DISTRIBUTION SOLUTIONS

OVR-15, 27 & 38 outdoor vacuum recloser

High voltage unit

Instruction, operation, and maintenance manual

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This product has been designed to be connected to medium voltage distribution networks. It is the sole responsibility of the person or entity responsible for the network administration to ensure a secure connection to the network and take necessary measures to protect the product and the network, its system and interface included against any kind of security breaches, unauthorized access, interference, intrusion, leakage and /or thefts. ABB is not liable for any such damages and/or losses.

This product is intended to be operated and maintained by qualified personnel, thoroughly trained and knowledgeable with regards to the associated hazards involved. This publication is written only for such qualified personnel and is not intended to be a substitute for adequate training and experience in the safety procedures for this device.

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1 CONTENTS

For your safety!

- Make sure that the installation place & environment is suitable for the electrical apparatus.
- Check that all the installation, putting into service and maintenance operations are carried out by qualified personnel having relevant knowledge of the apparatus.
- Make sure that the standard and legal prescriptions are complied with during installation, putting into service and maintenance, so that installations according to the rules of good working practice and safety in the workplace are constructed.
- Strictly follow the information given in this instruction manual.
- Ensure that the rated performance of the apparatus is not exceeded during service.
- Ensure that the personnel operating the apparatus have this instruction manual to hand as well as the necessary information for correct intervention.

A. INTRODUCTION

This manual contains the information needed to install HV unit of OVR-15, 27 & 38 Auto-recloser and put them into service.

For correct use of the product, please read this manual carefully along with instruction, operation, and maintenance manual for low voltage unit.

OVR-15, 27 & 38 reclosers are designed for different installation configurations. However, the mounting structure for this apparatus allows further technical-construction modifications (at the customer's request) to adapt to special installation requirements. Consequently, the information given below may sometimes not contain instructions concerning special configurations.

Apart from this manual, it is therefore always necessary to consult the latest technical documentation (electric circuit and wiring diagrams, assembly and installation drawings, any protection coordination studies, etc.), especially regarding any variants requested in relation to the standardized configurations.

Only use original spare parts for maintenance operations. For further information, please refer recommended spare part list mentioned in this manual.

All the installation, putting into service, running and maintenance operations must be carried out by skilled personnel with in-depth knowledge of the apparatus.

B. ENVIRONMENTAL PROTECTION PROGRAM

The OVR-15, 27 & 38 reclosers are manufactured in accordance with the ISO 14000 Standards (Guidelines for environmental management).

The production processes are carried out in compliance with the Standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. All this is thanks to the medium voltage apparatus manufacturing facility environmental management system.

C. X-RAY EMISSION STANDARDS

One of the physical properties of vacuum is the possibility of X-ray emission when the interrupter contacts are open & subjected to high voltage. Specific tests carried out shows that local emission at a distance of 10 cm from the Interrupter or pole surface does not exceed 1mSv/h.

It follows that:

At the rated service voltage, use of vacuum interrupter is absolutely safe.

Application of the withstand voltage at industrial frequency, according to the IEC 62271 - 111 standard, is safe.

Application of a voltage higher than the power frequency withstand voltage at the industrial frequency or direct current specified in the IEC standard, may cause permanent damage to the unit and it is out of the guaranteed operating limits.

Limitation of the above-mentioned local phenomena, with interrupters with open contacts, depends on keeping the specified distance between the contacts. This condition is intrinsically guaranteed by correct operation of the operating mechanism and adjustments of the transmission system.

D. END OF LIFE RECYCLE/DISPOSAL

ABB is committed for complying with relevant legal and other statutory requirements for environment protection according to the ISO 14001 standard. The duty of the end user is to facilitate end of life recycling & disposal according to the applicable regulations.

During disposal of product, it is necessary to act in according with local legal requirements in force. Disposal can either be carried out thermally in an incineration plant or by storing on a waste site.

Following are the methods of recycle/disposal:

Table 1 : Recycle/disposal methods

Raw Material	Recycle	Environmental effects & reuse processes
Iron	Yes	Separate, utilize in favor of new source (ore)
Stainless steel	Yes	Separate, utilize in favor of new source (ore)
Copper	Yes	Separate, utilize in favor of new source (ore)
Brass	Yes	Separate, utilize in favor of new source (ore)
Aluminum	Yes	Separate, utilize in favor of new source (ore)
Zinc	Yes	Separate, utilize in favor of new source (ore)
Thermoplastic	Yes	Make granulate, re-use or apply as energy superior
Epoxy incl. 60% quartz	Yes	additive in refuse incineration
Rubber	Yes	Cut into pieces & use as high-grade energy
Porcelain	Yes	additive in cement mill
Packing foil	Yes	Cut into pieces & used for landfills
Wooden pallet	Yes	High grade energy additive in refuse incineration

E. PRODUCT RELATED SAFETY NOTICES

The OVR-15, 27 & 38® recloser should be installed within the design limitations as described on its nameplate and in these instructions. In addition, always follow your company's safety procedures.

This recloser should not be used by itself as the sole means of isolating a medium voltage circuit. For the safety of the personnel performing maintenance operations on the recloser or connecting equipment, all components should be electrically disconnected by means of a visible break and securely grounded.

This manual uses terms "ground" & "grounding" as per IEEE. These are equivalent to IEC terms "earth" and "earthing".

This manual contains terms and expressions commonly used to describe this kind of equipment.

These instructions do not attempt to provide the user of this equipment every possible answer to questions which may appear in the application, operation, and maintenance of the product.

Detailed descriptions of standard repair procedures, safety principles, and service operations are not included. It is important to note that this document contains some warnings and cautions against some specific service methods that could cause personal injury to service personnel or could damage equipment or render it unsafe. These warnings do not cover every conceivable method in which service (whether or not recommended by ABB) may be performed.

Secondly, ABB cannot predict or investigate all potential hazards resulting from all conceivable service methods. Anyone using service procedures or tools, whether or not recommended by ABB, must be completely certain that both their personal safety and the safety of the equipment will not be jeopardized by the service method or tools selected.

All information contained in this manual is based on the latest product information available at the time of printing. The right is reserved to make changes at any time without notice.

Also, as improvements in assemblies and parts are made, some parts may differ in appearance that depicted in illustrations; however, functionality will be equivalent.

F. WORKING ON HV CABINETS AND MANDATORY SAFETY PROCEDURES.

Whenever it is required to work on HV &/or LV units, it is mandatory to follow following minimum procedures:

a. Isolate the recloser from power system on its both sides. Put recloser in OPEN condition by operating the emergency manual trip handle (yellow handle).

   Once recloser is opened, the handle gets locked & blocks close operation both electrically & mechanically till the handle is reset to its original (not operated) position.

b. Confirm the OPEN status of the recloser from the mechanical ON/OFF indicator, from SLD on LCD display & the indication LEDs on RER615 HMI.

c. Always put the SERVICE /DISCHARGE selector switch in the LV cabinet to DISCHARGE position.

d. Follow the safety warning instructions on various warning labels provided on the LV & HV units

e. Remove the control cable from both HV & LV cabinets & cover the 24 pin male connectors by plastic caps provided.

Although warning hazards are related to personal injury, it is necessary to understand that under certain operational conditions, operation of damaged equipment may result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

G. WARNING TEXTS AND SYMBOLS

Warning texts mentioned are stated based on different degrees of urgency, which should be carefully observed. These are described below.

Danger

Danger *Indicates an immediate risk situation that can lead to death or serious personnel injury if not avoided*

Warning

Warning *Indicates an immediate risk situation that can lead to death or serious personnel injury if not avoided*

Caution

Caution *Indicates a risk situation that can lead to small or moderate damage*

Note

Note *is used when there is a danger that can lead to equipment damage only.*

Important

Important *indicates an operation or a suggestion for handling.*

Warning Symbols

Following warning symbols may appear on warning sticker as a part of the product.

The electrical warning icon indicates the presence of a hazard which could result in electrical shock.

Dangerous voltages can occur on the connectors, even though the auxiliary voltage has been disconnected

Only a competent electrician is allowed to carry out the electrical instllation

National and local electrical safety regulations must always be followed.

Non-observance can result in death, personal injury or substantial property damage.

The warning icon indicates the presence of a hazard which could result in personal injury.

The equipment contains components which are sensitive to electrostatic discharge. Unnecessary touching of electronic componenets must therefore be avoided

2 PACKING AND TRANSPORT

2.1 GOODS MARKING

The recloser is transported in “Contact OPEN” position. The factory assembled recloser may be transported in different packing cases for HV unit, LV unit and mounting brackets. Each case is marked with case markings on two sides with indelible black ink. The case markings include information of case number, gross weight, etc.

Optional accessories like auxiliary power voltage transformer, terminal connectors, etc. might be transported in a separate case.

In addition to the above, the cases are marked with the following symbols. These should be observed when choosing lifting equipment.

