Set Series

PIX STANDARD

Medium Voltage Distribution 12-17-24 kV
Air-insulated Switchgear with Vacuum Switching Devices

Installation Manual

GEX2564100SWE-00(NORDICS)

03/2025

www.se.com

Legal Information

The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

The Schneider Electric brand and any trademarks of Schneider Electric SE and its subsidiaries referred to in this document are the property of Schneider Electric SE or its subsidiaries. All other brands may be trademarks of their respective owner.

Schneider Electric does not grant any right or license for commercial use of the document or its content, except for a non-exclusive and personal license to consult it on an "as is" basis.

Schneider Electric reserves the right to make changes or updates with respect to or in the content of this document or the format thereof, at any time without notice.

To the extent permitted by applicable law, no responsibility or liability is assumed by Schneider Electric and its subsidiaries for any errors or omissions in the informational content of this document, as well as any non-intended use or misuse of the content thereof.

Set Series

Featuring outstanding medium-voltage (MV) and low-voltage (LV) switchboards, motor control centers and power distribution solutions for high-performance power applications, Schneider Electric's Set Series provides optimized solutions based on high levels of safety and an optimized footprint. Built on a modular architecture and incorporating smart connected devices for maximum safety, reliability, performance and energy efficiency, the Set Series is delivered to customers directly from our Schneider Electric plants or via a global network of licensed partner panel builders, who are trained and audited to provide quality equipment and support.

Table of Contents

Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

Safety Precautions

Safety Rules

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate Personal Protective Equipment (PPE) and follow safe electrical work practices. See standards or local equivalent.
- This EvoPacT HVX Vacuum Circuit Breaker (VCB) and the PIX equipment must only be installed and serviced by qualified electrical personnel.
- Perform work only after reading and understanding all of the instructions contained in this guide.
- Turn off all the power sources before working on or inside the equipment.
- Turn off or trip the VCB and discharge the mechanism.
- Always use a properly calibrated voltage sensing device to confirm power is off.
- Use only Schneider Electric specific tools (operating crank, extraction table, and so on).
- Check all devices, covers, and doors are in correct position before turning on the power.
- Beware of potential hazards and carefully inspect the work area for tools and objects that may have been left inside the equipment.
- Do not modify the mechanical or electrical parts.
- Do not bypass the interlocks before operation.
- Do not operate with protective barriers removed.

Failure to follow these instructions will result in death or serious injury.

NOTICE

HAZARD OF INAPPROPRIATE HANDLING OR STORAGE CONDITIONS

- Comply with the handling rules and avoid causing any shocks to the device.
- If the equipment is stored before its final installation, observe the storage conditions.

Failure to follow these instructions can result in equipment damage.

Cleaning Instructions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not use solvents or alcohol for cleaning the equipment.
- Do not use high-pressure cleaner for cleaning the equipment.

Failure to follow these instructions will result in death or serious injury.

About the Document

Intended Use

This Installation Manual describes air-insulated medium-voltage switchgear units of the series PIX Sweden.

It is exclusively intended for use by the manufacturer's staff or by persons certified for the PIX series (training certificate).

Read instructions before operating, servicing, or doing maintenance of the equipment.

This Installation Manual is an integral part of the product and should be stored so that it is readily accessible at all times for and can be used by persons who are to work on the switchgear. If the switchgear is relocated to another site, this Installation Manual must be passed on to the new operators along with the unit.

As our products are subject to continuous development; we reserve the right to make changes regarding the standards, illustrations and technical data described in this Installation Manual.

This Installation Manual cannot describe every imaginable individual case or every customer-specific version of the product. For information which is not included in this manual, contact the manufacturer.

All dimensional data in this manual is in millimetres.

Related Documents

The following additional documents must be complied with:

- Purchase agreement with the stipulations regarding the switchgear-specific equipment and the legal details
- The appropriate switchgear-specific circuit diagrams/documentation
- The operating manuals of the low-voltage devices installed in the switchgear (for example, voltage presence detecting systems and devices in low-voltage cabinet)
- The assembly drawings supplied with the equipment
- The assembly instructions of the manufacturer of the cable connection systems to be connected to the switchgear
- The operating instructions of the trucks being used

Title of Document	Reference Number
EvoPact HVX Vacuum Circuit Breaker 12–24 kV, Ir ≤ 2500 A	AGS531301-01
Metering Truck EvoPact MTX and Disconnector Truck EvoPact UTX up to 24 kV	AGS 531361-01
Vacuum Contactor CVX	NTV 133
Voltage Transformer Truck in Cable Compartment (can be Racked Out)	AGS 531505-02
PIX Additional Equipment	AMTNoT 077-02
Motor Control Center with Ur ≤ 7.2 kV	AGS 531500-02

Safety Provisions

Read the following instructions carefully before you work on the switchgear, and perform the work detailed in them as described. Do not perform any work which is not described in this guide.

Applicable Standards and Regulations

- IEC 62271-1: Common regulations for high-voltage switchgear and controlgear
- IEC 61936-1/HD 637 S1
- EN 50110-1: Operation of electrical equipment
- The locally applicable standards and regulations related to accident prevention, operating and work instructions. These national standards must be compliant with the above international standards

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before starting work on the earthing and testing trolley/cubicle, de-energize the system, verify it for zero voltage and earth the system according to the applicable safety rules pursuant to EN50110-1.
- After removal of covers, isolate the appropriate part of the switchgear unit from the power supply, for the operator safety in accordance to IEC 62271-200.
- Before performing work on the drive mechanism, switch off the supply voltage and prevent it from reclosing.
- Before starting work, release the energy-storing device by: an OFF–ON–OFF operating sequence for the circuit breaker and a closing via the make-proof earthing switch.

Failure to follow these instructions will result in death or serious injury.

Design and Description

Panel Design

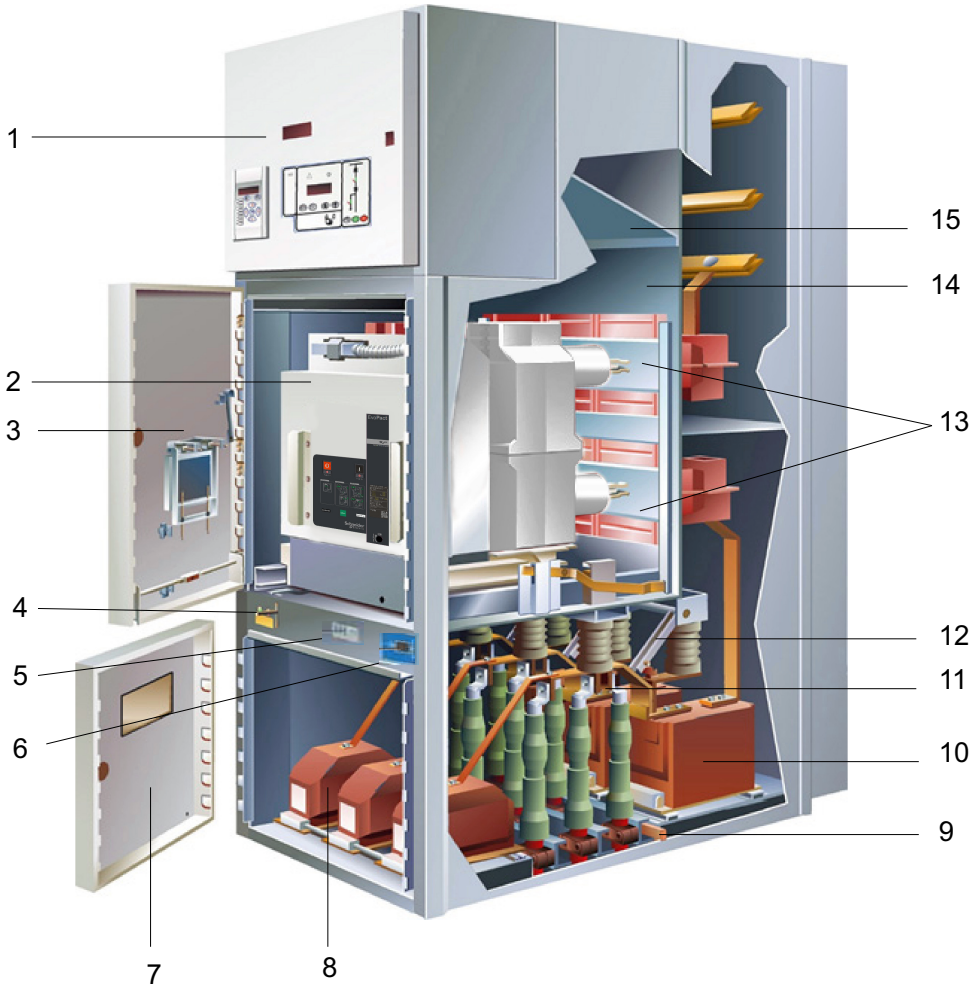


Figure 1
Feeder panel PIX 12 with circuit breaker truck EvoPact HVX (for rated currents ≤ 2500 A)

1	Low-voltage compartment	9	Earth bar
2	Circuit breaker truck EvoPact HVX	10	Current transformer
3	Front door	11	Cable connections
4	Earthing switch control element	12	Earthing Switch
5	Voltage indicator	13	Shutter
6	Position indicator of earthing switch	14	Busbars
7	Cable compartment cover	15	Pressure relief flap of switching device compartment
8	Voltage transformer (optional)		

NOTE: Image is for representation purpose. Actual color of component/ product may differ from document.

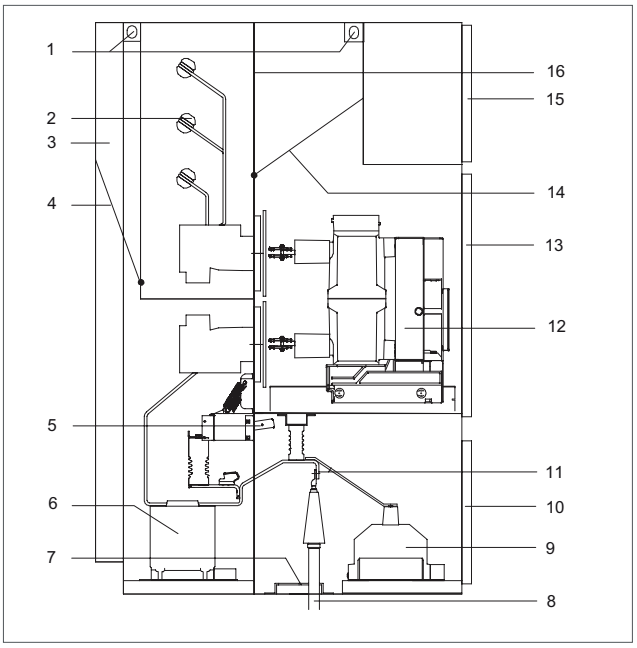


Figure 2
Feeder panel with circuit breaker truck EvoPact HVX (for rated currents ≤ 2500 A)

1	Jack rings for transport harness	9	Voltage transformer (optional)
2	Busbars	10	Cable compartment cover
3	Pressure relief duct	11	Cable connection
4	Pressure relief flap of cable compartment	12	Circuit breaker truck EvoPact HVX
5	Earthing switch	13	Front door
6	Current transformer	14	Pressure relief flap of switching device compartment
7	Cable fastening	15	Door of low-voltage compartment
8	High-voltage cable	16	Pressure relief flap of busbar compartment

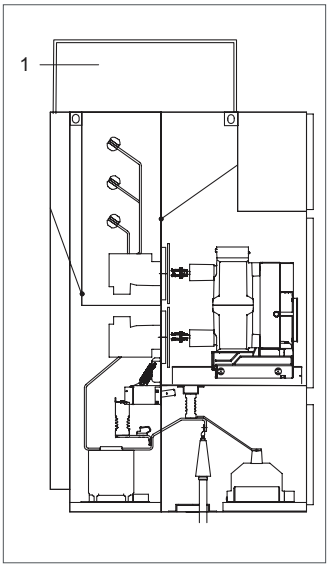


Figure 3
Panel with Internal Arc Classification (IAC)

1	Pressure relief duct

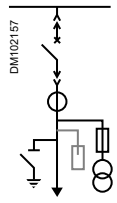
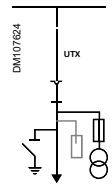
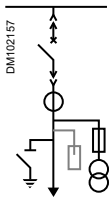
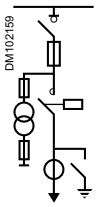
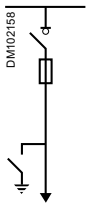
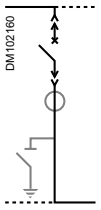
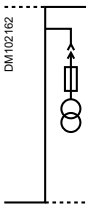
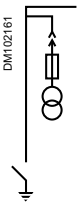
Panel Variants

The sub-chapters always show panel types with the appropriate basic equipment. Customized models with additional equipment are described in the switchgear-specific documentation.

Functional Overview

PIX has a comprehensive range of functions to suit all requirements for many applications.

The table below can be used to link requirements to functional units and gives basic information on the general composition of each unit.

Panel Architecture	**Feeder**					**Bus coupler**	**Bus riser**	**Busbar metering & busbar earthing**	
Application	**Line transformer generator**	**Line**	**Line transformer motor capacitor**	**Motor capacitor**	**Auxiliary transformer**	**Bus section coupler**	**Bus section riser**	**Voltage transformer**	**Earthing switch**
Main device	Circuit breaker	Disconnector or fix copper bar	Circuit breaker	Contactor with fuse	Load break switch with fuse	Circuit breaker	Voltage transformer, disconnector or fix copper bar	Voltage transformer	Earthing switch
Type of device	EvoPact HVX	EvoPact UTX	EvoPact HVX	CVX	LTRI	EvoPact HVX	EvoPact MTX, UTX or copper bar	EvoPact MTX	Earthing switch
Panel function	Incomer	Direct incomer	Feeder			Bus sectioning		bb voltage metering	Busbar earthing
Panel name, code	**F**	**F**	**F**	**FC (PIX-M)**	**FS**	**BSC**	**BSR**	**BME**	
Single line diagram									

Feeder Panels with Switching Devices

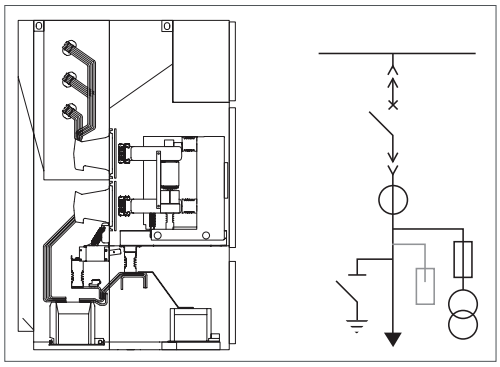


Figure 4
Feeder panel with circuit breaker truck EvoPact HVX for rated currents > 2500 A and voltage transformer (optional)

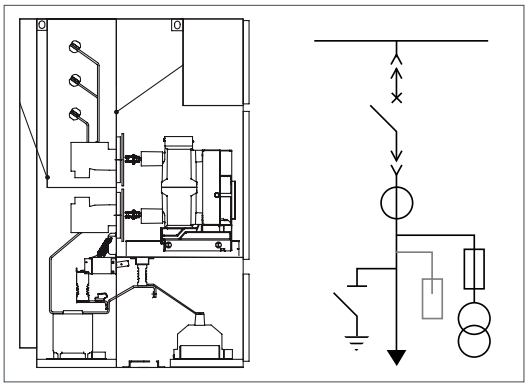


Figure 5
Feeder panel with circuit breaker truck EvoPact HVX for rated currents ≤ 2500 A and voltage transformer (optional)

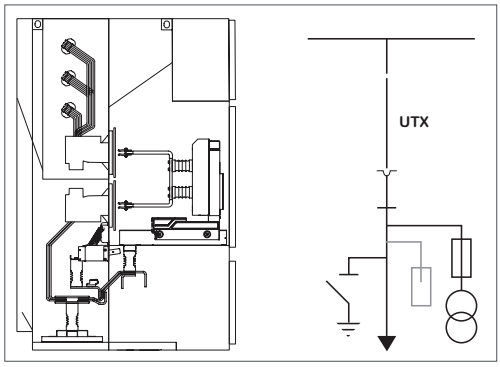


Figure 6
Panel with disconnector truck EvoPact UTX

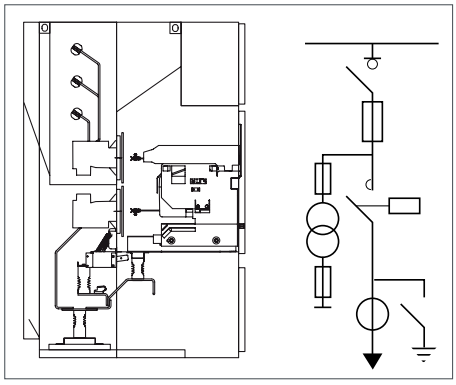


Figure 7
Motor Control Center panel with vacuum contactor CVX (only 12 kV)

