Power Xpert® UX with W-VAC*i* circuit breaker (up to 24 kV) Air Insulated Medium-voltage switchgear

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. It consists of copper bars which may be supported by insulator depending on rated short-circuit current. The bars are provided with an insulation layer over their entire length.

Pressure relief vents at the top of the circuit breaker 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.

An additional low-voltage compartment (for secondary equipment) is fitted to a circuit breaker panel

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 busbar insulating bushings, voltage transformers etc.

The standard installation supplied is a single busbar model.

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 8 – Glossary.

1.2.2 Notation guide

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

⚠ WARNING

Personal (fatal) danger 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 9 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 texts, supported by illustrations as necessary. Illustrations are numbered consecutively for each chapter, and are captioned if necessary.

Chapters 3 to 7 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.

Further information regarding chapters 3 to 7 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 commissioning and decommissioning

Chapter 5.1 sets out the actions required before the system can be commissioned. These actions should be carried out in conjunction with Eaton.

Chapter 5.2 deals with decommissioning the system. It also includes recommendations for the safe disposal of the system or parts of the system.

Chapter 6 – System inspection, maintenance and repair

This chapter describes only those operations that may be carried out by the user.

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

Chapter 7 - Accessories

This chapter contains a list of accessories that can be supplied

Chapter 8 - Glossary

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

Chapter 9 – 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 the switchgear. Make sure that you have read and understood all safety warnings and instructions.

1.3.1 General instructions

Eaton has done its utmost to inform user 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.

During switching operations, no personnel must be behind or above the installation.

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.).

Safety standards

Power Xpert® UX switchgear complies with the following standards:

- IEC 62271-200: 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: General conditions for high voltage switchgear and control gear standards.

The components used comply with standards:

- IEC 62271-100: High-voltage alternating current circuit breakers
- IEC 62271-102: Alternating current disconnectors and earthing switches
- IEC 60044-1: Instrument transformers – part 1: Current transformers
- IEC 60044-2: Instrument transformers – part 2: Voltage transformers
- IEC 60265: High-voltage switches – part 1: Switches for rated voltages above 1 kV and less than 52 kV
- IEC 60282-1: High-voltage fuses – part 1: Current-limiting fuses
- IEC 62271-105: High-voltage alternating current switch fuse combinations
- IEC 60470: High-voltage alternating current contactors and contactor-based motor-starters.

Eaton Power Xpert® switchgear can be used in areas under normal conditions as described in IEC 62271-1, Chapter 2.1.

1.3.2 Safety of the Switchroom

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 and must meet at least the following requirements:

- Clear space

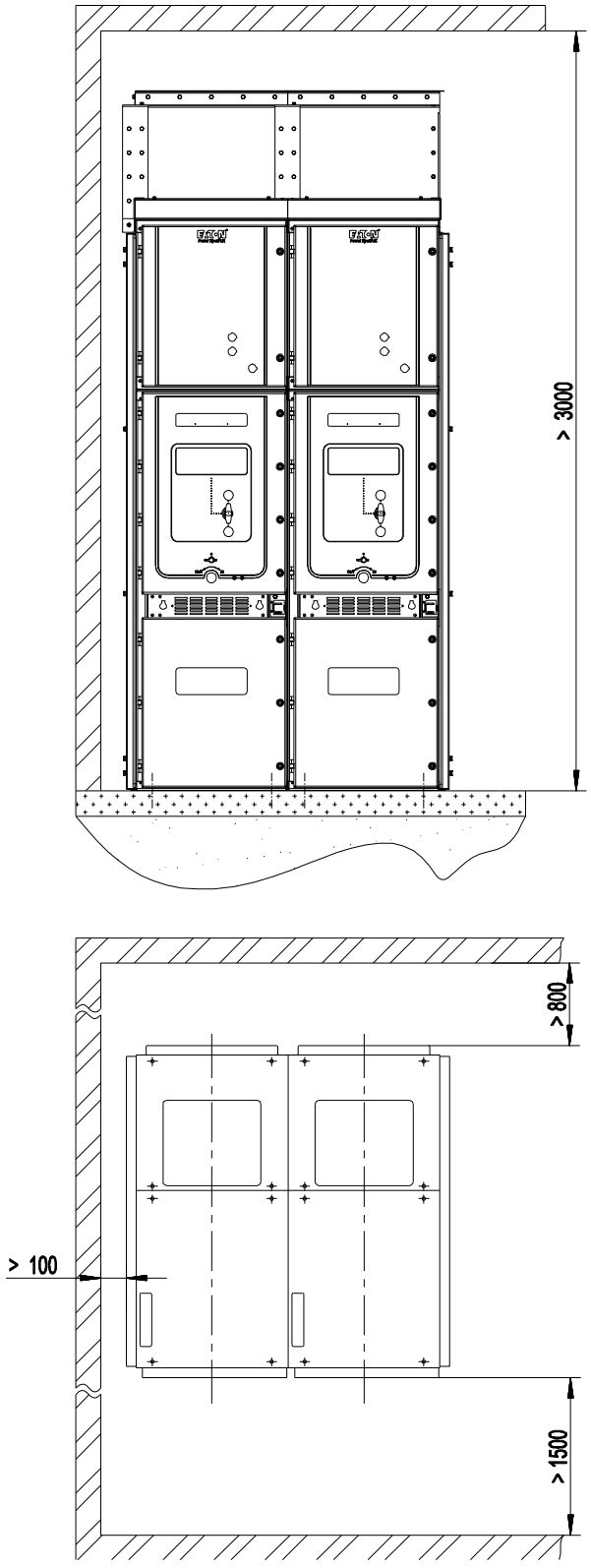
NOTE

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

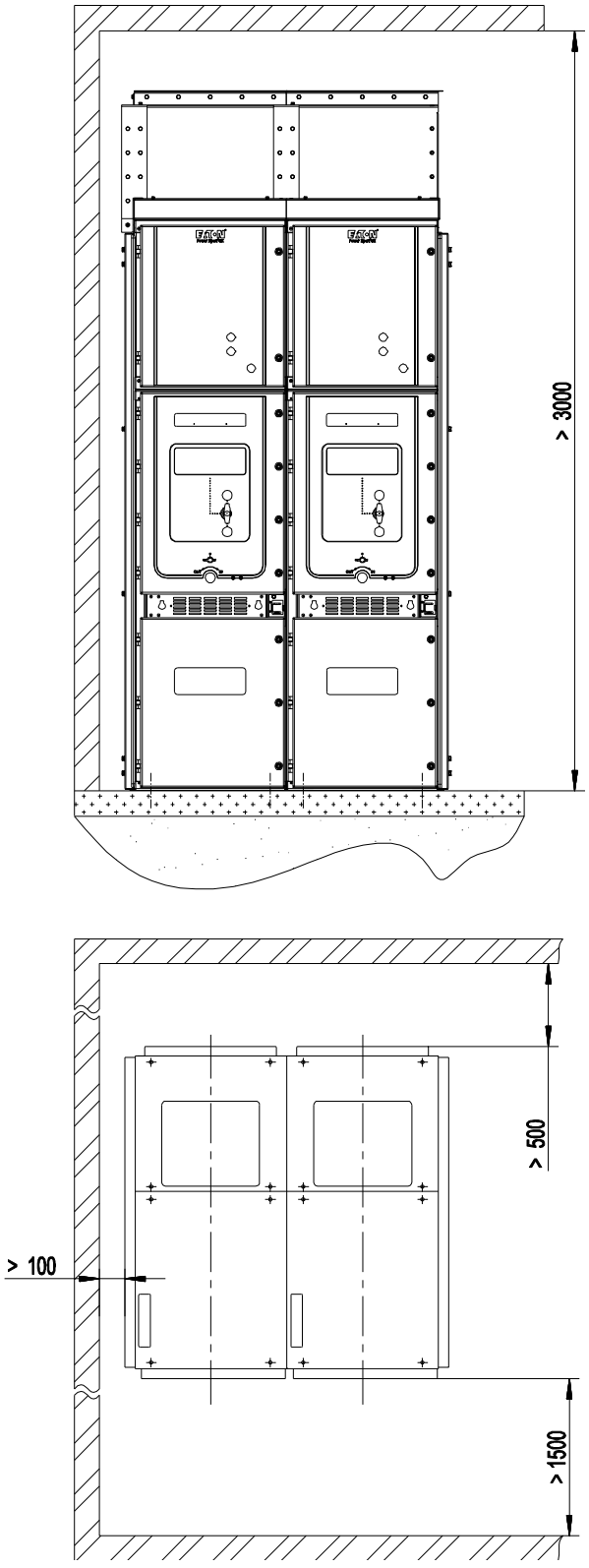
Front Access:
If the switchgear is arranged for Front cable access then rear or side clear space of at least 0.1 m is required. However Eaton recommends at least 1 m at one end of the switchgear and at least 0.5 m to the rear wall are left to allow for ease of installation.

Rear Access:
If the switchgear is arranged for Rear cable access then a clear space of 0.8 m is required to the rear wall of the switchroom, at least 0.1 m space at one end of the switchboard and 0.5 m space at the other end of the switchboard to allow for adequate escape routes, and if switchboard length is more than 10 m, then at least 0.5 m clear space of both sides is required to allow for adequate escape routes.

All installations:
Eaton recommends a dimension of at least 1.5 m at the front of the switchgear to allow for ease of operation, removal of vacuum circuit breaker from the panel and adequate escape route. In the case of facing installations aisle width of 2.5 m is required between the installations.

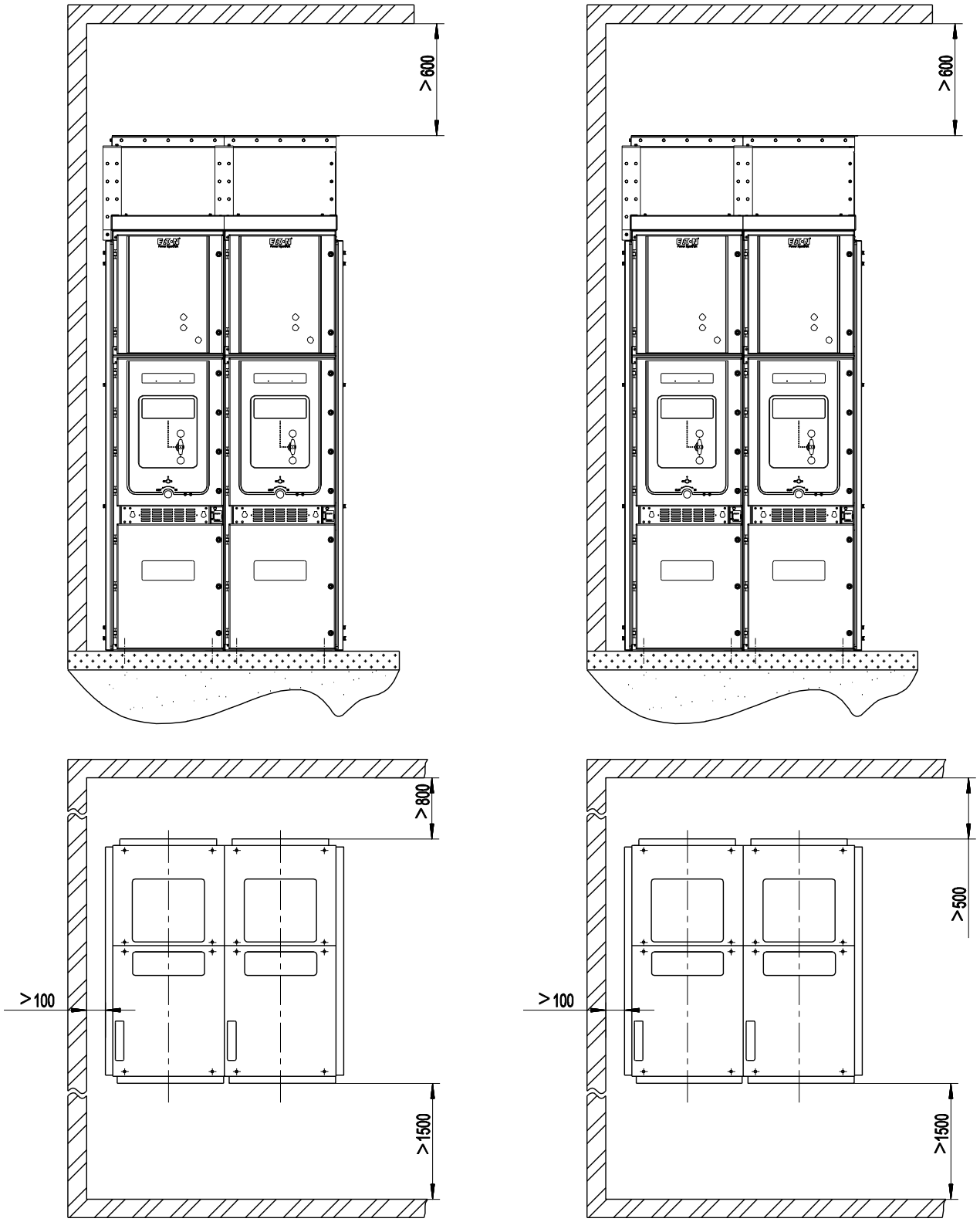


Clear space for Power Xpert® UX switchgear with front and rear access



Clear space for Power Xpert® UX switchgear with front access

Fig. 1-1 Clear space for 12 kV and 17.5 kV panel



Clear space for Power Xpert® UX switchgear with front and rear access

Clear space for Power Xpert® UX switchgear with front access

Fig. 1-2 Clear space for 24 kV panel

- Escape routes

To the front and rear of the installation, and between two installations sited opposite each other, an escape route at least 0.5 m wide and 2 m 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 furthest. The escape route must be completely clear and as far as possible in a straight line.

REMARK

The installation may be set up with the back against a wall. In that case there will be no clear area or escape route at the rear or sides.

- Entrances

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

Entrances must be provided at suitable places and must be at least width of panel plus 0.2 m wide and height of panel (without arc channel) plus 0.2 m high. For details of width and height of panel, 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 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, a voltage may pass through the extinguishing equipment.

Putting the fire out:

- 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 if required. The main product rating plate is headed with the **Eaton** logo.

The type of switching system, the type of panel it contains and the components used determine the complete product rating plate. Each panel contains a complete product rating plate. 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 fixed 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).

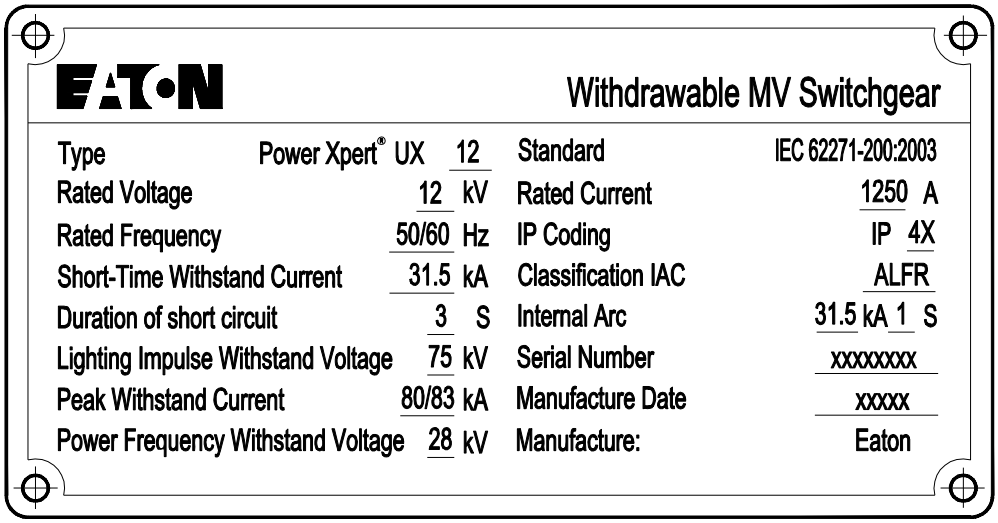


Fig. 1-3

Description		Description	
Type		Standard	
Rated Voltage		Rated current	
Rated Frequency		IP coding	
Short-time withstand current		Classification IAC	
Duration of short circuit		Internal arc	
Lighting impulse withstand voltage		Serial number	
Peak withstand current		Manufacture date	
Power frequency withstand voltage		Manufacture	

2 Product description

2.1 The system

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

2.1.1 Panels

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

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

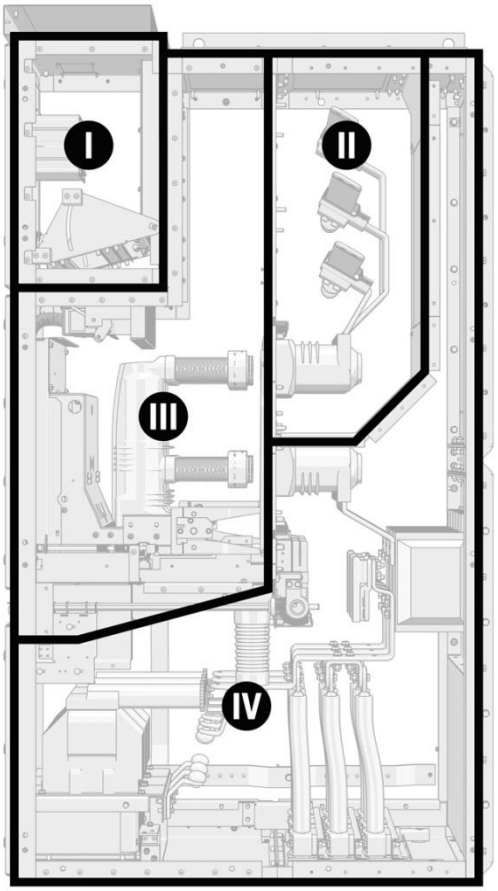


Fig. 2-1 Panel compartmenting

2.1.2 Circuit Breaker or Contactor unit

The unit is inserted into the panel with the aid of a transport trolley.

