



RV64 Load Break Switch 12 kV isolating and earthing switches for underground substations

User's manual



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PREFACE

About this manual

This document is intended as a reference for qualified and trained operators to operate the medium voltage switchgear in a safe and economical way.

This document uses the term "medium voltage switchgear" to denote a random, but in actual practice, existing combination of RV64 functions that, mutually coupled and connected, constitute a client-specific transformation or distribution station. See: "General description".

The chapters and sections are numbered. The page numbers (consisting of the chapter number and the page number) and the document code can be found at the bottom of every page.

In the documentation the words "left", "right", "front" and "behind" are used to indicate a specific part of the medium voltage switchgear. The starting point is always the position of the operator, standing in front of the medium voltage switchgear, facing the switchgear.

Pictograms and safety symbols in and on the medium voltage switchgear

Depending on the version, the following pictograms are used on the medium voltage switchgear:



WARNING

Danger of high Voltage Access to this cubicle is only allowed after this cubicle and both the directly adjacent cubicles (previous and next one) are de-energized.



WARNING

Drilling prohibited. Drilling is strictly prohibited on surfaces bearing this pictogram.

Pictograms in the documentation

The following pictograms apply to the medium voltage switchgear user documents:



CAUTION!

A procedure that can, if not carried out with the proper care, result in damage to the medium voltage switchgear, the surrounding area or the environment.



WARNING Danger of high Voltage



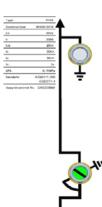
CAUTION! Clamping danger



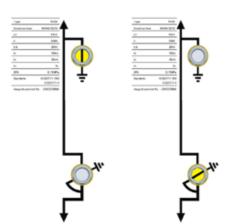
Notes, suggestions and advice.



Consult the indicated information sources first.



Render this cubicle, the next one and the previous cubicle, voltage-free, before carrying out the work described.



Open the load break switch and the earthing switch before carrying out the work described in the manual.

Service and technical support

For information concerning specific settings, maintenance or repair work which are not covered in the manual, please contact MEVOCO N.V..

- When contacting MEVOCO N.V., always provide the following information:
 - Cubicle designation and characteristics
 - Serial number of the cubicles

General safety directions and instructions

MEVOCO N.V. does not accept any liability for damage or injury caused by not (strictly) following the safety directions and instructions, or by negligence during the installation, use, maintenance, or the repair of the medium voltage switchgear and its (possibly) accompanying options.

Depending on any specific user circumstances, or installed options, extra safety instructions may be required. Please contact MEVOCO N.V. immediately if you encounter a potential danger during the operation of the medium voltage switchgear.

The owner/operator of the medium voltage switchgear is fully responsible at all times for following the locally applicable safety directions and guidelines.

User manual

- Anyone who uses or operates the medium voltage switchgear, must be familiar with the contents of the user manual, and follow the directions contained within very closely. The owner/operator must educate the users in accordance with the user manual and obey all directions and instructions.
- Never change the order of the required actions.
- Always keep the user manual in the vicinity of the medium voltage switchgear.

Pictograms and safety symbols

The pictograms, symbols and instructions applied to the medium voltage switchgear are a part of the safety equipment. They may therefore not be covered or removed, and must be present and clearly readable throughout the entire lifespan of the medium voltage switchgear.

• Replace or repair unreadable or damaged pictograms, symbols and instruction immediately. Therefore contact MEVOCO N.V.

Operators

The execution of the work described (transport, installation, use and maintenance) is strictly reserved for trained and qualified operators, who are familiar with the dangers that can occur when operating medium voltage switchgears. Temporary staff and personnel in training may not operate the medium voltage switchgear under any circumstances.

Technical specifications

- Technical specifications may not be changed.
- Modification of the medium voltage switchgear (or parts thereof) is not permitted.

Storage.

The switchgear RV64 should be placed upwards in a vertical position in a warehouse clean and dry and free of chemical or corrosive vapors. The RV64 is packed in appropriate protection. The unpacking should take place at the final installation area. Range of temperature at the storage: -25°C to 55°C.

Content of the delivery.

The switchgear RV64 is delivered with a load break switch operating handle, 2 earthing switch handles and a user manual.

Intended use

The medium voltage switchgear is designed exclusively for use as transformation or distribution stations, in accordance to the specifications and conditions provided by MEVOCO N.V.. Any other or further use is not in accordance with the intended use.¹ MEVOCO N.V. does not accept any liability for damage(s) or injuries resulting from deviation(s) of the intended use.

