

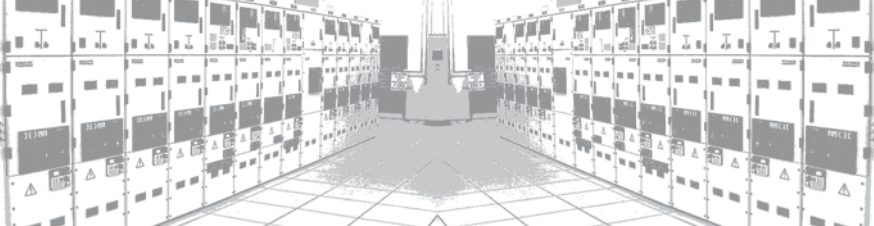
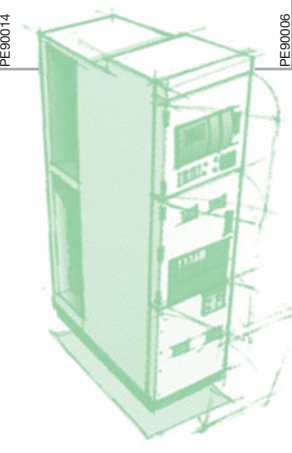
MCset 1 - 2 - 3 17.5 kV Medium voltage equipment

Air-insulated switchboards

Metal-enclosed switchgear
with moving parts







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Warning

Preventive maintenance operations must be carried out regularly on medium-voltage equipment.

Technicians trained to work on this type of equipment are required.

Two skills are essential:

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

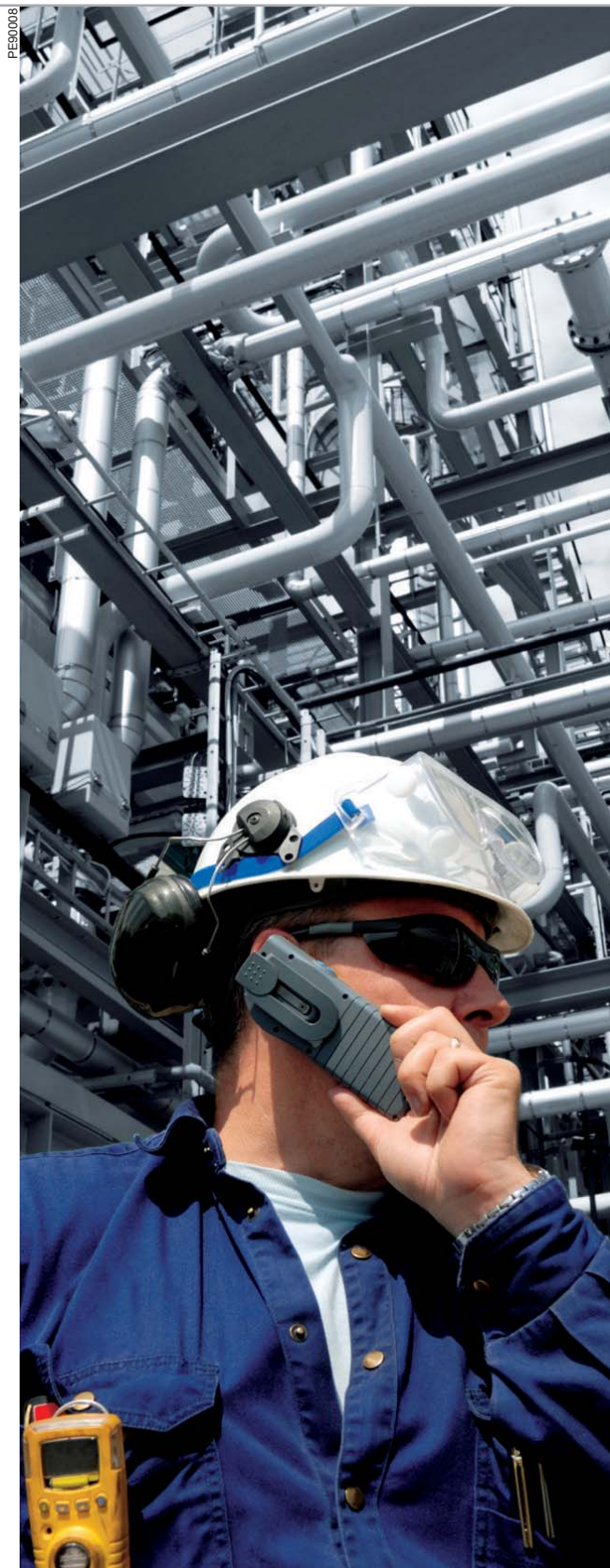
This document does not apply to moving parts and protection relays (1).

