Power Xpert UX
Air insulated Medium Voltage Switchgear up to 24 kV

Powering Business Worldwide

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1 Introduction

1.1 General system description

The Eaton Power Xpert UX™ switchgear system is designed for medium-voltage supply stations such as main supply stations, distribution sub-stations and industrial connections. It can also be used in industry and power plants as motor control centers.

1.1.1 System type

The Eaton Power Xpert UX system is an air-insulated, medium voltage switchgear system. It is defined as 'metal enclosed switchgear' in accordance with IEC 62271-200 and classified in the category LSC2B-PM.

1.1.2 System construction

A Power Xpert UX panel is constructed of sheet metal circuit breaker panels, withdrawable vacuum circuit breakers and withdrawable contactors.

The main busbar system is located at the top of the panels. Standard delivery is a single busbar system (double busbar in duplex configuration is also available). It consists of copper bars which may be supported by insulators depending on rated short-circuit current. The bars are provided with an insulation layer over their entire length. For contactor panels up to 12 kV this is an optional feature for the branch busbars.

Pressure relief vents at the top of the panels provide protection against overpressure in any of the main compartments (busbar, circuit breaker or cable) that may be caused if an internal arc occurs.

Each panel has a low-voltage compartment for secondary equipment.

The installation is divided functionally into panels (such as circuit breaker panels, a busbar section panel, etc.). The panel function and the rated current of the panel in question determine the width of the panel.

Options

The installation may be provided with optional equipment such as surge arrestors, voltage transformers etc.

For further details, see technical data.

1.2 Using the manual

1.2.1 Target group

The switchgear is designed for use by personnel who are expert or adequately trained in using switchgear and/or carrying out electrical operations.

For definitions of these terms, see chapter 7 – Glossary.

1.2.2 Notation guide

This manual uses the following warning boxes to alert the user to possible dangers while operating or maintaining the equipment:

WARNING

Danger of injury or death to personnel and bystanders.

CAUTION

Danger of damage to equipment.

NOTE

Important note for clarification.

REMARK

Useful advice.

1.2.3 Structure of the manual

The manual contains 8 chapters.

Chapters 1 and 2 contain general information on the system design and construction and general safety aspects. The information is presented in the form of descriptive text, supported by illustrations as necessary. Illustrations are numbered consecutively for each chapter, and are captioned where necessary.

Chapters 3 to 6 consist mainly of procedures. These procedures contain step-by-step descriptions of actions in the order in which they should be carried out. Illustrations are on the same page as the relevant step and have the same number.

WARNING

Never take any action without knowing what effect it will have.

REMARK

Read through all actions first, using the relevant figures. Contact Eaton if you do not understand what you have to do or require any clarification.

Further information regarding the chapters is given below.

Chapter 3 – Setting up the system

This chapter contains instructions on transport, assembly and busbar coupling. It also describes what is required for the operating area and gives an overview of connection possibilities.

Chapter 4 - System operation

This chapter is aimed at the operator, who is expected to operate and monitor the system independently. For that reason, these activities are described in detail.

Chapter 5 – System inspection, maintenance and repair

This chapter describes only those operations that may be carried out by the user. It also includes recommendations for the safe disposal of the system or parts of the system.

NOTE

Operations not included in the manual or supplementary documentation provided must be carried out by or under the supervision of Eaton.

Chapter 6 - Accessories

This chapter contains a list of accessories that can be supplied.

Chapter 7 - Glossary

This chapter contains clarifications of specific terms used in the manual but not explained further.

Chapter 8 – Appendix

This chapter shows the structure of all the documentation supplied with the system.

1.3 Safety instructions

Read this user manual carefully before commissioning and operating the switchgear. Make sure that you have read and understood all safety warnings and instructions. Do not proceed if you are unclear and contact your local Eaton representative.

1.3.1 General instructions

Eaton has done its utmost to inform users as accurately and as fully as possible concerning any dangers involved in using the system. Users are responsible for supervising implementation of the instructions contained in this manual.

Personnel

The user must make sure that personnel are qualified to carry out the task.

Safety of bystanders

Access to the equipment is to be limited to those directly involved in operating or maintaining it.

Other persons must not remain in the vicinity of the equipment.

Safety plan

It may be necessary to draw up a safety plan. Comprehensive advice on this should be obtained from the relevant authorities (fire brigade, local authorities, occupational health & safety, company safety department, first aid service etc.).

Relevant standards

Power Xpert UX switchgear complies with the following standards:

- IEC 62271-200: High-voltage switchgear and controlgear – Part 200:AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV.
- IEC 60529: Degrees of protection provided by enclosures (IP code).
- IEC 62271-1: High-voltage switchgear and controlgear – Part 1: Common specifications.

The components used comply with the following standards:

- IEC 62271-100: High-voltage switchgear and controlgear – Part 100: Alternating-current circuit-breakers.
- IEC 62271-102: High-voltage switchgear and controlgear – Part 102: High-voltage alternating current disconnectors and earthing switches.
- IEC 61869-2: Instrument transformers – Part 2: Additional requirements for current transformers.
- IEC 61869-3: Instrument transformers – Part 3:Additional requirements for Inductive Voltage transformers.
- IEC 62271-103: High-voltage switchgear and controlgear – Part 103: Switches for rated voltages above 1 kV up to and including 52 kV.
- IEC 60282-1: High-voltage fuses – Part 1: Current-limiting fuses.
- IEC 62271-105: High-voltage switchgear and controlgear - Part 105:High-voltage alternating current switch fuse combinations.
- IEC 62271-106: High-voltage switchgear and controlgear – Part 106: Alternating current contactors, contactor-based controllers and motorstarters.

Eaton Power Xpert UX switchgear can be used in areas under normal conditions as described in IEC 62271-1, Chapter 4.1.2

1.3.2 Safety of the switch room

The installation and the switchroom must comply with all applicable local safety regulations. The switchroom is the room in which the switchgear has been set up. Clearances around the switchgear are described for following configurations:

1. Power Xpert UX up to 24 kV – with arc channel for venting gasses outside the switchroom.
2. Power Xpert UX up to 24 kV - with arc channel + arc absorber for venting gasses inside the switchroom.

The minimum requirements and recommendations are given for front and/or rear access of primary cables, depending on the switchgear arrangement.

Clear spaces

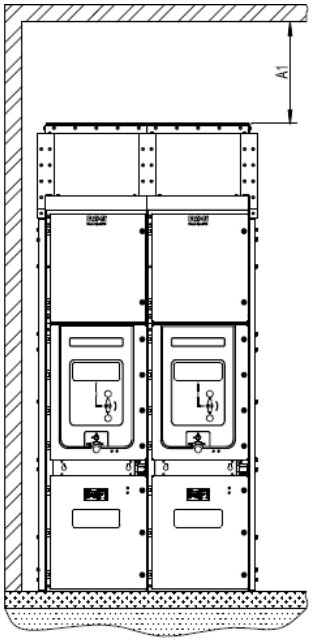


Fig. 1-1 Power Xpert UX up to 24 kV – with arc channel for venting gasses outside the switchroom

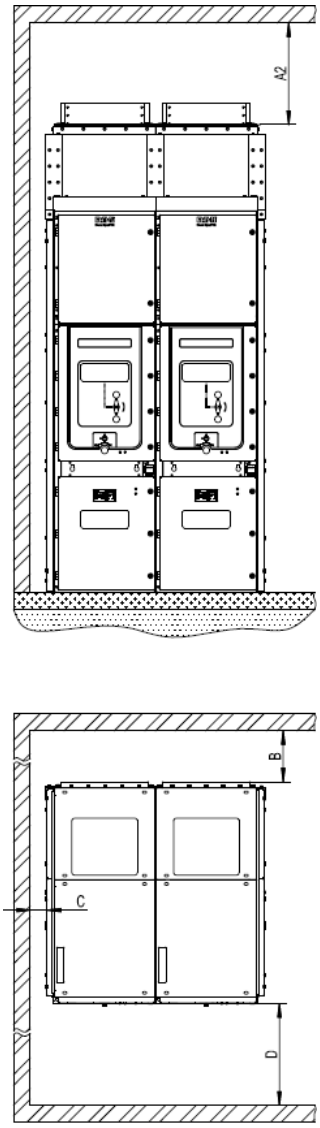


Fig. 1-2 Power Xpert UX up to 24 kV – with arc channel + arc absorber for venting gasses inside the switchroom

Dimension	In case front and rear access		In case of front only access	
	Minimum (mm)	Recommended (mm)	Minimum (mm)	Recommended (mm)
A1	250	600	250	600
A2	600	600	600	600
B	500	800	100	500
C-left side	100	500	100	500
C[(1)]-right side	500	700	500	700
D	1500	1500	1500	1500

[(1)]: Clear space required to operate the earthing switch of the right end panel, if applicable. Please contact Eaton if less than 700 mm is available.

Exceptions:

- In case a feeder panel is provided with busbar side voltage transformers or busbar earthing switch mounted on top of the panel, recommended heights (A1 or A2) and a minimum depth (B) of 500 mm is required.
- In case a feeder panel is provided with withdrawable voltage transformers with shutter operation mounted in the cable compartment, then the primary cables can only be connected via rear access.
- If the switchboard is intended to be installed at a minimum distance of 100 mm from the rear wall, it is Eaton's recommendation to install the panels on a foundation frame. This is for easy installation at site.

All installations:

- Eaton recommends a dimension of at least 1500 mm at the front of the switchgear to allow for ease of operation, removal of the withdrawable unit from the panel and adequate escape route. In case switchboards are installed front to front, then a minimum distance of 2500 mm is required between the installations.
- If a switchboard at one end is installed at 100 mm from the side (C), then Eaton recommends at least 500 mm free space to be considered for ease of installation to the side wall at the other end.
- If the switchboard is arranged for front and rear access and the switchboard length is more than 10 m, then at least 500 mm clear space at both sides is required to allow adequate escape routes.
- At the right side of the switchboard recommended clear space is 700mm to enable manual operation of the earth switch of the right end panel, if applicable. This allows operation of the earth switch with both standard and extended length handle. If less space is available, please contact Eaton.

Escape routes

To the front and rear of the installation(s) an escape route at least 500 mm wide and 2000 mm high must be present over the entire length of the installation. The width of the escape route is measured from the part of the installation that projects the furthest. The escape route must be completely clear and as far as possible in a straight line. Local safety regulations need to be checked that may exceed or take precedence over the recommendations given herein.

REMARK

The installation may be set up at a minimum distance of 100 mm from the rear wall. In which case there will not be a requirement for a clear area or escape route at the rear or sides.

Entrances

Entrances to the switch room and escape routes must be kept clear at all times.

Entrances must be provided at suitable places. Dimensions of entrances must be at least both panel height (without arc channel) and panel width plus 200mm for free space. For details of width and height of panels, see chapter 2.4.3. Entrances must be accessible via the escape routes. It must be possible to open access doors outwards without the use of aids.

Storage of materials

Items not connected with the installation must not be stored in the switch room. Flammable materials, combustible gases and dangerous chemicals must not be stored.

Availability of extinguishers

Suitable extinguishers must be present in and around the switch room. Obtain expert advice (fire brigade) on the best choice, quantity and location of the extinguishers.

1.3.3 What to do in the event of a fire

In the event of a fire in the switch room, proceed as follows:

- Evacuate all personnel from the switch room
- Call the fire brigade.
- Notify specialists who can switch off the installation completely, i.e. including:
  - Incoming cables.
  - Low-voltage cables.
  - Feedback from the low-voltage side.
  - Any other power sources.
- Follow local fire instructions.

⚠ WARNING

NEVER ATTEMPT TO EXTINGUISH THE FIRE BEFORE THE INSTALLATION IS COMPLETELY DEAD I.E. ISOLATED FROM THE SUPPLY.

NEVER extinguish with a water jet.

Make sure that no water flows into the installation.

Keep well clear of the installation while the fire is extinguished in the area around the installation. Even using non-conducting extinguishing materials may result in a voltage passing.

Extinguishing the fire:

- If possible, leave extinguishing the fire to the fire brigade.
- Use non-conducting extinguishing materials.
- If necessary, use extinguishers in the area around the installation. Never attempt to extinguish the installation itself, even if it appears to be dead.

1.4 Product information

The main system specifications are indicated on the product rating plates. Further information is available from the information pack that includes this manual.

1.4.1 Product rating plate

A complete product rating plate is made up of a main rating plate with supplementary rating plates, where applicable. The main product rating plate is headed with the **Eaton** logo.

Each panel is provided with a product rating plate describing the panel type and corresponding ratings. This also applies to the withdrawable part (i.e. circuit breaker or contactor unit). Fig. 1-3 shows one example of product rating plate of the panel part. For the product rating plate on the withdrawable part, refer to the manual of the withdrawable part (i.e. circuit breaker or contactor unit).

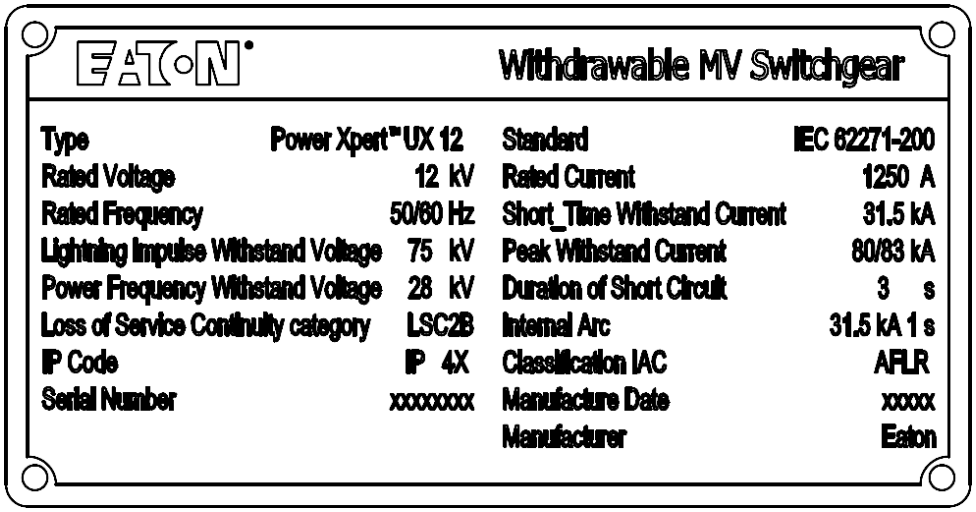


Fig. 1-3

2 Product description

2.1 The system

This paragraph contains a short description of the most common system components. Since each Power Xpert UX™ switchgear installation is matched to its application, it is not possible to give a complete and detailed description here. For further information, please refer to the information pack which includes this manual.

2.1.1 Panels

The panels are compartmentalized according to the type of function. The compartments are:

I. Low-voltage compartment
II. Busbar compartment
III. Circuit breaker compartment
IV. Cable compartment

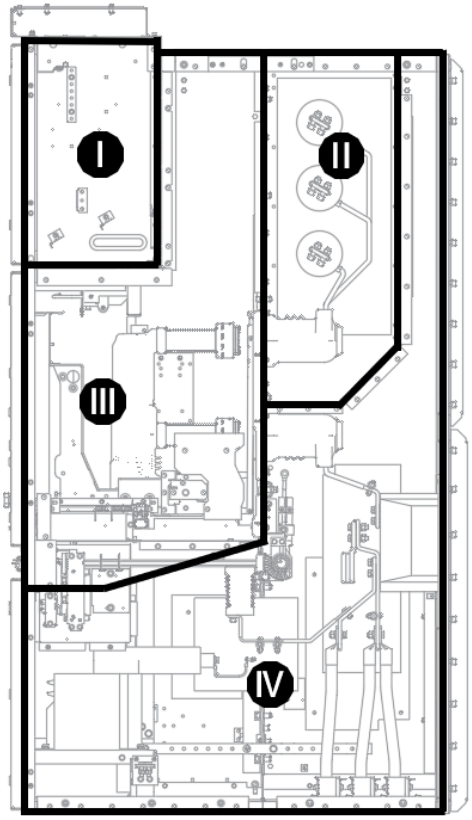


Fig. 2-1 Panel compartmentalization

2.1.2 Circuit breaker compartment

The withdrawable unit is inserted into the circuit breaker compartment with the aid of a transport trolley.

The unit is earthed through the rollers located on the base of the carriage, which provides an effective earth as the unit is inserted. Connection to the busbar system is established via isolating contacts which are cluster type contacts, the fixed portion being behind automatic shutters.

Electrical control signals for the unit are routed via a 58-pole secondary connector.

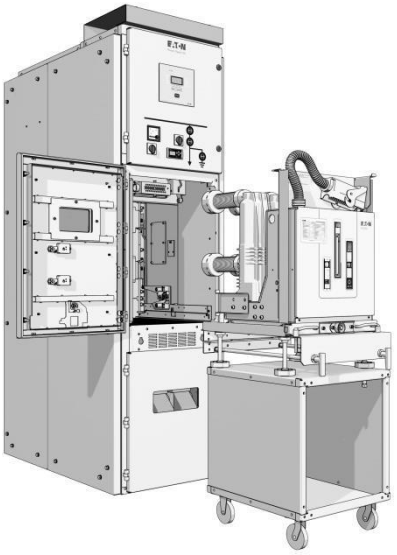
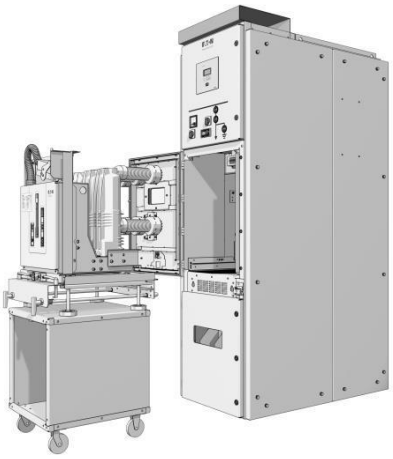
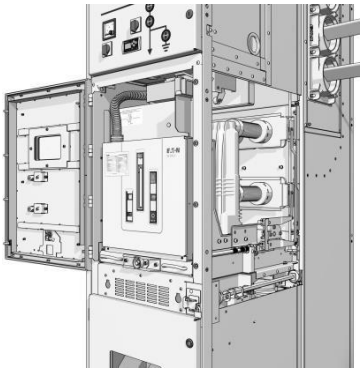


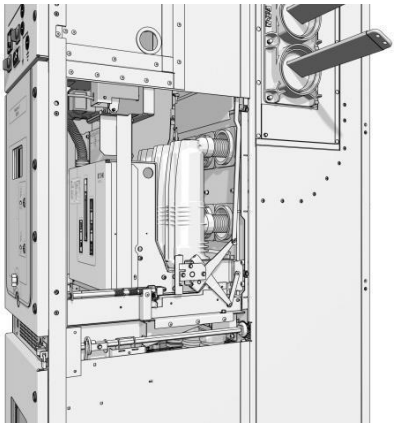
Fig. 2-2 Withdrawable unit on transport trolley

2.1.3 Withdrawable unit positions

Each unit can be placed in any one of three positions:







Insert / removed position

The unit is transferred into the ‘Insert / removed’ position when:

- The compartment door is open.
- The unit is moved to the front of the panel ready for insertion, or
- The unit is moved completely out of the panel.

Test position

The unit is transferred into the ‘Test’ position, when:

- The unit is in the panel but moved to the front of the compartment.
- The primary contacts are disconnected, the shutters are closed.
- The 58-pole secondary connector is connected (control over the operation of the unit is now possible).
- The compartment door can be opened.

Service position

The unit is transferred into the ‘Service’ position, when:

- The compartment door is interlocked and cannot be opened.
- The unit is fully inserted and engaged into the compartment.
- The primary contacts are connected.
- The 58-pole secondary connector is connected.
- In emergency situations, the door interlock can be defeated with the use of a tool.

2.1.4 Cable connections

Cables can be connected in a number of ways. Connection from the front or rear via the bottom side of the panel with cable lugs is standard. The rear of the panel may also be fitted with a cable duct for top connection.

Besides primary cables, secondary wiring may also be installed. Entrance of secondary wiring is standard via the bottom side. A segregated secondary cable duct is provided inside the panel to run the wiring from the bottom front up to the low voltage compartment.

In addition a low voltage wire way runs horizontally across the entire switchboard allowing for interconnections between panels. Solutions are available for top entry of secondary wiring.

2.1.5 Voltage transformers

The installation may include a number of voltage transformers for protection, measuring and metering. Voltage transformers are available in fixed/removable and withdrawable design. On the primary side voltage transformers can be protected by HV fuses.

Cable side mounting:

- Fixed/removable - mounted in the cable compartment of a feeder panel.
- Fully withdrawable – mounted on truck and positioned in the cable compartment of a feeder panel.

Busbar side mounting:

- Fixed/removable – mounted in an unit mounted on top of a feeder panel.
- Fixed/removable – mounted in the bus-section or measuring panel.
- Fully withdrawable – mounted on truck and positioned in the circuit breaker compartment of a bus-section or measuring panel.

2.1.6 Current transformers

Power Xpert UX switchgear can be equipped with current transformers for protection, measuring and metering.

Cable side mounting:

- At the cable connection points of the feeder panels. Special arrangements can be made for mounting up to 2 cast resin insulated current transformers per phase, each suitable for housing multiple cores.
- A special arrangement allows for an extra set of cast resin insulated current transformers mounted in the branch busbar of a circuit breaker panel (positioned on the upper side of the circuit breaker)

Busbar side mounting:

- In the riser or bus-section panel.

2.1.7 Auxiliary equipment

Auxiliary equipment such as relays, position indicators, meters and instruments are housed in the low-voltage compartment of each panel.

Measuring and indicating equipment is fitted to the door of the low-voltage compartment. This may also include a circuit mimic diagram.

Voltage Detection System (VDS)

Power Xpert UX switchgear can be provided with a voltage detection system, which is connected via internal wiring to capacitive sensors mounted on the cable or busbar side. It continuously shows the presence of the primary voltage on all three phases via a voltage indicator mounted on the front door.

