

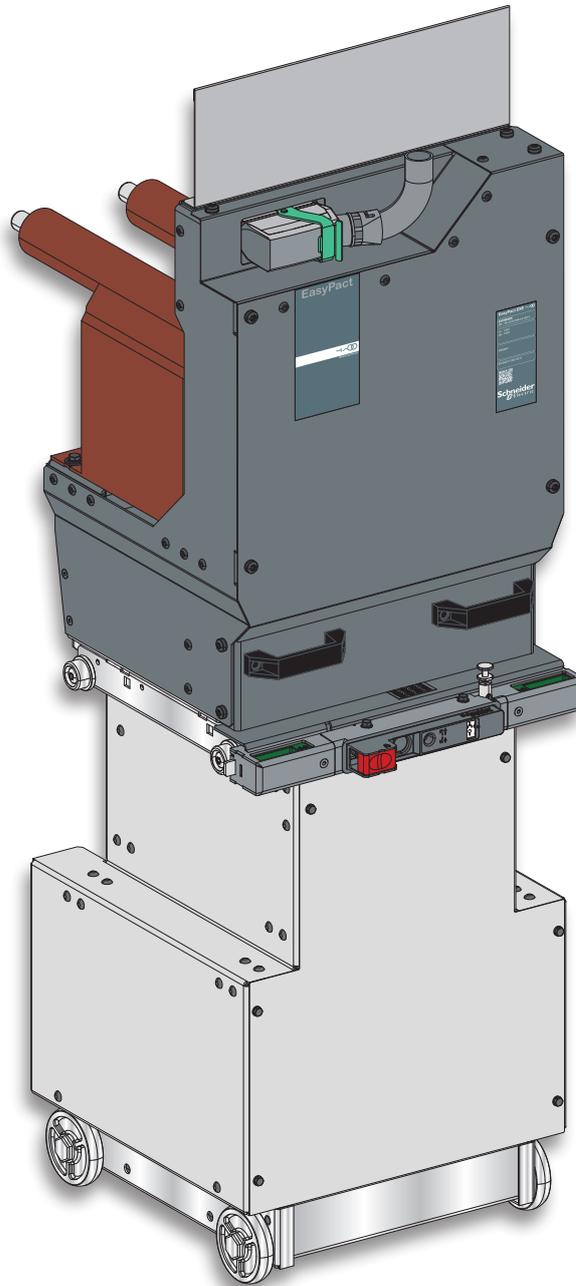
EasyPact EXE



Medium Voltage Metering Device (MD)
Up to 17.5 kV - 31.5 kA - 800 to 2500 A
for PIX Roll on Floor Switchboard

User Guide

GDE6209300-00
02/2020



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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

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 bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either 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. The safety alert symbol shall not be used with this signal word.

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.

Before You Begin

- This user guide is meant for qualified person who will operate the metering device: installer or end user. The generic term used in this guide for any such person is the USER.
- This user guide cannot be used to define or check the device's compatibility with every single user's application, nor its reliability within it. It is the duty of every user to perform a complete risk analysis, evaluation and testing of the products in specific applications in accordance with applicable standards.
- When the products are used in applications with specific technical requirements, integration and protection rules relating to these requirements are to be used.

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 Metering device and the PIX Roll on Floor 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 supplying this metering device before working on or inside the metering device.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, covers and doors before turning on power to this metering device.
- Beware of potential hazards and carefully inspect the work area for tools and objects that may have been left inside the metering device and the PIX Roll on Floor equipment.
- Do not modify the mechanical or electrical parts.
- Do not operate the system with interlocks and safety barriers removed.

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

CAUTION

HAZARD OF NON COMPLIANT CONDITIONS OF USE

- 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.
- Observe the normal service conditions described in this manual.
- If the metering device, or the equipment in which the metering device is mounted, is stored before its final installation, observe the storage conditions.

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

Overall information



Purpose of the document



This user guide is an integral part of the device. It describes the operation and use of the PIX Roll on Floor Metering device, as well as its storage and handling conditions. This document should be available at any times to those required to use or work on the metering device. If the device is sold after installation, this document should be given to the new owner.

It is required to read this manual carefully and follow its recommendations. However, this manual cannot describe every single condition of use or every variant specific to the customer.

Access to the technical documentation



Visit our website www.se.com:

- for downloading additional documents
- for contacting Schneider Electric customer support if you need information not contained in this document
- if you have any suggestions on how to improve this document.

Connect to <https://saferepository.schneider-electric.com>

Enter the reference number and the serial number of the device:

- for downloading "public documents" regarding EasyPact EXE
- for downloading "private documents" specific to the device.

You can access this information using the QR code located on the front cover of the metering device.

Limitation of liability



Schneider Electric cannot be held responsible for damage due to :

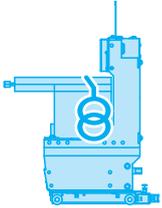
- failure to follow the instructions in this guide and additional documents
- improper use of the device
- improper assembly, testing, installation, connection or misuse of the device
- use of components or spare parts other than those recommended by Schneider Electric.



Introduction to EasyPact EXE

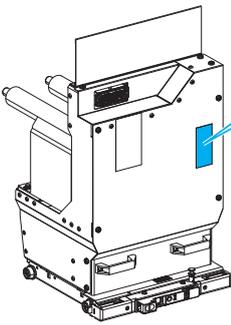
Presentation of Metering Device (MD)

Function



EasyPact EXE Metering Device is a device enabling measurement of Voltage presence on Busbars. Installed in a Medium Voltage cubicle, it measures the voltage and gives indication to Relay for overvoltage / undervoltage protection.

Nameplate



Commercial reference

SN : Serial number
Ur : Rated voltage
Up : Rated lightning impulse withstand voltage

Standard with date of issue

QR code

How to use the QR code

The serial number (SN) located on the nameplate is using 18 characters in order to be easy to understand.

Example: SE-2016-W44-5-0015.

To access to Safe Repository, enter the SN with its simplified 11 characters' format.

Example: SE164450015.

If you type the long description, it will be automatically convert in short description.

The QR code link implement the simplified format.

The QR code located on the nameplate grants access to all data relating to your metering device, from a Smartphone or a connected tablet:

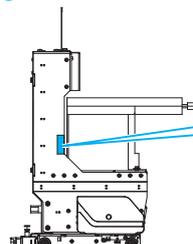
- serial number
- operating characteristics
- user guide
- warranty period
- ...

To access this information, read the QR code with your Smartphone or your connected tablet; you will be directed to the website containing the data relating to your device.

Follow the instructions to obtain personal access.

The serial number and the commercial reference also allow to access the information without Smartphone or connected tablets.

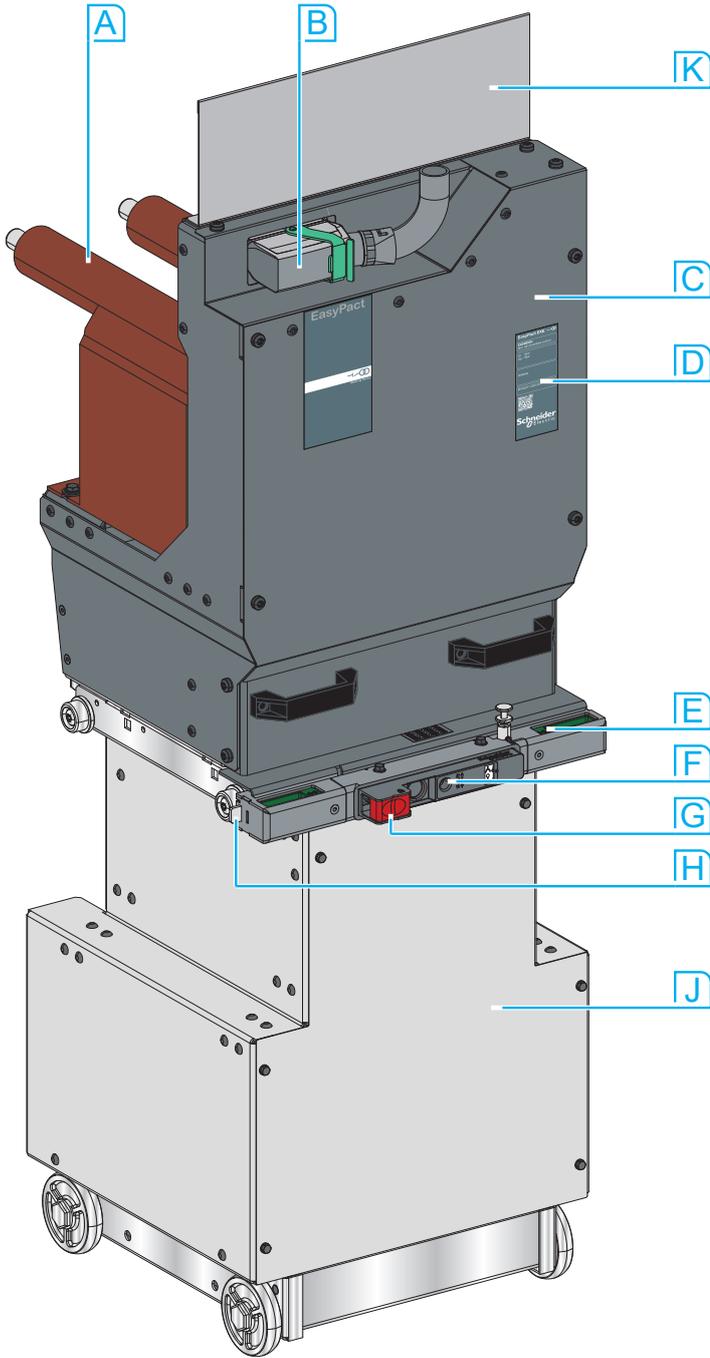
Identification plate



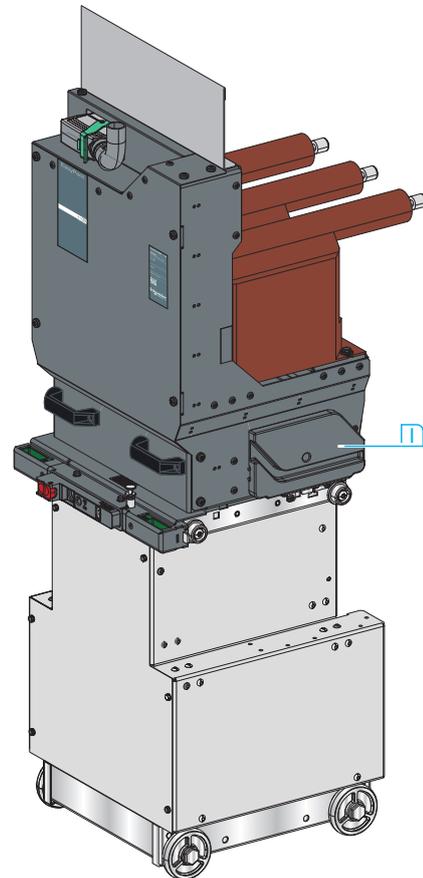
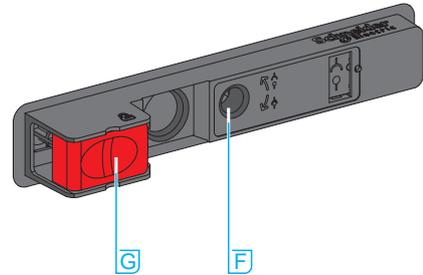
The serial number is also located on the right side of the metering device.