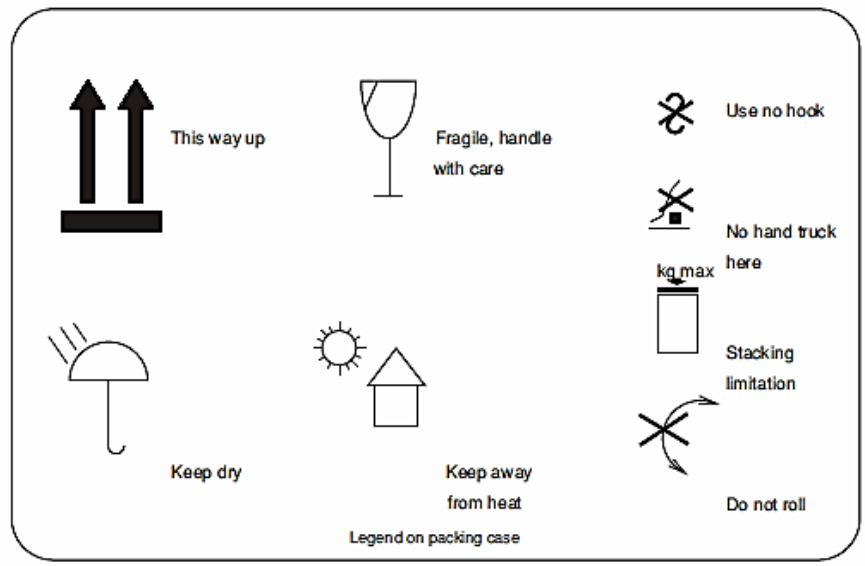


Figure-1 : General symbols on packing case

2.2 DOCUMENTS

Documents provided with the recloser during dispatch.

- Instruction manual
- Routine test certificate
- Drawings
- Packing list
- Other documents as mutually agreed in contract with ABB

2.3 TRANSPORT AND LIFTING

The recloser shall be transported in packed condition only. Before lifting the case, observe the information on it (such as symbol, weight, etc.).

Following precautions are to be taken while lifting:

- Ensure that packing cases are not placed on wet surfaces / waterlogged areas.
- Reclosers should not be stacked one over the other.
- Reclosers should be lifted by a lifting device equipped with forks or slings. If a crane is used, slings shall be used. The units must not be rolled or dropped.

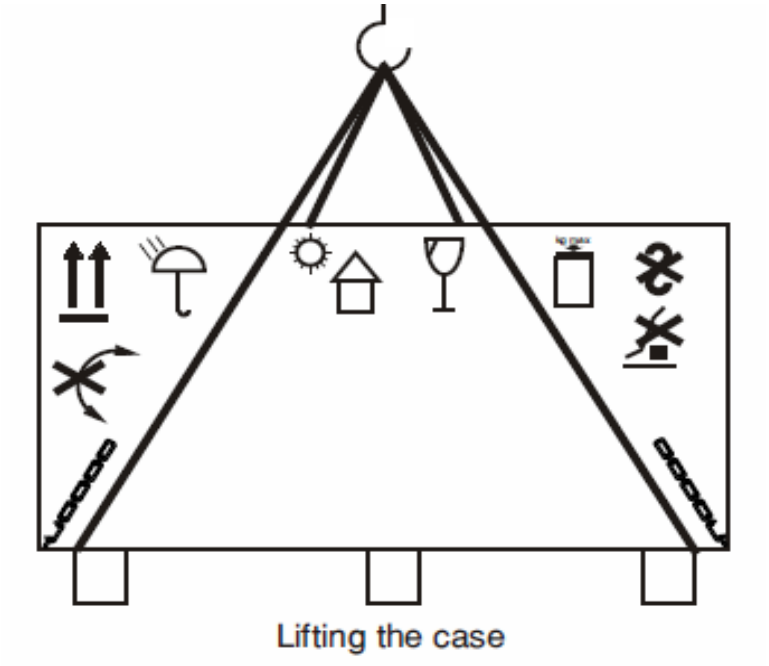


Figure-2 : Packing case lifting arrangement

3 RECEIPT AND STORAGE PRIOR TO INSTALLATION

3.1 RECEIPT OF RECLOSER

Each recloser is assembled and tested at the factory. Prior to shipment, the equipment is thoroughly inspected to ensure a quality product free from defects. If damage is noticed, call the carrier at once for inspection, and request an inspection report. Afterwards, file a formal claim with the carrier, supported with the Airway/Roadway Bill.

Each delivery, on receipt, should be checked for,

- Shortages and discrepancies. (Check against order and delivery documents).
- Any transit damage and material losses.
- Abnormality, if any, must be notified immediately to ABB, forwarding agents and the insurance company.

Instructions and literature packed with the recloser should be kept with the unit. Additional copies may be obtained upon request from the local ABB sales office. Following are the typical parts in which recloser are generally shipped from factory.

Default Shipment	High voltage (HV) cabinet
	Control cable (length as per order specific drawings)
Optional items **(only if ordered separately)**	Mounting brackets
	Auxiliary power cable (2x1.5 sq.mm)
	Terminal connectors for main power cable connections
	Insulating boots for main power connections
	Auxiliary power voltage transformers
	Any additional spares

3.2 STORAGE OF RECLOSER

The recloser with complete packing should always be stored indoor to protect from direct sunlight & rain or snow. The recloser should be stored in its original transport units, where they are well protected from damage.

Reclosers can be stored up to 3 months from date of shipment from the factory. For longer storage, the packing needs to be removed and the recloser to be kept under controlled environmental conditions.

We define storage in controlled conditions as a place with:

- Leak proof roof
- Solid, flat ground
- Relative humidity less than 50%
- Temperature 20 ^{0}C (+10°C)
- The heating elements must be connected to the electric supply to protect the control equipment from corrosion or freezing damage.

Structures may be stored outdoors with proper care by avoiding any water accumulation or soil deposition. Spare parts should be stored indoors in their original packing.

Important

The HV cabinets must be stored in the upright position to avoid moisture accumulation.

Recommended storage temperature range is -20 °C to + 40 °C.

Note

If the recloser is not placed in service immediately, it is essential that proper care be exercised in handling and storage to ensure good operating condition in the future. Please consult ABB if the recloser will be in storage for an extended period of time before installation.

3.3 HANDLING

Each HV cabinet come with lifting brackets on the sides of these cabinets for lifting. A four-point lift is strongly recommended using the loops in these brackets. The approximate mass in Kg is separately mentioned on rating plates on HV cabinets.

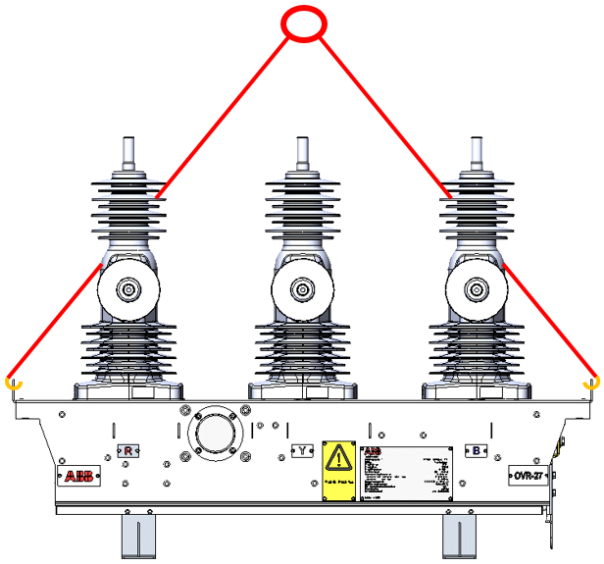


Figure-3 : HV cabinet lifting details

Caution

Exercise care during lifting to avoid damage to the poles

Caution

Do not place the recloser HV unit on an uneven surface. Placing the HV unit on an uneven surface may cause tilting / galling of the HV unit causing damage to the equipment and injuries to the person nearby

Caution

Spreader bar should be used if necessary, to ensure lifting straps do not press against and damage the poles, & mechanical ON/OFF indicator.

Caution

Do not use forklift to move recloser as it may damage the mechanical ON/OFF position indicator, Yellow Trip handle and associated interlock

Caution

Exercise care during lifting to avoid damage to the poles

4 TECHNICAL DETAILS

This operating instruction is applicable for medium voltage, three phase mechanically ganged operated vacuum reclosers OVR-15, 27 & 38 HV Unit.

Each OVR-15, 27 & 38 Recloser has three vacuum interrupters, each assembled in pole casted with an advanced Hydrophobic Cycloaliphatic Epoxy (HCEP). Together with the specialized control functions, the recloser will sense a pickup current (or other pre-configured condition) and automatically open, or “trip”. After a pre-configured Open Interval Time, the recloser will close again. If the tripping condition still exists, the recloser will trip again and reclose. OVR-15, 27 & 38 can be reclosed up to three times in one operating cycle.

