

DF-2

MEDIUM VOLTAGE SWITCHGEAR

THE MODULAR CONCEPT



Manual integrated surge arrester and surge arrester monitor



READ THIS DOCUMENT CAREFULLY BEFORE ANY OPERATION



THE SPECIALIST IN **MEDIUM VOLTAGE SWITCHGEAR**

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PREFACE

Introduction

This document is intended as a reference for qualified and trained operators to install 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 DF-2 functions that, mutually coupled and connected, constitute a client-specific transformation or distribution station.

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 equipped with 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

High Voltage Danger

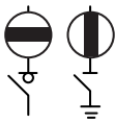


CAUTION!

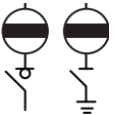
Clamping danger



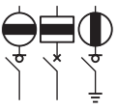
Notes, suggestions and advice.



Make 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.



Make this cubicle, the next one and the previous cubicle, voltage-free, before carrying out the work described. Open the load-break switch and the circuit breaker. Close the earthing switch



Consult the indicated information sources first.



Protect the medium voltage switchgear from water and damp.

Related documentation

The following technical documentation for medium voltage switchgear is available:

- Installation manual DF-2
- User manual DF-2
- User manual VA-2/VAS-2
- User manual Arc-killer SV-25 on VA-2/VAS-2

Service and technical support

For information concerning specific settings, maintenance or repair work which is not covered in the manual, please contact SGC - SwitchGear Company nv.

When contacting SGC – Switchgear Company nv, always provide the following information:

- Cubicle designation and characteristics
- Serial number of the cubicle(s)

General safety directions and instructions

SGC – SwitchGear Company nv 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 accompanying options.

Depending on specific user circumstances, or installed options, extra safety instructions may be required. Please contact SGC – SwitchGear Company nv 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 SGC – SwitchGear Company nv.

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 switchgear. 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.

Transport, storage, installation, operation and maintenance

See corresponding documents:

- “Safety guidelines – transport”
- “Safety guidelines – storage”
- “Safety guidelines – installation”
- “Safety guidelines – operation”
- “Safety guidelines – maintenance”



Cubicles that fell over or have otherwise been damaged always **HAVE TO BE RETURNED** to SGC - SwitchGear Company for a checkup

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 SGC – SwitchGear Company nv. Any other or further use is not in accordance with the intended use.¹

SGC – SwitchGear Company nv 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.

SURGE ARRESTER AND SURGE ARRESTER MONITOR

1 GENERAL DESCRIPTION

The surge arrester and the surge arrester monitor are both integrated in the corresponding cubicle. The surge arrester is mounted in the cable compartment; the surge arrester monitor is integrated in the low voltage compartment of the cubicle.

1.1 Low voltage compartment

The leakage current of the surge arrester is measured in a continuous manner. The recorded values are displayed in the LV compartment of the corresponding cubicle (Figure 1). The measurement is performed by means of a mA-meter per phase.