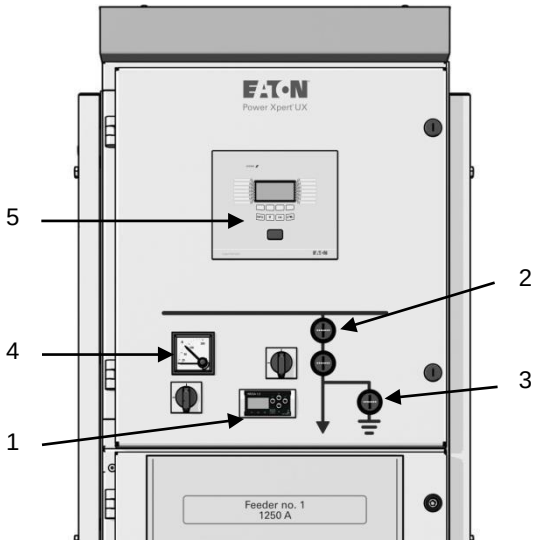


Fig. 2-3 Front door low-voltage compartment

1. Optional voltage detection system
2. Position and status indicators (optional)
3. Earthing switch status indicator (optional)
4. Optional instruments
5. Protection relay

Position and status indication

LED position indicators may be mounted as part of the mimic diagram to indicate following:

- Position indication of the truck (Service / Test).
- Status indication of the switch (On / Off).
- Status indication of the earth switch (On / Off).

Integration into the graphical display of a protection relay is another alternative.

Measuring

Depending on customer requirements, the LV compartment may be provided with various analogue meters/selector switches or multi-function measuring devices.

Protection

Depending on customer requirements, the LV compartment may be provided with various protection relays, optionally with combined control and metering functions.

2.1.8 Earthing

Power Xpert UX switchgear offers a number of options for applying safety earthing.

Earthing busbar

Power Xpert UX switchgear includes a continuous short-circuit-proof earthing busbar to which all components of the installation can be connected.

Earthing switch

Power Xpert UX switchgear can be provided with manual or motor operated short-circuit-proof earthing switches fitted to the cable or busbar side. The earthing switch connects the connection points of the cable or busbar with the earth busbar.

The earthing switch is mechanically interlocked with the position of the withdrawable circuit breaker or contactor unit. The earthing switch can be padlocked in the open or closed position. Special locks are used in some installations, e.g. with the aid of a blocking coil or mechanical key interlock.

Cable side:
Integral part of the cable compartment of a feeder panel.

Busbar side:

- Integral part of the bus-section or measuring panel.
- Integrally mounted on top of a feeder panel.

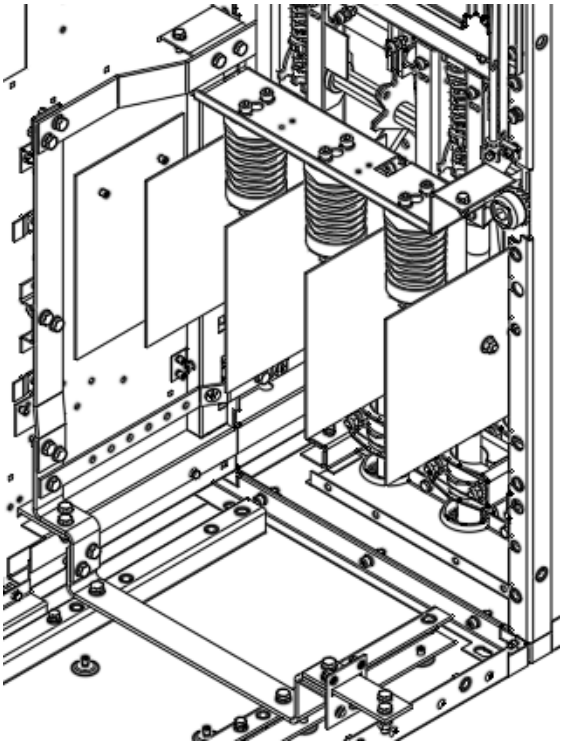


Fig. 2-4 Earth busbar

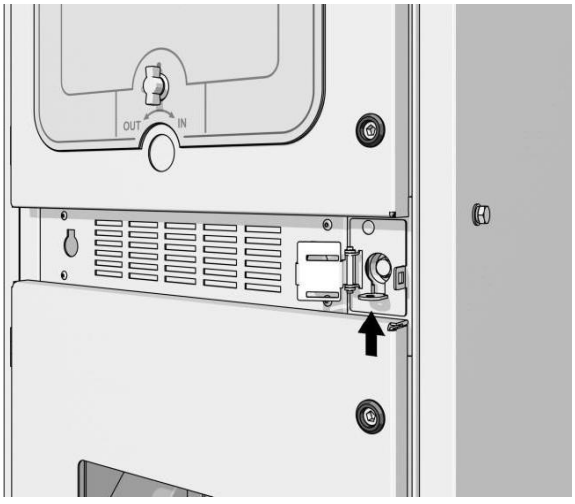


Fig. 2-5 Location of the earthing switch at the front side of the switch panel

2.1.9 Withdrawable units

Power Xpert UX switchgear may accommodate a variety of switching/measuring equipment in the circuit breaker compartment. Each unit is mounted on a withdrawable cradle with an integral racking mechanism. Manual operation of the mechanism via a hand crank is the standard. Optional an electrically operated racking mechanism is available suitable for remote operation.

Withdrawable circuit breaker unit

The circuit breaker is the W-VAC*i*.
W-VAC*i* circuit breakers are provided with vacuum interrupters.

Electrical control signals are supplied from the low-voltage compartment via a 58-pole secondary connector. Mechanical and electrical interlocks prevent unintentional switching.

Refer to separate user manual for specific details relating to the circuit breaker.

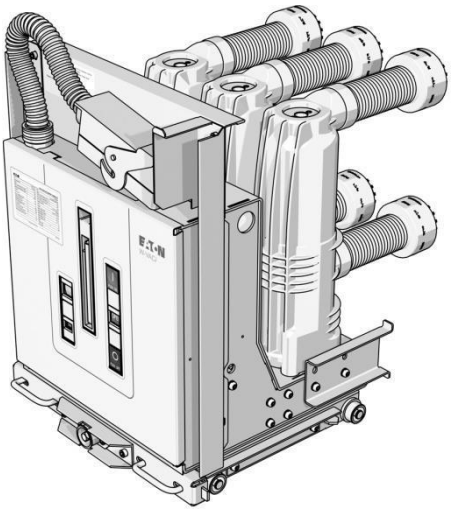


Fig. 2-6 Vacuum circuit breaker unit

Withdrawable contactor unit

The contactor is the W-SLC.
The vacuum contactor is ideal for controlling applications requiring a high number and frequency of switching operations and for AC motors. The contactor consists of a moulded resin monobloc, where the vacuum interrupters, moving apparatus, control electromagnet, multi-voltage control feeder and auxiliary accessories are housed. The contactor unit may be provided with an on-board control power transformer for internal auxiliary supply of the closing/holding coil. As a standard this is arranged via an external auxiliary supply.

Refer to separate user manual for specific details relating to the contactor.

As an alternative for the W-SLC contactor a switchboard may contain W-SLN contactors fitted into slimline panels. Reference is made to a separate user manual for the W-SLN contactor.

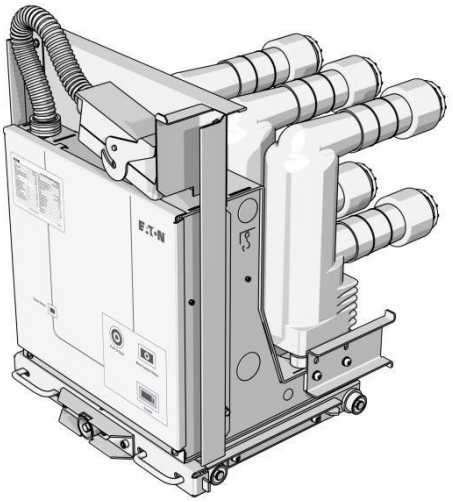


Fig. 2-7 W-SLC contactor unit

Withdrawable voltage transformer unit

The voltage transformer unit is used to measure the voltage of the busbar or cable side.

Operation of the withdrawable voltage transformer unit is described in chapter 4.2 of this manual.

Withdrawable isolation unit

The isolation unit is used to provide isolation gap between the busbars and the cable.

WARNING

Never operate a withdrawable isolation unit under LIVE conditions

Operation of the withdrawable isolation unit is described in chapter 4.2 of this manual.

Withdrawable earthing unit

The earthing unit is used to earth the busbar or cable depending on the configuration. The earthing unit is not fault make rated, meaning that operation of the unit is not allowed under LIVE condition.

Operation of the withdrawable earthing unit is described in chapter 4.2 of this manual.

2.1.10 Interlocks

Power Xpert UX switchgear is equipped with interlocks to prevent unsafe switching operations. For further information, see chapter 4.

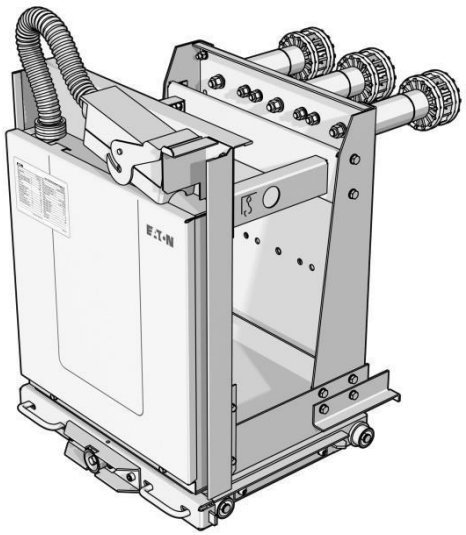


Fig. 2-8 Withdrawable earthing unit

2.2 Panel types

Power Xpert UX switchgear is constructed in a modular fashion with a series of panels with different functions. Each panel is made up of 4 compartments.

Below is a summary of the types of panels fitted as standard in Power Xpert UX switchgear. It is possible that they are not all included in any particular installation; it is also possible that an installation contains one or more custom panels.

2.2.1 Circuit breaker panel

A circuit breaker panel is an incoming or outgoing cable panel fitted with a switch, to provide short-circuit-proof power switching.

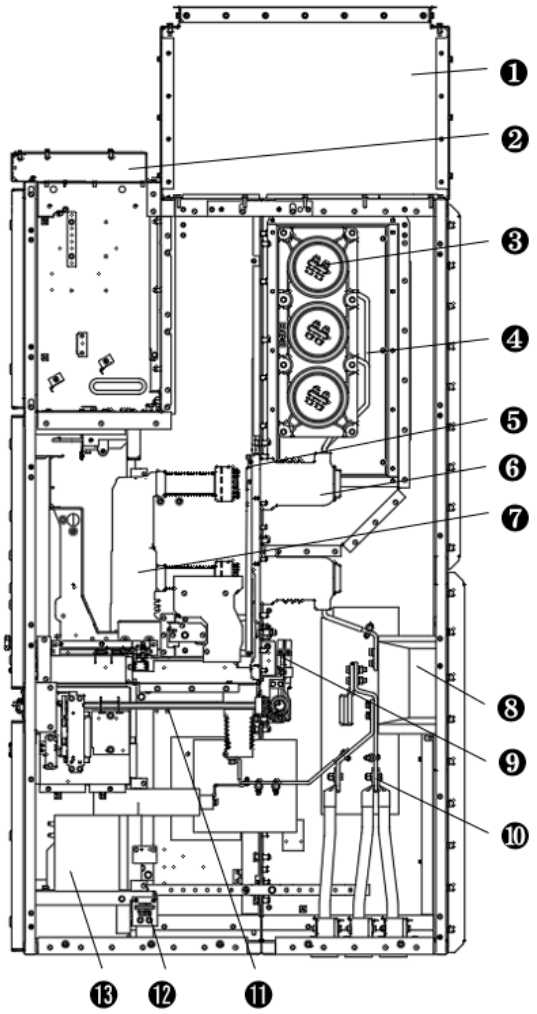


Fig. 2-9 Circuit breaker panel

1. Arc channel
2. Low voltage wire way
3. Busbar
4. Branch busbar
5. Automatic shutter
6. Fixed contact spout
7. Withdrawable circuit breaker
8. Current transformer
9. Earthing switch
10. Cable connection point
11. Earthing switch operating shaft
12. Earthing busbar
13. Voltage transformer

2.2.2 Bus-section panel (connecting panel)

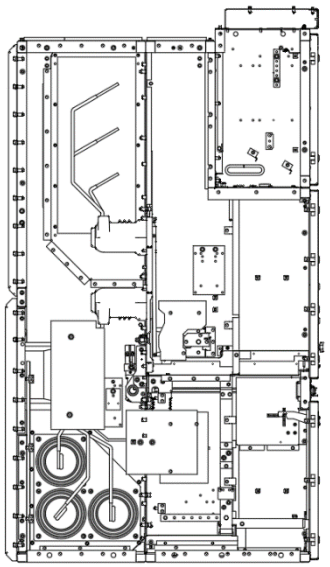
The bus-section panel is used to separate or connect parts of the installation (bus-sections).

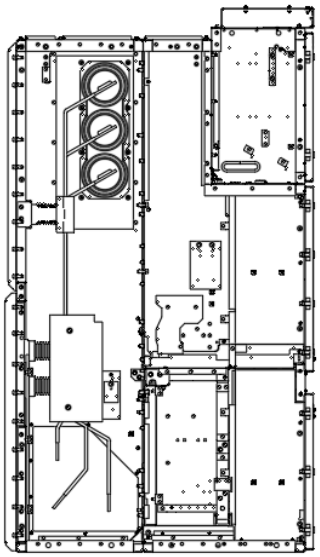
The bus-section panel consists of two panels; one panel contains the circuit breaker, the other panel is the bus riser panel.
Depending on the customer requirements the bus sectionalizer may contain:

- Current transformers
- Voltage transformers
- Earthing switch
- Withdrawable earthing unit
- Voltage detection system

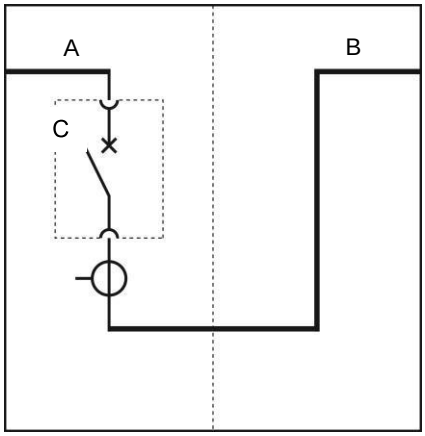
The bus riser panel may contain:

- Current transformers
- Withdrawable voltage transformer unit
- Withdrawable isolation unit
- Withdrawable earthing unit





Bus sectionaliser + Bus Riser



A. Sectionalizer panel
B. Riser panel right
C. Bus-section circuit breaker

Fig. 2-10 A bus-section and riser configuration comprises two panels

2.2.3 Direct connection panel

The direct connection panel is a panel with a straight connection between busbars and cable connection points. There is no direct provision for isolation from the power supply.

2.2.4 Disconnector panel

The disconnector panel is provided with a withdrawable isolation unit to enable the possibility to isolate the cable from the busbar side.

WARNING

The disconnector panel requires extra attention/interlocks to avoid unsafe switching operations.

2.2.5 Measuring panel

A measuring panel is used for integration of functionalities such as busbar voltage measuring and/or busbar earthing. These functionalities can also be integrated in the bus-section panel.

2.2.6 Contactor panel

A contactor panel is often used as an outgoing cable feeder for applications that require a high number of switching operations. The load will be protected by current limiting main fuses placed in series with the contactor. Contactor panels are available up to a rated voltage of 12 kV.

2.3 Equipment safety

This paragraph contains a description of the safety provisions on the switchgear and directions on how to deal with them.

2.3.1 Safe operation

Competence

Only adequately trained expert personnel and specialist operators must operate the equipment.

Conditions

The installation may only be operated if the operating area complies with the requirements of the IEC 62271-1 standard, paragraph 4.1.2.

Additional conditions may also apply. These are laid down in the operating instructions, which relate specifically to a particular installation. The operating instructions are included in the information pack, which includes this manual.

Actions not described in this manual

Operating or maintenance actions not described in this manual may be required:

- Actions, which are specific to a particular installation, are described in the operating instructions supplied with it. See the information pack, which includes this manual.
- Actions, which are not described at all, must only be carried out in consultation with an Eaton specialist. The instructions of this specialist must be followed exactly.

Special safety measures

In general it will not be necessary to take special safety measures when operating the switchgear. It is advisable, however, to wear suitable ear protection when there is repeated switching.

Local codes, internal safety standards and procedures must be strictly followed.

2.3.2 Safety features

The switchgear is provided with the following safety features:

- A sheet steel enclosure to protect against contact with live components.
- Compartments with earthed steel walls.
- Automatic metallic shutters shielding live parts when a switch is withdrawn.
- Pressure relief valves for the safe discharge of overpressure inside the enclosure in the event of arcing.
- Arc channel provided with or without arc absorber to allow the safe exhaust of gasses respectively in or outside the switchroom in case of an internal fault.
- Mechanical and electrical interlocks to prevent unintentional switching.
- Provision for padlocks on the switches, earthing switches and automatic shutters.
- Visible separation between cable and busbar (the separation is visible on a withdrawn switch).
- Visible direct status indication of the earthing switch.
- Special equipment intended for the earthing of cables and busbars.
- A continuous earthing busbar extending the full length of the installation.
- Locks on panel doors.
- Warnings on equipment to alert personnel to possible dangers (see also par. 2.3.4).

2.3.3 Execution of work

WARNING

ALWAYS check that the equipment is dead.
Fit suitable earthing.
NEVER approach an unearthed installation.

Ensure maintenance work is carried out in accordance with the instructions in this manual.
Replace worn and/or damaged parts only with original Eaton spares or spares approved by Eaton.

Take the following minimum precautions when carrying out work:

Working on live or partly live installation:

- Clearly indicate the working area.
- Make sure that the installation is clean and dry; check for leakage paths where voltage could track to the outside.
- Fit earthing to the panel, which is being worked on; only operate on earthed panels.
- Always check that the part that is being worked on is dead.

Working on a dead installation:

- Fit earthing; work on earthed panels only.
- Always check that the system is dead.

When re-commissioning:

- Check that all the work in the immediate area has been completed.
- Check (if necessary) that all related work in other areas has been completed.
- Check the safety of all personnel concerned.
- Check that all tools used have been retrieved from, within and around the switchgear.
- Remove safety earthing and other safety provisions.

2.3.4 Safety markings

These signs further indicate possible dangers:

Dangerous electrical voltage.

Electrical safety earth.

2.4 General technical data

This paragraph contains only general technical data. For details concerning any particular installation, see the information pack supplied with the installation, which includes this manual.

2.4.1 Electrical data according to applicable IEC standards

General				
Rated voltage	**kV**	12	17.5	24
Impulse withstand voltage	**kV**	75	95	125
Power frequency withstand voltage	**kV**	28	38	50
Rated frequency	**Hz**	50/60	50/60	50/60
Busbar system				
Rated normal current	**A**	630 … 4000		630 … 2500
Rated short time withstand current	**kA/s**	25 … 50/3		31.5/3
Rated peak withstand current	**kA**	63 … 130		80/82
Circuit-breaker type W-VAC*i*				
Rated nominal current	**A**	630 … 4000 (FC)		630 … 2500
Rated breaking current	**kA**	25 … 50		31.5
Rated short-circuit making current	**kA**	60 … 130		80/82
Rated short time withstand current	**kA/s**	25 … 50/3		31.5/3
Contactor type W-SLC				
Rated nominal current	**A**	400		
Rated current contactor / fuse combination	**A**	Max. 200		
Rated breaking current	**kA**	50 (limited by the fuse)		
Rated short time withstand current	**kA/s**	6/1		
Rated peak withstand current	**kA**	15.6		
Earthing switch Eaton				
Rated short-circuit making current	**kA**	82 … 130		80/82
Rated short time withstand current	**kA/s**	31.5...50/3		31.5/3
Internal Arc				
Internal Arc classification AFLR	**kA/s**	25 … 50/1		20 … 31.5/1

2.4.2 Environmental conditions

During operation

Environment	In accordance with IEC 62271-1 paragraph 4.1.2.

Ambient temperature

Maximum over 24 hours	+40°C (apply de-rating in case of higher ambient conditions)
Average over 24 hours	+35°C
Minimum	-5°C

Altitude at site

Maximum altitude	1000 m above sea level (apply de-rating in case of higher altitude conditions)

Humidity

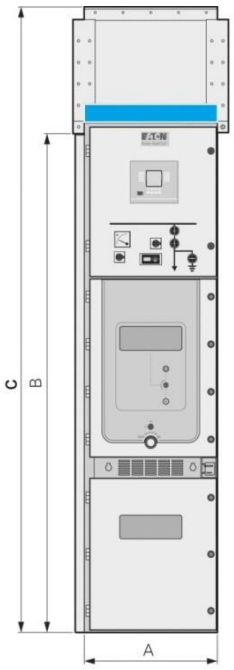
Relative humidity	
Maximum over 1 month	90%

During storage

Environment	In accordance with IEC 62271-1 paragraph 4.1.2

2.4.3 Dimensions and weights

Main dimensions and weight for standard circuit-breaker panel



	Width – A (mm)	Height – B (mm)	Height – C (mm)(1)	Depth – D (mm)	Weight (kg) (2)
3.6/7.2/12/17.5 kV					
630 A – 25 kA	600	2200	2760	1320	860
1250 A – 25/31.5 kA	600	2200	2760	1320	880
2000 A – 25/31.5 kA	800	2200	2760	1320	1230
2500 A – 25/31.5 kA	800	2200	2760	1320	1250
1250 A – 40/50 kA	800	2200	2760	1500	1250
2000 A – 40/50 kA	800	2200	2760	1500	1440
3150 A – 25/31.5/40/50 kA	1000	2200	2760	1500	1650
24 kV					
1250 A – 25/31.5 kA	800	2320	2880	1570	1480
2000 A – 25/31.5 kA	1000	2320	2880	1570	1820
2500 A – 25/31.5 kA	1000	2320	2880	1570	1820

(1) Total height with standard arc channel for venting gasses outside switch room.
For the availability of lower height arc channel and integral arc absorber solutions, please contact Eaton.

(2) Approximate weight including circuit breaker and current transformers.

3 System assembly

If required, the switchgear can be transported and installed by specialist personnel from Eaton.

This chapter contains information on transporting and setting up Power Xpert UX™ switchgear, coupling busbars and connecting the cables.

3.1 Environmental requirements

The switchroom in which the switchgear is installed must comply with the following:

- All applicable local safety regulations.
- The requirements set out in the chapter on safety.
- The requirements in this paragraph.

