# Medium Voltage Switchgear -PIX Easy Middle Rolling

Air Insulated Switchgear Withdrawable Circuit Breaker Vacuum Technology

# **User Guide**

06/2020





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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.

As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.

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## Safety Information

### Important Information

#### NOTICE

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

## **A** 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, installation and operation of electrical equipment, and has received safety training to recognize and avoid the hazards involved.

## Safety Provisions

Before performing work on the cubicle, it is essential that you comply with the following instruction:



#### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before removing covers and before performing assembly or maintenance work, make sure that you isolate the system from the high voltage and the supply voltage and that you ground it.
- Comply with the five safety rules:
  - $\odot\,$  Isolate from the power supply
  - $\sigma\,$  Make sure that unintentional restart (reclosing) is prevented
  - O Verify zero voltage
  - O Earth and short-circuit
  - O Cover or cordon off adjacent live components

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

## **WARNING**

#### HAZARD OF INJURY DUE TO MOVABLE PARTS IN MECHANICAL DRIVES

Before performing mounting and maintenance work:

- Isolate the system from the supply voltage.
- Release the circuit breaker's energy storing device by OFF-ON-OFF operation.
- Switch make-proof earthing switches to ON position.
- $\odot\,$  Do not remove the mechanisms during maintenance work.

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

## **WARNING**

#### HAZARD OF INJURY DUE TO SHARP-EDGED SHEET METAL AND METAL PARTS

During installation and maintenance work:

- Always wear the approved protective clothing in accordance with the valid accident prevention and work regulations.
- Always cover sharp edges.

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

## **A**CAUTION

#### HAZARD OF DEGRADED EQUIPMENT PERFORMANCE

- O Respect the handling rules and avoid any shocks to the device.
- Perform the maintenance and servicing operations described in the maintenance section of this guide.
- O Observe the normal service conditions described in this manual.
- If the disconnecting device, or the PIX Easy Middle Rolling equipment in which the disconnecting device is mounted, is stored before its final installation, observe the storage conditions.

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

#### Applicable standards and regulations :

- Metal-enclosed AC switchgear for rated voltages > 1 kV up to including 52 kV: IEC 62271-200 : 2011 Common specification: IEC 62271-1 : 2017
- Comply with the locally applicable accident prevention, operating and work instructions
- Assembly and maintenance: IEC 61936-1 : 2010
- Operation of electrical equipment: EN 50110-1 : 2013

**NOTE** : The national standards applicable in the country where the equipment is to be installed should be complied.

Other standards or regulations have to be checked and accessed locally.

#### Behaviour in case of incidents or accidents

For the case of an internal fault, the cubicle PIX Easy Middle Rolling is equipped with pressure relief ports which helps preventing the cubicle from bursting.

This technical manual does not include information regarding the safety of the buildings in case of internal faults (pressure load of the switchboard room and necessary relief ports). The pressure calculations for switchboard rooms incl. recommendations regarding pressure relief ports is provided on request against a fee. For further details, contact the manufacturer.

In case of fire or of internal faults, toxic and caustic decomposition products are produced. Comply with the locally applicable accident and safety provisions.

Ensure that first-aid measures are taken in case of injury to persons.

## **Before You Begin**

- This technical manual cannot be used to define or check the equipment's compatibility with every single user application, nor its reliability within it. It is the duty of every user or panel builder to perform a complete risk analysis, evaluation and testing of the products in specific applications in accordance with applicable standards.
- In order to ensure the right functioning of the device installed in the equipment, refer to your equipment manufacturer documentation.
- When the products are used in applications with specific technical and safety rules, you should follow the integration and protection rules for the specific application.

## A A DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate Personal Protective Equipment (PPE) and follow safe electrical work practices. Refer standards or local equivalent.
- The circuit breaker and the PIX Easy Middle Rolling 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 power supply to the circuit breaker, before working on or inside the circuit breaker.
- Always use a properly rated voltage sensing device to confirm power is OFF.
- O Use only genuine Schneider Electric specific tools (operating crank, extraction ramp...).
- Check all devices, covers and doors are in correct position before turning ON power to the circuit breaker and PIX Easy Middle Rolling equipment.
- Beware of potential hazards and carefully inspect the work area for tools and objects that may have been left inside the circuit breaker and the PIX Easy Middle Rolling equipment.
- o Do not modify the mechanical or electrical parts.
- O Do not operate the system with interlocks and protective barriers removed.

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

## A WARNING

### HAZARD OF DEGRADED EQUIPMENT PERFORMANCE

- O Respect the handling rules and avoid any shocks to the device.
- Perform the maintenance and servicing operations described in the maintenance section of this guide.
- O Observe the normal service conditions described in this manual.
- If the circuit breaker, or the PIX Easy Middle Rolling equipment in which the circuit breaker is mounted, is stored before its final installation, observe the storage conditions.

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

## About the Guide

### At a Glance

#### **Document Scope**

This user guide describes operation and maintenance of the air-insulated medium voltage switchgear units of the PIX Easy Middle Rolling cubicle series.

The operations described in this guide is only be performed by the qualified personnel with proven experience regarding.

- The PIX Easy Middle Rolling cubicle series
- All relevant safety provisions

This user guide is the integral part of the product and should be stored such that it is all time readily accessible and is used by persons who work on the switchgear. If the switchgear is relocated to another site, this guide should be passed on to the new operator along with the unit.

This guide does not describe every imaginable individual case or every customer-specific version of the product. Contact Schneider Electric for more information that is not included in the guide.

### Validity Note

This guide is valid for PIX Easy Middle Rolling cubicle. It is an extension of the standard PIX range and delivers performances up to 17.5 kV/31.5 kA/2500 A. It is equipped with a Vacuum Circuit Breaker and has other functional units like the metering device.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI and so on.), go to <u>www.se.com/green-premium.</u>

The information contained in this guide is likely to be updated at any time. Schneider Electric strongly recommends that you have the most recent and up-to-date version available on <u>www.se.com/ww/en/download</u>.

The technical characteristics of the devices described in this guide also appear online. To access the information online, go to the Schneider Electric home page at <u>www.se.com</u>.

#### Product Related Information

Air-insulated medium voltage switchgear units of the PIX Easy Middle Rolling Cubicle series are designed exclusively for switching and distributing electrical power. They are used in the scope of the specified standards and the switchgear-specific technical data. Any other utilization constitutes improper use will result in dangers and damage.