Panels for Bus Section

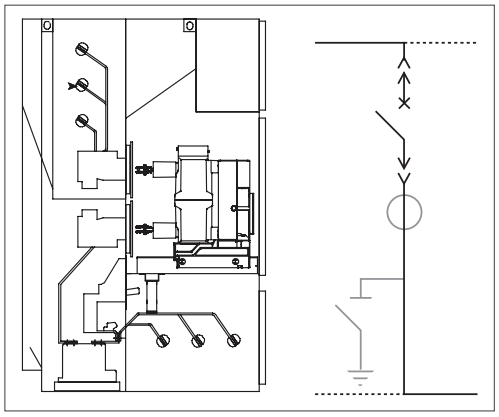


Figure 8
Bus section coupler **Circuit breaker panel with earthing switch**

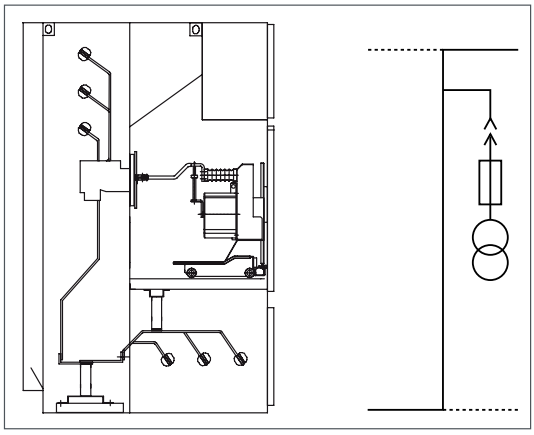


Figure 9
Bus section coupler **Bus riser panel with metering truck EvoPact MTX**

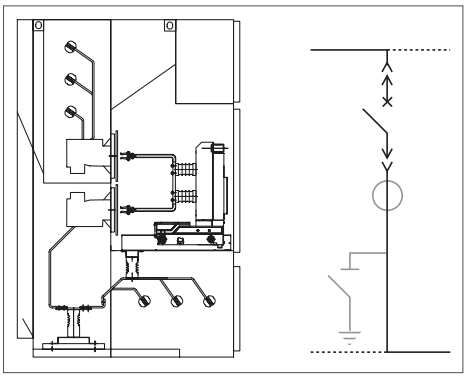


Figure 10
Bus section coupler **Bus riser panel with disconnector truck EvoPact UTX**

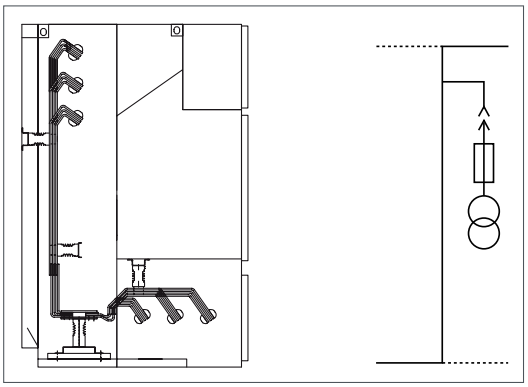


Figure 11
Bus section coupler **Bus riser panel**

Panels with Busbar Voltage Transformer and Earthing Switch

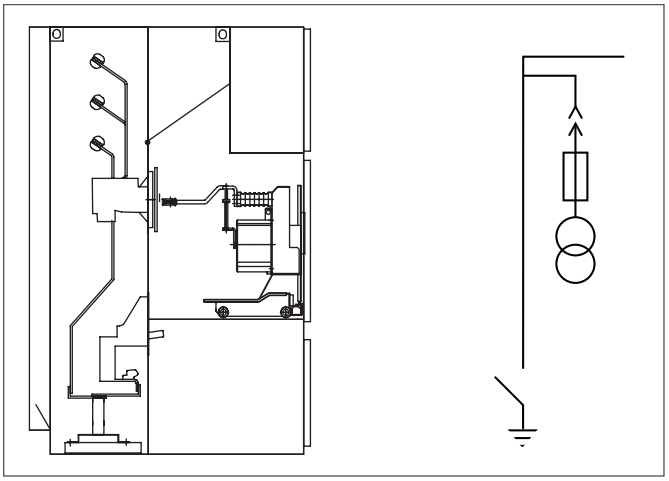


Figure 12
Metering panel with metering truck and busbar earthing switch

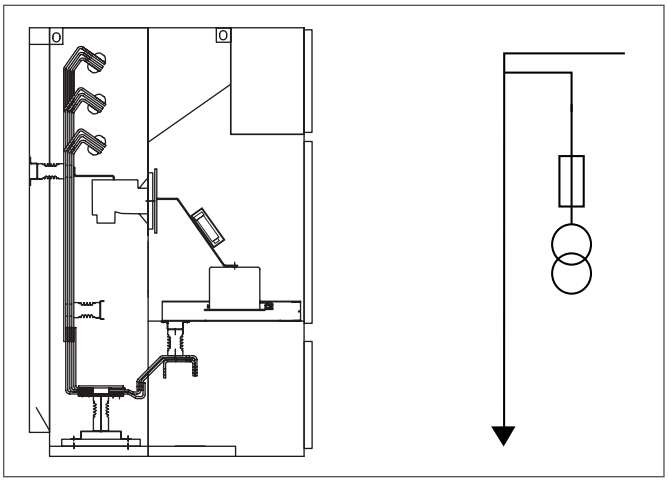


Figure 13
Bus riser panel, optionally available with fixed voltage transformer

Dimensions and Weights (Without Packaging)

For the precise panel dimensions, refer to the switchgear-specific documentation. These depend on:

- the rated voltage
- the rated normal current
- the rated short-time current and
- additional equipment:
  - busbar or fan attachments
  - rear high voltage cable connection

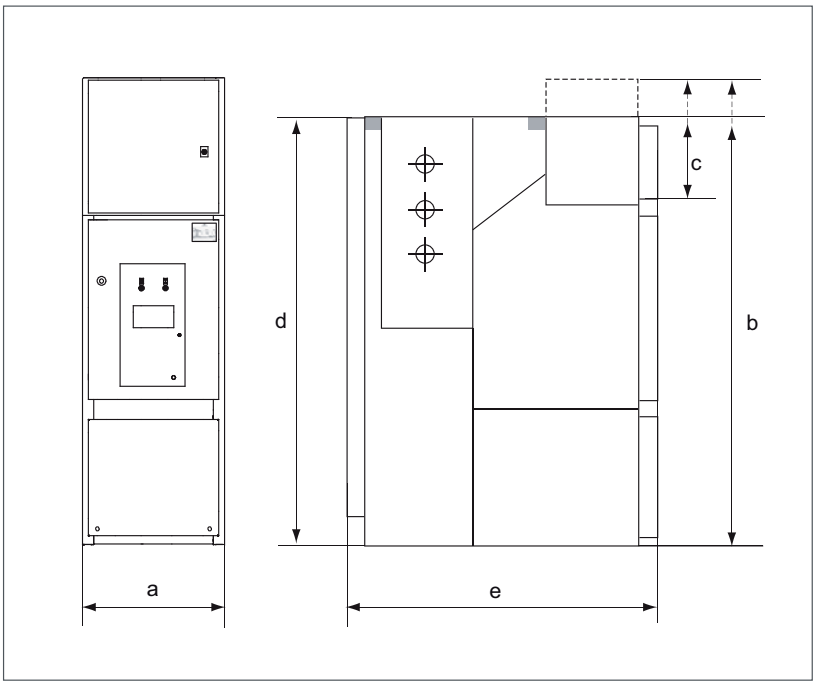


Figure 14
Dimensions of PIX panels

a Panel width

b Panel height (depending on height of low-voltage compartment)

c Height of low-voltage compartment

d Panel height without low-voltage compartment and attachments

e Panel depth

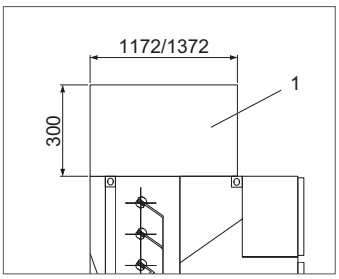


Figure 15
Dimensions of pressure relief duct

1 Pressure relief duct

PIX 12

F type characteristics		PIX 12						
Rated voltage	Ur	12 kV						
Rated short circuit breaking current	Isc	25–31.5 kA						
Rated short time withstand circuit	Ip@ 50 Hz	63–100 kA						
	Ip@ 60 Hz	65–104 kA						
Rated duration of short circuit	tk	3 s						
Rated current busbar, max	Ir bb	up to 3150 A(1)						
	Rated current circuit breaker	Ir	630 A	1250 A	1600 A	2000 A	2500 A	3150 A(1)
Dimensions	H	2130 mm						
	D	1605 mm(2)						
	W	650 mm/800 mm(3)		800 mm/1000 mm(3)		1000 mm		
Approximate mass		820 kg		850 kg		870 kg		

(1) Higher ratings for forced cooling can be provided on request.

(2) 2 set of CT or 31.5 kA.

(3) Wider panel on request.

PIX 17

F type characteristics		PIX 17						
Rated voltage	Ur	17.5 kV						
Rated short circuit breaking current	Isc	25–31.5 kA						
Rated short time withstand circuit	Ip@ 50 Hz	63–100 kA						
	Ip@ 60 Hz	65–104 kA						
Rated duration of short circuit	tk	3 s						
Rated current busbar, max	Ir bb	up to 3150 A(1)						
	Rated current circuit breaker	Ir	630 A	1250 A	1600 A	2000 A	2500 A	3150 A(1)
Dimensions	H	2200 mm						
	D	1605 mm						
	W	750 mm/1000 mm(2)				1000 mm		
Approximate mass		850 kg				870 kg		

(1) Higher ratings for forced cooling can be provided on request.

(2) Wider panel on request.

PIX 24

F type characteristics		PIX 24						
Rated voltage	Ur	24 kV						
Rated short circuit breaking current	Isc	25–31.5 kA						
Rated short time withstand circuit	Ip@ 50 Hz	63–80 kA						
	Ip@ 60 Hz	65–82 kA						
Rated duration of short circuit	tk	3 s						
Rated current busbar, max	Ir bb	up to 2500 A(1)						
		Rated current circuit breaker	Ir	630 A	1250 A	1600 A	2000 A	2500 A(1)
Dimensions	H	2330 mm						
	D	1605 mm/1805 mm(2)						
	W	800 mm/1000 mm(3)				1000 mm		
Approximate mass		850 kg				870 kg		

(1) Higher ratings for forced cooling can be provided on request.

(2) 2 set of CT.

(3) Wider panel on request.

Applied Standards

Series PIX switchgear units with vacuum switching devices are:

- metal-enclosed; loss of service continuity category accordance IEC 62271-200: 2011 LSC 2B-PM
- type-tested
- optional: tested for internal faults (qualification IAC)
- dimensioned for indoor installation.

The PIX switchgear units meet the following standards and regulations:

Designation	IEC/EN-Standard
Switchgear	IEC 62271-200: 2011 IEC 62271-1: 2017
Internal arc classification (IAC)	IEC 62271-200: 2011
Circuit breaker	IEC 62271-100: 2017
Vacuum contactor	IEC 60470
Earthing switch	IEC 62271-102: 2018
Disconnector truck	IEC 62271-102: 2018
Current transformer	IEC 61869-2: 2012
Voltage transformer	IEC 61869-3: 2011
Voltage presence Indicating systems (VPIS)	IEC 62271-206: 2011
Voltage detection indication system (VDIS)	IEC 62271-213: 2021
Protection against accidental contact, foreign bodies and water	IEC 62271-200: 2011 IEC 60529: 2013

Designation	IEC/EN-Standard
Installation	IEC 61936-1
Operation of electrical equipment	EN 50110-1
High-voltage fuse link	IEC 60644: 2009 IEC 60282-1: 2009

Degrees of protection against accidental contact and foreign objects

Degrees of protection against accidental contact and foreign objects according to IEC 60529: 2013	
External enclosure of panel	IP3X(1)
Between the compartments of the panel	IP2X
(1) Optional IP4X; other values available on request.	

Environmental and Operating Conditions

PIX is an indoor switchgear and may only be operated under normal conditions in accordance with IEC 62271-1: 2017.

Operation under conditions deviating from these is only admissible subject to consultation with and written approval from the manufacturer.

Ambient conditions in accordance with IEC 62271-1: 2017	
Temperature class	-5 °C Indoors(1)
Ambient temperature minimum/maximum	-5 °C/+40 °C(1)
Average value over 24 hours	≤ 35 °C
Mean relative air humidity: 24 hours/1 month	≤ 95%/≤ 90%
Installation altitude above sea-level	≤1000 m
(1) Higher values available on request.	

Ratings of the PIX Series

Switchgear Panel		**PIX 12**	**PIX 17**	**PIX 24**
Rated voltage U_r		12 kV	17.5 kV	24 kV
Rated lightning impulse withstand voltage U_p		75 kV	95 kV	125 kV
Rated power frequency withstand voltage U_d		28 kV	38 kV	50 kV
Rated normal current I_r	Busbar	≤ 3150 A(1)		≤ 2500 A(1)
	Circuit breaker			
	Vacuum contactor	200-400 A	—	
Rated peak withstand current I_p(2)		≤ 100 kA		≤ 80 kA
Rated short-time current I_k(2)		≤ 31.5 kA		
Rated frequency f_r		50/60 Hz		
(1) Higher ratings for forced cooling can be provided on request.				
(2) The short-circuit capability of the current transformers must be considered separately.				

The applicable panel-specific technical data are indicated on the nameplate (see Nameplate, page 18) and in the switchgear-specific documentation.

The technical data of the switching device (EvoPact HVX, UTX) are indicated on the nameplate and in the operating manual of the device concerned.

Nameplate

The type designation on the nameplates on the front of the panels (see Figure 16) informs about essential technical data. When submitting enquiries to the manufacturer or ordering spare parts, the following information is required:

- Type designation
- Serial number
- Year of construction

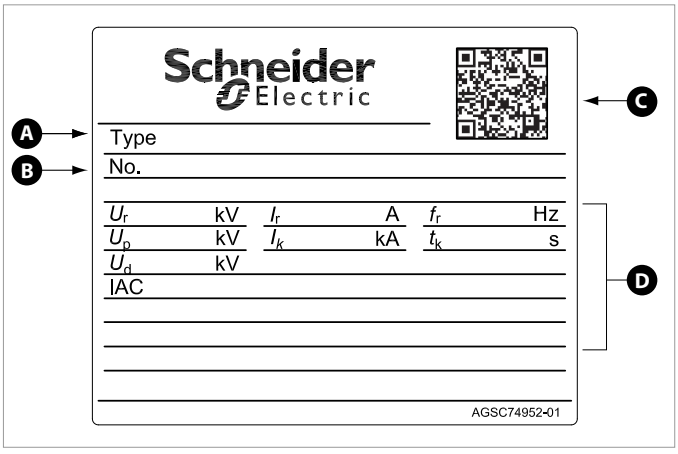


Figure 16
Nameplate on panel front

A Type designation

B Serial number

C Year of construction

D Technical data

Technical Data of Electrical Control and Operating Devices

The switchgear panels have been designed on principle so as to permit manual operation.

The drive mechanisms of the individual switching devices can be equipped, depending on the specific customer‘s model, with additional electrical control and operating devices. These are defined in the switchgear-specific circuit diagram (see switchgear documentation).

Component fitting options:

- Motor-operated drive mechanism for the earthing switch control element
- Blocking coil

  The blocking coil helps to prevent manual actuation of the earthing switch. If the supply voltage has failed or is shut off, all blocking coils are in **blocked** position.
- Auxiliary switches

  Auxiliary switches are always actuated directly by the truck or by the switch shaft via an intermediate linkage. Their position always corresponds to that of the main contacts. The switching functions have been set in the factory according to the circuit diagram.
- Micro-switches are used depending on the customized panel models.

Overview of rated supply voltages

	Overview of rated supply voltages					
Direct voltage DC	24 V	48 V	60 V	110 V	125 V	220 V
Alternating voltage AC	(110)/120 V			(220)/230 V		

Power consumption

Device	**Rated power consumption**	
	DC approx. [W]	**AC 50/60 Hz approx. [VA]**
Blocking coil	12	
Motor for earthing switch	150	

Information about the power consumption of solenoids and the motor is available in the related user guides, for example EvoPact HVX and CVX.

Trucks

Electrical control and operating devices of trucks are described in the appropriate Technical Manuals (see Reference documents)

- Circuit breaker EvoPact HVX with 12–24 kV, Ir ≤ 2500 A see *Technical Instruction AGS 531301-01*
- Disconnector truck EvoPact UTX/Metering truck EvoPact MTX up to 24 kV see *Technical Instruction AGS 531361-01*
- Vacuum contactor CVX see *Technical Instruction NTV 133*

Utilization in Line with the Intended Purpose

PIX series air-insulated medium-voltage switchgear units are designed exclusively for switching and distributing electrical power. They may only be used in the scope of the specified standards and the switchgear-specific technical data. Any other utilization constitutes improper use and may result in dangers or damage of equipment.

⚠WARNING

HAZARD OF INCORRECT ASSEMBLY, USE AND OPERATION

- Only use the PIX series air-insulated medium-voltage switchgear units in the scope of the specified standards and the switchgear-specific technical data.
- Operate the PIX series air-insulated medium-voltage switchgear unit according to its intended use.
- Assemble, connect or operate the PIX series air-insulated medium-voltage switchgear unit properly.
- Use accessories or spare parts which have been approved by the manufacturer.
- Do not convert the switchgear or attach inadmissible parts without the manufacturer's approval.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Disposal After the End of the Useful Life

A material and recycling data sheet can be provided on request for the disposal of series PIX switchgear at the end of its service life.

Disposal is performed as a service by the manufacturer's Service Center which to payment.