3.1.1 Climate

In accordance with IEC 62271-1 par. 4.1.2 the climate in the switchroom must comply with the following:

- Humidity:
  - The average value of the relative humidity over a period of 1 month does not exceed 90%.
  - The average value of the relative humidity measured over a period of 24h does not exceed 95%.
  - In new buildings it is essential to dry out the area before installing the system.
- Temperature:
  - Maximum +40°C, measured over a period of 24 hours.
  - Average not more than +35°C.
  - Minimum not less than -5°C.
- The room must be free from dust, corrosive or flammable gases and salts.

If the installation has to operate in a less suitable operating environment it may be necessary to take special precautions. Users should consult Eaton.

3.1.2 Room for extension

If necessary, reserve sufficient space for later extension of the installation or the addition of auxiliary equipment.

3.1.3 Floor

The floor of the operating area should comply with the following:

- The switch room floor surface must be flat within the tolerance of ± 2mm per meter and maximum of ± 3mm for the entire length of the switchboard
- The floor must not have any raised areas (bumps) though indentations are permitted.
- The floor must be of adequate strength.
- The maximum difference in height with reference to width and length of the installation shall not exceed 4 mm.

Sections or foundation frames set in the floor can be used as the support surface for the installation. The area between the floor sections and the panel must always be filled in with filler plates to create a suitable support surface.

Details on the dimensions and weight of the switchgear can be found in the floor plan drawing in the information pack.

3.1.4 Floor plan

Fig. 3-1 gives an example of how equipment is set up. For some other floor plans, see Appendix paragraph 8.2. Further information is available from the information pack that includes this manual.

3.1.5 During transport and storage

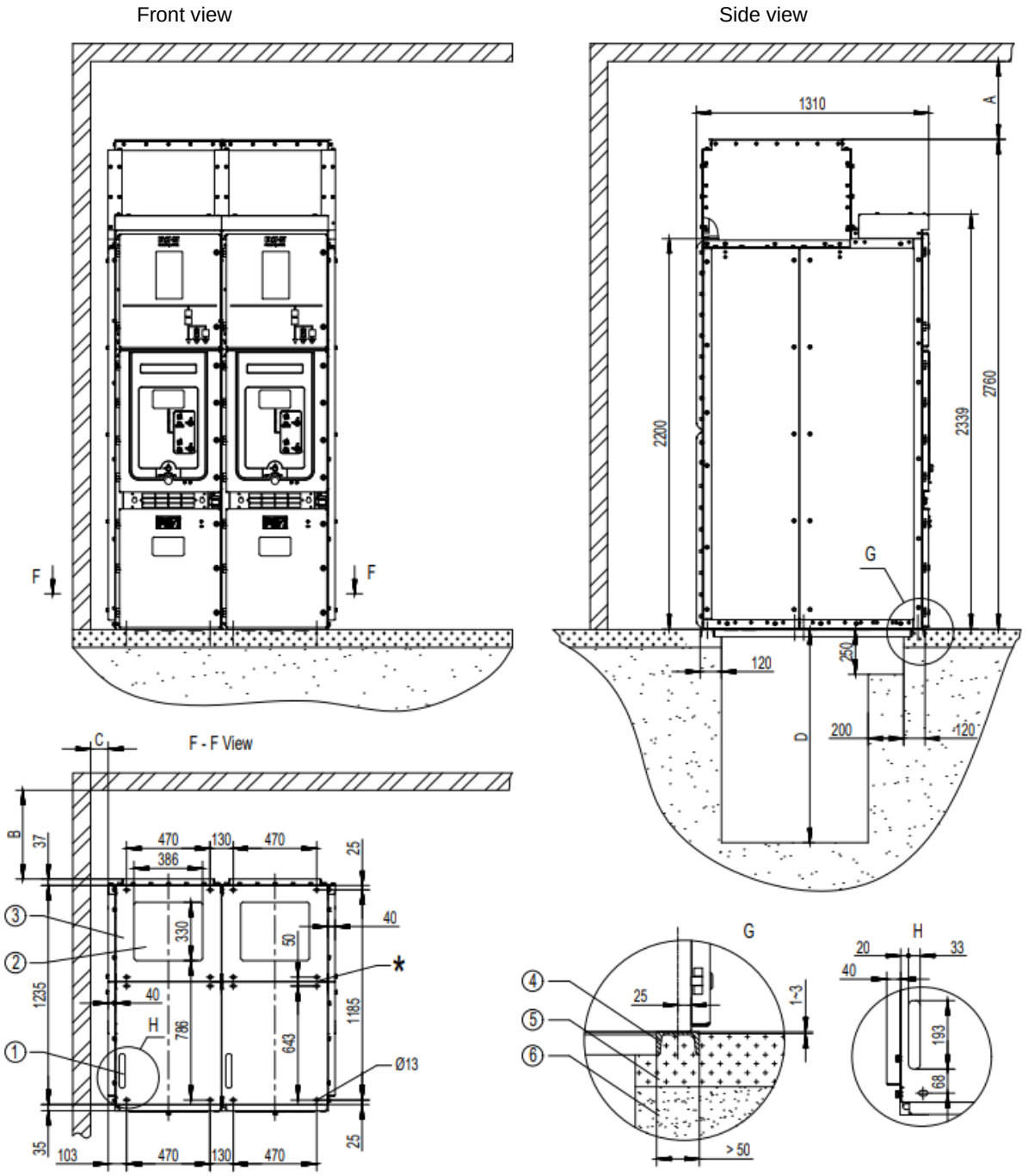
If the switchgear panels are stored temporarily prior to installation, or during transport:

- Do not unpack the switchgear panels.
- Store the switchgear panels vertically in a dry and dust-free area.
- Ensure that the transport and storage environment complies as far as possible with the requirements of IEC 62271-1, par. 4.1.2.
- Avoid condensation caused by rapid temperature changes.

NOTE

If the installation is kept in poor conditions in the open air, corrosion and a reduction in the level of insulation may result.

System assembly



	Front and rear access		Front access only	
Dimensions	Minimum (mm)	Recommend (mm)	Minimum (mm)	Recommend (mm)
Dim A	250	600	250	600
Dim B	500	800	100	500
Dim C - left side	100	500	100	500
Dim C[(1)] -right side	500	700	500	700
Dim D	Dependent upon cable bending radius			
*Optional	Centre mounting is optional			

[(1)]:Clear space required to operate the earthing switch of the right end panel, if applicable. Please contact Eaton if less than 700 mm is available.

① LV control cable entry
② Main cable entry
③ Foundation
④ C channel steel
⑤ Second pouring of the concrete
⑥ First pouring of the concrete

Fig. 3-1 Floor plan for Power Xpert UX switchgear (example)

3.2 System transport

Shipment

On-site delivery is contingent on the presence of an appropriate access route.

A Power Xpert UX system is normally transported as individual panels, suitably packed for road transportation.

On request, transport of factory assembled sections can be arranged and/or alternative ways of packing such as seaworthy crating.

Transport aids

The Power Xpert UX panel is fitted with 4 temporarily lifting plates. The panel can be lifted by using long suitable hoisting straps or chains. Before lifting, these should be connected to the lifting plates which have holes with diameter of 30mm prepared for hoisting. See Fig 3-2.

Care should be taken to ensure even lifting is achieved and no bending stresses are placed on the equipment.

A packed Power Xpert UX panel can be moved with the aid of a forklift truck or by crane. If the panel has to be moved by crane, the temporary lifting plates on the top of the panel shall be used.

3.2.1 Delivery inspection

Eaton cannot accept claims which are not reported within 24 hours after delivery.

Damage

It is advised to check the equipment directly after arrival of the shipment.

Completeness

It is advised to check for missing parts and accessories directly after arrival of the shipment.

3.2.2 Instructions for transport

The user is to follow the supplier’s instructions.

Transport

- The installation must always be transported in the vertical position.
- During transport, suitable precautions are taken:
  - To prevent intrusion of dust.
  - To prevent intrusion of moisture (e.g. rain).
  - To prevent against damage.

Lifting

Lifting under normal conditions

- See that the work area is clean and safe; obey the local statutory provisions.
- Never stand under a hoisted load.
- The angle of the lifting chain or strap relative to the lifting point must never be smaller than 60°.

Lifting under cold conditions

- See that the work area is clean and safe; obey the local statutory provisions.
- Never stand under a hoisted load.
- The angle of the lifting chain or strap relative to the lifting point must never be smaller than 60°.
- Between -5°C and -19°C, the workload is to be reduced by 25% if the used lifting gear is made from steel, which complies with or is less than grade B of the Euro norm 25-67.

Lifting under windy conditions

- See that the work area is clean and safe; obey the local statutory provisions.
- Never stand under a hoisted load.
- The angle of the lifting chain or strap relative to the lifting point must never be smaller than 60°.
- The lifting operation has to be stopped if the wind force exceeds force 7 on the scale of Beaufort (more than 13.9-17 m/s). If lifting takes place at great height lifting must be stopped earlier.

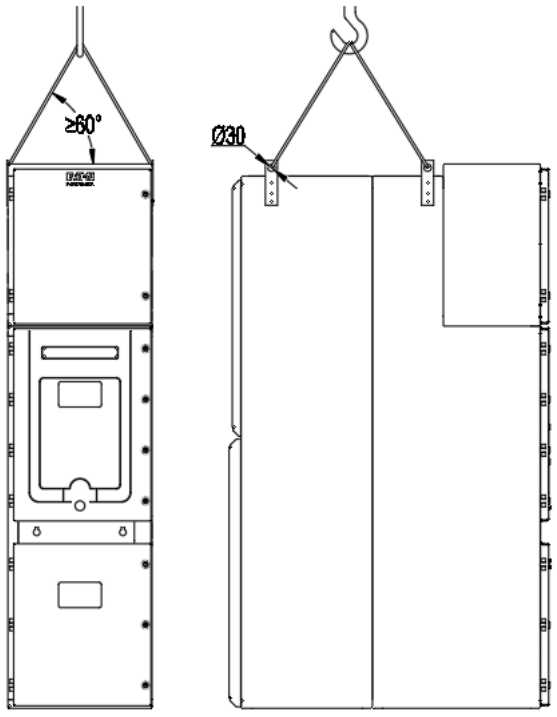


Fig. 3-2 Handling by crane

3.2.3 Transport in the operating area

The installation can be moved in the operating area by means of all suitable aids. This can vary from solid bars, lifting trolleys, cranes or forklift trucks.

Solid bars

1. Lift the Power Xpert UX on one side and put a solid bar under the equipment.
2. Repeat this until a bar is present under each section.
3. Locate additional bars in front of the transport direction and push the Power Xpert UX towards its final location.
4. Remove the bars in reverse order.

CAUTION

Make sure that under each section a solid bar is always present. This is to prevent sagging, which could cause alignment issues or damage to the enclosure.

Lifting trolleys

1. Lift the Power Xpert UX on one side and put a lifting trolley under the installation end.
2. Support the installation adequately to prevent rolling away.
3. Lift the Power Xpert UX on the other side and put a lifting trolley under the installation end.
4. Carefully push the Power Xpert UX towards its final location.
5. Remove the lifting trolleys in reverse order.

Inside cranes

Transport by indoor cranes is done in the same way as outside transport. Please refer to the applicable paragraph above.

Forklift trucks

Transport by forklift trucks is done in the same way as outside transport. Please refer to the applicable paragraph above.

3.3 System assembly

REMARK

Site installation of the switchgear should be carried out by authorized and qualified personnel.

Eaton offers fully warranted switchgear when installation is performed or supervised by Eaton or Eaton certified partners. Warranty can be void if switchgear is not installed by authorized and qualified personnel or not in accordance with Eaton instructions.

3.3.1 Foundation on site

The switchroom needs to have a suitable foundation in order to mount the switchgear assembly. Foundation requirements are based on the depth and width of the switchgear. There are many types of switchgear in the UX series and the required dimensions of the foundation are different. For foundation details, see Appendix paragraph 8.2.

3.3.2 Unpacking the delivery

Dispose of the packing material in an environmentally sound manner. It is essential to adequately pack the products so as to avoid damage. All packing materials are inoffensive to the environment and can be re-used.
If any wood is used, it has not been treated chemically.

Foils are from polyethylene (PE). CFC-free polystyrene foam is used for padding. These plastics are pure hydrocarbon compounds, so they can be recycled. If incinerated, there will be no emissions that are damaging to the environment.

REMARK

By using and reusing packing materials, we can save on raw materials, therefore reducing waste.

Procedure

1. As required, remove the packaging materials from the equipment.
2. Reuse or dispose of packaging materials in an environmental friendly manner.

3.3.3 Inspection of the floor

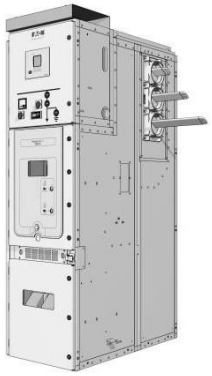
NOTE

The maximum difference in height with reference to width and length of the installation shall not exceed 4 mm.

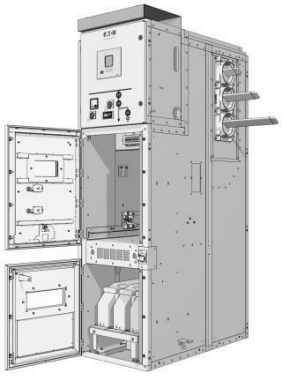
1. Prior to the installation, make sure the floor is smooth and level.
2. Find the highest point in the installation area. Installation of the sections should start from this point. Differences in height must be eliminated with the use of shims.
3. Check the location of the recesses with reference to the approved floor plan, which is part of the information package to which this manual belongs.
4. Check the location of the cable trench / cable cellar with reference to the floor plan.
5. If any cables come out of the floor, make sure they are electrically insulated.
6. Put the cables downwards or into the cable cellar/trench in such a way that the Power Xpert UX switchgear can be installed on top.

3.3.4 Preparations

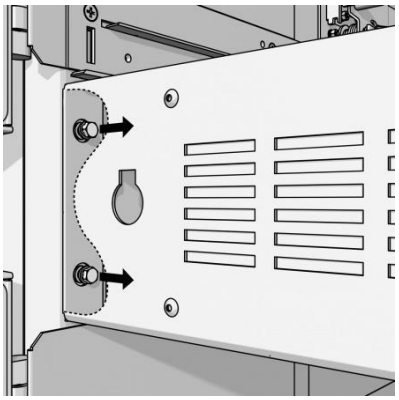
1. If any cables come out of the floor, make sure they are electrically isolated.
2. Open doors with panel door key.
3. Remove the bolts (2 on left and 2 on the right) from behind the mid-pan.
4. Pull the mid-pan forward and remove from the panel.
5. If fixed VT's are in the cable compartment, remove nuts connecting VT and bracket copper bar. If not, please continue with step 8.
6. Remove bolts connecting VT and VT mounting tray.
7. Remove the VT one at a time and then remove the VT mounting tray.
8. Remove secondary cable duct cover inside of the front left side sheet.
9. Remove the protective covering from the installation side, which is to be coupled.
10. Remove venting plate.
11. If the installation is not backed against a wall, it is recommended to remove the rear walls of the Power Xpert UX installation.
    a. Remove screws connecting rear bottom cover and rear panel.
    b. Remove rear bottom cover (see arrow in illustration).
    c. Remove screws connecting rear down cover plate and rear panel.
    d. Remove rear down cover plate.
12. When all busbars and cables are connected, follow upper steps in reverse to reassemble installation.



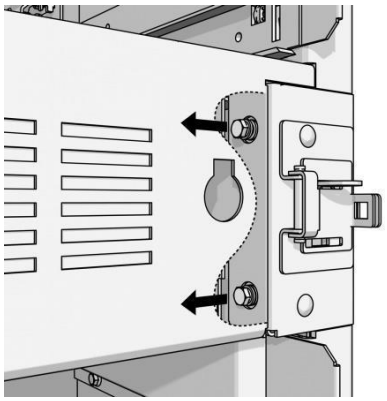
Panel with door closed



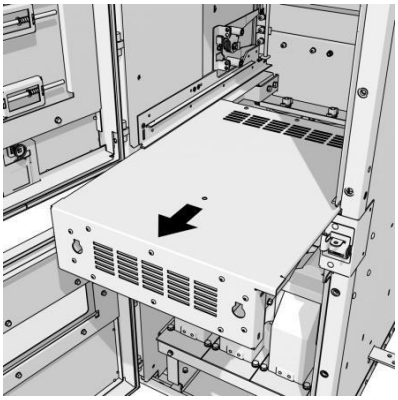
Door open



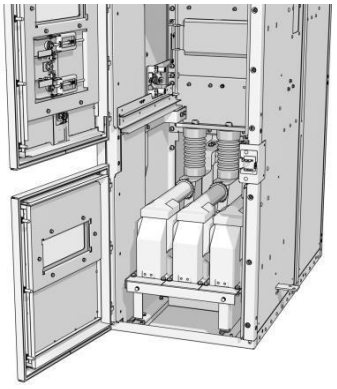
Removing left bolts of mid-pan



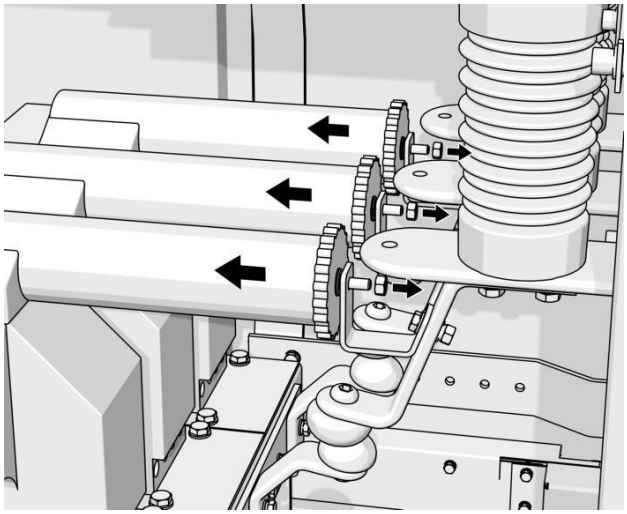
Removing right bolts of mid-pan



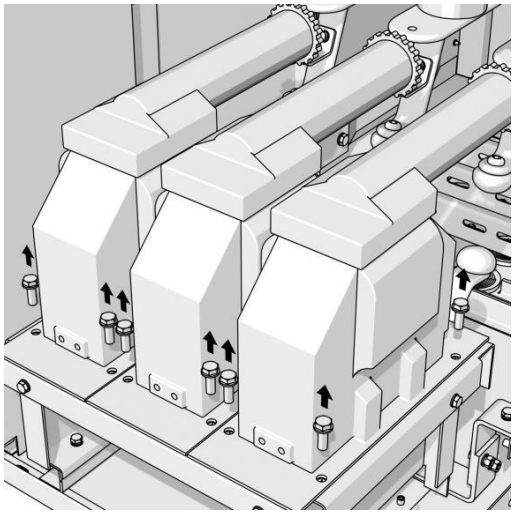
Removing mid-pan



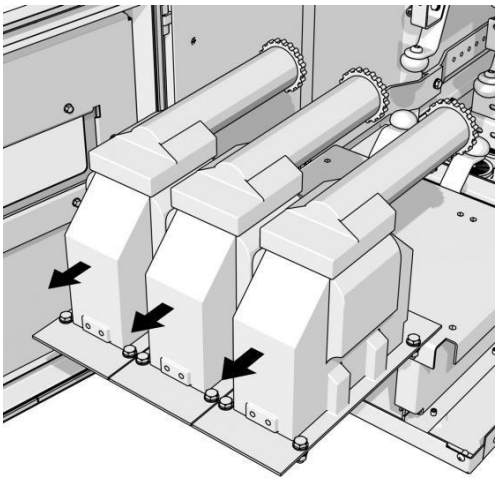
Panel without mid-pan



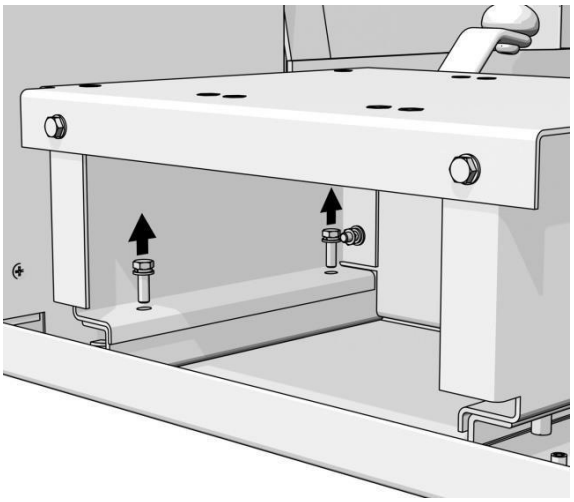
Removing nuts connecting PT and copper bar



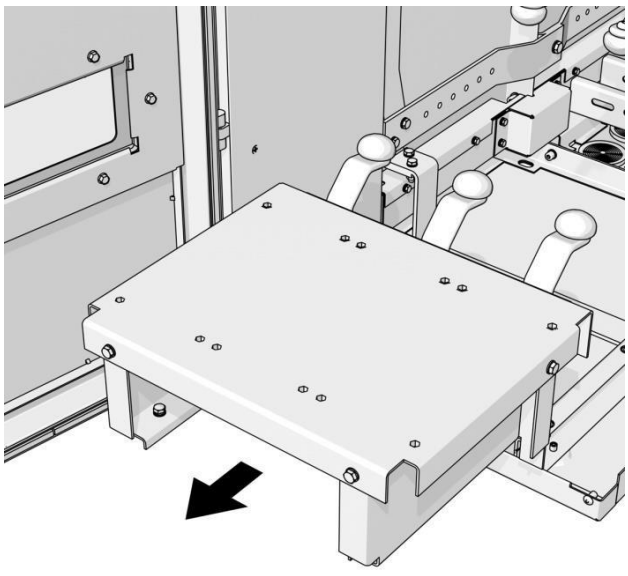
Removing bolts connecting PT and PT mounting tray