The standard OVR-15, 27 & 38 recloser control, RER615, will allow up to three closing operations before the recloser will “lock out” in the open position.

4.1 TABLE 1 : TECHNICAL DATA SHEET FOR OVR-15, 27 & 38

Sr. No.	Technical Characteristic	OVR-15	OVR-27	OVR-38
1	Installation	Outdoor, Pole / substation mounting		
2	Suitable as standard	IEC 62271-100 / IEEE C37.60		
3	Rated system voltage	15 kV	27 kV	38 kV
4	Rated frequency	50 / 60 Hz		
5	Nominal current at 40 ^{O}C ambient	630 Amps	1000 Amps	1200 Amps
6	Short time current withstand capability	12.5 kA_{rms} for 3 sec	12.5 kA_{rms} for 3 sec	16 kA_{rms} for 3 sec
7	Fault current breaking capability	12.5 kA_{rms}	12.5 kA_{rms}	16 kA_{rms}
8	Making current capability	32.5 kA_p	32.5 kA_p	41.6 kA_p
9	One minute power frequency withstand capability (Dry / Wet)	50 kV_{rms} / 45 kV_{rms}	60 kV_{rms} / 50 kV_{rms}	70 kV_{rms} / 60 kV_{rms}
10	Lightning Impulse voltage withstand capability	110kVp	125kVp	170kVp
11	Switching of line charging current	2 A	5 A	5 A
12	Switching of Cable charging current	10 A	25 A	40 A
13	Operating sequence (Reclosing Sequence)	O – 0.2 s – CO – 2 s – CO – 2 s – CO - Lockout		
14	Closing time	≤ 65 ms		
15	Opening time	≤ 40 ms		
16	Number of operations at rated current	10000 CO (With proper periodic maintenance the unit can perform up to 25000 CO operations)		
17	Insulating Material of Poles	Hydrophobic cycloaliphatic epoxy insulator		
18	Type of operating mechanism	Magnetic actuator		
19	Minimum Creepage distance	481 mm	960 mm	1178 mm
20	Center to center distance between phases	394 mm	394 mm	394 mm
21	Mass of the Auto Recloser Excluding Mounting Frame (Approx.)	140 kg	145 Kg	180 Kg
22	Protection class for cabinet (HV & LV)	IP55		
23	Maximum load on foundations (inclusive of the mass of the recloser)	11600 N – Compression (open operation) 7000 N – Tension (close operation)		
24	Suitable for wind Speed up to	200 km/Hr.		
25	Ambient Temperature range	-40 ^{0}C to +55 ^{0}C		

For other technical details, please refer the order specific drawings.

5 GENERAL DESCRIPTION OF OVR-15, 27 & 38 RECLOSER

5.1 HIGH VOLTAGE ASSEMBLY

The high-voltage assembly of the OVR-15, 27 & 38 consists of three poles mounted onto a common housing. Each of the poles is a separate assembly comprised of a vacuum interrupter assembled in a HCEP molded pole. All the three poles are gang operated by a single coil magnetic actuator through a common operating shaft.

5.1.1 Housing

The housing comprises of a stainless steel enclosure. The bottom cover of the housing is removable. Housing is provided with legs for safe transportation and storage. These legs are not meant to be used for mounting the recloser on its structure.

The HV unit has its dedicated name plate showing important rating information, serial number of HV unit and manufacturing year is mounted on the front side of the HV cabinet. The ON/OFF position indicator is also provided in the front side and is visible from ground.

A 50 W heater is provided in the high voltage cabinet, to prevent condensation and must be energized at all times.

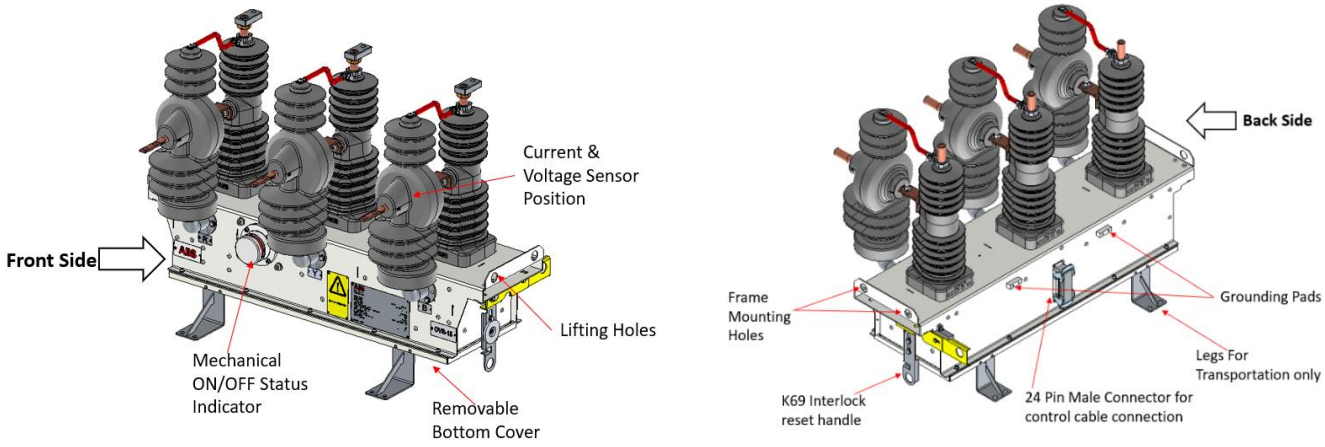
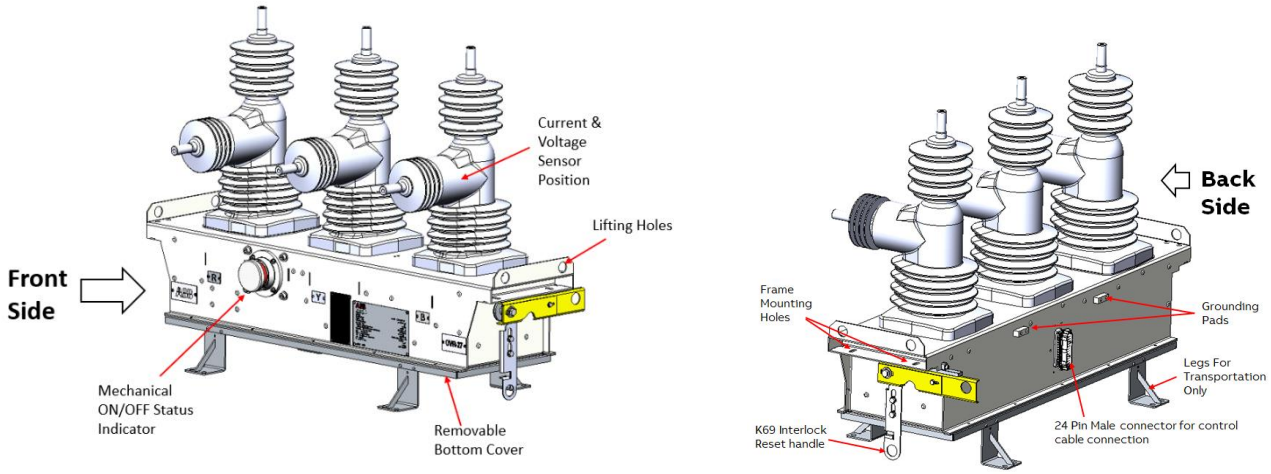


Fig-5.1: OVR-15 HV cabinet overview

Figure-5.2 : OVR-27/38 HV cabinet overview



5.1.2 Recloser Pole and current & voltage sensor

Each of the three recloser poles consists of vacuum interrupter inside a pole cast with an advanced Hydrophobic Cycloaliphatic Epoxy (HCEP). The upper and lower terminals for connecting medium voltage power conductors are made of ETP copper.

5.1.3 Current & voltage sensor

The current (I) sensing is by current transformer (CT) and voltage (U) sensing is by a voltage divider. The sensor secondary connections are bought out of the pole via shielded cables.

In OVR-15 & 27, option is available for single OR dual voltage sensing per pole.