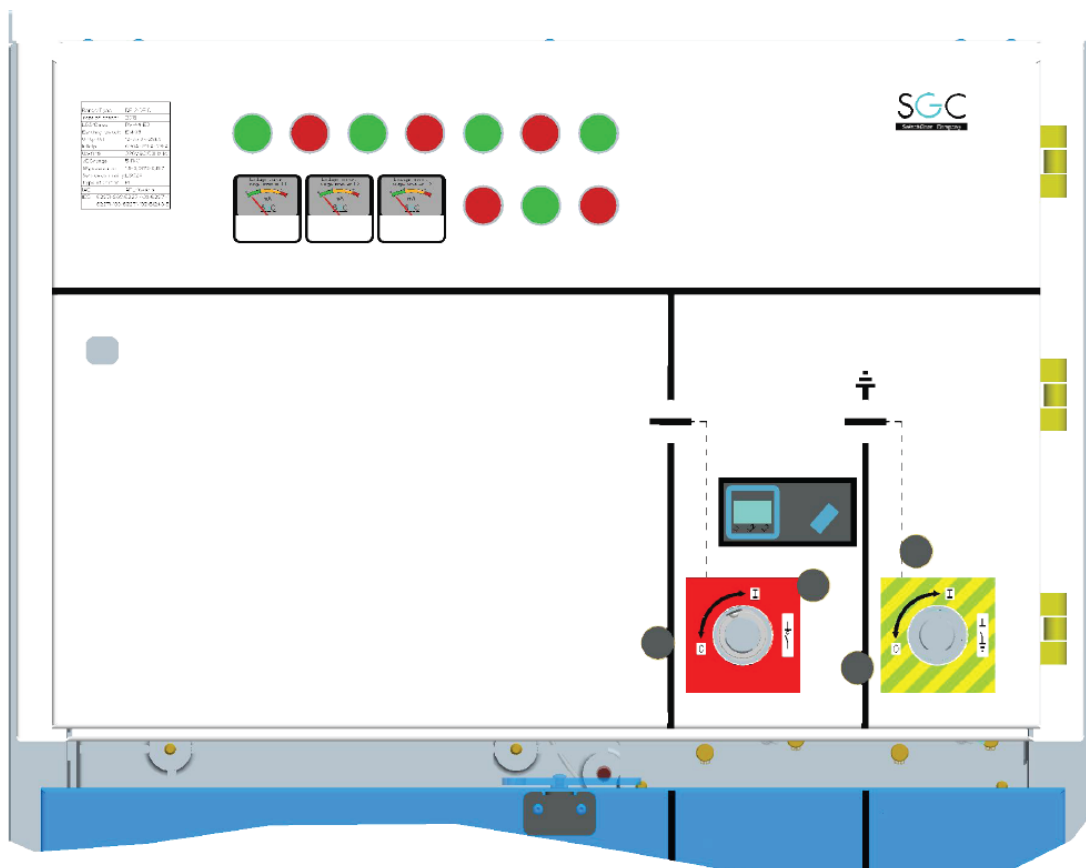


Figure 1: Front panel DF-D cubicle

1.2 Cable compartment

The surge arrester is mounted in the cable compartment between the current transformer and the capacitive insulator.

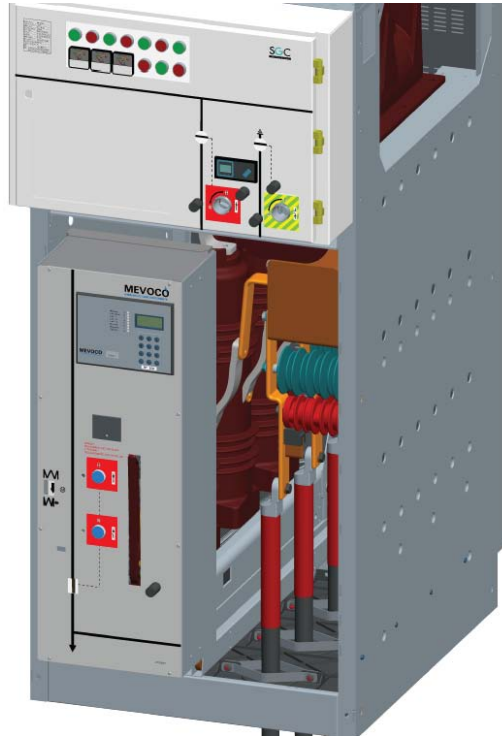


Figure 2: Front view DF-D, door removed

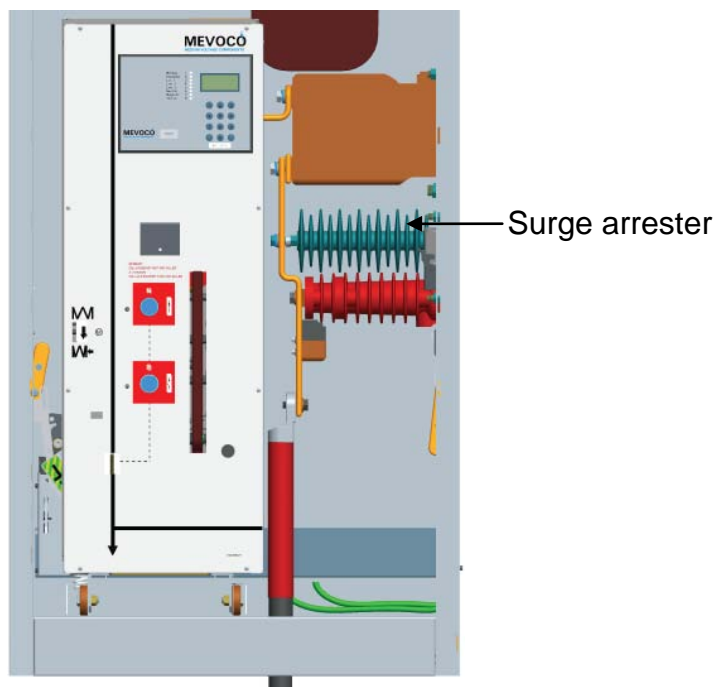


Figure 3: Detailed view cable compartment

2 GENERAL USE

The leakage current of each individual surge arrester is monitored (Figure 4). During the lifespan of the surge arrester at rated voltage, three different phases can be distinguished:

- Green zone: leakage current is less than 2mA; surge arrester is in good condition
- Orange zone: measured leakage current is situated between 2mA and 5mA; ageing of the surge arrester is started, replacement of the surge arrester is advised.
- Red zone: measured leakage current exceeds 5mA; replacement of the surge arrester should be performed.