The medium voltage switchgear complies with the current norms and guidelines. See: Technical Brochure

• Only use the medium voltage switchgear in technically perfect condition, in accordance with the intended use described above.



Leave the sealed connections intact, at all times. Breaking the sealed connections irrevocably voids any guarantee claims.

¹ The "Intended use" as defined in EN 292-1 "is the use for which the technical product is suited as specified by the manufacturer including his directions in the sales brochure." In case of doubt, it is the use that can be deduced from the construction, the model and the function of the technical product that is considered normal use. Operating the product within the limits of its intended use also involves observing the instructions in the user manual.

1 GENERAL INSTALLATION & SAFETY INSTRUCTIONS

1.1 General



Installation of the medium voltage switchgear is restricted to qualified and trained operators with strictly observance of the locally applicable safety instructions and guidelines.

The connection and commissioning must be done by qualified and authorized staff employed by the power supplying company.

- See also: "General safety prescriptions and instructions".
- Never leave tools or other material in, or on top of the medium voltage switchgear.
- Install the medium voltage switchgear exclusively in spaces that fully comply with the following recommendations (according to IEC 62271-200):

1.1.1 Recommendations – installation room

Recommendations regarding the installation room parameters are subdivided in recommendations concerning:

- wall surface
- environmental conditions
- free height of the installation area
- sizes of the entrance doors or manholes of the installation area
- free passage in front of the cubicles
- internal arc protection

1.1.1.1 Wall surface

The surface on which the medium voltage switchgear must be installed, needs to firm and completely level. The maximum permissible difference in level is **2 mm/m**.

1.1.1.2 Environmental conditions

RV64 cubicles have been designed for **indoor** installation, provided that the following environmental conditions are met:

description	values
environmental temperature	min15 °C - max. +50 °C
relative air humidity (%)	min. 10% - max. 100%
installation altitude (m.a.s.l.)	max. 1.000 m above sea level
water exposure	Very occasional immersion of water up to 3m above the
	top of the equipmenent.

 Table 1: Environmental conditions

Consequently this means:

- Avoid installation in dusty areas.
- Avoid installation in areas subject to lightning strikes.
- Avoid installation in surroundings where cubicles may be exposed to corrosive gases or fluids.



Contact MEVOCO N.V. when cubicles must be installed in areas where the required environmental conditions cannot be guaranteed.

1.1.1.3 Free height of the installation area

The free height of the installation room has to be **at least 2.000 mm**. The height of the switchgear RV64 is 1250mm, ,however you need a certain dimension to attache the medium voltage cables and their cable supports.

1.1.1.4 Sizes of the entrance doors or manhole to the installation area

The provided dimensions apply to all doors or manholes that offer access to the installation room. These minimum requirements also apply if the installation room is not directly accessible from the outside.



If the medium voltage switchgear is to be installed in basements, an entrance hatch is required, whose length as well as width is at least 200 mm larger than the dimensions of the RV64.

The overall dimensions of the RV64 are: Height: 1250mm Widt: 805mm (with frame, without handles), 750mm (installed, with handles) Dept: 475mm

1.1.1.5 Free passage in front of the cubicles

The free passage in front of the cubicles depends on the assembly of the medium voltage switchgear.

If the medium voltage switchgear does not contain any transformer cubicle(s), the minimum free passage is **800 mm**.

1.1.1.6 Internal arc protection

To prevent major material damage and serious physical injury or electrocution in the (unlikely) event of an internal arc, the following installation instructions apply:

- Make sure that the RV64 is properly attached and anchored to the wall by means of all its fixation points.
- There is forseen a gas deflector, which will deflect the hot gasses..



Anchor each cubicle of the medium voltage switchgear to the wall as described.

In medium voltage switchgears installed in accordance with the installation manual, the (unlikely) internal arc will always be limited.



The minimum height of the switchgear room shall be 2000mm.

1.2 Unpacking

The RV64 cubicles are by default crated in a wooden sea-freight crate. The most appropriate place to unpack the cubicle is of course the final installation area.

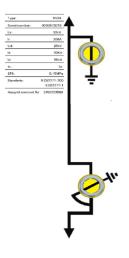
- Uncrate the cubicle.
- Examine the delivery note to ensure that the cubicle is complete.
- Check the cubicle for possible (transport) damage.
- Carefully lift the cubicle out off the crate.