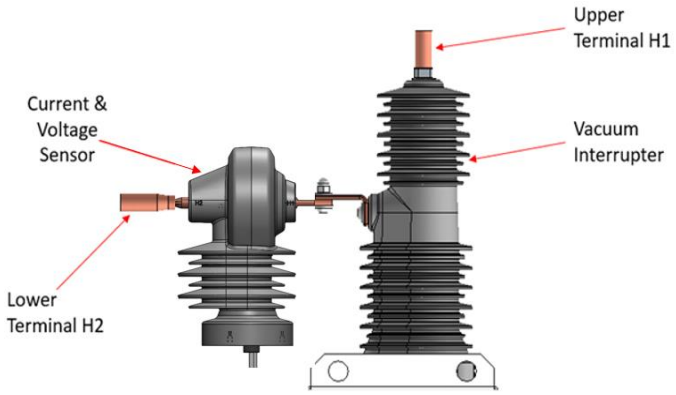


Figure-6.1: OVR-15 Pole with single voltage sensor

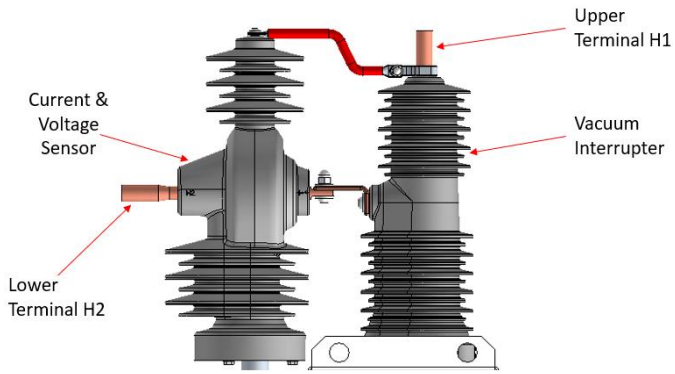


Figure-6.2: OVR-15 Pole with dual voltage sensor

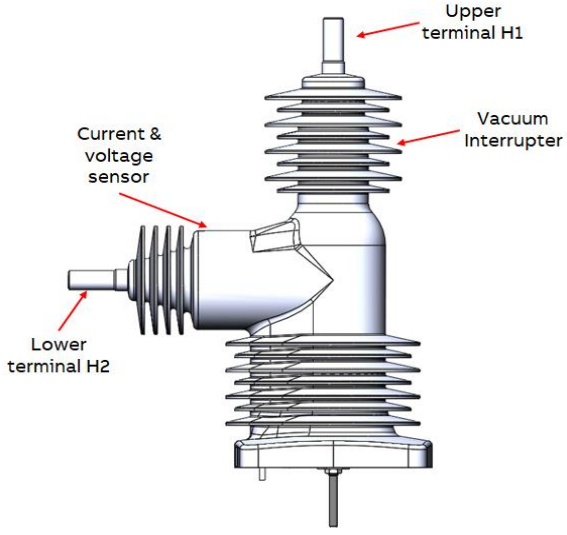


Figure-6.3: OVR-27/38 Pole with single voltage sensor

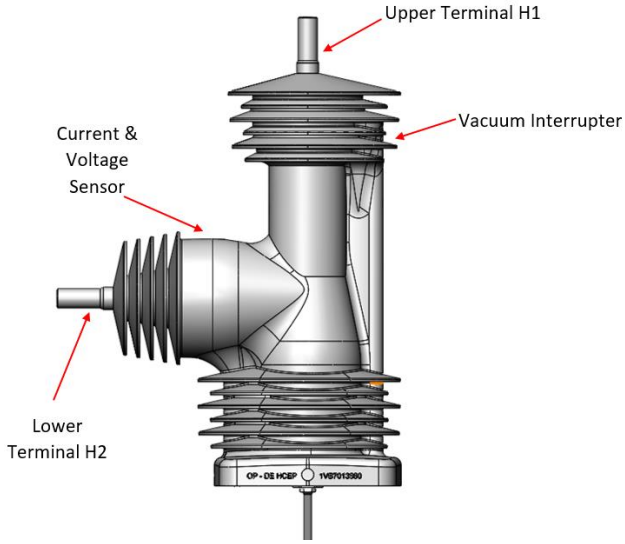


Figure-6.4: OVR-27 Pole with dual voltage sensor

5.1.4 Single Coil Magnetic Actuator

The recloser is operated by a single coil magnetic actuator. One actuator gang operates all the three poles through a common shaft mechanism. The magnetic actuator is bi-stable and does not require any continuous power to hold it in ON or OFF position.

Note

- *Disassembly of the magnetic actuator is not allowed. Lubrication or maintenance is not required and will void the warranty.*
- *Should an actuator fail to operate, contact ABB Customer Service Group.*

5.1.5 Emergency Manual Trip (k69) Handle

A yellow colored handle is provided on the side of HV cabinet housing for mechanically opening the recloser during emergency situations. When viewed from front of the cabinet (with rating plate visible), this handle can be seen on the right hand side of the housing. Recloser can be mechanically opened (not manual close possible) by pulling this handle from ground level with a standard hook stick (not in ABB's scope). Please refer the clause "mechanical opening" under the "operation" section for more information.

5.1.6 Mechanical ON/OFF position Indicator

The HV cabinet includes a mechanical ON/OFF position indicator which can be easily viewed from the ground level. The general color convention is:

	Close	Open
Default Color coding	**Red**	**Green**
Option available on request*	Green	Open

* Please check the order specific documents for confirming the color coding

5.1.7 Status Auxiliary limit switches

The status limit switches are mounted inside the HV cabinet housing. They are wired to provide the recloser status information to the protection & control in LV control cabinet.

6 STANDARD PRODUCTION TESTS

Routine tests are carried out on OVR-15, 27 & 38 with HV units connected with its dedicated LV units . The standard factory production tests include:

1. Verification of wiring as per approved wiring diagram.
2. Electrical operation:
   a. Close and Open in Local/Remote modes
   b. Overcurrent response and automatic reclosing through primary injection.
3. Functional checks of manual controls (K69) & associated electrical & mechanical close block
4. Contact resistance measurements on poles.
5. One minute power frequency voltage withstand test on primary circuit of HV unit.
6. Partial discharge test
7. Minimum Trip and Time-Current Test
8. No load mechanical operation test.

The routine test report with a summary of results is shipped as a part of documentation package.

7 INSTALLATION

The OVR-15, 27 & 38 recloser can be installed in a substation frame, pole-mounting frame, or can be mounted into a customer supplied structure. However, it is required that in all of the mounting methods the recloser be vertical, levelled and securely fastened. Follow your company guidelines and various codes for setting the height of the recloser, securing the frame to the pole or foundation, and making connections.

Before shipping from factory, the OVR-15, 27 & 38 recloser HV unit is tested as a system in factory with a LV control. It is mandatory that during installation, the HV unit and LV control cabinet are properly matched by serial number mentioned on rating plates provided on each of them.

Note

- All metal mounting frames and structures must be commonly grounded to the grounding grid at site. For proper operation of the electronic components, it is mandatory that the total impedance of the grounding grid at site should be less than one Ohm (1 Ω)
- It is also mandatory to ensure that all the grounding connections to the welded star grounding pad inside the LV cabinet are always intact and secured.
- Be careful not to bend the cable below a radius of 12 inches to avoid damage to itself.

7.1 TESTS BEFORE INSTALLATION

7.1.1 Vacuum test procedure

It is recommended to conduct one minute power frequency voltage withstand test on each interrupter to verify that there has been no loss of vacuum during transportation or handling. Experience has indicated that while a vacuum interrupter with the vacuum seal intact will withstand 40 kV AC (80% of 50kV) for OVR-15, 45 kV AC (80% of 60kV) for OVR-27 and 56 kV AC (80% of 70kV) for OVR-38 across the open contacts. The same interrupter with leaked vacuum (open to normal atmosphere) will flashover at the gap at a much lower voltage.

High voltage applied across an open gap in a vacuum can produce X-ray radiation. However, no radiation is emitted when the recloser is closed since no gap exists. Also, X-ray radiations at one meter is below the concern level when the recloser is open to the specified contact spacing during testing (within specified voltages) or in normal service conditions. Danger could exist at voltages above rating plate specified voltages.

For testing, with recloser in open position, connect all the three upper terminals together with jumpers. Connect all three lower terminals together with separate jumper and ground them to cabinet housing. Connect the high voltage to the top terminals.

During testing, it is mandatory that.

- HV & LV cabinets are connected properly by the control cable
- Both HV and LV cabinets are securely grounded.
- LV cabinet is placed at least three meters away from HV cabinet
- Stand clear more than three meters before energizing the high voltage source.
- Do not apply voltage for more than 60 seconds.

If internal flashover occurs, isolate the phases, and test each one independently to identify the defective interrupter. Any defective pole assembly must be replaced prior to the recloser is installed & placed in service.

7.1.2 Contact Resistance

Close the recloser with the help of LV unit and connecting cable associated with that. Measure contact resistance with suitable equipment rated not less than 100 A DC. The value of the contact resistance for each phase should not exceed 40 micro-ohms. Make sure that the current injection leads of contact resistance measurement kit are connected across the incoming & outgoing terminals of the pole only.

Note *If the vacuum interrupter / complete pole needs to be replaced, please contact ABB*

7.2 MOUNTING

The HV Cabinet is shipped with mounting frame as per agreed type of mounting during ordering stage. For details, refer the recloser mounting documents supplied with the order bound drawings for details.