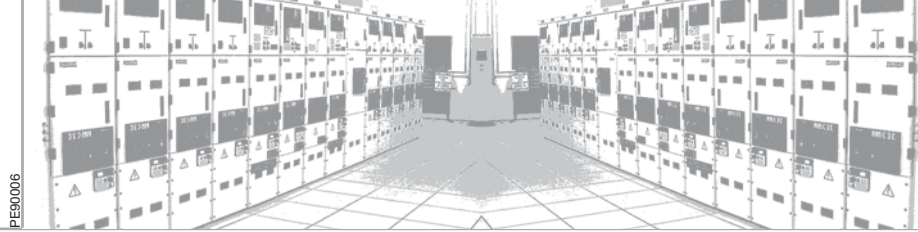
Please refer to the maintenance documents specific to each type of switchgear used. If necessary, you can also contact your Product, Country, Services agent.

(1) moving parts (circuit breaker, contactor) and protection relays (SEPAM)

Electrical qualifications

Only employees with appropriate electrical qualifications will be allowed to carry out these maintenance operations.





Intervention level

Different skill levels have been established to define the persons who are capable of working on medium-voltage equipment:

Level 1

Regular maintenance.

The maintenance operations to be carried out on the equipment are generally described in the instruction handbook.

Minor preventive maintenance operations not requiring disassembly and standard repairs that require one part to be replaced with another provided for this purpose, performed by an operator's accredited technician according to the manufacturer's maintenance instructions.

Level 2

Operations requiring simple procedures and/or support equipment (integrated into devices or external) that is easy to use and implement.

Level 3

Preventive maintenance operations, such as general adjustment, identification and troubleshooting, repairs requiring the replacement of one component or functional unit with another or minor mechanical repairs, carried out by a specialised technician using the tools, adjusting and measuring instruments specified in the manufacturer's maintenance instructions.

Level 4

Operations whose procedures involve knowledge of a particular technique or technology and/or how to use specialised support equipment.

All important corrective or preventive maintenance operations carried out by the manufacturer's after-sales services. Operations that may affect switchgear performance.

Level 5

Operations whose procedures involve know-how, requiring the use of particular techniques or technologies, industrial processes or support equipment.

Equipment will generally have to be returned to the factory; this applies only to moving parts.

Training

Schneider Electric offers a wide choice of training courses on operating or maintaining its equipment. Level 3-4-5 operations require training on the equipment.

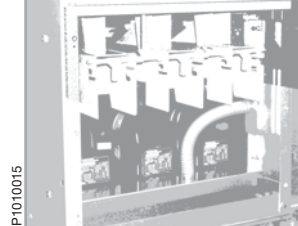
Training programme

This training is delivered in our training centres by Schneider Electric's accredited skilled staff.

Operations to be performed

DE90035  (the equipment must be switched off)

DE90036  (do not walk on the parts, assemblies and areas identified by this pictogram)



Control mechanisms

Dust, impacts, aggressive atmosphere, insufficient or excessive lubrication may adversely affect the mechanical operation of a device.

Safe operation will be maintained by removing dust / general cleaning, appropriate lubrication and regular use of the device.

The operations described below apply to flap control mechanisms, earthing switch and rack-out voltage transformer control rods, moving part guide rails and pins of connecting rods operating auxiliary position contacts.



1 - Medium voltage compartment flap control
2 - Voltage transformer extraction truck
3 - Rack-out circuit-breaker guide rails

Dust removal

An extractor must be used for this operation.

Do not use compressed air for this cleaning operation.