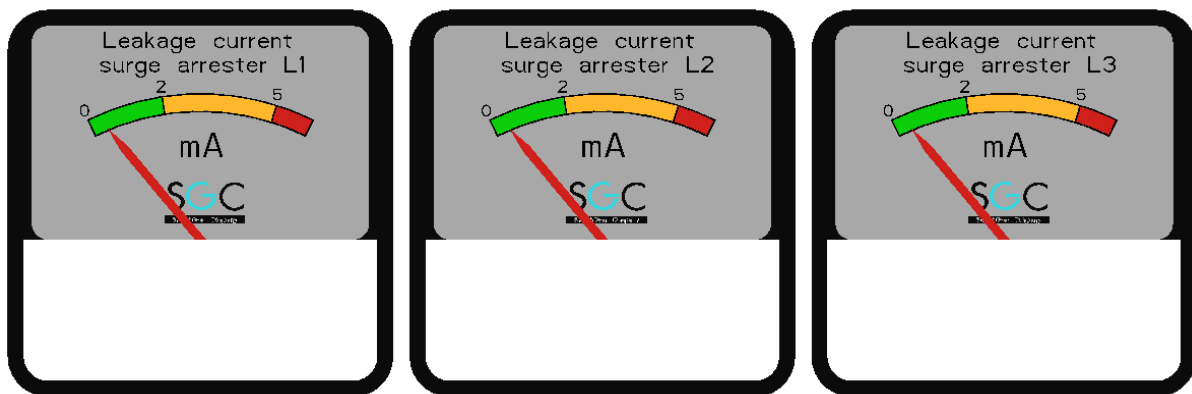


Figure 4: Detailed view front panel on mA-meters

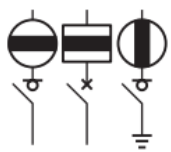
3 END OF LIFE SURGE ARRESTER

When the surge arrester is at the end of its lifespan, following steps should be made to perform the replacement in a safe and efficient manner.

3.1 Preparation before disassembling

The following preparations must be made before starting to disassemble the cubicle.

Make that the entire medium voltage switchgear and the circuit breaker is de-energized and grounded.



- On the particular unit, open both the load-break switch and the circuit breaker.
- The HV cable connection should be de-energized as well.
- Close the earthing switch on the particular unit.

3.2 Disassembly procedure

3.2.1 Removing the door

- Verify that the earthing switch is in closed position.
- Turn the locking latch, located at the middle of the door (Figure 5).
- Grab the door using the handles with both hands.
- Carefully lift the door out.
- Place the door where there is no risk of it being damaged.

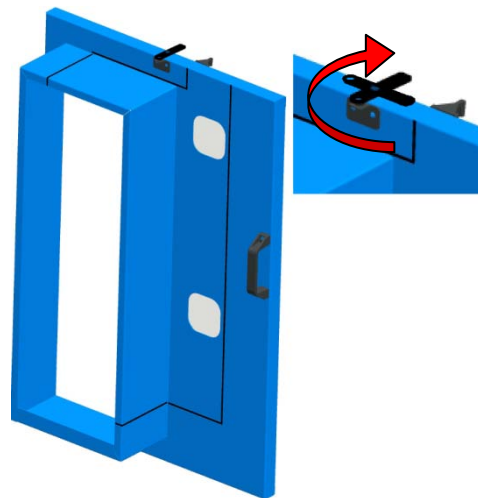


Figure 5: Removing the door

3.2.2 Retract the circuit breaker



If an arc-killer is present, make sure that the arc-killer is in grounded position and that the coupling between arc-killer and cubicle is disconnected before retracting the circuit breaker^[2]!