Caution *Do not use forklift to move recloser as it may damage the mechanical ON/OFF position indicator, Yellow Handle and associated interlock.*

7.2.1 Pole mounting

For pole mounting frames, perform the following;

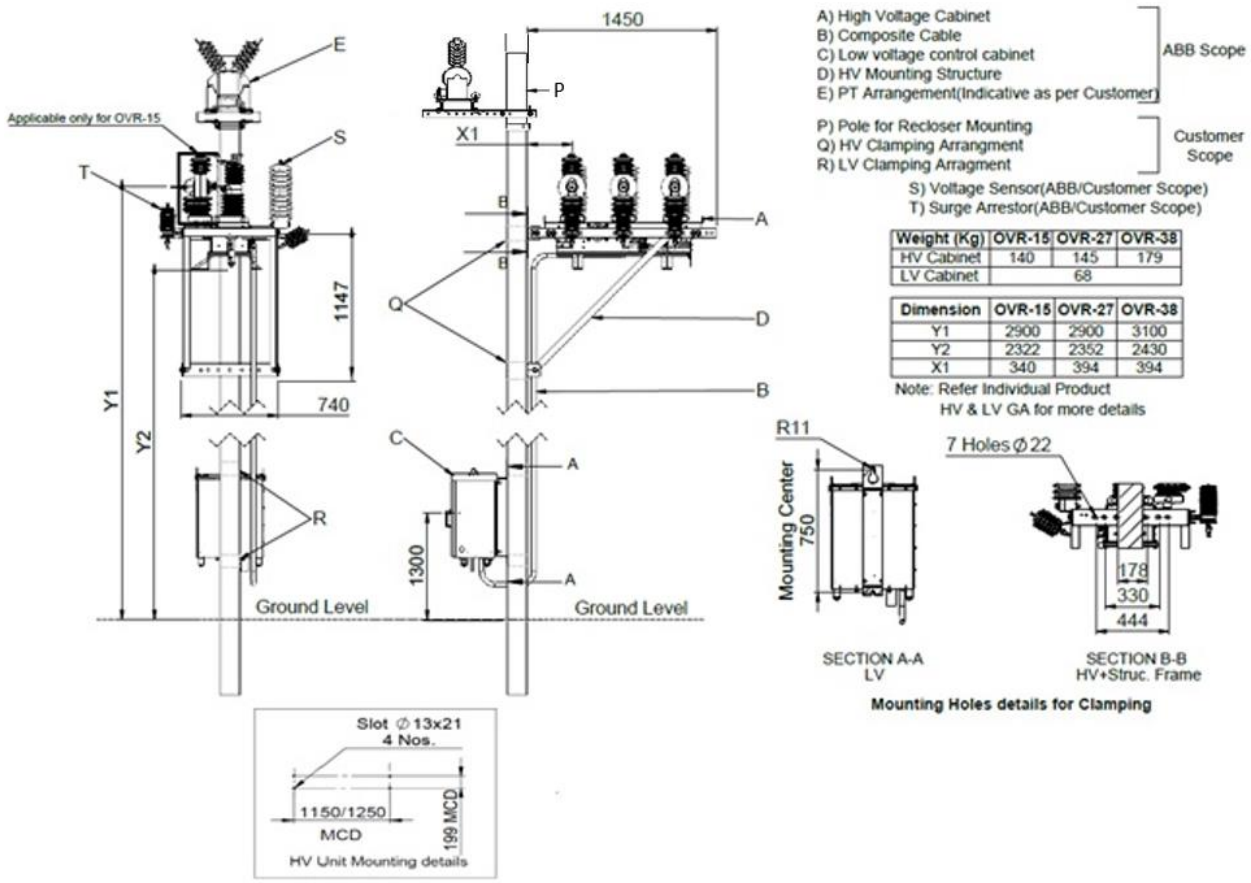
1. Attach the lifting hooks on the sides of the recloser as indicated in section 3 “Handling”
2. Complete the HV cabinet mounting on pole, as per detailed procedure in this manual
3. If Voltage Transformers (VTs) are used, it is recommended to install the frame without the transformers and then install the VT’s once the recloser and VT mounting brackets are on the pole.
4. Make sure all hardware is fastened tightly.

Caution

Do not exceed 750N cantilever force on any of the bushing terminals in any direction. Failure to comply will result in permanent damage

Note

Follow your company’s instructions for electrical products/assemblies. This operation should be done once it is secured that; there is no hazard or unsafe condition to the operator, such as energized OR live conductors.



Weight (Kg)	OVR-15	OVR-27	OVR-38
HV Cabinet	140	145	179
LV Cabinet	68		

Dimension	OVR-15	OVR-27	OVR-38
Y1	2900	2900	3100
Y2	2322	2352	2430
X1	340	394	394

Note: Refer Individual Product HV & LV GA for more details

Mounting Holes details for Clamping

Figure-12: General arrangement for OVR-15,27,38 Pole Mounting

Note

- *The heights of pole structure and recloser location shown are for reference purpose only. These depend on user's installation.*
- *XXX: To be decided by the user.*
- *Supply of pole is not in ABB's scope.*

7.3 GROUNDING

Important *Always follow international, national and company specific regulations when grounding the equipment.*

All metal mounting frames and structures must be commonly grounded to the grounding grid at site. Grounding is important to ensure proper operation of all electronic components, as well as to prevent penetration of EMC noise and other transients into the sensitive electronic circuits (RER615 relay, ACM, radios, etc.). Each HV cabinet includes two stainless steel welded grounding pads for grounding. Each pad will have internal threaded hole (M8 for HV unit) as shown in below figure. 80 Sq.mm cross-section, solid copper strip/equivalent is recommended for grounding.

If auxiliary power voltage transformers is used, it should be grounded to the main ground conductor leading from the recloser HV Cabinet to ground. It is mandatory that both the HV cabinet is firmly grounded as shown in figure in this section, when installed.

For the proper operation of electronic components, it is mandatory that the total impedance of grounding grid at site should be less than one Ohm (1 Ω).

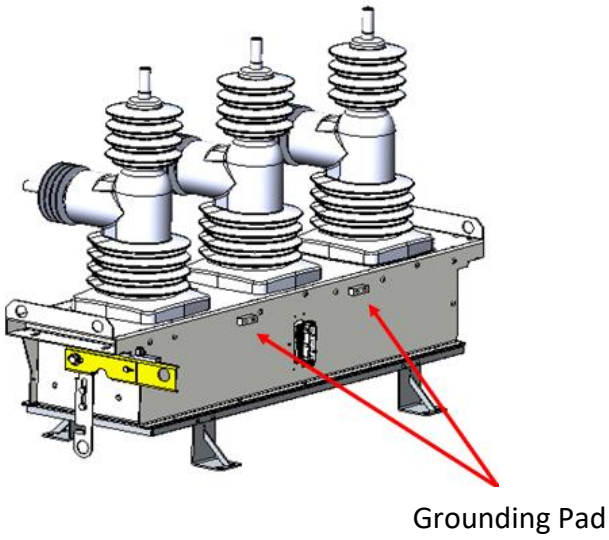


Figure -13 : Provisions for Grounding Connections on HV cabinet

1.Surge arrestors not indicated on drawing.Should be provided on incoming & outgoing MV terminals of reclosers.

2. PT2 For certain application we have a PT upstream & down stream of the recloser (loop control)
If only one PT but installed on utility pole 2, The AC supply must run along the main pole ground wired on control cable.

3. All devices such as HV Cabinet (Recloser), Aux. Power Trafo. (PT), Surge arrestors etc. interfacing with the LV Cabinet must be connected to the same pole ground.

4. All connections of the LV Cabinet must be routed in close proximity to and parallel to their corresponding ground paths for adequate surge protection.