Cleaning - Degreasing

A completely clean dry cloth or brush free from any kind of solvent must be used for this operation.

High-pressure spraying of products containing solvents (trichloroethane, trichloroethylene) is strictly prohibited.

The main disadvantages of such spraying may be:

- impossibility of reapplying grease to inaccessible lubrication points (greased for life),
- corrosion or clamping of non-regreased areas,
- deterioration due to the pressure of the jet, regreased areas,
- deterioration due to the pressure of the jet,
- risk of overheating due to the presence of insulating solvent on the contact areas,
- removal of special protection,
- deterioration of plastics.

Lubrication

This operation is carried out after certain mechanical joints, such as those described in the maintenance procedures, have been cleaned.

Greases recommended by Schneider Electric must be used. Never apply too much grease, because excessive greasing combined with dust can cause the mechanism to malfunction.

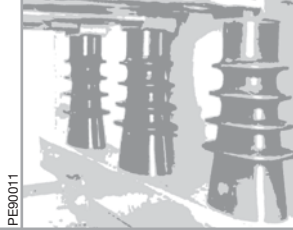
Grease must never be applied to insulating parts.

Operation

The necessity for an installation to run continuously generally means that the power devices are seldom operated. Although the ageing process of a device may be accelerated if it is used too frequently, mechanical malfunctions may occur if it is not operated for a long period of time.

Regular operation is necessary to maintain the original performance of each operating unit.

Interlocking with keys or padlocks must be fully tested to check that they are working correctly.



PE90011



PE90011

Vents and insulating materials

Dust deposited in various parts of the cubicle may adversely affect the electrical operation of a medium voltage device.

Too much dust on insulating materials may generate partial discharges that may ultimately cause dielectric flashover or internal arcing.

The air vents must also be cleaned to help the air to circulate in the cubicle and avoid overheating. In all cases, the cubicle must be thoroughly cleaned, especially the bottom of the cubicle.



PI010010

Dust removal

Insulating materials

An extractor must be used for this operation, as for the control mechanisms.

For parts that are difficult to access, use a dry cloth, taking care not to accumulate any dust on the insulating material.

During this operation, check that there is no foreign matter, corona or partial discharge, indicated by a change of colour or degradation of the insulating material.

Air vents

An extractor must be used for this operation. Natural ventilation is required for the cubicles.

This cleaning is mandatory for versions with forced ventilation (fans mounted on the top of the cubicle).

The frequency of these operations depends on the environmental and operating conditions.

2

1 - Insulator supports

2 - Air vents



Power circuits

The connections between the various switchboard distribution systems (busbars, cables) and the switchgear are an important source of heat dissipation.

Any tightening that does not conform to the recommendations can cause a thermal runaway resulting in a degradation of the device, insulating materials and cables, which may degenerate into a short circuit and/or fire.

This type of malfunction is often due to the non-observation of the installation specifications when the switchboards are installed.

Sliding connections (rack in)

They consist of two parts: clip and rack-in connector.

This type of connection requires appropriate regular cleaning in accordance with the procedures described. The grease makes it easier to connect the clips and rack-in connectors and prevents damage to the silvered surface by reducing the rack-in force.

In the case of a sulphiding corrosive atmosphere (H₂S / SO₂), the indications specific to each range must be complied with.

Special greases can be used to protect silver- and copper-plated contacts from sulphidation. Silver or copper sulphides reduce contact quality. They cause the contact resistance to increase, which leads to increased overheating.

As grease deteriorates over time, it must be replaced regularly.

Fixed connections (connection by lugs or busbars)

This type of connection does not require special maintenance if it is carried out according to Schneider Electric's recommendations (torque, 8.8 screws and bolts and contact washer).

Otherwise, regularly check the heating points (copper colour change / galvanisation) and remove the connection, polish the contact parts and reassemble them with new screws and bolts.

Standard tightening torques (non-greased screws and bolts)

The table below indicates the tightening torques for class 8.8 screws and bolts with contact washer and nut.

Screw	Torque in Nm
Ø 6	13
Ø 8	28
Ø 10	50
Ø 12	75
Ø 14	120

PE90013



1

P1010026



2

1 - Power connections
2 - Cable connection



P1010020



Low voltage compartment

Low voltage auxiliary circuits

Auxiliary wiring

It is used to transmit orders to the various control units of the device and retrieve its states.