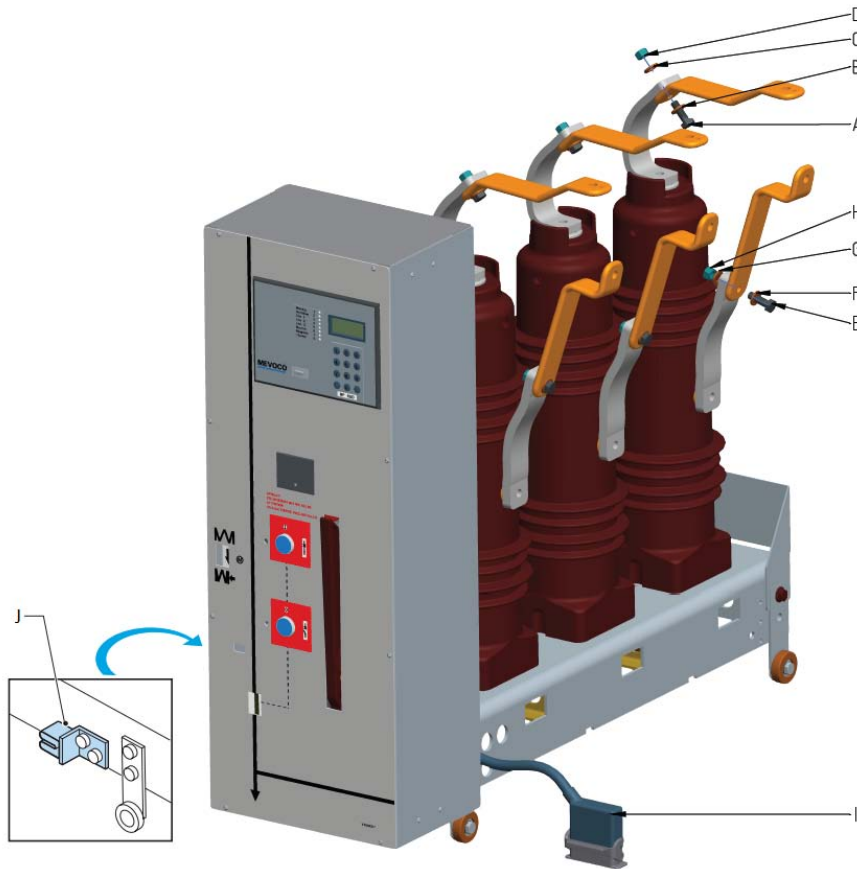
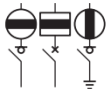


Figure 6: Removing the circuit breaker from the cable compartment



Make that the entire medium voltage switchgear and the circuit breaker is de-energized and grounded.

- Loosen the top connections of the circuit breaker
 - Loosen the nuts (Figure 6D)
 - Remove the washers (Figure 6B and C)
 - Remove the hexagonal tap bolt (Figure 6A)
- Loosen the bottom connections of the circuit breaker
 - Loosen the nuts (Figure 6H)
 - Remove the washers (Figure 6G and F)
 - Remove the hexagonal tap bolt (Figure 6E)



The flexible braids must stay on the circuit breaker!

- Disconnect any low voltage connector present on the circuit breaker (Figure 6I)
- Carefully retract the circuit breaker out of the cable compartment, avoid damage on the earthing contact (Figure 6J).

² Detailed procedure described in user manual arc-killer SV-25 on VA-2/VAS-2

3.2.3 Remove pre-assembly surge arrester

Once the circuit breaker is removed from the cable compartment, the pre-assembly of the surge arrester can be disconnected.