Packaging, Transport, Delivery and Storage

Shipping Units

- The conditions and types of transport have been stipulated in the contract details.
- The type of packaging depends on the type of transport and the storage conditions.
- The panels are delivered individually and are fastened on pallets. The standard accessories are included.
- In the case of panels with a width of 650, 750 and 800 mm, the trucks can be delivered within the panels. They are in **disconnected** position. With 1000 mm wide panels, the trucks are delivered in separate packaging.
- The panels are delivered in vertical position.
- The weight of the entire transport unit is indicated on the packaging.

Packaging

- If packed exclusively for truck transport, the panels are delivered on a pallet with PE protective film (Figure 17).
- For sea transport, the units are packed in sealed aluminium foil with desiccant and in a closed wooden case with tightly closed wooden base (also for container transport, see Figure 18).
- In case of air transport, the panels are packed in wooden crates with a protective PE film hood (dust protection) or in wooden crates, also with closed wooden bases, however without protective hoods (Figure 18).

When transporting the switchgear panels, check that the transport units do not shift or tilt over (nail the transport pallet to the loading bed if necessary). Observe the centre of gravity label (see Figure 18) to help ensure safe transport. You can find the label on the packaging or on the switchgear panel.

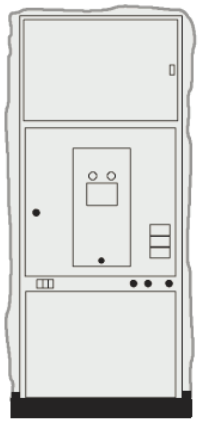


Figure 17
Packaging in PE protective film, on a pallet

Figure 18
Centre of gravity information on the transport unit (wooden crate for export packaging)

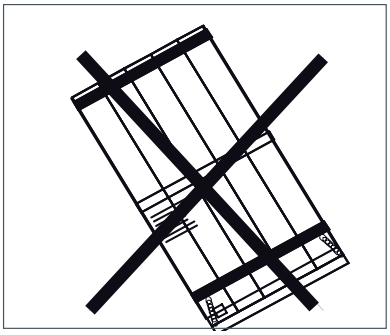
Transport

⚠WARNING

HAZARD OF TOPPLING

- When transporting the switchgear, ensure that the units do not tilt or tip.
- Secure the transport pallets to the loading surface with nails.
- When transporting the trucks, comply with the transport specifications outlined in the appropriate manuals.

Failure to follow these instructions can result in death, serious injury, or equipment damage.



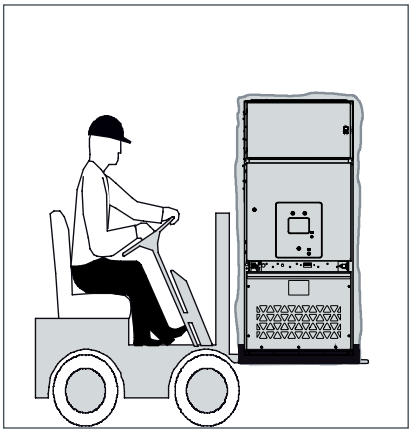
Transport with Forklift Truck

⚠CAUTION

HAZARD OF DEVICE FALLING

- For transport, the panels must be packaged completely.
- The entire length of the forks must be placed under the transport unit.

Failure to follow these instructions can result in injury or equipment damage.



Transport with circuit breaker in the switchgear panel (for 650, 750 and 800 mm panel width)

Delivery takes place in the position:

- Circuit breaker in the test position
- Earthing switch ON

Figure 21
Transport with circuit breaker in the switchgear panel

Transport with circuit breaker outside the switchgear panel (for 1000 mm panel width)

Figure 22
Transport with circuit breaker outside the switchgear panel

Delivery

NOTICE
HAZARD OF INADEQUATE HANDLING Handle shipping units carefully when unloading and unpacking them. **Failure to follow these instructions can result in equipment damage.**

Shipping units must be checked upon receipt. Any damage which may have occurred in transit must be recorded and reported to the manufacturer immediately.

Check completeness of consignment based on the transport documents.

The supplier must be notified in writing without delay about any deviations.

Storage

⚠WARNING
HAZARD OF INCORRECT STORAGE Sufficient stability and evenness of the supporting area must be ensured. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

If the panels are not installed immediately after delivery, they can be stored under the following conditions:

- Panels should be stored in vertical positions and should not be stacked.
- Indoor storage only is admissible.
- Switchgear and accessories should be stored sealed with desiccants in aluminum foil and packed in a wooden box (the storing time before installation is compliant with the warranty period in the terms and conditions).
- Pallet should not be removed until the installation.
- Storage only in packed condition. Performance will not be guaranteed if stored in open condition.
- The storage room environment should be healthy, no rodents, humidity control ≤95%/≤90% for 24 hrs and 1 month respectively, and no water on the floor.

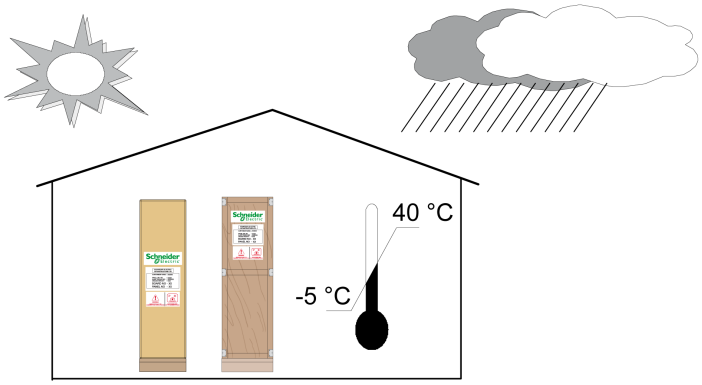


Figure 23
Schematic diagram of the storage conditions for PIX panels

Access to the Main Circuit Compartments

Safety Provisions

After removal of covers, isolate the appropriate part of the switchgear unit from the power supply, for the operator safety in accordance to IEC 62271-200.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before opening, removing doors or covers, isolate the compartment in question.
- Check for zero voltage and earth in accordance with the safety provisions in EN 50110-1.

Failure to follow these instructions will result in death or serious injury.

Access to the Cable Compartment

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Open the cable compartment only if the earthing switch is ON. Refer to *Operation — Switching ON the Earthing Switch* in User Manual.

Failure to follow these instructions will result in death or serious injury.

The panels can be equipped with supplementary cylinder locks to lock the cable compartment cover. Refer to *Operation — Interlocks* in User Manual.

Removing the Cable Compartment Cover

Follow the below steps to remove the cable compartment cover:

1. Release the securing bolts of the cable compartment cover as shown in (Figure 24, 1).

2. Lift and remove the cable compartment cover (2).

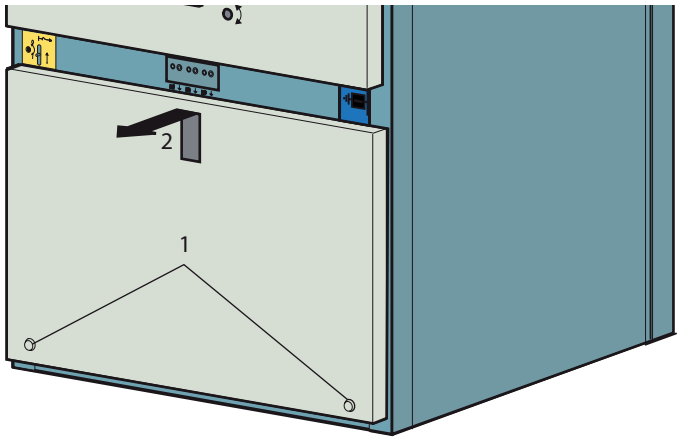
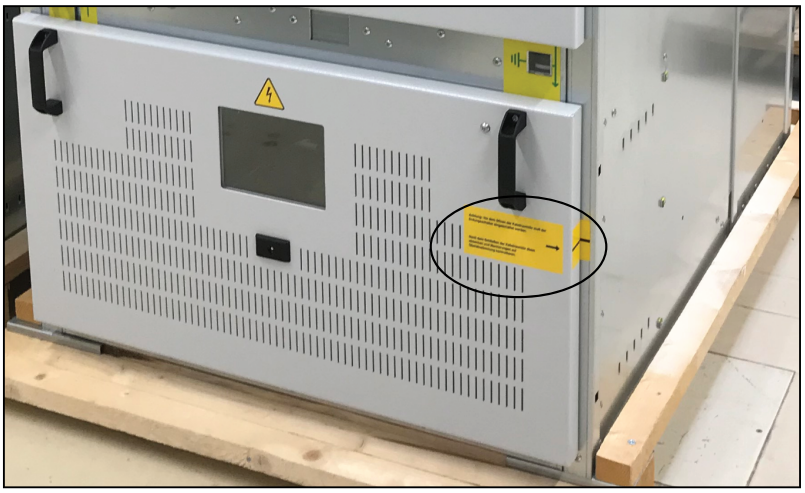


Figure 24
Transport units must not tip over

1	Securing bolts
2	Compartment cover

Re-mounting the Cable Compartment Cover

After terminating assembly work, place cable compartment cover onto the panel and lower it till the arrow sticker of cable matches with the arrow sticker of panel.



Removal of the Bottom Plate of Circuit Breaker Compartment

The bottom plate of the circuit breaker compartment can be removed as required. For example, for maintenance work refer *Maintenance* in User Manual or for access to the busbar compartment, (see Front Access, page 33).

Follow the below steps to remove bottom plate of circuit breaker compartment:

1. Remove truck from the panel (see Access to Switching Device Compartment, page 28).
2. Remove insulating walls (only in case of 17 and 24 kV panels).
3. Release the three securing bolts (see Figure 26, 1) of the support (2).
4. First remove support (2) and then the four insulating walls (3).
5. Dismantle auxiliary switch block for truck (4) and deposit carefully in the cable compartment.

6. If the panel features a voltage indicator: disconnect the plug-and-socket connector of the unit (5).
7. Remove the securing bolts of the truck carrier (6).
8. First raise truck carrier on the front, then pull it out (7).

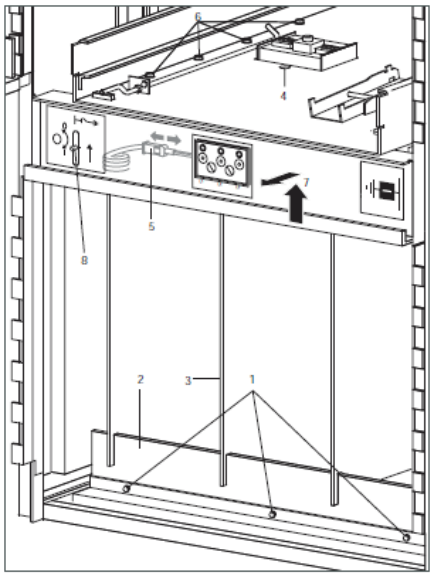


Figure 26
Removing the bottom plate of the circuit breaker compartment

1	Securing bolts of the support
2	Support (only for PIX 17 and 24)
3	Insulating walls (only for PIX 17 and 24)
4	Fastening the auxiliary switch block
5	Plug-and-socket connector of voltage indicator
6	Securing bolts of bottom plate of the circuit breaker compartment
7	Raise truck carrier on the front and pull it out
8	Slide for earthing switch actuation

Re-install bottom plate of the circuit breaker compartment

Re-install the bottom plate of the circuit breaker compartment and dismantled components by reversing the above order. When screwing the truck carrier down, check that the slide (see Figure 26, 8) to open the insertion opening for the earthing switch operates smoothly. If necessary, release bolts and reposition the truck carrier.

Access to Switching Device Compartment

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Open the switching device compartment only if the truck is in disconnected position. Refer to *Operation — Racking-out the truck from service into disconnected position* in User Manual.

Failure to follow these instructions will result in death or serious injury.

Opening and Closing the Front Door

Opening the Front Door

Follow the below steps to open the front door:

1. Insert double-bit key into the door opening and turn it to the left (Figure 27, 1).
   The door is unlocked.
2. Insert handle with the lever pointing down, and turn handle to the left (2).
   The front door is lifted.
3. To open the door, swing it to the left (3).

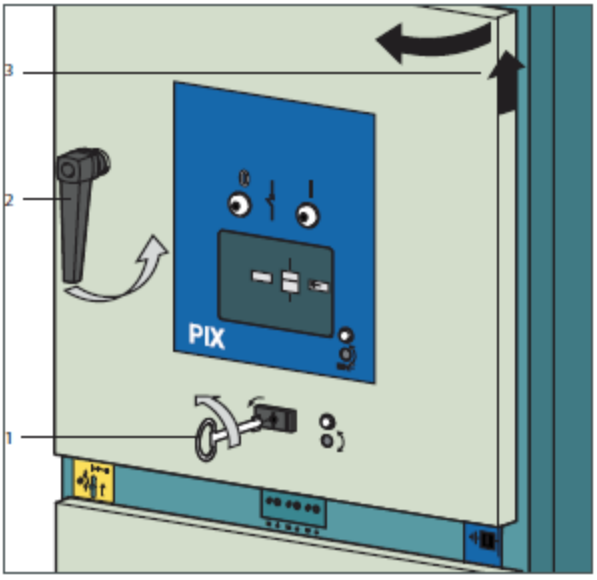


Figure 27
Opening the front door

Closing the Front Door

Follow the below steps to close the front door:

1. Close the door completely.
2. Turn the handle downwards; the door is lowered.
3. Pull door handle off and stow it in the tool tray of the trolley (see Operation Accessories, page 73).
4. Lock the door using a double-bit key

Removing the Transport Lock of the Circuit Breaker

In the case of panels with a width of 650, 750 and 800 mm, the circuit breakers can be delivered within the panels and transport locks (Figure 28) that helps to secure the circuit breaker.

Follow the below steps to remove the transport lock of the circuit breaker

1. Release the two bolts (Figure 29, 1).
2. Release lock bolts M8 x 25 (2).
3. Remove transport lock (3).
4. Reinsert the two bolts (1).

Remove transport lock on the other side following the same procedure.

Figure 28
Transport lock of circuit-breaker truck

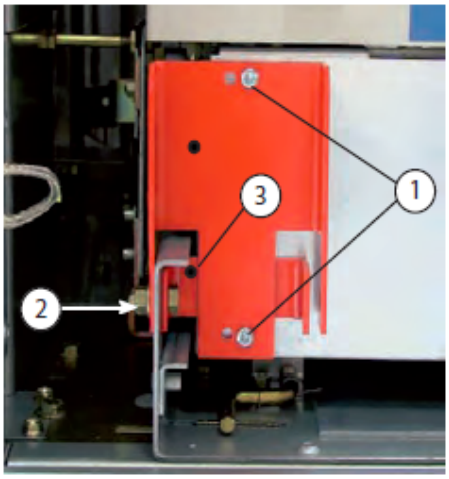


Figure 29
Remove transport lock

1	Bolts
2	Lock bolts
3	Transport lock

Removing and Connecting the Low Voltage Connector

NOTICE

HAZARD OF INCORRECT OPERATION

Remove or insert the low-voltage connector only if the truck is in disconnected position.

Failure to follow these instructions can result in equipment damage.

Removing the Low-Voltage Connector

Follow the below steps to remove the low voltage connector:

1. Pull interlocking slide of low voltage connector forward (Figure 30, 1) and remove the connector (2).
2. Stow low-voltage connector in storage tray above the circuit breaker (Figure 31).

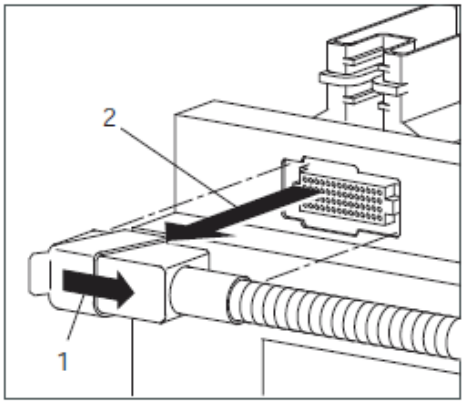


Figure 30
Removing the low-voltage connector

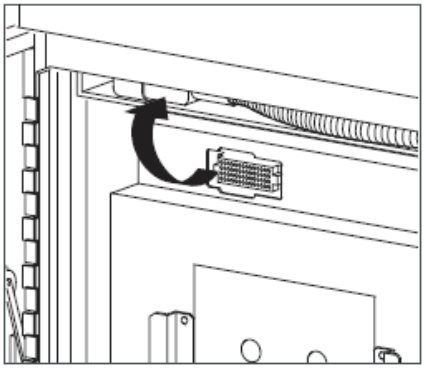


Figure 31
Place low-voltage connector in tray above the circuit breaker

Connecting the Low-Voltage Connector

Follow the below steps to connect the low voltage connector:

1. Take low-voltage connector from the storage tray above the circuit breaker (Figure 31).
2. Insert low-voltage connector into the circuit breaker and press interlocking slide forward.

Removing the Circuit Breaker from the Panel

Coupling the Transport Trolley to the Panel

Follow the below steps to couple the transport trolley to the panel:

1. Adjust rails and unlocking bar of trolley to the correct track width of the circuit breaker (see Transport Trolley for Circuit Breaker, page 73).
2. Turn lever to the left (Figure 32, 1).

   The trolley is lifted on the front.
3. Move trolley to the panel so that the lateral guides (Figure 33, 2) are close to the panel, and turn lever (1) back to the right. The trolley is locked on the panel (3).