Through the rollers on the carriage the unit is earthed when it 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 plug.

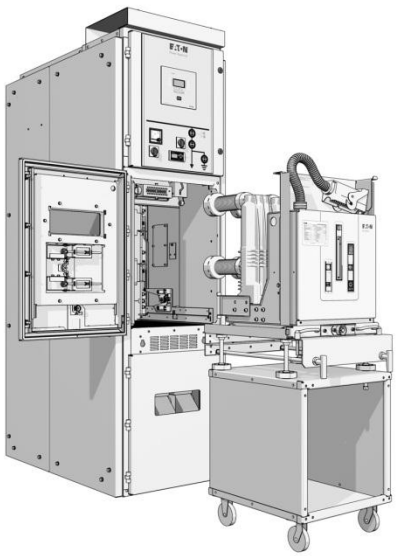
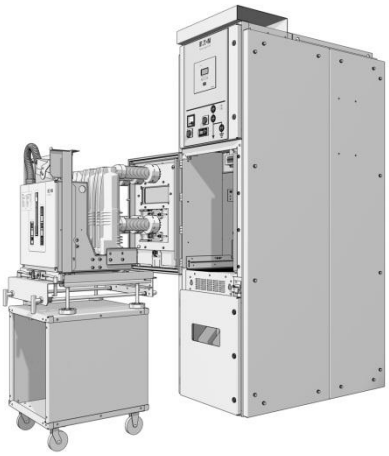
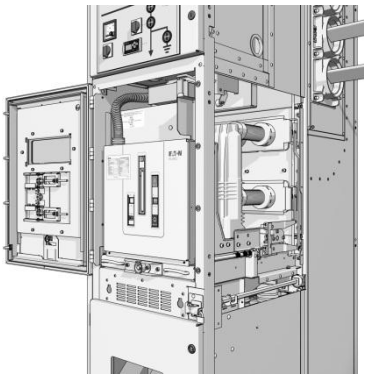


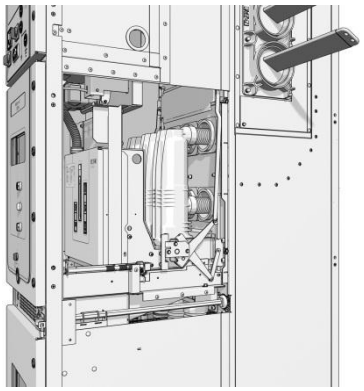
Fig. 2-2 Circuit Breaker or Contactor Unit on transport trolley

2.1.3 Circuit Breaker or Contactor Unit Positions

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







Insert / Removed position

The unit is put / placed in 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 put / placed in 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 and
- The 58-pole secondary plug is connected (control over the operation of the unit is now possible)
- The compartment door can be opened.

Service position

The unit is put / placed in the service position, when:

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

2.1.4 Cable connections

Cables can be connected in a number of ways. Connection from the front or rear of the panel with cable lugs is standard.

Besides primary cables, secondary and auxiliary cables may also be installed.

1. Spout containing fixed contact, cable side.
2. Current transformer.
3. Earth switch.
4. Power cable
5. Cable glanding plate

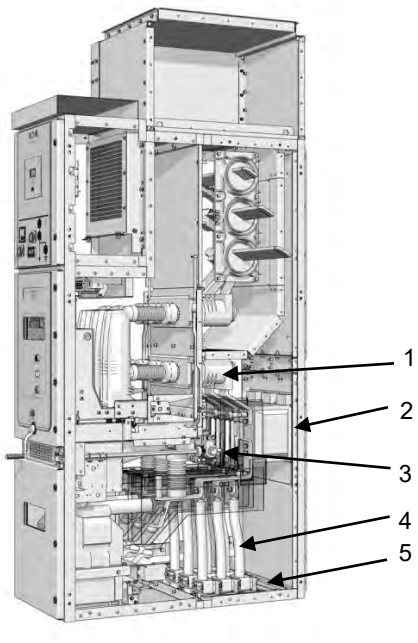


Fig. 2-3 Cable connections

2.1.5 Voltage transformers

The installation may include a number of voltage transformers to measure the voltage on the cable side. Voltage transformers are fixed type. Each voltage transformer is fitted with 3 primary fuses.

Cable side mounting:

- Fixed in the cable compartment of a circuit breaker or contactor panel (to suit client requirements).
- Voltage transformers can also be mounted in the bus-section or the riser panels as required.

For special arrangements, a withdrawable busbar side voltage transformer truck can be provided.

2.1.6 Current transformers

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

Current transformers are always fitted in the rear of the cable compartment or in the riser / sectionaliser panel.

Standard version:

- At the cable connection points for the feeder panels or supply panels.

Customer-specific version:

- 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 switch panel.

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

Voltage Detection System

The voltage indicator consists of three Light Emitting Diodes (LEDs) mounted in a small panel on the low-voltage compartment of a switch panel. Each LED is connected to a measurement capacitor connected to a phase of the primary cable. The LEDs light up when the cable is live. This indicates that the cable is live without the use of a voltage transformer.

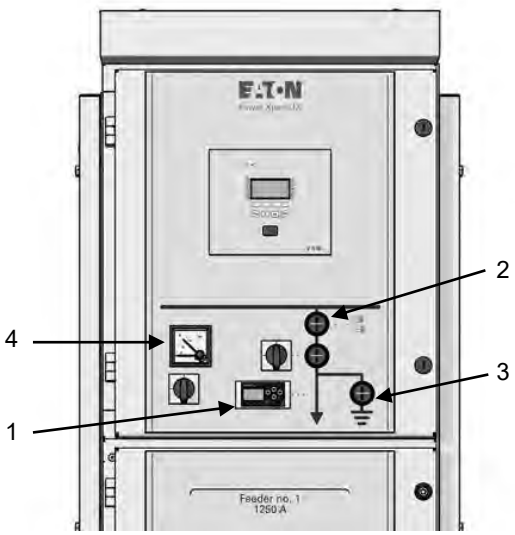


Fig. 2-4 Mimic panel

1. Voltage Detection System
2. Position indicator
3. Status indicator
4. Measuring and selector switch

Switch Position Indication

An optional LED flag indicator can be mounted as part of the mimic diagram to indicate the position (In Service / Test) of the circuit breaker or contactor unit.

Status Indication

An optional LED flag indicator can be mounted as part of the mimic diagram to indicate the On / Off status of the circuit breaker or contactor.
An optional LED flag indicator can also be mounted as part of the mimic diagram to indicate the On/Off status of the earth switch.

Measuring

An optional Ammeter / Voltmeter and phase selector switch can be mounted in the LV compartment to provide current / Voltage measurement for the circuit. Additional multi-function measuring meters can also be fitted.

2.1.8 Earthing

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

Earthing busbar

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

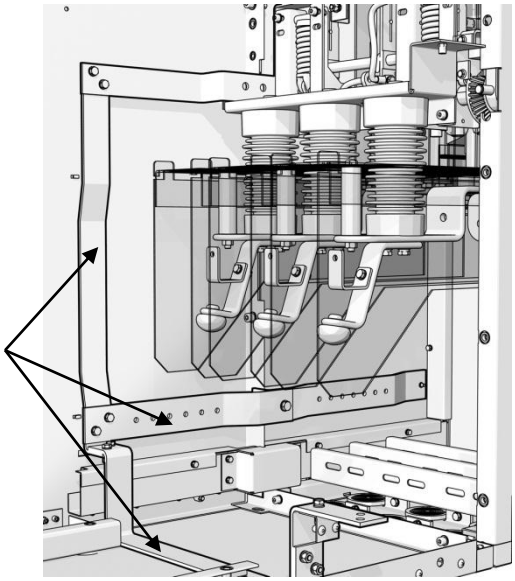


Fig. 2-5 Earthing busbar

Earthing switch

Each cable panel can be fitted with a short-circuit-proof earthing switch fitted to the cable side. The earthing switch connects the connection points of the cable with the earthing busbar. A mechanical interlock ensures that the earthing switch is always open when the circuit breaker or contactor unit is in the connected position. The earthing switch can be closed only with the circuit breaker or contact unit is in the Test / Disconnected position or completely removed.

The earthing switch can be locked with a padlock. Special locks are used in some installations, e.g. with the aid of a locking coil.

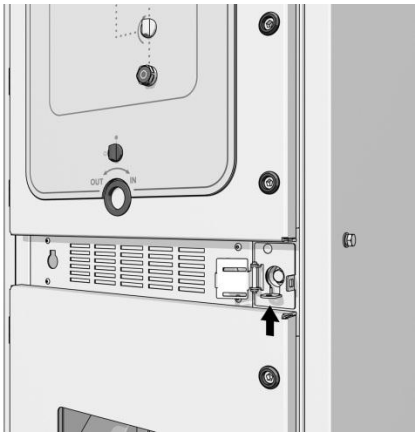


Fig. 2-6 Location of the earthing switch at the front side of the switch panel

2.1.9 Withdrawable units

Power Xpert® UX switchgear can contain a variety of switching/measuring equipment in circuit breaker compartment

Withdrawable circuit breaker unit

The circuit breaker is the W-VAC*i*.
W-VAC*i* circuit breakers are provided with vacuum interrupters. This assembly is mounted on a switch cradle and racking mechanism.

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

Refer to separate Operations and Maintenance Manual for the Circuit Breaker.

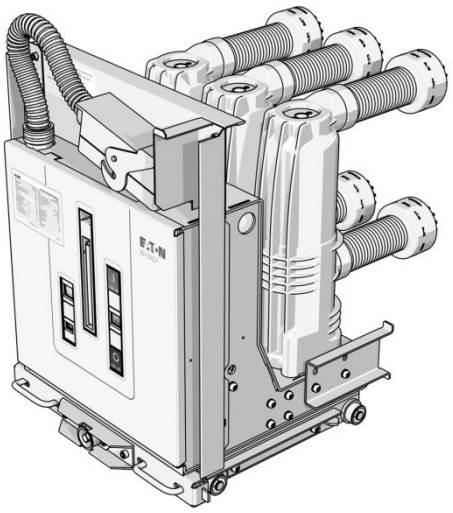


Fig. 2-7 Vacuum Circuit Breaker unit

Withdrawble contactor unit

The vacuum contactor is ideal for controlling applications requiring a high number and frequency of switching operations and for AC motors. The contactor basically consist of a moulded resin monobloc, where the vacuum interrupters, moving apparatus, control electromagnet, multi-voltage control feeder and auxiliary accessories are housed.

Refer to separate Operations and Maintenance Manual for the Contactor

Fig. 2-8 Contactor unit

Withdrawable Voltage Transformer unit

The Voltage transformer mounted on a withdrawable cradle with integral racking mechanism is used to measure the voltage of the busbar or cable side depending on configuration.

Refer to separate Operations and Maintenance Manual for the Withdrawable Voltage Transformer Unit

Withdrawable Isolation unit

The isolation unit is mounted on a cradle with integral racking mechanism and is used to provide isolation gap between the busbars and the cable.

Refer to separate Operations and Maintenance Manual for the Withdrawable Isolation unit

Withdrawable Earthing unit

Earthing truck assembly is mounted on a withdrawable cradle, with integral racking mechanism used to earth the busbar or cable depending on the configuration.

Refer to separate Operations and Maintenance Manual for the Withdrawable Earthing unit

2.1.10 Interlocks

Power Xpert® UX switchgear is equipped with interlocks to prevent undesirable switching operations. For further information, please see par. 4.3.2.

2.2 Panel types

All Power Xpert® UX switchgear is constructed in 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® 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 a cable panel fitted with a switch, to provide short-circuit-proof power switching.

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

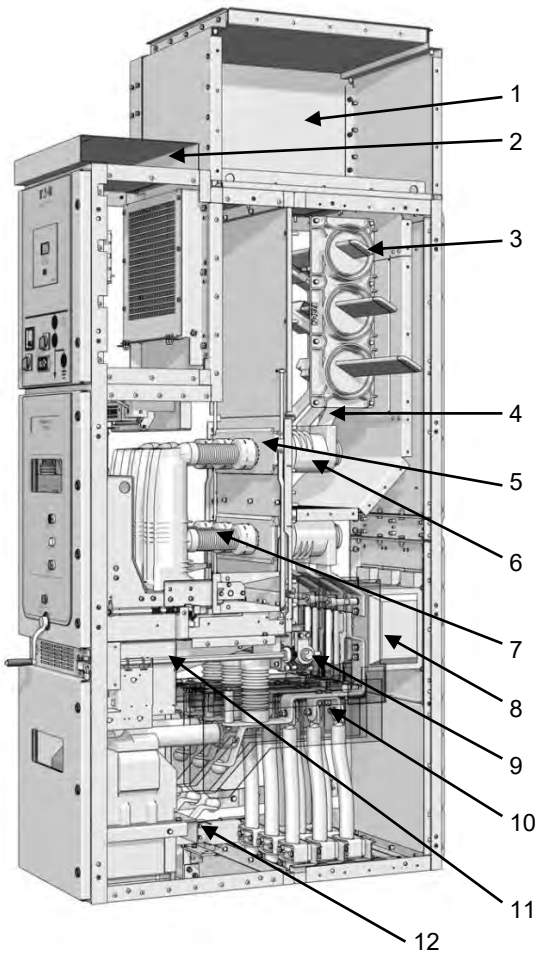


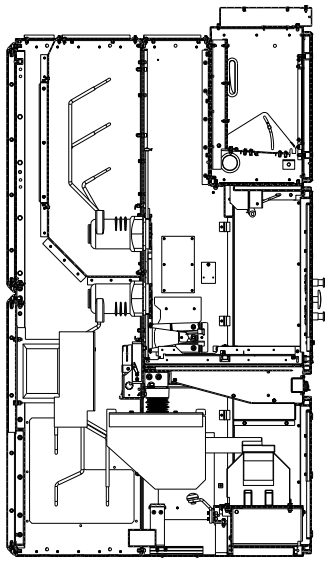
Fig. 2-9 Circuit-breaker panel

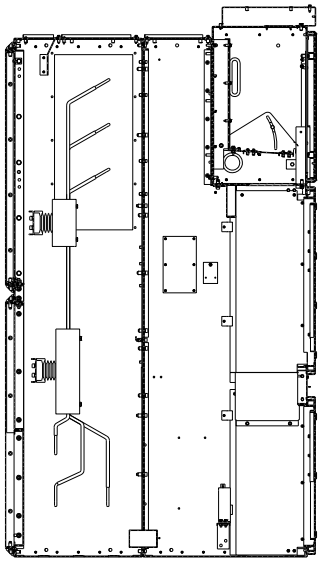
2.2.2 Bus-section panel (connecting panel)

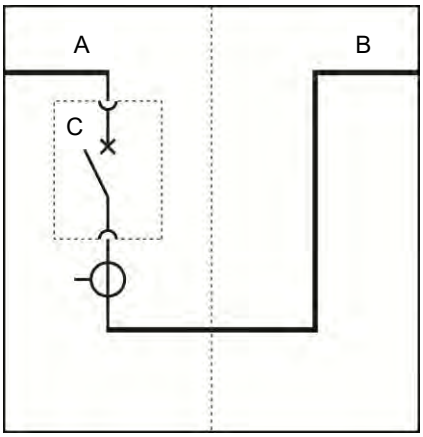
The bus-section panel is used to separate or connect parts of the installation (bus-sections).