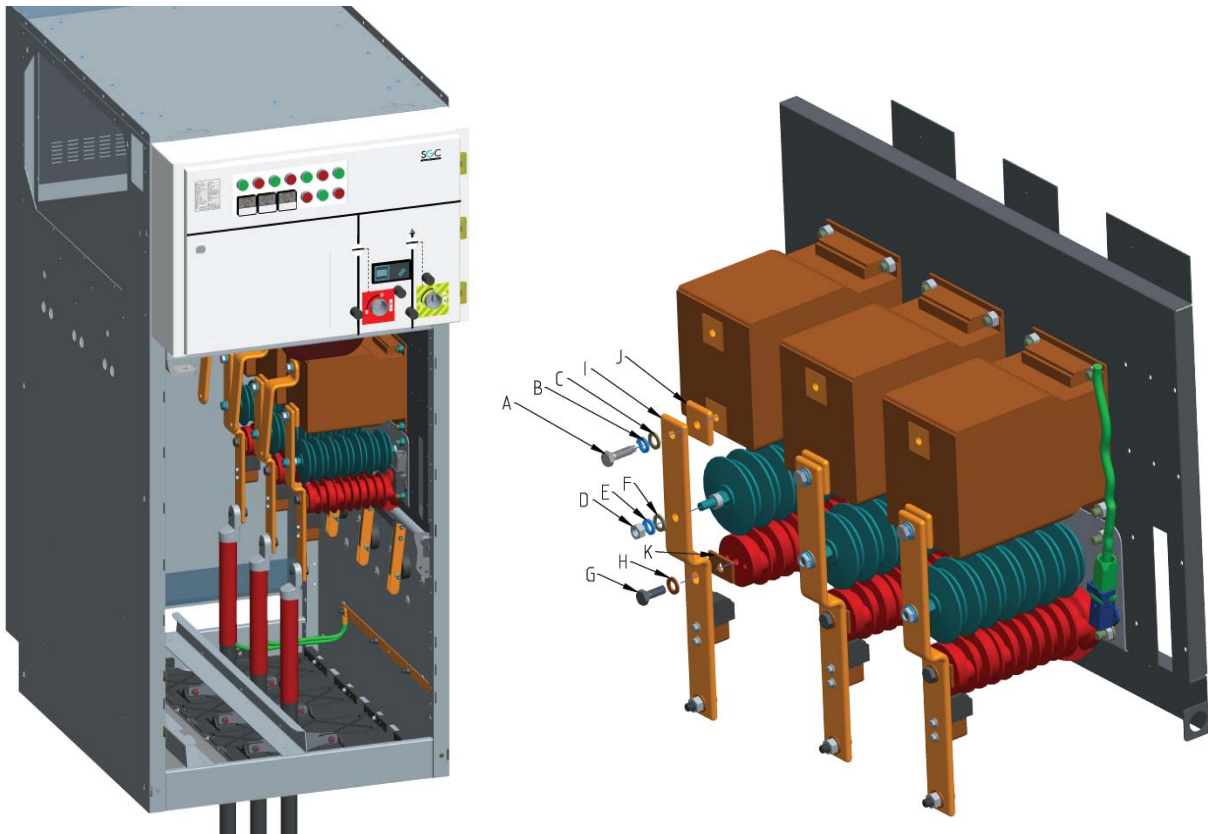


Figure 7: Cable compartment, VCB retracted

Figure 8: Remove copper connection CT - Insulator

- Loosen the connection to the current transformer
 - Loosen the hexagonal tap bolt (Figure 8A)
 - Remove the washers (Figure 8B and C)
- Loosen the connection to the surge arrester
 - Loosen the nut (Figure 8D)
 - Remove the washers (Figure 8E and F)
- Loosen the connection to the capacitive insulator
 - Loosen the hexagonal tap bolt (Figure 8G)
 - Remove the washers (Figure 8H)
- Remove the copper connection between the current transformer and the capacitive insulator Figure 8 I, J, K.

Continue as described for the remaining two phases.

Once the connection copper between current transformer and capacitive insulator is removed, loosening of the pre-assembly of the surge arrester can be started.

Unplug the connector (Figure 9A) located at the front, afterwards remove the nuts (Figure 9B) and the washers (Figure 9C).

