequate air ventilation to locations where batteries or battery cabinets are. For the EBC-L, the minimum air flow per battery cabinet is 3.8 m^3/hour and the minimum free area of opening for inlet and outlet is 108 cm^2, when natural ventilation is used.

Note: For more information about the battery room ventilation requirements, including the calculation of the necessary air flow, see: IEC 62485-2: Safety requirements for secondary batteries and battery installations.

2.5 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.

2.6 Warning labels and notices in rooms

Doors to battery rooms and cabinets must be marked with warning labels as follows:

- "Dangerous voltage", if the battery voltage is more than 60 V.

- Barring sign for "Fire, naked flames, smoking prohibited".
- Warning sign "Accumulator, Battery Room" to indicate corrosive electrolyte, explosive gases, dangerous voltages and currents.

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.

Call 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

Note: For more information about the installation space, safe operation and working, see IEC 62485-2: Safety requirements for secondary batteries and battery installations.

3 Introduction to 9PHD Accessory cabinets

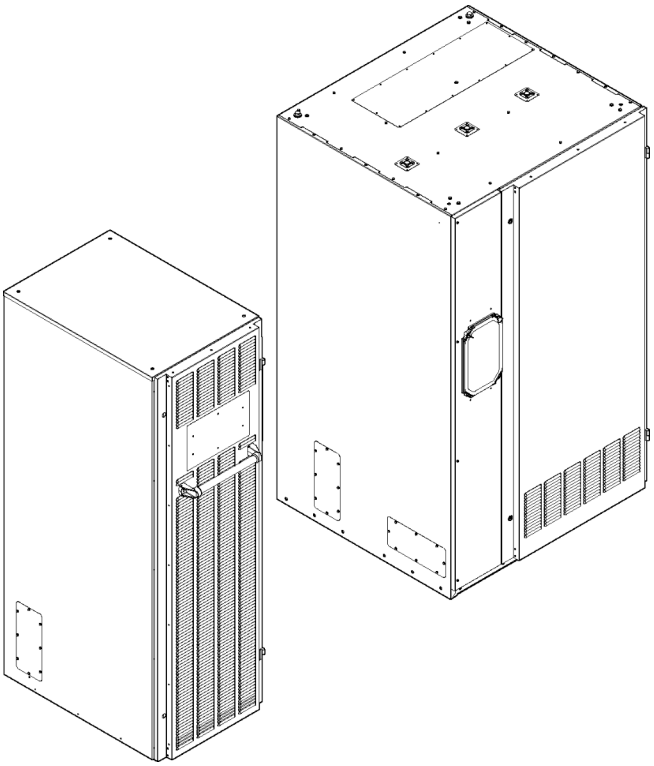


Figure 1. 9PHD transformer cabinet and large external battery cabinet (EBC-L)

3.1 Introduction to EBC-L

The Eaton external battery cabinet provides emergency short-term backup power to safeguard operation during brownouts, blackouts, and other power interruptions. It matches and lines with the Eaton 9PHD product line. There is one battery cabinet for 9PHD: the large external battery cabinet, EBC-L.

EBC-L is designed to be used with the uninterruptible power supply (UPS) rated up to 200 kW output power. EBC-L has one battery string that has 36 or 40 battery blocks.

Power and control wiring for EBC-L is supplied with the cabinet. The length of the supplied wiring is 4.0 m. The battery cabinet can be located freely of the UPS cabinet, if you run the Battery-to-UPS power wiring outside the cabinets.

However, if you choose to run the wiring through the side panels of the UPS and battery cabinet, the battery cabinet must be located on the UPS's right side.

By default, UPSs are configured to use valve-regulated lead-acid (VRLA) batteries. For the battery specification of your UPS unit, see the User's and Installation Guide of your UPS. If you are considering to connect any other type of batteries or other energy storage means, consult a certified and authorized service technician before proceeding with the installation.

The battery block configuration in the chosen battery cabinet must always match the UPS requirement. The battery configuration in use must be inserted into UPS settings during commissioning or start-up. Refer to the UPS User's and Installation Guide for UPS configuration.

The wiring for battery cabinet internal power wiring, battery-to-UPS power wiring and integral line-up and match battery cabinets control wiring is supplied with the external battery cabinets.

If you must use wiring other than that supplied with the cabinet, the following or similar wiring is recommended:

Table 2: Signal wiring specifications

Wiring	Description
Signal wires	4*0,75 mm^2, 300/500 V

Table 3: Minimum recommended multi-core cable and fuse sizes for battery connection, 9PHD 30–100 kW UPS

Input supply line-to-line voltage [V]		UPS rating [kW] 30	40	50	80	100
Battery cables	Pos. & neg. line	1 x 35	1 x 35	1 x 50	2 x 35	2 x 50
	Battery fuse [A]	200	200	200	400	400

Table 4: Minimum recommended multi-core cable and fuse sizes for battery connection, 9PHD 120–200 kW UPS

Input supply line-to-line voltage [V]		UPS rating [kW] 120	150	160	200
Battery cables	Pos. & neg. line	2 x 70	2 x 95	2 x 95	2 x 120
	Battery fuse [A]	500	500	630	630

EBC-L has cable entries on the cabinet's bottom, on its both sides and on the back wall.

For more information on connecting external battery cabinets to UPS, refer to 9PHD UPS 30–200 kW User's and Installation Guide.

3.2 Introduction to 9PHD transformer cabinet

The 9PHD external transformer cabinet can be used to house one or two transformers for the UPS system. The transformers can be either isolation or auto transformers.

The transformers can be used in the UPS input (single feed, supplying both rectifier and bypass inputs), rectifier input, bypass input or output lines. Typically the transformer cabinet is used for input and output, or input and bypass lines.

The transformers inside the transformer cabinet are temperature monitored. Those transformers are cooled by fans that have failure monitoring. The cooling fans are supplied from a 3-phase power supply through the circuit breaker F1.

For information on transformer cabinet power and signal terminals, see Figure *11* , Figure *12* and Table *12* .

3.3 Options

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

3.3.1 IP classifications

A properly installed 9PHD accessory cabinet enclosure is at a minimum IP23 rated against electrical shock and foreign objects. Higher IP classifications (IP33 or IP54) are available for 9PHD accessory cabinets as option.