Figure 32
Turning lever on trolley to the left

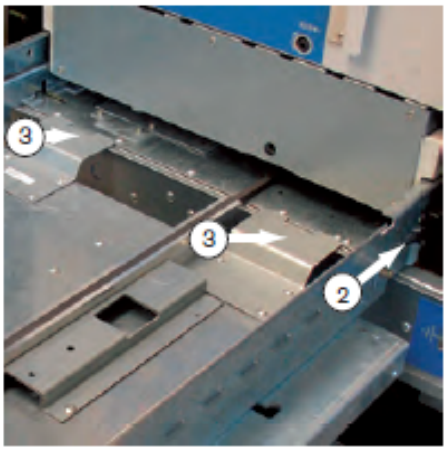


Figure 33
Locking transport trolley on panel

Remove Panel

Follow the below steps to remove the panel:

1. Push unlocking bar (Figure 34, 4) forward to its stop.

   The latching of the circuit breaker in the panel is released.
2. Pull the circuit breaker onto the trolley via the two handles (5) until it snaps in on the trolley audibly.
3. Turn lever back to the left (6).

   The trolley is lifted on the front, and removed from the panel.
4. Pull trolley with the circuit breaker away from the panel (7) and turn lever back to the right to lower it (8).

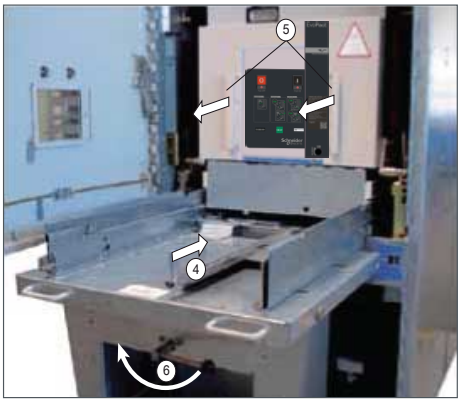


Figure 34
Pull circuit breaker onto trolley

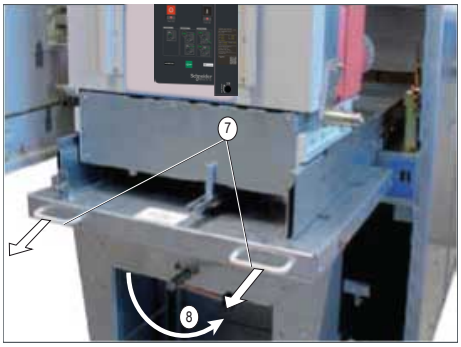


Figure 35
Pull circuit breaker onto trolley

Now the circuit breaker can be raised by means of a crane, and deposited.

For more information, see Circuit Breakers, page 42. Instructions regarding lifting and transporting trucks (EvoPact HVX, UTX, MTX and CVX).

Inserting the Circuit Breaker into the Panel

NOTICE

HAZARD OF ABNORMAL USE CONDITIONS

Circuit breakers and panels must match rating to prevent the truck from being racked completely into the panel.

Failure to follow these instructions can result in equipment damage.

Follow the below steps to insert the circuit breaker into the panel:

1. Move the circuit breaker on the trolley in front of the panel.
2. Turn the lever on the trolley clockwise to lift the transport table.
3. Move the trolley on the handles (2) with the lateral guides (3) to the panel and turn the lever to the right again.
4. Press the left release button (Figure 36, 5) and push the circuit breaker briefly over the locking lever.
5. Push the circuit breaker into the panel by means of the handles (6) until it engages in the control panel.
6. Turn the lever to the left again (7).

   The trolley is lifted at the front and released from the panel.
7. Pull the trolley away from the panel and turn the lever to the right again to lower it.

Figure 35
Move trolley with circuit breaker towards the panel until they are in contact, and lock.

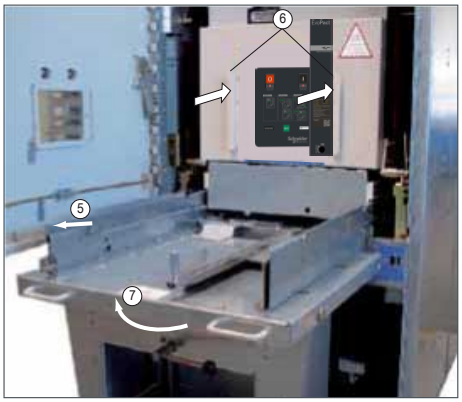


Figure 36
Pushing the circuit breaker into the panel.

Access to the Busbar Compartment

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Open the busbar compartment only if the busbar is earthed. Refer to *Operation — Earthing the busbar* in User Manual.

Failure to follow these instructions will result in death or serious injury.

Front Access

Follow the below steps to access the busbar compartment from front side:

1. Remove cable compartment cover (Figure 37, 1).
2. Open front door (see Opening and Closing the Front Door, page 28).
3. Remove circuit breaker EvoPact HVX, UTX etc. (see Removing the Circuit Breaker from the Panel, page 30).
4. Remove circuit breaker(see Access to the Cable Compartment, page 25).
5. Unscrew pressure relief flap (5) and take it out in forward direction.
6. Remove partition plate (6) to busbar compartment and take it out in forward direction.
7. Insert temporary base plate (7) to enable safe access to the cable compartment.

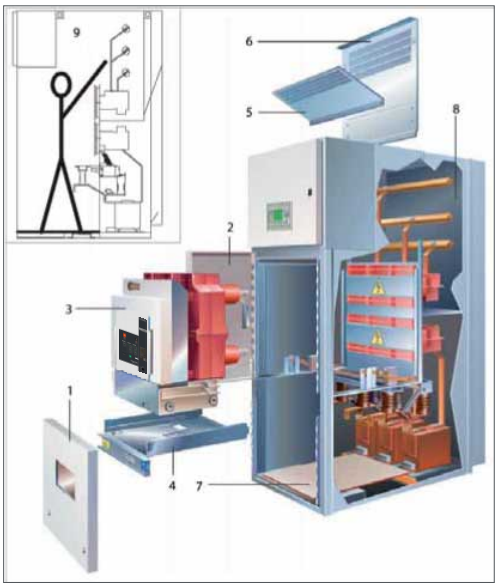


Figure 37

1 Remove cable compartment cover

2 Open front door

3 Remove circuit breaker (the example shows the circuit breaker truck EvoPact HVX)

4 Remove truck carrier

5 Unscrew pressure relief flap and take it out in forward direction

6 Remove partition plate to busbar compartment and take it out in forward direction

7 Insert temporary base plate to enable safe access to the cable compartment

8 Busbar compartment

9 Working position

Top Access

⚠WARNING

HAZARD OF FALLING

- Do not walk upon the topsides of the switchgear cubicles.
- During civil engineering activities, when working on the top of the switchgear cubicles (such as during the installation of deflectors, fans, or pressure relief ducts), temporarily attach a sturdy base plate that is walkable.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Access to the busbar is possible from the top as well (Figure 38) provided the space available so permits (sufficient ceiling height is required).

1. Cover top of panel using a temporary base plate (1).
2. Release the screw fastening of the upper busbar compartment cover (2) and remove sheet metal cover (3). Now, the busbar compartment (4) is accessible.

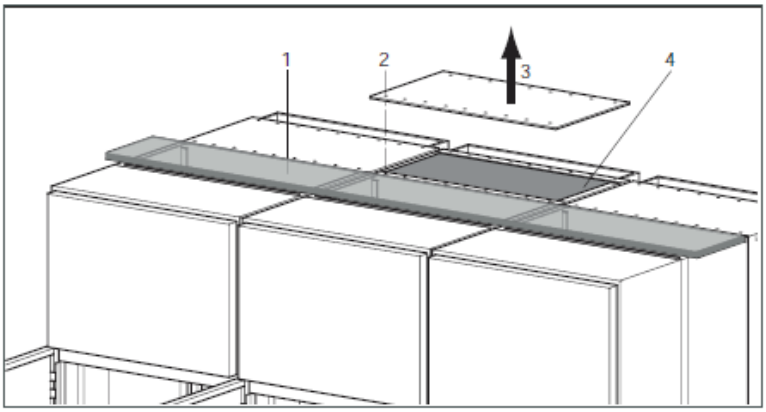


Figure 38
Top access to the busbar compartment

1 Temporary base plate

2 Screw fastening

3 Sheet metal cover

4 Busbar compartment

Assembly

Safety Provisions

The switchgear panels may only be installed and assembled by the manufacturer's staff or by persons who have been certified for this work.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

During assembly, installation and connection, the energy storing devices must not be charged.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

HAZARD OF INCORRECT OPERATION

- Watch out for floor openings in the switchgear room.
- Do not walk on the top sides of the panels. When work has to be performed on the panel top, for example for assembly of fans or pressure relief ducts, temporarily position a solid base plate to step on.
- The switchgear panels must only be installed and assembled by the manufacturer's staff or by persons who have been certified for this work.
- Observe the safety provisions, page 8.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Important Information for Assembly

PIX panels are delivered with the earthing switch ON.

In the case of panels with a width of 800 mm, the trucks can be delivered within the panels. They are in disconnected position. The circuit breakers are always shipped in open state (OFF) with the energy storing device released.

⚠CAUTION

HAZARD OF INCORRECT ASSEMBLY

- Condensation, dirt and dust during assembly must be avoided on all accounts, in order to prevent damage to the panels.
- For assembly, observe the assembly drawings supplied with the equipment.
- For all Screw Fastenings, page 72, comply with the tightening torques specified.

Failure to follow these instructions can result in injury or equipment damage.

Requirements Regarding the Switchgear Room

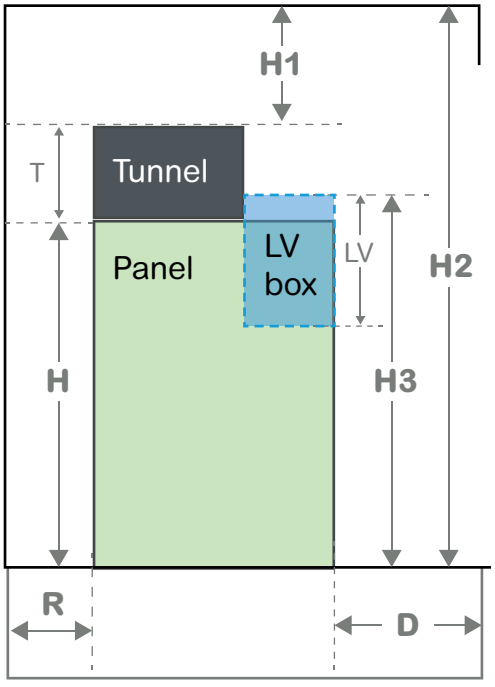
Before installing the switchgear panels:

- Refer and comply with the switchgear room measurements mentioned in the document.
- Observe the minimum distance between the switchgear and the wall of the building.
- The load-bearing capacity of the fastening areas must correspond to the weight of the switchgear (perform a stress analysis of the building).
- Check base frame (if used) for dimensions and positional tolerances.
- Check position of floor openings for high-voltage and low-voltage cables.

Before the switchgear is positioned at its site of installation, check that the fastening points are level. Unevenness must not exceed ± 2 mm/meter and 6 mm difference in height over the entire switchgear width.

NOTE: Observe switchgear-specific space assignment plan.

Pressure relief
Outside the building only
Tunnel



Basic structure panels				Pressure relief Outside the building only Tunnel		
Ur	**H (mm) (1)**	**LV (mm)**	**H3 (mm)**	**T (mm) (2)**	**H1 (mm) (3)**	**H2 (mm)**
12 kV	2130	530	2130	330	290	2750
		630	2230			
		730	2330			
17 kV	2200	600	2200	330	220	2750
		700	2300			
		800	2400			
24 kV	2330	530	2330	330	90	2750
		630	2430			
		730	2530			

H	Panel height, basic structure
LV	LV box height
H3	Basic panel including LV box height
T	Tunnel height
H1	Distance to ceiling
H2	Height of ceiling

		Tunnel
R	Distance to rear wall	>100 mm
D	Width of control aisle	1500 mm
	Panel replacement	2000 mm

(1) With standard LV cabinet 530 mm. Increased height of LV cabinet is available, without impact on the ceiling height.

(2) Height of 30mm for AVVS is considered.

(3) Minimum 90 mm.

Ground Plan of a PIX Switchgear within a Switchgear Room

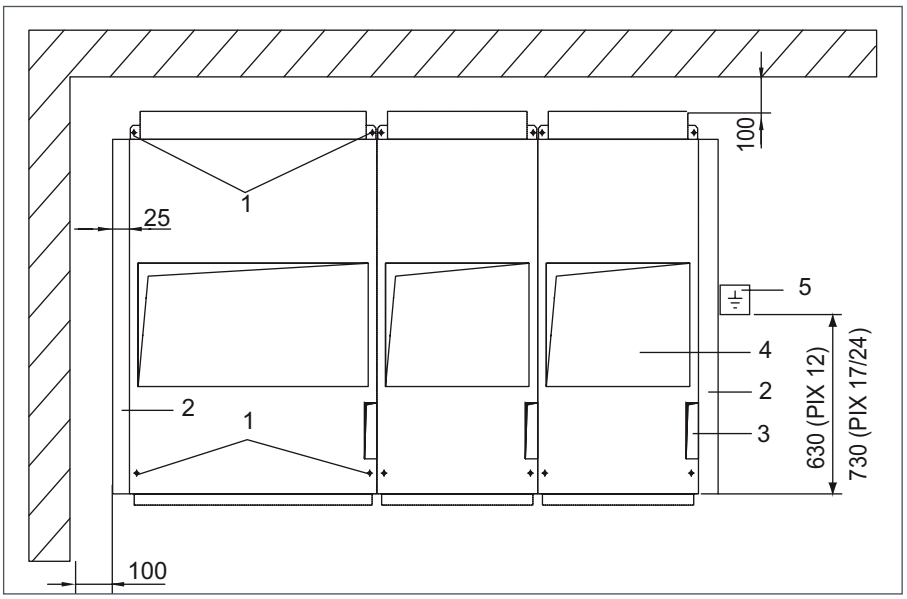


Figure 39

Design example: The switchgear is located in the left-hand corner of the room

1	Bore-hole for fastening of panel
2	Switchgear side wall
3	Openings for routing external low-voltage cables
4	Openings for routing high-voltage cables
5	Reserved (100 x 100 mm) for the connection of the earth bus of the switchgear to the building's earth cable

Ground Plan of the Panels

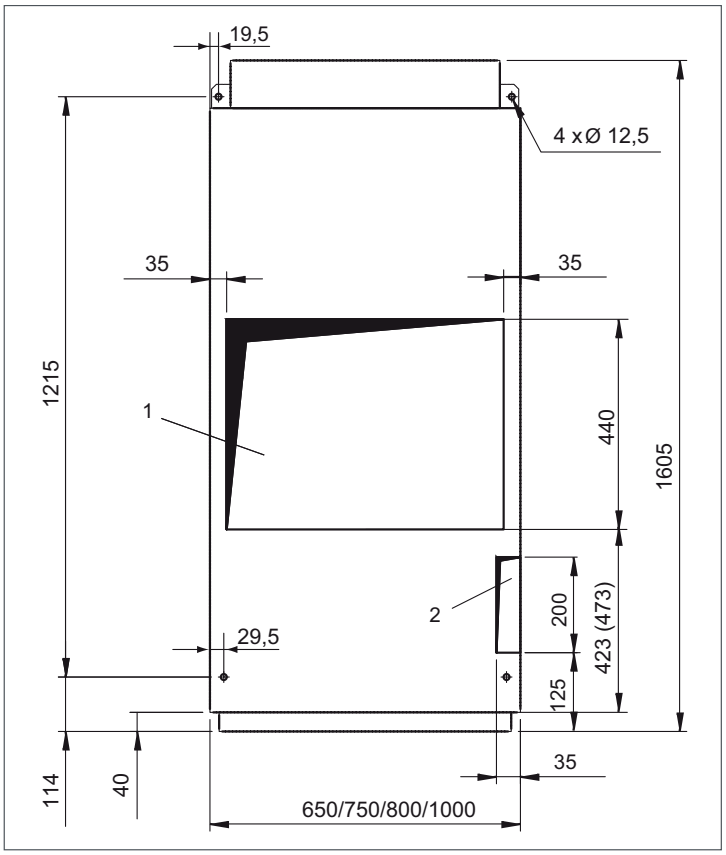


Figure 40
Dimensions (example: PIX 12 panels)

Transport of the Panels/Circuit Breakers on the Construction Site

⚠WARNING

HAZARD OF INCORRECT OPERATION

- Make sure the rope or the chain being used is strong enough to bear the weight of the panel (see Dimensions and Weights (Without Packaging), page 14). Comply with the relevant provisions for hoisting equipment.
- On lowering the panels, make sure that the supporting platform is sufficiently stable and even.
- Pay attention to floor openings.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Transport using a Crane

Follow the below steps to transport the panels and circuit breakers using crane:

1. Attach the crane straps in the four jack rings on top of the panel (Figure 41), maintaining a minimum height of 1 m (Figure 42).
2. Release the front and rear panel screw fastening from the transport packaging. To this effect, remove the cable compartment cover, see Opening and Closing the Front Door, page 28.
3. Carefully lift the panel and deposit it at the intended location.