This allows to associate the front covers to the device. The datamatrix is used for internal Schneider Electric traceability.

Front view of Metering device

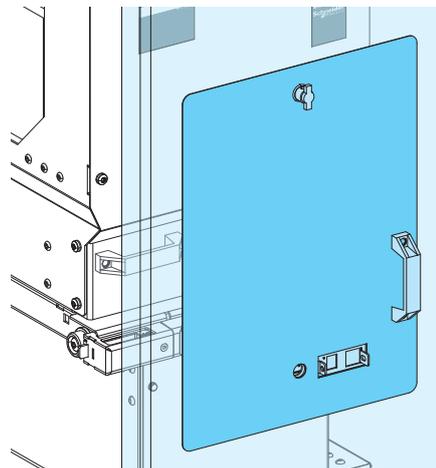
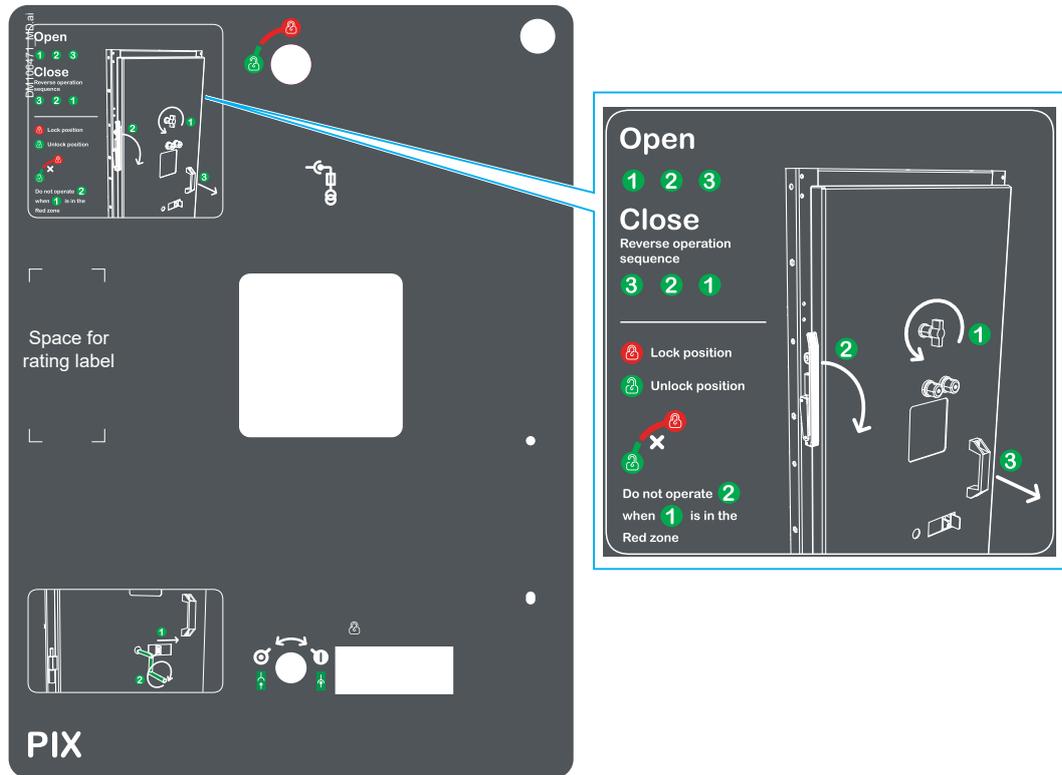


- A** Power connections
- B** Auxiliary connection plug
- C** Front cover
- D** Nameplate
- E** Locking handles
- F** Hole for crank insertion
- G** Pushbutton for Rackin Access
- H** Locking tabs
- I** Shutter ramp
- J** Roll on floor trolley
- K** IP Sheet



Operating Instructions

Label of racking device operating instructions



Label location on the metering device compartment door.

This label located on the front of the metering device compartment door recaps the racking-in and racking-out operations.

Service conditions

Normal service conditions

The device, including the auxiliary and control circuits which are part of it, is designed to operate according to its rated characteristics and the service conditions below:

Indoor device	
IEC 62271-200: 2011	
Ambient air temperature: <ul style="list-style-type: none"> • minimum value • maximum value • average measured over a 24-hour period 	-25 °C +40 °C ≤ 35 °C
Average relative humidity: <ul style="list-style-type: none"> • measured over a 24-hour period • measured over a 1-month period 	≤ 95 % ≤ 90 %
Average water vapor pressure: <ul style="list-style-type: none"> • measured over a 24-hour period • measured over a 1-month period 	≤ 2.2 kPa ≤ 1.8 kPa
Altitude above sea level	≤ 1000 m
Atmosphere	The ambient air is not significantly polluted by dust, smoke, corrosive and/or flammable gases, vapours or salt.

Other service conditions

If operated beyond the normal service conditions, the metering device is submitted to accelerated aging.

The Metering device may only be used under conditions other than the normal service conditions with express written permission from Schneider Electric.

Storage conditions and arrangements

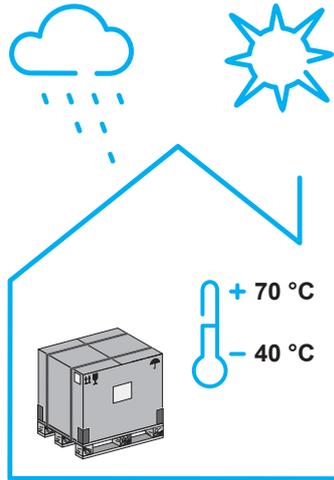
Storage conditions

⚠ CAUTION

HAZARD OF DEVICE DAMAGE

- If the device is to be stored, observe all storage instructions. The device is to be kept in the original packaging until final installation.
- Never install the device if damaged.

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



In order to preserve all of the device's characteristics when stored for prolonged periods, we recommend to store the device in its original packaging, in dry conditions, and sheltered from the sun and rain at a temperature of between -40°C and $+70^{\circ}\text{C}$. The maximum storage period is 12 months.

If the device was stored:

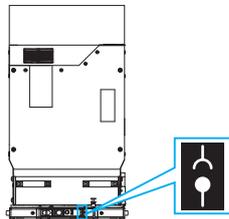
- between 6 and 12 months, perform basic level preventive maintenance to ensure a correct device operation.
- beyond 12 month, contact your Schneider Electric Service local representative for device check-up.

After unpacking, check the device carefully for:

- absence of broken or damaged parts
- absence of condensation marks or droplets
- absence of visible degradation (color change, rust, deposits, etc.).

In case of any degradation detected the metering device is not to be installed.

The metering device is to be stored in racked out position.

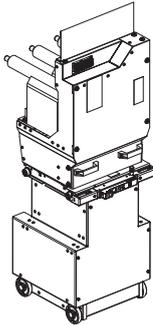
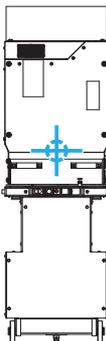
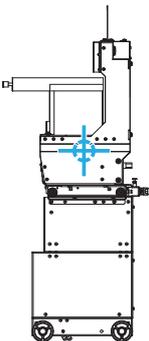
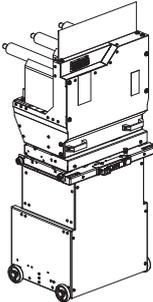
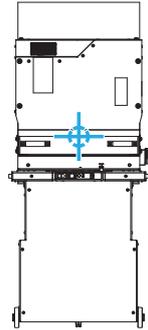
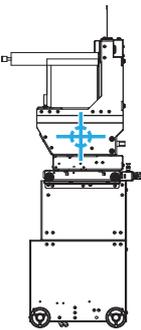


Handling

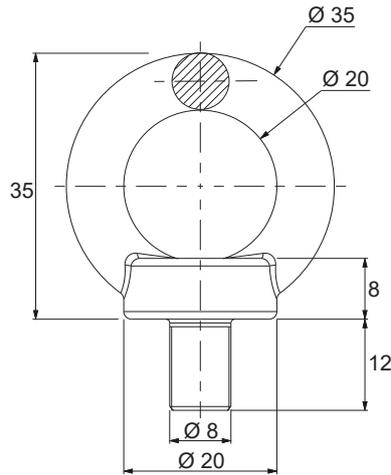
⚠ WARNING
<p>HAZARD OF FALL OR TIPPING OF THE DEVICE DURING UNLOADING OR HANDLING</p> <ul style="list-style-type: none"> • Apply appropriate personal protective equipment (PPE) and provide collective protection equipment (CPE) whenever required. Follow all safe work practices. • Do not try to catch the parcel if it falls. • Use handling equipment suitable for the dimensions and weight of the device. • Take into account the position of the center of gravity when handling the parcels or the device. <p>Failure to follow these instructions can result in death, serious injury or equipment damage.</p>

⚠ CAUTION
<p>HAZARD OF DEVICE DAMAGE</p> <p>Move the device with the utmost caution and avoid shocks.</p> <p>Failure to follow this instruction can result in injury or equipment damage.</p>

Position of Center Gravity

Rating	Mass	Centre of Gravity	
600 mm	 112 kg		
800 mm	 123 kg		

How to use the lifting eyes



Technical Drawing of Lifting Hook

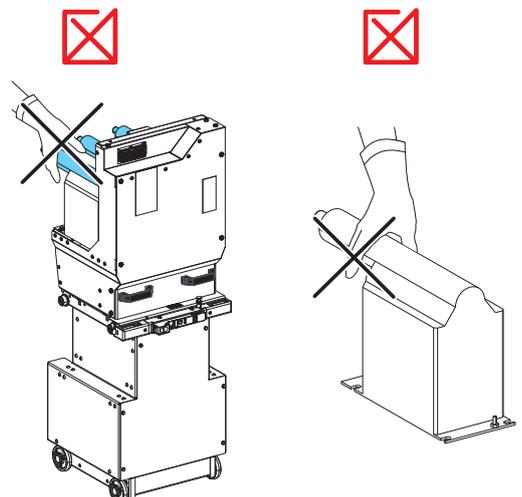
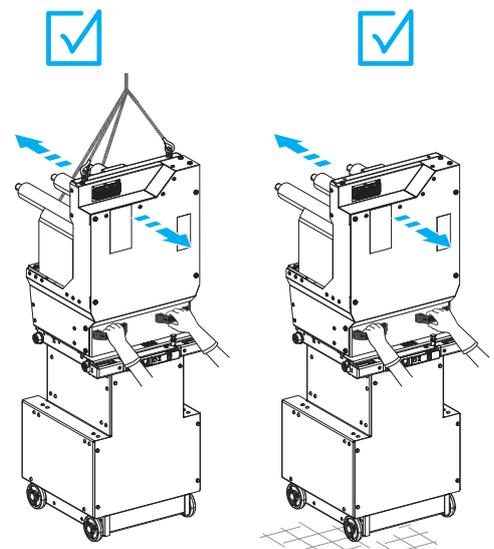
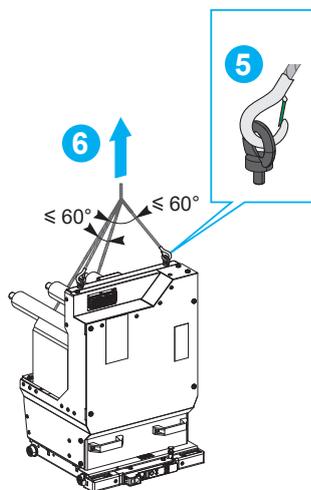
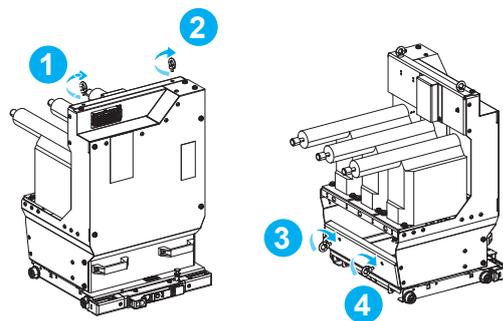
Assemble the Lifting hooks on the device at 4 locations shown. Lift the device using the 4 lifting eyes.