If any parts are missing or damaged, contact the conveyor or MEVOCO N.V.. Seriously damaged cubicles must always be returned to MEVOCO N.V..

The RV64 cubicles are equipped with lifting lugs. Use suitable lifting & hoisting machinery, in perfect condition and with sufficient hoisting capacity only.



Observe the applicable safety precautions. The handling and operating of hoisting or lifting machinery is restricted to experienced staff within the visible and shouting range of the operator of the hoisting or lifting machinery.



RV64 cubicles are equipped with a load break switch and 2 earthing switches. The RV64is by default delivered in the position: "load break switch opened – earthinges switches closed".

After the used packing material has been disposed in accordance with the applicable directives, the installation of the cubicles can begin.

1.3 Handling

Two lifting eyes are welded on the top of the RV64 switchgear. They are located at the leftand right hand side of de top.

The eye has a hole of 28,5mm to accommodate any type of lifting tool.

They lifting eyes are centered on top of the RV64, when lifting the switchgear it is in balance.



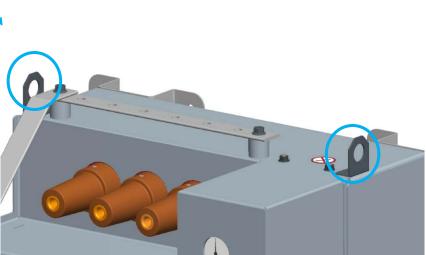


Figure 1: Lifting eyes

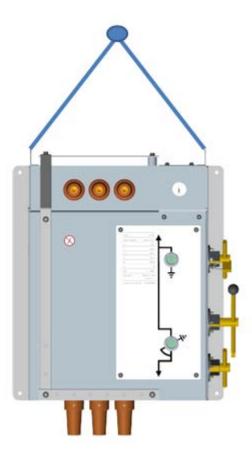


Figure 2: Lifting the RV64

1.4 Wall mounting

The RV64 must be mounted on a vertical concrete substation wall. All fixation points need to be used.

At the rear side of the RV64 switchgear, there are 2 vertical profiles welded for the fixation to the wall. The fixation points are in a rectangular shape 790mm (height) and 700mm (width) to be drilled in the wall.

The switchgear has to be anchored to the wall with appropriate fasteners (not delivered).

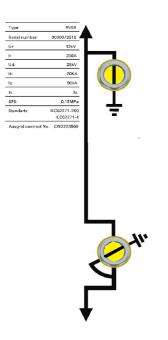
1.5 Cable connection mounting

The following applies in all circumstances:



Cable connections can only be carried out by qualified and authorized staff in service of the power supply company. Cables must never cross each other.

1.5.1 Preparations



Ensure that the cubicle, the next one, and the previous one are de-energized and earthed

1.5.2 Possible bushings

The RV64 medium-voltage switchgear is equipped with bushings in compliance with Cenelec EN50181 and IEC 60137 for cable connections.

Interface C (screw connection M16x2) 400 series, In = 630A

Figure 3: Cable transit type Interface C

• Plug/cable supply manufacturer's installation instructions need to be followed strictly.

The following rules need to be taken into account at all times:

Thorough cleaning of the bushings and cable connection



- The entire bushing needs to be carefully coated with a layer of silicon grease over the entire surface (denoted in blue). The grease is available in
- the cable connection kit.
- When connecting the cables, the prescribed torque needs to be respected.

Example of proper cable connections:

Manufacturer	Name of cable support	Diameter conductor [mm ²]	I _n [A]	Type of cable transit
Euromold	K400TB/G	35-300	630A	Interface C

The following manufacturers of cable connections are recommended:

- o Euromold/Elastimold
- Tyco Electronics

1.5.3 Assembly guidelines for cable connection

- Connect the cable to the bushing:
 - Assemble the cable connection according to the supplier's installation instructions.



The entire bushing needs to be carefully coated with a layer of silicone grease, which can be found in the cable connection kit.

Appropriate cable support is needed. There is no cable support assembled on the RV64. The cable support should meet the requirements of the short-circuit current of the RV64, 20kA 3s.



Figure 4: Cable mounting

• Connect the three earthing cables to the tinned copper bar using self-securing hexagonal flange bolts and self-securing hexagonal flange nuts.