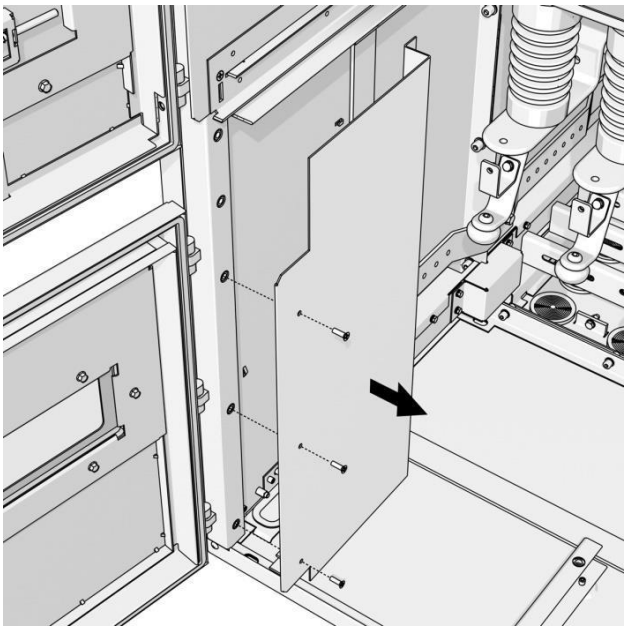
Removing PT



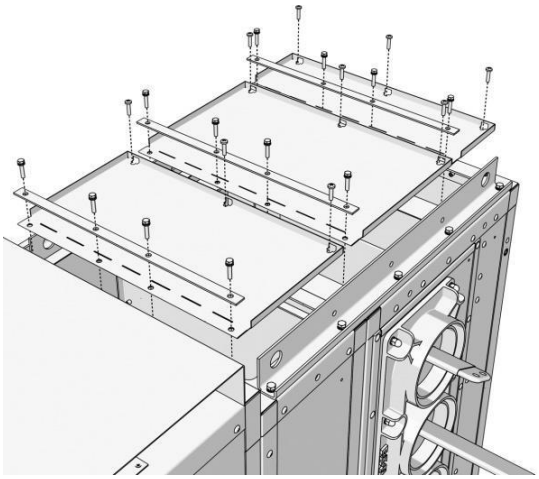
Removing bolts connecting PT mounting tray and support



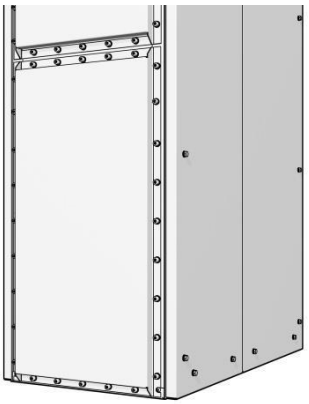
Removing PT mounting tray



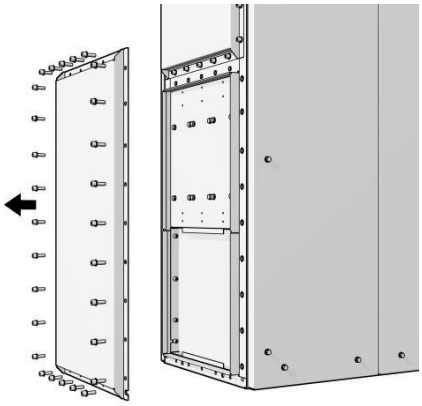
Removing secondary cable duct cover



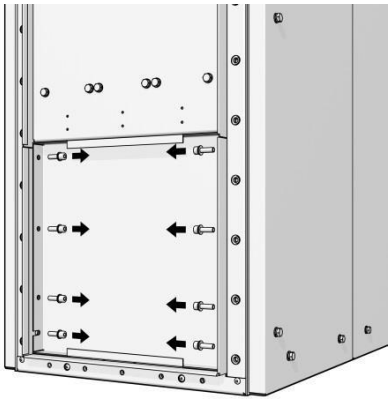
Removing Venting flap



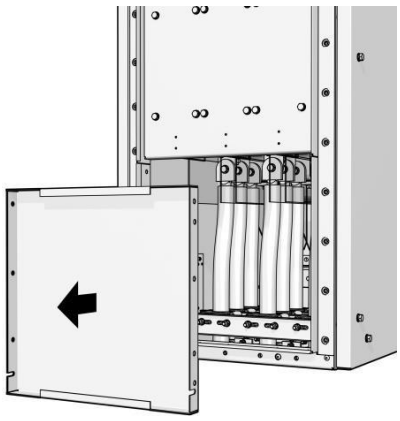
Rear panel with rear bottom cover



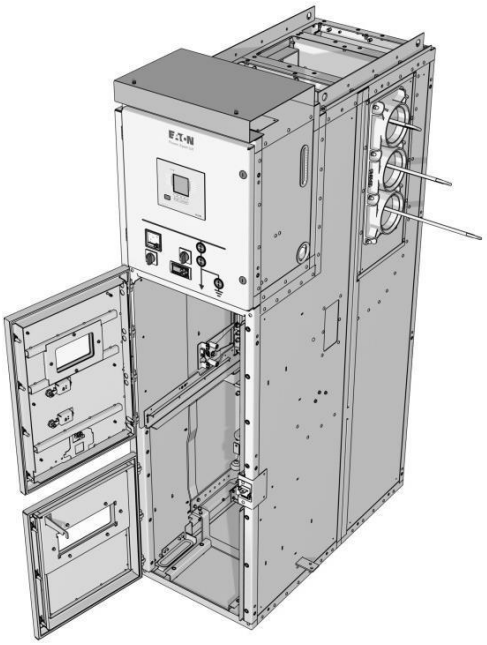
Removing rear bottom cover



Removing the rear down cover plate



After removing the rear down cover plate



Right top view after preparation for system assembly

3.3.5 Installation of the switchgear

NOTE

The maximum difference in height with reference to width and length of the installation shall not exceed 4 mm. Start from the highest location.

1. Position the first panel and level it. If the floor is not level, use shims at the corners and in the centre. It is proposed to start from the middle of the floor if more than 10 panels need to be assembled.
2. Make sure the panel is properly and equally supported. See the illustration for the locations – Fig 3-4, which need to be supported.
3. Fix the panel to the floor with use of M12 bolts. Apply a standard torque 70Nm, see Fig.3-4. Bolts fixing at the centre of panel is optional, but is required for seismic level.
4. Remove the hoisting frame, bolts and washers if applicable. Check locations of junction holes, see Fig.3-5. Remove the bolts and washers if installed.
5. Move a second panel to the first one.
6. Align the panel front edges with vertical deviations not exceed 2mm.
7. Use the bolts and washers and apply a torque of 40Nm to fix the panels together, see Fig.3-3. Bolts location, see Fig.3-5
8. Coupling the other panels in the same way as given.
9. Put on each panel label if applicable.
10. Fix the other panels to the floor with use of M12 bolts and washers, apply torque 70Nm. Bolts Location see Fig.3-4

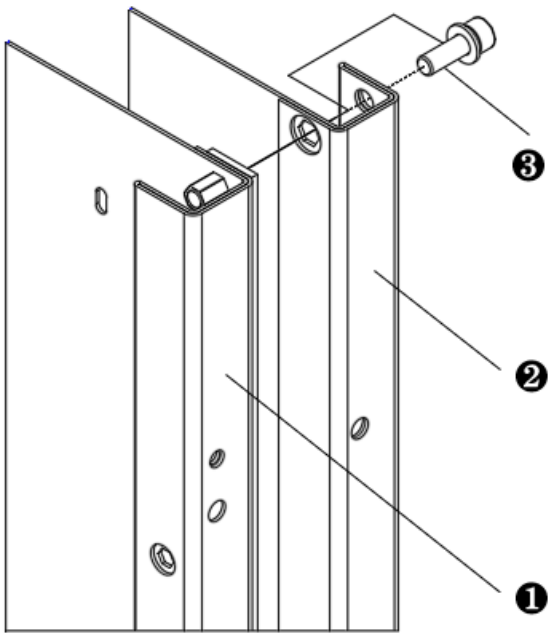


Fig. 3-3 Coupling bolts assembly

1. Right side sheet with riveted nuts of the first panel
2. Left side sheet of the second panel
3. M10 bolt assembly

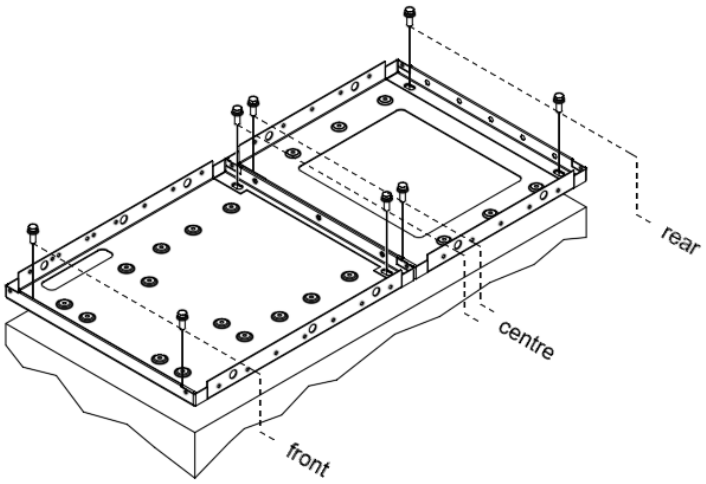


Fig. 3-4 Location of the bolts connecting panel and floor

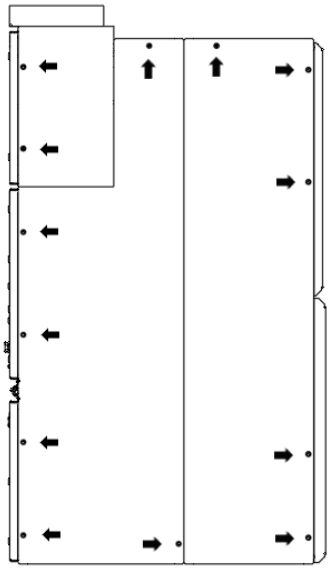


Fig. 3-5 Location of the bolts connecting adjacent panel

3.4 Busbar coupling

3.4.1 Main busbar

General

The main busbar system is located in the top compartment of the panel which is named as the busbar compartment. For 40kA and 50kA short time withstand currents , busbar ends are provided with arc horns. This is to guide the energy released as a result of an internal fault in a secured way.

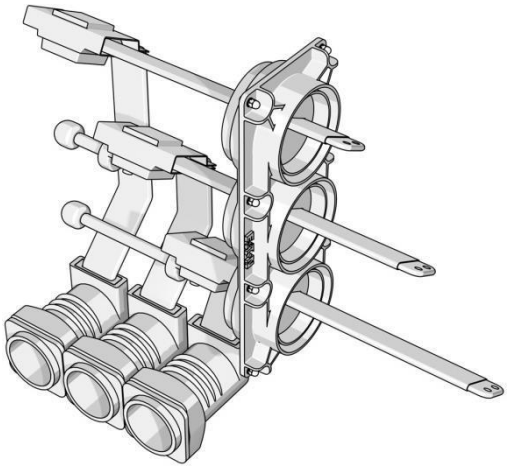


Fig. 3-6 Main busbar with arc horns

Main busbars - coupling

1. Remove any oxide film from the mating surfaces of the busbars and connecting strips with the use of very fine abrasive cloth (eg Scotch Brite).
2. Hold the busbars in position as shown in the illustration.
3. Place bolts, washers and nuts through busbars as shown in the illustration.
4. Tighten the bolts by hand (finger tight only).
5. Align the busbars and tighten the bolts using a torque wrench. Apply a torque of 70 Nm (M12 bolts).
6. Cover the joint with the insulation box using either cable ties or plastic rivets to close the insulation cover.

NOTE

Wire connection between wall tube and main busbar required for 24kV, see Fig.3-9

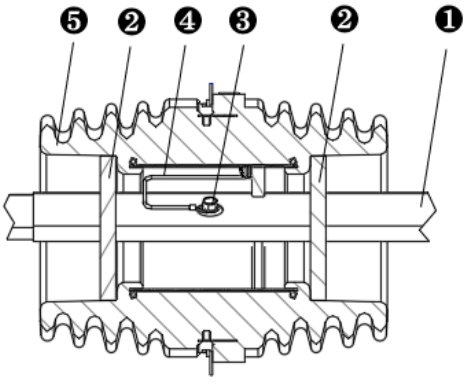


Fig. 3-9 24kV wire connection between wall tube and main busbar

1. Main busbar
2. Bung
3. M6 bolt assembly
4. Wire
5. Wall Tube- 24kV

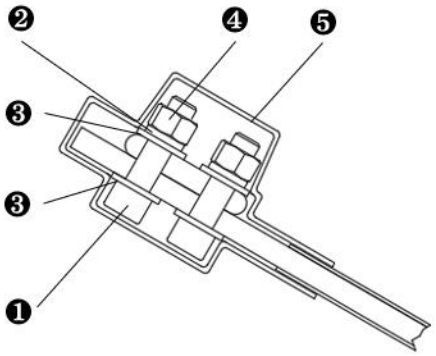


Fig. 3-7 Bolts connection for main busbar

1. Bolt M12
2. Spring washer 12
3. Plain washer 12
4. Nut M12
5. Cover insulation

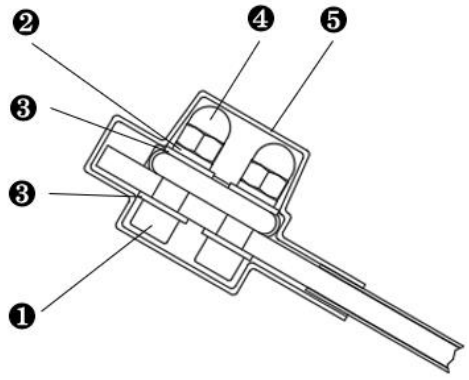


Fig. 3-8 24kV bolts connection for main busbar

1. Bolt M12
2. Spring washer 12
3. Plain washer 12
4. Cover nut M12
5. Cover insulation

NOTE

The adjacent illustration shows the assembly of the main busbar with a T-off:

UX branch busbar ratings :

a. 630A/25kA
b. 1250A/31.5kA
c. 1250A/40kA
d. 1250A/50kA
e. 2000A, 2500A/31.5kA
f. 2000A/40kA
g. 2000A/50kA
h. 3150A/40kA, 50kA

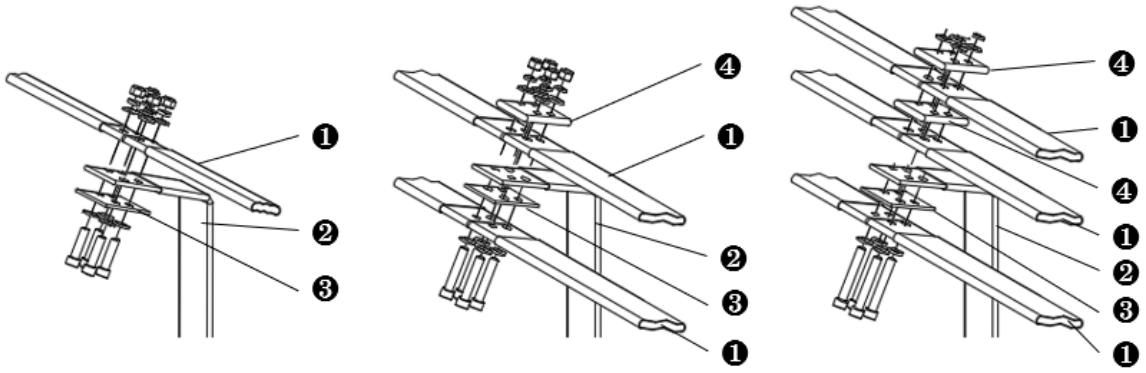


Fig. 3-10 Branch Busbar-630A / 25kA connecting single / double / triple main busbars

1. Main busbar
2. Branch busbar
3. Copper packer (Th=4mm)
4. Copper packer (Th=10mm)

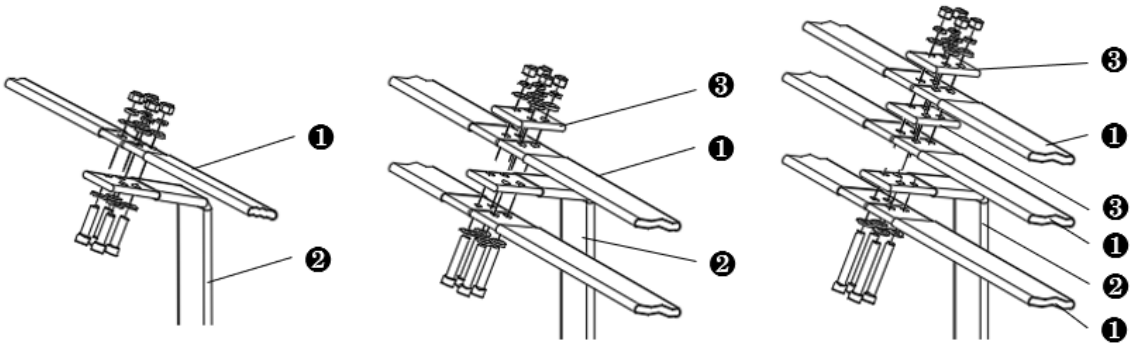


Fig. 3-11 Branch Busbar-1250A / 31.5kA (40kA) connecting single / double / triple main busbars

1. Main busbar
2. Branch busbar
3. Copper packer (Th=10mm)

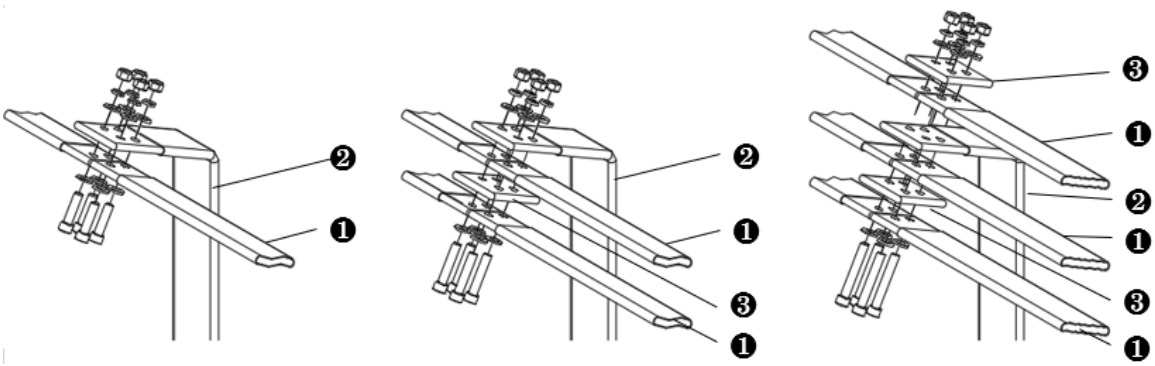


Fig. 3-12 Branch Busbar-1250A / 50kA connecting single / double / triple main busbars

1. Main busbar
2. Branch busbar
3. Copper packer (Th=10mm)

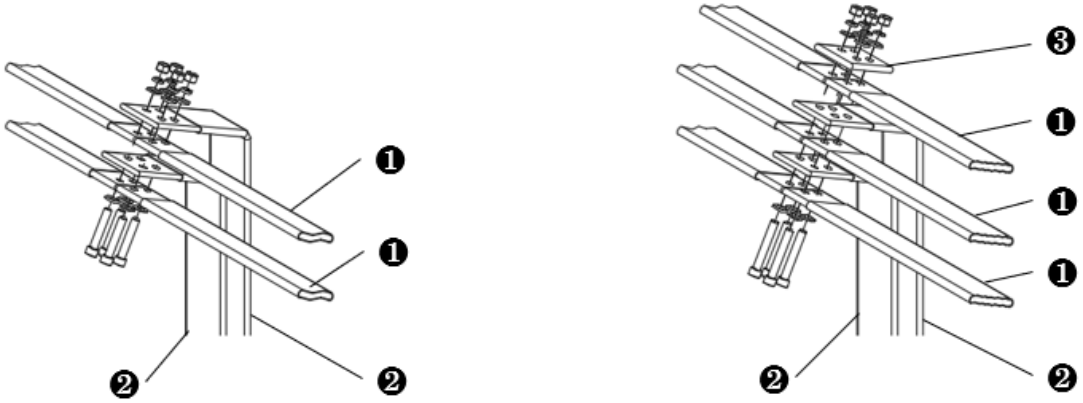


Fig. 3-13 Branch Busbar-2000A, 2500A / 31.5kA (40kA / 50kA) connecting double / triple main busbars

1. Main busbar
2. Branch busbar
3. Copper packer (Th=10mm)

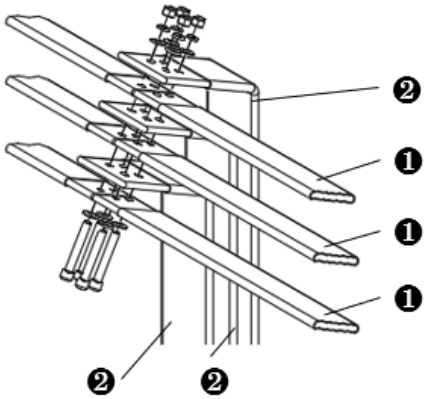


Fig. 3-14 Branch Busbar-3150A / 40kA (50kA) connecting triple main busbars

1. Main busbar
2. Branch busbar

3.4.2 Earthing busbars

General

The earthing busbar system is located in the bottom compartment of the panel and consists of a copper bar.

WARNING

To prevent against electrical shock:

Earthing connections have to be properly made.

Connect the Power Xpert UX earthing busbars to the earth connection of the building (local earth potential).

Earthing busbars - coupling

1. Connect adjacent panels earthing busbar in the bottom part of the cable compartment.
2. Connect the earthing busbar of the Power Xpert UX installation to the earth point of the switchroom.
3. Remove all tools, equipment and materials from the compartment.