A degraded connection or insulating material may prevent the device from operating or cause unwanted tripping. Auxiliary wiring must be checked and replaced at regular intervals, if necessary, especially in the event of vibrations, a high ambient temperature or corrosive atmospheres.

Signalling contacts

The contacts indicating the position of the circuit breaker, earthing switch, voltage transformer truck and ready-to-operate circuit breaker allow the operator to view the states and to act accordingly. Any incorrect signalling can lead to device control errors that may endanger the operators.

Contact failure (worn contacts, loose terminals) may be the result of vibrations, corrosion or abnormal overheating; preventive maintenance must ensure good continuity (or non-continuity) of the contact in the different states.

Protection relay

An electrical fault on the installation is detected by the relay which orders the circuit breaker to open in order to ensure that the equipment and operators are protected.

Electronic components and cards are sensitive to the environment (ambient temperature, humid and corrosive atmosphere) and to harsh operating conditions (magnetic fields, vibrations, etc.). To ensure safe operation, the following must be checked at regular intervals:

- the tripping chain,
- the intervention times according to fault current levels.

Refer to the documents specific to the protection relay used.

Normal operating conditions

The maintenance programme must be carried out on the cubicles as soon as they are commissioned and then every five years at most; the maintenance operator must have the required skill level (see the description in the table below). These operations are applicable for the environmental and operating conditions that meet the normal service conditions, in accordance with IEC 60694 for indoor switchgear.

PE90010



Ambient air temperature

- less than or equal to 40°C,
- less than or equal to 35°C, on average over 24 hours,
- greater than or equal to – 5°C.

Altitude

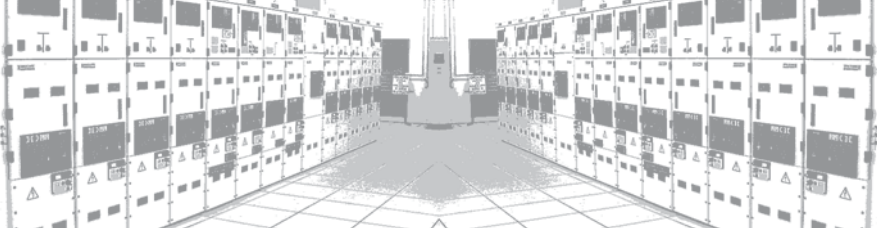
- less than or equal to 1000 m,
- above 1000 m, a derating coefficient will be applied (please consult us).

Ambience

- no dust, smoke, salt, corrosive or flammable gas and vapour (clean industrial air).

Humidity

- average relative humidity over 24 hours < 95%,
- average relative humidity over 1 month < 90%,
- average vapour pressure over 24 hours < 2.2 kPa,
- average vapour pressure over 1 month < 1.8 kPa.



Check	Frequency (year)	Tools - Products	Intervention level	Power down	Approximate intervention time	Reference document
	COM*	5		Cubicle	Switchboard	

Switchgear

Visually check the general condition of the cubicle (front panel, control unit, box, frame)	■	-	-	1	-	-	15 min	
Check the voltage transformer fuses (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2 - 3	-	-	1h 30 min	Technical Guide 07897302
Check the fuses in the feeder cubicles fitted with fused switches (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2 - 3	■	-	1h 30 min	Technical Guide 07897334
Check the fuses in the feeder cubicles fitted with fused contactors (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2 - 3	■	-	1h 30 min	Technical Guide 07897409

Removable devices

Remove and replace the circuit breaker or contactor	-	■	-	1	-	-	15 min	Technical Guide 07897302
Remove and replace the voltage transformer frame	-	■	-	1	-	■ ⁽¹⁾	45 min	Technical Guide 07897302

Check the operation of the position contacts

- Removable racked-in or racked-out part	-	■	-	1	-	-	30 min	
- Earthing switch	-	■	-	1	-	■	30 min	
- Racked-out voltage transformer	-	■	-	1	-	■	30 min	
Replace the grease on the rack-in connectors	-	■	Grease for electrical use	1	-	■	1 h	Technical Guide 07897302