1.6 Initial commisioning

The actual connection to the MV grid and the initial commissioning of the medium voltage switchgear can be done by qualified and trained staff employed by the power supply company only, observing the locally applicable safety regulations.

2 USE

2.1 Safety instructions – use

 See also "GENERAL INSTALLATION & SAFETY ".Use of the medium voltage switchgear is restricted to qualified and trained operators, while observing the locally applicable safety instructions and guidelines.

2.2 Identification of the cubicles

Every RV64 medium-voltage cubicle is equipped with a identification plate and a stamped serial number.

2.2.1 Type plate

The synoptic diagram is equipped with an identification plate, in the top-left corner.

The type plate registers the following data:

Cubicle type

Serial number and production year of the medium-voltage switchgear Voltage

Other technical specifications

Туре:	RV64
Serial number:	00000/2018
Ur:	12kV
lr:	200A
Ud:	28kV
lk:	20KA
lp:	50kA
tk :	3s
SF6:	0,15MPa
Standarts:	IEC62271-200 IEC62271-1

Ausgrid contract No: CW2223569



Figure 5: Type plate on the synoptic diagram

2.2.2 Serial number

The stamped serial number can be found on the left lateral side of the medium-voltage cubicle.

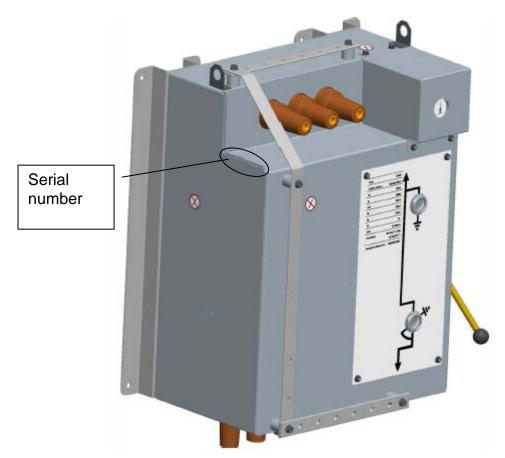


Figure 6: Serial number stamped in the medium-voltage cubicle

2.3 Operation

Depending on the version, the medium-voltage switchgear is equipped with (a number of) the following controls and indicators:

- synoptic diagram (see "Synoptic diagram")
- operating handle
- load break switch
- earthing switch



The function of these controls and indicators, as well as their operation, is described by their actual operation.

2.3.1 Operation of the load break switch, line side and load side earthing switch

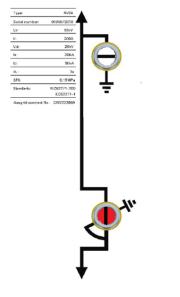


Figure 7: Load break switch closed line side and load side earthing switches opened During normal operation, the position is as follows:

- load break switch CLOSED

- earthing switch line side and load side OPENED

The indicator on the synoptic diagram is placed vertically, see Figure 7.

In this position the earthing switches is automatically locked. It is impossible to close the earthing switches.

2.3.1.1 Closing the load break switch

- Make sure that both earthing switches are OPENED.
- Place the operational handle on the operational axis of the load break switch. The operating handle can be attached permenantly onto the switchgear.
- Turn the operational axis **clockwise** until the load break switch audibly opens. The indicator on the synoptic diagram is no longer in the slanted position, the earthing switch is automatically locked.

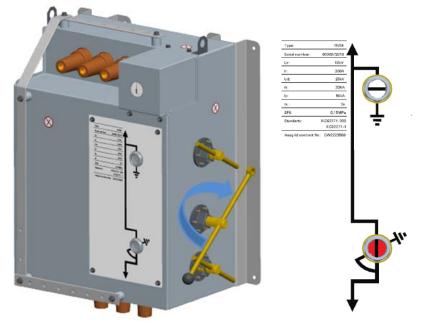


Figure 8: Closing the load break switch



Turning counterclockwise = opening switch Turning clockwise = closing switch

2.3.1.2 Opening the load break switch

- Place the operational handle on the operational axis of the load break switch. The operating handle can be attached permenantly onto the switchgear.
- Turn the operational axis **counterclockwise** until the earthing switch audibly opens. The indicator on the synoptic diagram is in the neutral position.
- The open operation can also be done by wire-rope operation.