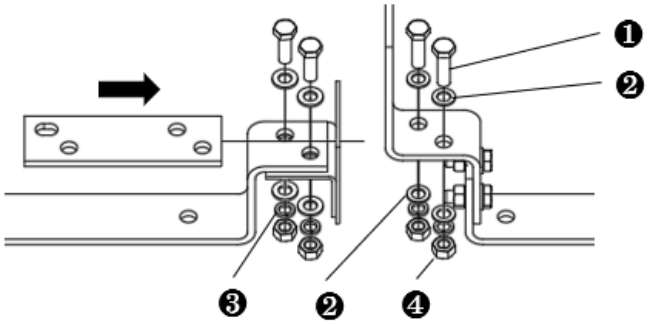


Fig. 3-15 Bolts connection for earthing busbar between panels

1. Bolt M10x35
2. Plain washer 10
3. Spring washer 10
4. Nut M10

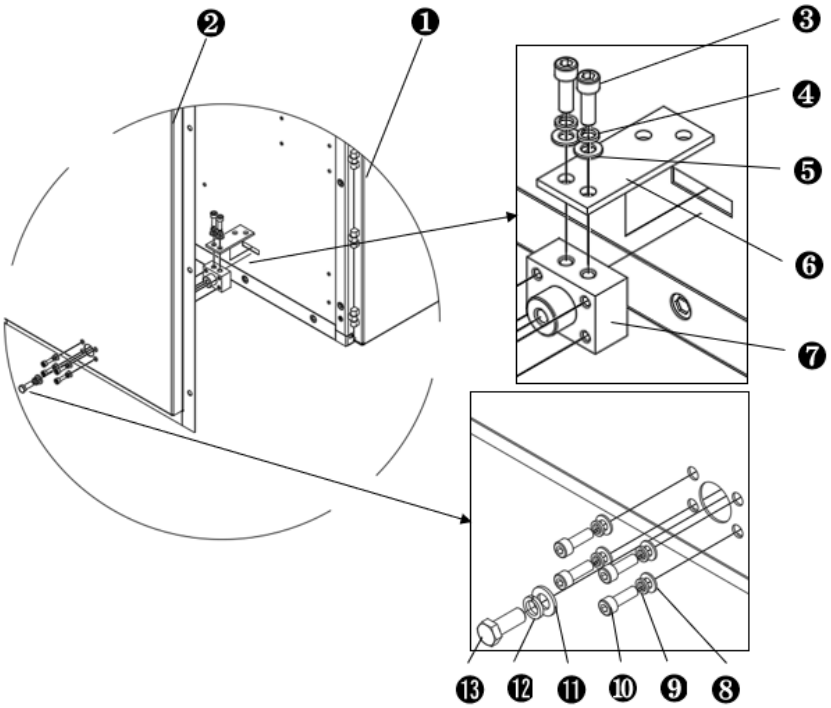


Fig. 3-16 End earth bar connection to station earth system (optional)

1. End panel
2. End panel side cover
3. Bolt M10
4. Spring washer 10
5. Plain washer 10
6. End earth bar
7. End copper block
8. Plain washer 8
9. Spring washer 8
10. Bolt M8
11. Plain washer 12
12. Spring washer 12
13. Bolt M12

3.5 Connection of wiring and cables

Different types of cables can be connected to the switchgear for example 1 or 3 core paper lead, XLPE or synthetic cables.

WARNING

Ensure that the installation and the cables are dead.

NOTE

Wiring and cables must be connected only:

- By authorized and qualified personnel.
- In accordance with the data in the information pack.
- In accordance with cable manufacturers or cable box supplier's instructions.

In addition to providing for cable connection, the cable compartment can be used to house other components, such as:

- Current transformers
- Voltage transformers
- Earthing switch
- Over voltage surge arrestors
- Capacitive elements for voltage detection system

Not all the components mentioned may be accommodated in the cable compartment at the same time. This can be influenced by the cable specification and number of cables per phase to connect.

The cable compartment is configured for the connection of one or more cables. For detailed information, go to paragraph 3.5.1.

If necessary, cable cut outs may need to be made in the cable gland plate at site.

3.5.1 Connecting a main cable

Depending on what is housed in the cable compartment and the space behind the installation, the main cable can be connected from the front.

Proceed as follows:

1. Open the middle and bottom door (connection at the front).
2. Terminate the cable in accordance with the manufacturer's instructions.
3. Connect the cable in accordance with the manufacturer's instructions.
4. Secure the cable or cable box with clamps or blocks to the angle section in the compartment (this also provides stress relief).
5. Connect the earthing screen of the cable to the earth busbar of the cable compartment.

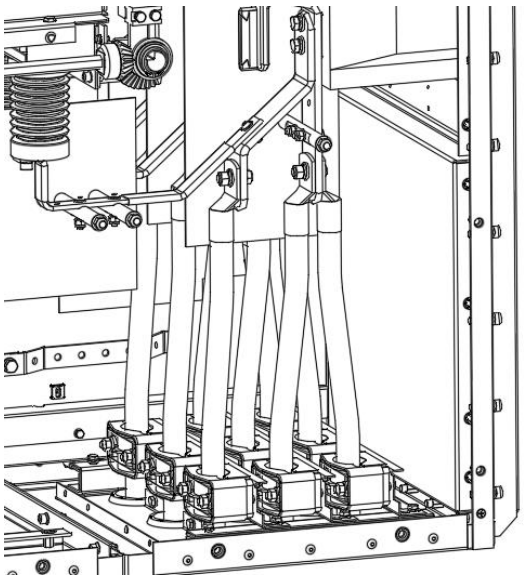


Fig. 3-17 Connecting main cable

3.5.2 Connection of secondary wiring

The documentation pack contains a wiring diagram for the secondary wiring.

Both the terminal strips and the internal secondary wiring are coded. These codes can be found in the wiring diagram.

External secondary wiring

For connection of external secondary wiring proceed as follows:

1. Remove the cover from the cable duct (see arrow in illustration).
2. Feed the secondary wiring into the switch panel from underneath.
3. Secure the cables in the cable duct with cable clips or tie-wraps.
4. Terminate the wire ends, where necessary, in accordance with the diagram pack.
5. Connect the cables in accordance with the diagram pack and codes.
6. Refit the cable duct cover.

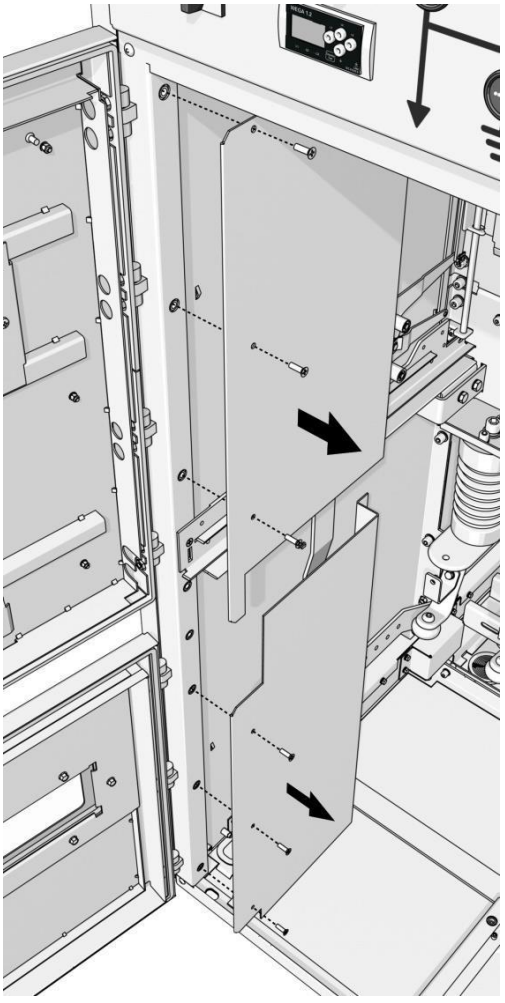


Fig. 3-18 Connecting secondary wiring

Internal secondary wiring (inter-panel wiring)
Secondary wiring for inter-panel connection may come to the adjacent panel through the round or rectangular holes, covered with grommets, in the side sheet of the low-voltage compartment. Alternatively they may exit the low-voltage compartment at the top, run along the switchgear in the low-voltage wire way (see arrow) and enter the adjacent or other panels in the switchgear in the same way.

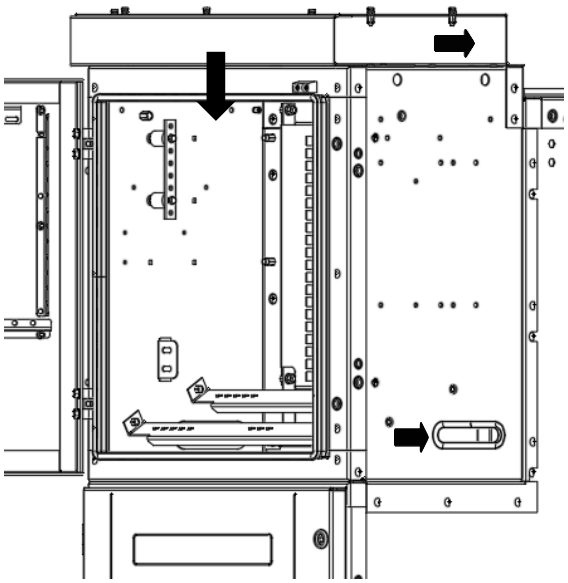


Fig. 3-19 Inter-panel connection of secondary wiring

4 System operation

This chapter contains the operating procedures for the withdrawable circuit breaker and W-SLC contactor units used in Eaton Power Xpert UX™ switchgear

Refer to the W-VAC*i* circuit breaker or W-SLC contactor user manual for specific details relating to the circuit breaker of contactor.

WARNING

Interlocks must only be removed by a specialist, and only if absolutely necessary for operational reasons. When removing an interlock, the specialist must take special and adequate safety measures to prevent situations which might have fatal consequences. When re-installed ensure that the interlocks works as intended.

CAUTION

The switchgear must be operated only as prescribed in this manual. Actions, which are not prescribed, or actions prescribed in unusual circumstances, must be taken only with the approval of the responsible Eaton specialist. The latter's instructions must be followed exactly.

NOTE

Only adequately trained experts and operating specialists may operate the equipment. No other personnel must be present in the operating area.

4.1 Operation - General

This chapter describes operating actions relating to standard equipment. The operation of optional equipment and accessories is included in the operating instructions. These can be found in the information pack, which includes this manual.

Refer to individual user manuals for optional equipment and accessories.

4.1.1 Mechanical operation with open door

When the middle door is open, the circuit breaker or contactor withdrawable unit can be operated directly from the controls mounted on the front of the unit. For full information refer to the user manual of those devices

If the secondary connector is connected, then a full functional test of the unit is possible.

NOTE

The door cannot be opened when the unit is in the 'Service' position. To open the door make sure the unit is in the 'Off' position and it is racked out fully to the 'Test' position. This will release the door interlock mechanism and the door can now be opened.

NOTE

Door interlock defeat mechanism: To open the door in an emergency, remove two screws. Adequate safety measures must be taken to prevent situations which might have fatal consequences.

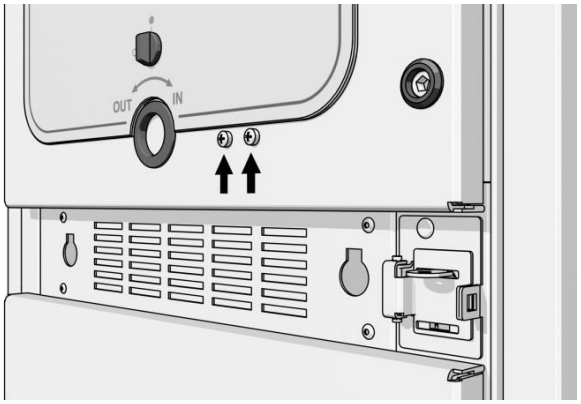


Fig. 4-1 Door interlock defeat operation

4.1.2 Manual operation of the circuit breaker

For operating of the circuit breaker unit, see the user manual of the W-VAC*i*.

1. Secondary connector
2. Manual close button
3. Closed/open indicator
4. Manual open button
5. Front panel
6. Manual charging handle
7. Nameplate
8. Spring charged/discharged Indicator
9. Operation counter

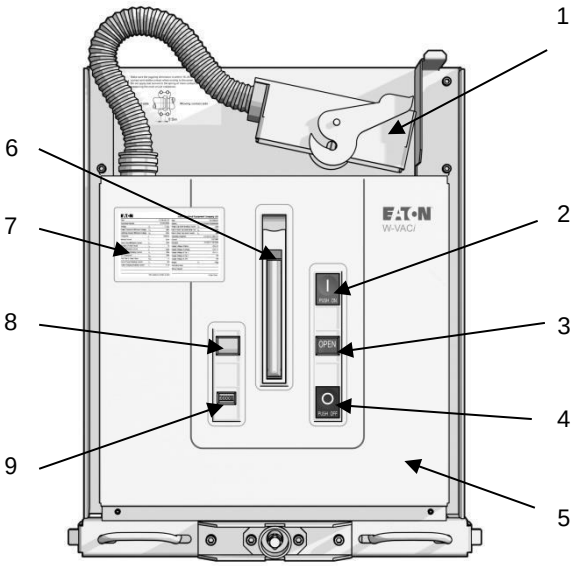


Fig. 4-2 WVACi circuit breaker

4.1.3 Manual operation of the contactor

For operation of the contactor unit, see the user manual of the W-SLC.

1. Secondary connector
2. Manual open button
3. Closed/open indicator
4. Operation counter
5. Front panel
6. Name plate
7. Fuse status indicator

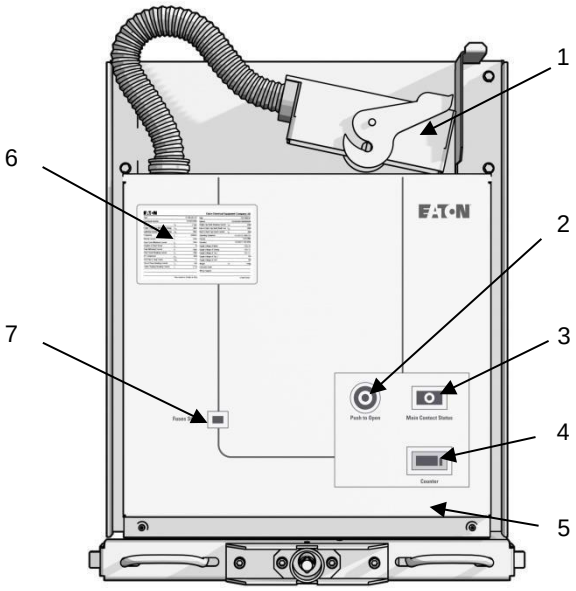


Fig. 4-3 W-SLC contactor

4.1.4 Mechanical operation with closed door

Mechanical operation with door closed is intended to be used for emergency control only.
The circuit breaker can be switched Off or On (optional) via the operating facility at the front of the middle door. The contactor can only be switched Off (valid for latched type only).
In case the panel is provided with the switching On facility, ensure that the secondary connector is mounted before operation. Mounting of the secondary connector can be visually checked via the inspection window in the door. This to make sure that the unit is working correctly after the auxiliary voltage would have been returned. Optional mechanical or electrical interlocks are available to ensure the connection of the secondary connector before operating the unit from the ‘Test’ to the ‘Service’ position.

NOTE

If you are not sure whether the unit is working properly, carry out the following procedure:

Visually check if the withdrawable unit is in the ‘Service’ or ‘Test’ position (via inspection window in the door). The unit should be fully racked in the ‘Service’ position. Check that spring position indicator on the switch is in the ‘Spring charged’ position (valid for circuit breaker only).

NOTE

The door cannot be opened when the withdrawable unit is in the ‘Service’ position.

Two methods of operation are possible. Rod operation is the standard method and as an option pushbutton operation is available.

4.1.4.1 Rod operation

Switching Off

- If key lock is provided, turn the key clockwise 90 degree to unlock position.
- Insert the rod into the initial position (‘Trip’).
- Move the rod rightward.
- Push the rod until the manual open button will be triggered, the unit will switch Off.
- Draw the rod backward.
- Move the rod leftward and take out.

For switching On, same steps to be followed, making use of the ‘Close’ initial position. Ensure that the secondary connector is mounted.

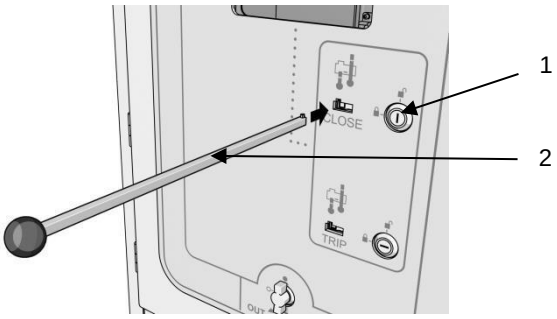


Fig. 4-4 Rod operation

1. Key lock, if provided
2. Operating rod

4.1.4.2 Pushbutton operation

Switching On

- Turn the key of the change-over selector clockwise 90 degree to unlock position.
- Turn the change-over selector (2) anti-clockwise to the end stop.
- Press firmly on the ‘On’ button (1), the unit will switch On.

Switching Off

- Turn the key of the change-over selector clockwise 90 degree to unlock position.
- Turn the change-over selector (2) clockwise to the end stop.
- Press on the ‘Off’ button (3), the unit will switch Off.

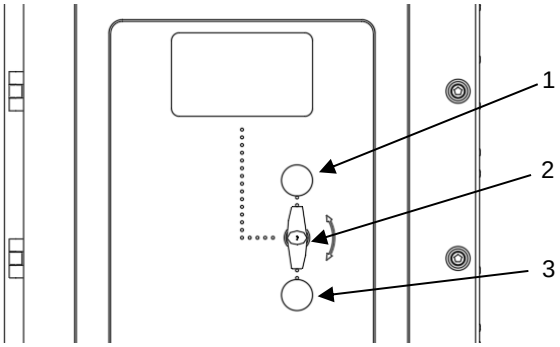


Fig. 4-5 Pushbutton operation

1. ‘On’ button
2. Change-over selector
3. ‘Off’ button

4.1.5 Electrical operation

The procedures described here apply to operation from the low-voltage compartment door.

The circuit breaker and/or contactor can also be electrically operated by remote control.

When operated electrically, a motor automatically tensions the closing spring of the circuit breaker.

The circuit breaker and / or contactor can be switched On and Off in both the ‘Service’ and the ‘Test’ position, however the secondary connector must be connected to allow for electrical operation of the units.
An optional electro-mechanical interlock can be fitted to ensure that the breaker cannot be racked from “test” to “service” position without the secondary connector being connected

Switching On

Press the ‘On’ button on the low-voltage compartment door.

- The unit switches On.
- If provided, the position indicator on the mimic, if fitted, indicates the unit is in the ‘On’ position.

Switching Off

Press the ‘Off’ button on the low-voltage compartment door.

- The unit switches Off.
- If provided, the position indicator shows the unit is in the ‘Off’ position.
- For circuit breaker operation the mechanism spring is automatically re-charged.

4.2 Unit insertion and withdrawal

This and the following paragraphs contain instructions for the manual insertion and withdrawal of withdrawable circuit breaker units. The same procedure is followed to insert and remove other withdrawable units such as contactors, voltage transformers, earthing trucks etc.
The instruction is also applicable if a withdrawable voltage transformer unit with shutter operation is available in the cable compartment.

It is possible that any specific installation requires operations which have not been described in this manual. For these, refer to the separate operating instructions/manuals.

The units are fitted with interlocks to prevent them from being inserted or withdrawn at the wrong time or in the wrong place. A special hand crank is provided to rack the unit in and out of the compartment.

During initial insertion (‘Insert’ position) or complete withdrawal (‘Removed’ position) of a unit from the panel, a transportation trolley is used.

4.2.1 Standard interlocking

A unit can be set in three interlocked positions, namely:

INSERT/REMOVED

NOTE

Ensure that any padlocks that have been used to lock the shutters have been removed before the unit is inserted.

The unit is outside of the panel, mounted on the transportation trolley and ready for insertion into the panel. The 58-pole secondary connector is unplugged and the unit is ready to be completely removed from the panel.

It is possible to complete a functional test on the unit in the ‘Removed’ position with the use of the optional extension umbilical cable which connects the secondary connector of the unit with the stationary secondary socket inside the compartment.

In this position the shutters are closed and can be padlocked for additional safety.

TEST

The unit is in the panel and located in the most forward position, known as the ‘Test’ position. Connection to either the cable or busbar side has not been made. The 58-pole secondary connector can now be connected.

In the ‘Test’ position, the unit can be operated electrically and mechanically with the door open.

The earthing switch can be operated with the door open or closed when the unit is in the ‘Test’ position.

The unit can only be put into the ‘Service’ position when the earthing switch is Open.

In this position the shutters are closed.

Once the compartment door is closed and secured, the unit can be moved (racked in) from the ‘Test’ position to the ‘Service’ position by means of a hand crank. The earth switch must be Open to allow the unit to be racked in. Any padlocks fitted to the shutter mechanism should have been removed.

WARNING

If the shutter padlocks have not been removed and the unit is forcibly racked in damage may be caused to the shutters and / or the carriage mechanism.

Opening and closing of the unit is only after the hand crank has been removed. When the unit is Closed, it cannot be moved either into the ‘Service’ or out to the ‘Test’ position. Movement is only possible with the unit switched Off.

SERVICE

The unit is fully inserted and the hand crank has been removed.

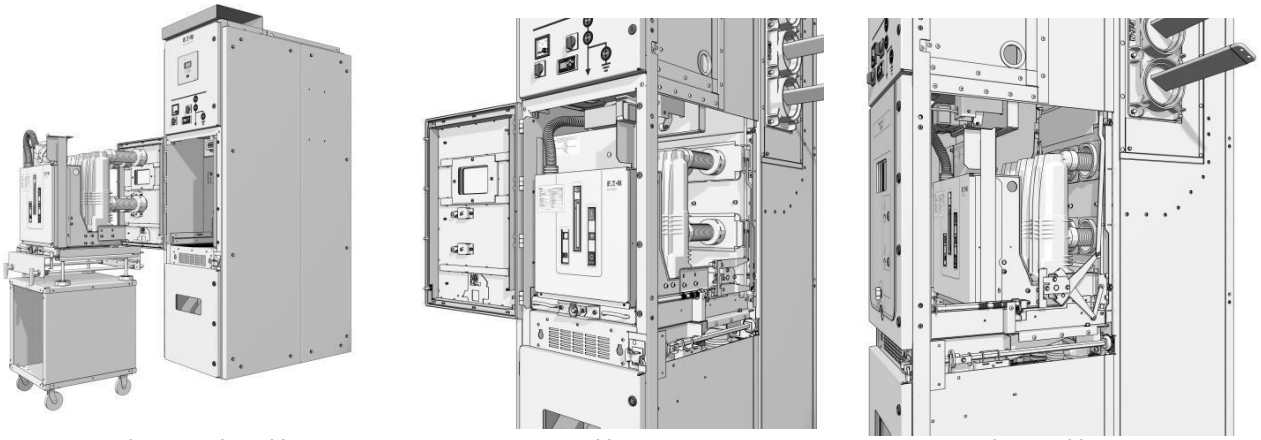
The earthing switch is interlocked to prevent operation.
In this position the shutters are open.