Never lift the metering device by placing forklift bars beneath the metering device frame.

Note: The four lifting hooks are to be removed before insertion of device in the cubicle and stored near the installation.

When handling, guide the device by the front cover.

Do not lift the metering device by the power connections.



Before energizing for the first time



A general check of the device takes only a few minutes and reduces the risk of mistakes due to errors or negligence.

Before energizing after installation or before re-energizing after an extended shut down, a general inspection of devices is to be performed.

⚠️ ⚠️ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Perform all the checks with the entire switchboard de-energized.
- Check on the switchboard that the Metering device's clamping elements have been removed.
- Check that the four lifting hooks are to be removed.
- Check that nameplate data is compatible with that of electrical installation.

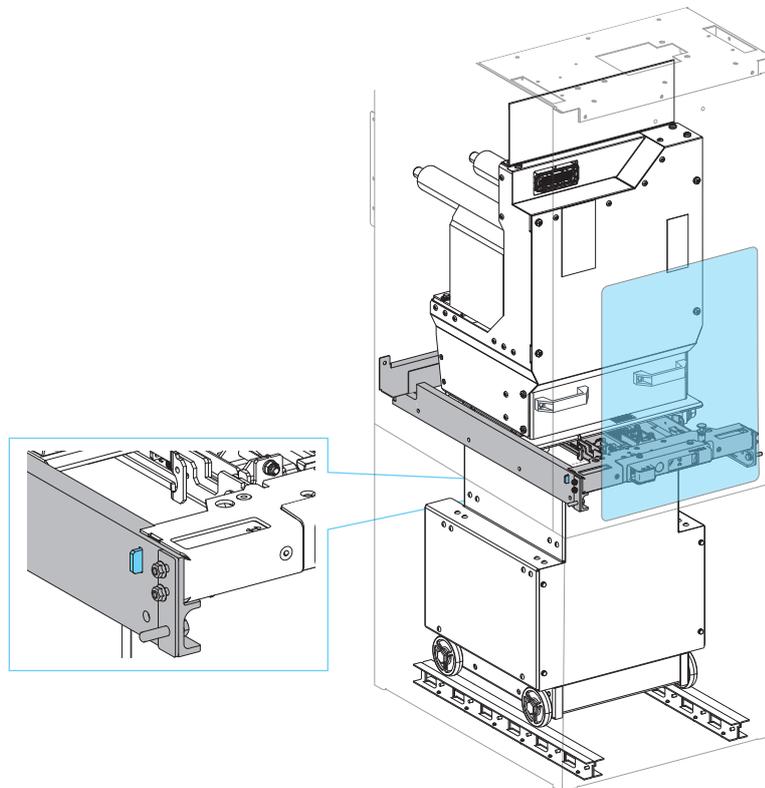
Failure to follow these instructions will result in death or serious injury.

The installer of your PIX Roll on Floor equipment should deliver a commissioning report before the first energizing of your electrical installation.

Switchboard inspection

Check that the switchboard and devices are in good serviceable condition. Ensure the switchboard and device are clean and free from scrap and foreign objects such as: tools, electrical cable, broken parts, metal objects...

The metering devices are shipped in their cubicles in service condition and they are attached by the two locking tabs of the racking device.



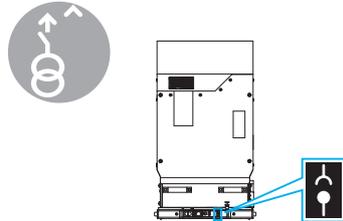
Conformity with the installation electrical diagram

Check that the devices match the installation diagram:

- ratings indicated on the nameplates.

Operating

Refer to your PIX Roll on Floor documentation and follow your switchboard commissioning rules.



The Metering device initial state is shown opposite.

Initial state for Metering device

Check the mechanical operation of the devices for every possible operation:

- rack in and rack out your device (according to the configuration of your switchboard)
- check the operation of the locking and interlocking.

Place back the metering device in its initial state waiting for the switchboard energizing.

Initialization of the maintenance information

Initialize the maintenance information in the maintenance log of your installation.



Using the EasyPact EXE

Understanding the Metering device controls and indicators

⚠️ ⚠️ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

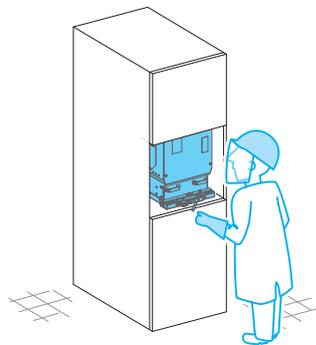
- Installation, repair and maintenance work on the device must only be carried out by qualified personnel.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.

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

Local control

A control of an operation is performed at a point on or adjacent to the controlled device.

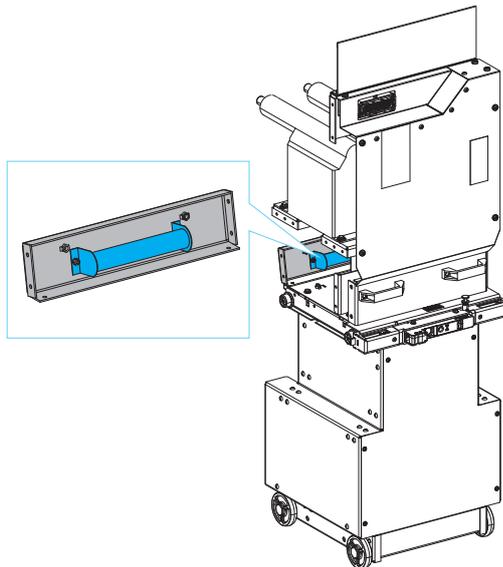
Mechanical control



A mechanical operation on the racking device allows you:

- to perform the metering device racking-in/racking-out.
- to operate the red pushbutton of the racking device.

VTs and Neutral earthing system



VT selection has been simplified to two :

- Isolated neutral system or not solid earthed (with: resistor, reactance, Petersen coil)
- the usage of a Damping resistor in the open delta of the tertiary winding is required. The Damping resistor is ideally to be installed in the MD.
- Solid earthed neutral system
- no risk of ferroresonance therefore no need of Damping resistor.

Fused Voltage Transformer

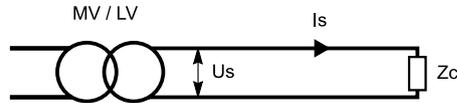
The VT fuse is there to protect the upstream MV system in the event of a VT failure, it is not intended to protect the VT from the MV network.

The fuse will blow due to VT failure as a result of overvoltage or internal short circuit of the VTs.

In the event of failure of a VT, the fuse will blow thus disconnecting the VT from the MV circuit. This can be detected as voltage will not be present on the secondary connections of the VT.

Voltage transformers (VT)

Voltage transformers (VT) meet standards IEC 61869-3. Their function is to supply a voltage proportional to the MV circuit that they are installed on to the secondary. The primary, which is parallel mounted on the MV network between phases or from phase to earth, is subject to the same overvoltages as the latter. The secondary supplies a voltage that is virtually constant, whatever the load. The secondary must never be placed in short circuit.



Simplified schematic diagram of a voltage transformer

Is: secondary current

Us: secondary voltage

Zc: load impedance.

Voltage transformers (VT)

Voltage transformers have two key functions:

- adapting the value of MV voltage on the primary to the characteristics of metering or protection devices by supplying a secondary voltage that is proportional and lower
- isolating power circuits from the metering and/or protection circuit.

Composition and type

The VTs are connected between phase and the earth comprise a primary winding, a magnetic core, one or several secondary windings, with everything encapsulated in an insulating resin.

Characteristics

These are defined by standard IEC 61869-3.

Insulation

Characterized by the rated voltages:

- insulation voltage, which will be that of the installation (e.g.: 12 kV)
- power frequency withstand 1 min (e.g.: 28 kV)
- impulse withstand (e.g.: 75 kV).

Rated frequency

50 or 60 Hz.

Rated primary voltage (Upn)

According to their design, voltage transformers are connected:

- between phase and earth and in this case $U_{pn} = U/3$ (e.g.: 10/3).

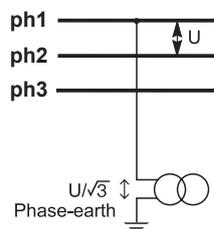
Rated secondary voltage (Usn)

This is equal to 100 or 110 V divided by 3 (e.g.: 100/3).

Accuracy power Pn

Apparent power (VA) that the VT can supply the secondary for the rated secondary voltage for which the accuracy is guaranteed (accuracy load).

Standardized values 30, 50, 100 VA (IEC).



Connection of a VT

Accuracy class

Defines the error limits guaranteed relative to the transformation ratio and the phase shift under specified conditions of power and voltage.

Voltage error (%)

Error that the transformer introduces into the voltage measurement when the transformation ratio is different from the rated value.

Phase shift or phase error (in minutes)

Phase difference between primary and secondary voltages, in angle minutes.

Rated voltage factor KT

This is the factor, a multiple of the rated primary voltage, which determines the maximum voltage which the transformer must meet the specified temperature rise and accuracy recommendations. The maximum operating voltage depends on the network neutral system and the earthing conditions of the primary winding.

Table of voltage factors KT

Voltage factor	Rated duration	Connection mode of the primary winding	Network neutral system
1.2	Continuous	Between phase and earth	Directly earthed
1.5	30 s		
1.2	Continuous	Between phase and earth	Earthed via a limiting resistor with automatic earthing fault elimination
1.9	30 s		
1.2	Continuous	Between phase and earth	Insulated neutral without automatic earthing fault elimination
1.9	8 h		

Table of voltage transformer characteristics

Characteristics	Rated values		
Insulating voltage (kV)	7.2	12	17.5
• power frequency withstand (kV) (1) 1 min	20	28	38
• lightning impulse withstand (kV - peak)	60	75	95
Frequency (Hz)	50 - 60		
Primary voltage U1n (kV) (divided by $\sqrt{3}$)	3 - 3.3 - 5 - 5.5 - 6 - 6.6 - 10 - 11 - 13.8 - 15		
Secondary voltage U2n (V)	100/ $\sqrt{3}$ - 110/ $\sqrt{3}$		
Accuracy power (VA)	15	30	50

(1) When there is a major difference between the highest voltage for the equipment (U_m) and the rated primary voltage, the power frequency must be limited to five times the rated voltage.