5. The LV Cabinet must be grounded to the same pole ground.

6. The neutral of the secondary winding of the Aux. pole mounted transformer must be grounded at the transformer level.

7. Pole grounding conductor should be a continuous conductor.

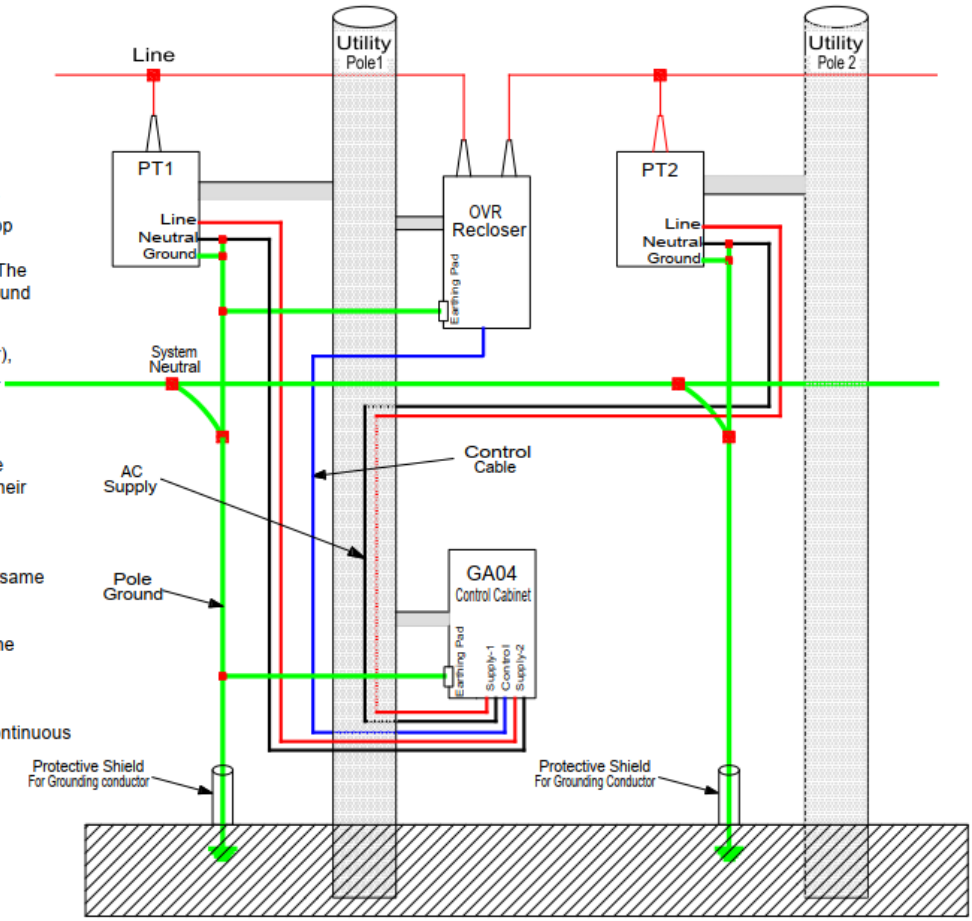


Figure-14 : Grounding connections proposed for OVR-15,27,38 Pole Mounted arrangement

Note *The grounding cables used shall be same for all components*

7.4 ARRESTER PROTECTION

Surge arresters can be connected on both HV (source and load) sides of the recloser. It is recommended that the arrester grounds are connected to the recloser ground and continued to the pole ground.

The leads connecting the arresters to recloser pole terminals should be as short as feasible to limit stray inductance and to maximize the arresters' effectiveness.

7.5 LINE CONNECTIONS

The recloser is connected in series with the line. The medium voltage line conductors are to be connected to the OVR terminal H1 & H2 via suitable terminal connector/clamp. Both these terminals are silver plated copper. The fasteners use for connectors must be torqued between 50 to 60 NM (442 to 531 inch lbf). Respective H1 and H2 terminals Line connections for OVR-15 and OVR-27/38 are shown in the below pictures

General convention proposed for power connection is H1 terminal should be on the source side and H2 on load side. However, based on site requirements, these terminals can be connected in reverse order as well.

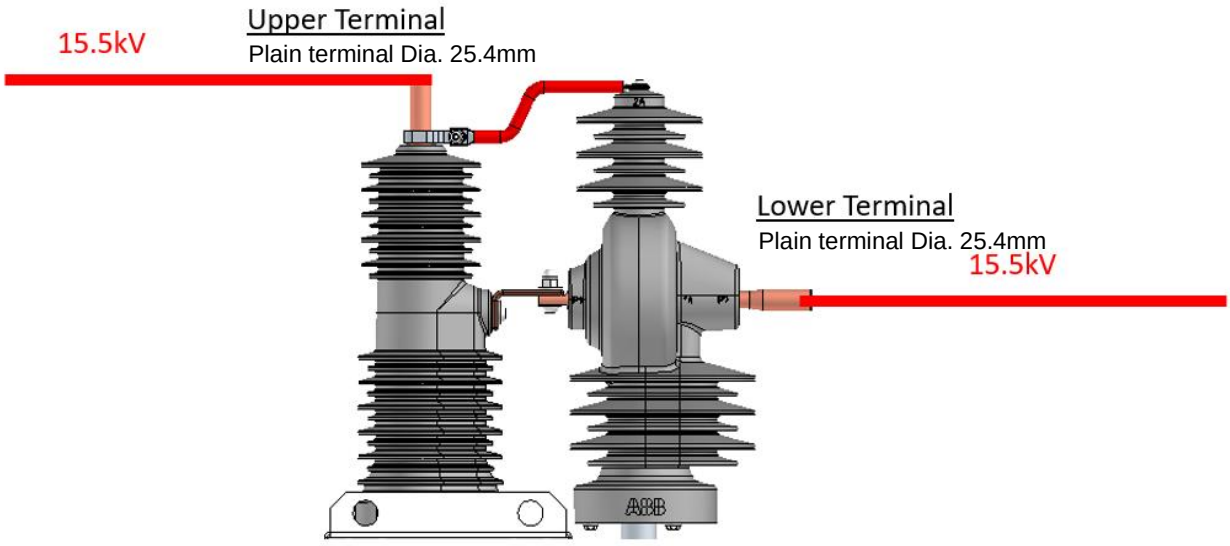


Fig-17: Line connections for OVR-15 Pole

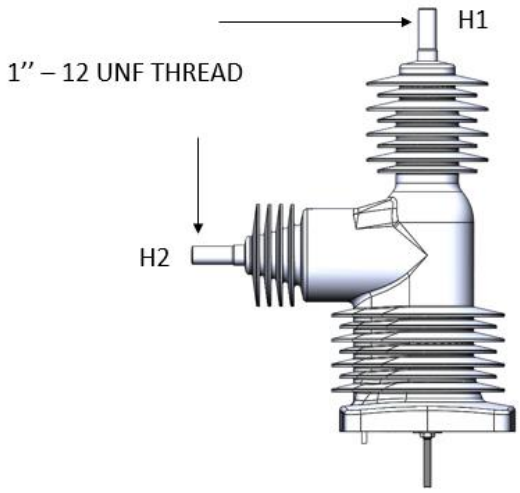


Fig-17.1: Line connections for OVR-27 SVS Pole

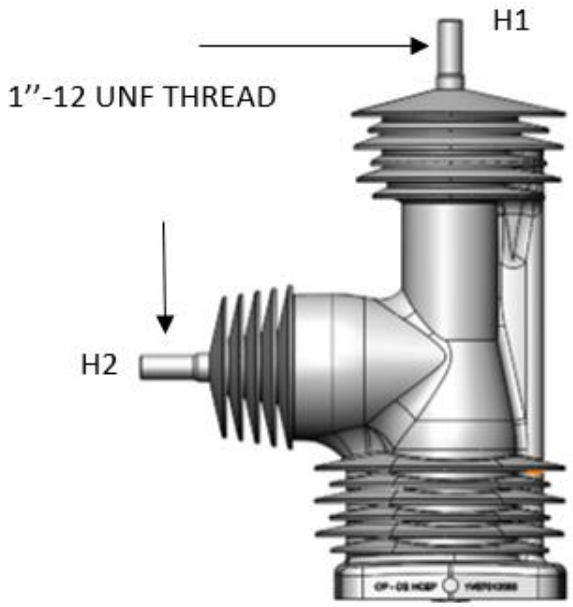


Fig-17.1: Line connections for OVR- 27 SVS Pole

If a voltage transformer (PT) is used for providing external AC auxiliary power to the LV cabinet, then it is recommended to connect this PT on the source side of the recloser so that auxiliary power is available even if the recloser is in open condition during service. This will avoid unnecessary draining of recloser battery back-up power.

7.6 FINAL INSPECTIONS BEFORE ENERGIZING

The recloser should be tested for mechanical and electrical operation before it is energized in the power system. It is to be noted that the recloser is shipped in OPEN (OFF) condition from the factory.

Caution

Do not ground either side of the battery or attach ground to the terminals of the actuator operating coils. This will result in permanent damage to the unit.

When the recloser has been installed completely with all mechanical and electrical connections completed, conduct following mandatory inspection before energizing the recloser on the main lines;

1. Ensure the recloser is properly levelled and securely anchored.
2. Make a final check of tightness of all hardware.
3. Securely tighten terminals and ground connections.
4. Check control cable is properly connected, routed and secured.
5. Ensure both the HV & LV cabinets are grounded as mentioned in this manual.

8 RECLOSER OPERATION

Following are the descriptions about major operations for the recloser. Please refer Table of operation procedure in this section for further information.

8.1 CLOSING

OVR-15, 27 & 38 recloser can be closed only electrically. With RER615 in LOCAL mode, the recloser can be closed from the "I" pushbutton on the RER615 front HMI. If proper remote connection is established, the recloser can also be closed from remote SCADA via communication, with RER615 relay in REMOTE mode.

Due to safety concerns, OVR-15, 27 & 38 is not allowed to manually be closed and does not have any separate provision to close the recloser manually using any hook stick.