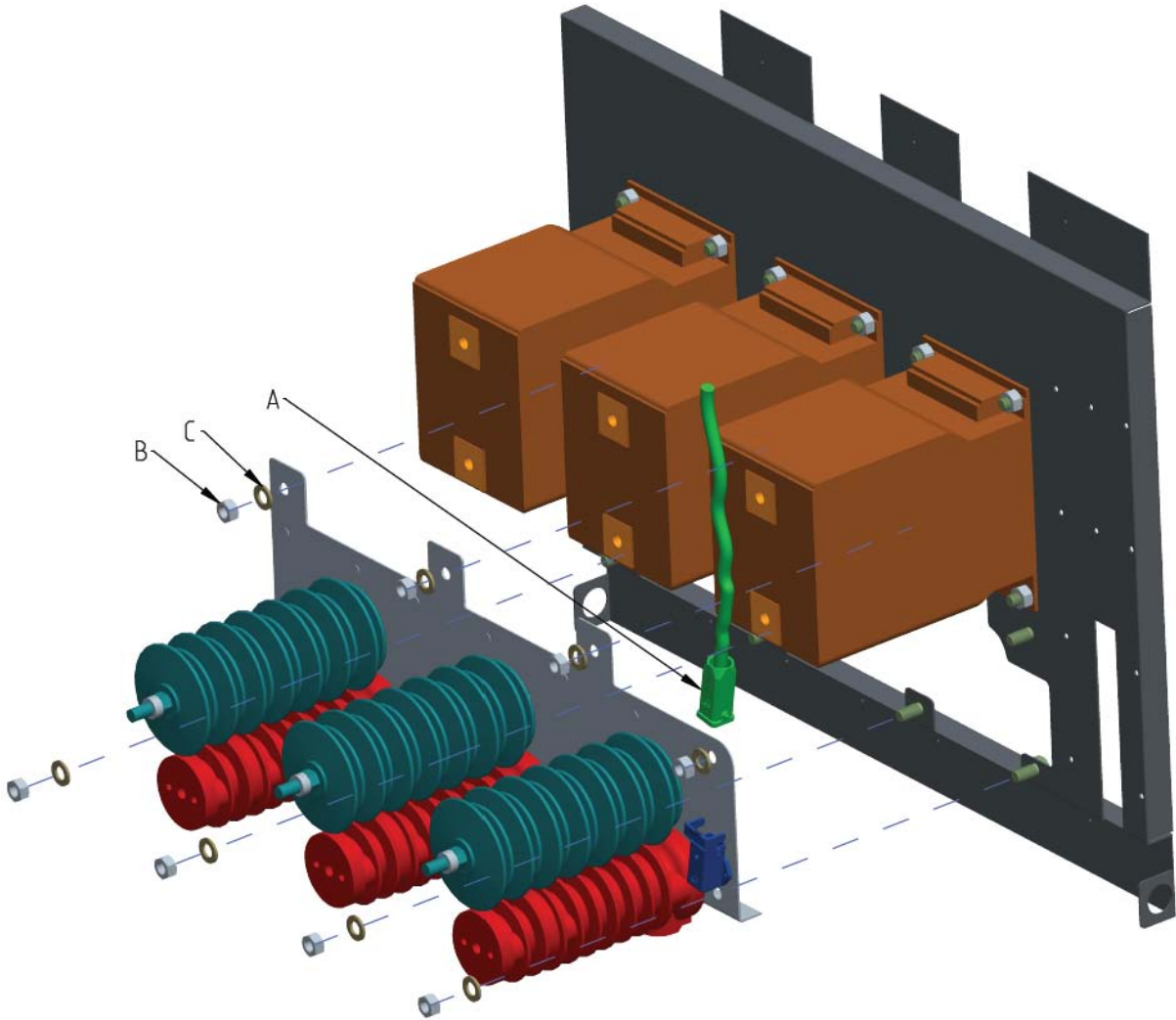


Figure 9: Remove of the pre-assembly surge arrester

3.3 Disassembly procedure

3.3.1 Replacement pre-assembly surge arrester

The replacement can be done by performing the opposite operation. Fix the pre-assembly using the nuts (Figure 10B) and the washers (Figure 10C). Replug the connector (Figure 10A) located at the front.