Figure 41
Jack rings on top of the panel

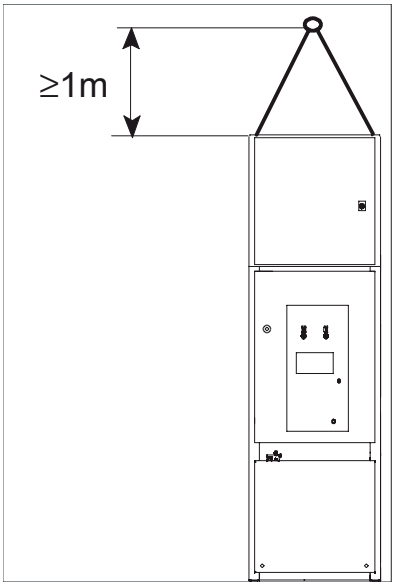


Figure 42
Observe the minimum height

Transport on the Floor

Follow the below steps to transport the panels and circuit breakers using cylindrical rollers:

1. Push panel onto three cylindrical rollers (minimum diameter 30 mm) (Figure 43).
2. Move the panel until it reaches its final location.

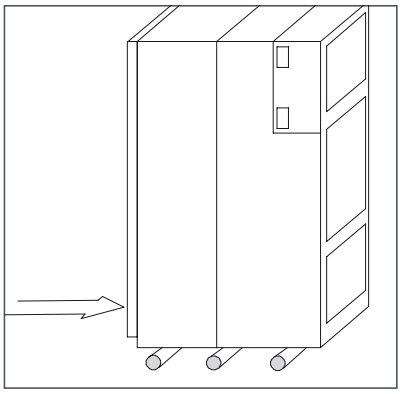


Figure 43
Transport of the panel on the floor

Circuit Breakers

The circuit breakers can be transported by means of the optional handling crane (Figure 44).

Verify the circuit breakers are always placed on external wooden beams (Figure 45).

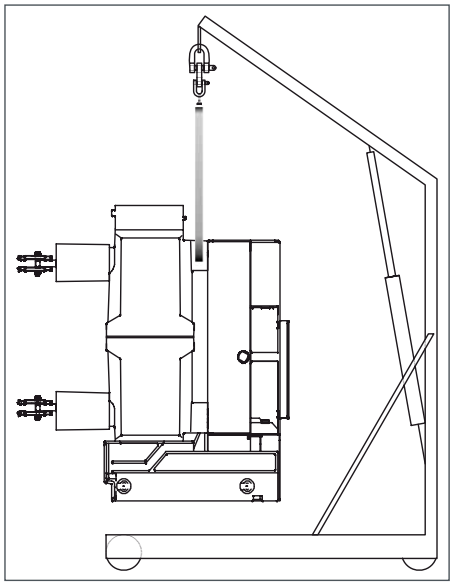


Figure 44
Transport of circuit breaker using the handling crane

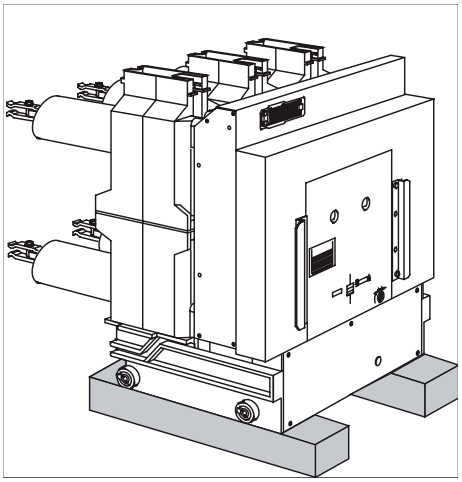


Figure 45
Circuit breakers must always be placed on external wooden beams

Aligning and Fastening Panels

NOTICE
HAZARD OF INCORRECT ASSEMBLY It is essential that measuring is effected with the utmost precision. **Failure to follow these instructions can result in equipment damage.**

Fastening on Base Frame

Follow the below steps to fasten the panel on base frame:

1. Drill holes (Ø 8.5 mm) into the base frame at the intended panel fastening points (Figure 46).
2. Cut threads M 10 in the bore holes.
3. Screw-fasten panel to the frame.

   NOTE: Screws, bolts and accessories are not included in the scope of delivery.

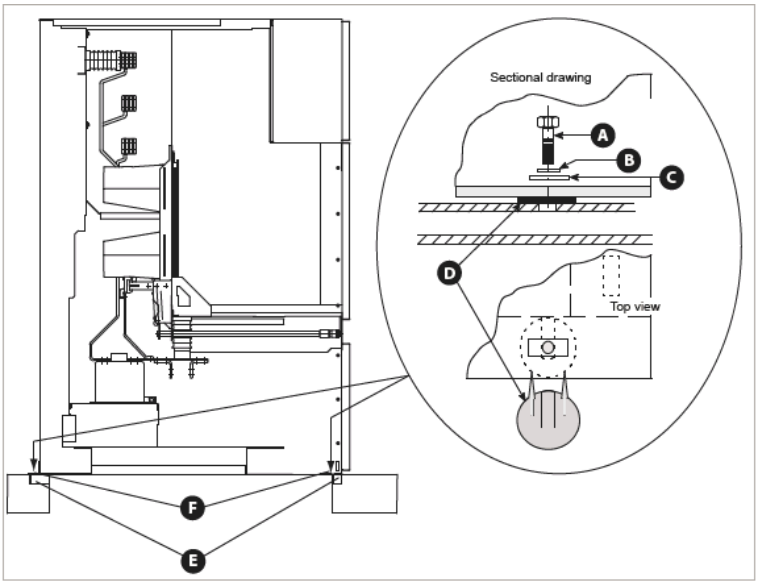


Figure 46
Panel fastening on base frame

A	Hex. bolt M 10l
B	Lock washer ES 10
C	Washer ES 12
D	0, 1 or 2 shims
E	Base frame
F	Fastening points

Fastening on Concrete Foundations

Follow the below steps to fasten the panel on concrete foundations:

1. Position first panel on the foundations in accordance with the switchgear specific space assignment plan.
2. Remove cable compartment cover (see Access to the Cable Compartment, page 25).
3. Align panel. Check the panel front for correct horizontal and vertical position. If applicable, lift the panel and place shims in the direct vicinity of the fastening points, until the horizontal position has been reached. Assembly drawing: SEM102173-01
4. Screw-fasten panel to the two fastening points on the front end and at least one fixation point on the rear end (Figure 47); hex. bolt M 10 x 30 + dowel pin.

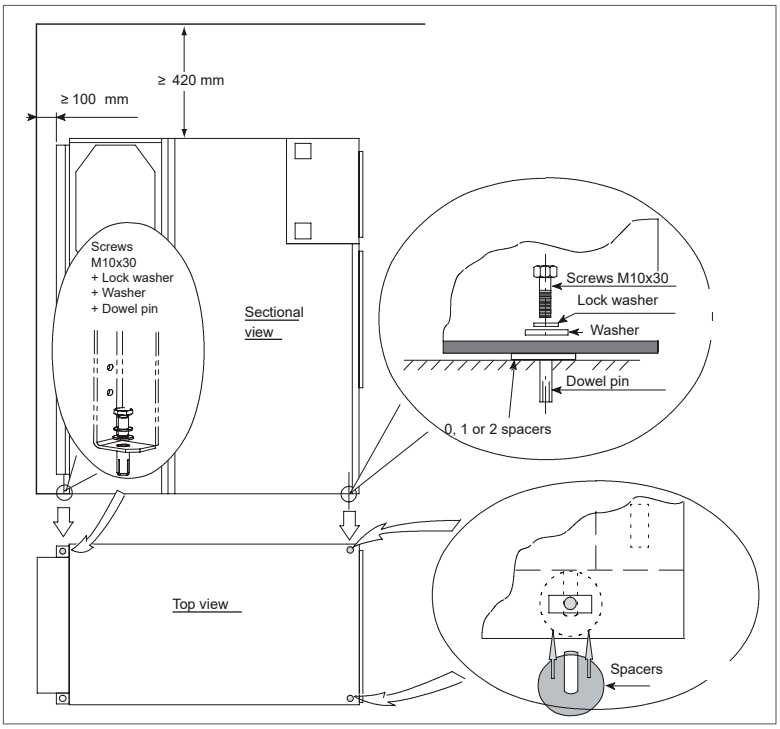


Figure 47
Panel fastening on concrete foundations

Additional Fastening Variants

The additional fastening variants are available on request. Therefore, contact the manufacturer to this effect.

Panel fastening with seismic or vibration qualification characteristics can be supplied on request.

For skid and concrete floor, see *assembly drawing AGSC72824-01* and *AGSC72824-02* respectively.

Screw-fastening the Panels to One Another

Assembly drawing: SEM102056-01.

Follow the below steps to screw fastening the panels to one another:

1. Screw-fastening panel fronts to one another using 6 fastening points (Figure 48).
2. Fasten panels to one another at the top on the rear side using a connecting link. To this effect, use the screws provided on the panel.

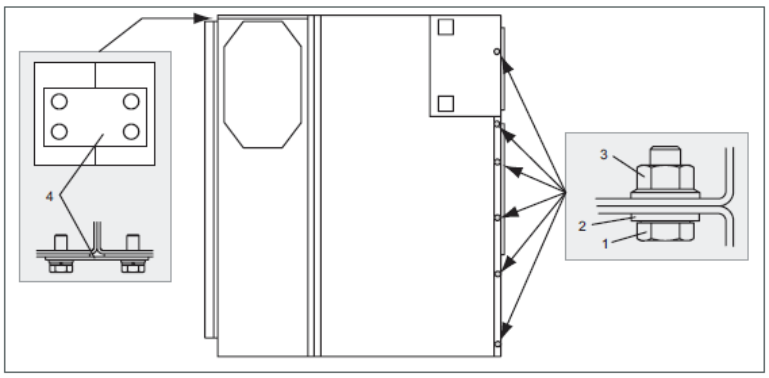


Figure 48
Screw-fastening the panels to one another

1	Screw M8
2	Spring washer
3	Hex. nut M8 with lock washer
4	Connecting link

Installation of the Busbar Bushings

Panels can be equipped, depending on the customer specifications, with retaining plates to increase the mechanical strength (Figure 50 and Figure 51) or busbar section segregations to increase the mechanical strength (Figure 49).

The Busbar retaining plate (1), Busbar section segregation and the bushings (2) with retaining ring and rubber part are included in the accessories.

Slip bushing from the outside through the bore-hole and mount retaining ring from the inside.

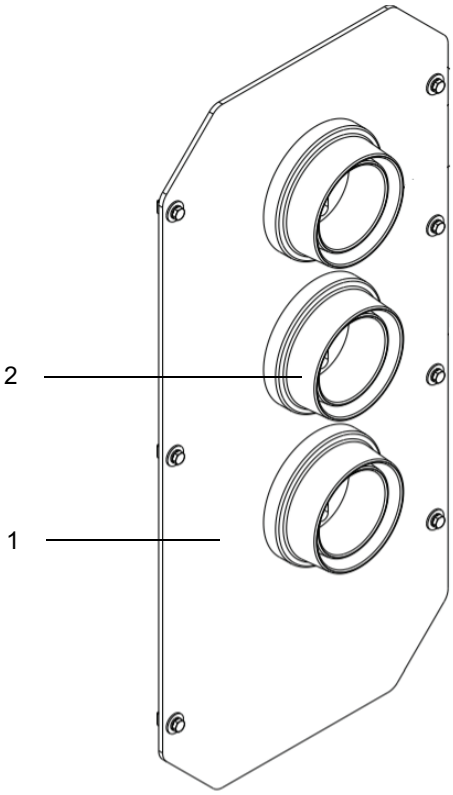


Figure 49

1 Busbar section segregation (option)

2 Bushing

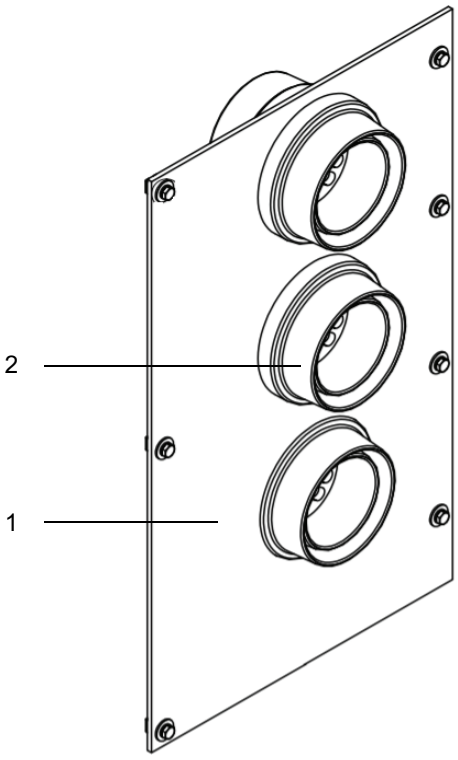


Figure 50

1 Busbar retaining plate

2 Bushing

3 Retaining ring

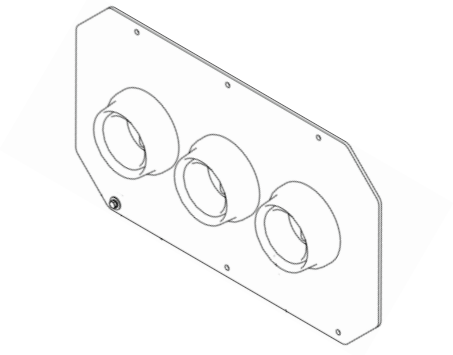
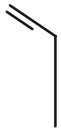
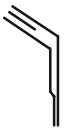
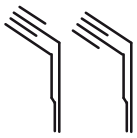
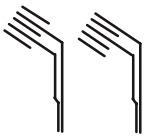


Figure 51
Busbar retaining plate in bus section couplers

Busbar Assembly

Arrangement of Busbars in Branch-Circuit Panels

		Number of busbars per phase		
		1	2	3
Number of feeder bars per phase	1			
	2		1250 A (60x10)  1600 A (80x10)	1250 A (60x10)  1600 A (80x10)
	3	-		

Arrangement of the Lower Busbars in Bus Section Couplers

		Number of busbars per phase		
		1	2	3
Number of feeder bars per phase	1			-
	2	-	-	

Mounting Busbars

Access to the busbar compartment: see Access to the Busbar Compartment, page 32.

⚠CAUTION

HAZARD OF INCORRECT ASSEMBLY

Comply with the specifications on treatment of contact surfaces and the tightening torques for busbar screw fastening in the Appendix.

Failure to follow these instructions can result in injury or equipment damage.

Follow the below steps for mounting busbars:

1. Clean all contact areas of the busbars and feeder bars in the switchgear panels and coat them with lubricant KL (see Treatment of Firmly Screw-Connected Contact Surfaces, page 71).
2. Screw-fasten busbars to the feeder bars as shown in Figure 52 using four bolts (PIX 12, Figure 53) or four bolts and an electrode (PIX 17/24, Figure 52). Observe location of busbars and feeder bars (see Arrangement of Busbars in Branch-Circuit Panels, page 47).