## **General Information**

## Glossary

### Acronymns

FU	Functional Unit (cubicle + mobile part)
IC	Incomer Cubicle
FD	Feeder Cubicle
BC	Bus Coupler Cubicle
BR	Bus Riser Cubicle
BM	Bus Metering Cubicle
BE	Bus Earthing Cubicle
VT	Voltage Transformer
PT	Potential Transformer
СТ	Current Transformer or Current Sensor
VPIS	Voltage Presence Indicator System
LV	Low Voltage
MV	Voltage Class, including levels 17.5 kV
ES	Earthing Switch

Mobile Part	
EasyPact EXE	Vacuum Circuit Breaker
MD	Metering Device

## Chapter 1 Design and Description

### PIX Easy Middle Rolling with EasyPact EXE Vacuum Circuit Breaker



1 Low voltage cabinet with control device

2 LV door

3 Metallic shutter for busbar side arm of circuit breaker connecting to molded seal-off spouts

4 Front circuit breaker compartment door

- **5** Vacuum circuit breaker
- 6 Door handle
- 7 Metallic shutter for line side arm of circuit breaker connecting to molded seal-off spouts
- 8 Breaker guiding rails
- 9 Insertion opening for operating lever of the earthing switch
- 10 Earthing switch position indicator
- 11 Mechanical interrogation interlock of insertion port for the earthing switch
- **12** Front cable compartment door
- 13 Voltage transformer with primary fuse
- 14 Surge arrester
- 15 Cable compartment cover
- 16 Phase barrier
- 17 Cable compartment
- 18 Earth switch with making capacity
- 19 Cable connections
- 20 Current transformers
- 21 Busbars

## Chapter 2 Functions and Characteristics

### What Is in This Chapter?

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## IC or FD Type Cubicle - Incomer or Feeder





- Busbars 1
- 2 Main switching device
- 3 Cable connections (rear access)
- Earthing switch 4
- 5
- Current transformers Voltage transformers (Optional) 6
- 7 Low voltage cabinet

IC or FD				
Rated voltage	Ur	(kV)	17.5	
Breaking capacity		(kA)	25	31.5
Rated current - vacuum circuit breaker		(A)		
	lr	800	Width	600 mm
	lr	1250	Width	600 mm
	lr	2000	Width	800 mm
	lr	2500	Width	800 mm
Rated peak withstand current	lp	(kA)	65	82
Short-time withstand current	lk	(kA)	25	31.5
	Duration	(s)	3	3
Dimensions	H <sup>(1)</sup>	(mm)	:	2300
	D <sup>(2)</sup>	(mm)		1660
Approximate mass		(kg)	80	0-1000
<sup>1</sup> With the standard LV cabinet				
<sup>2</sup> Add 500 mm for 2CT variant				

## BC Type Cubicles - Bus Coupler



- Busbars 1
- 2 Main switching device3 Lateral connections (connection to/from adjacent bus riser cubicle)
- 4
- Earthing switch Current transformers 5
- Low voltage cabinet 6

Bus Coupler				
Rated voltage	Ur	(kV)	17.5	
Breaking capacity		(kA)	25	31.5
Rated current - vacuum circuit breaker		(A)		
	Ir	800	Width	600 mm
	lr	1250	Width	600 mm
	lr	2000	Width	800 mm
	Ir	2500	Width	800 mm
Rated peak withstand current	lp	(kA)	65	82
Short-time withstand current	lk	(kA)	25	31.5
	Duration	(s)	3	3
Dimensions	H <sup>(1)</sup>	(mm)	2300	
	D	(mm)	16	60
Approximate mass		(kg)	650-	850
<sup>1</sup> With the standard LV cabinet				

## **BR Type Cubicles - Bus Riser**



- Busbars 1
- 2 3 4
- Withdrawable voltage transformer (optional) Lateral connections (connection to/from adjacent bus coupler cubicle)
- Low voltage cabinet

Bus Riser				
Rated voltage	Ur	(kV)	17.5	
Breaking capacity		(kA)		
Rated current		(A)		
	Ir	800	Width 6	00 mm
	Ir	1250	Width 6	00 mm
	lr	2000	Width 8	00 mm
	lr	2500	Width 8	00 mm
Rated peak withstand current	lp	(kA)	65	82
Short-time withstand current	lk	(kA)	25	31.5
	Duration	(s)	3	3
Dimensions	H <sup>(1)</sup>	(mm)	23	00
	D	(mm)	16	60
Approximate mass		(kg)	650	-850
<sup>1</sup> With the standard LV cabinet				

## BM Type Cubicles - Busbar Metering with Earthing



- Busbars 1
- Withdrawable voltage transformer Earthing switch 2
- 3
- 4 Low voltage cabinet

Busbar Metering				
Rated voltage	Ur	(kV)	17.5	
Breaking capacity		(kA)		
Rated current		(A)		
	lr	800	Width 6	00 mm
	lr	1250	Width 6	00 mm
	lr	2000	Width 8	00 mm
	lr	2500	Width 8	00 mm
Rated peak withstand current	lp	(kA)	65	82
Short-time withstand current	lk	(kA)	25	31.5
	Duration	(s)	3	3
Dimensions	H <sup>(1)</sup>	(mm)	23	00
	D	(mm)	16	60
Approximate mass		(kg)	650-	-800
<sup>1</sup> With the standard LV cabinet				

## Labels and Indicators on the Front Cubicle



- 1
- Knob for door lock Space for the panel rating label 2
- 3 Glass window to inspect circuit breaker
- 4 Push button with pad lock
- 5 Slider for rack-in/rack-out
- Rack-in/Rack-out lever insertion 6
- 7 Breaker position indicator

## Vacuum Circuit Breaker



- A Auxiliary terminal cover
- B Knock-out provision for auxiliaries
- C Front cover
- D Nameplate
- E Pushbuttons and indicators
- E1 Opening pushbutton
- E2 Closing pushbutton
- E3 Spring charged and ready-to-close indicator



- E4 Main contact position indicator
- **F** Operating mechanism charging handle
- G Operation counter
- H Operating instructions
- I Power connections
- J Auxiliary connection plug
- K Locking handles
- L Racking position indicator
- M Hole for crank insertion
- N Opening pushbutton
- Locking tabs
- P Shutter ramp
- Q IP Sheet
- R Door interlock



Figure 07

## Nameplate

The type designation of the switchgear panels on the nameplate specifies the essential technical data. To access this information, flash the QR code with your smartphone or your connected tablet. You will be directed to the website containing the data relating to your device. When submitting enquiries to the manufacturer or ordering spare parts, the following information is required:

- Type designation
- Serial number



- A Type designation
- B Serial number
- C Technical data
- **D** QR code with product information

## Label and Indicator of Earthing Switch



## **Metering Device**



- A Power connections
- B Auxiliary connection plug
- C Main front cover
- D Nameplate
- E Shutter ramp
- F Door interlock
- G Locking handles
- H Racking position indicator
- Hole for crank insertion
- J Push button to access hole for crank insertion



## Chapter 3 Operation

## What Is in This Chapter?

This chapter contains the following topics:

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Intended Use	27
Ambient and Operating Conditions	28
Operating Instructions	29

## **Operation Accessories**

#### Overview

The operation accessories are supplied with the panel. The panel is operated only by these accessories.