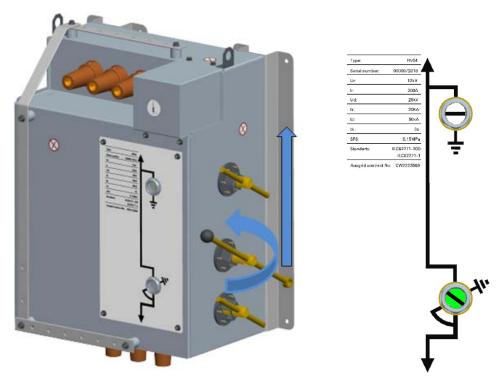


Figure 9: Opening the load break switch

2.3.1.3 Closing the line side earhting switch

- The load break switch has to be OPENED.
- Make sure that the cable is not energized.
- Place the operational handle on the operational axis of the line side earthing switch. The operating handle can be attached permenantly.
- Turn the operational axis **counterclockwise** until the line side earthing switch audibly closes. The indicator on the synoptic diagram is in the earthing position.

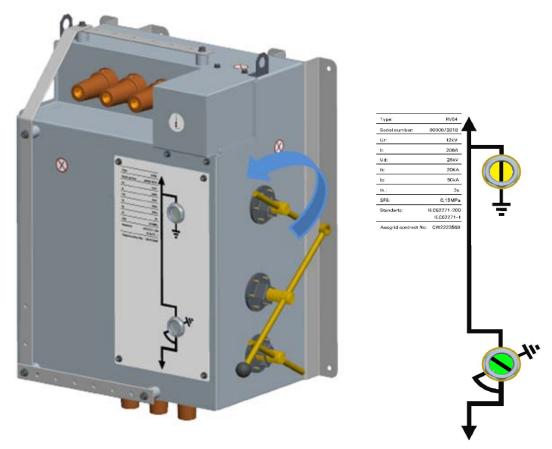


Figure 10: closing line side earthing switch

2.3.1.4 Opening the line side earthing switch

- Place the operational handle on the operational axis of the line side earthing switch. The operating handle can be attached permenantly.
- Turn the operational axis **clockwise** until the line side earthing switch audibly opens. The indicator on the synoptic diagram is in the opened position.

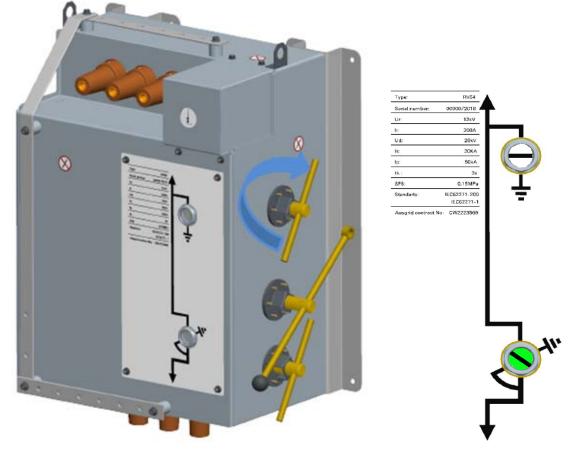


Figure 11: Opening of the line side earthing switch

2.3.1.5 Closing the load side earthing switch

- The load break switch has to be OPENED.
- Make sure that the cable is not energized.
- Place the operational handle on the operational axis of the load side earthing switch. The operating handle can be attached permenantly.
- Turn the operational axis **counterclockwise** until the line load earthing switch audibly closes. The indicator on the synoptic diagram is in the earthing position.

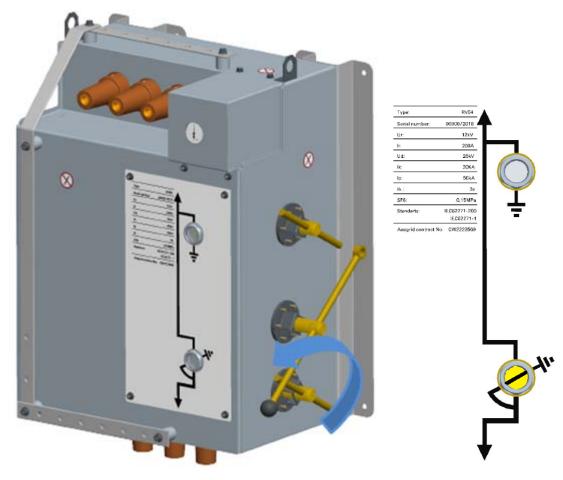


Figure 12: closing load side earthing switch

2.3.1.6 Opening the load side earthing switch

- Place the operational handle on the operational axis of the load side earthing switch. The operating handle can be attached permenantly.
- Turn the operational axis **clockwise** until the load side earthing switch audibly opens. The indicator on the synoptic diagram is in the opened position.