Busbar Screw Fastening for PIX 12/17/24

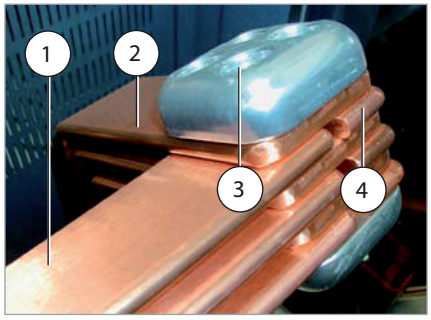


Figure 52
Assembly of busbar in a left-hand end

1 Busbar

2 Feeder bar

3 Busbar screw fastening with electrode

4 Intermediate layer

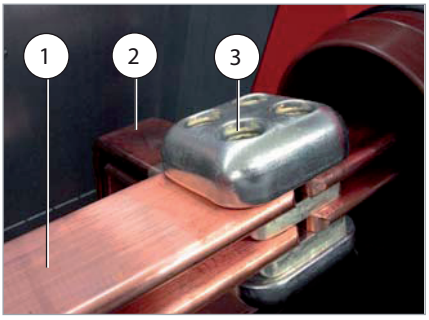


Figure 53
Busbar fastening in a center panel

1 Busbar

2 Feeder bar

3 Busbar screw fastening with electrode

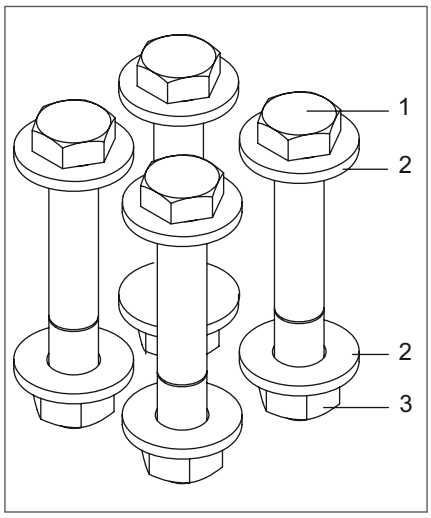


Figure 54
Busbar screw fastening PIX 12

1 Bolt M 12

2 Spring washers

3 Nut M 12

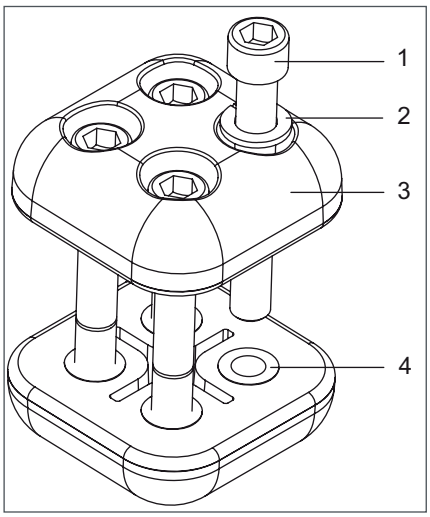


Figure 55
Busbar screw fastening PIX 17/24

1 Bolt M 12

2 Lock ring

3 Electrode

4 Electrode with inner thread

Take differing busbar screw fastening in PIX-12 busbar end panels into consideration:

1. In busbar end panels, the phases L1 and L3 are required to be screw fastened to electrodes in accordance with PIX 24 (Figure 56, 1)

2. In the bus section coupler, all phases L1, L2, and L3 in the lower busbar are required to be screw fastened to electrodes in accordance with PIX 24 (Figure 56, 2)

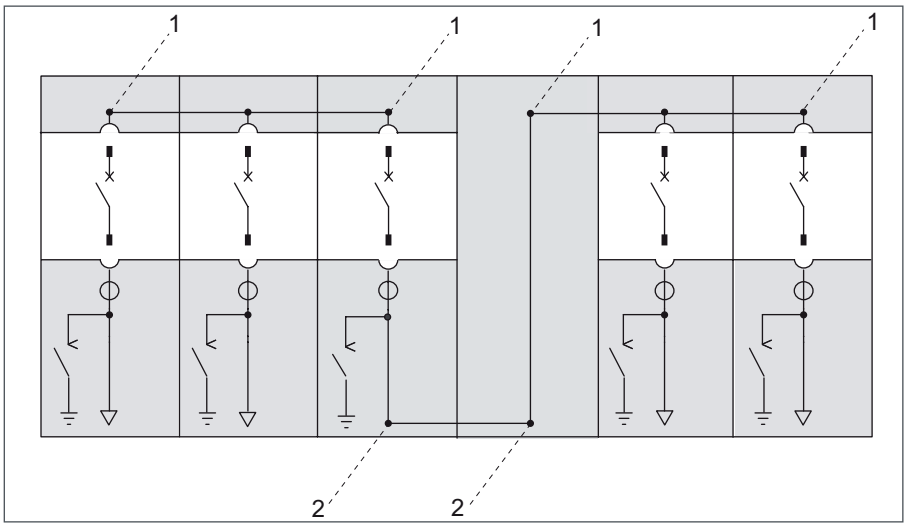


Figure 56
PIX-12 busbar end panels

Assembly of the Earth Bus

Earth bars are screw-fastened between the switchgear panels using connecting bars (Figure 57).

⚠CAUTION

HAZARD OF INCORRECT ASSEMBLY

- Comply with the specifications on treatment of contact surfaces and the tightening torques for busbarScrew Fastenings , page 72 in the Appendix.
- Observe the specific standards referring to earthing systems which apply in your country.

Failure to follow these instructions can result in injury or equipment damage.

Follow the below steps for assembly of the earth bus:

1. Clean all contact areas of the connecting bar and the appropriate earth bar in the switchgear panels and coat them with lubricant KL (see Treatment of Firmly Screw-Connected Contact Surfaces, page 71).
2. Slip the connecting bar (Figure 57,1) into the adjacent panel (3) through the cutout in the panel-supporting structure (2).

3. Screw-fasten (5) connecting bar on both sides to the earth bar (4) in question.

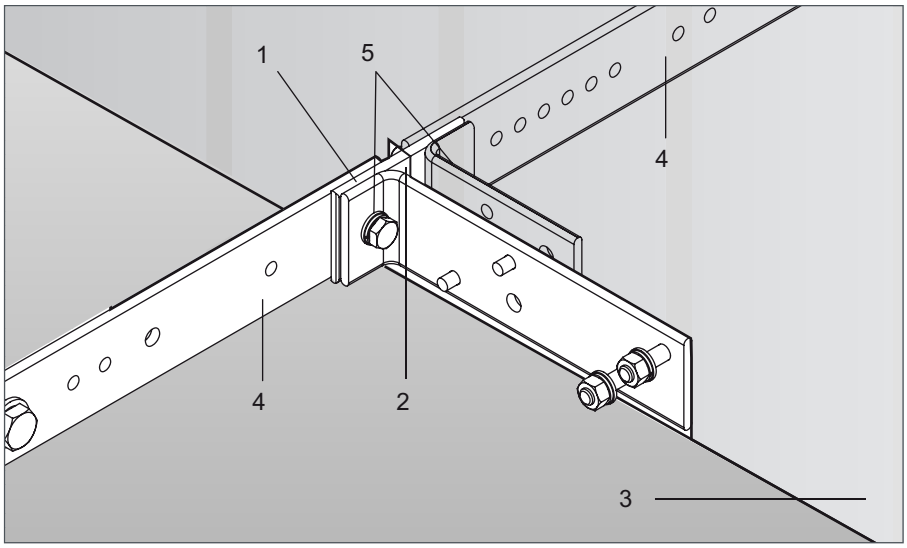


Figure 57
Mounting the earth bar

1	Connecting bar
2	Cutout in panel-supporting structure
3	Adjacent panel
4	Earthing bars in the panels
5	Screw fastening of connecting bar to earthing bars

4. Connect earth bus (Figure 58) to the earthing system of the switchgear building (connecting lines and screw accessories are not included in the scope of supplies).

Figure 58
Connecting point of switchgear earth bus to building earth

High-Voltage Connection

Overview of Cable Connection System

Cable connection variants:

Cable connection for Ø 13: Cable cross section ≤ 400 mm²

Cable connection for 4 bore-holes of Ø 9: Cable cross section 500 or 630 mm²

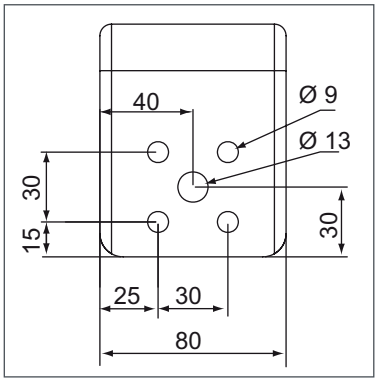
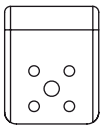
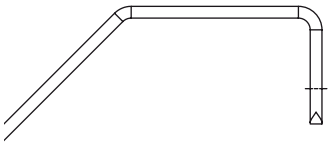
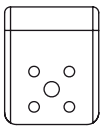
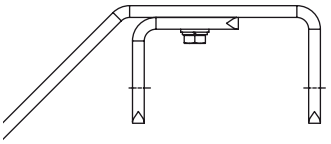
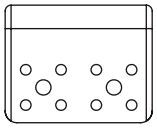
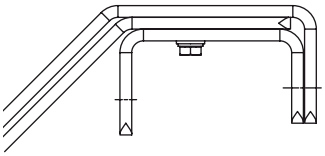
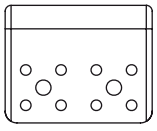
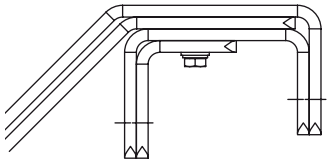


Figure 57
Connecting bar 80 x 10 with dimensions for the fastening of cable sealing end

Overview of cable connection variants

Cable terminal per phase	Representation of a connection phase	
	Front view	Side view
max. 2		
max. 4		
max. 6		
max. 8		

Further cable connection variants optionally available:

- Metal-clad rear cable compartment for cable connections behind the panel (see High-Voltage Connection to Rear of Panel (Optional), page 55)
- Conductor bar terminal

Clarify technical details and design specifications with the manufacturer, as required.

Cable Connection Height

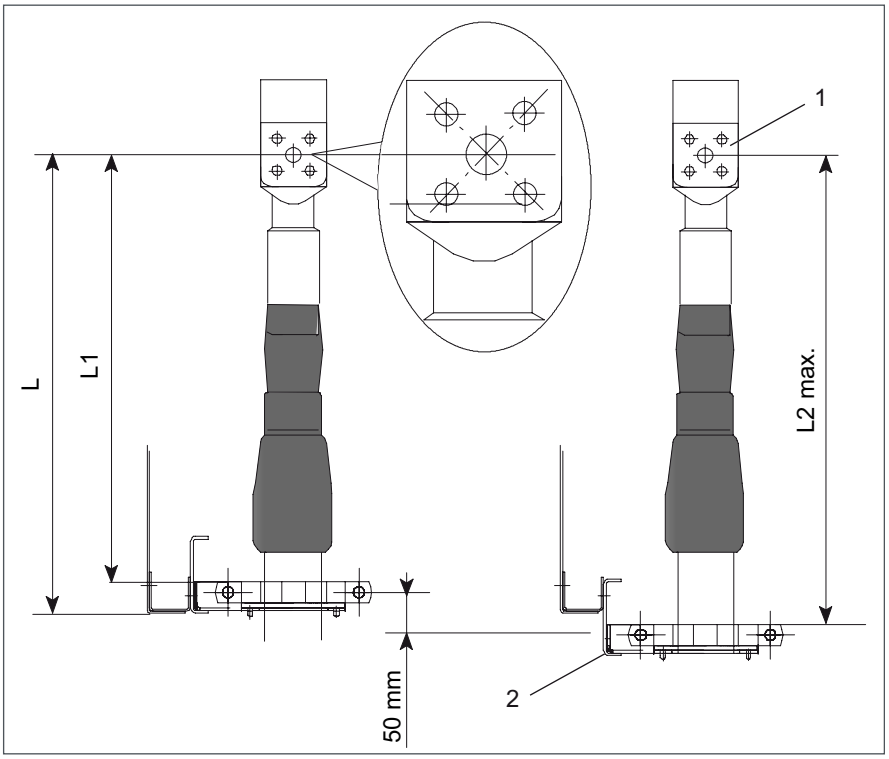


Figure 58
Cable connection height in panel

1	Cable connection
2	Adjustable lateral support

Height	Connection clearances (mm)		
	PIX 12	PIX 17	PIX 24
L	430	460	555
L1	390	420	515
L2	440	470	565

Connection of High-Voltage Cables

Preparation of Cable Compartment

Access to cable compartment: see Access to the Cable Compartment, page 25.

1. Release fastening of cable clips (Figure 59, 1).
2. Remove cable clips (2).
3. Remove rubber sleeves (3).
4. Remove base plate (4) as required.

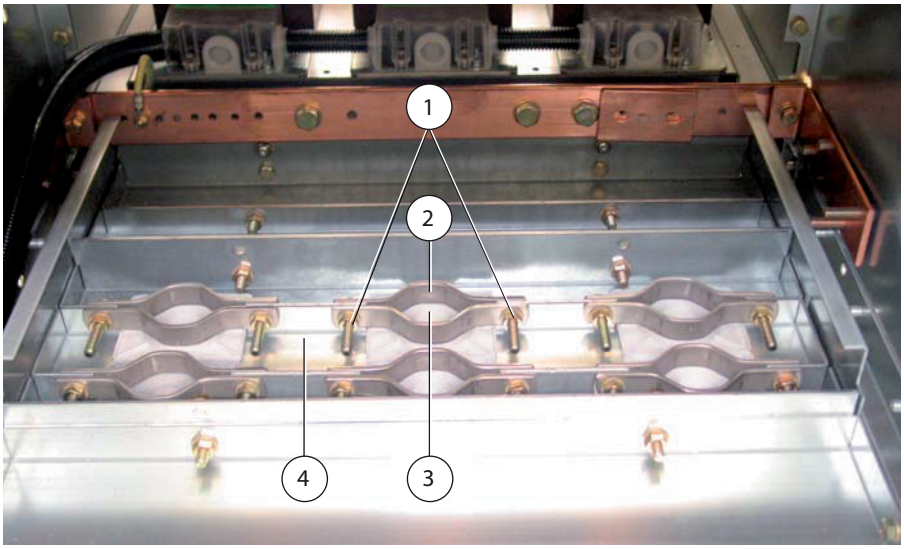


Figure 59

1 Fastening of cable clips

2 Cable clips

3 Rubber sleeves

4 Base plate

Mount Sealing End and Cable Lug

⚠CAUTION

HAZARD OF INAPPROPRIATE ASSEMBLY

- Do not use aluminium cable lugs for the cable connection. Materials do not match.
- Unless otherwise specified by the cable manufacturer, comply with the specified tightening torques and pre-coat contact areas. Refer to Treatment of Firmly Screw-Connected Contact Surfaces , page 71.
- Observe the phase assignment of the switchgear panel.

Failure to follow these instructions can result in injury or equipment damage.

Follow the below steps to mount sealing end:

1. Route the individual cables outwards through the cable compartment of the panel to enable assembly of the cable ends.
2. Cut the rubber sleeves to fit the cable diameter, and push them onto the cables (Figure 60).

3. Strip cable ends and assemble the sealing end as specified by the cable manufacturer.

Figure 60
Cut rubber sleeves to size and slip them onto the cables

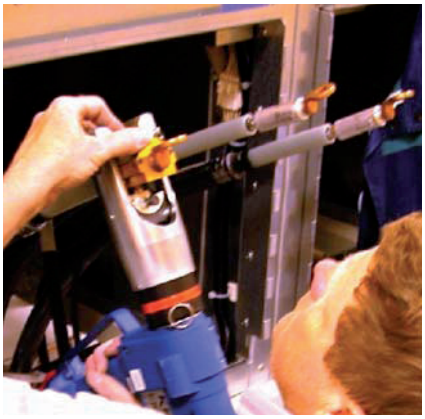


Figure 61
Mount cable lug

Follow the below steps to mount cable lug:

1. Fasten the individual cables to the appropriate connection surfaces (Figure 62 to Figure 64). In case of two cables per phase: Connect the two cables to the first connection (Figure 63).
2. Re-mount the base plates.
3. Fasten high-voltage cable to the base plates using clamping assemblies (Figure 65 and Figure 66).
4. Screw-fasten the earthing screens (2) of the cables to the earthing bar (3) of the panel.

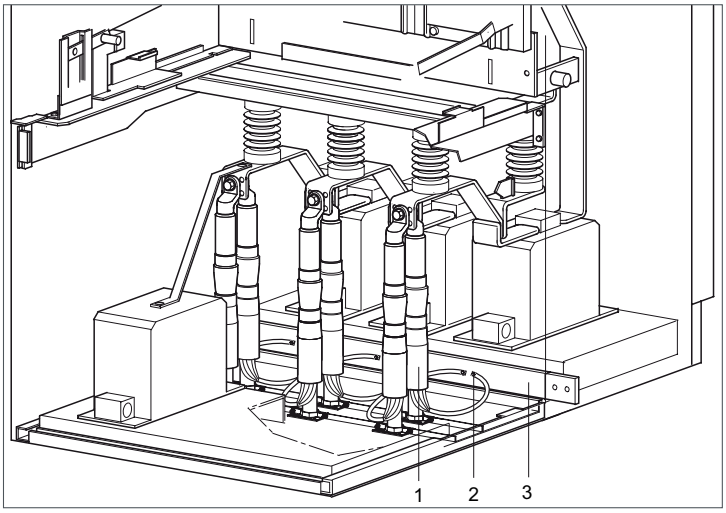


Figure 62

1 High-voltage cable 2 Earthing screen 3 Earthing bar

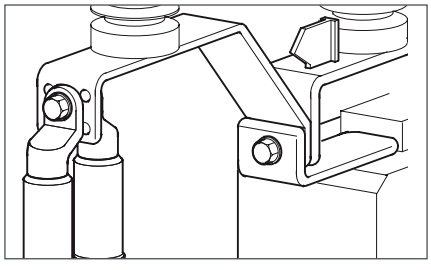


Figure 63

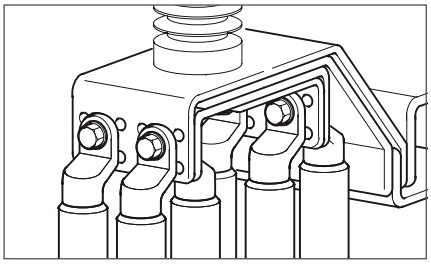


Figure 64

Connection using 1 - 2 cables

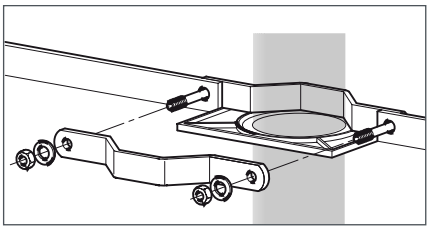


Figure 65
Clamping assembly for cables with a diameter of ≥ 40 mm

Connection using 8 cables

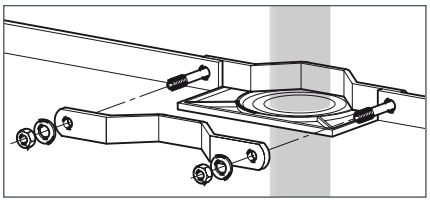


Figure 66
Clamping assembly for cables with a diameter of < 40 mm

NOTE: The first cable position is reserved for a withdrawable voltage transformer. It can be used for a normal cable connection, if no withdrawable voltage transformer is used.

High-Voltage Connection to Rear of Panel (Optional)

Panels can be extended optionally by a rear cable compartment (Figure 67). In this case the cable connection can be done from top or from bottom.

This rear connection compartment permits connection to high voltage behind the panel. The variants of the cable connection options (depending on the rated nominal current) correspond to the explanations in Overview of Cable Connection System, page 51.