Control mechanisms (p.4)

Open / close the moving parts manually and electrically (refer to the switchgear-specific documents)	■	-	-	1	■	-	30 min	
Open / close the earthing switch manually	-	■	-	1	-	■ ⁽¹⁾	1 h	Technical Guide 07897302
Remove the dust and grease the earthing switch control	-	■	Mobilith SCH100 grease to be applied to the moving parts	3 - 4	-	■	1 h	Technical Guides 07897324 07897302 ⁽³⁾
Remove the dust and grease the flap control	-	■	-	3 - 4	-	■	1 h	
Remove the dust from the moving part guide rails	-	■	-	3 - 4	■	-	30 min	
Operate the key-operated interlocks	-	■	-	1	-	■	1 h	Technical Guide 07897302
Operate the rack-in inhibition mechanism	-	■	-	1	■	-	15 min	

Vents and insulating materials (p.5)

Remove the dust from the air vents

- Outside	■	-	-	1	-	-	30 min	
- Inside	-	■	-	3 - 4	-	■	30 min	Technical Guide 07897302
Remove the dust from the fans (on cubicles according to performance)	-	■	-	3 - 4	-	■	1 h	Technical Guide 07897302 ⁽³⁾
Remove the dust from the insulating materials	-	■	-	3 - 4	-	■	3 h	Technical Guide 07897302

Power circuit (p.6)

Check and retighten the connections, if necessary (busbars, CTs, earthing switch, cables)	■	■	Calibrated torque wrench	2 - 3	-	■	3 h	Technical Guide 07897302
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Control and signalling auxiliaries (p.7)

Check that the auxiliary wiring is uninterrupted and the appearance of the insulating material	-	■	-	1	-	■	1h 30 min	
Check the tripping chain	-	■	-	1	-	■	1 h	
Ask for the thermal diagnosis system to be checked (refer to specific documents)	-	■	Schneider Electric checking tools	4	-	-	1 h	

* Commissioning - (1)) Power down the cubicle according to its configuration in the switchboard (for example, the feeder cubicle)

(2) To be selected according to the fuse ratings - (3) Removal procedure

Operating conditions in a corrosive atmosphere

The maintenance programme must be carried out on the cubicles as soon as they are commissioned and then every three years at most; the maintenance operator must have the required skill level (see the description in the table below). These operations apply to the H₂S specific MCset switchboard for the environmental and operating conditions specific to the conditions as defined.

PE30009



The operating conditions in certain fields of activity require the maintenance programme to be carried out under normal conditions to be complemented for the impact of atmospheric pollutants to be taken into account.

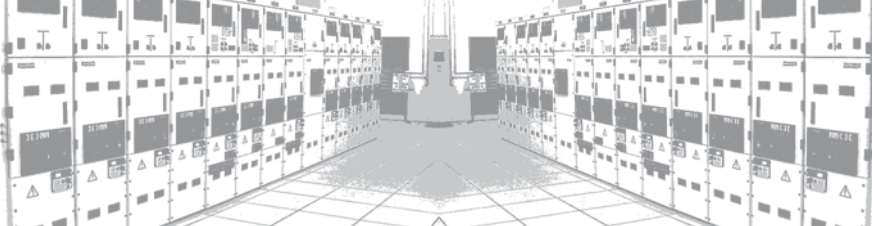
Pollution:

SO₂ = sulphur dioxide,

H₂S = hydrogen sulphide.

These types of atmospheric pollutants are mainly found in heavy industry, such as refineries, the iron and steel industry, paper mills, the petrochemical industry, etc. When these pollutants are combined with humidity, they are highly corrosive for the parts used in our equipment:

- bare copper, silvering for electrical contacts,
- control mechanisms.