The bus-section panel in the illustration consists of two panels; one panel contains the circuit breaker, the other panel is the bus riser panel. The Power Xpert® UX has designs that allow for the bus-section to be mounted either on the Left or the Right of the riser panel. An additional option with Power Xpert® UX Switchgear is that the bus riser panel can be supplied suitably equipped with a number of units:

- Circuit Breaker
- Contactor
- Earthing Truck
- Voltage Transformer
- Disconnect/Isolation

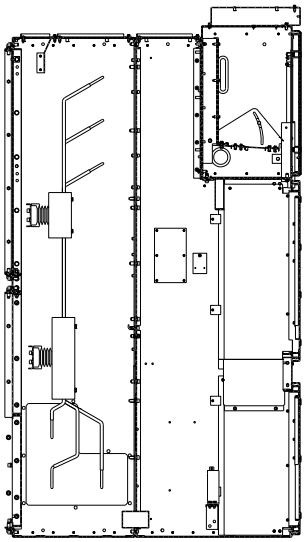


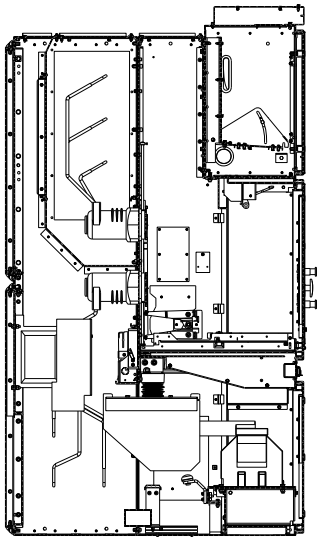


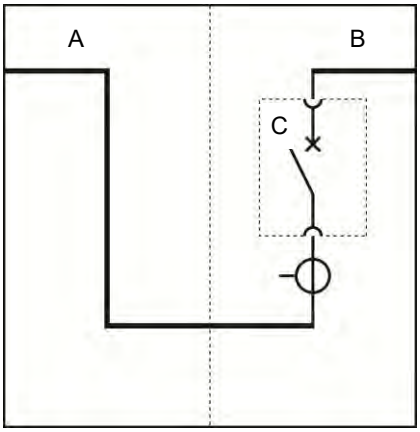


Bus sectionaliser + Bus Riser

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







Bus Riser + Bus sectionaliser

A. Riser panel left
B. Sectionaliser panel
C. Bus-section circuit breaker

Fig. 2-10 A bus-section and riser; the bay is two panels wide

2.2.3 Incoming panel

The incoming panel is a circuit-breaker panel intended to provide isolation from the power supply.

2.2.4 Outgoing panel

The outgoing panel is a circuit-breaker panel intended to provide consumers with energy, offering short-circuit protection and switching of the circuit.

2.2.5 Metering panel

(Client-specific)
A metering panel allows current and voltage measurement on the busbar side. The metering panel may be linked to the bus-section panel.

2.2.6 Contactor panel

The contactor panel provides for motor starting duty. The contactor can be a latched type for continuous supply to transformers and or Power Factor Correction Capacitor unit. The contactor panel includes a withdrawable contactor unit with main fuses mounted on the withdrawable cradle.

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 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 2.1.1.

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.

2.3.2 Safety features

The switchgear may be 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.
- Internal arc classification testing has been conducted and an arc channel provided to allow the safe exhaust of gasses outside of the switchroom.
- Mechanical and electrical interlocks to prevent unintentional switching.
- Provision for locating locks on the switches, earthing switches and automatic shutters.
- Visible separation between switch, 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 timely, 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.
- 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

General in accordance with IEC 62271-200				
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, 1250, 2000, 2500, 3150, 4000 FC		800, 1250, 2000, 2500
Rated short time withstand current	**kA/s**	25/3, 26.3/3, 31.5/3, 40/3, 50/3		20/3, 25/3
Rated peak withstand current	**kA**	63, 80, 100, 125		50, 63
Circuit-breaker type W-VAC*i*: IEC 62271-100				
Rated nominal current	**A**	630, 1250, 2000, 3150		800, 1250, 2000, 2500
Rated voltage	**kV**	17.5		24
Rated breaking current	**kA**	25, 26.3, 31.5, 40, 50		20, 25
Rated short-circuit making current	**kA**	63, 80, 100, 125		50, 63
Rated short time withstand current	**kA/s**	25/3, 26.3/3, 31.5/3, 40/3, 50/3		20/3, 25/3
Earthing switches ABB with IEC 62271-102				
Rated voltage	**kV**	Max. 17.5		Max. 24
Rated short-circuit making current	**kA**	63, 80, 100, 125		50, 63, 80
Rated short time withstand current	**kA/s**	25/3, 31.5/ 3, 40/3, 50/1 (12kV only)		20/3, 25/3
Internal Arc				
Internal Arc	**kA/s**	25/1, 26.3/1, 31.5/1, 40/1, 50/0.5		20/1, 25/1

2.4.2 Environmental conditions

During operation	
Environment	In accordance with IEC 62271-1 par. 2.1.1, Limit values below, among others, apply
Ambient temperature	
Maximum over 24 hours	+40°C (adequate de-rating if higher ambient conditions apply)
Average over 24 hours	+35°C
Minimum	-5°C
Altitude at site	
Maximum altitude	1000 m above sea level (adequate de-rating if higher altitude conditions apply)
Humidity	
Relative humidity	
Maximum over 1 month	90%
Sound level produced	
Average	< 70 dBA
During storage	
Environment	In accordance with IEC 62271-1 par. 2.1.1

2.4.3 Dimensions and weights

Main dimensions (standard model)

Circuit-breaker panel		Depth	Width (C)	Height (A)	Height including arc chamber (B)
12 kV and 17.5 kV					
UX17 25 kA 630 A	600 mm wide	1310 mm	600 mm	2200 mm	2760 mm
UX17 31.5 kA 1250 A	600 mm wide	1310 mm	600 mm	2200 mm	2760 mm
UX17 40 kA 2000 A	800 mm wide*	1325 mm	800 mm	2200 mm	2760 mm
UX17 40/50 kA 2000 A	800 mm wide	1500 mm	800 mm	2200 mm	2760 mm
UX17 40/50 kA 3150 A	1000 mm wide	1500 mm	1000 mm	2200 mm	2760 mm
24 kV					
UX24 20 kA 800 A	800 mm wide	1570 mm	800 mm	2320 mm	2880 mm
UX24 25 kA 1250 A	800 mm wide	1570 mm	800 mm	2320 mm	2880 mm
UX24 25 kA 2000 A	1000 mm wide	1570 mm	1000 mm	2320 mm	2880 mm
UX24 25 kA 2500 A	1000 mm wide	1570 mm	1000 mm	2320 mm	2880 mm

*: IAC of this panel is 26.3 kA-1s

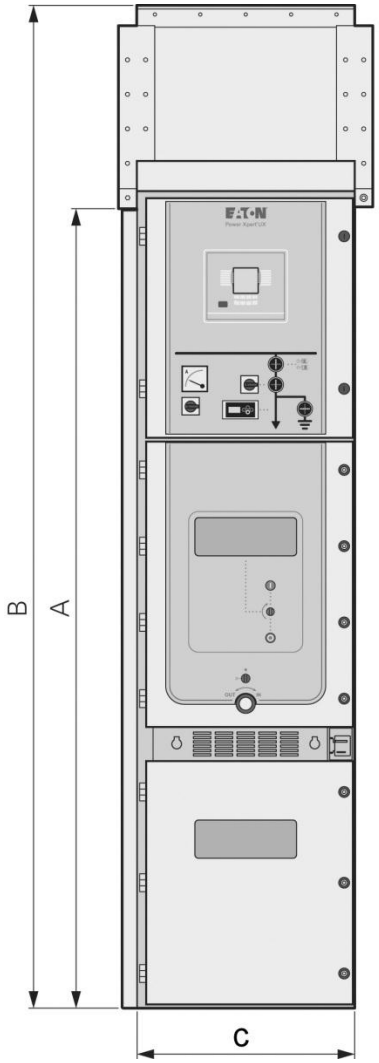


Fig. 2-11 Panel front view

Weights

Circuit-breaker panel	Approximate weights including Circuit Breaker and current transformers	
12 kV and 17.5 kV		
UX17 25 kA 630 A	600 mm wide	860 kg
UX17 31.5 kA 1250 A	600 mm wide	880 kg
UX17 40 kA 2000 A	800 mm wide*	1230 kg
UX17 40 kA 2000 A	800 mm wide	1650 kg
UX17 50 kA 2000 A	800 mm wide	1650 kg
UX17 40 kA 3150 A	1000 mm wide	1650 kg
UX17 50 kA 3150 A	1000 mm wide	1650 kg
24kV		
UX24 20 kA 800 A	800 mm wide	1460 kg
UX24 25 kA 1250 A	800 mm wide	1480 kg
UX24 25 kA 2000 A	1000 mm wide	1820 kg
UX24 25 kA 2500 A	1000 mm wide	1820 kg

* IAC of this panel is 26.3 kA-1s

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, on coupling busbar and on connecting the cables.

3.1 Environmental requirements

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

- All safety regulations applicable locally;
- 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. 2.1.1 the climate in the switchroom must comply with the following:

- Humidity:
  - 90% Maximum relative humidity over a period of 1 month.
  - 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 floor must be flat and level to within ± 2mm per metre length of the intallation;
- The floor must not have any raised areas (bumps) though indentations are permitted;
- The floor must be of adequate strength.

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, refer to 9.2 of APPENDIX. Further information is available from the information pack that includes this manual.

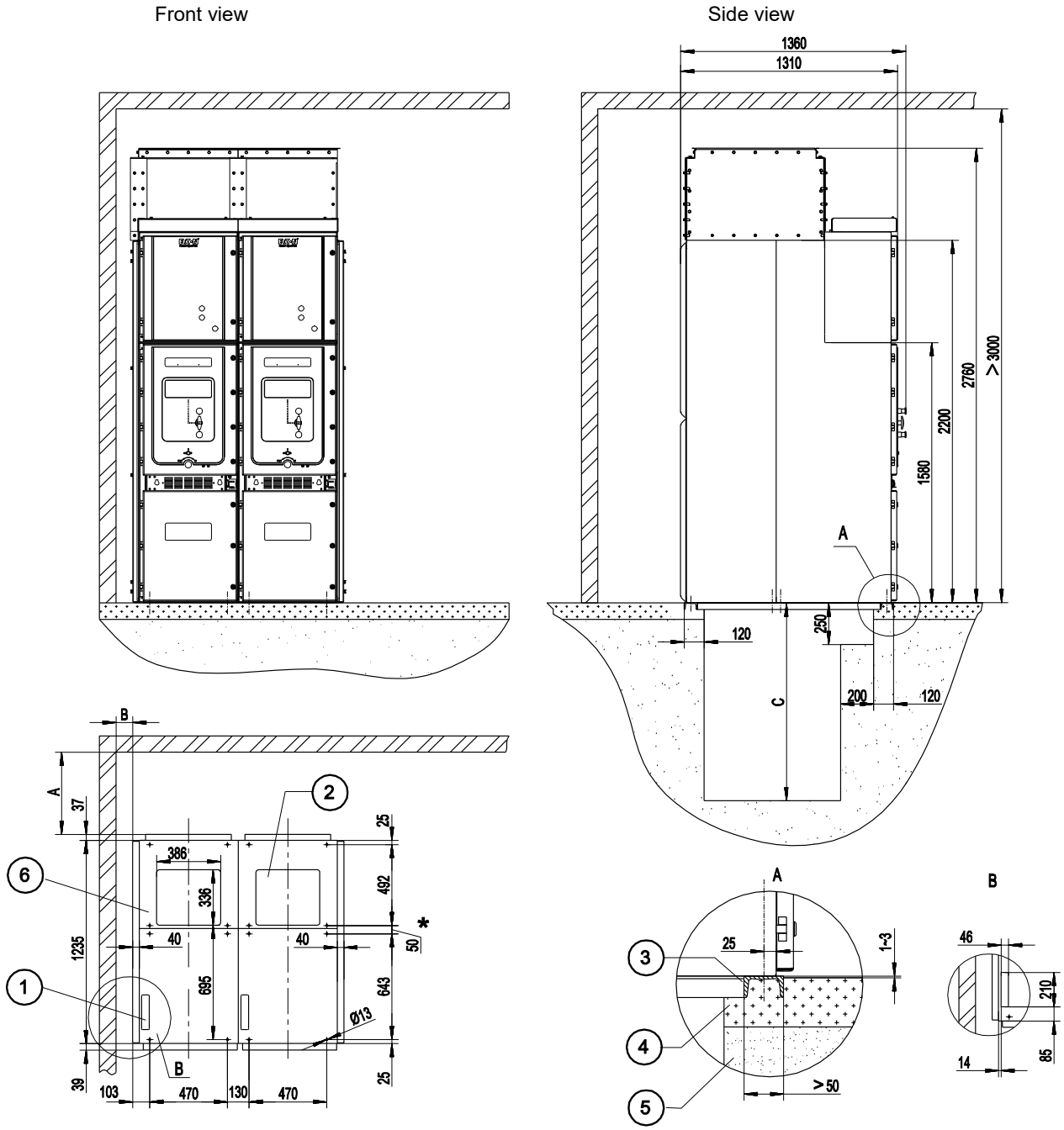
3.1.5 During transport and storage

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. 2.1.1;
- 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.



Dimension	Front and rear access	Front acces
Dim A	Min. 800	Min. 500 recommended
Dim B	Min. 100	Min. 100
Dim C	Depends on cable bend radius	
* Optional	Centre mounting is optional	

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

1. LV Control cable entry
2. Main cable entry
3. C Channel steel
4. Second pouring of the concrete
5. First pouring of the concrete
6. Foundation

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 in sections of up to 2 panels. The sections can be assembled on site. The sections are placed onto pallets and are packed in Styrofoam and plastic foil to prevent against damage. The pallets are attached to the equipment by means of steel straps.

On request, transport of individual panels can be arranged.

Transport aids

Normally the Power Xpert® installation is fitted with a lifting device. This can either be temporarily fitted hoisting frame or lifting eyes. If lifting eyes are fitted, the installation can be lifted with solid bars, which are pushed through the lifting eyes. Solid bars with a diameter between 30 mm shall be used for this purpose.

If a lifting device is not fitted, long suitable hoisting straps or chains have to be used. Care should be taken to ensure even lifting is achieved and no bending stresses are placed on the equipment.

A packed Power Xpert® installation can be moved with the aid of a forklift truck or by crane. If the installation has to be moved by crane, a special hoisting frame is available. The hoisting frame can be attached on top of the installation.

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 for damage due to transport 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.

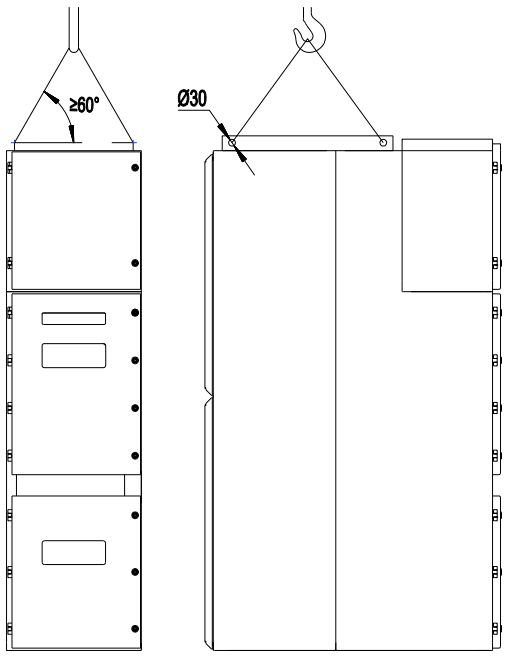


Fig. 3-2 Handling by crane

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, inside 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. Put some bars in front of the transport direction and push the Power Xpert® towards its final location.
4. Remove the bars in reverse order.

⚠ CAUTION

Make sure, under each section a solid bar is always present. This is to prevent sagging.

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

3.3.1 Foundation on site

The switchroom needs to provide a suitable foundation in order to mount the switchgear assembly. The dimension of foundation is based on the depth and width of the switchgear. There are many types of switchgear in the UX series and the dimensions of the foundation are different. For detailed foundation, please go to par. 9.2 of Appendix.