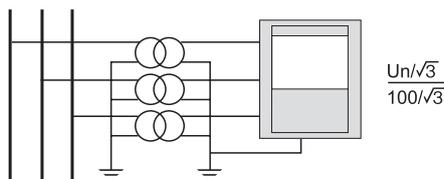
VT operating characteristics

The secondary voltage is virtually independent of the load, due to it being connected through a high impedance (virtually used in an open circuit).

Therefore, **the secondary must not be short circuited**. Under these conditions an excessively high current will damage the transformer.

VT connections

Star-connection of 3 transformers: requires 1 isolated MV terminal for each transformer.

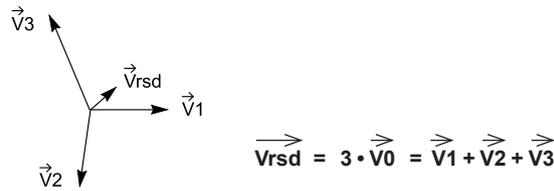


Star-connected VT and example of transformation ratio.

Residual voltage metering

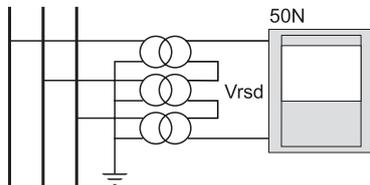
The residual voltage which characterizes the voltage of the neutral point relative to earth, is equal to the vectorial sum of the three phase-earth voltages.

The residual voltage is equal to 3 times the zero-sequence voltage V_0 .

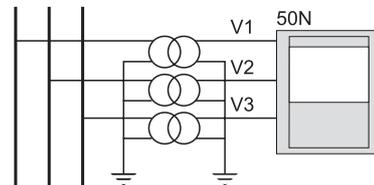


The appearance of this voltage signifies the existence of an earthing fault. It is obtained by measurement or by calculation:

- measuring by three voltage transformers whose primary circuits are star-connected and whose secondary circuits are open-delta connected, supplying the residual voltage ①
- calculation by the relay based on three voltage transformers whose primary and secondary circuits are star-connected ②.



① Direct measurement of the residual voltage



② Calculation of the residual voltage

Voltage transformer for metering

Accuracy class

These devices are intended to send an image as accurately as possible of the rated primary voltage between **80 and 120%** of the latter.

The accuracy class determines the permissible error in the phase and in the module in this range for the accuracy load.

It is valid for all loads of between 25 and 100% of the rated accuracy power with an inductive power factor of 0.8.

The table below gives the usual classes according to application.

Application	Class
Accurate laboratory metering applications (calibration devices)	0.2
Billing metering industrial measurements	0.2
Statistical switchboard metering indicators	0.5 - 1

- Class 0.5 corresponds to an error $\leq \pm 0.5\%$ for the rated primary voltage, with the accuracy load over the secondary.
- Class 1 corresponds to an error $\leq \pm 1\%$ in the same conditions.

For a given accuracy class, voltage and phase-shift errors must not exceed the values indicated in the table opposite.

Error limits according to the accuracy class

Accuracy class	Voltage error (ratio) $\pm \%$	Phase-shift error $\pm mn$
0.2	0.2	10
0.5	0.5	20
1	1.0	40

Example:

Metering voltage transformer $\frac{10000}{\sqrt{3}} / \frac{110}{\sqrt{3}}$, 50 VA, cl. 0.5

- rated primary voltage 10000 V/3, rated secondary 110 V/3
- accuracy power 50 VA
- accuracy class 0.5. The table of limit error values gives, under the specified conditions for the accuracy class:
 - a primary voltage 80% to 120% of the rated voltage (8 kV to 12 kV)
 - a load of between 25% and 100% of the accuracy power, i.e. between 12.5 VA and 50 VA with an inductive power factor of 0.8, the metering errors will be $\leq \pm 0.5\%$ for voltage and $\leq \pm 20$ min for phase shift.

Voltage transformer for protection

Accuracy class

These devices are intended to send an image that is as accurate as possible of the voltage in the case of a fault (voltage drop or overvoltage).

They must have the right accuracy and power for the fault voltages and therefore different from those used for instrument transformers.

In practice, the accuracy class **3P** is used for all applications and the error limits for voltage and phase given in the table below.

These are guaranteed for all loads of between 25 and 100% of the accuracy power with an inductive power factor of 0.8.

Error limits for each accuracy class

Accuracy class	Voltage error (\pm %) between		Phase shift error (minutes) between	
	5% Upn and KT	2% Upn and KT	5% Upn and KT	2% Upn and KT
3P	3	6	120	240
6P	6	12	240	280

KT: over-voltage coefficient.

Upn: rated primary voltage.

Example:

Protection voltage transformer $\frac{10000}{\sqrt{3}} / \frac{110}{3}$, 100 VA, 3P, KT = 1.9 8 h

- rated primary voltage 10000 V/3, rated secondary 110 V/3
- accuracy power 50 VA
- accuracy class 3P. The table of limit values shows that for:
 - a primary voltage of 5% of the rated voltage at KT times the rated voltage, i.e. $10000 : r3 \times 5\% = 289$ V at $10000 : r3 \times 1,9 = 10970$ V
 - a load of between 25% and 100% of the accuracy power, in other words of between 25 VA and 100 VA with a power factor of 0.8, the metering error will be $\leq \pm 3\%$ in voltage and $\leq \pm 120$ min in phase shift.

Connecting a VT

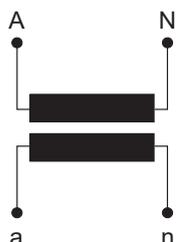
VT with a double secondary

A VT can have one or two secondaries (figure opposite), for the appropriate applications (protection and/or metering).

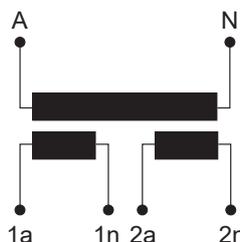
Identifying terminals

A VT is connected across the terminals identified according to the IEC:

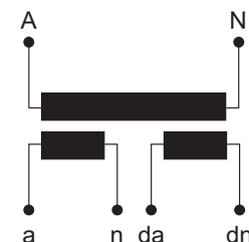
- A for phase and N for earth on the MV side
- a and n on the corresponding secondary side. In the case of a double output, the first output is shown by 1a and 1n, the second by 2a and 2n.



Single secondary for metering



Double secondary for metering



Double secondary for metering
Double secondary for Residual Voltage Protection

Calculating the power (VA)

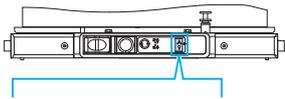
Indicative metering consumption

Device		Max consumption in VA (per circuit)
Voltmeter	Electromagnetic	5
	Electronic	1
Transducer	Self-powered	5
	External power	2
Meter	Induction	5
	Electronic	4
	Wattmeter, varmeter	5

Indicative protection consumption

Device	Consumption in VA (per circuit)
Static and digital overvoltage relay	0.2 to 1
Electromagnetic overvoltage relay	1 to 8

The different states

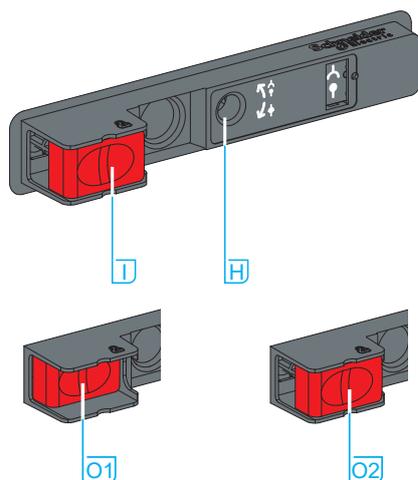


Racking position indicator	Metering device position	State description	Command available
		Service The Metering device connections are connected to the switchboard contacts, the LV auxiliary circuit is connected, and the compartment door is closed and locked.	<ul style="list-style-type: none"> Racking-out (refer to page 33)
	<p>Racking-in ←</p> <p>→ Racking-out</p>	Intermediate The Metering device is moving from the disconnected position to the service position or vice versa. The compartment door is closed and locked and the LV auxiliary circuit is connected.	<ul style="list-style-type: none"> Racking-in (refer to page 32) Racking-out (refer to page 33)
		Disconnected/test The Metering device is inside the compartment ; its power connections are separated from the switchboard contacts by shutters, the LV auxiliary circuit is connected and it is possible to open the compartment door.	<ul style="list-style-type: none"> Racking-in (refer to page 32)
		Removed The Metering device is extracted from the switchboard.	

The following table describes the functions available on EasyPact EXE Metering device:

Metering Device positions				
		<p>Racking-in ←</p> <p>→ Racking-out</p>		
Parts	Service	Intermediate	Disconnected/test	Removed
Locking tabs	Locked	Locked	Locked	
LV connection plug	Connected	Connected	Connected / Disconnected	Disconnected
Compartment door	Closed and Locked	Closed and Locked	Unlocked	Unlocked
Earthing switch mechanical link position	Earthing switch OPEN	Earthing switch OPEN	Earthing switch OPEN	Earthing switch OPEN
			Earthing switch CLOSED	Earthing switch CLOSED
Shutters	OPEN	OPERATING	CLOSED	CLOSED

Opening pushbutton



The red opening pushbutton of the racking device **I** allows clearing the access to the crank hole **H**.

The two positions of this pushbutton are shown opposite:

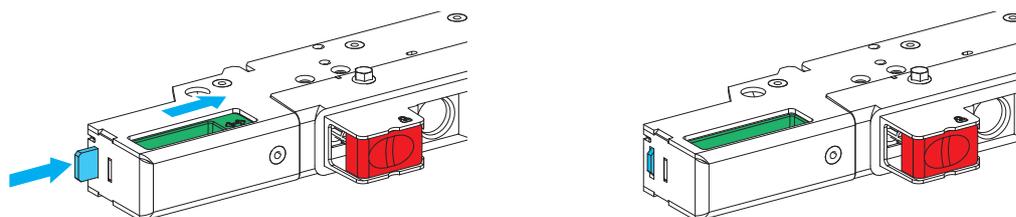
- **O1** pressed-in position after the button was pushed or while the crank is inserted in the racking device
- **O2** resting position

Operation of locking tabs

The locking tabs allow the locking of the metering device inside the compartment or on the extraction table.

At rest (without any manual action on the locking handles), the locking tabs are out.

To unlock the metering device, manually push the locking handle to pull in the locking tabs.



When the device is in intermediate or service positions the locking tabs are blocked and cannot be operated.

Insertion and extraction

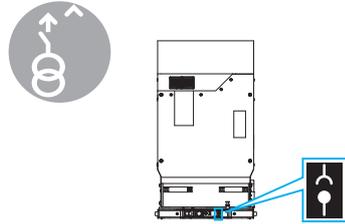
This section is describing the insertion and extraction operations of your device that can be used during installation or maintenance phases.