Figure 11 Standard double-bit key to lock/unlock the door of the low voltage cabinet



Figure 12 Operating lever for the earthing switch

Figure 13 Crank for circuit breaker and metering device



Figure 14 Transport trolley for circuit breaker insertion

Figure 15 Ramp for VT trolley insertion

### **Intended Use**

Air-insulated medium voltage switchgear units of the PIX Easy Middle Rolling with EasyPact EXE series are designed exclusively for switching and distributing electrical power. They are used in the scope of the specified standards and the switchgear-specific technical data.

#### **Disclaimer of Liability**

The manufacturer shall not be held responsible for damage which occurs if:

- Instructions in this Technical Manual are not complied with.
- The switchgear is not operated according to its intended use.
- The switchgear is assembled, connected or operated improperly.
- Accessories or spare parts are used which have not been approved by the manufacturer.
- The switchgear is converted without the manufacturer's approval, or if inadmissible parts are added.

No liability is accepted for parts provided by customers, for example current transformers.

#### Applicable Standards

Switchgear units of the PIX Easy Middle Rolling with EasyPact EXE series.

- Metal-enclosed; loss of service continuity category according to IEC 62271-200:2011 : LSC 2B-PM
- Type-tested
- Tested for internal faults (qualification IAC AFLR)
- Dimensioned for indoor installation.

PIX Easy Middle Rolling with EasyPact EXE switchgear units meet the following standards and regulations:

Designation	IEC Standard
Switchgear	IEC 62271-200 : 2011
	IEC 62271-1 : 2017
Internal Arc Classification (IAC)	IEC 62271-200 : 2011
Circuit breaker	IEC 62271-100 : 2017
Earthing switch	IEC 62271-102 : 2018
Disconnecter 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
Protection against accidental contact, foreign bodies and	IEC 62271-200 : 2011
water	IEC 60529 : 2013
High voltage fuse link	IEC 60644 : 2009
	IEC 60282 : 2009

The following table provides information about degrees of protection against accidental contact and foreign objects:

Degrees of protection against accidental contact and foreign objects according to IEC 62271-200:2011 and IEC 60529:2013		
Switchgear enclosure	IP4X	
Inner compartments	IP2X	

## **Ambient and Operating Conditions**

PIX Easy Middle Rolling with EasyPact EXE is an indoor switchgear and is only operated under normal conditions in according with IEC 62271-1 : 2017.

Operation under conditions deviating from this is only admissible upon consultation with the written approval of the manufacturer.

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

### Ratings of the PIX Easy Middle Rolling with EasyPact EXE Series

Rated voltage U <sub>r</sub>		kV	17.5	
Rated insulation level				
Rated power frequency withstand voltage $U_d$ 50 Hz - 1 min		[rms kV]	38	
Rated lightning impulse withstand voltage Up 1.2/50 µs		[kV peak]	95	
Nominal current and maximum short time withstand current <sup>1</sup>				
Functional unit with circuit breaker				
Short time withstand current	l <sub>k</sub> max.	[kA /3s]	31.5	
		[A]	800	
Dated surrent	LCB		1250	
Rated current	1 <sub>r</sub> CD		2000	
			2500	
Internal arc withstand (maximum value) AFLR		[kA/1s]	[31.5]	

<sup>1</sup> For functional units equipped with circuit-breakers, the breaking capacity is equal to the short time withstand current, In all cases, the device peak making capacity is equal to 2.5 times the short time withstand current

## **Operating Instructions**

For each Medium Voltage (MD) device (Vaccum Circuit Breaker (VCB) and Metering Device (MD)) you have at your disposal a user guide. It describes the operation, use and maintenance of the corresponding MV device, as well as its storage conditions.

GDE6209200	GDE6209300
Circuit Breaker Metering Device	
<section-header><section-header><text><text><text><text><text></text></text></text></text></text></section-header></section-header>	<section-header><section-header><section-header><section-header><section-header><section-header></section-header></section-header></section-header></section-header></section-header></section-header>
Figure 16	Figure 17

#### Interlocks with Padlock (not included in the scope of delivery)

Padlocks from 4 mm to 8 mm shank is accommodated:







## Interlocking using Key Locks (option)

### Withdrawable Part Keylocking

Depending on the function of the MV device, the racking device is keylocked:

• In Disconnected/Test position for the Vacuum circuit breaker (refer to the VCB user guide GDE6209200).





### Earthing Switch Keylocking

The earthing switch is keylocked in open position.



### Locking using an Electromagnet (option)

#### Locking the Racking Device Pushbutton

This function is achieved using a coil which blocks racking-in or racking-out operation. When the electromagnet is energized, the red pushbutton is activated and the racking device is racked in or out. When the electromagnet is not energized or the power supply is lost, the red pushbutton cannot be activated and the racking device cannot be racked in or out. The consignment and locking procedures should be defined by operating company.



Figure 25

#### Locking the Earthing Switch

The locking of earthing switch is made with an electromagnet located inside the MV compartment, which blocks manual switching operation.

• When the electromagnet is energized, it locks the earthing switch position selector in open position.



Figure 26

## Chapter 4 Access To The Main Circuit Compartments

### What Is in This Chapter?

This chapter contains the following topics:

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Moving Truck into Operating/Disconnected Position	57
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## **Overview of Access**

Access to the main circuit compartments of a feeder panel.



1	Access to Cable/CT/Earthing switch
2	Access to VT and Fuses
3	Access to Breaker/Shutter mechanism/Bushing
3 and 4	Access to Busbar
5	Access to Low voltage
## Access to Cable Compartment

# A DANGER

# HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Move the circuit breaker to disconnected position before opening the front circuit breaker compartment door.
- In case of incomers, there will be presence of voltage in cable compartment even if the circuit breaker is racked out. Ensure earthing switch is closed before opening.