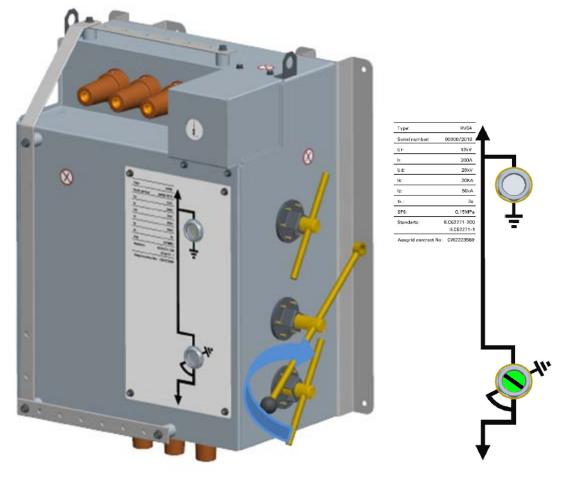
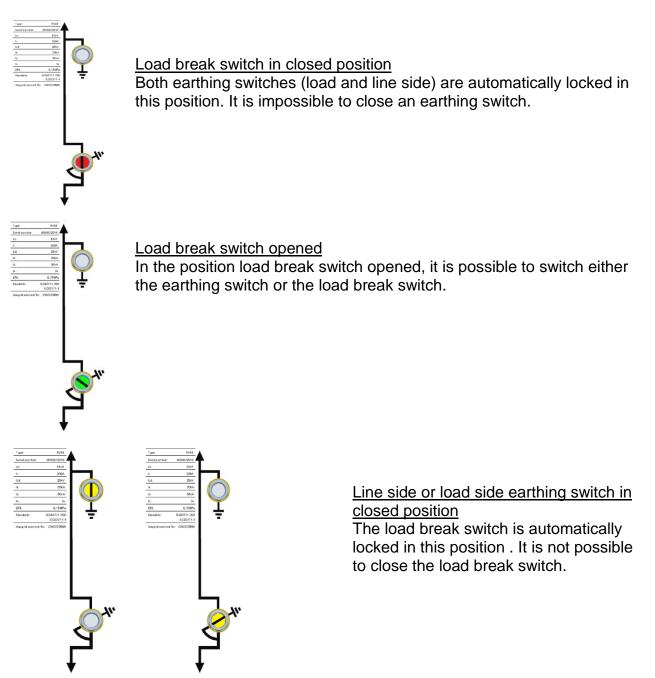


Figure 13: Opening of the load side earthing switch

2.4 Interlocking

The interlocks below are provided by default on the RV64. If other specifications are required, additional interlocks can be examined on simple request.



2.4.1 Padlocking

Padlocking can be done with a hasp of 5mm on each switches in all positions. Other switches can be operated while one switch is padlocked, never the less keep mind the interlocking.

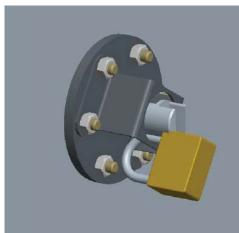


Figure 14: padlock

2.5 Control of the insulating gas SF₆ pressure

The control of the insulating gas pressure is realised with a colored zone (red/green) on the gas pressure monitor. (Figure 15).

Green zone :

The insulating gas pressure is within the tolerances.

Red zone :

The insulating gas pressure is too low. In this case, it is forbidden to do any switching operation on the switchgear RV64.

The gas pressure monitor is positioned on the front side of the RV64 and it is protected by means of a stainless steel cap.

The gas pressure monitor is temperature compensated.



Figure 15: Gas pressure monitor



Contact Mevoco nv if the insulating gas pressure is in the red zone !

3 MAINTENANCE

3.1 Safety guidelines - maintenance

- See also "GENERAL INSTALLATION & SAFETY INSTRUCTIONS". The maintenance actions described are restricted to qualified and trained operators. Always observe the local applicable safety instructions and guidelines.
- All other, not indicated maintenance tasks are restricted to trained and qualified service personnel (employed by the power supply company).
- Ensure that the whole medium voltage switchgear is de-energized before you carry out the maintenance actions described.
- Never leave tools or fitting material in or on top of the medium voltage switchgear.