Metering device will be shipped inside your PIX Roll on Floor equipment and it will be in "Service" position. Refer to the PIX Roll on Floor documentation to identify the case you are using.

Insertion of a device

Before insertion, check:

- the correspondence of the device with the cubicle performances.
- all lifting hooks have been removed.

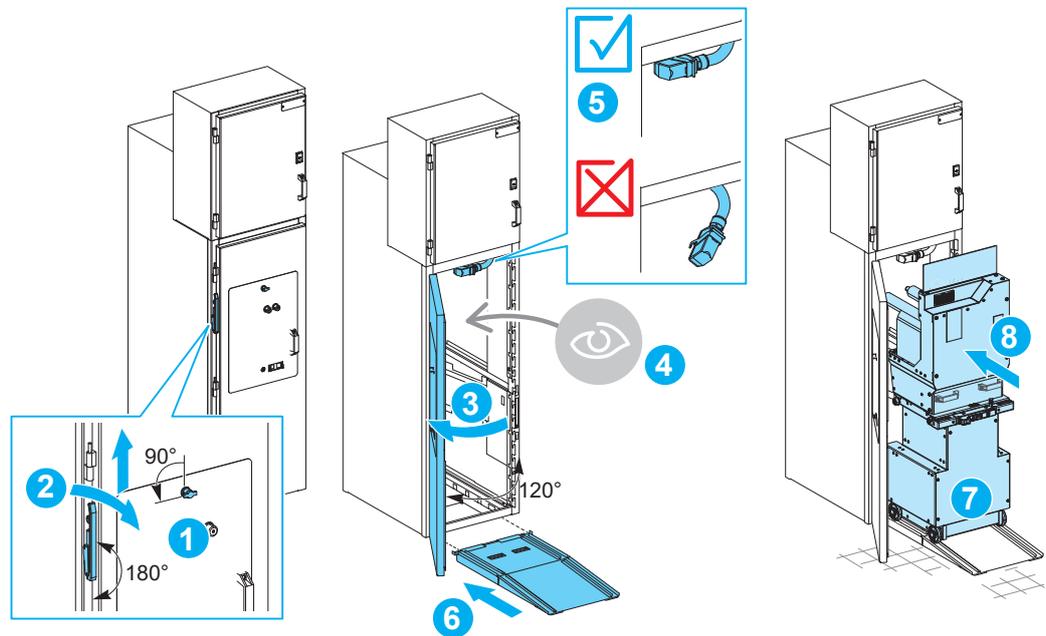


1. Rotate 90° counterclockwise the locking tab to unlock the handle.
2. Pull down the door lifting handle.

Open the metering device compartment door.

Note: For PIX Roll on Floor switchboards, the door opening of the metering device compartment is up to 120°.

3. Check that the metering device is 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, etc.).
4. Check that the female LV connection plug is properly secured on the upper side of the metering device compartment.
6. Put the ramp and align it with the metering device compartment door.
7. Put the device on the ramp.
8. Push the device into the metering device compartment.

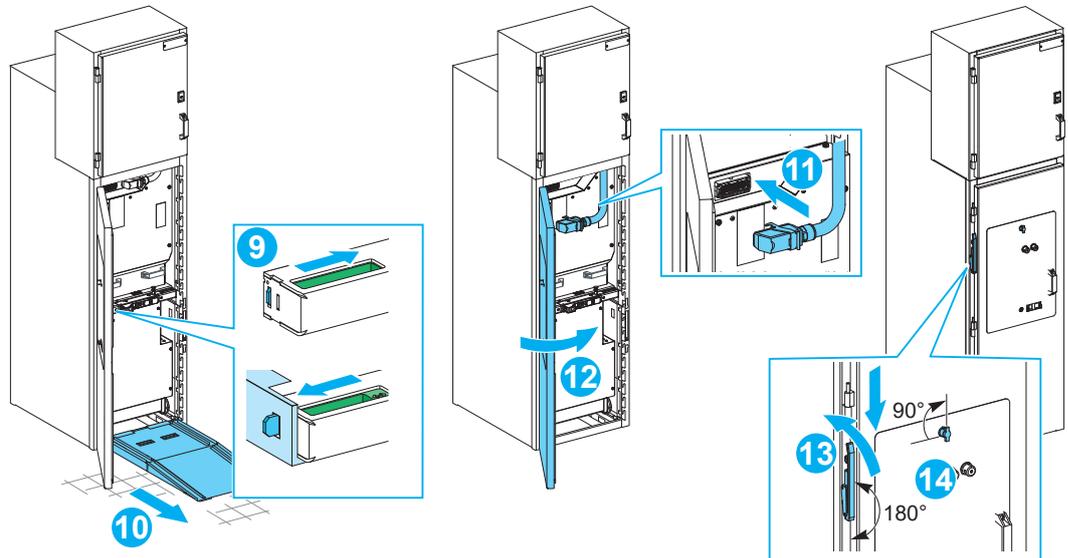


⚠ CAUTION

CRUSH HAZARD

Ensure not to get your fingers caught when pushing the device inside the metering device compartment.

Failure to follow this instruction can result in injury or equipment damage.



9. Lock the device in position inside the metering device compartment using the locking tabs.

10. Remove the ramp.

11. Connect the LV auxiliary connection plug on the device.

12. Close the metering device compartment door.

13. Pull up the Door Lifting Handle to lock the Metering Device compartment door.

14. Lock the door lifting handle by rotating clockwise 90° the locking tab.

For electrical control, ensure the LV auxiliary connection plug is connected and locked in position and that the LV circuit is energized.

Extraction of a device

Before extraction, check:

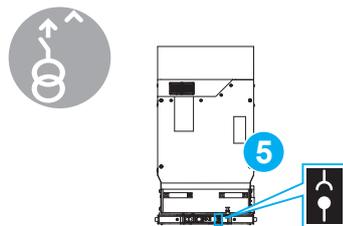
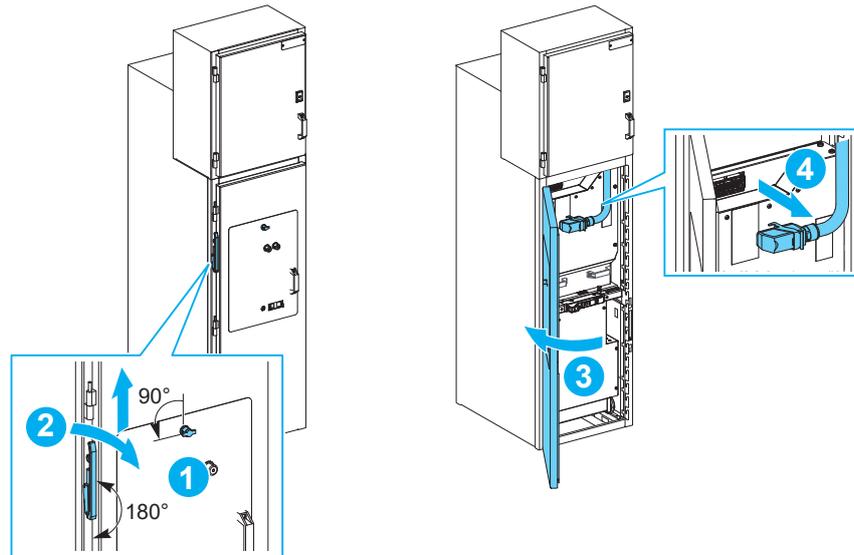
- the device is in disconnected/test position

1. Rotate 90° counterclockwise the locking tab to unlock the door lifting handle.
2. Pull down the door lifting handle.

Open the metering device compartment door.

Note: For PIX Roll on Floor switchboards, the door opening of the metering device compartment is up to 120°.

3. Disconnect LV auxiliary connection plug of the device and put it on the upper side of the circuit breaker compartment.



5. Check the device indicators and, if necessary, operate the metering device mechanically to place it in the disconnected/test position.

- Put the ramp and align it with the metering device compartment door.

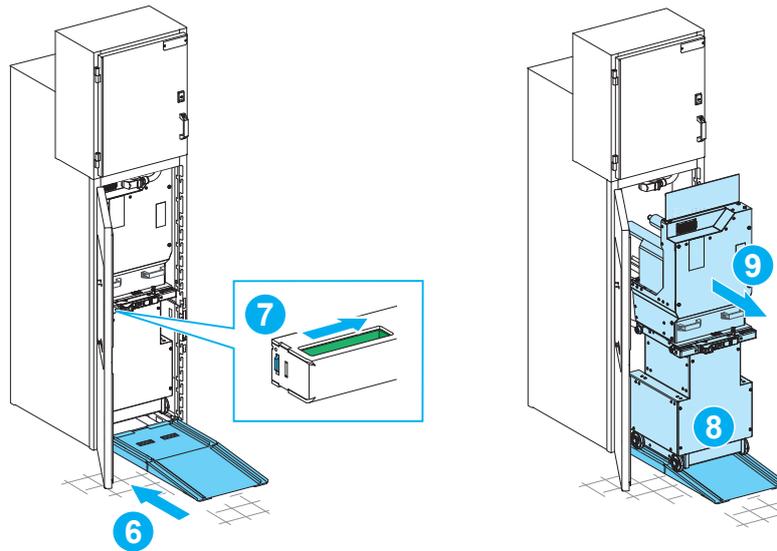
⚠ CAUTION

CRUSH HAZARD

Ensure not to get your fingers caught when pushing the device inside the metering device compartment.

Failure to follow this instruction can result in injury or equipment damage.

- Unlock the device from its position inside the metering device compartment.
- Pull the device out on the ramp.



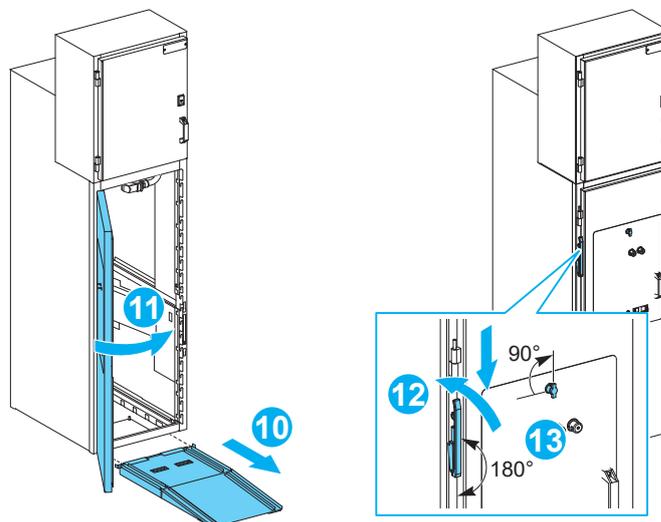
⚠ WARNING

LOSS OF PROTECTION HAZARD

Close the door's shutter when the metering device is extracted.

Failure to follow this instruction can result in death, serious injury.

- Take off the device from the ramp.
- Remove the ramp.
- Close the metering device compartment door.
- Pull up the Handle to lock the Metering Device compartment door.
- Lock the handle by rotating clockwise 90° the locking tab.