3.3.2 Lifting eyes

Lifting eyes are an optional feature that can be incorporated into all 9PHD accessory cabinets. When unpacking and unloading the accessory cabinet, lifting eyes can be used to lift the cabinet to its installation location.

WARNING

Do not use lifting eyes to lift the battery cabinet, if batteries have already been installed. With batteries, the cabinet is too heavy.

To avoid serious injury and damage to the cabinet, only use lifting eyes when lifting an empty battery cabinet.

For more information on unpacking and unloading the accessory cabinets, see Section *4.4*.

3.3.3 Vibration dampers

Vibration dampers are an optional feature that can be incorporated into all 9PHD cabinet models. They are typically used in marine or offshore environments to eliminate vibration that could have a negative impact on the unit's performance.

Vibration dampers are alternative to casters and levelling feet: only one or the other can be incorporated to any 9PHD cabinet. The vibration damper option also features wall and floor mounting steel rails that enable firm fastening to vessel structure.

Contact your Eaton representative for dimensional drawings of vibration dampers.

Note: If your unit is equipped with vibration dampers, a minimum of 30 mm clearance is recommended on both sides of the cabinet to avoid the vibrating cabinet hitting any paralleled UPS or accessory cabinets.

4 Installation

Use the following basic sequence of steps to install the UPS and its accessory cabinets:

1. Create an installation plan for the UPS system.
2. Prepare your site for the UPS system.
3. Inspect and unpack the cabinets.
4. Unload and install the cabinets and wire the system.
5. Complete the installation checklist provided in Section *4.2*.
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 the warranty terms specified in the Warranty (see Chapter *7*) 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.

4.1 Creating 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 Sections *4.3*, *4.5* and *4.6* to create a logical plan for installing the system.

4.2 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 installed 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 any ancillary cabinets.	
All power cables are properly sized and terminated.	
Neutral conductors are installed according to the requirements.	
A ground conductor is properly installed.	
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.	
Room ventilation and air conditioning equipment is installed and operating correctly.	
The area around the installed UPS system is clean and dust-free (it is recommended that the UPS is installed on a level floor suitable for computer or electronic equipment).	
There is adequate workspace around the UPS and other cabinets.	
Adequate lighting is provided around all the UPS equipment.	
A 230 VAC service outlet is located within 7.5 meters of the UPS equipment.	
(OPTIONAL) Alarm relays and signal outputs are wired appropriately.	
(OPTIONAL) A remote battery disconnect control is mounted in its installed location and its wiring is terminated inside the UPS and battery cabinet.	
(OPTIONAL) Accessories are mounted in their installed locations and their wiring is terminated inside the UPS cabinet.	
Start-up and operational checks are performed by an Eaton authorized Customer Service Engineer.	

4.3 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.

The accessory cabinet installation site must meet the following guidelines:

- Install the system indoors on a level floor suitable for computer or electronic equipment.
- 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 and has sufficient air exchange.

The battery cabinet and transformer dimensions are shown in Figure *2* and Table *5* .

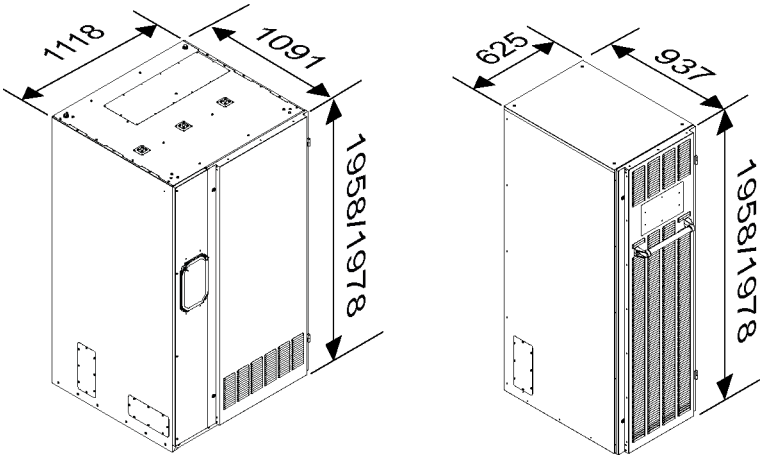


Figure 2. Battery cabinet and transformer cabinet dimensions for IP23/33 models (height with casters / with vibration dampers)

Table 5: Accessory cabinets' dimensions

Dimensions (W x D x H)	Transformer cabinet	EBC-L
IP23/33 cabinet dimensions	625 x 937 x 1,958/1,978*	1,118 x 1,091 x 1,958/1,978*
IP54 cabinet dimensions	625 x 987 x 1,958/1,978*	1,118x 1,145 x 1,958/1,978*
*Height for models with casters: 1,958. Height for models with vibration dampers: 1,978.		

Table 6: Accessory cabinets' maximum weights

	Shipping weight [kg]	Installed weight [kg]	Floor loading [kg/m^2]
Transformer cabinet	780	720	1,400

	Shipping weight [kg]	Installed weight [kg]	Floor loading [kg/m^2]
EBC-L	2,560	2,530	2,470

A DC-rated circuit breaker within each cabinet provides protection and service isolation.

The battery cabinets use convection cooling to regulate internal component temperature. Air inlets are at the bottom of the door and in the large battery cabinet also at the bottom of the back wall and outlets are on the rear of the cabinet. Allow clearance in front and rear of each cabinet for proper air circulation.

The clearance required around the accessory cabinets is shown in Table *7*.

Table 7: Battery and transformer cabinet minimum clearances

	EBC-L [mm]	Transformer [mm]
From the top of the cabinet	500	500
From the front of the cabinet	900	900
From the back of the cabinet	100*	300*
From the side of the cabinet	0	0
* Cabling may require more space.		

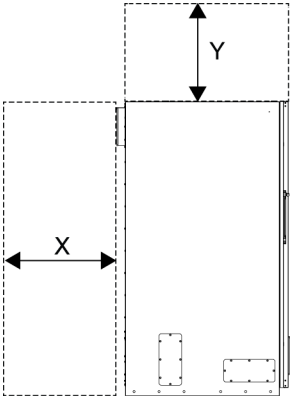


Figure 3. EBC-L clearances

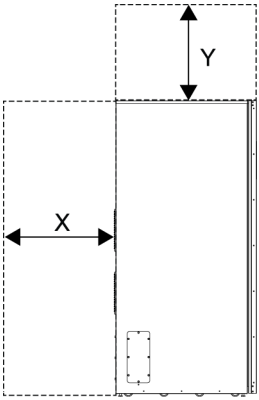


Figure 4. Transformer cabinet clearances

X= *clearance at the back of cabinet* ***Y=*** *clearance at the top of cabinet*

4.4 Unpacking and unloading the EBC-L and transformer cabinet

There are two options for unpacking and unloading the accessory cabinets:

- Unpacking and unloading Eaton 9PHD accessory cabinets with casters
- Unpacking and unloading Eaton 9PHD accessory cabinets with vibration dampers

For more information about these options, see Sections *4.4.1* and *4.4.2*.