8.2 OPENING

OVR-15, 27 & 38 recloser can be opened mechanically as well as electrically. With RER615 is in LOCAL mode, the recloser can be opened from the "O" pushbutton on the RER615 front HMI. If proper remote connection is established, the recloser can also be opened from remote SCADA via communication, with RER615 relay in REMOTE mode.

8.3 MECHANICAL (MANUAL) OPENING

If due to some reason it is not possible to electrically open (LV cabinet door is locked or electrical opening is disabled/de-energized) the recloser main contacts, the high voltage unit may be safely opened mechanically with the help of a standard insulated hook stick from ground level (the hook stick is not in ABB's scope of supply).

Manual opening can be performed by quickly and firmly pulling down the emergency manual trip handle (yellow handle) located on the side of the HV unit. This will mechanically open all three poles simultaneously.

OVR-15, 27 & 38 has a safe and secured manual trip arrangement. When the recloser is opened manually, the yellow handle remains locked in and blocks any further close operation of the recloser (CLOSED BLOCKED). Such a situation for manual opening the recloser can most likely be an emergency situation, it is to be ensured that the recloser should not be closed back if it is manually opened.

To ensure recloser stays open, a provision is made inside the recloser that no electrical close command can be initiated from the LV cabinet locally or remotely. Further, to ensure additional safety, OVR-15, 27 & 38 HV unit gets mechanically locked even if electrical command is forced from the LV unit.

After the emergency situation is taken care of, to enable closing operation, it is mandatory to reset the yellow handle manually to its normal position. This can be done by pulling down the interlock reset handle with the help of hook stick.

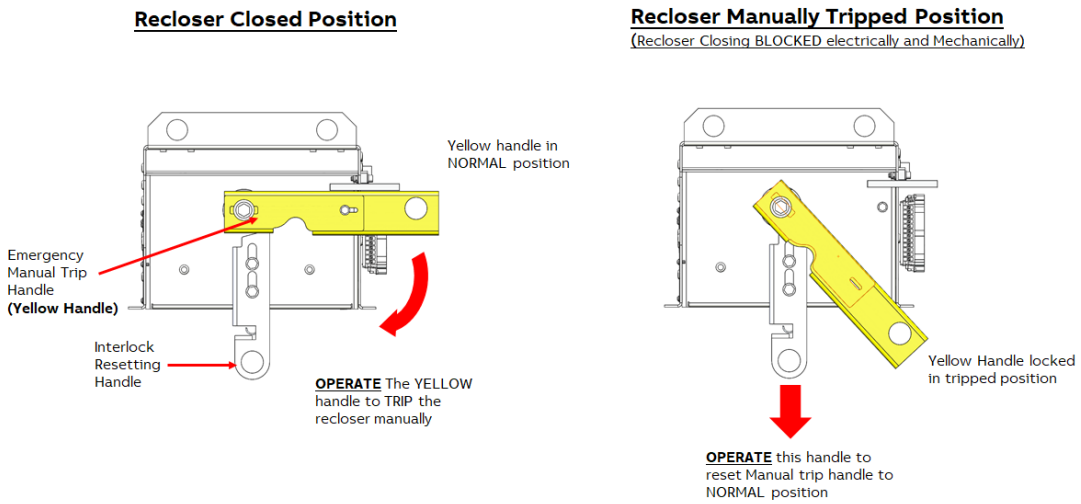


Figure-18 : Manual Opening

9 INSPECTION AND MAINTENANCE

The OVR-15, 27 & 38 will require minimal maintenance if handled properly. Frequency of operation and local environmental conditions should be considered when determining maintenance schedule.

To a large extent, the safety and successful functioning of any apparatus or system connected with the recloser depends on the proper installation, commissioning, programming and configuration of the unit.

To provide long, reliable service, the recloser should be inspected at regular intervals. Operating experience, environmental conditions, the number of operations, the magnitude of current interrupted and any unusual service conditions will guide you in establishing a maintenance schedule.

The maintenance work can only be carried out by trained personnel who knows & respect all safety regulations, furthermore, it is recommended that ABB service personnel should be called in, to check the service performance and for repair work.

9.1 ACTIVITIES BEFORE DOING ANY MAINTENANCE OF THE RECLOSER HV UNIT

1. Follow all activities mentioned in previous clause
2. Disconnect the power supply from both sides of the HV unit
3. Ensure that the isolators on both sides of the feeder are open properly and securely locked out
4. Ensure that the main circuit is properly earthed
5. Ensure that all the safety norms are followed as per your country and company's policy

9.2 TABLE 3 : RECOMMENDED INSPECTION AND MAINTENANCE PLAN

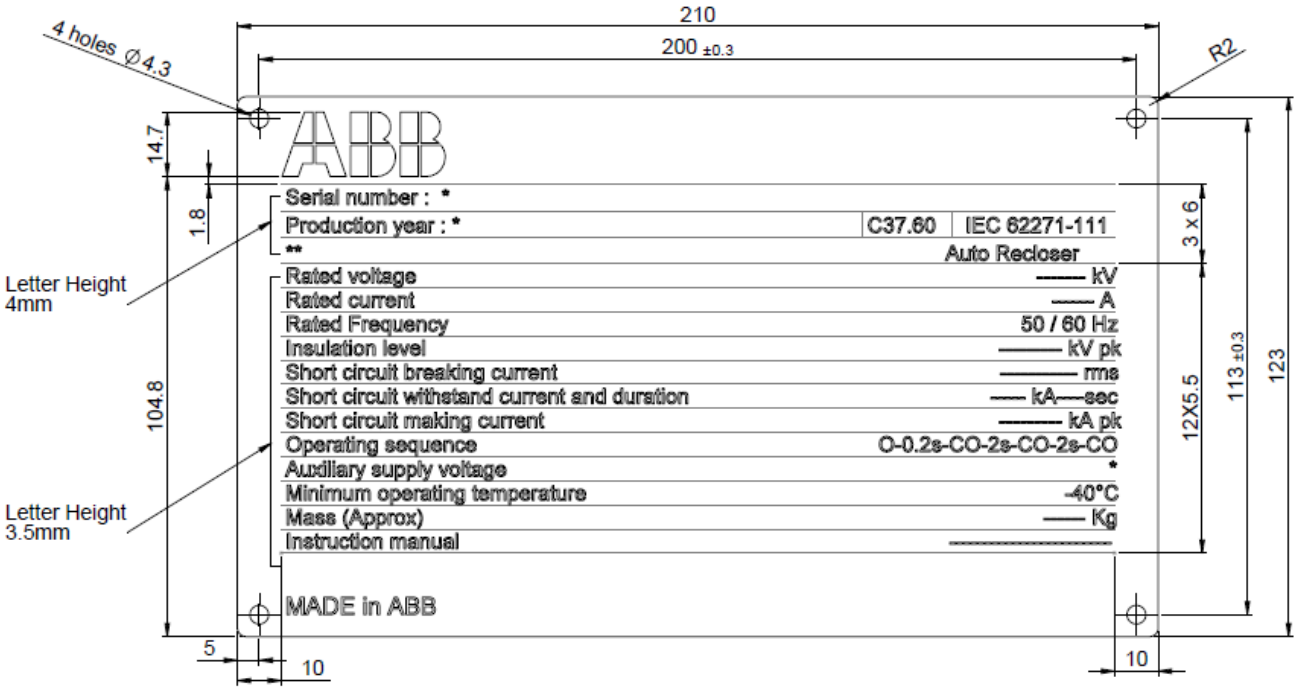
Sr. no.	*Tests/ Inspections*	*Work to be performed*	*Recommended Interval for installations in normal environment*	*Recommended Interval for installations in extreme environment*
1	Visual inspections	Pole terminals for cleanliness, damage (bents/breaks) and tightness of connections	18 months (adjust interval according to experience)	12 months (adjust interval according to experience)
		The poles can be cleaned with a mild detergent.		
		Check for visible corrosion or damage to metal parts and cables		
		Check all connections of metal parts (nuts, bolts, Hardware)		
		Check all the Ground (earth) connections to be secured and undamaged		
		All nameplates/rating plates, labels clearly legible & secured		
		Any loose wire connections		
2	Function tests	Battery general condition and terminals	6 months	6 months
		Fault-free operation of communication modules (if applicable)	6 months	6 months
		Protection test using secondary injection equipment, in conjunction with recloser function test (see the Installation and commissioning section of the control and protection relay instruction manual)	4 years (adjust interval according to experience)	2 years (adjust interval according to experience)
		Measure the insulation resistance (Value should be more than 100 mega ohm)		
		Proper/smooth operation of Emergency Manual Trip (K69) handle	12 months	12 months
3	Replacements	Battery Replacement (Please refer to the battery product documentation by the manufacturer for instructions on optimal utilization of battery life; based on frequency/duration of external auxiliary supply failures and extent of battery discharge during such conditions)	3 to 5 Years	3 to 5 years

It may be required to remove the RER615 relay & Batteries for replacements.