The preassembled sheet metal housing of the rear cable compartment is screw-fastened to the panel on the construction site.

The current transformers are located in the rear cable compartment. The front earth bar has a connection to the rear into the rear cable compartment.

NOTE: Verify further technical details and design specifications with the manufacturer, as required.

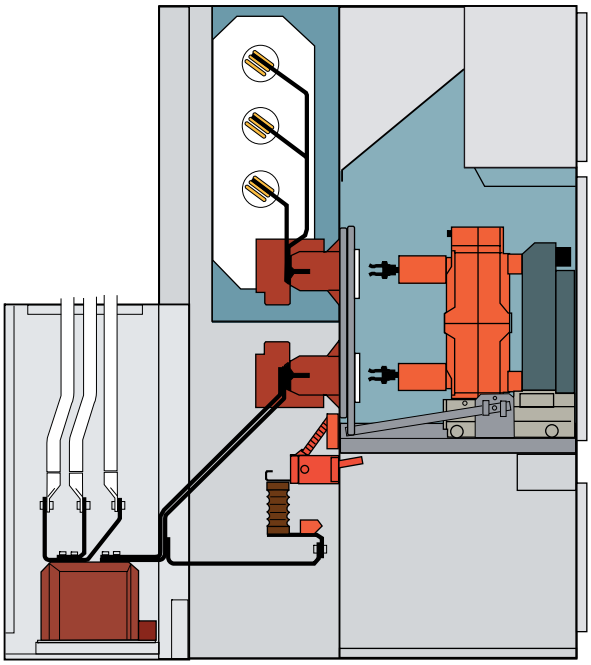


Figure 67
High-voltage connection on rear side of switchgear panel (optional)

Low-Voltage Connection

Normally the low-voltage compartment is already mounted on top of the panel when delivered to site. In some cases both components - high-voltage part and low-voltage part can be delivered separately.

Follow the below steps to connect the low-voltage compartment.

1. Remove transport protection covers. Assign the low-voltage compartment to the appropriate panel.
2. Position low-voltage compartment carefully on top of the panel, verifying that the top internal connection cables of the panel are not damaged.
3. Align low-voltage compartment and screw-fasten it to the panel. Assembly drawing: AGS C73 180-01 .
4. Screw-fasten the low-voltage compartments to each other at the sides.
5. Connect the panel's internal terminals for control and measuring cables according to the connector identification and the circuit diagram to the terminal strips in the low-voltage compartment.

Access to the Low-Voltage Compartment

Follow the below steps to access to the low-voltage compartment.

1. Insert double-bit key into the lock of the low-voltage compartment and turn it to the left by 90°.
2. Open door to the left.
3. The door can be secured optionally in open position using a lock plate (Figure 68, 1).

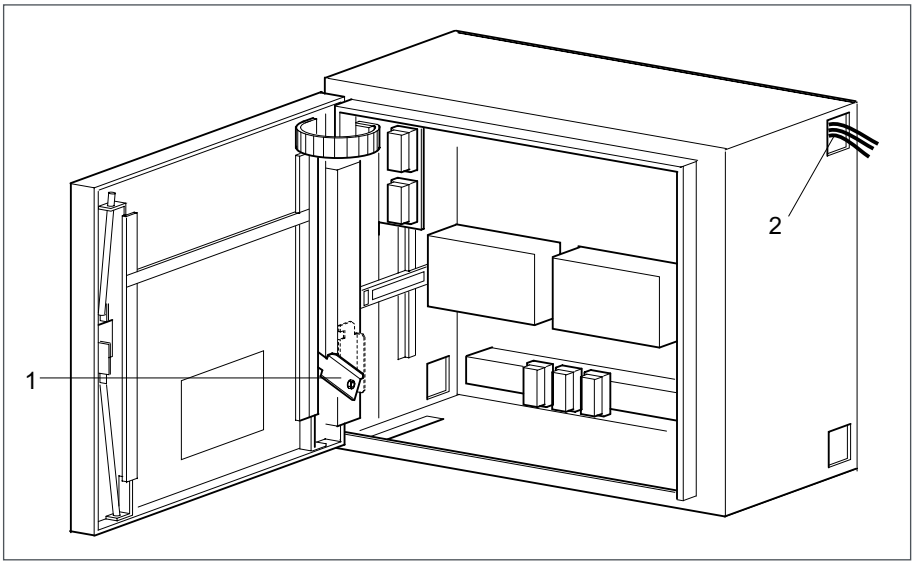


Figure 68

1	Lock plate (optional)
2	Ring circuits

Connection of the Ring Circuits in the Low-Voltage Compartment

Follow the below steps to connect of the ring circuits in the low-voltage compartment.

1. Route the ring circuits for the intra-panel wiring through the lateral openings of the low-voltage compartment (Figure 68, 2).
2. The ring circuits have been designed with connectors. Connect ring circuits in accordance with the connector identification (or the circuit diagram) to the appropriate terminal strips in the low-voltage compartment.

Connecting External Cables in the Switchgear Panel

Routing the External Cables through the Panel's Internal Cable Duct

Customized low-voltage cables for control and measurement can be routed to the low-voltage compartment inside each panel on the right hand side (Figure 69). In the bus section panel the cable duct for the external cables is only located on the left side in the bus section coupler.

1. Remove the metal cable duct covers on the right inside of the panel (3).
2. Break sheet-metal cutouts in the panel base (1) out as required.
3. Route external cables (2) from the cable basement through the cutout into the panel's internal cable duct and to the low-voltage compartment. Fasten cables to the panel using cable clamps (4).
4. Connect external cables to the terminal strip in the low-voltage compartment according to the circuit diagram.
5. Reposition the cable duct covers (3).

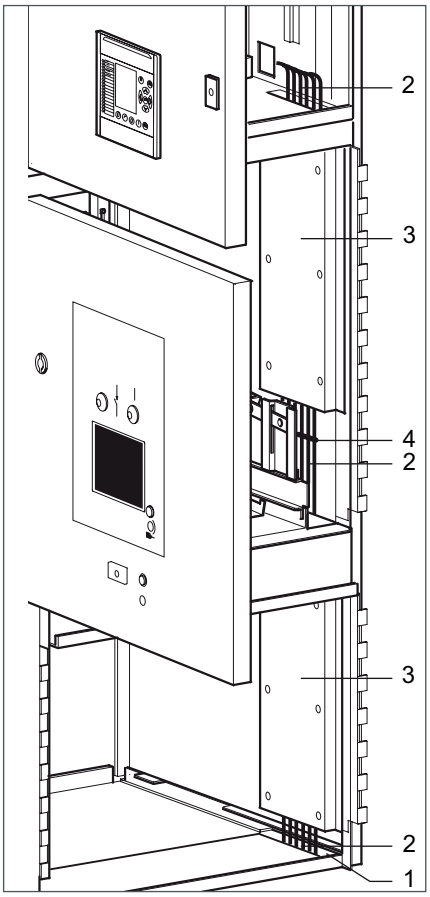


Figure 69

1	Sheet metal cutouts in the panel base
2	External cables
3	Cable duct covers
4	Cable clamp

Routing the External Cables through an Additional Cable Duct (Optional)

Customized low-voltage cables for control and measurement can be routed via an optional, separate cable duct above the low-voltage compartment (Figure 70).

The cable duct is mounted on site, and is included in the accessories.

1. Mount the cable duct in accordance with the assembly drawing AMT 000 376-01.
2. Route external cables through the cable duct (2) to the lowvoltage compartment (3). Connect external cables to the terminal strips in the low-voltage compartment according to the circuit diagram.
3. Screw-fasten cover of cable duct (1).

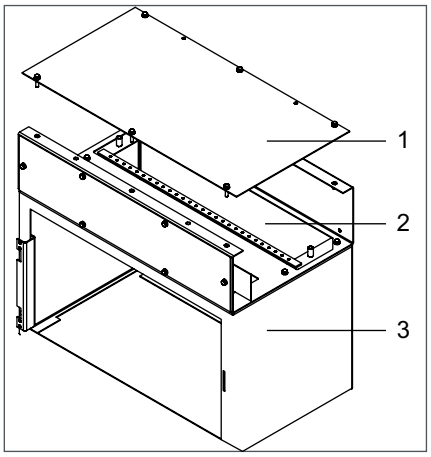


Figure 70
Top cable duct

1 Cable duct cover

2 Cable duct

3 Low-voltage compartment

Commissioning

Final Steps

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- The high-voltage supply must not be connected.
- All active parts must be earthed.
- Do not commission the earthing and testing truck if you detect anomalies, faults or malfunctions. Inform the manufacturer.

Failure to follow these instructions will result in death or serious injury.

NOTE: Whenever you detect anomalies, faults or malfunctions, do not commission the switchgear, but inform the manufacturer.

Cleaning the panel and checking panel assembly

NOTICE

HAZARD OF INCORRECT CLEANING AND CHECKING OF ASSEMBLY

Observe the following instructions for this step.

Failure to follow these instructions can result in equipment damage.

1. Clean the switchgear, removing contamination resulting from assembly work.
2. Remove all the attached information tags, cards, brochures and instructions no longer needed.
3. Check the tightening torques of all screw fastenings and connections established on the site of installation:
   a. High-voltage connection
   b. Earth conductor
   c. Panel screw fastenings
   d. Busbar links
   e. Special attachments.

Damaged paint

The panels are powder-coated. Minor damage to the paint can be repaired using commercially available paint (standard colour RAL 7044 or corresponding colour).

Re-mounting the covers

1. Removed partition and cover plates in the busbar and switching device compartment (see Front Access, page 33)
2. Cable duct covers of the external control and measurement cables.
3. Cable compartment cover (see Access to the Cable Compartment, page 25).
4. Remove temporary base from the panel top, if such a base has been used (see Top Access, page 34).

Inspection

1. Check the switchgear for damage which might be due to transport or assembly work.
2. Compare data on nameplate to the required ratings.

Racking-in the trucks

Insert trucks in the panels depending on the panel configuration (see Inserting the Circuit Breaker into the Panel, page 32):

- Disconnector truck EvoPact UTX
- Vacuum contactor CVX
- Metering truck EvoPact MTX
- Circuit breaker truck EvoPact HVX

Close front doors

For details, refer to Opening and Closing the Front Door, page 28.

NOTE: Check operation of all doors after the installation.

Checking Switching Functions and Interlocks

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- The high-voltage supply must not be connected.
- All active parts must be earthed.

Failure to follow these instructions will result in death or serious injury.

Preparation

1. Apply supply voltage.
2. Perform several manual test operations with each switching device.
3. Check switch position indicators.
4. Check electrical functions of control and operating devices:
   a. Closing and opening releases for circuit breaker
   b. Optional motor-operated drives for the truck and the earthing switch
5. Check switch position indicators and interlocks (see *Operation — Interlocks* in User Manual).

Power Frequency Test of Busbar (Optional)

⚠WARNING

HAZARD OF INCORRECT OPERATION

Comply with the safety provisions, page 8.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

A test unit and a test adapter (not included in scope of supply) are required for the power frequency test.

Preparation

⚠⚠DANGER

HAZARD OF INCORRECT OPERATION

- Ensure that no high-voltage cables are connected.
- Observe the assembly and operating instructions for the test unit and the test adapter.
- All panels must be isolated from the power supply and earthed. Switch position during the power frequency test (example: five panels).

Failure to follow these instructions will result in death or serious injury.

1. Busbar:
   Disconnect voltage transformer (EvoPact MTX) and surge arrester. Earth voltage detecting systems.
2. Incoming feeder panel for voltage test:
   Remove cable compartment cover and disconnect voltage transformer and surge arrester. Earth voltage detecting systems.

   NOTE:

   - Observe the assembly and operating instructions for the test unit and the test adapter.
   - Observe admissible test values for the switchgear and the admissible test values for power-frequency tests after installation of the switchgear in accordance with IEC 62271-200: 2011.

Performing the power frequency tests

1. Connect test unit to the test cable.
2. Switch the earthing switch OFF.
3. Move circuit breaker truck EvoPact HVX into service position and switch circuit breaker ON.
4. The adjacent phases are required to be earthed prior to conducting the power frequency test in sequence for all three phases (L1, L2, and L3) according to the specifications provided by the test unit manufacturer.

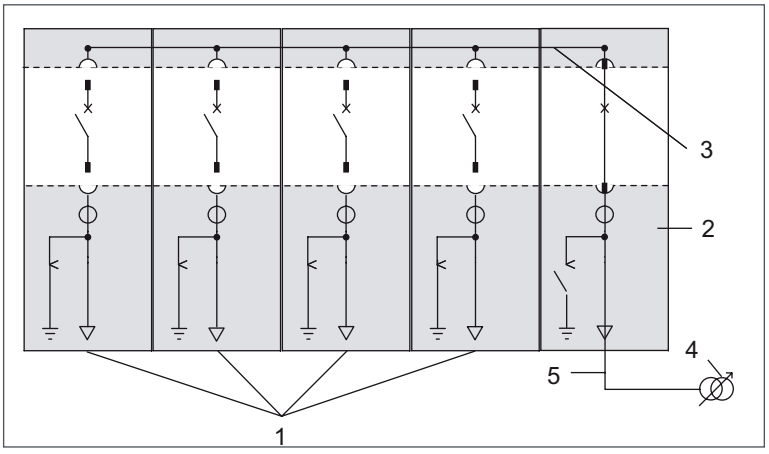


Figure 71
Switch position during the power frequency test (for example: five panels)

1. Feeder panels

2. Incoming feeder panel for test voltage
3. Busbar
4. Test unit (for example, high-voltage source, test transformer)
5. Test cable

After the power frequency test

1. Switch circuit breaker OFF and put circuit-breaker truck into disconnected position;
2. Switch earthing switch ON.
3. Remove test unit and test cables.
4. Reconnect disconnected voltage transformers and surge arresters.

Cable Test after Assembly

⚠WARNING

HAZARD OF INCORRECT OPERATION

Comply with the safety provisions, page 8.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

A test unit and a test adapter (not included in scope of supply) are required for cable testing.

NOTE: The assembly, operating and testing instructions for cable fittings and connectors and the test unit must be taken into consideration.

During the cable test, the busbar can be operated at rated voltage (see nameplate). For qualification of the current transformers for cable tests, enquire at the appropriate manufacturer's.

Preparation

⚠WARNING

HAZARD OF INCORRECT OPERATION

Strictly observe the assembly instructions for the test adapters and the operating and inspection instructions for the test unit.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

1. Isolate outgoing feeder cable of the panel to be tested.
2. Isolate outgoing feeder cable in remote station.
3. Earth outgoing feeder cable of the panel to be tested.
4. Remove cable compartment cover (see Access to the Cable Compartment, page 25).
5. Disconnect voltage transformer and surge arrester; earth voltage detecting systems.

Performing the cable test

NOTE: Verify the metallic components of the test adapter are at a sufficient distance from the earthed switchgear components (for example, housing).

1. Connect the test adapter to a free cable connection in the panel and on the test unit. To this effect, observe the specifications of the test unit's manufacturer.
2. Set switchgear panel to test position:

Circuit breaker	OFF
Truck	In disconnected position
Earthing switch	OFF

3. Perform cable test according to the cable manufacturer's specifications. When doing so, do not exceed the admissible limits (see Table).

Once the cable test has been completed:

1. Earth feeder cable again.
2. Remove test set.
3. Reconnect voltage transformer, surge arrester and voltage detection systems or de-earth them.
4. Reposition cable compartment cover.

Admissible limits for the cable test in panels

Admissible limits for the cable test in panels(1)	**DC test voltage [kV] max. 15 min.**
PIX 12	34
PIX 17	42
PIX 24	67

(1) Admissible limits for the switchgear in case of cable tests with a testing frequency of 0.1 Hz available on request from the manufacturer's.

Voltage Indicators

Voltage Detection Systems (VDS)

⚠CAUTION

HAZARD OF INCORRECT USE

Refer to the operating manual of the voltage detection system concerned.

Failure to follow these instructions can result in injury or equipment damage.

Pluggable Voltage Detection System

⚠CAUTION

HAZARD OF INCORRECT USE

Always check all three phases L1, L2 and L3 together.

Failure to follow these instructions can result in injury or equipment damage.

The operating voltage or the zero voltage state of the feeders is detected via a separate voltage detection system according to IEC 61243-5.

Socket-contacts for the indicator units are located on the panel front (Figure 73). Capacitive voltage indicators of all the approved manufacturers can be used (Figure 72).

NOTE: All three phases L1, L2 and L3 are always required to be checked together.

Close non-used socket-contacts using caps.

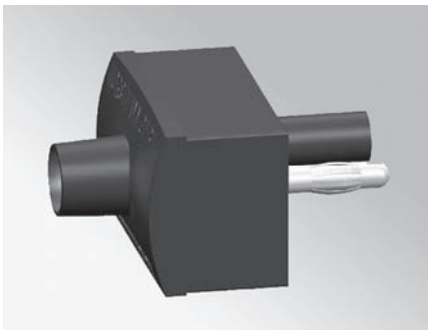


Figure 72
Voltage indicator (Type HR-ST, Horst-mann GmbH)

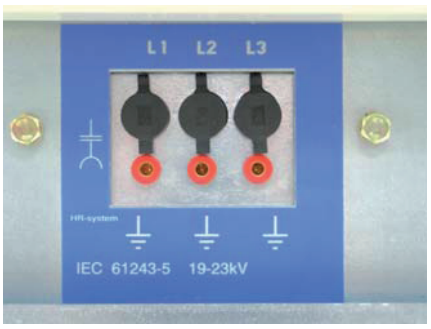


Figure 73
Socket-contacts for HR system on the panel front

Integrated Voltage Detection System IVIS

IVIS is an integrated voltage detection system with display unit used to determine zero voltage according to IEC 61243-5.