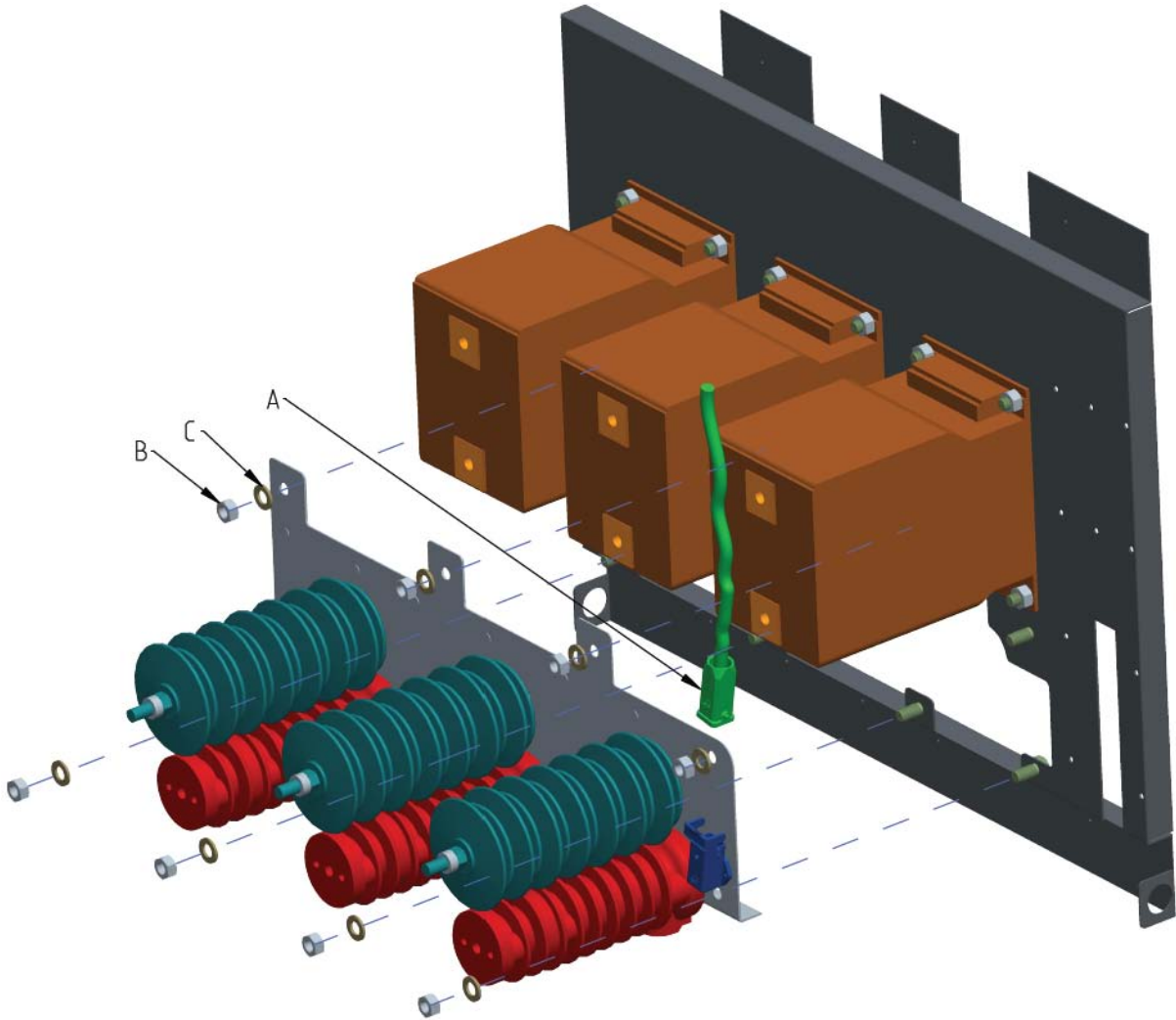


Figure 10: Replacement pre-assembly surge arrester

Once the pre-assembly is back into place, the connection copper between CT and the capacitive insulator can be mounted.

- Mount the connection to the current transformer
 - Place the washers (Figure 12B and C) on the hexagonal tap bolt (Figure 12A)
 - Place the combination in the copper connection (Figure 12I) and the copper space (Figure 12J).
 - Fix into the current transformer with a torque of 35Nm.

- Mount the connection to the surge arrester
 - Place the washers (Figure 12E and F) and the nut (Figure 12D) on the surge arrester
 - Fix with a torque of 25Nm, do not apply any force on lower nut of the surge arrester (Figure 11)

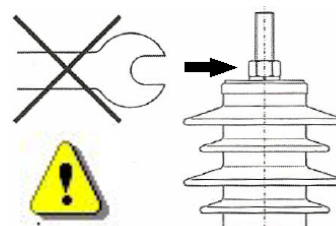


Figure 11: Prohibited action

- Mount the connection to the capacitive insulator
 - Place the washers (Figure 12H) on the hexagonal tap bolt (Figure 12G)
 - Place the combination in the copper connection (Figure 12I) and the copper space (Figure 12K).
 - Fix into the capacitive insulator with a torque of 35Nm.