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 they 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 offensive to the environment.

REMARK

By using and reusing packing materials, we can save on raw materials. This again reduces the amount of waste.

Procedure

1. As required, remove the packaging materials from the equipment.
2. Dispose the packaging materials in an environmental friendly manner.

3.3.3 Inspection of the floor

NOTE

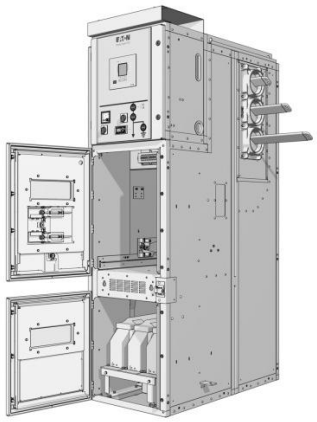
The maximum difference in height with reference to width and length of the installation shall not exceed 4 mm.

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® switchgear can be installed on top.

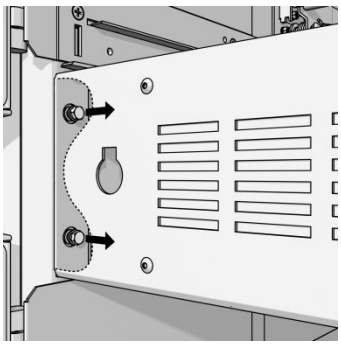
3.3.4 Preparations

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. Remove nuts connecting VT and bracket copper bar.
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 partition 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.
12. When all busbars and cables are connected, follow upper steps in reverse to reassemble installation.

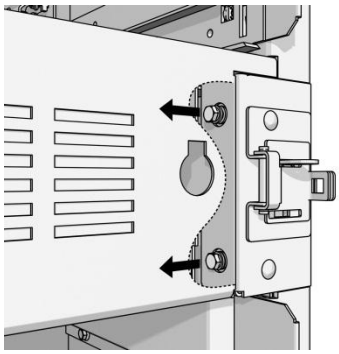
Panel with door closed



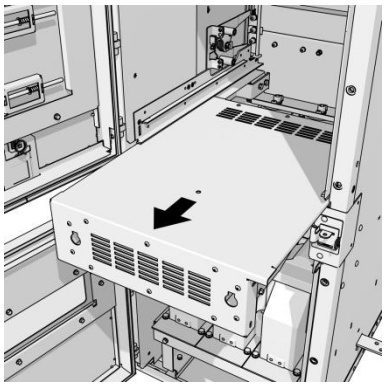
Door open



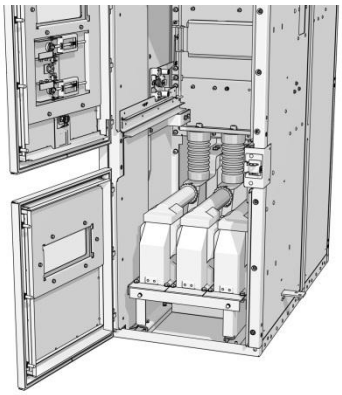
Removing left bolts of mid-pan



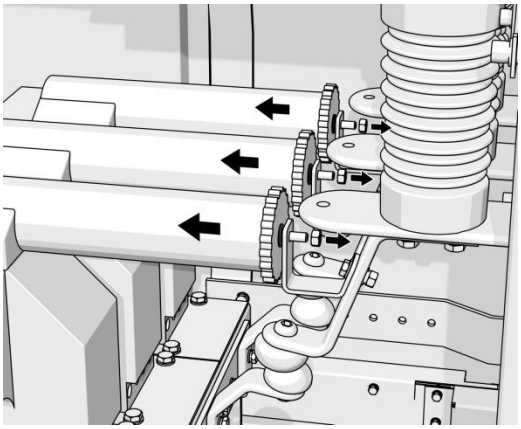
Removing right bolts of mid-pan



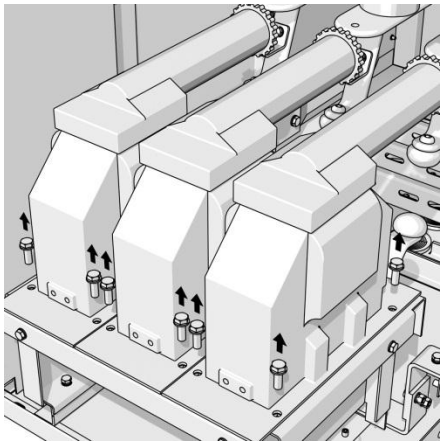
Removing mid-pan



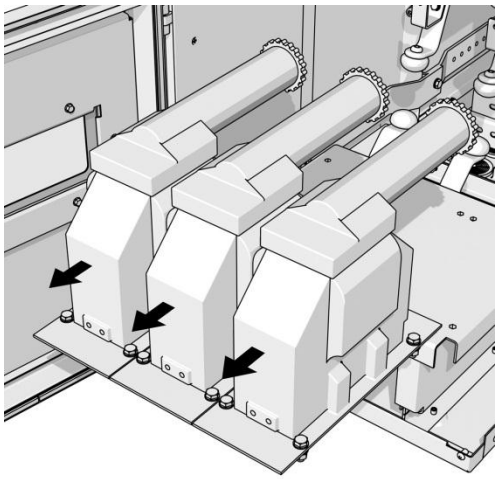
Panel without mid-pan



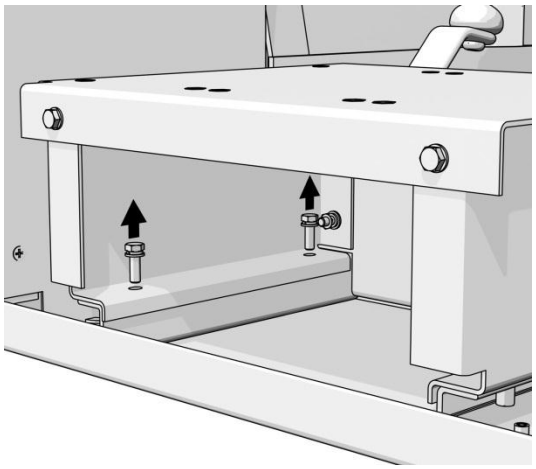
Removing nuts connecting PT and copper bar



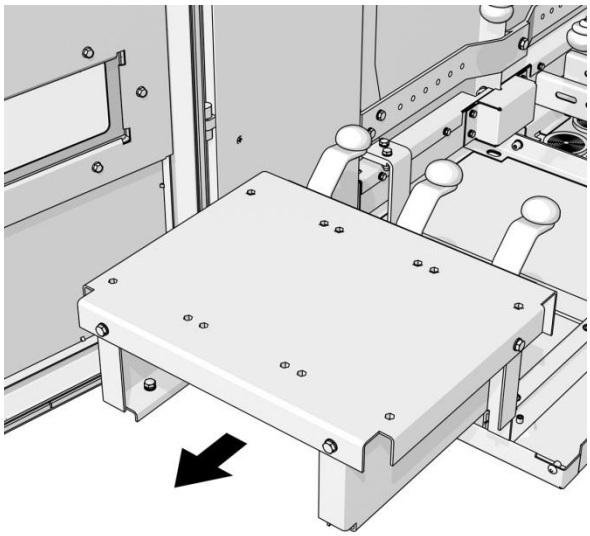
Removing bolts connecting PT and PT mounting tray



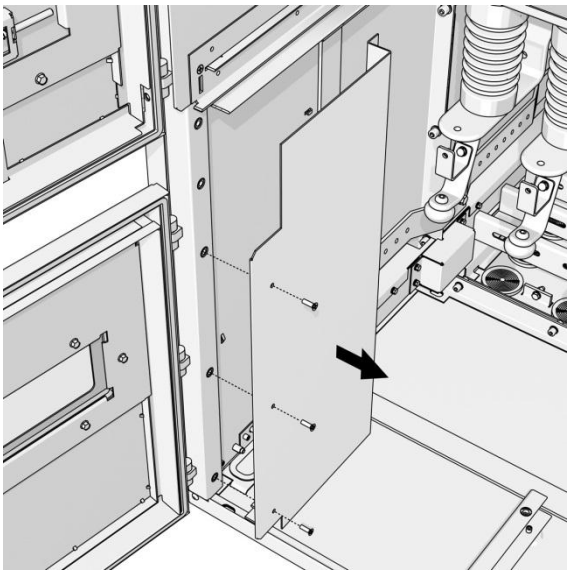
Removing PT



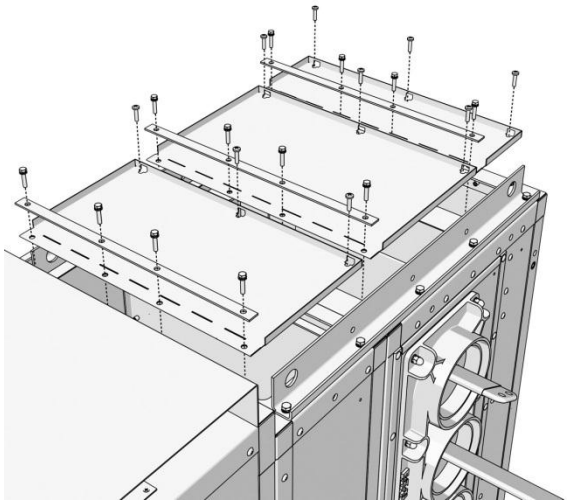
Removing bolts connecting PT mounting tray and support



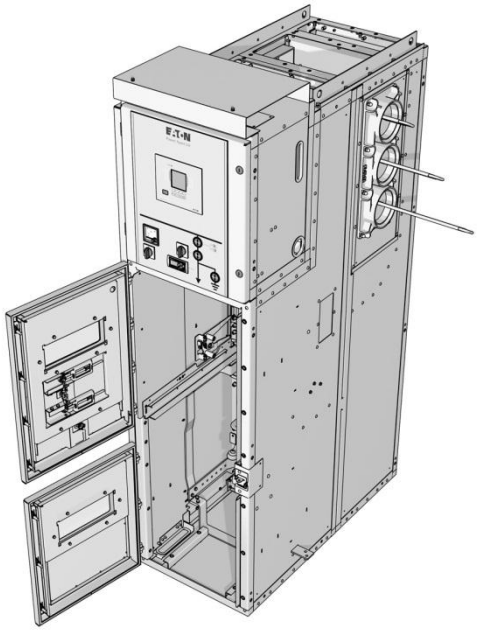
Removing PT mounting tray



Removing secondary left partition



Removing Venting flap



Right top view after preparation

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 section and level it. If the floor is not level use shims at the corners and in the centre.
2. Make sure the section is properly and equally supported. See the illustration for the locations, which need to be supported.
3. Attach the section at the front side to the floor with use of M12 bolts. Apply a standard torque 70Nm.
4. Remove the bolts and washers from the coupling rivet nuts, be careful the side plates keep their position.
5. Move a second section to the first one.
6. Carefully align the side posts of the second section with those of the first section.
7. Replace the bolts and washers in step 4 and apply a torque for 40Nm. For front cable access, Long tools are used to bolt the top rear side of adjacent section
8. Attach the other sections in the same way as given before.
9. Install the panel type plates on top of the installation, which corresponds with the panel below.
10. Repeat (3) above for all other panel sections in the switchgear to align and fix to the level floor.

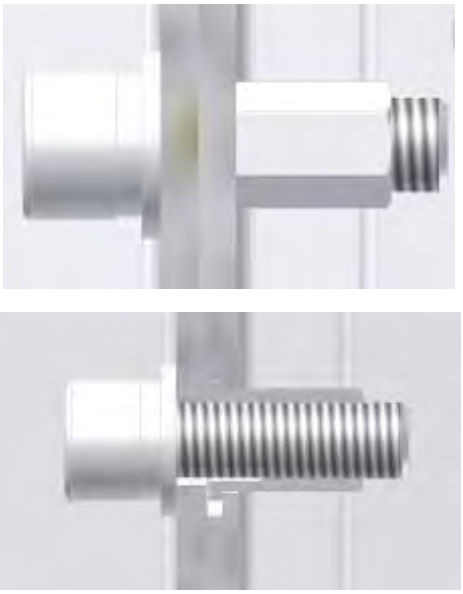


Fig. 3-3 Coupling bolt assembly

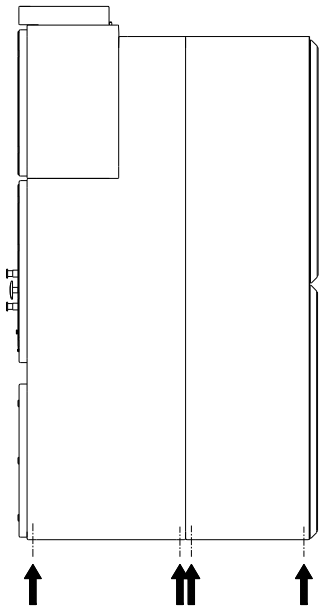


Fig. 3-4 Location of the bolts connecting panel and floor

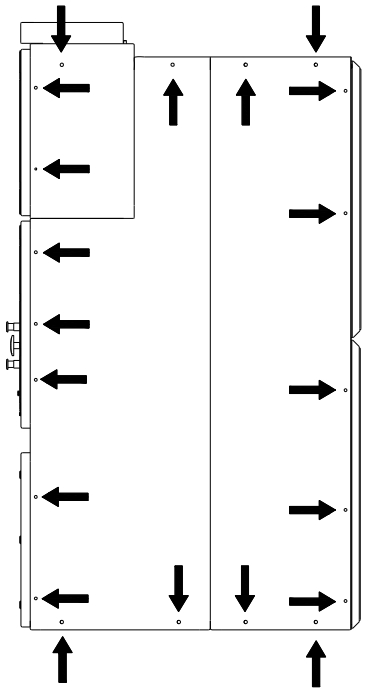


Fig. 3-5 Location of the bolts connecting adjacent panel

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 busbar compartment.

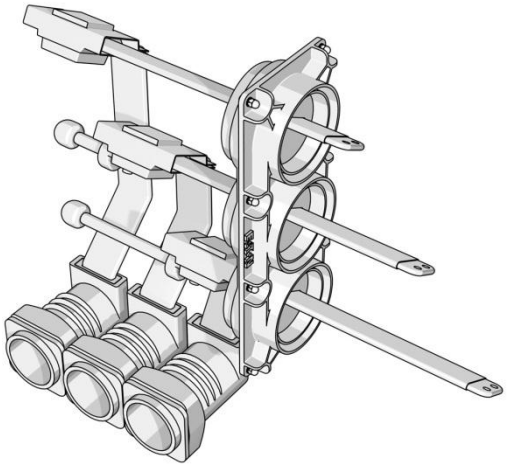


Fig. 3-6 Main busbar

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 bus bars as shown in the illustration
4. Tighten the bolts by hand (use no tools).
5. Align the busbars and tighten the bolts.
   Apply a torque of 40 Nm (M12 bolts).
6. Cover the joint with the insulation box using either cable ties or plastic rivets to close the insulation cover.

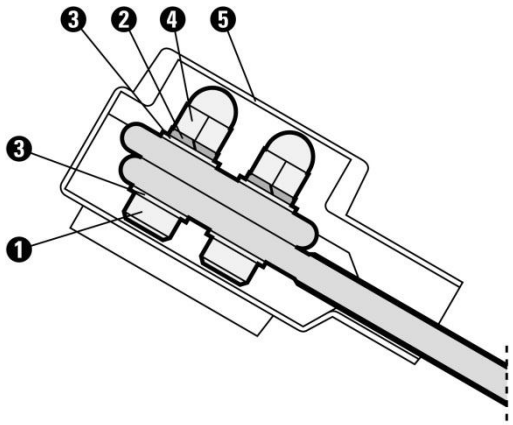


Fig. 3-7 Bolts connection for main busbar

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:

Top: Assembly for main busbar/T-off 630/800/1250 A
Centre: Assembly for main busbar/T-off 2000/2500 A
Bottom: Assembly for main busbar/T-off 3150 A.