Door interlocking mechanism

⚠ ⚠ DANGER

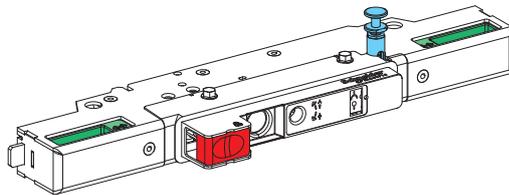
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Always keep the metering device compartment door closed when racking the device from one position to another.
- When the metering device is connected to the main power circuit, always use the controls with the metering device compartment door closed.

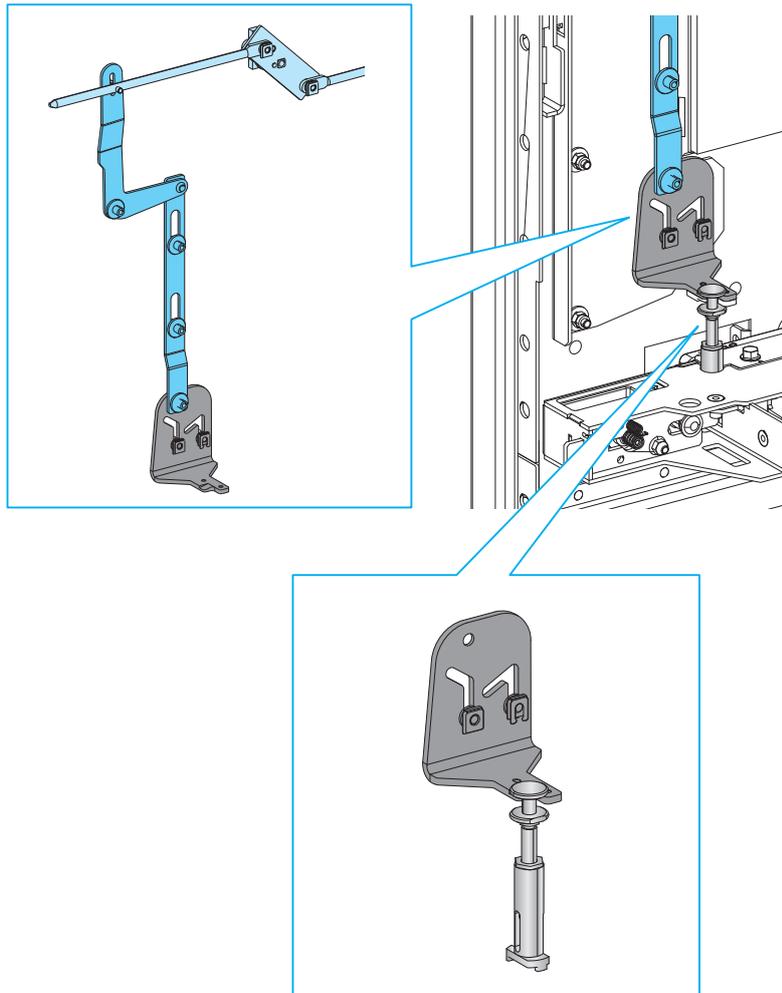
Failure to follow these instructions will result in death or serious injury.

When the door of the metering device compartment is closed and locked, the door locking mechanism interacts mechanically with the racking device mushroom and enables the racking-in movement.

During the racking-in or the racking-out, the door handle is locked to prevent the door opening. The door handle can be unlocked only if the metering device is in the "Disconnected/test" position.



Racking device mushroom fitted in its connecting rod.



View from the interior of the metering device compartment: door locking mechanism and racking device mushroom.

The following table resumes the opening and closing operations of the metering device compartment door.

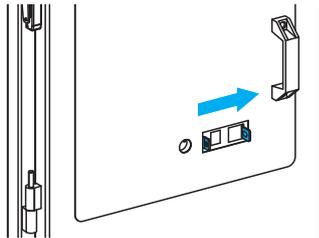
Door, Door Lifting Handle and its locking tab	Door Locking Mechanism & Mushroom	Metering device and its compartment status

Manual Racking-in

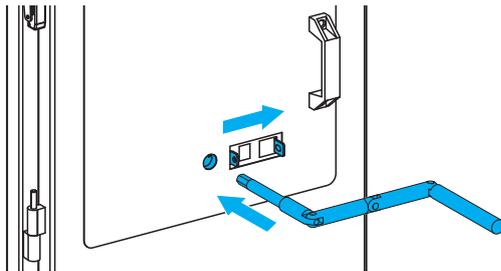
⚠ CAUTION
HAZARD TO USE INAPPROPRIATE RACKING CRACK
Operate the racking device, only with the genuine Schneider Electric racking crack.
Failure to follow this instruction can result in injury or equipment damage.

1. Sliding the tab on cubicle door will allow the access to the insertion hole of the crank. If all interlocks are implemented, and the lock on the tab is removed (in any) the following conditions are needed for the insertion hole of the crank to be opened:

- the racking device is locked in position
- the LV auxiliary connection plug is connected and locked
- the door is closed and locked
- the earthing switch is open

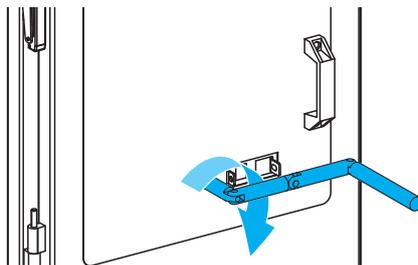


2. Maintain the effort on the tab and insert the crank.



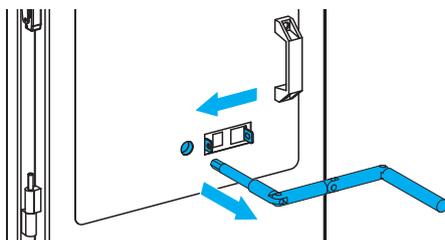
3. Turn the crank clockwise until the racking device state indicator move to the position below.

Note: The crank can be extracted from the hole at any time prior the end of the racking-in, but this action stops the operation. Operation can be resumed by reinserting the crank after sliding the tab on cubicle door.



4. Remove the crank.

The device is in the service position.



Device stroke (mm)	Nos. of crank turns
230	38

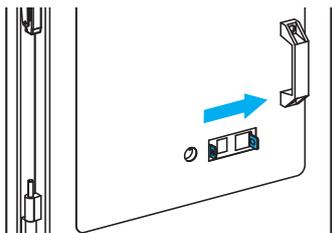
Manual Racking-out

⚠ CAUTION

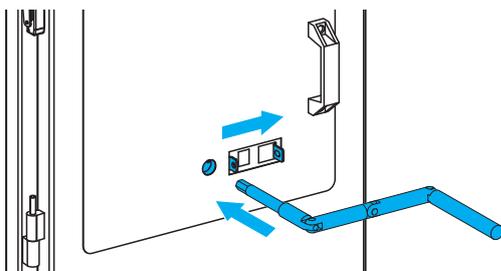
HAZARD TO USE INAPPROPRIATE RACKING CRANK
 Operate the racking device, only with the genuine Schneider Electric racking crank.
Failure to follow this instruction can result in injury or equipment damage.

1. Sliding the tab on cubicle door will allow the access to the insertion hole of the crank. If all interlocks are implemented, and the lock on the tab is removed (in any) the following conditions are needed for the insertion hole of the crank to be opened:

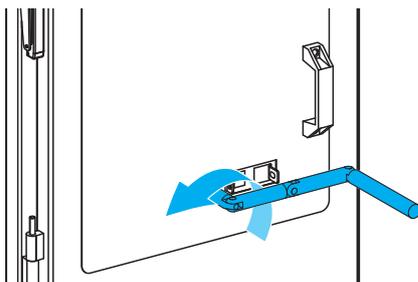
- the LV auxiliary connection plug is connected and locked
- the door is closed and locked



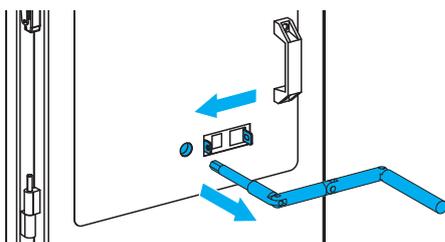
2. Maintain the effort on the tab and insert the crank.



3. Turn the crank anticlockwise until the racking device state indicator move to the position below.
 Note: The crank can be extracted from the hole at any time prior the end of the racking-in, but this action stops the operation. Operation can be resumed by reinserting the crank after sliding the tab on cubicle door.



4. Remove the crank.
 The device is in the service position.



Device stroke (mm)	Nos. of crank turns
230	38

Protection, control and monitoring

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Never close a metering connected to the main power circuit unless the tripping chain voltage is energized and the protection, control and monitoring controllers are connected and operable.

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

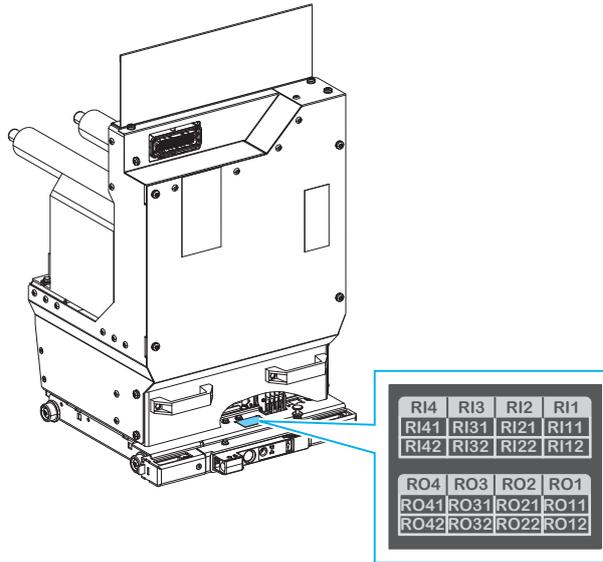
To enable the maximum performance of your installation, EasyPact EXE should be used with a corresponding protection, control and monitoring system that is configured to the requirements of your installation.

Refer to the user guides for PIX Roll on Floor, protection relay and supervisory system.