Before you start to unpack and unload the accessory cabinets, check the TipNTell / DropNTell indicator on the package surface (see Section *4.4.1* step

2). 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.

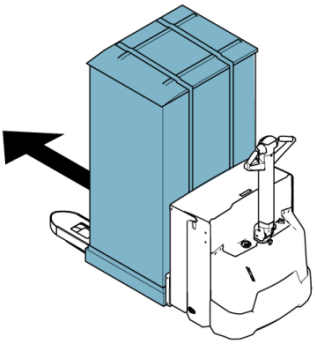
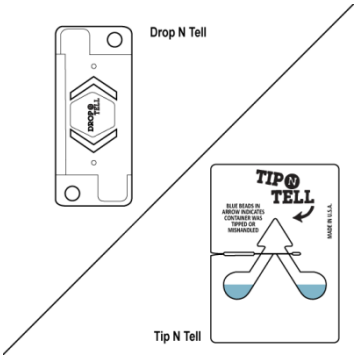
For transportation purposes, the accessory cabinet is bolted onto a wooden pallet or two wooden beams. To remove the pallet or beams, perform one of the following procedures, depending on the composition of your cabinet.

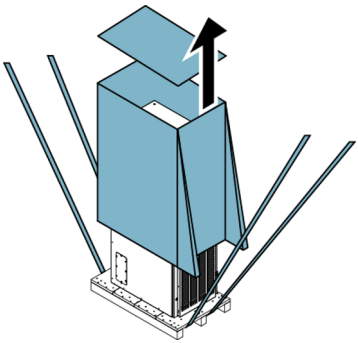
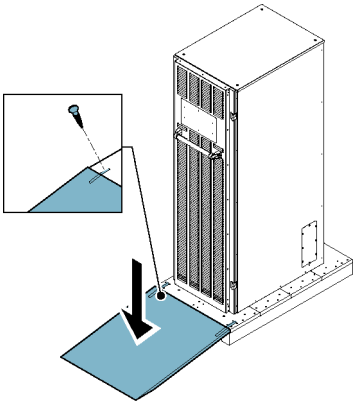
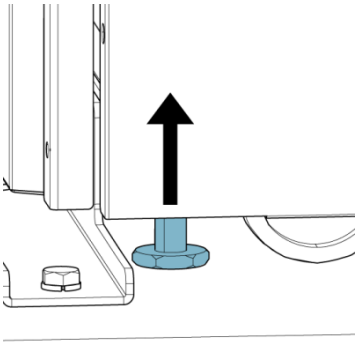
4.4.1 Unpacking and unloading Eaton 9PHD accessory cabinets with casters

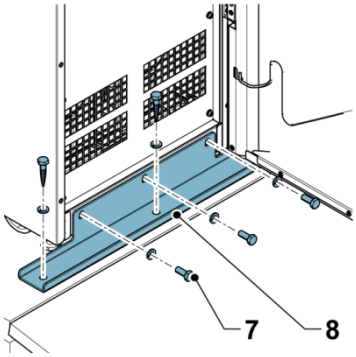
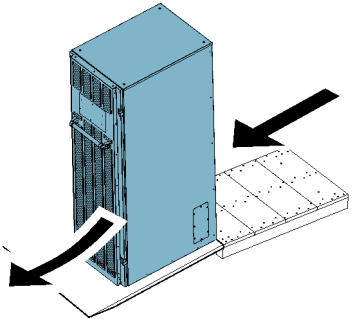
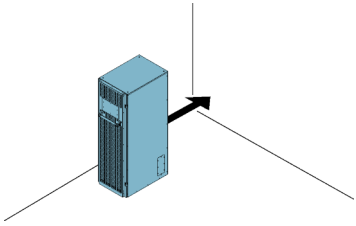
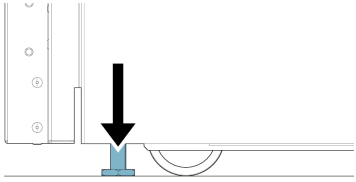
WARNING

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

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

1. Before you unload the cabinet from the pallet, use a forklift or other material handling equipment to move the cabinet to the installation area. Insert the forks of the forklift between the skids on the bottom of the unit.	
2. Make a visual inspection and check that there are no signs of shipping damages. Check the indicators. See the instructions next to the indicators on the package.	

3. Open the accessory cabinet package. A ramp for moving the cabinet off the pallet is attached on one side of the package.	
4. Place the ramp on the floor and attach it to the pallet with nails or screws so that it can be safely used for wheeling the cabinet off the pallet.	
5. If the leveling feet are not fully retracted, turn them until they are retracted.	
6. Open the cabinet door.	

7. Remove the bolts that fasten the shipping brackets to the cabinet and to the pallet. 8. Remove the shipping brackets.	
9. Slowly roll the cabinet toward the ramp edge. Be careful not to push the cabinet too much or too fast since it may cause the cabinet to tip over. Note that the cabinet is heavy. Make sure that you have enough manpower to handle and support the unit while rolling it off the pallet.	
10. Roll the cabinet to its final installation location.	
11. To secure the accessory cabinet in position, lower the leveling feet until the cabinet is level. Only use the leveling feet for leveling. Do not lift the casters off the ground, as the casters should still carry most of the cabinet's weight.	