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



#### Figure 28

#### Removing Procedure

Follow the steps for removing the cable compartment:

Step	Action
1	Close earthing switch, it is recommended to padlock in this position.
2	Dismantle by removing screws, keep in proper place for mounting after completion of planned activity.
3	Lift the cover.

### Mounting Procedure:

Follow the step for mounting the cable compartment :

Step	Action	
1	To place back into operation, carry out the operations in the reverse order of removal.	

# Access to Voltage Transformer and Fuses

Follow the steps for removal of voltage transformer:









NOTE: To place back into operation, carry out operations in the reverse order of removal.

# Access to Low Voltage

# **Opening Procedure**

Follow the step for opening the Low Voltage (LV) door:

Step	Action
1	Put the key and rotate anti-clockwise to open the LV door.



# Figure 30

# **Closing Procedure**

Follow the step for closing the LV door:

Step	Action
1	To place back into operation, carry out operations in the reverse order of opening.

# Opening and Closing the MV/CB Door

## **Opening Procedure**

Follow the steps for opening the MV/CB door:

Step	Action
I	Withdraw the device to TEST position, refer to the circuit breaker guide.
II	Close earthing switch.
III	Rotate the knob 90° anti-clockwise, the lateral lever is unlocked.
IV	Pull the door handle.
V	Open the MV/CB door.



- 1 Lock and unlock knob
- 2 Lever to unlock the front door
- 3 The front door is opened laterally
- 4 Access for manual unlocking only in case of emergency and breaker is not returning to TEST position

## Figure 31

#### **Closing Procedure**

Follow the step for closing the MV door:

Step	Action
1	To place back into operation, carry out operations in the reverse order of opening.

# Removing and Connecting the LV Plug

# **Removing Procedure**

Follow the steps for removing the LV plug:

Step	Action
1	Withdraw the device to TEST position, refer to the circuit breaker guide.
2	Open the MV door.
3	Pull interlocking slide of LV plug (01).
4	Remove the LV plug (02) from circuit breaker.
5	Store in the parking area (03).





# Figure 32

- Interlock 1
- 2 3 Removal of LV plug from circuit breaker
- Parking area

## **Connecting Procedure**

Follow the step for connecting the LV plug:

Step	Action	
1	To place back into operation, carry out operations in the reverse order of removal.	

# Removing the Truck from the Panel

Step	Action
1	Fix the transport trolley in front of the panel.
2	Move both truck handles inwards to unlock the truck in the panel (see the below figure).
3	Pull the truck carefully and remove it from the panel.

Follow the steps for removing the racking truck from the panel:

# Unlocking the truck in the panel



Figure 34

#### Inserting the Truck into the Panel

**NOTE:** Optionally trucks and panels are given matching coding. This helps to ensure that the truck is completely racked into a panel if the ratings do not match.

Follow the steps to insert the truck into the panel:

Step	Action
1	Move transport trolley with locked truck in front of the panel.
2	Align and lock transport trolley with panel.
3	Unlock the truck and push it towards the panel.
4	Move both truck handles outwards to lock the truck in the panel.

#### Insertion and Extraction of a Withdrawable Device

\Lambda CA	UTI	ON
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#### HAZARD OF CRUSHING

- Ensure the trolley is locked in panel before insertion of device.
- Ensure the device to be locked on trolley after extraction of device.

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

This section describes the insertion and extraction operations of your device that is used during installation or maintenance phases.

Depending on your equipment manufacturer, your device will be shipped inside or outside of your equipment. Refer to your equipment installation documentation to identify the case you are facing.

#### Insertion of a device

Before insertion, check the following:

- The correspondence of the device with the cubicle performances.
- The front lifting eyes should be put back to their down position.
- If required by your equipment manufacturer the rear lifting eye should be removed and stored close to the device operating area.
- The device is OFF/Discharged.



Figure 35 - a

Follow the steps for the insertion of a device:

Step	Action	
1	Rotate the tab to unlock the handle (see 1 in figure 35 - b).	
2	Pull door handle to open door (see 2 in figure 35 - b).	
3	<ul> <li>Open the circuit breaker compartment door (see 3 in figure 35 - b).</li> <li>NOTE:</li> <li>For PIX Easy switchboards, the door opening of the circuit breaker compartment is up to 120°.</li> <li>For ease of understanding, this door is no longer shown on the following drawings.</li> </ul>	
4	Check that the circuit breakers are installed in a clean cubicle in accordance with the service conditions, free of any installation scrap or items (tools, electrical wires, broken parts or shreds, metal objects, and so on) (see 4 in figure 35 - b).	
5	Check that the female LV connection plug is properly secured on the upper side of the circuit breaker compartment (see 5 in figure 35 - b).	
6	Move transport trolley with locked device in front of the panel (see 6 in figure 35 - b).	
7	Align and lock transport trolley with panel (see 7 in figure 35 - b).	
8	Unlock the device and push it towards the panel (see 8 in figure 35 - b).	
	Finure 26. b	
	rigule 35 - D	
Stop	Action	

Step	Action
9	Lock the device in position inside the circuit breaker compartment using the locking tabs (see 9 in figure 35 - c).

Step	Action	
10	Unlock and remove the transport trolley (see 10 in figure 35 - c).	
11	Connect the LV auxiliary connection plug on the device (see 11 in figure 35 - c).	
12	Pull door handle and close the circuit breaker compartment door (see 12 in figure 35 - c).	
13	Push door handle to fix door (see 13 in Figure 35 - c).	
14	Lock the door handle by rotating the tab (see 14 in figure 35 - c). To use the electrical control mode, the LV auxiliary connection plug should be connected to the device and auxiliary circuit should be energized.	
	Figure 35 - c	

## Extraction of a device

Before extraction, check the following:

- The device is in Disconnected/Test position.
- The device is open.

Follow the steps for the extraction of device:

Step	Description
1	Rotate the tab to unlock the door handle (see 1 in figure 36 - a).
2	Pull door handle to open door (see 2 in figure 36 - a).
3	Open the circuit breaker compartment door (see 3 in figure 36 - a). NOTE:
	<ul> <li>For PIX Easy switchboards, the door opening of the circuit breaker compartment is up to 120°.</li> </ul>
	• For ease of understanding, this door is no longer shown on the following drawings.



Step	Description
6	Move transport trolley in front of the panel (see 6 in figure 36 - c).
7	Align and lock transport trolley with panel (see 7 in figure 36 - c).
8	Unlock and pull the device out on the transport trolley (see 8 in figure 36 - c).