Discovering the electrical auxiliaries

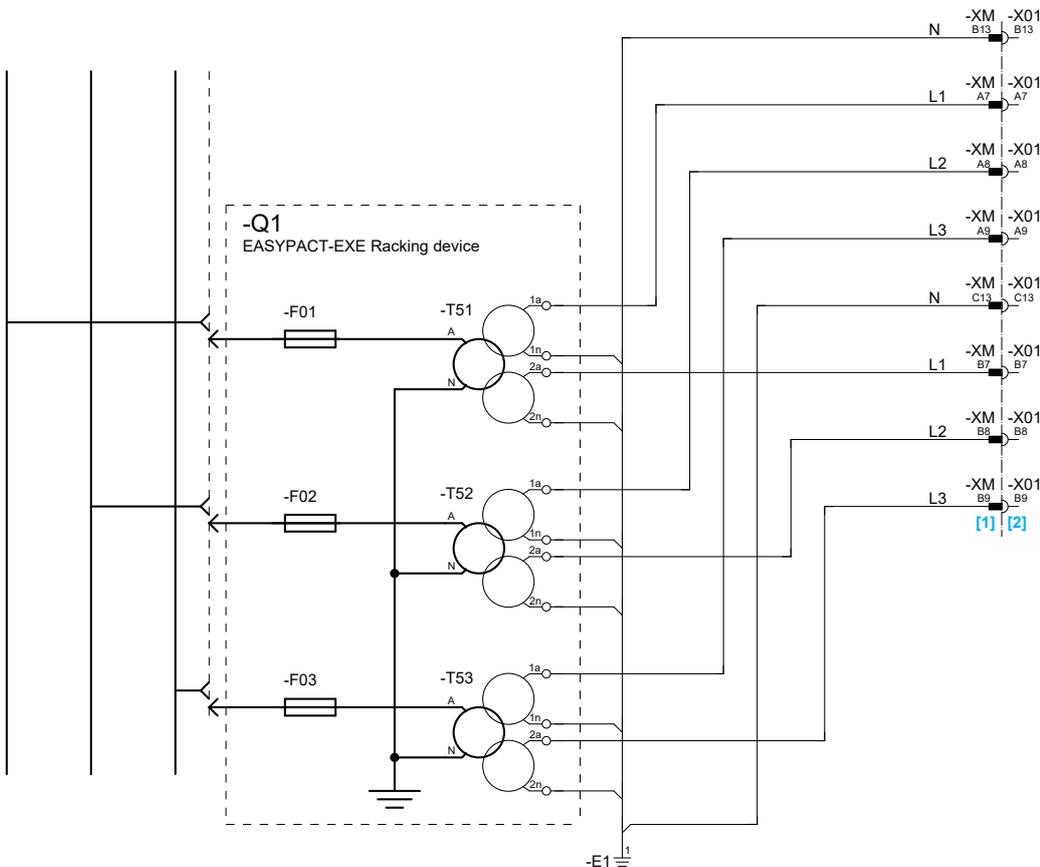
Identification of auxiliary labels



Label of racking device position contacts

Electrical diagrams for Metering device

The following electrical diagrams shows an application for Metering Device using the number of pins available in the PIX Roll on Floor offer.



Example of wiring diagram for Metering Device.

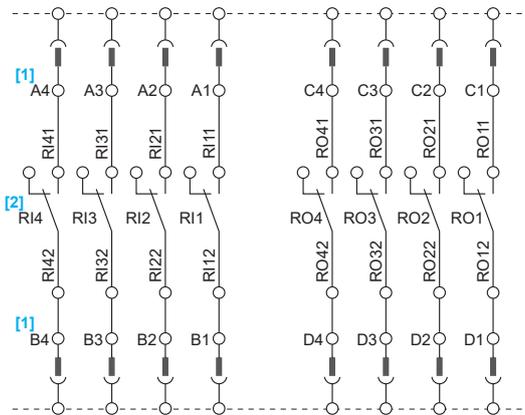
- [1] LV plug pin number (fixed part on the metering device top)
- [2] LV plug pin number (mobile part on the cubicle)

F01 – F03: Fuses
T51 – T53: Voltage Transformers
RT: Load Resistance

RACKING DEVICE POSITION CONTACTS

Service position switches (Rack-In)

Disconnected position switches (Rack-Out)



[1] : LV plug pin number

[2] : Racking position block designation

RI1-4: Racking-in position contacts, closed when the metering device is in the service position.

RO1-4: Racking-out position contacts, closed when the metering device is in disconnected/test position.

Maintaining the performance of EasyPact EXE



Maintenance

General information

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Electrical equipment may only be maintained by qualified personnel.
- The Metering device must not be completely disassembled for maintenance work, except of those accessories described in this maintenance section.

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

As Medium-Voltage devices are to be installed in accordance with appropriate professional practices. Similarly, preventive maintenance operations are to be strictly and regularly observed.

Certain maintenance operations can be carried out independently by the User. Two skills are essential:

- electrical qualifications,
- knowledge of the equipment to be maintained.

This user guide is not intended to be used by anyone who has not completed the relevant training.

Other very complex operations are however exclusively the responsibility of Schneider Electric. This allows our customers to benefit from optimized maintenance with regards of the economic perspective, and the availability of electric power:

- Schneider Electric's engineers are highly qualified and have a thorough knowledge of Schneider Electric's equipment and its various technical levels; they have all the methods and procedures specific to the different types of devices at their disposal, as well as the advantage of feedback from the whole company,
- they have the relevant diagnostic tools and equipment for the system they are working on,
- they carry with them the appropriate consumables and spare parts for each device, which are available from local or regional stocks.

On request, Schneider Electric will be able to provide at any time:

- an installation diagnosis,
- if required, an appropriate maintenance programme,
- an appropriate maintenance contract,
- adjustments, where necessary.

Maintenance definitions

Preventive

Preventive maintenance consists in carrying out, at predetermined intervals or according to prescribed criteria, checks intended to reduce the probability of a failure or deterioration in the operation of a system.

Corrective

Corrective maintenance repairs a system in view of fulfilling a required function.

Intervention Levels

Different skill levels have been established to define the persons who are qualified to work on Medium-Voltage equipment.



End User

Level 1

Maintenance operations that can be carried out by actors with basic electrician skills doing operations according to instructions provided with the device by Schneider Electric (Racking-in/out...)



End User Schneider Electric

Level 2

Preventive maintenance operations requiring simple procedures and / or support equipment that can be carried by professional electrical actors performing actions according to Schneider Electric documentation.



Schneider Electric

Level 3

Preventive or curative maintenance operations that can be carried out by an authorized person performing actions delegated by Schneider Electric.



Schneider Electric

Level 4

Preventive or curative maintenance operations that may affect the device performances that can be carried out by Schneider Electric local entities, either in charge of adaptation or Services.



Schneider Electric

Level 5

Curative maintenance operations that can be carried out by the Schneider Electric global entities. The device will generally have to be returned to the factory.

Trainings

Schneider Electric offers a wide choice of training courses on how to operate or maintain its equipment. Level 1-2 operations require training on the equipment. This training is delivered in our training centres by Schneider Electric's accredited qualified staff.

Adaptation of the device and component replacement

End Users (Level 2) are only allowed to replace the components listed below. These kit components should only be assembled, installed, used, tested, repaired or maintained by qualified personnel.

Schneider Electric shall not be held responsible for damage which occurs if:

- the instructions provided in the instruction document were not followed,
- any other component other than genuine Schneider Electric was installed.

Quality and performances of final assembly is under the End User responsibility. After each operation, conduct electric tests according to the standards in force.

 DANGER	
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH	
Be careful when conducting replacements, replace imperatively with new parts the following accessories: Nylstop (self-stopping nut), contact washer, stop ring and mechanical pin.	
Failure to follow these instructions will result in death or serious injury.	

Component replacement	Instructions
Voltage Transformer	-
LV 64-pin Plug	NVE1810501

Schneider Electric supplies original spare parts and can provide assistance with identifying the spare parts required for your electrical distribution equipment. To order spare parts, please contact your Schneider Electric local representative. For any modification or upgrade of the metering device, contact Schneider Electric.

Products and consumables

Products and consumables		
Supplier	Designation	Reference ^[1]
SCHNEIDER ELECTRIC	Electrical lubricant Amblygone TA 15/2	18327916
SCHNEIDER ELECTRIC	Mechanical lubricant Isoflex Topas L 152	18315110
LOCAL	Chloride free degreasing agent	-
LOCAL	Lint-free wipe	-
LOCAL	Brush for lubricant application	-
LOCAL	3M green Scotch-Brite GP-SH	-

^[1] To order products, please contact your Schneider Electric local representative.

Recommended maintenance program

Preventive maintenance operations

⚠ WARNING
<p>HAZARD OF DEVICE DAMAGE OR ELECTRICAL FAILURE</p> <ul style="list-style-type: none"> • Comply with specified maintenance intervals. • Perform maintenance according to the actual operating and ambient conditions. • Contact your Schneider Electric local representative for any queries. <p>Failure to follow this instruction can result in death or serious injury.</p>

Different maintenance programs should be carried out:

- Basic preventive maintenance
 - to be performed every year ^[1]
 - by level 1 and level 2.
- Advanced preventive maintenance
 - to be performed every two years ^[1]
 - by level 3.
- Exclusive preventive maintenance
 - to be performed every five years ^[1].
 - by level 4.

*[1] Recommended under normal operating conditions. However, this recommended frequency should be increased according to the level of criticality (low, major, critical) and the severity of environment conditions.
To define appropriate Maintenance program for your equipment, contact your Schneider Electric Maintenance Service local representative.*

Operating limits for EasyPact EXE

EasyPact EXE installed in normal service condition and with preventive maintenance program is designed up to:

Racking device	Mechanical interlocks
1000 cycles	25 operations during 1000 operation cycle of Racking device

Before reaching these operating limits contact your Schneider Electric Service representative in order to put in place the relevant maintenance.

Basic level preventive maintenance program to be performed every year

Troubleshooting and solutions

Diagnose the problem	Identify the probable causes	Find the solutions
Racking-in or Racking-out		
Impossible to insert the crank in "Disconnected/test" or "Service" position	A padlock or keylock is present on the racking trolley or an "open door" interlock is present	Bring installation into compliance to release locked state
	A lock is present on the racking device in the "Service" position	Bring installation into compliance to release locked state
	The auxiliaries connection plug is not locked in the correct position	Lock the auxiliaries connection plug in the correct position
	The racking trolley is not properly locked in the correct position in the cubicle	Lock the racking trolley in the correct position in the cubicle
	An interlock with earthing switch is present	Bring installation into compliance to release locked state
	The pushbutton located on the racking trolley is locked	Check the condition of pushbutton located on the trolley and disable this lock
	The door is open or the "open door" interlock is ineffective	Close the cubicle door or check the operation of the "open door" interlock
Impossible to press the pushbutton located on the racking trolley	The auxiliaries connection plug is not locked in the correct position	Lock the auxiliaries connection plug in the correct position
	The racking trolley is not properly locked in the correct position in the cubicle	Lock the racking trolley in the correct position in the cubicle
	An interlock with earthing switch is present	Bring installation into compliance to release locked state
	The pushbutton located on the racking trolley is locked	Check the condition of the pushbutton located on the trolley and disable the lock
	The door is open or the "open door" interlock is ineffective	Close the switchboard door or check the operation of the "open door" interlock
Impossible to turn the crank	Wrong direction of rotation	Check the direction of rotation
Device cannot be racked in "Service" position	Mechanical problem on the insulating shutters	Check the operation of the insulating shutters
	Clusters are incorrectly positioned	Replace clusters
	The auxiliaries connection plug is not locked in the correct position	Lock the auxiliaries connection plug in the correct position
	The racking trolley is not properly locked in the correct position in the cubicle	Lock the racking trolley in the correct position into the cubicle
	An interlock with earthing switch is present	Open earthing switch
	The pushbutton located on the racking trolley is locked	Check the condition of the pushbutton located on the trolley and remove the lock
	The door is open or the "open door" interlock is ineffective	Close the switchboard door or check the operation of the "open door" interlock
Device cannot be pulled out	Device is not in the "Disconnected/Test" position	<ul style="list-style-type: none"> Turn the crank until the device reaches the "Disconnected/Test" position Check device to cubicle lock is disengaged on both sides
Device insertion or extraction		
Withdrawable device cannot be inserted into the cubicle	An interchange stop system between the racking trolley and the device is present	Check concordance between the racking trolley and the device
	A lock is present on the shutters	Bring installation into compliance to release locked state
Device cannot be locked in the "Service" or "Disconnected/test" position	Device is not in the correct position	Turn the crank until the device reaches the wanted position ("Service" or "Disconnected/Test" position)
	Crank remains in the racking trolley	Remove crank and store it
Cubicle door cannot be opened	The racking trolley is not in the "Disconnected/test position"	Rack out to disconnect the device
Cubicle door cannot be closed	The racking trolley is not properly locked in the correct position in the cubicle	Lock the racking trolley in the correct position in the cubicle
	The "open door" interlock is ineffective	Check the operation of the "open door" interlock