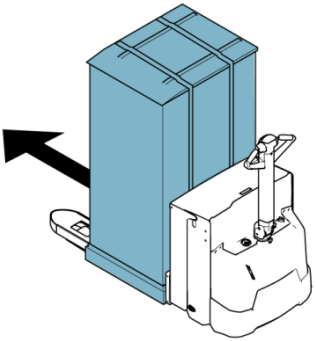
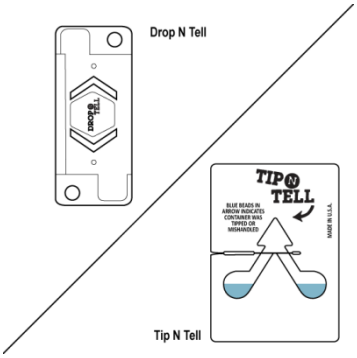
12. Reattach the shipping brackets to the accessory cabinet to provide extra support. Position the shipping brackets on the front and rear of the unit.

4.4.2 Unpacking and unloading Eaton 9PHD accessory cabinets with vibration dampers

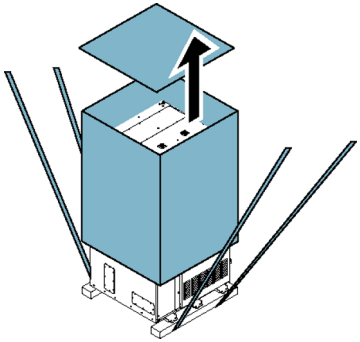
WARNING

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

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

1. Before you unload the cabinet from the pallet, use a forklift or other material handling equipment to move the cabinet to the installation area. Insert the forks of the forklift between the skids on the bottom of the unit.	
2. Make a visual inspection and check that there are no signs of shipping damages. Check the indicators. See the instructions next to the indicators on the package.	

3. Open the accessory cabinet package.



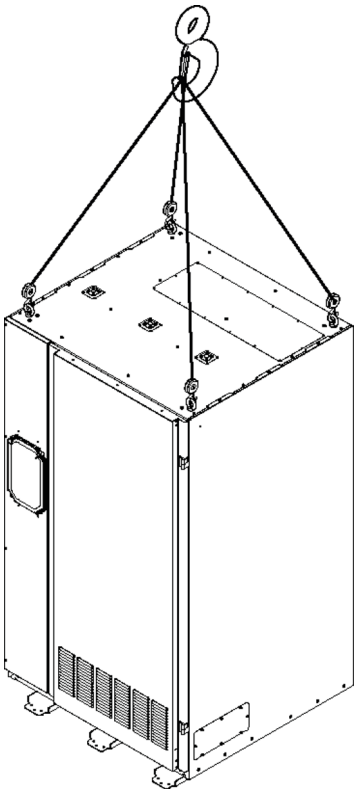
4. Remove the bolts that fasten the cabinet to the transportation beams.

5. Lift the accessory cabinet carefully from the pallet with your chosen method.
You can lift the cabinet:

   - from the bottom with a forklift or lifting slings, or
   - from the top with optional lifting eyes (only use lifting eyes for EBC-L if the cabinet is empty).

   If you lift from the bottom with lifting slings or a forklift:

   - remove the door stoppers and the cabinet door to avoid damaging it during lifting, and
   - support the cabinet from both sides with adequate manpower.



WARNING

Do not use lifting eyes to lift the battery cabinet, if batteries have already been installed. With batteries, the cabinet is too heavy.

To avoid serious injury and damage to the cabinet, only use the lifting eyes when lifting an empty battery cabinet.

6. Carefully lower the accessory cabinet to its installation location.
7. Fix the vibration dampers to the floor and the wall behind the cabinet with appropriate steel hardware or by welding.

4.5 Installing the EBC

DANGER

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

Make sure that:

- all of the parallel battery cabinets use the same number of battery blocks (36 or 40) and

- the UPS is configured to the same number of battery blocks.

WARNING

Make sure that all power sources are disconnected before installation.

CAUTION

If the cables are routed outside the cabinets, only use double insulated cables. If you need to use other cables than the ones provided with the cabinet, make sure that their temperature class and the cross-sectional area match those of the original cables.

For the 9PHD product line, there is one battery cabinet available: EBC-L.

Power and control wiring for the external battery cabinet is included in the cabinet delivery. The battery cabinet must be located to the right of the UPS cabinet if the wiring is to go through the inside panels of the cabinet. Because of this, the recommended installation is on the right.

There are several cable entries in the battery cabinet. EBC-L can be wired in the following ways:

- through the right side panel (see Figure *5*)

- through the left side panel (see Figure *6*)
- through the back wall (see Figure *6*)
- through the bottom (see Figure *6*)

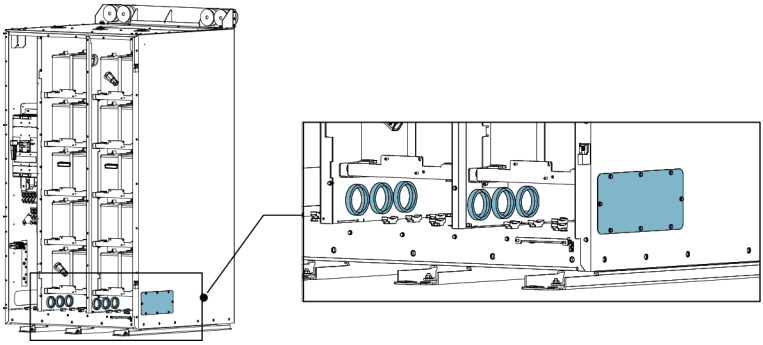


Figure 5. Battery cabinet through holes 1

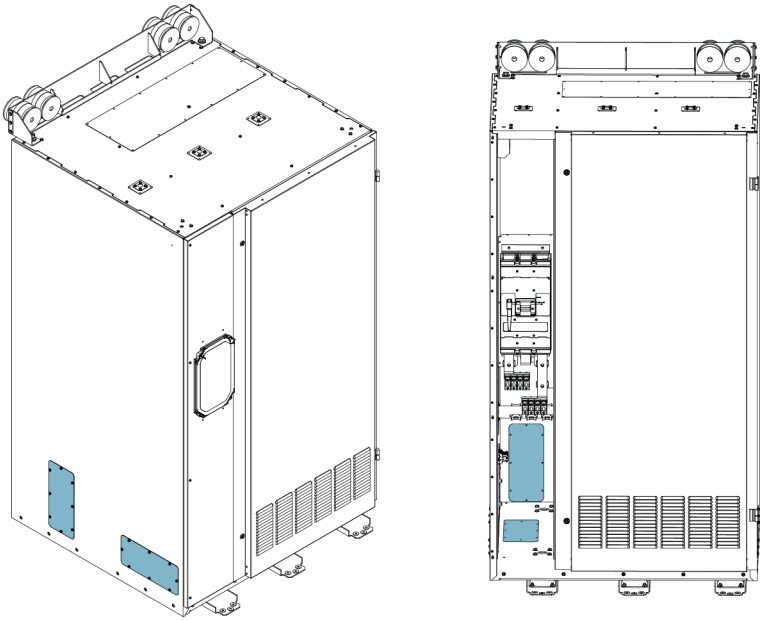


Figure 6. Battery cabinet through holes 2

Note: If you choose to run the wiring through the side panels of the UPS and battery cabinet, the battery cabinet must be located on the UPS's right side.