Step	Description
9	Lock the device on transport trolley (see 9 in figure 36 - c).
10	Unlock the transport trolley and remove it from panel (see 10 in figure 36 - c).
	Figure 36 - c

Step	Action	
11	Pull door handle and close the circuit breaker compartment door (see 11 in figure 36 - d).	
12	Push door handle to fix door (see 12 in figure 36 - d).	
13	Lock the door handle by rotating the tab (see 13 in figure 36 - d).	
	Figure 36 - d	

# **Accessing Busbars**

#### **Remove Truck and Partition Plate**

# A DANGER

### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Open the busbar compartment only if the busbar is grounded.
- For more information, refer to the circuit breaker and metering device user guide.

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

#### Accessing Procedure:

- 1. Withdraw the breaker to TEST position in upstream switchboard.
- 2. Close earthing switch of upstream, padlock in this position.
- 3. Withdraw the breaker to TEST position.
- 4. Close earthing switch.
- 5. Open MV/CB door.
- 6. Disconnect LV plug and remove the circuit breaker from MV compartment, keep it in a safe manner to use after the planned activity.
- 7. Open VT door.
- 8. Remove VT trolley, keep it in a safe manner to use after the planned activity.
- 9. Remove the screw and CB base and front tie assembly (partition of front unit).
- 10. Remove the screw and the partition plate between circuit breaker and busbar compartment.







1 Removal of truck from the panel

- 2 Removal of VT trolley
- 3 Removal of CB base and front tie assembly
- 4 Removal of partition plate

#### Figure 37

## Assembly Procedure:

To put back into operation, carry out the operations in reverse order of accessing.

# Interlocks

# A DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Complete switchgear interlocking can only be done with complete locking devices.
- You should be familiar with these interlocks before operating panels.

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

## **Mechanical Interlocks**

Interlocks	Function of Interlock	Method of Operation of Interlock
Between truck and LV plug	The truck cannot be actuated unless the LV plug is inserted.	Operating crank insertion access not available.
	The LV plug cannot be removed when the truck is not in disconnected position.	The MV door is closed and LV plug is locked.
Between truck and earthing switch	The truck cannot be racked in if the earthing switch is ON.	The opening in the front door for the truck crane is locked.
	The earthing switch can no longer be switched ON if the truck has left its disconnected position.	The slider near the earthing switch operating part is locked. The insertion of the earthing switch lever is blocked.
Between the circuit breaker and the truck	The circuit breaker cannot be racked in or out while it is switched ON.	Operating crank insertion access not available.
	The circuit breaker cannot be switched ON/OFF unless the truck is completely in its disconnected or service position.	The circuit breaker cannot be switched ON or OFF.
Between truck and cubicle	If the truck front frame is not locked in the cubicle, the truck cannot be actuated.	The crank cannot be inserted to the truck if both truck handles in the front frame are not moved outwards. Operating crank insertion access not available.
	If the truck has left its disconnected position the truck front frame cannot be unlocked in the cubicle.	Both truck handles in the front frame are locked.
Between truck and front circuit breaker compartment door	The front circuit breaker compartment door can only be opened if the truck is in its disconnected position.	The double-bit key cannot be turned. Provision available in the front door to open the interlock.
	If the front circuit breaker compartment door is opened, the truck cannot be moved into service position. This interlock is standard.	The crank cannot be inserted to the truck if the front door is opened.
	If the front circuit breaker compartment door is not locked by rotating the knob, the truck cannot be actuated.	The opening in the front door for the truck crank is locked.
Between front cable compartment door and earthing switch	The front cable compartment door can only be opened, if earthing switch is ON.	The door handle cannot be operated.
	Unless the front cable compartment door is close, earthing switch cannot be switched OFF.	Earthing switch handle cannot be inserted.

#### **Cable Earthing Switch Interlocks**

Interlocks	Function of Interlock	Method of Operation of Interlock
Incoming/Outgoing cubicle (mechanical key lock optional) between truck and earthing switch	Key lock fixed on the cubicle. Key required to switch on earthing switch. Insertion of earthing switch operating handle is blocked by the key lock.	The key lock helps preventing the operation of earthing switch lever until key is inserted. (Key should be brought from upstream/downstream).
Incomer cubicle (electrical) between truck and earthing switch	The insertion of the earthing switch operating handle is blocked using solenoid if the VPIS shows the presence of voltage in incoming side. Also upstream circuit breaker should be in disconnected position.	The solenoid plunger helps preventing the operation of earthing switch lever until it gets supply from the VPIS auxiliary contacts and upstream disconnected position contact. Supply to the solenoid is possible when there is no presence of voltage in incoming side. Both the conditions should be fulfilled.
Outgoing cubicle (electrical - optional) between truck and earthing switch	The insertion of the earthing switch operating handle is blocked using solenoid if the VPIs shows the presence of voltage in outgoing.	The solenoid plunger helps preventing the operation of earthing switch lever until it gets supply from the VPIS auxiliary contacts. Supply to the solenoid is possible when there is no presence of voltage in incoming side.

#### **Bus Earthing Switch Interlocks**

Interlocks (Bus earthing switch in outgoing feeder - optional)

Interlocks	Function of Interlock	Method of Operation of Interlock
Cable earthing switch in outgoing cubicles used for bus earthing (mechanical) key lock between incomer and other outgoing cubicle. No electrical interlock available	The insertion of the earthing switch lever (mounted inside cubicle) is free with the use of master key of key lock. The earthing switch is switched ON when identified outgoing circuit breaker truck is in service position and closed condition which will earth the bus.	Set of keys gets free from all cubicles other than the identified outgoing cubicle when all circuit breakers are in disconnected position. The master key is released from the key junction box by inserting the above set of keys which is used for making the earthing switch lever free.

#### Bus Earthing Switch for Bus PT and Bus Coupler

Interlocks	Function of Interlock	Method of Operation of Interlock
Bus PT and Bus coupler cubicle (mechanical) key lock. All feeders of the same bus should be in disconnected position. No electrical interlock is available.	Key lock fixed on the cubicle Key required to switch ON earthing switch. Insertion of earth switch operating handle is blocked by the key lock.	Set of keys gets free from all cubicles when all circuit breakers are in disconnected position. The master key is released from the key junction box by inserting the above set of keys which is used for switching earthing switch in Bus PT or Bus coupler cubicle.
Bus PT and Bus coupler cubicle (electrical) optional. All feeders of the same bus shall be in disconnected position.	The insertion of the earthing switch lever is blocked using solenoid unless all circuit breakers of all cubicles are completely in its disconnected position.	The solenoid plunger prevents the operation of earthing switch lever until it gets supply when all the circuit breakers of all the cubicles are completely in its disconnected position. Supply to the solenoid is possible when there is no presence of voltage in bus side.