The door of the compartment cannot be opened with the unit in the ‘Service’ position.
The unit is now fully operational.

NOTE

Apart from the interlocks described above, other mechanical key or electrical interlocks may be present depending on the options chosen.

The following three steps are always followed when inserting or withdrawing a withdrawable unit.



Insert/removed position | Test position | Service position

Fig. 4-6

4.2.2 Inserting a unit

Inserting the unit to the 'Test' position.

Proceed as follows:

1. Open the door of the circuit breaker compartment.
2. Check that there are no padlocks fitted on the shutters; remove them if fitted.
3. If the panel has an earthing switch, ensure it is in the required position (Off during normal operation, On during maintenance or testing).
4. Remove all locks in accordance with any specific operating instructions.
5. Check that the unit is Off.
6. Move the unit on its trolley to the front of the panel compartment.
7. Move the trolley up to the unit compartment; align the interlocking tabs with the holes in the front panel and secure the trolley to the front of the panel using the handle (1).
8. If necessary, adjust the height of the trolley to align with the insertion plate in the panel with the aid of the adjusting wheels (3).
9. Unlock the unit from the trolley by releasing the shoot bolt handles (2) at the front of the unit and push the unit into the panel until it stops. The unit is now mechanically coupled to the compartment.
10. Mount the secondary connector. The unit is now in the 'Test' position.
11. Unlock the trolley by turning unlock handle (1) to the centre of the panel and remove the trolley.

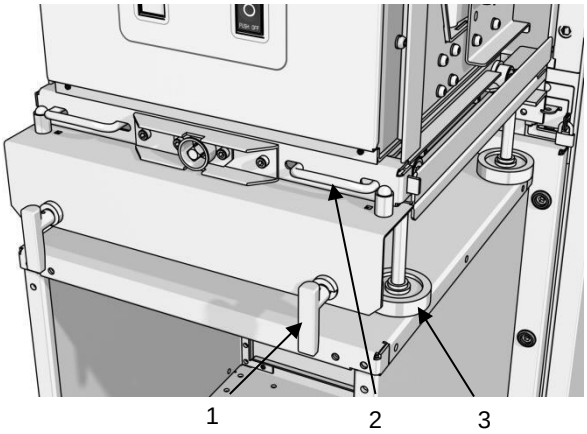


Fig. 4-7 Inserting a circuit breaker or other withdrawable functional unit

1. Unlock handle
2. Shoot bolt handle
3. Adjusting wheel

Unit: from ‘Test’ to ‘Service’ position.

1. Insert the 58-pole connector into the socket.
2. Check that the unit is Off.
3. If there is an earthing switch on the panel, ensure it is switched Off.
4. Close the panel door of the compartment by tightening all door bolts with the panel door key.
5. Turn the release (1) located in the centre bottom of the door anti-clockwise until the operating hole is free.
6. Fit the hand crank to the drive shaft and push a little to unlock the spindle mechanism and the handle will rotate.
7. Turn the hand crank clockwise until the unit is fully inserted (hand crank will not continue to turn).
8. Remove the hand crank.
9. The unit is now locked in the ‘Service’ position and is fully operational.

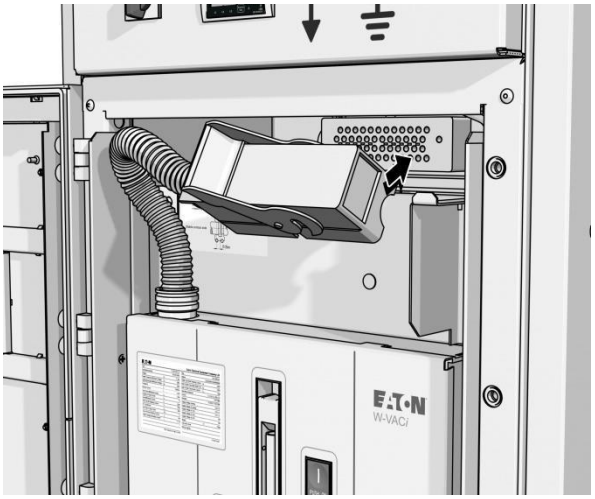


Fig. 4-8 Placing the 58-pole connector into the socket

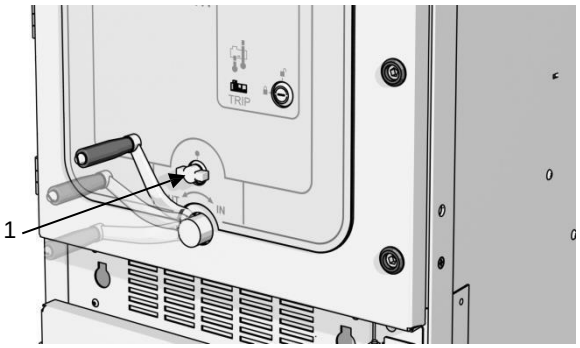


Fig. 4-9 Rack IN-OUT with closed door

1. Release

4.2.3 Door interlock mechanism

It is only possible to rack the unit from ‘Test’ position to ‘Service’ position when the door is fully closed and secured.

4.2.4 Withdrawing a unit

Withdrawal from ‘Service’ to ‘Test’ position

1. Check that the unit is Off.
2. Turn the release (1) located in the centre bottom of the door anti-clockwise until the operating hole is free.
3. Fit the hand crank to the drive shaft and push a little to unlock the spindle mechanism.
4. Turn the hand crank anti-clockwise until the unit is fully withdrawn (hand crank will not continue to turn).
5. Remove the hand crank. The unit is now in the ‘Test’ position and the door can be opened.

Withdrawal from ‘Test’ to ‘Insert/removed’ position

1. Check through the window of the door that the unit is in the ‘Test’ position.
2. Open the circuit breaker compartment door by unscrewing the door bolts with the panel door key.
3. Unplug the 58-pole secondary connector.
4. Place the trolley in front of the panel and ensure that the trolley is fully locked to the front of the panel. Use the height adjusting wheels (3) on the trolley to adjust the height of the trolley as necessary to align with the height of the unit compartment.
5. Release the shoot bolt handles (2) by moving them toward the centre of the panel and pull to move the unit onto the trolley.
   Release the shoot bolt handles (2) to lock the unit with the trolley.
6. Unlock the trolley by turning unlock handle (1) to the centre of the panel and remove the trolley.
7. If necessary fit a padlock to the automatic shutters (see procedure below).
8. Close the door by tightening all door bolts with the panel door key.

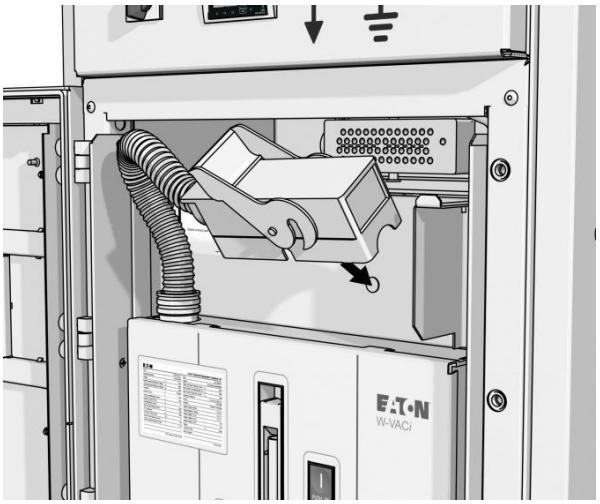


Fig. 4-10 Removing secondary connector

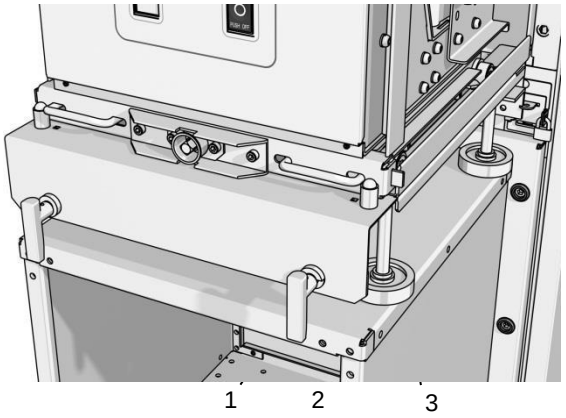


Fig. 4-11 Withdrawing a circuit breaker or other withdrawable functional unit

1. Unlock handle
2. Shoot bolt handle
3. Adjusting wheel

4.2.5 Locking the shutters

It may be necessary for safety reasons to lock the shutters when the unit has been withdrawn from the panel.

To do this, the shutter mechanism can be secured with a padlock. The maximum size of the padlock hasp is 8mm diameter.

To install the padlock, proceed as follows:

1. Withdraw the unit.
2. Check that the shutters are in the fully closed position.
3. Install the padlock as shown in the illustration.

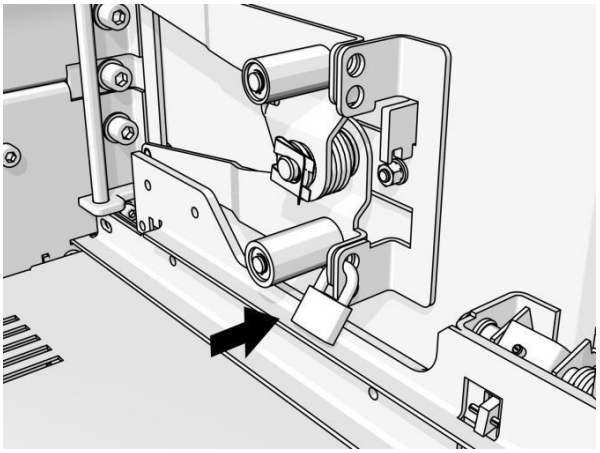


Fig. 4-12 Padlock shutters

4.3 Earthing

This manual contains general instructions for applying an earthing device within Power Xpert UX.

An installation may be fitted with specific interlocks (e.g. a blocking coil or mechanical key interlock). These are intended to permit operation of the earthing switch in a safe manner and in line with a pre-determined process.

WARNING

Only authorised and qualified personnel may fit an earthing device.

NEVER approach an unearthed installation.

The following paragraphs discuss the way of applying an earthing device:

- Manual earthing a cable using an integral earthing switch. See par. 4.3.2.
- Manual earthing a busbar using an integral earthing switch in the bus-sectionaliser panel or measuring panel. See par. 4.3.2.
- Earthing a busbar using an integral earthing switch mounted on top of a feeder panel. See par. 4.3.3.
- Earthing a busbar using a withdrawable earthing unit. See par. 4.3.4.
- Earthing a cable using a withdrawable earthing unit . See par. 4.3.4.

CAUTION

Make the necessary provisions on both ends of the cable before switching the earthing switch On.

4.3.1 Cable door interlock mechanism

The cable compartment door is mechanically interlocked with the earth switch operating mechanism such that it is only possible to open the compartment door when the earth switch is in the ‘On’ position (i.e. the cables earthed). It is only possible to open the earth switch when the cable compartment door is closed. In case an earthing switch is not provided, the cable door may be provided with specific interlocks (e.g. a blocking coil or mechanical key interlock). These are intended to permit opening of the cable door in a safe manner and in line with a pre-determined process.

WARNING

Do not attempt to operate the earthing switch when the cable door is open, the earth switch will not operate and using force may damage the interlock mechanism.

NOTE

To open the door make sure the earthing switch is switched On. The door interlock mechanism is released now. Before opening the door ensure that the cable is dead.

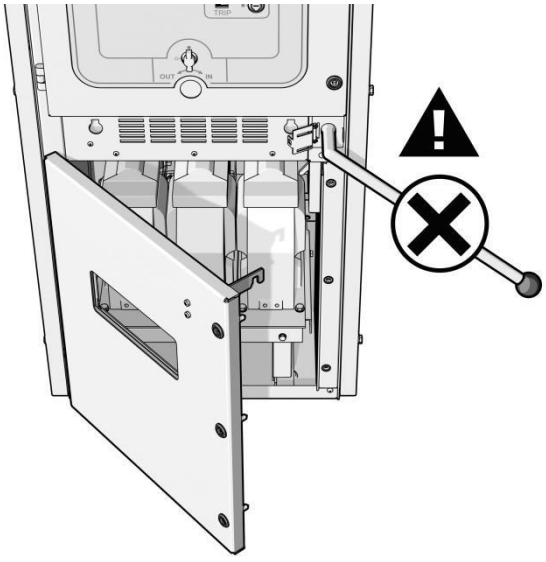


Fig. 4-13

NOTE

Door interlock defeat mechanism: To open the cable door in an emergency, remove two screws. Adequate safety measures must be taken to prevent situations which might have fatal consequences.

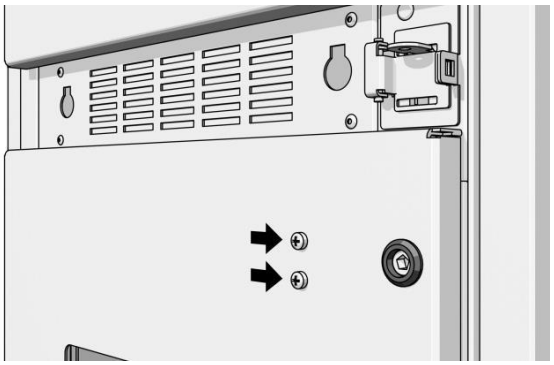


Fig. 4-14 Interlock defeat mechanism screws

4.3.2 Manual operation of an integral earthing switch

Switching the earthing switch On

1. Put the unit in the ‘Insert/Removed’ or ‘Test’ position;
2. Remove any padlock if fitted to the earth switch operation mechanism and open the cover (1).
3. Press the interlock driver (2) down to reveal the mechanism opening.
4. Insert the operating handle (3) through the opening to engage the operating shaft of the earthing switch.
5. Turn the handle clockwise;
   - The earthing switch will move to the ‘On’ position.
   - The position indicator indicates ‘I’ (On).
   - It is not possible to put a withdrawable unit into the ‘Service’ position with the earth switch On.
6. Remove the operating handle (3).
7. The cover (1) can now be closed and if required a padlock can be fitted on the locking catch. The earth switch is now padlocked in the ‘On’ position.
8. The cable door is released now and can be opened by unscrewing the door bolts with the panel door key.

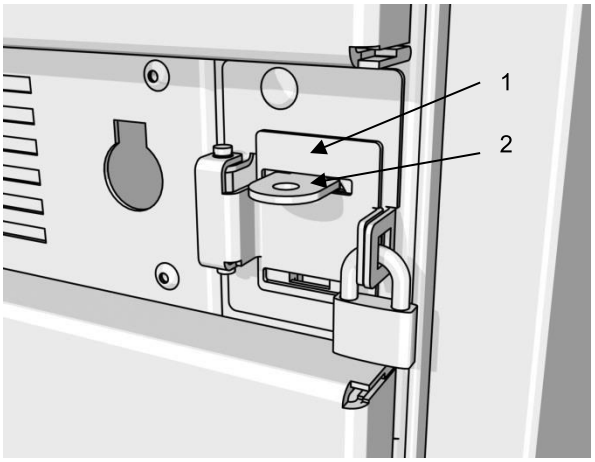


Fig. 4-15 Location of the operating shaft on a standard integral earthing switch

NOTE

The interlock driver (2) will be released to allow insertion of the operating handle (3) when the unit reaches the ‘Test’ position.

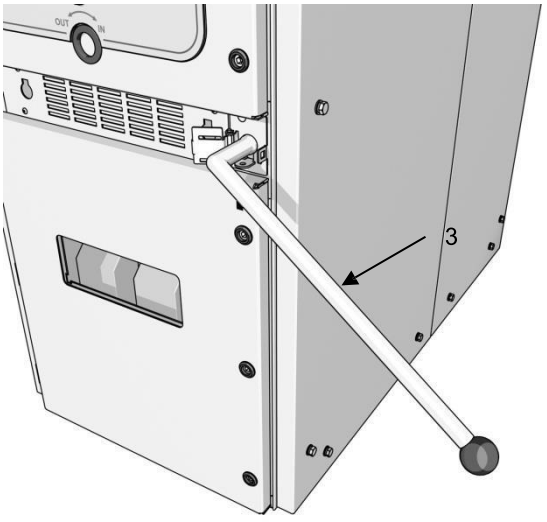


Fig. 4-16 Operating earth switch

1. Earth switch operating mechanism cover
2. Interlock driver
3. Operating handle

Switching the earthing switch Off

1. Close the cable door by tightening the door bolts with the panel door key.
2. Release all interlocks; if a padlock has been fitted, remove it.
3. Place the operating handle (3) on the operating shaft of the earthing switch.
4. Turn the handle anti-clockwise; release the interlock driver.
   - The earthing switch will move to the ‘Off’ position.
   - The position indicator indicates ‘O’ (Off).
5. Remove the operating handle (3).
6. The interlock driver will return to its original position. The cover (1) can be closed and if required a padlock can fitted. The earthing switch is now padlocked in the ‘Off’ position.

NOTE

The earthing switch can only be operated when:

- The unit is in the ‘Insert/removed’ or ‘Test’ position.
- The earthing switch is not locked with either a blocking coil, mechanical key lock or padlock (maximum size of the padlock hasp is 8 mm diameter).
- The cable door is closed and secured.

CAUTION

Check if all conditions for operation of the earthing switch are met to avoid unintended closing of the earthing switch onto a LIVE cable or busbar.

4.3.3 Operation of an integral earthing switch installed in a top unit

Normal operation of the integral fixed earthing switch is possible via electrical operation from the low voltage control panel door or via remote control.

The earthing switch is NOT mechanically interlocked with any withdrawable unit. Electrical contacts can be incorporated into the closing or opening circuits to prevent incorrect electrical operation of the earthing switch.

Emergency operation without the need of an auxiliary supply is possible by placing the operating handle on the operating shaft of the earthing switch. The operating shaft is situated at the rear side of the panel, see arrow. By turning the handle anti-clockwise the earthing switch will be switched to the ‘On’ position. By turning the handle clockwise the earthing switch will be switched to the ‘Off’ position.

CAUTION

Check if all conditions for operation of the earthing switch are met to avoid unintended closing of the earthing switch onto a LIVE busbar.

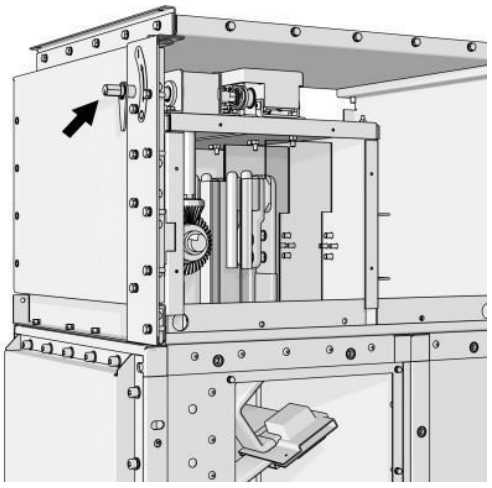


Fig. 4-17 Earthing switch installed in a top unit

4.3.4 Earthing busbar/cable using withdrawable earthing unit

The withdrawable earthing unit can be inserted into the circuit breaker compartment of a panel special provided with a direct earth busbar connection. Meaning that either the cable or busbar side is connected to earth with the unit inserted in the ‘Service’ position.

The procedure for insertion and withdrawal of the unit is described in paragraph 4.2.

WARNING

The withdrawable earthing unit is not fault make rated. Operation under LIVE conditions is not permitted.

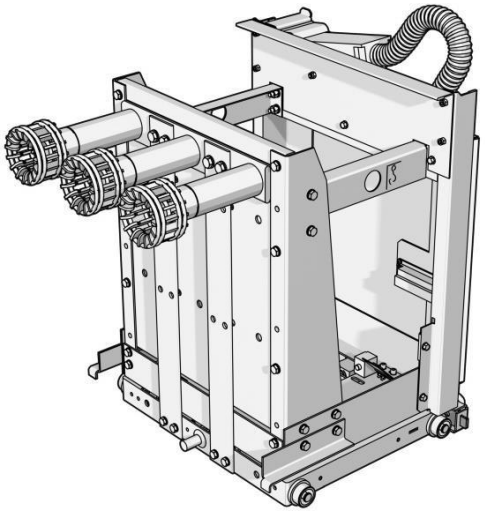


Fig. 4-18 Withdrawable earthing unit

4.4 Checks

WARNING

Checking and testing procedures must only be carried out by expert and authorised personnel.

This paragraph describes the main checking and testing procedures for Power Xpert UX switchgear:

- Operation of the automatic shutters.
- Testing the voltage indicator according to users procedure.

4.4.1 Shutter lifter truck

Panels suitable for insertion of withdrawable units are provided with automatic shutters to cover the cable and/or busbar side primary contacts when there is no withdrawable unit in the panel.

If access to the primary contacts, either busbar or cable, is required then an optional shutter lifter truck is used to lift the appropriate shutter and permit access.

WARNING

When using the shutter lifter truck to gain access to the fixed primary contacts BEWARE that the contacts may be LIVE and suitable safety precautions should be taken.

For shutter lifter truck operation proceed as follows:

Insert withdrawable shutter lifter truck unit to 'Test' position

1. Open the door of the unit compartment and remove the switch if present.
2. Insert the shutter lifter:
   - For busbar and cable side shutters: Fit push plate as indicated on the picture Fig. 4-19.
   - For busbar side shutters: Fit push plate as indicated in the picture Fig. 4-20.
   - For cable side shutters: Fit push plate as indicated on the picture Fig. 4-21.
3. For remaining steps, refer to inserting the unit to the 'Test' position of paragraph 4.2.2.

Opening the shutter

1. If there is an earthing switch fitted, check that it is switched Off.
2. Insert the shutter lifter truck from the 'Test' position to the 'Service' position.
3. The busbar and/or cable side shutter will now be open depending on the configuration 1, 2, 3 above.