A DC-rated circuit breaker within each cabinet provides protection and servicing isolation.

The battery cabinet uses convection cooling to regulate internal component temperature and for cabinet ventilation. Air inlets are in the front of the cabinet and outlets are on the top or in the top back of the cabinet. Clearance must be allowed in front and back of each cabinet for proper air circulation.

- The system must be installed on a level floor suitable for computer or electronic equipment.
- The system must be installed in a temperature and humidity controlled indoor area free of conductive contaminants.

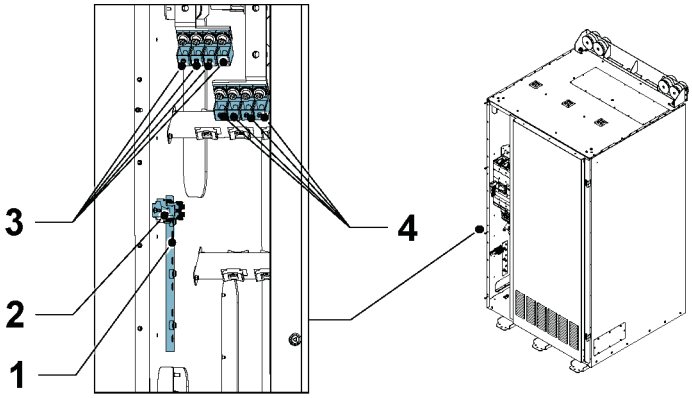


Figure 7. Battery cabinet terminals

1	*PE*	***3***	*MINUS terminals*
2	*Signal wiring block TB2*	***4***	*PLUS terminals*

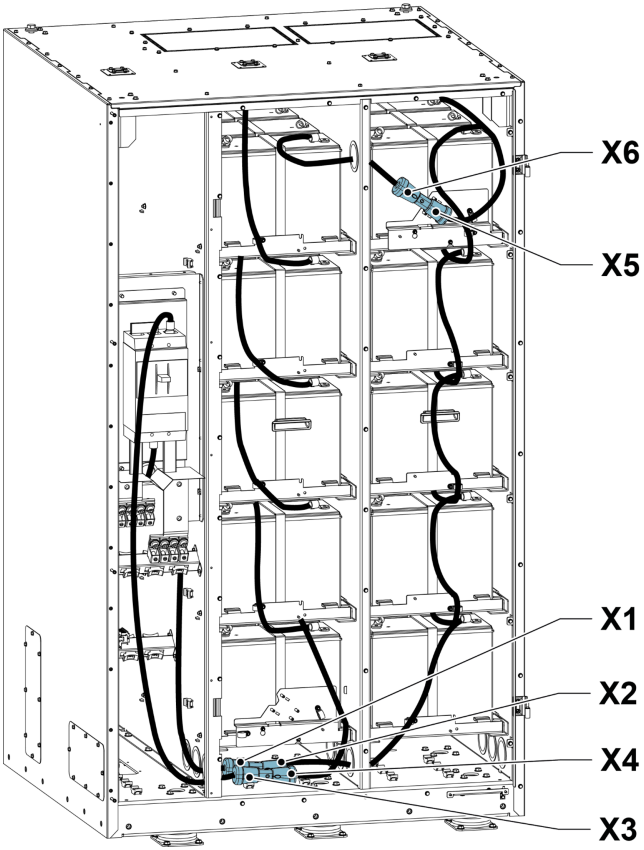


Figure 8. EBC-L battery cable connectors

1	*Connector X1*	**4**	*Connector X4*
2	*Connector X2*	**5**	*Connector X5*
3	*Connector X3*	**6**	*Connector X6*

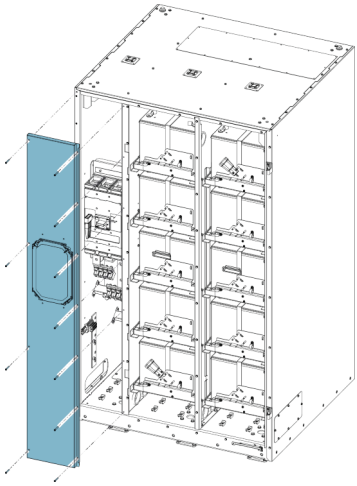
Figure *8* explains the battery cable connectors inside EBC-L. The connectors X1–X4 are set according to the correct battery string polarity by Eaton personnel. No customer operations to connectors X1–X4 are needed during normal operation.

If the batteries are exchanged for ones with different polarity, connectors X1–X4 have to be disconnected before the exchange and cross-connected after the new batteries are in place. Check battery string polarity on the battery circuit breaker before switching it on.

Note: For safety reasons, connectors X5 and X6 are disconnected during transportation. Connect them before operating EBC-L.

Follow these steps to connect the power cables and signal wires to the external battery cabinet:

1. Open the cabinet door.
2. Open the screws on the right front panel.
3. Remove the right front panel.



4. Route the signal wires and power cables through the through hole of your choosing. See Figures *5* and *6* for more information.
5. Apply suitable protection to protect the wiring from the sharp metal edges.
6. Connect the signal wires and the power cables to the connectors according to Figure *7*.
7. Put the front plate back and fasten the screws.

If multiple cabinets are used, repeat the steps for the rest of the cabinets and make sure that the signal wire harnesses are daisy chained in the next cabinet.

To daisy chain signal wires, cut the multiple connector and extra length of the cables and connect the cables to signal wiring block TB2 terminals.