#### Electromagnetic Interlocks (Optional)

- Electromagnetic blocking coils is used for inter-panel as well as interpanel interlocks:
- The circuit breakers ON and OFF push buttons are blocked.
- Manual actuation of the earthing switch is blocked.
- **NOTE:** In case of no supply voltage available, all electrical interlocks should be in their locked position. Action: Re-establish power supply.

The purchase contract and the switchgear-specific circuit diagram as regard the design of the interlocking systematics.

# **Operating Specifications**

#### **Overview**

The switchgear unit is only operated by the qualified personnel who have proven experience (training certificate) for the PIX series and all the relevant safety standards, refer to the Safety Provisions *(see page 68)*.

# **WARNING**

### HAZARD OF FAULTY SWITCHING OPERATIONS

- The operating sequences described below must be complied with.
- Each switching operation must be completed.

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

Check whether the supply voltage is ON.

#### NOTE:

• While the power supply is not available, blocking coils (locking the interrogation slides and circuit breaker push button, depending on design), are in locked position. An under-voltage release (optional) has dropped out.

Action: Re-establish the supply voltage.

• After each switching operation for which you have used a crank or a lever, remove this tool and store it in the tool board.

# Charging the Circuit Breaker Energy Storing Device

#### Initial situation:

Circuit breaker: OFF

Energy storing device: Released

## Charging by Hand

Follow the steps to charge by hand:

Step	Action
1	Open the cover and insert the crank.
2	Turn in direction of arrow until the charge drive mechanism is uncoupled (sounds). The energy storing device indicates the Charged condition.
3	Remove the crank.

#### Charging the Mechanism

Step	Description		
1	Manual charging		
	Pull down the charging handle six times until you hear the sound indicating that the closing mechanism is charged.		
	Figure 28 o		
2	Figure so - a		
-	Charges not OK: Activation MN: permanent opening order: intermediate position of racking device.		
	Charged OK: The circuit breaker is closed		
	Or         Or         Or		
	Charged OK		
	Device "ready to close".		
	Figure 38 - b		

## **Charging through Motor**

The energy storing device is charged automatically as soon as the motor supply voltage is applied. The position indicator of the energy storing device is in the charged condition, see figure 38 -b.

### Switching the Circuit Breaker Electrically

#### Switching ON (Closing)

Actuate closing release through by computer or remote control.

The energy storing device is charged immediately after switching ON (manually or by motor). If voltage is applied to the motor, charging is performed automatically.

### Switching OFF (Opening)

- Actuate the opening release through bay computer or remote control
- Under-voltage release or
- Secondary release

#### Position Indicators on Circuit Breaker and Possible Operating Sequences

Item	Position indicator device (closing s	r energy storing pring)	Position indicator O position	N/OFF switch	Possible operating sequence
1	₹ <b>-</b> t	Released		OFF	None
2	₹	Changed		OFF	C-O
3	Ž ←¥	Released		ON	0
4	₹ <del>→</del> ¥	Changed		ON	0-C-0
C = Switching ON (Closing) O = Switching OFF (Opening)					

# Moving Truck into Operating/Disconnected Position

#### **Overview**

# A DANGER

# HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Only rack isolate truck UTX and truck with jumper in and out when the busbar and outgoing feeder cable are in de-energized condition.

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

#### Initial Situation:

- Circuit breaker: OFF
- Earthing switch: OFF

#### Racking-in the Truck from Disconnected into Service Position

Follow the steps to rack-in the truck from disconnected into service position:

#### Manual Racking-in

SI. No.	Description		
1	(A) Slide the tab on cubicle door.		
	(B) Press the push button on cubicle door, which will apply an opening order to the circuit breaker.		
	If all interlocks are implemented, the following conditions are needed for the insertion hole of the crank to be opened:		
	<ul> <li>the racking device is locked in position</li> <li>the LV auxiliary connection plug is connected and locked</li> <li>the door is closed and locked</li> <li>the device is OPEN</li> <li>the earthing switch is OPEN</li> </ul>		
	Figure 39		



SI. No.	Description		
5			
	Device stroke [1] (mm)	Nos. of crank turns	
	230	74	
	Figure 43		

### Racking-out the Truck from Service into Disconnected Position

Follow the steps to rack-out the truck from service into disconnected position:

Manual Racking-out

SI. No.	Description		
1	<ul><li>(A) Slide the tab on cubicle door.</li><li>(B) Press the push button on cubicle door, which will apply an opening order to the circuit breaker.</li></ul>		
	If all interlocks are implemented, the following conditions are needed for the insertion hole of the crank to be opened:		
	<ul> <li>the racking device is locked in position</li> <li>the LV auxiliary connection plug is connected and locked</li> <li>the door is closed and locked</li> <li>the device is OPEN</li> <li>the earthing switch is OPEN</li> </ul>		
	Figure 44		





# Operating the Earthing Switch

# **Closing Operation:**

Initial situation: Circuit breaker: OFF Earthing switch: OFF Truck: Disconnected position

- 1. Push interlock slide (1) downward to allow access for inserting operating crank.
- 2. Insert operating crank and rotate upward.





Figure 49

# **Opening Operation:**

#### Initial situation:

Circuit breaker: OFF Earthing switch: ON Truck: Disconnected position

- Pull interlock slide (1) upward to allow access for inserting operating crank.
   Insert operating crank and rotate downward.



Figure 50

# **Standard Switching Operations**

### Operating the Outgoing Feeder Cable

#### Initial situation:

Circuit breaker: OFF

Racking device: In disconnected position

Earthing switch: OFF

#### Switching Outgoing Feeder Cable ON

Follow the steps to switch outgoing feeder cable ON:

Step	Action
1	Move truck into service position (see item 1 in the below figure).
2	Switch circuit breaker ON (see item 2 in the below figure).



#### Figure 51

#### Switching Outgoing Feeder Cable OFF

Follow the steps to switch outgoing feeder cable OFF:

Step	Action
1	Switch circuit breaker OFF.
2	Move truck into disconnected position.

## Earthing the Outgoing Feeder Cable

### Initial situation:

Circuit breaker: OFF

Racking device: In disconnected position

Earthing switch: OFF

Follow the steps to earth the outgoing feeder cable:

Step	Action
1	Check the branch circuit for zero voltage.
2	Switch the earthing switch ON (see item 1 in the below figure).