Appendix : Extract of CT190 : Ferroresonance

Introduction

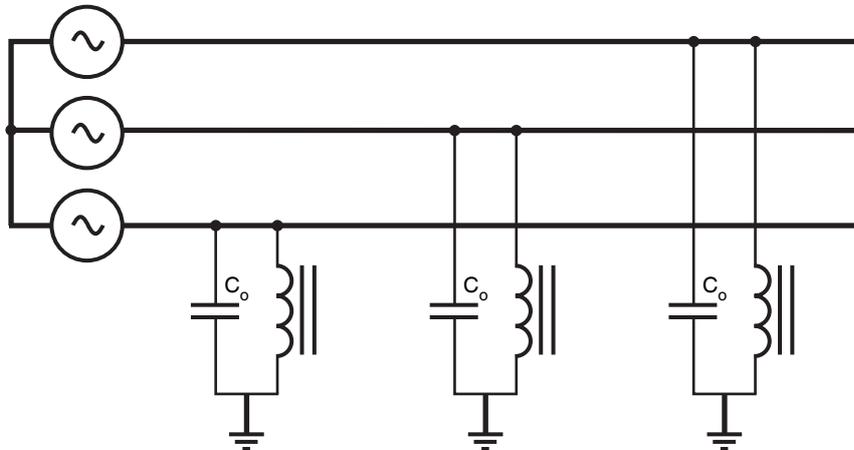
Ferroresonance is a non-linear resonance phenomenon that can affect power networks. The abnormal rates of harmonics and transient or steady state overvoltages and overcurrents that it causes are often dangerous for electrical equipment.

The term “Ferro-résonance ”, refers to all oscillating phenomena occurring in an electric circuit which must contain at least: a non-linear inductance (ferromagnetic and saturable), a capacitor, a voltage source (generally sinusoidal), low losses. Power networks are made up of a large number of saturable inductances (power transformers, voltage transformers (VT), shunt reactors), as well as capacitors (cables, long lines, capacitor banks). They thus present scenarios under which ferroresonance can occur.

Ferroresonance is frequently accompanied by some of the symptoms described below: high permanent overvoltages of differential mode (phase-to-phase) and/or common mode (phase-to-earth), high permanent distortions of voltage waveforms, displacement of the neutral point voltage, transformer heating (in no-load operation), continuous, excessively loud noise in transformers, damage of electrical equipment (capacitor banks, VT, ...) due to thermal effect or insulation breakdown. A characteristic symptom of VT destruction by ferroresonance is a destroyed primary winding and an intact secondary winding.

Typical case where voltage transformers (VT) can be impacted by Ferroresonance:

- VT connected to an isolated neutral system.
- Transient overvoltages due to switching operations on the power system (load rejection, fault-clearing ...) or to an earth fault, can initiate the phenomenon by driving into saturation the iron core of one or two of the VTs of the parallel ferroresonant circuit in following figure . Ferroresonance is then observed both on the phase-to-earth voltages and on the neutral point voltage (VN). Overvoltage values may exceed normal phase to-phase voltage under steady state condition, and cause dielectric destruction of the electrical equipment.



Practical solutions for VT protection against Ferroresonance :

In isolated neutral systems, avoid wye connection of VT primaries with earthed (primary) neutral either by leaving the neutral of the VT primaries unearthed or using deltaconnection for the VTs. If wye-connection of primaries with earthed neutral is used (for example to measure zero-sequence voltage) in an isolated neutral system or on a system whose earthing system cannot be anticipated, introduce losses by means of one or more load resistances whose value is sufficiently low to effectively damp the phenomenon, while yet ensuring that total power consumption complies with required precision conditions.

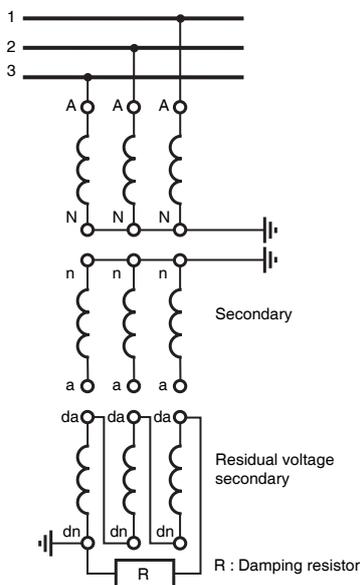
The following method can be used to compute load resistances values.

In the case of VTs with two secondary windings (one secondary winding for measurement, and one residual voltage secondary winding also known as a tertiary winding), it is advisable to connect a resistance to the terminals of the open delta connected tertiary windings of the three transformers (see Cahier Technique Schneider n° 190 fig. 12). The advantage of this damping device is that it does not affect measurement accuracy or introduce losses in normal (balanced) operating conditions, but only in unbalanced conditions in order to damp the phenomenon.

If not already specified by the VTs manufacturer, the recommended minimum values for the resistance R and power PR of this resistance are:

$$R = \frac{3\sqrt{3} U_s^2}{P_e}, \quad P_R = \frac{(3 U_s)^2}{R}$$

where: U_s : rated voltage of the VT secondary, connected to the resistance (V) P_e : rated thermal burden of the VT secondary winding concerned by the resistance (VA).



Selection guide for VT load resistance :

Residual voltage windings connected in open delta, closed on a resistance.

Rated secondary voltage	Rated thermal burden of the secondary winding concerned by the resistance (VA)	Minimum computed resistance (Ω)	Practical choice (in the 140 W series)	
			Standardised resistance (Ω)	Resistance power (W)
100/3	50	115.5	120	83
	100	57.7	2 x 120 in //	2 x 83
	200	28.9	2 x 100 in //	2 x 100
110/3	50	139.7	150	80.7
	100	69.9	2 x 150 in //	2 x 80.7
	200	34.9	2 x 100 in //	2 x 121
100/√3	50	346.4	390	77
	100	173.2	2 x 390 in //	2 x 77
	200	86.6	2 x 220 in // 2 x 390 in //	2 x 136 3 x 77
110/√3	50	419.2	470	77
	100	209.6	2 x 470 in //	2 x 77
	200	140.8	2 x 390 in //	2 x 93

Bibliography :

ECT190 – Schneider-Electric – Ferroresonance – Ph.Ferracci.

Basic level preventive maintenance tasks

Basic preventive maintenance corresponds to maintenance levels 1 and 2. Basic preventive maintenance tasks such as operational checks, as well as repairs by standard exchange of certain assemblies can be carried out by qualified customer personnel with basic training. There is no dismounting of parts of the metering device.

Part	Check	Frequency: every year ^[1]
Device	<ul style="list-style-type: none"> Check the general condition of the device (Cover, Frame, Racking device and Shutter Ramp, MV connection, LV Connection) Check the cleanliness of the device (Chair, Insulating cover) 	<ul style="list-style-type: none"> ■ ■ ■ ■ ■
Auxiliaries	Check auxiliary wiring and insulation	■
Racking Device for metering Device	Check the device racking operation (Rack In/Rack Out)	■
	Check the device racking interlock (operation of the red opening pushbutton)	■
	Operate the racking device manually	■
Racking Device Padlocking	Operate padlocking system	■

[1] every fifth year diagnostic checks is carried out by Schneider Electric Service.

Tools

Performing the procedure of the maintenance program requires the following :

- a standard toolbox with electrical tools and equipment for an electrician
- specific tools, detailed in the maintenance procedures (check the instruction sheet : sum-up of all instruction sheet).

Time Required

The global time required to perform this maintenance program is 15 minutes.

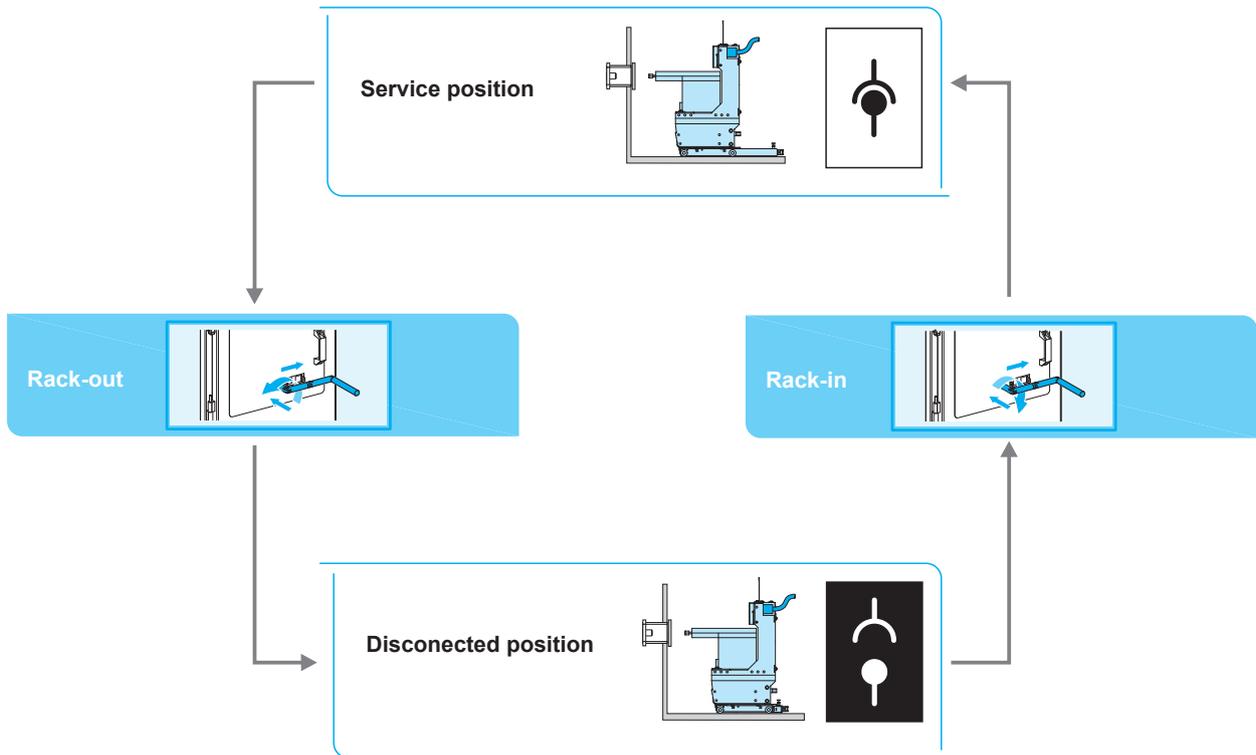
Safe Repository

For better follow-up of your equipment, upload your Maintenance Reports in Safe Repository.

Metering Device operation in a nutshell



Metering Device operation



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