4.6 Installing the transformer cabinet

When you plan and perform the installation, read and understand the following notes:

- Refer to national and local electrical codes for acceptable external wiring practices.
- To allow for future kVA upgrades (software and/or hardware), consider using conductors sized for full bypass rating of the UPS.
- Material and labor for external wiring requirements are to be provided by designated personnel.
- For external wiring, use copper cable rated for 70 °C at minimum. See the appropriate information in Table *8* and Table *9* . Refer to the UPS type plate for the input and output voltages of the UPS. Cable sizes are based on using the specified breakers.
- If cables are run in an ambient temperature greater than 30 °C, higher temperature cable and/or larger size cable may be necessary.

WARNING

Do not disconnect the neutral of a supply without disconnecting the phases at the same time.

- Neutral wire must be sized according to the load. With non-linear load equipment, neutral wire with a rating of 1.7 times the phase wire is recommended.
- A readily accessible disconnect device must be incorporated in all fixed input wiring.

Table 8: Minimum recommended multi-core cable and fuse sizes for rectifier input and by-pass input connection, 9PHD 30–100 kW UPS

Input supply line-to-line voltage [V]		UPS rating [kW] 30	40	50	80	100
208	Phase cables	1 x 50	1 x 70	1 x 95	1 x 185	1 x 240
	Rectifier and by-pass fuse [A]	125	160	200	315	400
	PE cable	1 x 25	1 x 35	1 x 50	1 x 95	1 x 120
230	Phase cables	1 x 50	1 x 70	1 x 95	1 x 185	1 x 240
	Rectifier and by-pass fuse [A]	125	160	200	315	400
	PE cable	1 x 25	1 x 35	1 x 50	1 x 95	1 x 120
380	Phase cables	1 x 16	1 x 25	1 x 35	1 x 70	1 x 95
	Rectifier and by-pass fuse [A]	63	80	100	160	200
	PE cable	1 x 16	1 x 16	1 x 16	1 x 35	1 x 50
400	Phase cables	1 x 16	1 x 25	1 x 35	1 x 70	1 x 95
	Rectifier and by-pass fuse [A]	63	80	100	160	200
	PE cable	1 x 16	1 x 16	1 x 16	1 x 35	1 x 50

Input supply line-to-line voltage [V]		UPS rating [kW] 30	40	50	80	100
415	Phase cables	1 x 16	1 x 25	1 x 35	1 x 70	1 x 95
	Rectifier and by-pass fuse [A]	63	80	100	160	200
	PE cable	1 x 16	1 x 16	1 x 16	1 x 35	1 x 50
440	Phase cables	1 x 16	1 x 25	1 x 35	1 x 70	1 x 95
	Rectifier and by-pass fuse [A]	63	80	100	160	200
	PE cable	1 x 16	1 x 16	1 x 16	1 x 35	1 x 50
480	Phase cables	1 x 10	1 x 25	1 x 35	1 x 70	1 x 95
	Rectifier and by-pass fuse [A]	50	80	100	160	200
	PE cable	1 x 10	1 x 16	1 x 16	1 x 35	1 x 50
690	Phase cables	1 x 6	1 x 10	1 x 16	1 x 35	1 x 50
	Rectifier and by-pass fuse [A]	40	50	63	100	125
	PE cable	1 x 6	1 x 10	1 x 16	1 x 16	1 x 25

Table 9: Minimum recommended multi-core cable and fuse sizes for UPS output connection, 9PHD 30–100 kW UPS

Input supply line-to-line voltage [V]		UPS rating [kW] 30	40	50	80	100
208	Phase cables	1 x 50	1 x 70	1 x 95	1 x 185	1 x 240
	PE cable	1 x 25	1 x 35	1 x 50	1 x 95	1 x 120
230	Phase cables	1 x 50	1 x 70	1 x 95	1 x 185	1 x 240
	PE cable	1 x 25	1 x 35	1 x 50	1 x 95	1 x 120
380	Phase cables	1 x 16	1 x 25	1 x 35	1 x 95	1 x 95
	PE cable	1 x 16	1 x 16	1 x 16	1 x 50	1 x 50
400	Phase cables	1 x 16	1 x 25	1 x 35	1 x 70	1 x 95
	PE cable	1 x 16	1 x 16	1 x 16	1 x 35	1 x 50
415	Phase cables	1 x 16	1 x 25	1 x 35	1 x 70	1 x 95
	PE cable	1 x 16	1 x 16	1 x 16	1 x 35	1 x 50
440	Phase cables	1 x 16	1 x 25	1 x 35	1 x 70	1 x 95
	PE cable	1 x 16	1 x 16	1 x 16	1 x 35	1 x 50
480	Phase cables	1 x 10	1 x 25	1 x 35	1 x 70	1 x 95
	PE cable	1 x 10	1 x 16	1 x 16	1 x 35	1 x 50
690	Phase cables	1 x 6	1 x 10	1 x 16	1 x 35	1 x 95
	PE cable	1 x 6	1 x 10	1 x 16	1 x 16	1 x 50

Note: Note that power upgrading of the UPS is possible only if the sizing of external cables is sufficient. Alternatively, external cabling must be upgraded as well. The type of the fuses is gG.

Cable sizing is based on IEC 60364-5-52. Sizing is for installation method C (wall installation) of PVC insulated copper wires. Conductor temperature: 70 °C, ambient temperature: 30 °C.

When using aluminium cables, check sizing recommendations from Eaton product support.

Table 10: Rated and maximum currents for rated power and voltage

Rated power [kW]	Rated voltage [V]	Rectifier input		Bypass input	UPS output
		Rated current [A]	Maximum current [A]	Rated current [A]	Rated current [A]
30	208	96	113	92	85
	230	87	102	83	77
	380	48	57	46	46
	400	46	54	44	44
	415	44	52	42	42
	440	45	53	43	40
	480	42	49	40	37
	690	29	34	28	26
40	208	127	150	123	113
	230	115	136	111	103
	380	64	76	62	62
	400	61	72	59	59
	415	58	69	56	56
	440	60	71	58	54
	480	55	65	53	49
	690	38	45	37	34
50	208	159	188	154	142
	230	143	170	140	129
	380	80	95	77	77
	400	76	90	74	74
	415	73	86	71	71
	440	75	89	73	67
	480	69	81	67	62
	690	48	57	47	43

Rated power [kW]	Rated voltage [V]	Rectifier input Rated current [A]	Rectifier input Maximum current [A]	Bypass input Rated current [A]	UPS output Rated current [A]
80	208	242	313	232	223
	230	219	283	210	202
	380	127	164	122	122
	400	121	156	116	116
	415	116	150	112	112
	440	115	148	110	105
	480	105	135	101	97
	690	73	94	70	67
100	208	302	373	290	279
	230	274	337	263	252
	380	159	196	152	152
	400	151	186	145	145
	415	145	179	140	140
	440	143	176	137	132
	480	131	161	126	121
	690	91	112	88	84
Note: Maximum rectifier current calculated at -15% voltage tolerance and 102% continuous overload.					