#### **De-earthing**

For de-earthing, switch the earthing switch OFF.

#### Coupling Busbar Sections Using the Bus Section Coupler

With Racking Device and Direct Bus Riser

## Initial situation:

Circuit breaker: OFF

Racking Device: In disconnected position

## Coupling busbar sections

Follow the steps to couple the busbar sections:

Step	Action
1	Move truck into service position (see item 1 in the below figure).
2	Switch circuit breaker ON (see item 2 in the below figure).



### Figure 53

#### Uncoupling busbar sections

Follow the steps to uncouple the busbar sections:

Step	Action
1	Switch circuit breaker OFF.
2	Move truck into disconnected position.

## Earthing the Busbar with Busbar Earthing Switch

#### NOTE:

- Observe switching positions (see page 56) and interlocking conditions (see page 52).
- Check the busbar for zero voltage

#### Initial situation:

Busbar earthing switch: OFF

## Earthing the busbar

To earth the busbar, switch the earthing switch ON (see item 1 in the below Figure).



## Figure 54

## De-earthing the Busbar

To de-earth the busbar, switch the earthing switch OFF.

# What Is in This Chapter?

This chapter contains the following topics:

Торіс	Page
Safety Provisions	68
Cleaning	70
Lubrication Instructions	71
Replacement of Components and Cubicles	

# Safety Provisions

# A A DANGER

## HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Maintenance work is only be performed by trained electricians with proven experience with the PIX Easy Middle Rolling series and the valid safety requirements.
- Before removing covers and before performing assembly or maintenance work, make sure that you isolate the system from the high voltage and the supply voltage and that you ground it.
- Comply with the five safety rules:
  - O Isolate from the power supply
  - O Make sure that unintentional restart (reclosing) is prevented
  - O Verify zero voltage
  - O Earth and short-circuit
  - o Cover or cordon off adjacent live components

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

# **WARNING**

# HAZARD OF INJURY DUE TO MOVABLE PARTS IN MECHANICAL DRIVES

Before performing mounting and maintenance work:

- $\circ\;$  Isolate the system from the supply voltage
- O Release the circuit breaker's energy storing device by OFF-ON-OFF operation
- o Switch make-proof earthing switches to ON position
- O Earth and short-circuit
- O Do not remove the mechanisms during maintenance work

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

# **WARNING**

HAZARD OF INJURY DUE TO SHARP-EDGED SHEET METAL AND METAL PARTS

During installation and maintenance work:

• Comply with the five safety rules:

- Always wear the approved protective clothing in accordance with the valid accident prevention and work regulations.
- O Always cover sharp edges.

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

#### Maintenance and Servicing Specifications

#### Overview

PIX Easy Middle Rolling series indoor switchgear units have been designed for normal operating conditions in accordance with IEC 62271-1 : 2017.

Outside normal conditions of use (between -5 °C and 40 °C, absence of dust, corrosive gas, and so on), it is recommended to examine with our Schneider Electric services center for the steps to be taken to ensure the correct functioning of the installation.

# NOTICE

HAZARD OF NON-COMPLIANCE TO TIGHTENING TORQUE

Tightening should be done with a calibrated torque spanner.

Failure to follow these instructions can result in equipment damage.

For more information, refer to the Specifications for Screw Connections (see page 77).

The elastic washers placed on the external sides of the connections and busbars helps to ensure better distribution of stress induced by the screw torque.

If no problems are detected and if the busbars and cable connections have not been modified, it is not necessary to check this again.

Our service centre is at your disposal at any time:

- to undergo an installation diagnostic
- to offer you, if need be, suitable maintenance operations
- to offer you maintenance contracts
- to offer you adaptations

For the other MV device maintenance, refer to the device user guide.

#### Inspection

# NOTICE

#### HAZARD OF INCORRECT LUBRICATION

- In case of frequent condensation or air pollution (dust, smoke or corrosive gases), the maintenance intervals must be adapted to the actual conditions.
- In case of dismantling, the elastic washers must be changed and replaced by the new ones which are supplied by Schneider Electric.

Failure to follow these instructions can result in equipment damage.

It is recommended to check the cubicles visually at regular intervals depending on the strain they are subject to during operation and in accordance with the national regulations.

A visual inspection includes a complete check of the cubicles by certified staff for contamination, condensation, and damage.

#### Maintenance

If there are signs of contamination or condensation, the cubicles should be cleaned in expert fashion (refer to the Cleaning *(see page 70)* and Avoid Condensation *(see page 70)* and subsequently the drives, interlocks, and position indicators are to be checked for proper functioning.

#### Repair

If damages are detected on the cubicles, they should be repaired or components should be replaced immediately (refer to the Replacement of Components and Cubicles *(see page 73)*.

In case of ambiguities or irregularities, contact the manufacturer's service centre immediately.

Maintenance Interval	Work to be carried out	Qualification/work performed by
4 years	<ul> <li>Clean and grease drives and movable main current contacts</li> <li>Check releases and blocking coils for proper function</li> </ul>	Staff who have been certified for this work
After 1000 actuations of the truck or the earthing switch	Revision of the switching device in question	Service centre manufacturer
Racking device Circuit Breaker EasyPact EXE	Refer to the applicable instruction m GDE6209200	anual for the racking device concerned.

# NOTICE

#### HAZARD OF NON-COMPLIANCE WITH MAINTENANCE AND SERVICING INSTRUCTIONS

Carefully follow the maintenance and servicing instructions.

Failure to follow these instructions can result in equipment damage.

# Cleaning

# A WARNING

HAZARD OF MOVABLE PARTS IN MECHANICAL DRIVE

Do not disassemble the drives for service and maintenance work.

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

# NOTICE

### HAZARD OF NON-COMPLIANCE TO CLEANING INSTRUCTIONS

To help to ensure the specified insulating level, the insulating components should be clean. On principle, cleanliness deserves the utmost attention.

When deposited dirt is detected, the cubicles should be cleaned in an expert manner.

When cleaning, ensure that the lubrication in the drive mechanism is not removed. If the drive mechanisms are no longer sufficiently lubricated, a new lubricant should be applied.

#### Use a dry cleaning cloth to remove slight soiling:

Clean using a dry lint-free cloth. Depending on the degree of soiling, replace cloth as often as necessary.