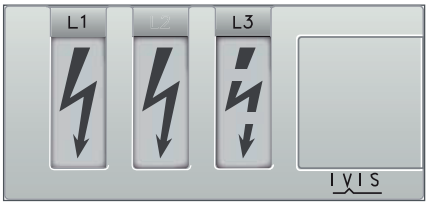


Figure 74
Integrated Voltage Detection System IVIS

The IVIS system has been designed for maximum operating reliability. It does not require supply from an external source. It features climateproof encapsulated electronics and is maintenance-free, due to permanent monitoring of the indication thresholds.

Flash arrow symbols on the indicators display the operating voltage still existing within the defined response thresholds. The IVIS system does not require the electrical repeat tests common for voltage detection systems.

For a description of all functions and messages of the IVIS system, please refer to the separate Operating Manual IVIS (No. AGS 531757-01).

Voltage Present Indicating System VPIS

VPIS (Figure 75) is a capacitive voltage indicator in accordance with IEC 61958. It is exclusively used to display the specified operating voltage.

The Voltage Presence Indicating System cannot be used to verify zero voltage.

⚠⚠DANGER

HAZARD OF INCORRECT OPERATION

- Use voltage indicators in accordance with IEC 61243-5 to determine zero voltage.
- Before opening the switchgear or before performing work on live components, these areas must always be earthed by means of a earthing switch.

Failure to follow these instructions will result in death or serious injury.

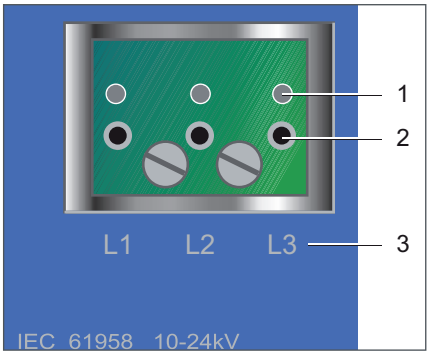


Figure 75
Voltage Present Indicating System VPIS

1. Indicator lamps
2. Connection points
3. Phases

In operation, each of the 3 phases L1, L2 and L3 (C) is displayed by its own flashing indicator lamp.

For each phase, a connection point is available below each indicator lamp for connection of the phase comparator. Only approved phase comparators may be used for this VPIS system. (see Phase Comparators, page 67).

Phase Comparators

Phase comparators are optionally available and not included in the scope of supplies.

Check phase coincidence before connecting different supply lines for the first time.

Phase Comparators for VDS Systems

If IVIS is used, phase comparison can be performed by means of the phase comparator MS 100 (Figure 76). For more information, refer Voltage Detection Systems (VDS), page 67.

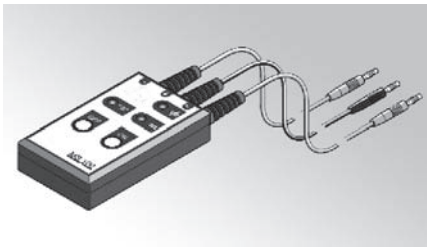


Figure 76
Phase comparator MS 100

Phase Comparator for VPIS System

This phase comparator may only be used for the VPIS system in Voltage Present Indicating System VPIS, page 66.

Rated voltage Ur [kV]	VPIS item number
5–7,2	AMT150384-01
10–24	AMT150384-02

Figure 77
Phase comparator for HR system (Type ORION 3.0, Horstmann GmbH)

Check the device before each operation:

- Connect the two plugs of the phase comparator to the two connection points of a VPIS device (Figure 78).
- The lamp must light up: The phase comparator is working properly.

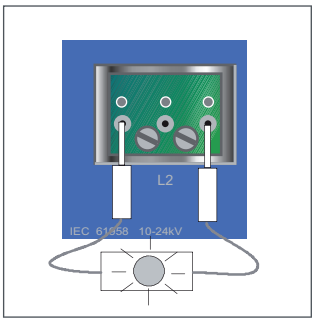


Figure 78
No phase coincidence: indicator lights up

Checking phase coincidence of two panels:

- Connect the plugs of the phase comparator to the same phase connection points of two different VPIS devices (panels) (Figure 79).
- The indicator must not light up. If the phases do not coincide, check the cable connection and, if necessary, exchange.
- After each operation, check the device once more (see item 1).

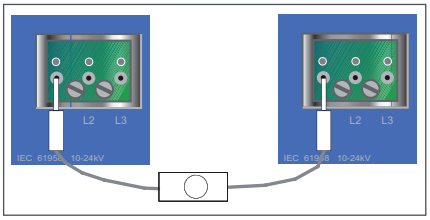


Figure 79
No phase coincidence: indicator lights up

Voltage Detecting and Indicating System (VDIS)

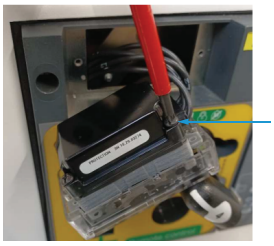
Description of VDIS Unit

The VDIS unit is a self-powered voltage detecting and indicating system.

The VDIS unit is integrated into Schneider Electric cubicles, flush-mountable and designed according to standard IEC 62271-213: 2021. The VDIS unit is fitted with a three LED display and detects the **operating** voltage presence/absence on the Cubicle main unit.

> **NOTE:** VDIS is not used to distinguish between voltage not present (that is U <10 % of nominal voltage) and dead circuit state (that is U = 0 V).

When installing the VDIS into the cubicle the fixation screws are required to be tightened to between 0.6 N•m and 1 N•m. When fixing the coupling sub-assembly to the Indication sub-assembly the screws are required to be tightened to between 0.6 N•m and 1 N•m. Check that the seal between the coupling and indication sub-assemblies completely covers the coupling sub-assembly before fixing the two sub-assemblies together.



Check that the seal fits flush between the two sub-assemblies and is not twisted or creased.

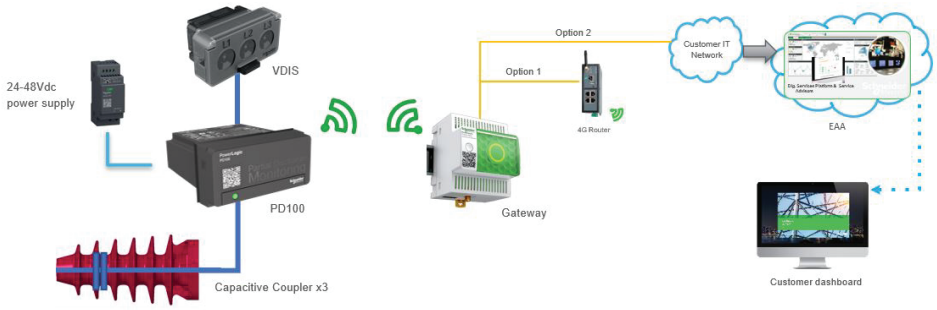
Accessing the Test Points of the VDIS

The test points on the VDIS are access by lifting the flap of the VDIS cover. However, there is a small catch (lock) that helps prevent the flap from being open accidentally, therefore the catch must be released.

PowerLogic PD100

The PowerLogic PD100 measures the partial discharge signals broadcast on the MV network through a capacitive coupler. The measurement is performed 24 hours a day, 7 days a week. The PowerLogic PD100 sends relevant data through a wireless communication network (Zigbee PRO) to a Zigbee PRO concentrator.

The PowerLogic PD100 is designed to be installed in the cubicle and connected to all three phases of the Medium Voltage supply of the cubicle. The PowerLogic PD100 is connected via the same capacitive connection as the one used for the VDIS unit. The PowerLogic PD100 can use the existing capacitive interfaces provided that the capacitive value is between 13 pF to 128 pF.



Annex

Auxiliary Products

⚠WARNING

HAZARD OF INAPPROPRIATE HANDLING

Observe the safety data sheets of the manufacturers of the auxiliary products.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Auxiliary product	Order number
Cleaning agent	S008152
Lubricant KL, 0.5 kg can	ST312-111-835
Liquid lubricant FL, 0.5 kg can	S008153
Repair paint, 500 g can, RAL 7044, silk-grey	S009 492

The auxiliary products are available from the manufacturer. The use of alternative auxiliary products is not permissible.

Treatment of Firmly Screw-Connected Contact Surfaces

NOTE:

- Check that the heat shrinkable sleeve is not in contact with lubricant (swelling) when handling the bars insulated by heat-shrinkable sleeves.
- Check that the contact areas coated with lubricant KL are not touched.

Follow the below steps for treatment of firmly screw-connected contact surfaces:

1. Check that the contact areas are subjected to preliminary treatment before screw fastening (see Table).
2. Immediately after the preliminary treatment, coat contact surfaces completely with a thin and uniform film of lubricant KL.

Material of contact surfaces	Pre-treatment
Silver-plated contact surfaces	Clean(1)
Nickel-plated contact surfaces	Remove passivation layer(4)
Copper or copper alloy	Clean(1), expose metallic surface(2)
Aluminium	Clean(1), expose metallic surface(2)
Steel	Clean1, expose metallic surface(2)
Zinc-plated steel	Remove passivation, not the zinc layer(3)
Hot-galvanized sheet-metal	Clean(1), passivation need not be removed

(1) Clean by means of lint-free cloth; use cleaning agent in case of serious contam-ination (see above)

(2) Expose metallic surface
- by treating the entire surface with emery cloth or a rotating grinding tool (grain-size 100 or 80) or
- using a wire brush which is clearly marked for use exclusively for aluminium or exclusively for copper

(3) Using a brass brush, steel brush

(4) Rub slightly by hand using Scotchbrite abrasive agent (check that the Ni layer is not reduced)

Screw Fastenings

The following elements are required to be used for all screw fastenings:

- Screws and bolts: Grade ≥ 8.8
- Nuts: Grade 8

NOTE: Do not grease screws or nuts.

Hex. bolts and socket-head capscrews (except slotted screws) and nuts (except self-locking nuts)

Thread size	Tightening torque [N•m]	
	min.	max.
M5	3,8	4,7
M6	7	9
M8	16	24
M10	36	44
M12	63	77

Screw fastening with casting nuts in cast resin parts (transformer and post insulator)

Thread size	Tightening torque [N•m]	
	min.	max.
M6	5	7,5
M8	12	18
M10	24	38
M12	36	54

Screw fastening for current transmission, conductor material: copper

Thread size	Tightening torque [N•m]	
	min.	max.
M6	5,5	7,5
M8	15	19
M10	30	40
M12	60	76
M12	63	77

Required Tools (not Included in the Scope of Supplies)

Cutter	
Nail puller	
Approved torque wrenches with different bits for hexagon socket screws and socket-head screws and nuts; bits for screw and nut grades M5, M6, M8, M10, M12	
Screwdriver and Philips screwdriver	
Cutting pliers	

4 Crane straps/chains of L ≥ 2000 mm	-
Lint-free, clean rags	-

Operation Accessories

Transport Trolley for Circuit Breaker

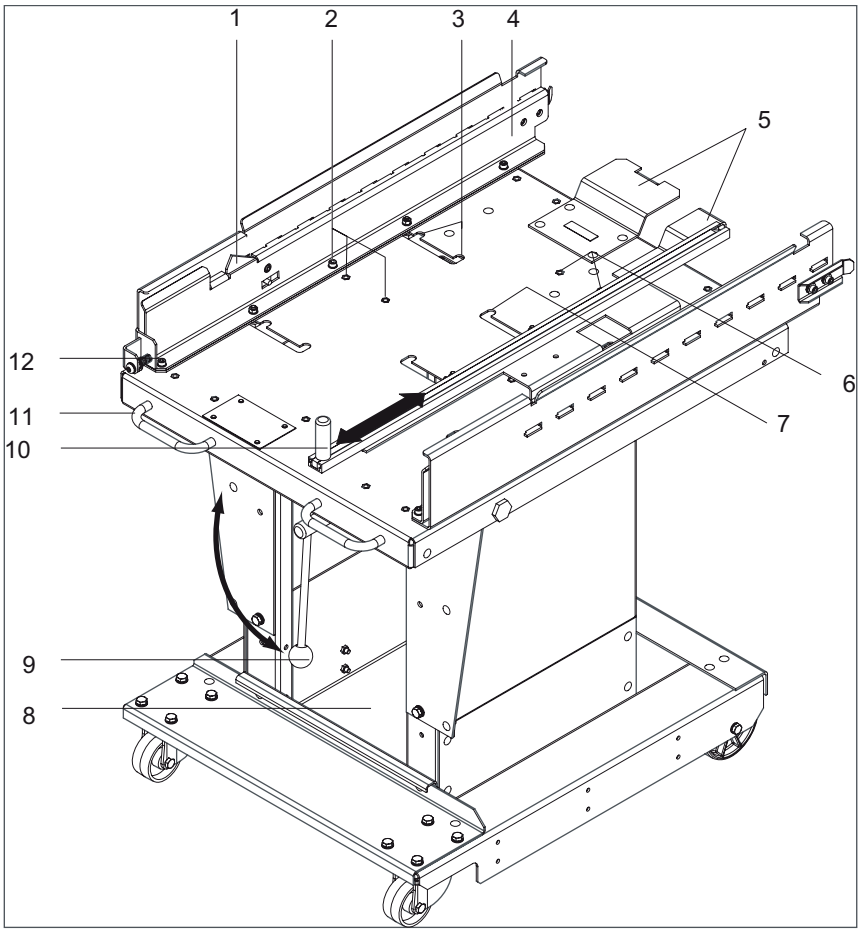


Figure 80
Transport trolley for truck

1 Autonomous interlocking of the racked-in truck on the trolley

2 Variable screw fastening of track

3 Positioning of track to adjust the various track widths

4 Track

5 Interlocking with panel

6 Variable screw fastening of unlocking bar

7 Positioning of unlocking bar to match various panel versions

8 Tray for accessories (lever, keys, handle)

9 Lever to lock / unlock the transport trolley on the panel. Table of trolley is lifted or lowered.

10 Unlocking bar. The truck is unlocked in the panel.

11 Handles of trolley

12 Slide to unlock the truck from the trolley

Rated volt-age Ur of the panel [kV]	Panel width [mm]	Truck	Item number of trolley
≤ 12	650/800	EvoPact HVX / UTX / MTX and CVX	EIB AE1 148-01(1)
	1000	EvoPact HVX / UTX (I_r = 2500 A)	EIB AE1 148-02
		EvoPact HVX / UTX (I_r = 3150 A)	AGS C74 125-01
≤ 17.5	750	EvoPact HVX / UTX / MTX and CVX	EIB AE1 148-01(1)
	1000	EvoPact HVX / UTX (I_r = 2500 A)	EIB AE1 148-02
		EvoPact HVX / UTX (I_r = 3150 A)	AGS C74 125-01(1)
24	800	EvoPact HVX / UTX / MTX and CVX	EIB AE1 148-01(1)
	1000	EvoPact HVX / UTX (I_r = 2500 A)	EIB AE1 148-02
(1) The trolley can be used for panel widths of 650, 750 and 800 mm.			

Adjusting the track width

Follow the steps to adjusting the track width:

1. Release 3 screws on each track (Figure 80, 2).
2. Adjust the two tracks to the appropriate panel track width and check them. Remount the six screws.
3. Adapt position of unlocking bar (10) also to the appropriate panel (same procedure).

Handling Crane for Circuit Breaker (Optional)

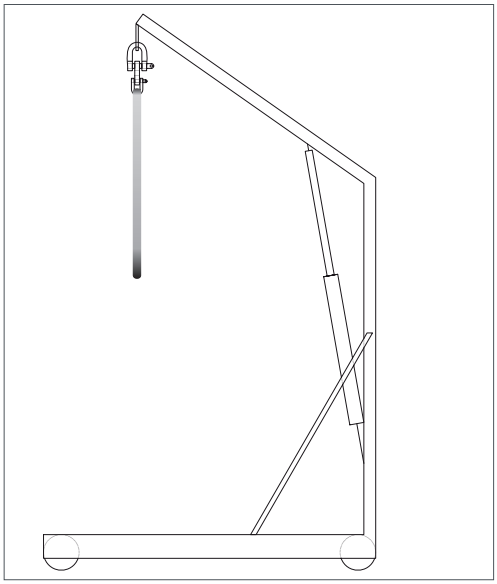


Figure 81
Handling crane for trucks Item no. AGSC73258-01

List of the Assembly Drawings

List of all assembly drawings specified in this manual. This does not apply to special modules or customer-specific special designs.

According to the switchgear configuration in question, only such drawings from the list are supplied by the factory as are actually required.

Description	Assembly drawing Chapter	Chapter
Panel fastening on concrete foundations	SEM102173-01	5.5
Screw-fastening the panels to one another	SEM102056-01	5.7
Mounting the low-voltage compartments	AGS C73 180-01	7.2
Mounting an additional cable duct	AMT 000 376-01	7.4.2

Schneider Electric
35 rue Joseph Monier
92500 Rueil Malmaison
France

+ 33 (0) 1 41 29 70 00

www.se.com

GEX2564100SWE-00(NORDICS)