Table 11: Transformer cabinet power cable terminal bolt torques

Function	Tightening torque [Nm]	Bolt size
L1, L2, L3, N	47	M10
PE	47	M10
L1, L2, L3, N	47	M10
PE	47	M10
L1, L2, L3, N	80	M12
PE	80	M12
L1, L2, L3, N	80	M12
PE	80	M12

CAUTION

To reduce the risk of a fire, connect only to a circuit that is provided with maximum input circuit breaker current ratings from Table *10* in accordance with the national and local installation rules.

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 shown in Table *10*. The recommended line-to-line load unbalance is 50% or less.

Source protection for the AC input to bypass must suit the characteristics of the load and take into account effects such as inrush or starting current.

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

CAUTION

An additional warning label, shown in Figure *9*, must be installed at the UPS input terminals and all the primary power isolators used to isolate the UPS unit if the UPS input is connected through external isolators that, when opened, isolate the neutral OR the UPS is installed in an IT distribution system. These warning labels can be obtained from your local service representative.

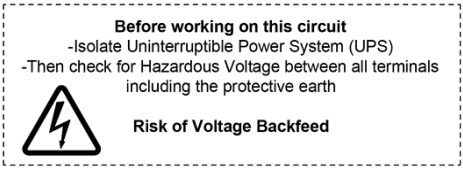


Figure 9. Warning label

4.6.1 Installing transformer cabinet power wiring

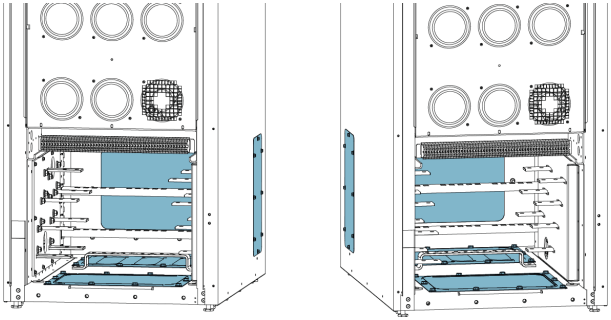


Figure 10. Transformer cabinet through holes

See figure *11* for transformer cabinet power terminals:

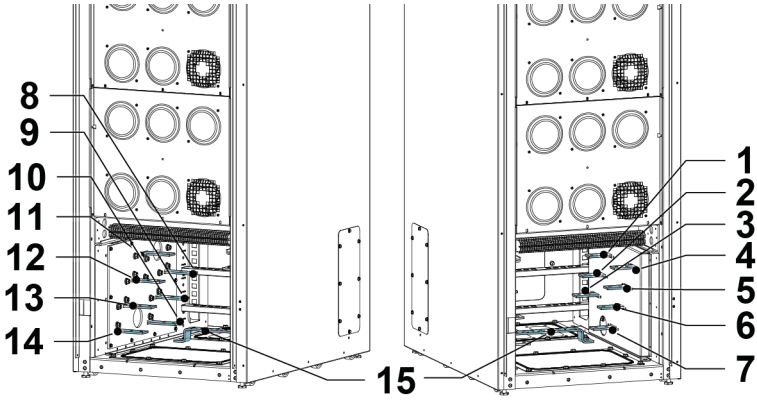


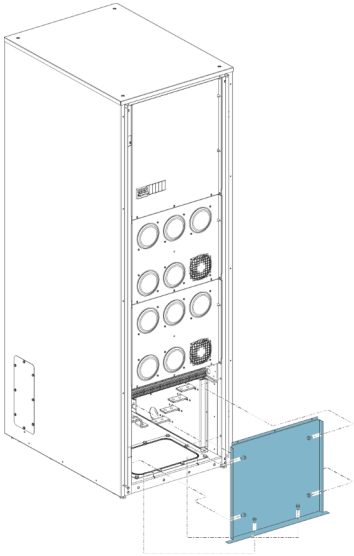
Figure 11. Transformer cabinet power terminals

	Reference	Transformer cabinet with input and output transformers	Transformer cabinet with rectifier and bypass input transformers
1	X3:L1	From UPS output L1	Bypass input L1
2	X3:L2	From UPS output L2	Bypass input L2
3	X3:L3	From UPS output L3	Bypass input L3
4	X4:L1	System output L1	To UPS bypass input L1
5	X4:L2	System output L2	To UPS bypass input L2
6	X4:L3	System output L3	To UPS bypass input L3
7	X4:N	System output N	To UPS bypass input N
8	X1:L1	System input L1	Rectifier input L1
9	X1:L2	System input L2	Rectifier input L2
10	X1:L3	System input L3	Rectifier input L3
11	X2:L1	To UPS input L1	To UPS rectifier input L1
12	X2:L2	To UPS input L2	To UPS rectifier input L2
13	X2:L3	To UPS input L3	To UPS rectifier input L3
14	X2:N	To UPS input N	To UPS rectifier input N
15	PE	Protective earth	Protective earth

Follow these steps to install transformer cabinet power wiring:

1. Open the cabinet door.

2. Open the screws on the lower front panel.
3. Remove the lower front panel.



4. Route the power cables through the through hole of your choosing. See Figure *10* for more information.
5. Apply suitable protection to protect the wiring from the sharp metal edges.
6. Connect the power cables to the connectors according to Figure *11* .
7. Put the front plate back and fasten the screws.

WARNING

The transformer cabinet does not have neutral to ground bonding. Where such bonding is required, it must be done separately in the power terminals of the transformer cabinet. Note that it's not allowed to bond the neutral to ground in an UPS system without isolation transformers.