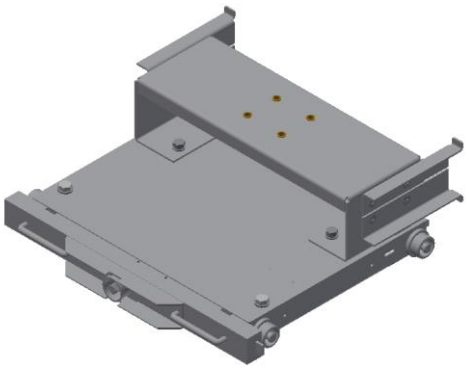


Fig. 4-19 Shutter lifter truck for busbar and cable side shutters

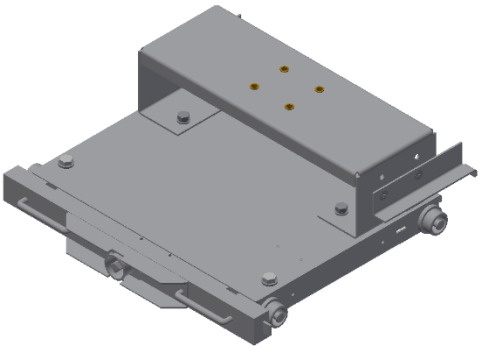


Fig. 4-20 Shutter lifter truck for busbar side shutter

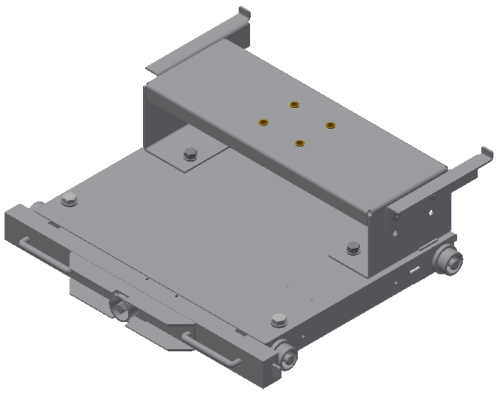


Fig. 4-21 Shutter lifter truck for cable side shutter

Closing the shutter

1. Withdraw the shutter lifter truck to the ‘Insert/Removed’ position.
2. Shutters are now closed.
3. If necessary, padlock the shutters.
4. Close the door.

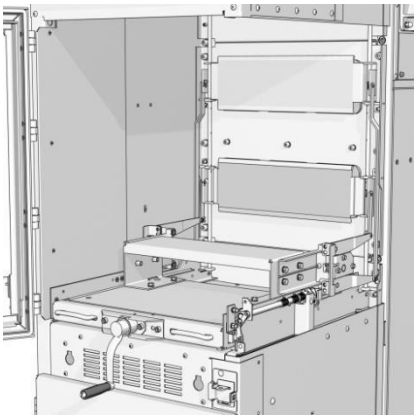


Fig. 4-22 Shutters closed

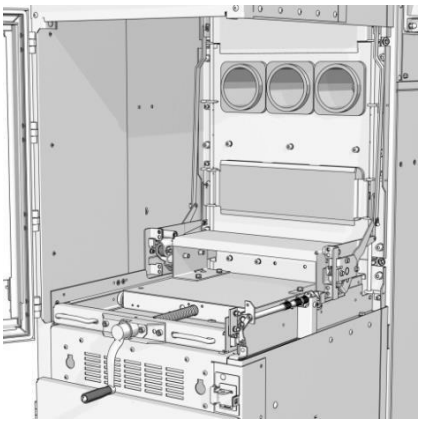


Fig. 4-23 Opening busbar side shutter

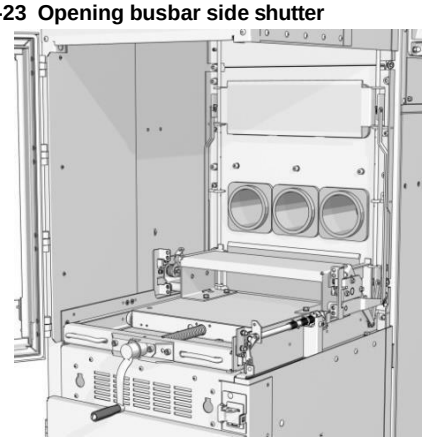


Fig. 4-24 Opening cable side shutter

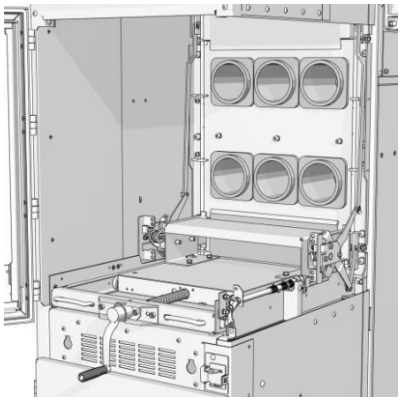


Fig. 4-25 Opening busbar and cable side shutters

4.4.2 Optional Voltage Detection System (VDS)

Power Xpert UX switchgear may be provided with a voltage detection system, which is connected via internal wiring to capacitive sensors mounted on the cable or busbar side. It continuously shows the presence of the primary voltage on all three phases via a voltage indicator mounted on the front door. If voltage is not present, this will be indicated.

For details refer to the specific user manual for the device fitted.

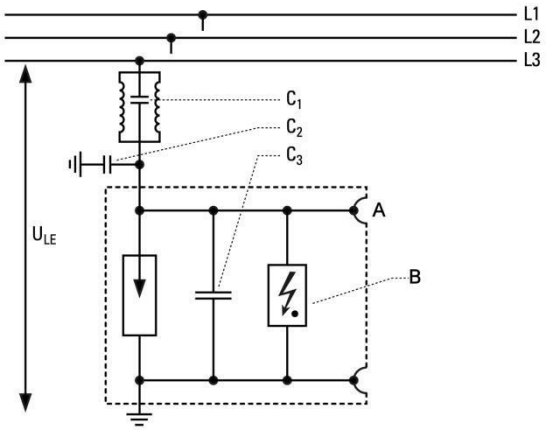


Fig. 4-26 Principle of the capacitive voltage detecting system

A Test point
B Voltage indication
C_1 Coupling electrode
C_2 Capacity of connecting leads
C_3 Adaption capacitor

5 System inspection, maintenance and repair

The maintenance described in this chapter may be carried out by the user's qualified personnel, with due attention to and compliance with instructions and safety regulations.

5.1 Logbook

The user should keep a logbook with data relating to the installation and any maintenance and repair carried out. The logbook should at least include dates and time of the following:

- All important incidents occurring in and with the switchgear;
- All faults;
- All maintenance work carried out;
- All repairs carried out;
- Note of contact with Eaton with regard to instructions and permissions if required for any changes and or modifications/repairs carried out.

5.2 Inspection and maintenance, general

Power Xpert UX™ switchgear and the withdrawable units used in the switchgear require minimal maintenance. Inspection and maintenance should be carried out at regular intervals.

Recommended inspection and maintenance schedule for Power Xpert UX switchgear:

- Periodic inspection: Annually.
- Maintenance: Every 5 years.

The first inspection is best carried out after six months of operation. A suitable inspection and maintenance schedule can be set up on the basis of this initial inspection.

If required, Eaton can carry out an intensive inspection of the installation and make recommendations with regard to life extension of the equipment.

Periodic checks can be made by the user's own qualified personnel. Eaton can provide guidelines and, if necessary, training for these.

REMARK

In the event of a fault always contact Eaton.

For details regarding inspection and maintenance on the withdrawable units, reference is made to the specific user manuals in the information pack.

WARNING

Inspections, checks and maintenance operations should only be carried out by authorized specialist personnel. Before inspections, checks and maintenance operations are commenced; all necessary steps must be taken to ensure safe working. This means among other things that:

All parts of the system being inspected must be dead and earthed.

Protective plates must only be removed after the installation has been made completely safe.

5.2.1 Periodic check

1. Carry out visual inspection checking:
   - For dirt, dust and moisture;
   - Instruments and relays for faults;
   - For loose or discoloured wiring;
   - Core end terminations/terminal strips;
   - For loose plates/mounting material;
   - For exceptional wear.
2. Remove dust and dirt (if possible use a vacuum cleaner).
3. Check the condition of the insulator surfaces.
4. If necessary clean with a dry cloth.
5. Inspect insulators.
6. Check isolating contacts on the busbar and cable sides for dirt and damage.
7. Check the adjustment of the auxiliary contacts.
8. Check operation of the switches and interlocks.
9. If necessary grease all pivot points.
10. Check the protective relays in accordance with the manufacturer's instructions.
11. Withdrawable units that are rarely or never used should be switched on and off 5 times. This can be done with the switch in the 'test' position.
12. Switch the earthing switch ON and OFF a few times.

5.2.2 Maintenance

1. Carry out the checks described under periodic checks.
2. Measure the contact resistance in the main current circuit. For resistance values, reference should be made to the test report in the specific installation documentation pack that includes this manual.
3. Apply a test voltage to the primary circuit.

On completion of the maintenance operations, remove all special safety measures. Then return the installation to normal operation.

5.3 Fault diagnosis

If a fault is found in the system, use the troubleshooting table to look for the cause.

Contact Eaton if you cannot find the cause.

⚠ WARNING

If correction of the fault might lead to dangerous situations, all necessary steps must be taken to limit these dangers to a minimum. You should contact Eaton if work on the primary part of the installation is required.

All operations must be carried out by or under the supervision of qualified persons.

5.3.1 What to do in the event of a fault

NOTE

Always make the installation safe if a fault occurs. Isolate the installation if necessary.

Simple faults in the secondary part of the installation (such as defective signal lamps) can and may be repaired by the user's own authorized personnel.

Faults in the primary part of the installation and serious faults in the secondary part must always be reported to Eaton.

Mechanical adjustments must be made by Eaton.

Every fault and all operations carried out must be recorded in the logbook.

5.3.2 Troubleshooting table

Symptom:	Possible cause:	What to do:
58-pole secondary connector cannot be removed.	Withdrawable unit is in the ''Service' position.	• Put the unit into ''Test'' position.
Earthing fault.	Poor insulation.	• Check insulation.
Earthing switch cannot be switched on.	Withdrawable unit is in 'Service' position. Blocking coil in operation.	• Put switch into 'Test' or 'Insert/ Removed' position. • Check interlocks. • Check connection conditions for the relevant earthing switch.
Door cannot be closed.	Transport truck has not been removed. Withdrawable unit not correctly inserted.	• Remove the truck. • Ensure unit is correctly inserted.
No auxiliary voltage.	Auxiliary voltage protection tripped. 58 pin auxiliary socket not connected.	• Correct problem and switch on again. • Connect the 58 pin auxiliary socket.
High contact resistance in earthing circuit.	Loose bolted joint.	• Check bolted joint for correct tightening torque. • Clean suspect connections. • Tighten bolt securely.
High temperature at cable connections.	Loose bolted joint at cable connection.	• Check bolted joint for correct tightening torque. • Clean suspect connections. • Tighten bolt securely.
Auxiliary voltage often interrupted by protection device.	Poor insulation.	• Check insulation.
Switch cannot be operated.	Switch not in 'Test' or 'Service' position.	• Put switch into correct position.

Symptom:	Possible cause:	What to do:
Fault during electrical switching on or off.	Auxiliary voltage too low. Fault in closing circuit (auxiliary contact). Make coil or break coil burnt out. Rotary spring not charged or spring-tensioning motor faulty.	• Check auxiliary voltage.
Withdrawable unit cannot be (completely) inserted into the panel.	The height of the truck is not properly set. Unit is turned On/Closed. Drive in the wrong position.	• Set the height of the transport trolley properly. • Turn unit Off/Open. • Put drive in correct position.
Withdrawable unit cannot be moved.	Unit is in the ON/Closed position.	• Turn Unit 'Off'/'Open'.
Withdrawable unit will not move from 'Test' to 'Service' position.	Earthing switch is 'On'. Withdrawable unit is 'On'/'Closed'.	• Turn earthing switch 'Off'. • Turn unit 'Off'/'Open'.
Withdrawable unit will not move from 'Test' to 'Insert/Removed' position.	Unit is 'On'.	• Turn unit 'Off'/'Open'.
Withdrawable unit will not move from 'Service' to 'Test' position.	Unit is in the 'On'/'Closed' position.	• Turn unit 'Off'/'Open'.
Circuit breaker will not open or close when given an electrical command or the mechanical buttons pushed on the door.	Breaker mechanism electro-mechanical interlock fitted and 58 pin socket not plugged in. No control voltage present.	• Connect the 58 pin socket. • Apply relevant control voltage.
Circuit breaker will not rack in or out of the panel, the racking in handle appears to be jammed.	Carriage electro-mechanical interlock fitted and 58 pin socket not plugged in. No control voltage present.	• Connect the 58 pin socket. • Apply relevant control voltage.
If applicable, no busbar or cable side voltage is indicated on metering device although cable or busbar is LIVE.	Protection secondary side of the voltage transformers tripped. HV fuse of the primary side, if provided, is melted.	• Check protection secondary side of the voltage transformer. • Check and replace HV fuses. Before that make sure that the voltage transformers are isolated from the source (in case of withdrawable units). Or in case of integral fixed/removable voltage transformers make sure that the particular cable or busbar section is not LIVE.

5.4 Decommissioning

5.4.1 Dismantling

WARNING

Prior to dismantling, ensure that the entire installation is dead (primary and secondary).

WARNING

The withdrawable units are not designed for field dismantling and should be returned to Eaton complete and as removed from the switchgear.

The following safety measures must be taken when dismantling the switchgear:

- During dismantling use protective equipment such as safety goggles, gloves, protective footwear and dust hoods.
- Watch out for sharp edges.
- Use suitable and safe tools.

5.4.2 Disposal

Power Xpert UX switchgear should be disposed of in an environmentally responsible manner. Substances and materials arising from dismantling should be destroyed, re-used or disposed of in accordance with the regulations currently in force.

The following table gives a list of materials that may be found in Power Xpert UX switchgear.

All materials used in the manufacture of the Power Xpert UX switchgear can be recycled. No toxic or harmful products are generated in the normal use of the switchgear.

MATERIALS THAT MAY BE FOUND IN POWER XPERT UX SWITCHGEAR

Material	Symbol	Description
Aluminium	Al	Plating
Various metal alloys	-	Gear wheels, rotation discs, vacuum switches
Epoxy	EP	Support and insulating bushings, tapered bushings, current and voltage transformers
Glass fibre plate, polyester	UP	Side sheet between adjacent panel
Glass fibre plate, epoxy	EP	Switch parts: drive rod
Glass fibre, PA	-	Cable clamp, release
Glass	-	Window
Copper	Cu	Conductors, busbars
Lead	Pb	Paper insulated lead covered cable sheathing
Unknown plastics	-	Relays and meters
Polyamide	PA	Truck wheels
Polycarbonate	PC	Protective hoods
Polyurethane	PUR	Current and voltage transformers
Polyvinyl chloride	PVC	Wiring, cables, cable ducts, cable terminals
Porcelain	-	Vacuum tubes
Rubber	-	Buffers and dust seals
Silicone rubber	VMQ	Sealing discs in tapered bushings and busbar insulating bushings
Steel plate, powder coated	-	Powder coated with epoxy/polyester
Steel plate, galvanised	-	Zinc coated plate, panels and switch trucks
Stainless steel	-	Fixed contact spout mounting plate, wall tube mounting plate
Tin / Stannum	Sn	Plating
Silver	Ag	Silver plating on conductors

6 Accessories

6.1 List of available accessories

The following accessories can also be supplied for Power Xpert UX™ switchgear.

6.1.1 Power Xpert UX

Name	Item no.
Operating handle for earthing switch	535.5902.077.05
Panel door key	535.5902.003.05
Operating rod for manual operation	535.5362.006.05
Shutter lifter truck 600 mm	535.5239.650.05
Shutter lifter truck 800 mm	535.5239.650.01
Shutter lifter truck 1000 mm	535.5239.650.02
Shutter lifter truck 800 mm	537.5239.650.01
Shutter lifter truck 1000 mm	537.5239.650.02
Transport truck 600 mm	535-5902010140
Transport truck 800 mm	535.5902.015.01
Transport truck 1000 mm	535.5902.015.02
Transport trolley for withdrawable cable side VT truck 600 mm	535.5902.801.04
Transport trolley for withdrawable cable side VT truck 800 mm	535.5902.801.01
Transport trolley for withdrawable cable side VT truck 1000 mm	535.5902.801.02
Transport trolley for withdrawable cable side VT	537.5902.015.02

Fig. 6-1 Operating handle for earth switch

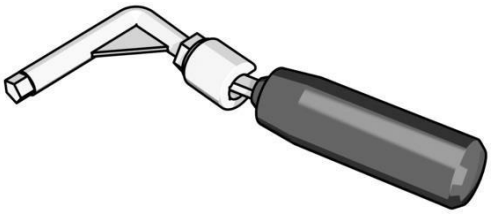


Fig. 6-2 Panel door key

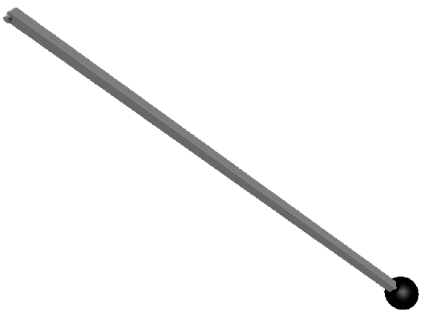


Fig. 6-3 Operating rod for manual operation

7 Glossary

7.1 Safety and qualification of personnel

European standard applicable

Standard applicable: EN 50110-1, chapter 4 ‘Basic principles’. This paragraph sets out the main requirements for safe operation as regards personnel.

Supplier:

Eaton, or its representative.

User:

The person or body responsible for operation and maintenance of the switchgear.

Competence

The following requirements apply to operating personnel: Operating personnel shall be ‘competent’. A COMPETENT PERSON has relevant training and experience so that he or she is capable of preventing dangers which may be caused by electricity, for instance during switching operations.

Operating personnel must hold a written certificate of authorization to perform switching operations signed by the management of the (power) company involved.

Responsibility

It must be clear who is responsible for operations.
All operations come within the area of responsibility of the WORK OPERATIONS MANAGER (this person must be designated in accordance with EN 50110-1 as the person responsible for *control* of operations).

An INSTALLATION MANAGER must be appointed (in accordance with EN 50110-1 the INSTALLATION MANAGER is directly responsible for operation of the installation). If two or more installations are in close proximity to each other, it is essential that appropriate arrangements are made between the INSTALLATION MANAGERS.

The responsibility which persons have for the safety of those involved in the operations, and of those who (may) have to deal with the consequences of the operations, must agree with national legislation.

Before operations are begun, while they are being carried out and prior to commissioning of the installation, the WORK OPERATIONS MANAGER must ensure that all requirements, rules and instructions are complied with.

Communication

Before starting operations, the INSTALLATION MANAGER must be informed of the intended operations. See EN 50110-1 § 4.4 for additional requirements.

Instruction

All personnel involved in operations carried out on, with or near electrical installations must have been instructed (using these operating instructions) concerning the safety requirements, safety rules and operating instructions applicable to operating the installation.

Clothing

Personnel must wear suitable clothing that fits the body closely.

Local rules and regulations

Of course, local rules and regulations (including operating instructions) must be followed.

7.2 Operating conditions

Rated voltage, current, power

The voltage, current, and power upon which the design of the switchgear is based.

Short-circuit:

An unintentional connection between two or more electrical conductors, or between a conductor and earth, in which extreme heat may be generated which may damage the installation and its surroundings.

Short-circuit current:

An electrical current which is higher, as a result of a short-circuit, than the nominal current.

Arc:

An electrical discharge, through the insulation, which produces a short-circuit. In general, and in particular in air-insulated installations, arcing may occur unexpectedly and be of an explosive nature.

7.3 Equipment and the area around it

Electrical installation:

An assembly of electrical leads and the appliances to which the leads are connected.

Switching and distribution unit, switchgear

A unit to protect or switch on or off, in one place, two or more parts of an electrical installation.

Switch room:

The area in which the switchgear is set up.

Working area:

A clearly indicated part of the operating area in which work on the installation can be carried out safely.

Switch:

An apparatus designed to switch electrical currents on and off.

Load break switch:

A switch capable of safely switching on a short-circuit current and switching off a nominal current.

Circuit breaker:

A switch capable of operating safely under abnormal circumstances, and in particular capable of switching a short-circuit current on and off safely.

Fuse:

An electrical appliance that is connected in series with a circuit, and can interrupt the circuit safely by the melting of an internal conductor immediately the current in the circuit exceeds a specified value for a specified time.

Cartridge fuse:

The replaceable part of a fuse that contains the (melting) conductor.

Busbar insulating bushings:

Insulators for running busbars through the sidewalls of switch panels so as to be proof against arcing.

Tapered bushings:

Insulators for running insertion contacts through the partition walls between the switch compartment and the busbar and cable compartments, so as to be proof against arcing.

Witdrawable unit:

A unit on a withdrawable carriage designed to be inserted into the circuit breaker compartment and can be a circuit breaker, contactor, disconnector truck, VT truck for example.

8 Appendix

8.1 General

This user manual is part of the information pack compiled whenever equipment is supplied and consists of the following parts.