Check	Frequency (year)	Tools - Products	Intervention level	Power down	Approximate intervention time	Reference document
Switchgear	COM*	3		Cubicle	Switchboard	

Visually check the general condition of the cubicle (front panel, control unit, box, frame)	■	-	-	1	-	-	15 min	
Check the voltage transformer fuses (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2 - 3	-	-	1h 30 min	Technical Guide 07897302
Check the fuses in the feeder cubicles fitted with fused switches (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2 - 3	■	-	1h 30 min	Technical Guide 07897334
Check the fuses in the feeder cubicles fitted with fused contactors (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2 - 3	■	-	1h 30 min	Technical Guide 07897409

Removable devices

Remove and replace the circuit breaker or contactor	-	■	-	1	-	-	15 min	Technical Guide 07897302
Remove and replace the voltage transformer frame	-	■	-	1	-	■ ⁽¹⁾	45 min	Technical Guide 07897302

Check the operation of the position contacts

- Removable racked-in or racked-out part	-	■	-	1	-	-	30 min	
- Earthing switch	-	■	-	1	-	■	30 min	
- Racked-out voltage transformer	-	■	-	1	-	■	30 min	
Replace the grease on the rack-in connectors	-	■	Grease for electrical use	1	-	■	1 h	Technical Guide 07897302

Control mechanisms (p.4)

Open / close the moving parts manually and electrically (refer to the switchgear-specific documents)	■	-	-	1	■	-	30 min	
Open / close the earthing switch manually	-	■	-	1	-	■ ⁽¹⁾	1 h	Technical Guide 07897302
Remove the dust and grease the earthing switch control	-	■	Mobilith SCH100 grease to be applied to the moving parts	3 - 4	-	■	1 h	Technical Guides 07897324 07897302 ⁽³⁾
Remove the dust and grease the flap control	-	■	-	3 - 4	-	■	1 h	
Remove the dust from the moving part guide rails	-	■	-	3 - 4	■	-	30 min	
Operate the key-operated interlocks	-	■	-	1	-	■	1 h	Technical Guide 07897302
Operate the rack-in inhibition mechanism	-	■	-	1	■	-	15 min	

Vents and insulating materials (p.5)

Remove the dust from the air vents

- Outside	■	-	-	1	-	-	30 min	
- Inside	-	■	-	3 - 4	-	■	30 min	Technical Guide 07897302
Remove the dust from the fans (on cubicles according to performance)	-	■	-	3 - 4	-	■	1 h	Technical Guide 07897302 ⁽³⁾
Remove the dust from the insulating materials	-	■	-	3 - 4	-	■	3 h	Technical Guide 07897302

Power circuit (p.6)

Check and retighten the connections, if necessary (busbars, CTs, earthing switch, cables)	■	■	Calibrated torque wrench	2 - 3	-	■	3 h	Technical Guide 07897302
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Control and signalling auxiliaries (p.7)

Check that the auxiliary wiring is uninterrupted and the appearance of the insulating material	-	■	-	1	-	■	1h 30 min	
Check the tripping chain	-	■	-	1	-	■	1 h	
Ask for the thermal diagnosis system to be checked (refer to specific documents)	-	■	Schneider Electric checking tools	4	-	-	1 h	

* Commissioning - (1)) Power down the cubicle according to its configuration in the switchboard (for example, the feeder cubicle)

(2) To be selected according to the fuse ratings - (3) Removal procedure

Recommended frequency

Operating conditions for naval use

The maintenance programme must be carried out on the cubicles as soon as they are commissioned and then every two years at most; the maintenance operator must have the required skill level (see the description in the table below). These operations are applicable for the environmental and operating conditions specific to the military or merchant navy, as defined.

PE90007



PE90015



BUREAU
VERITAS



Germanischer Lloyd



LR Type Approval Certificate



RINA - Registro Italiano Navale Group



Ambient air temperature

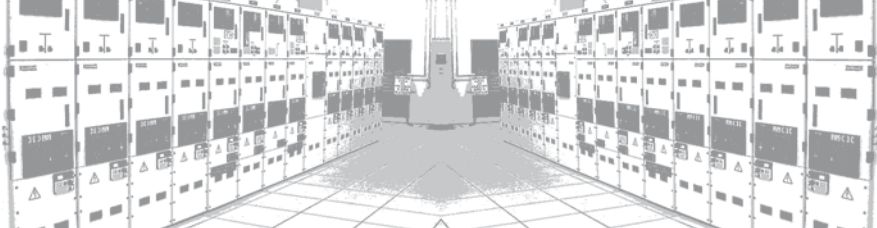
- less than or equal to 45°C,
and greater than or equal to - 5°C.