4.6.2 Installing transformer cabinet signal wiring

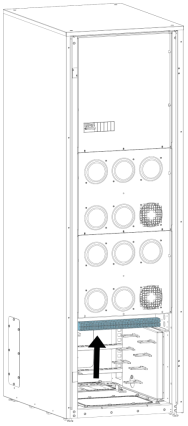


Figure 12. Location of transformer cabinet signal terminals

Table 12: Transformer-to-UPS signal terminals (terminal X5)

Pin	Pin function
X5:1	Over temperature
X5:2	Over temperature return
X5:3	Fan failed
X5:4	Fan failed return

The signal wires are routed from the transformer cabinet to the UPS. The transformer cabinet has 2 signals:

- Transformer over temperature signal
  This signal alarms the UPS that the transformer has exceeded its operating temperature range, and if the issue persists, the UPS will shut down after a delay.
- Fan failure signal
  This signal is generated, if one or more fans no longer rotate at the desired speed.

The signal outputs of the transformer cabinet are located in the signal terminal block X5. Refer to Table *12* for the pin assignments.

Follow these steps to install transformer cabinet signal wiring:

1. Connect the transformer over temperature alarm (transformer cabinet terminals X5:1–X5:2) to the UPS cabinet's signal inputs (UPS terminals X10:1–X10:10).
   - Any free signal input in the UPS can be used for this purpose.

2. Connect the fan failure signal (transformer cabinet terminals X5:3– X5:4) to the UPS cabinet's fan failure signal inputs (UPS X10:18– X10:20).
   - If the UPS is equipped with internal transformers, the signals are connected to UPS terminals X10:18 and X10:20.
   - If the UPS is not equipped with an internal transformer, the signals are connected to UPS terminals X10:18 and X10:19.

CAUTION

The UPS signal inputs must be configured by an Eaton authorized Customer Service Engineer or by a qualified service officer authorized by Eaton.

4.7 Operation

To set the battery cabinet on or off, open the safety hatch on the cabinet's front panel and flip the power switch down or up. See Figure *13* for the breaker.

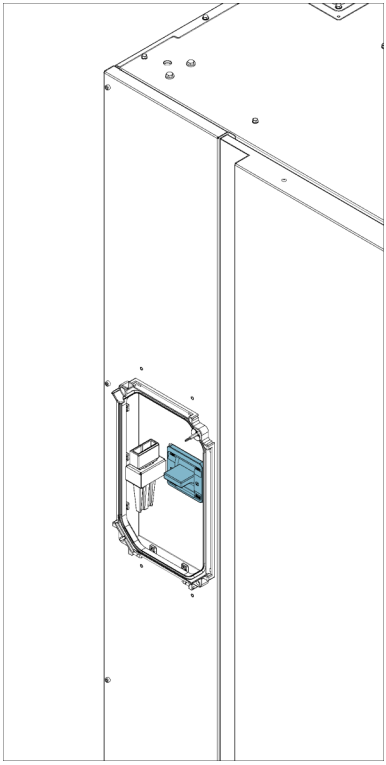


Figure 13. EBC-L breaker

The transformer cabinet has no operations that the customer can perform.

5 Maintenance

The components inside the 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.

5.1 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 performed by an Eaton authorized Customer Service Engineer or by a qualified service officer authorized by Eaton.

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 yourself. Voltages are always present in the battery strings. If you suspect that a battery string needs service, contact your service representative.

Observe 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.

- Prior to connecting or disconnecting terminal, 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 replacing batteries, use the same number of sealed, lead-acid batteries.
- Dispose of batteries according to your local codes for disposal requirements.

5.2 Performing preventive maintenance

The battery cabinet and transformer cabinet require 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.

5.2.1 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.

5.2.2 Annual maintenance

CAUTION

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

5.2.3 Battery maintenance

WARNING

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

5.3 Recycling the used UPS or batteries

Remove the battery bank before disposing of the UPS or its battery cabinet. Follow 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:

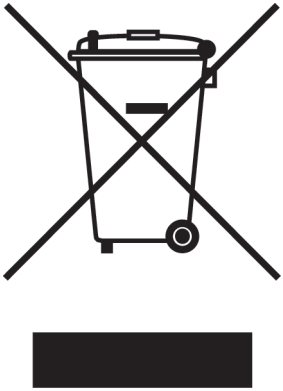


Figure 14. WEEE symbol

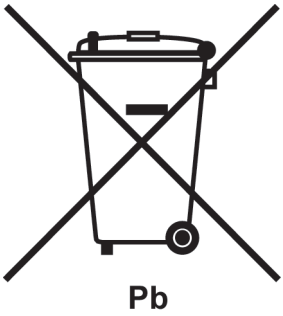


Figure 15. Recycling batteries symbol

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 of unwanted batteries or battery material in the public waste disposal system. Follow all the applicable local regulations regarding the storage, handling and disposal of batteries and battery materials.

5.4 Maintenance training

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

6 Technical data

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

6.1 Directives and standards

Safety	IEC 62040-1: Uninterruptible power systems (UPS) - Part 1: General and safety requirements for UPS IEC 60950-1: Information technology equipment - Safety - Part 1: General requirements (as referred through the IEC 62040-1)
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

6.2 Battery specification

Battery type	VRLA, 12 VDC
Battery quantity	36 blocks, 216 cells per battery string, or 40 blocks, 240 cells per battery string. **Note:** Do not connect battery strings with different battery quantity and voltage in parallel!

Battery voltage	432 V (36 blocks) or 480 V (40 blocks)
Recharge profile	ABM or float charge
End of discharge voltage	1.67 VPC to 1.75 VPC, configurable or automatic (load adaptive)
Charge current	Configurable:
30-50 kW units	Configurable 0...29.3 A At > 40kVA load automatically limited to 16.5 A.
80–100 kW units	Configurable 0...58.9 A At > 80kVA load automatically limited to 33A.
120–150 kW units	Configurable 0...87.9 A At > 120kVA load automatically limited to 49.5A.
160–200 kW units	Configurable 0...117.2 A At > 160kVA load automatically limited to 66 A. Note that the maximum charge current is 29.3 A per UPM.
Battery start option	Yes

6.3 Environmental specifications

Recommended storage temperature range	From -25 °C to +25 °C in the protective package
Ambient operating temperature range	From 0 °C to +40 °C
Recommended operating temperature range	From +20 °C to +25 °C
Relative humidity range	5 to 95%, no condensation allowed

7 Warranty

7.1 General

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 a service engineer approved by Eaton. Service and maintenance of the UPS shall also be performed only by a service engineer approved 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.

7.2 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)

Eaton Power Quality Oy
Koskelontie 13
FI-02920 Espoo, Finland
www.eaton.eu