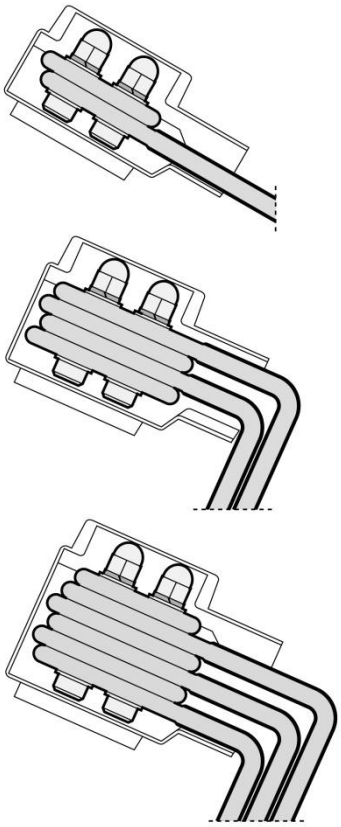


Fig. 3-8 Busbar connection for T-off

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® earthing busbars to the earth connection of the building (local earth potential).

Earthing busbars - coupling

1. Connect adjacent panel's 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.

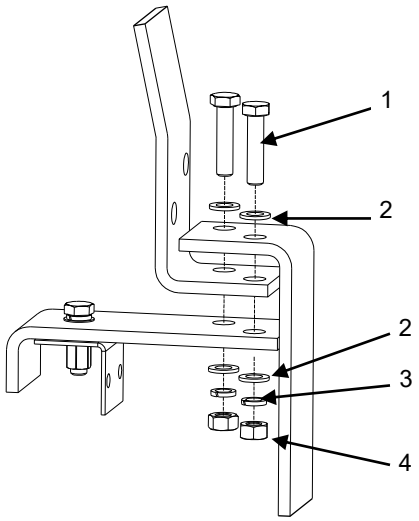


Fig. 3-9 Bolts connection for earthing busbar

1. Bolt M8x35
2. Plain washer 8
3. Spring washer 8
4. Nut M8

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 authorised and qualified personnel;
- In accordance with the data in the information pack;
- In accordance with cable manufacturer's 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;
- An earthing switch;
- Over voltage surge arrestors;
- Capacitive elements for voltage detection system.

Not all the components mentioned can be accommodated in the cable compartment at the same time.

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

If necessary, the cable gland plate must be provided with cable cut-outs 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 strain relief).
5. Connect the earthing screen of the cable to the earth busbar of the cable compartment.

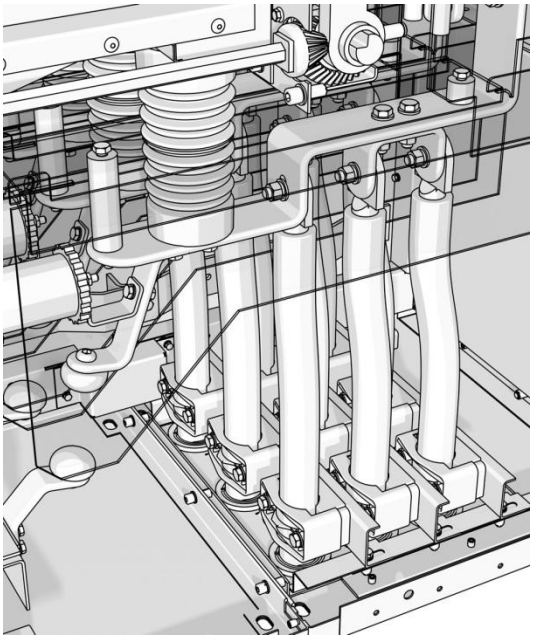


Fig. 3-10 Connecting main cable

3.5.2 Connection of secondary wiring

The documentation pack contains a wiring diagram for the secondary wiring (the inter-panel wiring).

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

Proceed as follows:

1. Terminate the wire ends, where necessary, in accordance with the diagram pack.
2. Open the doors of both the low-voltage and main MV switch compartments.
3. Install secondary wiring in accordance with the wiring diagram, using the bushings between the low-voltage compartments.
4. Connect the wiring to the terminal strips in accordance with the wiring diagram and codes.

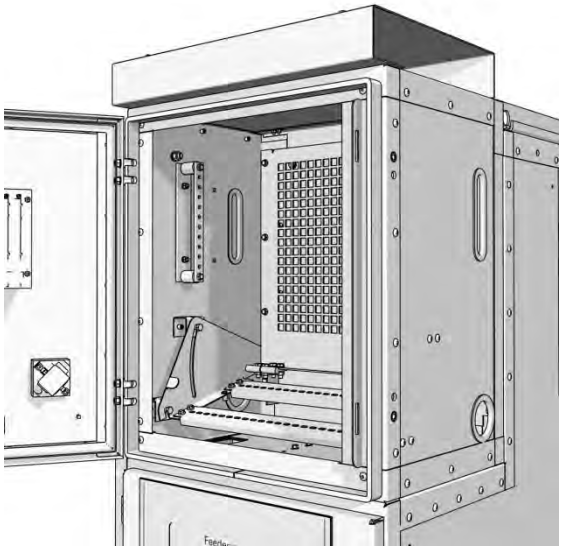


Fig. 3-11 Low voltage compartment

3.5.3 Connecting the auxiliary cables

Proceed as follows:

1. Remove the cover from the cable duct (see arrow in illustration).
2. Feed the auxiliary cables into the switch panel from underneath.
3. Secure the cables in the cable duct with cable clips or tie-wraps.
4. Connect the cables in accordance with the diagram pack.
5. Refit the cable duct cover.

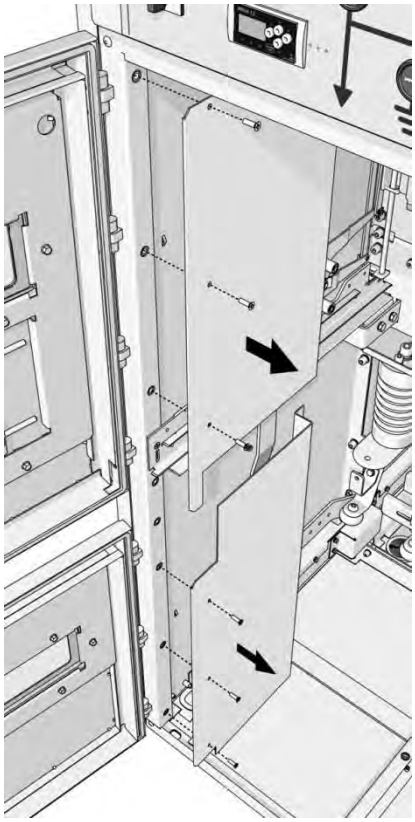


Fig. 3-12 Connecting auxiliary cable

3.5.4 Inter-panel connection of auxiliary cables

Auxiliary cables for inter-panel connection may come to the adjacent panel through the round or rectangular holes, covered with grommets, in the side sheet of LV compartment. Alternatively they may exit the LV compartment at the top, run along the switchgear in the LV Cable way (see arrow) and enter the adjacent or other panels in the switchgear in the same way.

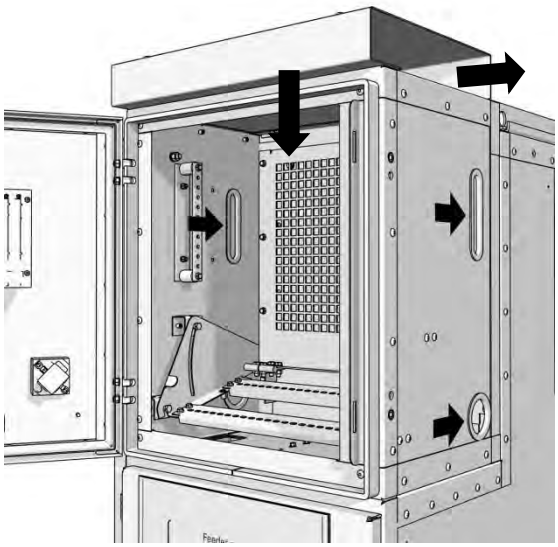


Fig. 3-13 Inter-panel connection of auxiliary cables

4 System operation

This chapter contains the operating procedures for Circuit breaker units used in Eaton Power Xpert® UX switchgear

Refer to insert the W-VAC*i* Operations and Maintenance Manual part of the technical documentation.

⚠ 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.

⚠ 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 qualified experts and qualified 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 Operations and Maintenance Manuals for specific equipment.

4.1.1 Mechanical operation door open

When the 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 individual operations and maintenance manual.

If the control plug 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.

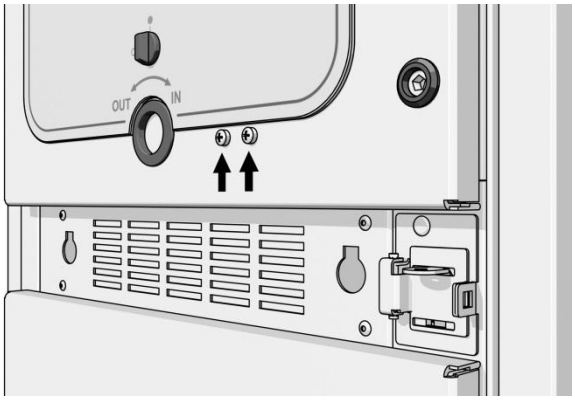


Fig. 4-1 Door Interlock defeat operation

4.1.2 Charging the closing spring

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

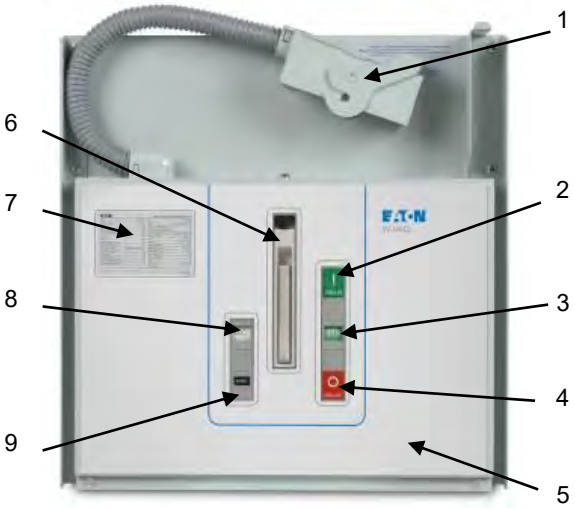


Fig. 4-2 Circuit Breaker

4.1.3 Mechanical operation door closed

When the door is closed, the circuit breaker can be manually switched ON or OFF by using the two buttons on the front of the compartment door. The Close button is an option and may or may not be operational. VCB with locking coil option needs to be used when choosing “close” feature.

NOTE

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

Look through the window in the door and check to see if the switch is in the SERVICE or TEST position. The switch should be fully racked in the SERVICE position. Check that spring position indicator on the switch is in the ‘spring charged’ position.

NOTE

The door cannot be opened when the switch is in the SERVICE position.

Switching ON

- Turn the change-over knob (2) anti-clockwise to the end stop.
- Press firmly on the “ON” button (1), the unit will switch ON

Switching OFF

- Turn the change-over knob (2) clockwise to the end stop
- Press on the “OFF” button (3) , the unit will switch OFF

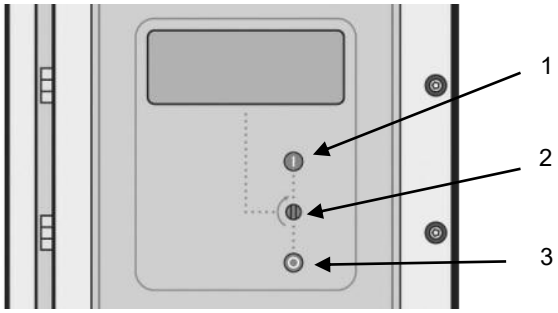


Fig. 4-3 Mechanical operating closed door

1. “ON” button
2. Change-over knob
3. “OFF” button

4.1.4 Electrical operation

The procedures described here apply to operation from the Low Voltage control panel 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 positions, however the control plug 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 operated On or OFF without the secondary plug being connected

Switching on

Press the ON button.

- The unit switches on.
- The position indicator on the mimic, if fitted, indicates the unit is in the ON position.

Switching off

Press the OFF button.

- The unit switches off.
- The position indicator, if fitted, 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 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.

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 provided for those specific operations

.

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 lifting and 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 plug 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 plug of the unit with the stationary secondary socked 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 at the front of the compartment; the unit has not yet made contact with the cable and the busbar. The 58-pole secondary plug 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.

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 mechanisms should have been removed.

The unit can be put into the Service position from this Test position only when the door is closed and any padlocks 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 possible when the hand crank has been removed. When the unit is Closed, it cannot be moved either into the connected or out to the test position.

SERVICE

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

The earthing switch cannot be operated.

Opening and Closing is only possible when the hand crank has been removed. When the unit is Closed,it cannot be moved

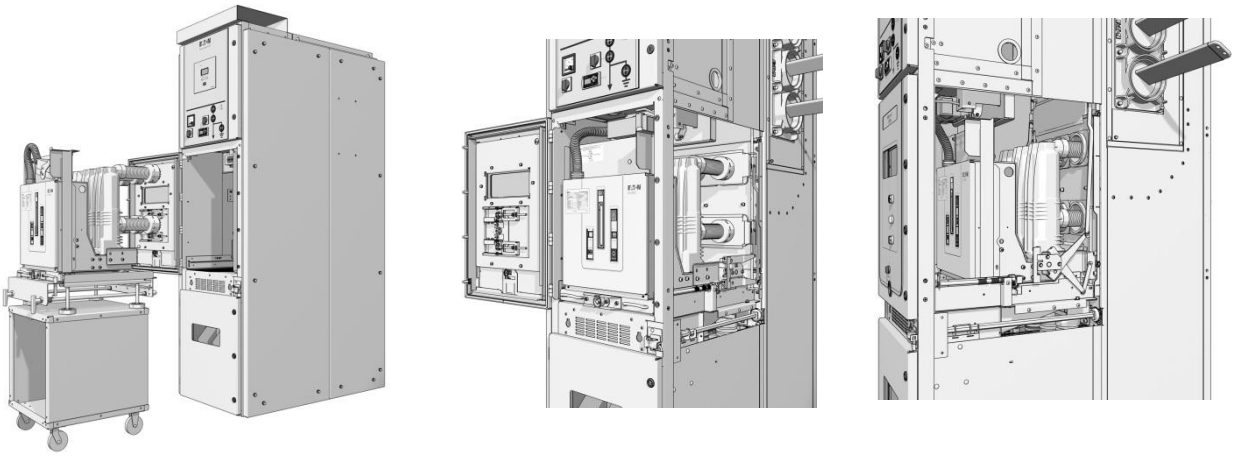
The door of the compartment cannot be opened with the unit in the Service position

The unit is now fully operational

NOTE

Apart from the interlocks described above, other 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. 4-4

4.2.2 Inserting a unit

Inserting the unit to the Test position.

Proceed as follows:

1. Open the door of the circuit breaker panel.
2. Check that there are no padlocks fitted on the shutters; remove them if fitted.
3. If the panel has an earthing switch, make sure it is in the required position (Open during normal operation, Closed during maintenance or testing).
4. Remove all locks in accordance with any specific operating instructions.
5. Check that the unit is Open.
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 knob (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 plug. (See instructions on the front of the plug). The unit is now in the test position
11. Unlock the trolley by turning unlock knob (1) to the centre of the panel and remove the trolley.

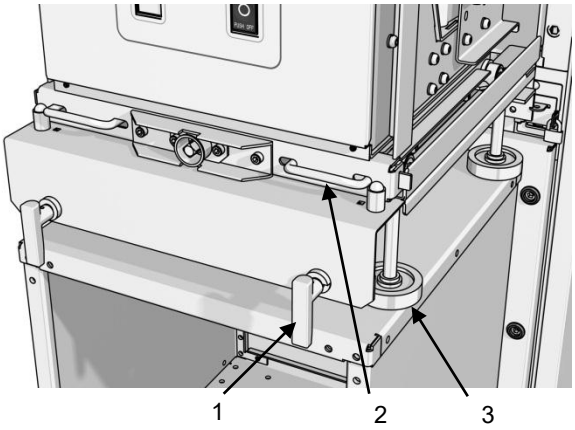


Fig. 4-5 Inserting a circuit breaker or other withdrawable functional unit

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

Unit: from Test to Service position.

1. Insert the 58-pole plug 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
5. Turn the knob (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
8. Remove the hand crank. Releasing the interlocking mechanism, the hand crank has to be turned a little in the opposite direction until a spring is released and the operating hand crank is pushed back.
9. The unit is now locked in the Service position and is fully operational.