Vibrations (IEC 60068-2-6)

- frequencies between 2 Hz
and 13.2 Hz: 1 min,
- frequencies between 13.2 Hz
and 100 Hz: 0.7 g

Humidity

- average relative humidity
over 24 hours: 96%,
- average relative humidity
over 1 month: 90%.



Check	Frequency (year)		Tools - Products	Intervention level	Power down		Approximate intervention time	Reference document
	COM*	2			Cubicle	Switchboard		
Switchgear								
Visually check the general condition of the cubicle (front panel, control unit, box, frame)	■	-	-	1	-	-	15 mn	
Check the voltage transformer fuses (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2-3	-	-	1h30 min	Technical Guide 07897302
Check the fuses in the feeder cubicles fitted with fused switches (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2-3	■	-	1h30 min	Technical Guide 07897334
Check the fuses in the feeder cubicles fitted with fused contactors (if necessary, replace the three fuses at the same time)	-	■	Multimeter ⁽²⁾	2-3	■	-	1h30 min	Technical Guide 07897409

Removable devices

Remove and replace the circuit breaker or contactor	-	■	-	1	-	-	15 min	Technical Guide 07897302
Remove and replace the voltage transformer frame	-	■	-	1	-	■ ⁽¹⁾	45 min	Technical Guide 07897302

Check the operation of the position contacts

- Removable racked-in or racked-out part	-	■	-	1	-	-	30 min	
- Earthing switch	-	■	-	1	-	■	30 min	
- Racked-out voltage transformer	-	■	-	1	-	■	30 min	
Replace the grease on the rack-in connectors	-	■	Grease for electrical use	1	-	■	1 h	Technical Guide 07897302

Control mechanisms (p.4)

Open / close the moving parts manually and electrically (refer to the switchgear-specific documents)	■	-	-	1	■	-	30 min	
Open / close the earthing switch manually	-	■	-	1	-	■ ⁽¹⁾	1 h	Technical Guide 07897302
Remove the dust and grease the earthing switch control	-	■	Mobilith SCH100 grease to be applied to the moving parts	3 - 4	-	■	1 h	Technical Guides 07897324 07897302 ⁽³⁾
Remove the dust and grease the flap control	-	■		3 - 4	-	■	1 h	
Remove the dust from the moving part guide rails	-	■		3 - 4	■	-	30 min	
Operate the key-operated interlocks	-	■	-	1	-	■	1 h	Technical Guide 07897302
Operate the rack-in inhibition mechanism	-	■	-	1	■	-	15 min	

Vents and insulating materials (p.5)

Remove the dust from the air vents

- Outside	■	-	-	1	-	-	30 min	
- Inside	-	■	-	3 - 4	-	■	30 min	Technical Guide 07897302
Remove the dust from the fans (on cubicles according to performance)	-	■	-	3 - 4	-	■	1 h	Technical Guide 07897302 ⁽⁴⁾
Remove the dust from the insulating materials	-	■	-	3 - 4	-	■	3 h	Technical Guide 07897302

Power circuit (p.6)

Check and retighten the connections, if necessary (busbars, CTs, earthing switch, cables)	■	■	Calibrated torque wrench	2 - 3	-	■	3 h	Technical Guide 07897302
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Control and signalling auxiliaries (p.7)

Check that the auxiliary wiring is uninterrupted and the appearance of the insulating material	-	■	-	1	-	■	1h 30 min	
Check the tripping chain	-	■	-	1	-	■	1 h	
Ask for the thermal diagnosis system to be checked (refer to specific documents)	-	■	Schneider Electric checking tools	4	-	-	1 h	

* **Commissioning** - (1)) Power down the cubicle according to its configuration in the switchboard (for example, the feeder cubicle)

(2) To be selected according to the fuse ratings - (3) Removal procedure



PE90006

Maintenance

Guide

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2007



PE90007



PE90008

PE90009

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