3.2 Maintenance – general

RV64 cubicles have been designed to operate faultless, maintenance-free. To optimise a long life span of the switchgear, it is advised to do a few simple maintenance and cleaning actions. If proper caution is exercised, and if the prescribed actions are performed accurately, any problem will usually be discovered and corrected before they lead to a serious problem. Since maintenance intervals depend on specific operating circumstances, and as a result vary strongly, no maintenance intervals are provided.

Exceptions to this are the following tasks:

Interval	Task
Every two years	Switching the switch(es) in RV64 cubicles with switching functionSee "§2.3 Operation".
Every two years	 De-energize the entire medium-voltage switchgear See " Safety guidelines – maintenance ".
After submersion	Clean the outside of the tank, so that the switchgear is dirt-free or corrosive mud –free. Perform some no-load operations.



Important notice concerning RV64 medium-voltage switchgear.

RV64 medium-voltage switchgear requires minimum maintenance. It is of the "sealed for life type" and does not require an intervention when it comes to sealing, during the entire life cycle of the switchgear.

The integrated RV-50 load break switches are developed according to IEC 62271-102 standards and have a mechanical life cycle of 1000 operations. The maintenance intervals can vary depending on the use of the load break switch. Nevertheless, a number of scheduled maintenance tasks are still required, as described in the previous table.

3.2.1 General control operations

- Regularly perform a thorough, general visual inspection.
- Check whether the cables are still connected properly.

3.2.1.1 Cleaning RV64 cubicles

Contamination of the RV64 cubicles can initially be limited by respecting the recommendations regarding the installation area. See: "Recommendations – installation area".

3.2.1.2 Cleaning the exterior

- First read the safety guidelines. See: "Safety guidelines maintenance".
- Clean the exterior with non-fluffy cloth and a non-corrosive cleaning agent.
- Rub the cleaned surfaces thoroughly dry.

3.2.1.3 Submersion

MEVOCO N.V.'s RV64 equipment is type tested to be submerged for a period of 24h at 3m height of water above the top of the switchgear.

After submersion:

Check if there is no condensation at the inner side of the sight glasses.

Clean the outside of the tank, so that the switchgear is dirt-free or corrosive mud –free. Perform some no-load operations.

3.2.2 Switching the switches

Switches that are used rarely or never, need to be switched **at least every two years** to check the functioning of the mechanical components. See "Operation".

4 RV64 CUBICLES AND THE ENVIRONMENT

4.1 Packing materials

Packing materials consist mainly of:

- (Untreated) wood
 - Plastic strips
 - Plastic film

Contact the local public cleaning department for the details of recycling or an environmentally friendly way of processing the packing materials Tender the packing material as instructed (separated)..

4.2 Disposal of the cubicles

With regards to reusing electrical components, SF₆-gas (sulphur hexafluoride) filled switchgear material can be returned to MEVOCO N.V. at the end of its life span or when damaged.

On consultation, complete RV64 cubicles can also be returned. If this is not possible, the cubicles must be processed in an environmentally friendly way. Contact the local sanitation services for possible recycling and tender the material in the prescribed manner (separated).

4.3 Recuperation of SF₆ gas

The recuperation of SF₆-gas in medium-voltage cubicles of the RV64 type, concerns the gas-filled compartment with integrated load break switche RV-50. The stainless steel tank contains a gaseous volume of $0,149m^3$ with a pressure of 1.5 bar absolute at 20°C. Taking into account the dimensions and the volume of the gas, users are advised to have the recycling of gas-filled components done, at the end of the life-cycle, by a specialized company. Only specific trained staff should recycle or recuperate the SF₆ gasat the end of the RV64's life span.

In this case, the user will take into account the local regulations with regards to transport. Insofar as possible, the user will denote the predictable state of decomposition of the gas, in order to be able to provide adequate treatment.

The RV64 is equipped with a standardised DN6 DILO connector for the recuperation of the SF_6 gas.

At end of the lifespan (40 years), the decomposition degree of the gas will be considered as minor (see Table 1 – section 6 IEC 61634). The customer can also consult MEVOCO N.V. in order to recycle or recuperate the SF_6 gas.



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