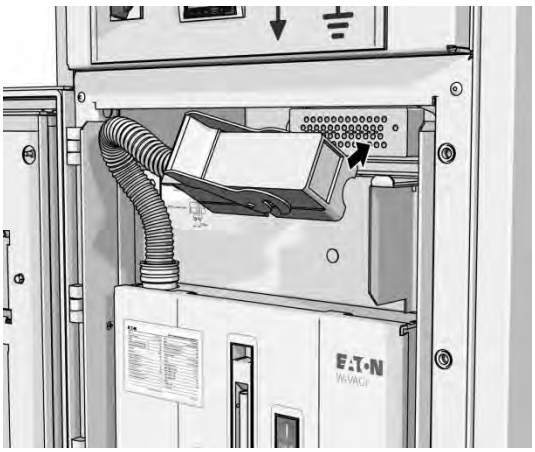


Fig. 4-6 Placing the 58-pole plug into the socket

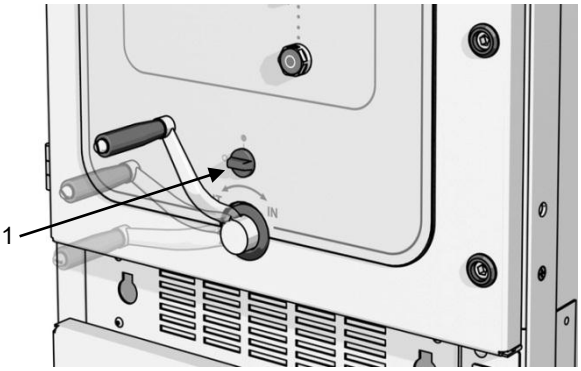


Fig. 4-7 Rack IN-OUT with closed door

1. Knob

4.2.3 Door interlock mechanism

It is only possible to rack unit from Test position to Service position when door closed

4.2.4 Withdrawing a unit

Withdrawal from Service to Test position

1. Check that the unit is Off
2. Turn the knob (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 and the handle is tight.
5. To release the interlocking mechanism the handle has to be turned a little in the opposite direction until a spring is released and the handle crank is pushed back
6. 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 unit compartment door.
3. Unplug the 58-pole secondary plug.
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 knob (1) to the centre of the panel and remove the trolley.
7. If necessary fit a padlock to the automatic shutters (see procedure).
8. Close the door.

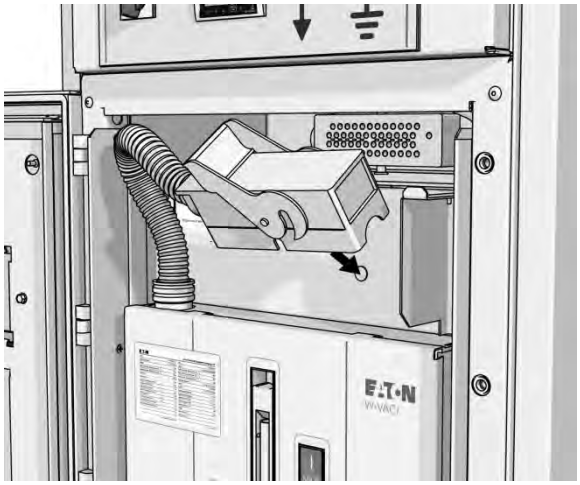


Fig. 4-8 Removing secondary plug

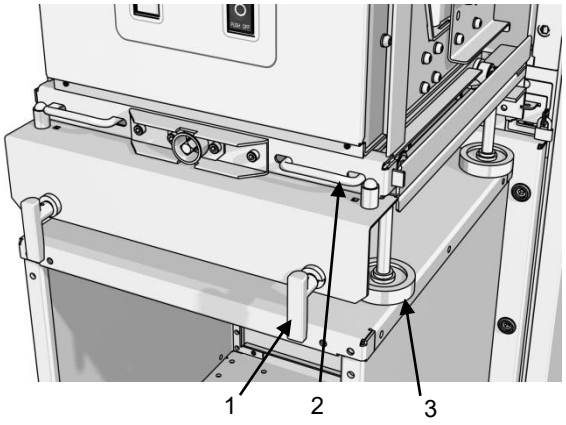


Fig. 4-9 Withdrawing a circuit breaker or other withdrawable functional unit

1. Unlock knob
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 closed properly.
3. Install the padlock as shown in the illustration.

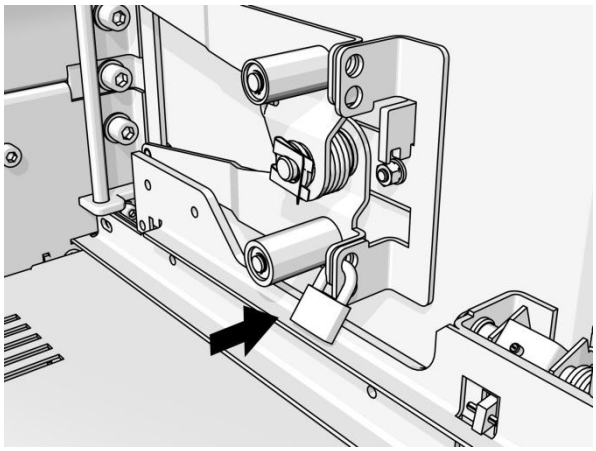


Fig. 4-10 Padlock shutters

4.3 Earthing

This manual contains general instructions for fitting a safety earth.

An installation may be fitted with specific interlocks (e.g. a locking coil), which are intended to prevent the earthing switch from switching on at the wrong time.

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:

- Earthing a cable using a built-in fixed earthing switch. See par. 4.3.1
- Earthing a busbar using a built-in fixed earthing switch in the bus-sectionaliser panel. See par. 4.3.1
- Earthing a busbar using a withdrawable earthing unit. See par. 4.3.2
- Earthing a cable using a withdrawable earthing unit . See par. 4.3.2

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 locking coil or padlock. The maximum size of the padlock hasp is 8 mm diameter.
- The earthing switch can be padlocked in either the “ON” or “OFF” position

CAUTION

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

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) and it is only possible to open the earth switch when the cable compartment door is closed.

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 and cable is dead. This will release the door interlock mechanism and the door can now be opened.

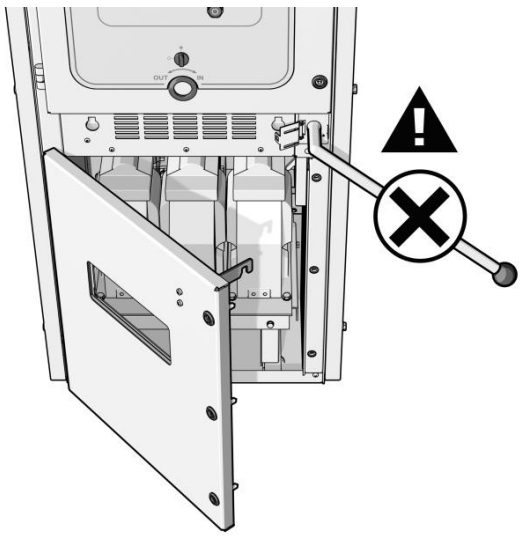


Fig. 4-11

NOTE

Door Interlock Defeat Mechanism: To open the cable door in an emergency, remove two screws.

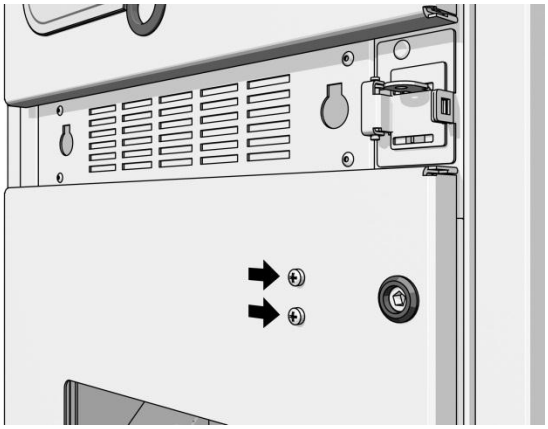


Fig. 4-12 Interlock defeat mechanism screws

4.3.3 Switching on/off the earthing switch

Switching on the earthing switch

1. Put the unit in the 'Insert/Removed' or 'Test' position;
2. Remove the 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 switches On.
   - 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 can now be closed, and if required a padlock can fitted on the locking catch. The earth switch is now padlocked in the "ON" position.

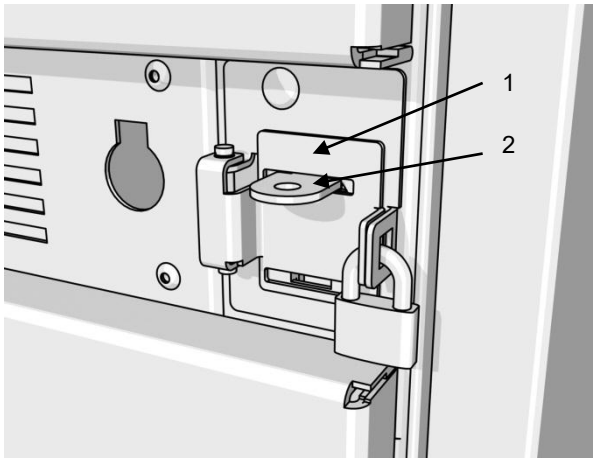


Fig. 4-13 Location of the operating shaft on a standard built-in earthing switch

Switching off the earthing switch

1. Release all interlocks; if a padlock has been fitted, remove it.
2. Place the operating handle (3) on the operating shaft of the earthing switch.
3. Turn the handle anti-clockwise; release the interlock driver.
   - The earthing switches are switched Off.
   - The position indicator indicates "O" (Off).
4. Remove the operating handle (3).
5. The interlock driver will return to its original position and the cover can be closed and if required a padlock can fitted on the locking catch. The earthing switch is now padlocked in the "OFF" position

4.3.4 Earthing busbar/cable using withdrawable earthing unit

Withdrawable busbar earthing unit only has the upper movable contact fitted.

Withdrawable cable earthing unit only has the bottom movable contact

Procedure for inserting the withdrawable earthing units is as the same as for inserting withdrawable circuit breaker unit to the Service position. For details, refer to 4.2.3

Procedure of unearthing busbar/cable is as the same to withdrawing withdrawable circuit breaker unit to the Insert/Removed position. For details, refer to 4.2.4

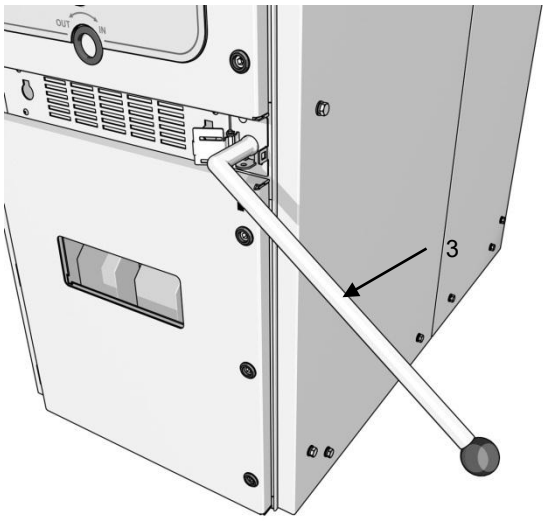


Fig. 4-14 Operating earth switch

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

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;
- Testing for dead cables and busbars according to users' procedure;
- Testing for phase coincidence according to users' procedure.

4.4.1 Shutter lifter truck

Power Xpert® UX with W-VAC*i* is provided with automatic shutters, which protect the cable side and/or busbar side isolating contacts when there is no switch in the panel.

If access to the primary contacts, either busbar or cable, is required then a shutter lifter truck is used to gain access to these contacts.

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.

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. Fit the shutter lifter:
   - For busbar and cable side shutters: Place push plate as indicated on the picture Fig. 4-15
   - For busbar side shutters: Place push plate as indicated in the picture Fig. 4-16
   - For cable side shutters: Place push plate as indicated on the picture Fig. 4-17
3. For remaining steps, refer to inserting the unit to the Test position of paragraph 4.2.3

Opening the shutter

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

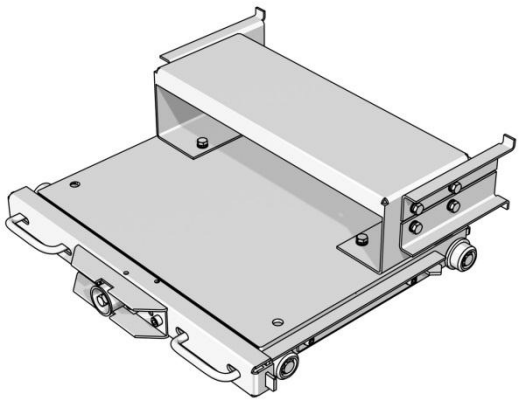


Fig. 4-15 Shutter lifter truck for busbar and cable side shutters

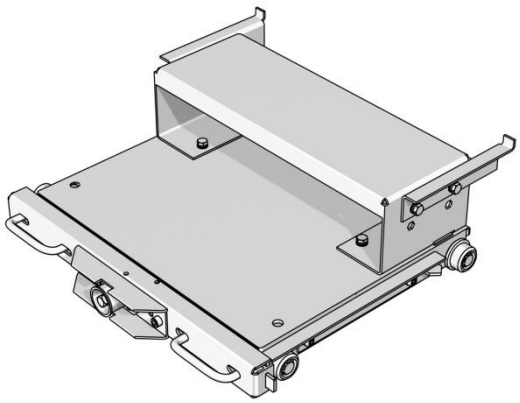


Fig. 4-16 Shutter lifter truck for busbar side shutter

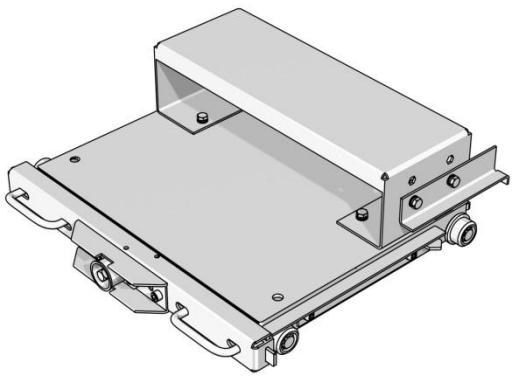


Fig. 4-17 Shutter lifter truck for cable side shutter

Closing the shutter

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

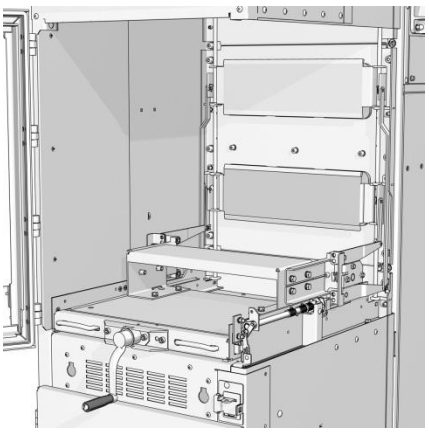


Fig. 4-18 Shutters closed

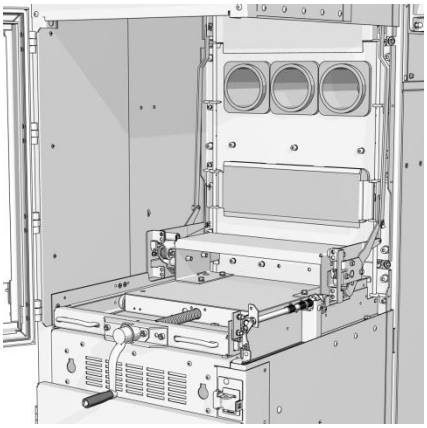


Fig. 4-19 Opening busbar side shutter

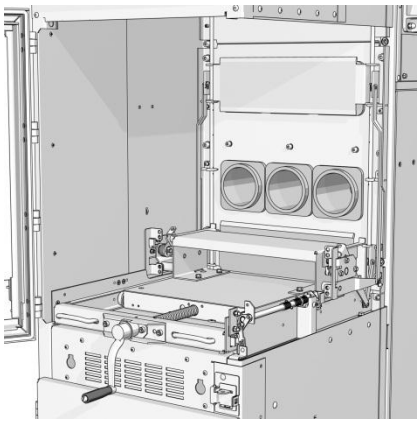


Fig. 4-20 Opening cable side shutter

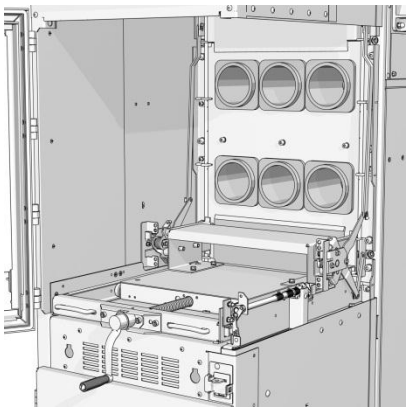


Fig. 4-21 Opening busbar and cable side shutters

4.4.2 Optional Voltage Detection System VDS

The low voltage control panel of a switch panel may be fitted with a voltage sensor and indicator. These may vary in functionality but the standard offering, if fitted, provides the following functionality.