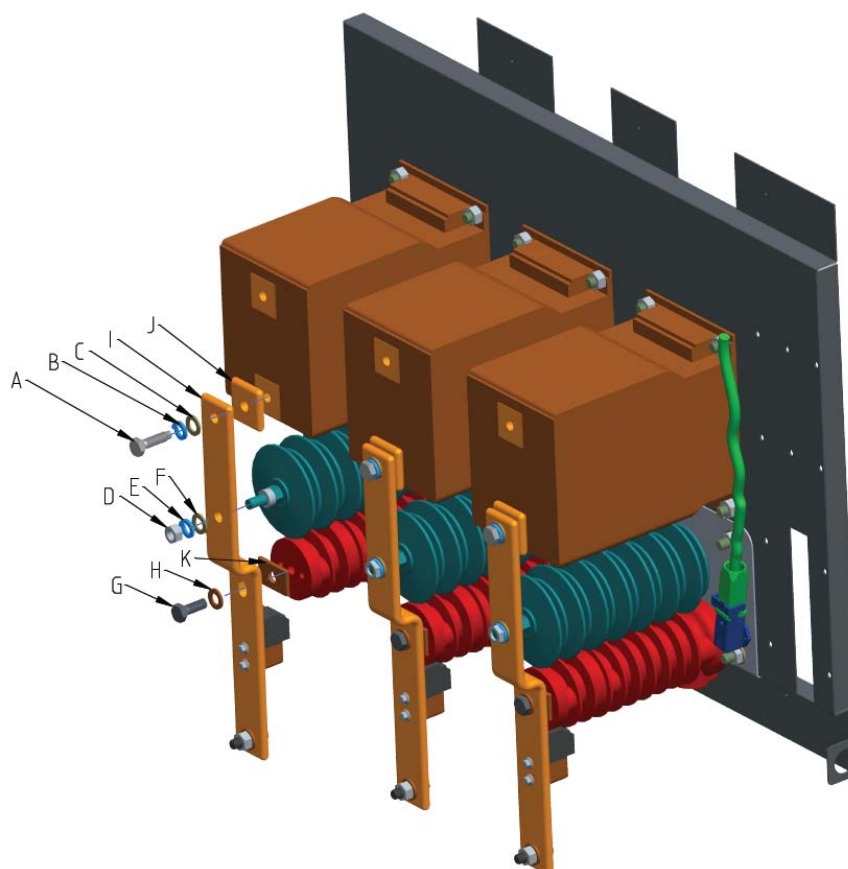


Figure 12: Fixation copper connection CT-Insulator

3.3.2 Insert the circuit breaker



If an arc-killer is present, make sure that the arc-killer is in grounded position and that the coupling between arc-killer and cubicle is disconnected before retracting the circuit breaker^[2]!

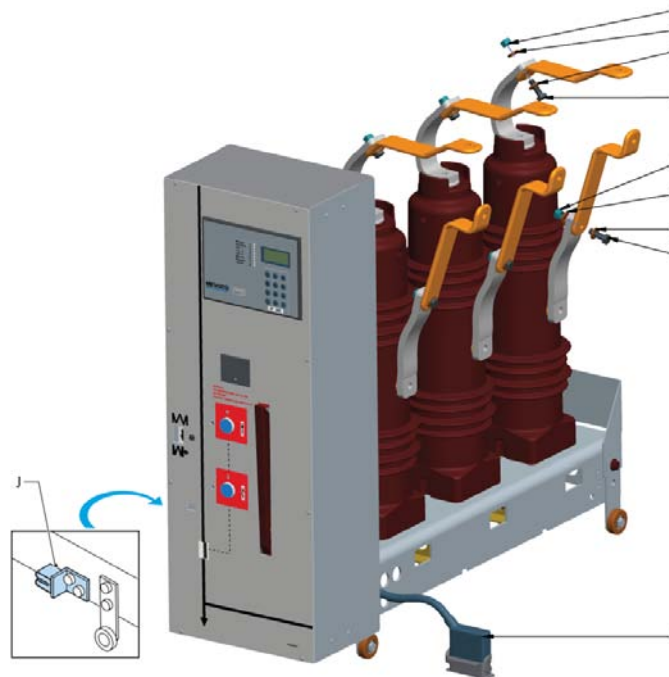


Figure 13: Entering the circuit breaker

Place the circuit breaker with its rear wheels in the transport rails and enter the circuit breaker against the rear stop guides.

- Connect any low voltage connector present on the circuit breaker (Figure 13I)
- Mount the top connection of the circuit breaker to the copper contact
 - Place the washer (Figure 13B) on the hexagonal tap bolt (Figure 13A)
 - Place the whole through the copper contact and the flexible braid.
 - Place the washer (Figure 13C) and the nut (Figure 13D) on the hexagonal tap bolt (Figure 13A)
 - Fix the connection with a torque of 35Nm.
- Mount the lower connection of the circuit breaker to the copper contact
 - Place the washer (Figure 13F) on the hexagonal tap bolt (Figure 13E)
 - Place the whole through the copper contact and the flexible braid.
 - Place the washer (Figure 13G) and the nut (Figure 13H) on the hexagonal tap bolt (Figure 13E)
 - Fix the connection with a torque of 35Nm.

After the door is fit back onto the cubicle and the padlock back into place, the switchgear can be put back in operation taking into account the procedure described in the manual.