#### Use cleaning agent for severe soiling:

- Use only cleaning agent specified by the Schneider Electric (refer to the Lubrication Instructions *(see page 71)*). The use of other cleaning agent is not admissible.
- Wear protective gloves.
- Use cleaning agent according to manufacturer's instructions.
- Soak the cloth thoroughly and wipe the insulating components. Keep the duration of exposure as short as possible.
- Expose the cleaned surface to the air for at least two hours.

Failure to follow these instructions can result in equipment damage.

#### Avoiding Condensation

# NOTICE

#### HAZARD OF NON-COMPLIANCE TO ANTI-CONDENSATION INSTRUCTIONS

To help to ensure the specified insulating, the insulating components of switchgear panels should not be exposed to condensation.

#### Measures to take in case of condensation:

- If condensation is detected in or on the cubicles, clean the cubicles by following the steps given in Cleaning (see page 70).
- Installation or inspection of panel heating: It should provide a sufficient heating performance to avoid any condensation on the panels.
- Condensation can also be avoided by providing suitable ventilation and heating of the station or by using de-humidification devices.

Failure to follow these instructions can result in equipment damage.

#### **Corrosion Protection**

Drive mechanisms and covers have a long-term protection against corrosion. To avoid corrosion, repair immediately any damage to the paint, scratches, and other damage.

# **Lubrication Instructions**

# NOTICE

# HAZARD OF INCORRECT LUBRICATION

- o The bearings and joints must not be washed out by the cleaning agent.
- O The following elements must not be lubricated:
  - Motor
  - Ball bearings
  - Auxiliary releases
  - Push switches
  - Blocking coils
  - Auxiliary switches
- O Only approved lubricants are to be used.

#### Failure to follow these instructions can result in equipment damage.

Lubrication points (see figure 55)	Lubricants (refer to appendix)	Lubrication procedure
Sliding contact surfaces	Synthetic lubricant	Apply a thin and uniform film of lubricant
All accessible friction points and sliding surfaces	Synthetic lubricant	Clean lubrication points with lint-free cotton cloth. Apply a thin film of lubricant (using a paint brush).
Bearings and joints	Liquid lubricant	Pour drops of liquid lubricant (oil can, drip feed lubricator) into the bearing gap. Liquid lubricant gets between the bearing surfaces due to the capillary effect. In case of inaccessible lubricating points, use an extension tube or spray.

#### After the maintenance work is complete:

- Remove all the tools and auxiliary equipment used.
- Reinsert truck into the panel. For details, refer to the Inserting the Truck into the Panel.
- Reposition covers, close doors, and check switching functions.



#### Figure 55

- 1 Fixed contacts for the trucks
- 2 Earthing switch drive
- 3 Earthing switch contacts
- 4 Withdrawable voltage transformers (optional)
- 5 Tracks for the truck
- 6 Shutter mechanism
- 7 Truck (lubricate in accordance with lubricating instructions in the appropriate operating manual)
- 8 Transport trolley
## **Replacement of Components and Cubicles**

Drive mechanisms, current transformers, voltage transformers, testing and monitoring systems, and complete switchgear cubicles is replaced as required.

For any queries regarding Replacement of components or cubicles, contact the manufacturer's service centre.

For correct processing of your enquiry, the following data of the nameplate of the cubicle in question are required,

- Type designation
- Serial number
- Year of construction

# Appendix Auxiliary Products and Required Tools

### What Is in This Chapter?

This chapter contains the following topics:

Торіс	Page
Auxiliary Products	76
Specifications for Screw Connections	77
Required Tools	78

## **Auxiliary Products**

## NOTICE

HAZARD OF NON-COMPLIANCE TO AUXILIARY PRODUCT INSTRUCTIONS

You must use the referenced auxiliary products listed hereafter.

#### Failure to follow these instructions can result in equipment damage.

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

Auxiliary products	Reference number
Cleaning agent	S 008 152
Synthetic lubricant, 0.5 kg can	ST 312-111-835
Liquid lubricant FL, 0.5 kg can	S008153
Touch up pen RAL 9003, signal white, 50 ml	ST0430 and ST0431
Touch up pen, special paint (specify color shade)	S 009 562

#### **Treating Contact Surfaces**

## NOTICE

#### HAZARD OF NON-COMPLIANCE TO SURFACE CONTACT INSTRUCTIONS

To treat the contact surfaces:

- Contact areas must be subjected to preliminary treatment before screw fastening.
- Immediately after the pre-treatment, coat the contact surfaces sparingly with a thin and uniform film of synthetic lubricant. This helps to ensure that the space between the contact surfaces is filled after the screws are fastened.
- Be careful when handling bars insulated by heat-shrinkable sleeves. The heat-shrinkable sleeves should not get into contact with lubricant (swelling).
- Contact areas coated with synthetic lubricant should not be touched if possible.

Failure to follow these instructions can result in equipment damage.

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

(1) Clean using lint-free cloth, use cleaning agent in case of serious contamination.

(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 aluminum or exclusively for copper

(3) Using a brass brush or steel brush.

(4) Rub slightly by hand using scotchbrite abrasive agent (Nickel layer should not be reduced).

#### **Specifications for Screw Connections**

## NOTICE

#### HAZARD OF NON-COMPLIANCE TO SCREW CONNECTION INSTRUCTIONS

- The thread of screws and bolts should not be pretreated.
- Maximum tolerance for the effective tightening torques: ±15%.
- The nut should correspond in strength to the grade of the screw/bolt used or be of better quality.

Failure to follow these instructions can result in equipment damage.

#### **General Screw Connections**

		Grade or material	
Screw or bolt	Plastics	≥8.8 ≤10.9	Self-locking screw ≤8.8
Thread φ	Tightening torques (Nm)		
M4	0.25	2.6	-
M5	0.5	5.0	7.0
M6	0.8	8.8	12.3
M8	1.8	21.0	30.0
M10	3.5	42.0	59.0
M12	6.0	70.0	97
M 16	12	170	-

#### Screw Fastening for Power Transmission

Screws and bolts: Grade ≥8.8

Conductor material: copper		
Thread $\phi$	Tightening torques (Nm)	
M6	6.5	
M8	17	
M10	35	
M12	68	
M 16	135	
M20	200	

#### Screw Connection for Terminal Strips

Thread $\phi$	Tightening torques (Nm)
M2.5, 2.6	0.5
M3	0.7
M3.5	1.0
M4	1.5
M 5	2.5

## **Required Tools**

The following required tools are 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, M16, M20
- Screw driver and Philips screwdriver
- Cutting pliers
- Four crane straps/chains of L≥2000 mm each, capacity ≥1500 kg
- Lint-free, clean rags









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