Voltage indicator

A voltage indicator is an indicator with three Light Emitting Diodes (LEDs) and three socket contacts L1, L2 and L3. It is connected via a signal cable to a voltage sensor, which is located on the cable section of the panel to be monitored. Each LED monitors one phase. The LEDs light up if a voltage is present on the phases monitored. If they are dead the LEDs do not light up

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

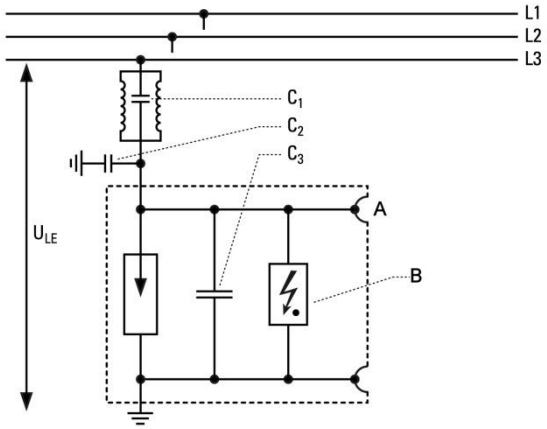


Fig. 4-22 Principle of the capacitive voltage detecting system

A Test point
B Voltage indication
C_1 e.g. coupling electrode
C_2 capacity of connecting leads
C_3 Adaption capacitor

5 System commisioning and decommisioning

The complete procedure is beyond the scope of this manual. This paragraph deals with a number of general points.

5.1 Commissioning

Following manufacture and factory testing, acceptance testing can take place on the basis of the IEC 62271-200 standard.

Acceptance testing can be carried out in the Eaton factory or on site, in the presence of the client and/or an independent testing authority

5.1.1 Acceptance testing

Acceptance testing involves:

- Electrical checking of closing and opening at the prescribed normal, maximum and minimum permitted auxiliary voltage.
- Checking the operation of auxiliary contacts, relays, coils and meters.
- Wiring checks.
- Measuring of contact resistance values in the primary circuit.
- Withstand voltage testing of the secondary circuit (except the spring charging and closing motor coils).
- Withstand voltage testing of the primary circuit.
- Visual inspection to establish whether the materials and installation are in accordance with specifications.

5.1.2 Inspections

After the installation has been set up, and no loads are connected physical inspection should be carried out and will include the following:

- Measurement of voltage losses on the busbar connections fitted on site.
- Checking mechanical interlocks and satisfactory insertion and withdrawal of the withdrawable units.
- Checking installed continuous wiring to confirm that it is in accordance with specifications and drawings.
- Applying power to the installation in accordance with the IEC standards 62271-200 and 62271-1

The following points are not inspected:

- Civil engineering work.
- The connections of main and auxiliary cables (unless carried out by or under the responsibility of Eaton).
- Materials outside the scope of Eaton's supply.

5.1.3 Handover

Following this inspection, handover of the installation can take place.

WARNING

Eaton cannot be responsible for actions carried out after handover.

5.2 Decommissioning

5.2.1 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.

5.2.2 Disposal

Power Xpert® 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® 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, knob
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
Stannum	Sn	Plating
Silver	Ag	Silver plating on conductors

6 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.

6.1 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 times 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.

6.2 Inspection and maintenance, general

Power Xpert® UX switchgear and the withdrawable units used in the switchgear require little maintenance. However, inspection and checks should be made at regular intervals and preventive maintenance carried out usually as part of any normal annual maintenance procedure.

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, at regular intervals or when considered necessary, 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 checks and maintenance on the withdrawable units, reference should be made to the specific unit manuals in the information pack.

Recommended inspection and maintenance schedule for Power Xpert® UX switchgear

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

⚠ WARNING

Inspections, checks and maintenance operations should only be carried out by authorised 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.

6.2.1 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.

6.2.2 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.

6.3 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.

6.3.1 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 authorised 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.

6.3.2 Troubleshooting table

Symptom	Possible cause	What to do:
58-pole secondary plug cannot be removed.	Withdrawable unit is in the 'Service/Connected' position.	• Put the unit into 'TEST' position.
Earthing fault.	Poor insulation.	• Check insulation.
Earthing switch cannot be switched on.	Withdrawable unit is in 'Service/Connected' position. Locking coil in operation.	• Put switch into 'TEST' or 'INSERT/ WITHDRAWN' 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/Connected' position. Hand crank has not been removed.	• Put switch into correct position. • Remove hand crank.

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/Connected’ 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/Withdrawn’ position.	Unit is ’On’.	• Turn unit ‘Off’/’Open’.
Withdrawable unit will not move from ’Service/Connected’ 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 jamed.	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.

7 Accessories

7.1 List of available accessories

The following accessories can also be supplied for Power Xpert® switchgear

7.1.1 Power Xpert® UX

Name	Item no.
Operating handle for earthing switch	535.5253.005.01
Panel door key	535.5253.006.01
Shutter lifter truck	535.5239.001.01
Transport truck 600	535.5043.031.04
Transport truck 800	535.5043.031.01
Transport truck 1000	535.5043.031.02

7.1.2 Optional

Name	Item no.
58 pole connection lead 2 m length	535.5211.004.01
58 pole connection lead 1 m length	535.5211.005.01

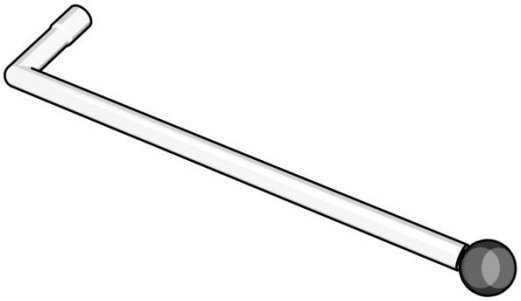


Fig. 7-1 Operating handle for earthing Panel door key switch

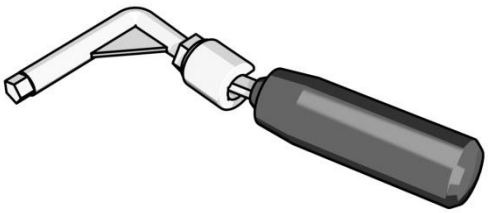


Fig. 7-2 Panel door key

8 Glossary

8.1 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 authorisation 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.

8.2 Abnormal 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.

8.3 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 switchgear compartment and can be a circuit breaker, contactor, metering truck, disconnector truck, VT truck for example.

9 Appendix

9.1 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

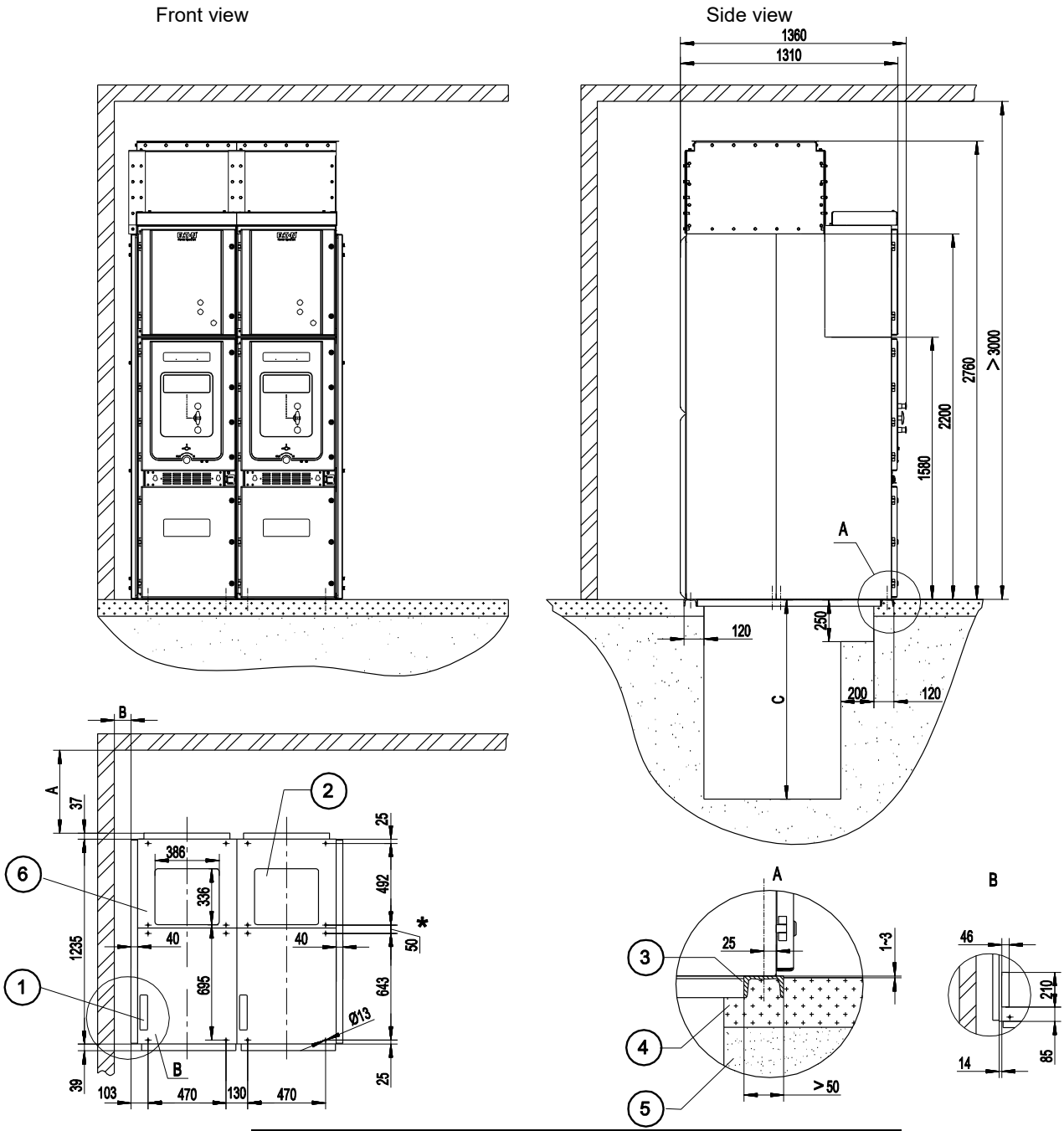
List of spare parts

- 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)

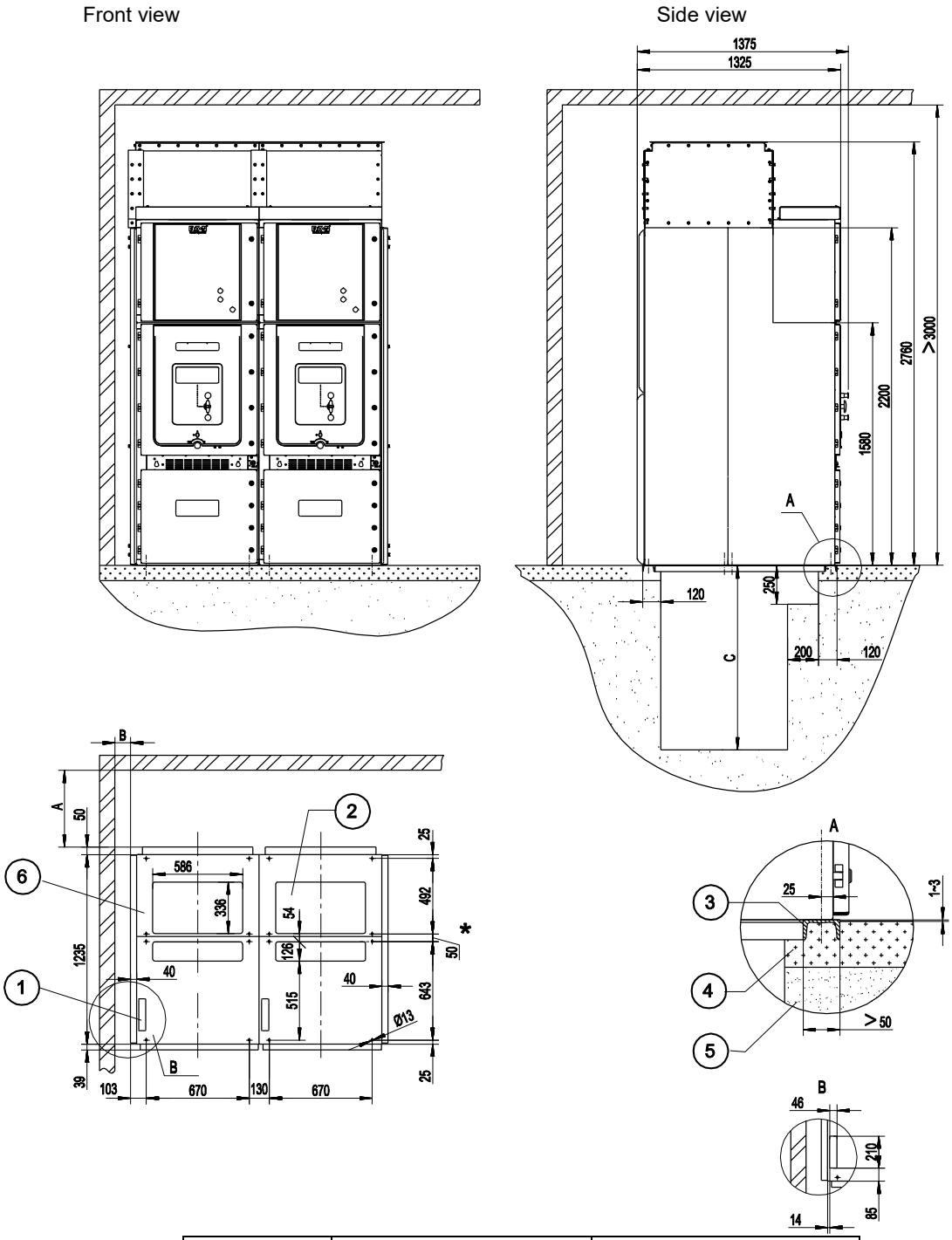
9.2 Floor Plan drawings



Dimension	Front and rear access	Front acces
Dim A	Min. 800	Min. 500 recommended
Dim B	Min. 100	Min. 100
Dim C	Depends on cable bend radius	
* Optional	Centre mounting is optional	

Fig. 9-1 Basic floor plan for bottom cable entry panel rating17.5kV 630/1250A 25/31.5kA