Information on the folder(s):

- Project title
- Name of the installation
- Type of installation (key data such as voltage, current etc.)
- Client order number
- Eaton name and order number
- Eaton contact address for fault reporting: name, telephone number, fax number
- Date of issue
- Table of contents

Diagram pack, including:

- Single line diagram
- Equipment diagrams
- Panel diagrams
- Key to codes
- Space allocation
- Floor plan drawings with dimensions, measurements and weights

Routine test reports:

Routing test reports if requested

- Routine test reports of:
  - Switchgear
  - Current and voltage transformers supplied
  - Other equipment (if supplied) e.g.:
  - Contactors
  - Load-break switches
  - Earthing switches
  - Battery sets

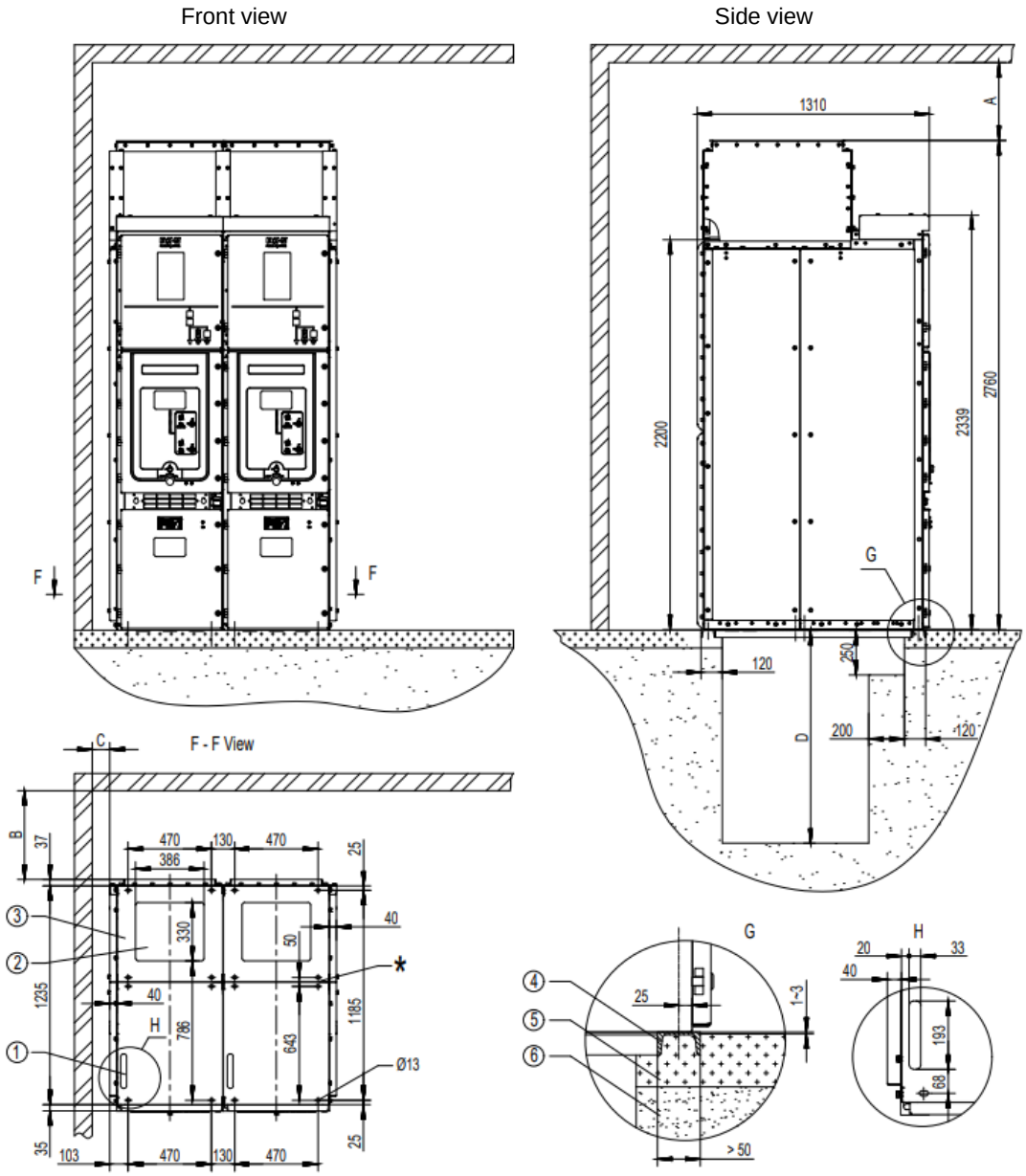
List of spare parts

- All parts which might be replaced during the lifetime of the installation, such as spring tensioning motors, trip coils, meters, push-buttons, terminal strips etc.
- Data such as type, ratings, price, stock number or other order information.

User manuals:

- User manual for the Eaton equipment used in the relevant version(s).

8.2 Floor Plan drawings

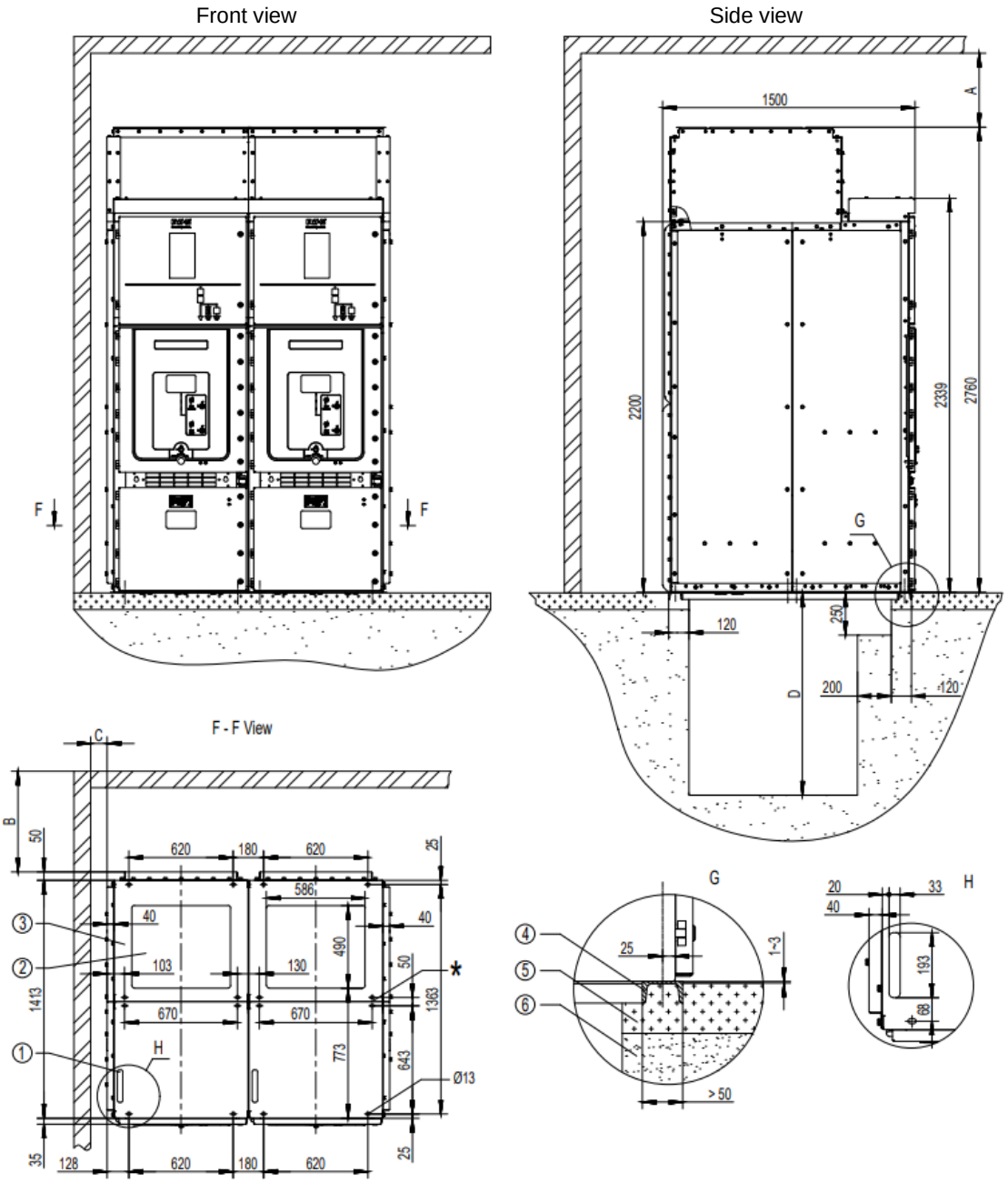


	Front and Rear access		Front access only	
Dimension	Minimum (mm)	Recommend (mm)	Minimum (mm)	Recommend (mm)
Dim A	250	600	250	600
Dim B	500	800	100	500
Dim C - left side	100	500	100	500
Dim C(1) - right side	500	700	500	700
Dim D	Dependent upon cable bending radius			
*Optional	Centre mounting is optional			

(1):Clear space required to operate the earthing switch of the right end panel, if applicable. Please contact Eaton if less than 700mm is available.

① LV control cable entry
② Main cable entry
③ Foundation
④ C channel steel
⑤ Second pouring of the concrete
⑥ First pouring of the concrete

Fig. 8-1 Basic floor plan for bottom cable entry panel rating 17.5kV 630/1250A 25/31.5kA

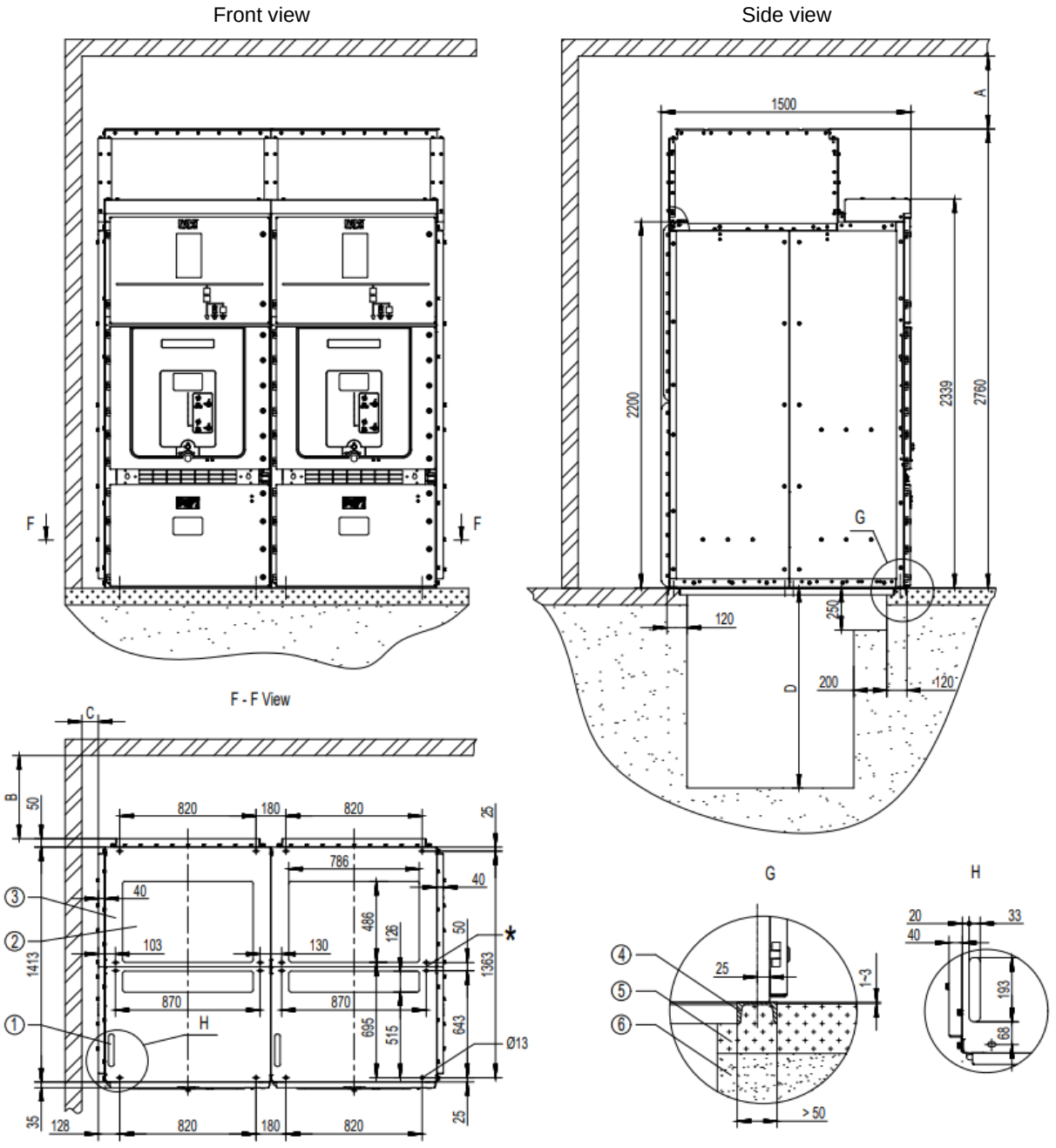


	Front and Rear access		Front access only	
Dimension	Minimum (mm)	Recommend (mm)	Minimum (mm)	Recommend (mm)
Dim A	250	600	250	600
Dim B	500	800	100	500
Dim C – left side	100	500	100	500
Dim C(1)- right side	500	700	500	700
Dim D	Dependent upon cable bending radius			
*Optional	Centre mounting is optional			

(1): Clear space required to operate the earthing switch of the right end panel, if applicable. Please contact Eaton if less than 700mm is available.

① LV control cable entry
② Main cable entry
③ Foundation
④ C channel steel
⑤ Second pouring of the concrete
⑥ First pouring of the concrete

Fig. 8-2 Basic floor plan for bottom cable entry panel rating 17.5kV 1250/2000A 40kA

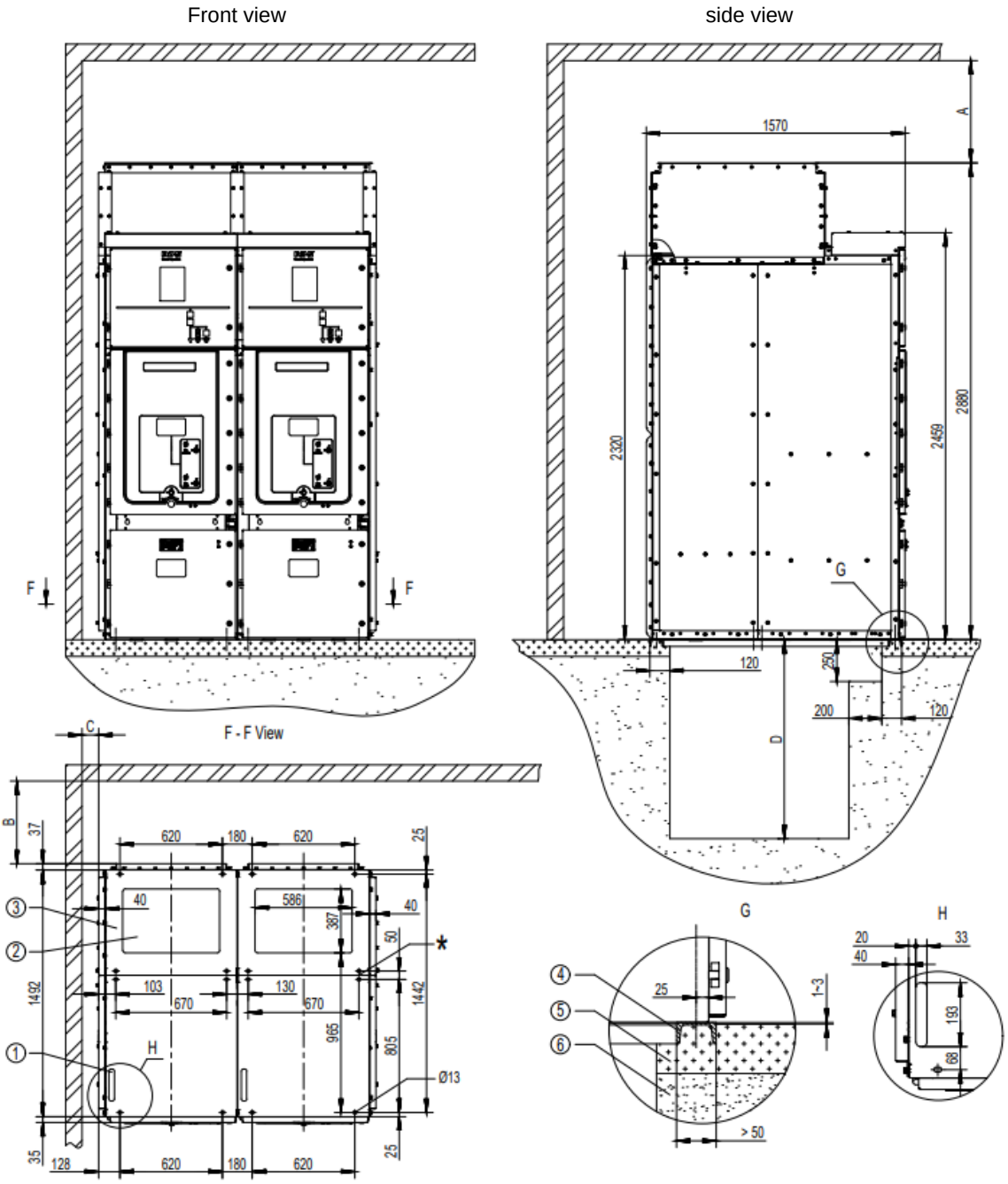


	Front and Rear access		Front access only	
Dimension	Minimum (mm)	Recommend (mm)	Minimum (mm)	Recommend (mm)
Dim A	250	600	250	600
Dim B	500	800	100	500
Dim C – left side	100	500	100	500
Dim C(1)- right side	500	700	500	700
Dim D	Dependent upon cable bending radius			
*Optional	Centre mounting is optional			

(1): Clear space required to operate the earthing switch of the right end panel, if applicable. Please contact Eaton if less than 700mm is available.

① LV control cable entry
② Main cable entry
③ Foundation
④ C channel steel
⑤ Second pouring of the concrete
⑥ First pouring of the concrete

Fig. 8-3 Basic floor plan for bottom cable entry panel rating 17.5kV 3150/4000A 40/50kA

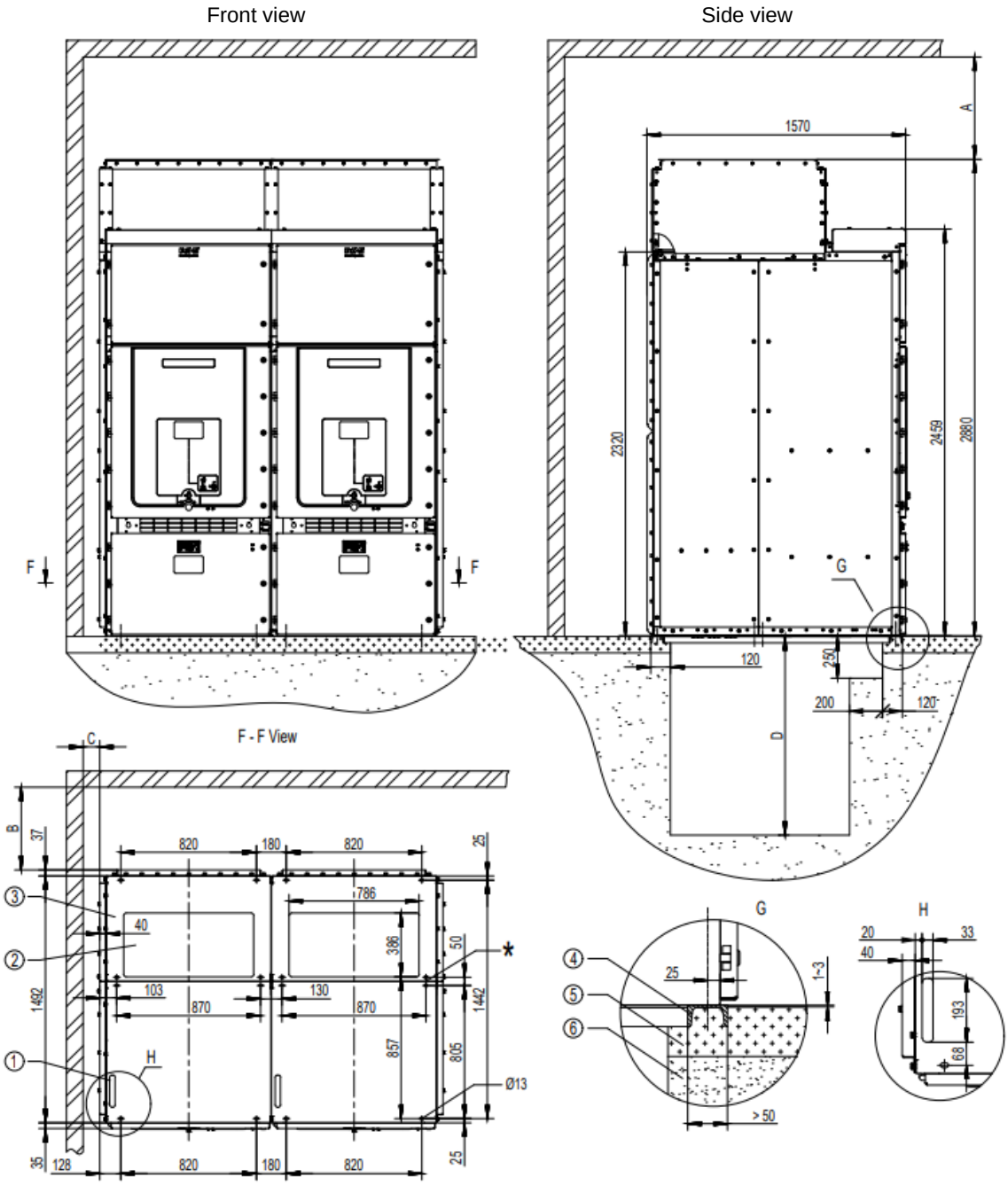


	Front and Rear access		Front access only	
Dimension	Minimum (mm)	Recommend (mm)	Minimum (mm)	Recommend (mm)
Dim A	250	600	250	600
Dim B	500	800	100	500
Dim C – left side	100	500	100	500
Dim C(1)- right side	500	700	500	700
Dim D	Dependent upon cable bending radius			
*Optional	Centre mounting is optional			

(1):Clear space required to operate the earthing switch of the right end panel, if applicable. Please contact Eaton if less than 700mm is available.

① LV control cable entry
② Main cable entry
③ Foundation
④ C channel steel
⑤ Second pouring of the concrete
⑥ First pouring of the concrete

Fig. 8-4 Basic floor plan for bottom cable entry panel rating 24kV 630/1250A 25/31.5kA



	Front and Rear access		Front access only	
Dimension	Minimum (mm)	Recommend (mm)	Minimum (mm)	Recommend (mm)
Dim A	250	600	250	600
Dim B	500	800	100	500
Dim C – left side	100	500	100	500
Dim C(1)-right side	500	700	500	700
Dim D	Dependent upon cable bending radius			
*Optional	Centre mounting is optional			

(1):Clear space required to operate the earthing switch of the right end panel, if applicable. Please contact Eaton if less than 700mm is available.

① LV control cable entry
② Main cable entry
③ Foundation
④ C channel steel
⑤ Second pouring of the concrete
⑥ First pouring of the concrete

Fig. 8-5 Basic floor plan for bottom cable entry panel rating 24kV 2000/2500A 25/31.5kA

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