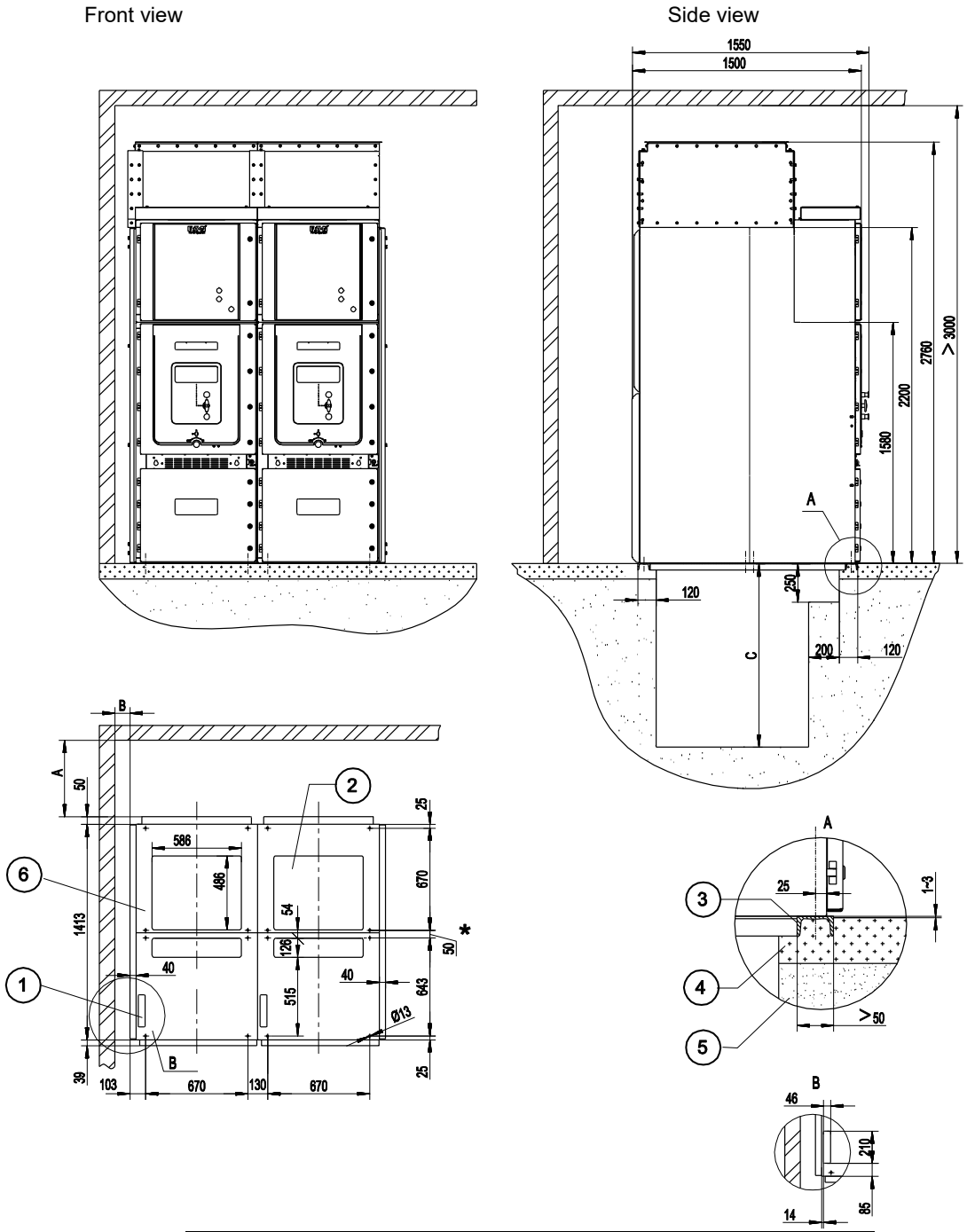
1. LV Control cable entry
2. Main cable entry
3. C Channel steel
4. Second pouring of the concrete
5. First pouring of the concrete
6. Foundation



Dimension	Front and rear access	Front acces
Dim A	Min. 800	Min. 500 recommended
Dim B	Min. 100	Min. 100
Dim C	Depends on cable bend radius	
* Optional	Centre mounting is optional	

Fig. 9-2 Basic floor plan for bottom cable entry panel rating 17.5kV 2000A 40kA (26.3kA-1s IAC)

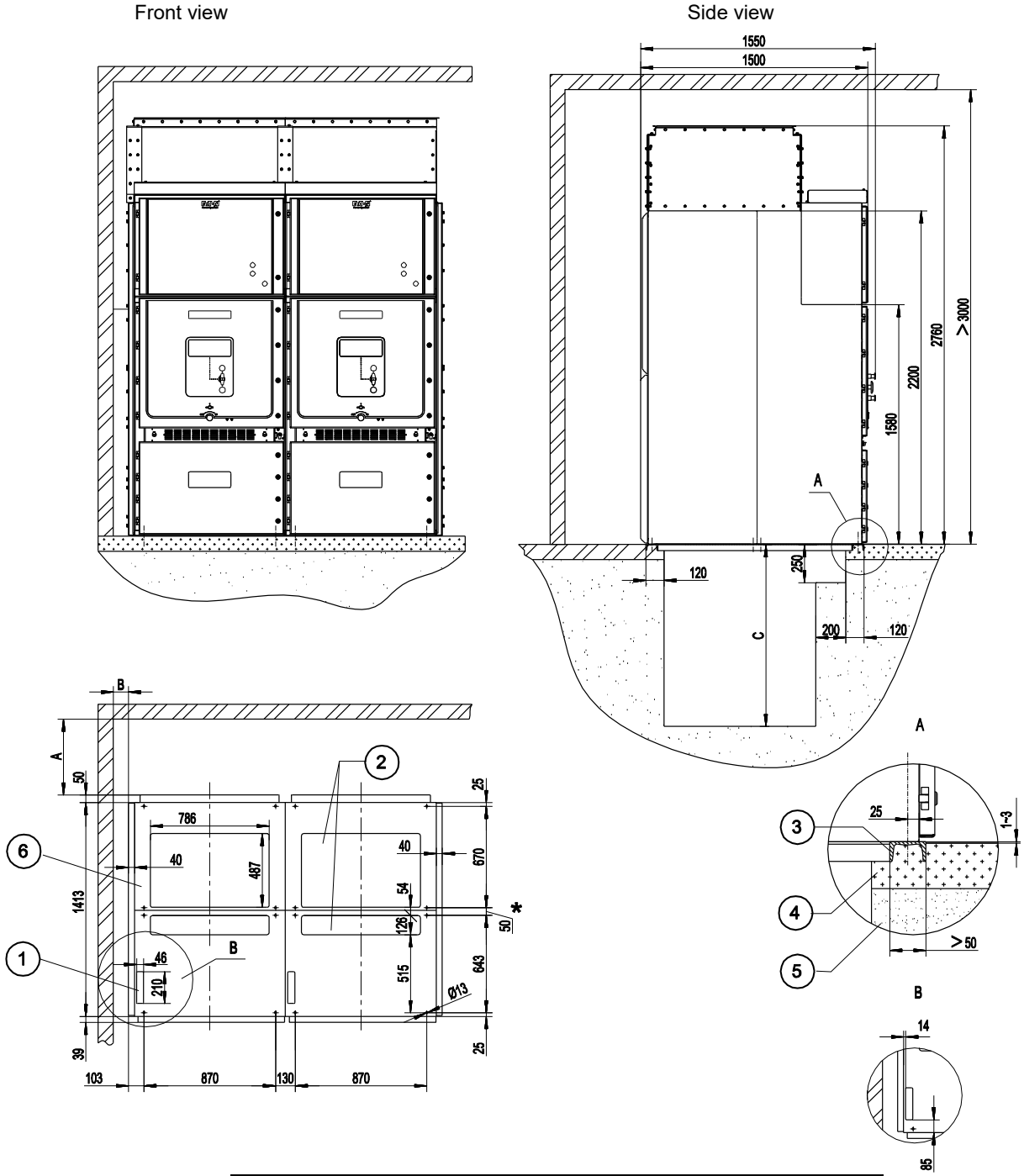
1. LV Control cable entry
2. Main cable entry
3. C Channel steel
4. Second pouring of the concrete
5. First pouring of the concrete
6. Foundation



Dimension	Front and rear access	Front acces
Dim A	Min. 800	Min. 500 recommended
Dim B	Min. 100	Min. 100
Dim C	Depends on cable bend radius	
* Optional	Centre mounting is optional	

Fig. 9-3 Basic floor plan for bottom cable entry panel rating 17.5kV 2000A 40/50kA

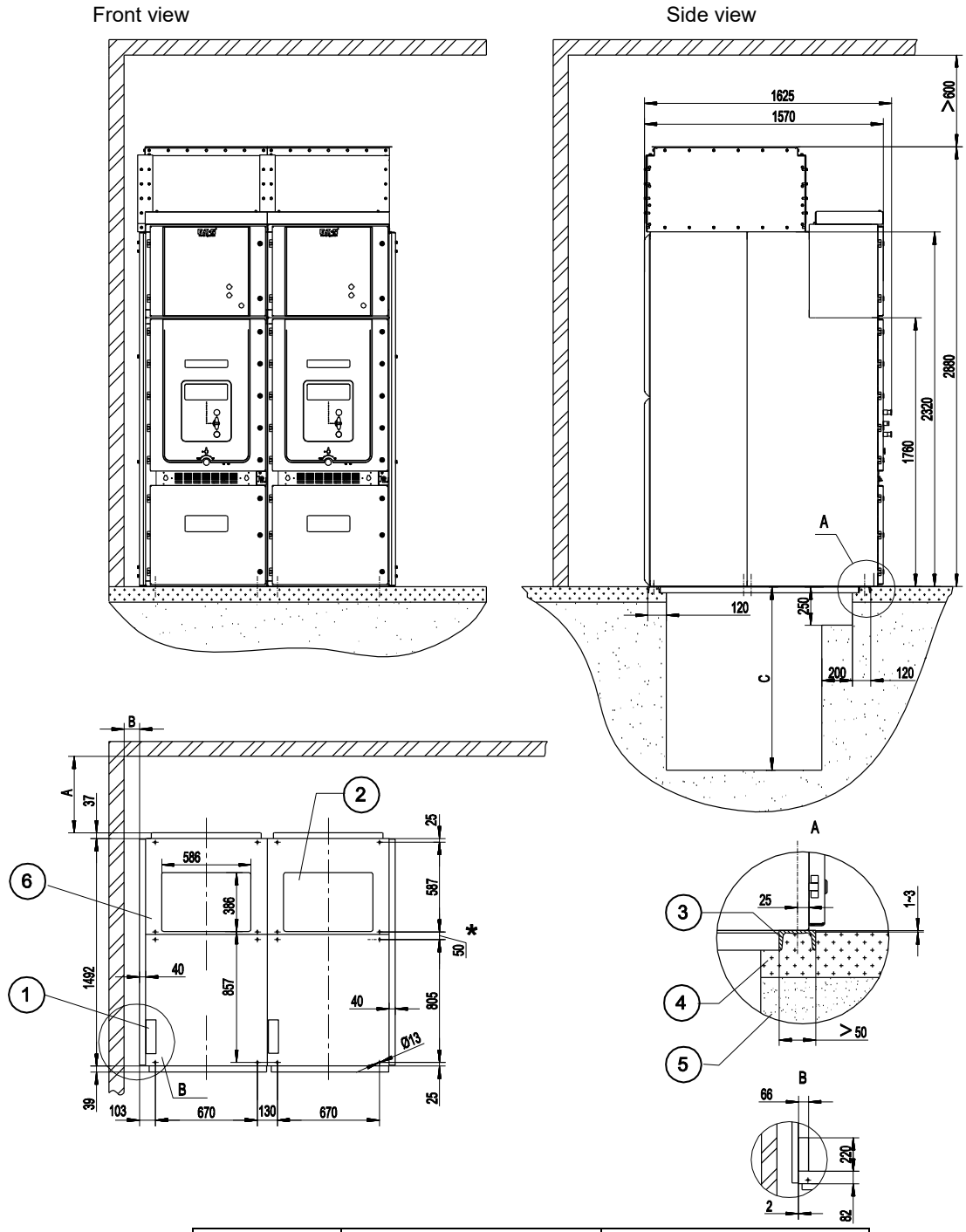
1. LV Control cable entry
2. Main cable entry
3. C Channel steel
4. Second pouring of the concrete
5. First pouring of the concrete
6. Foundation



Dimension	Front and rear access	Front acces
Dim A	Min. 800	Min. 500 recommended
Dim B	Min. 100	Min. 100
Dim C	Depends on cable bend radius	
* Optional	Centre mounting is optional	

Fig. 9-4 Basic floor plan for bottom cable entry panel rating 17.5kV 3150A 40/50kA

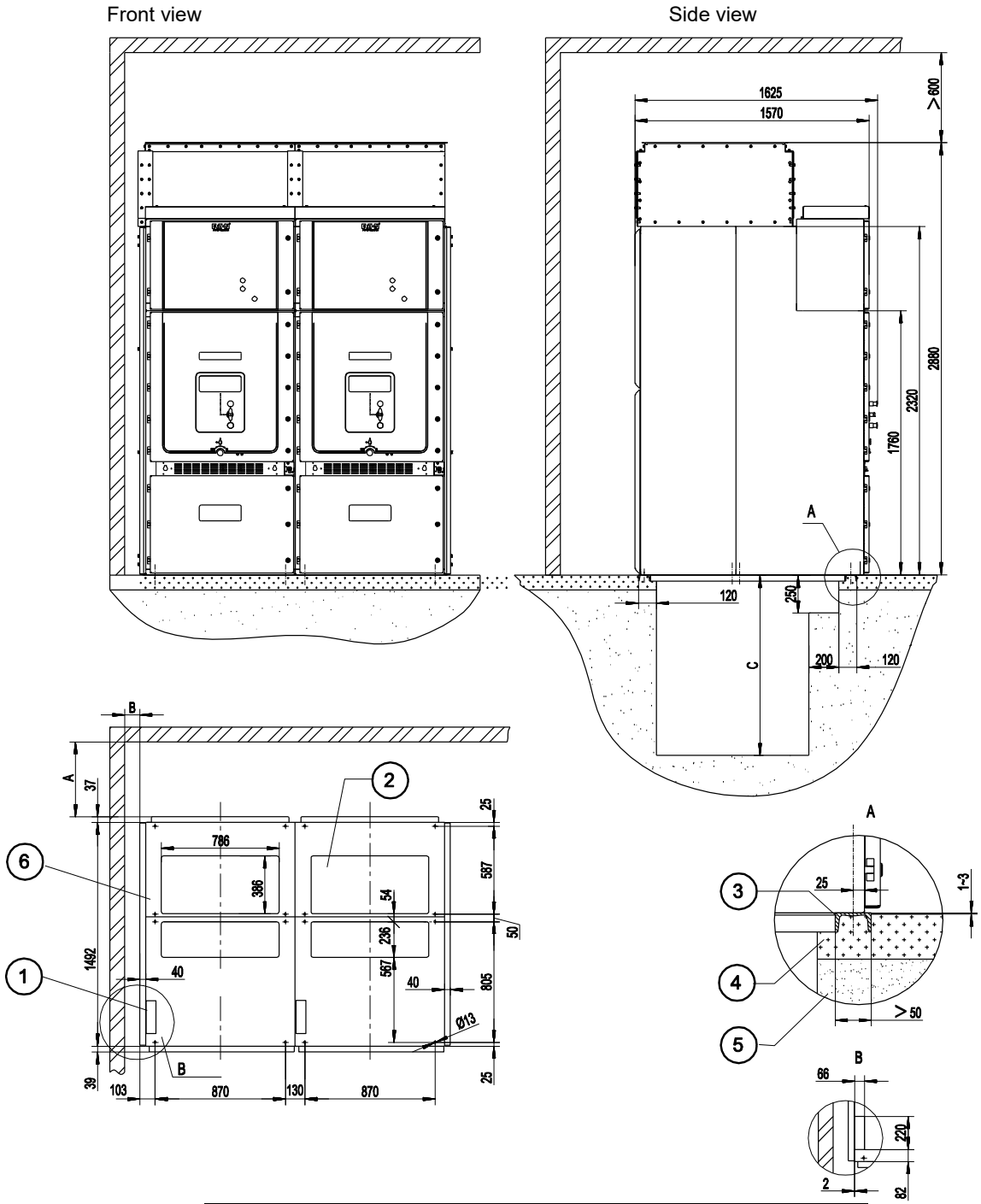
1. LV Control cable entry
2. Main cable entry
3. C Channel steel
4. Second pouring of the concrete
5. First pouring of the concrete
6. Foundation



Dimension	Front and rear access	Front acces
Dim A	Min. 800	Min. 500 recommended
Dim B	Min. 100	Min. 100
Dim C	Depends on cable bend radius	
* Optional	Centre mounting is optional	

Fig. 9-5 Basic floor plan for bottom cable entry panel rating 24kV 800/1250A 20/25kA

1. LV Control cable entry
2. Main cable entry
3. C Channel steel
4. Second pouring of the concrete
5. First pouring of the concrete
6. Foundation



Dimension	Front and rear access	Front acces
Dim A	Min. 800	Min. 500 recommended
Dim B	Min. 100	Min. 100
Dim C	Depends on cable bend radius	
* Optional	Centre mounting is optional	

Fig. 9-6 Basic floor plan for bottom cable entry panel rating 24kV 2000/2500A 25kA

1. LV Control cable entry
2. Main cable entry
3. C Channel steel
4. Second pouring of the concrete
5. First pouring of the concrete
6. Foundation

Eaton's Electrical Sector is a global leader in power distribution, power quality, control and automation, and monitoring products. When combined with Eaton's full-scale engineering services, these products provide customer-driven PowerChain™ solutions to serve the power system needs of the data center, industrial, institutional, public sector, utility, commercial, residential, IT, mission critical, alternative energy and OEM markets worldwide.

PowerChain solutions help enterprises achieve sustainable and competitive advantages through proactive management of the power system as a strategic, integrated asset throughout its life cycle, resulting in enhanced safety, greater reliability and energy efficiency. For more information, visit www.eaton.com/electrical.

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