On the basis of the result obtained during the periodic inspection, it is possible to set the optimal time interval for carrying out maintenance work.

10 TYPICAL RATING PLATE DETAILS

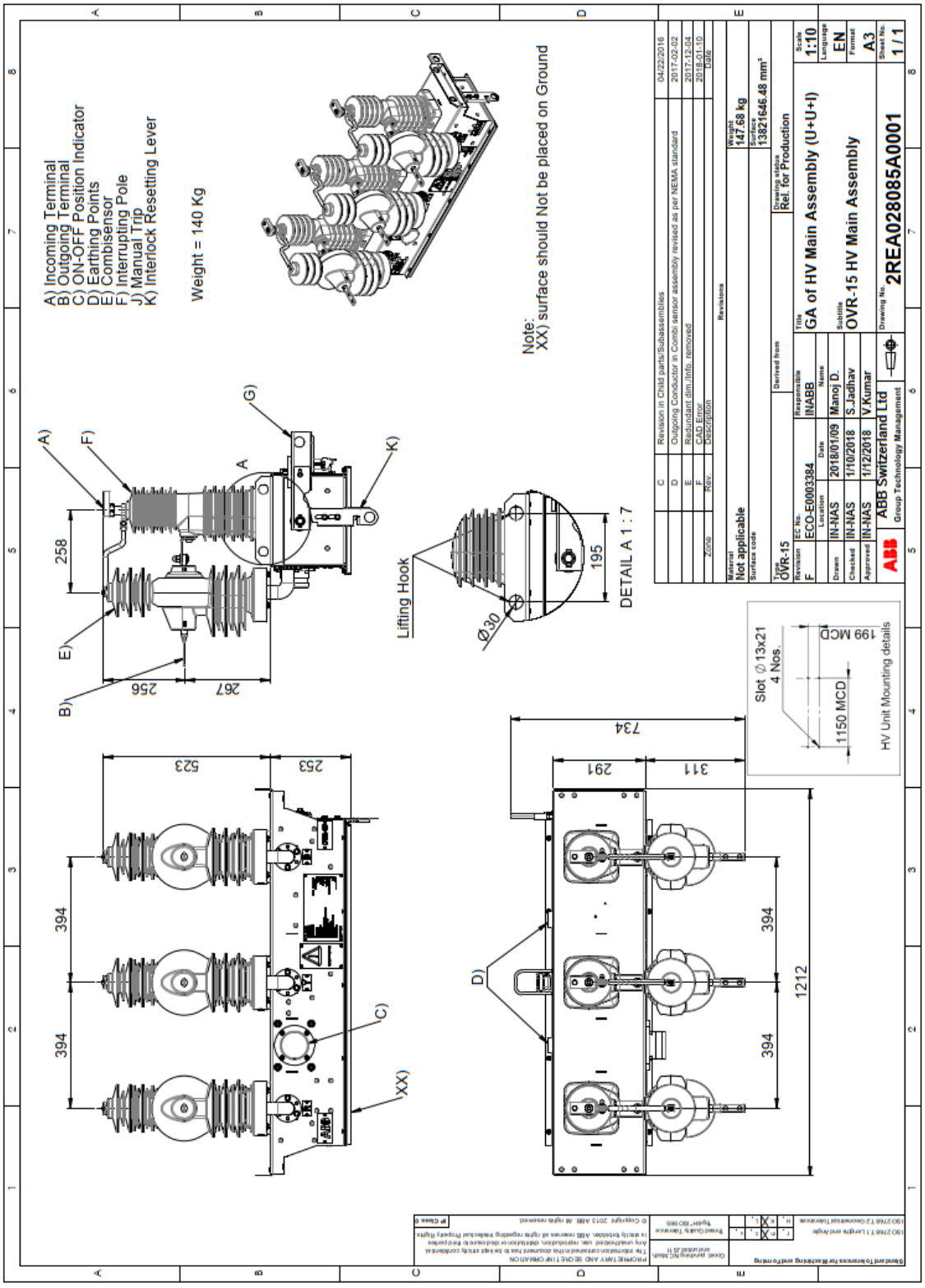
10.1 RATING PLATE ON OVR-15 HV CABINET



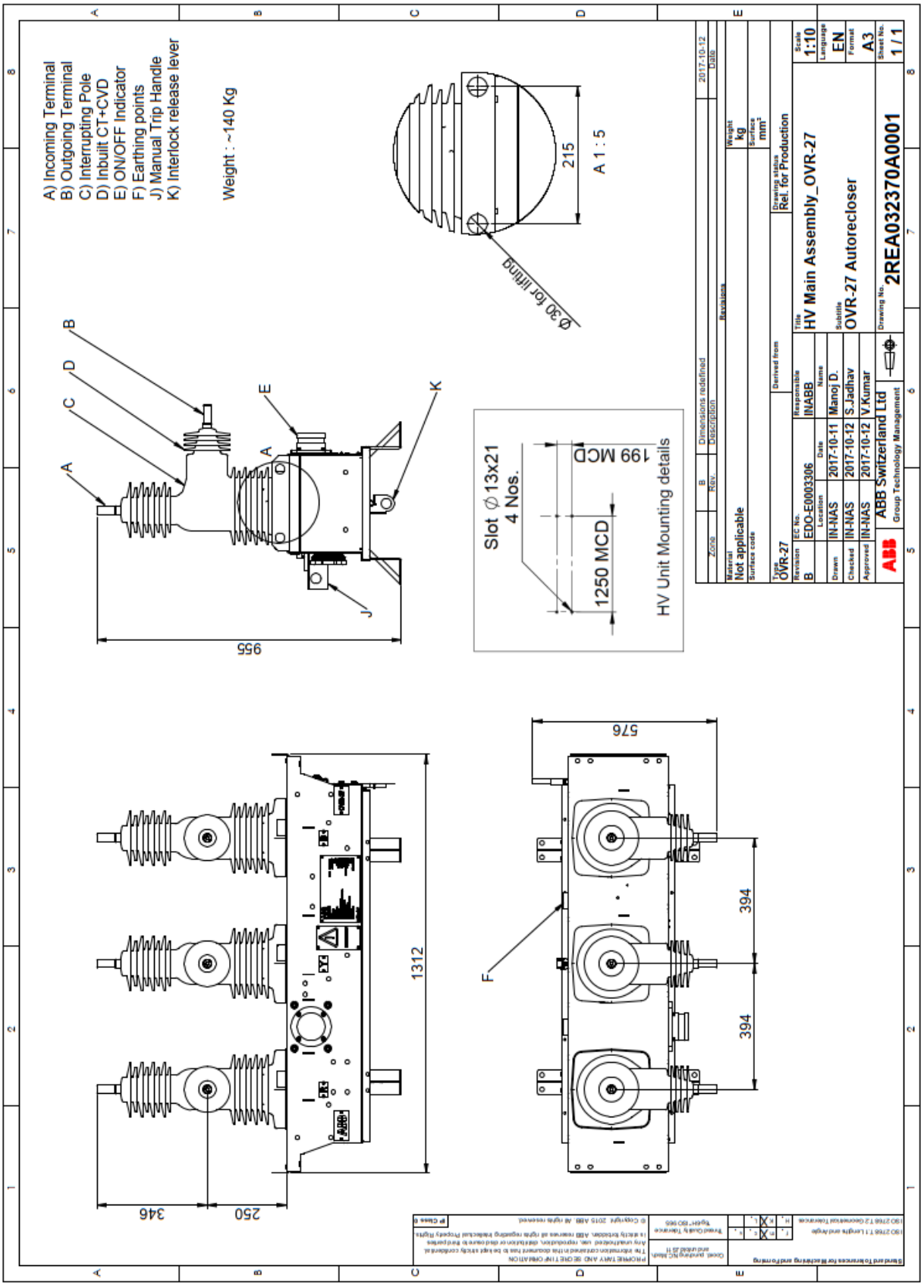
Description		Product		
		OVR-15	**OVR-27**	**OVR-38**
Product Name		OVR-15	OVR-27	OVR-38
Rated Voltage		15.5kV	27kV	38kV
Rated Current		630 A	1000 A	1200 A
Insulation Level		50/110 kV pk	60/125 kV pk	70/170 kV pk
Short Circuit Breaking Current		12.5 kA 3sec	12.5 kA 3sec	16 kA 3sec
Short circuit withstand current and duration		12.5 kA 3sec	12.5 kA 3sec	16 kA 3sec
Short Circuit Making Current (Peak)		31.25 kA pk	31.25 kA pk	41.6 kA pk
Mass (Approx.)	LV	70	70	70
	HV	140	140	175
Instruction Manual		1VYN401790-021	1VYN401790-049	1VYN401390-078

11 GA OF HV CABINET DRAWINGS

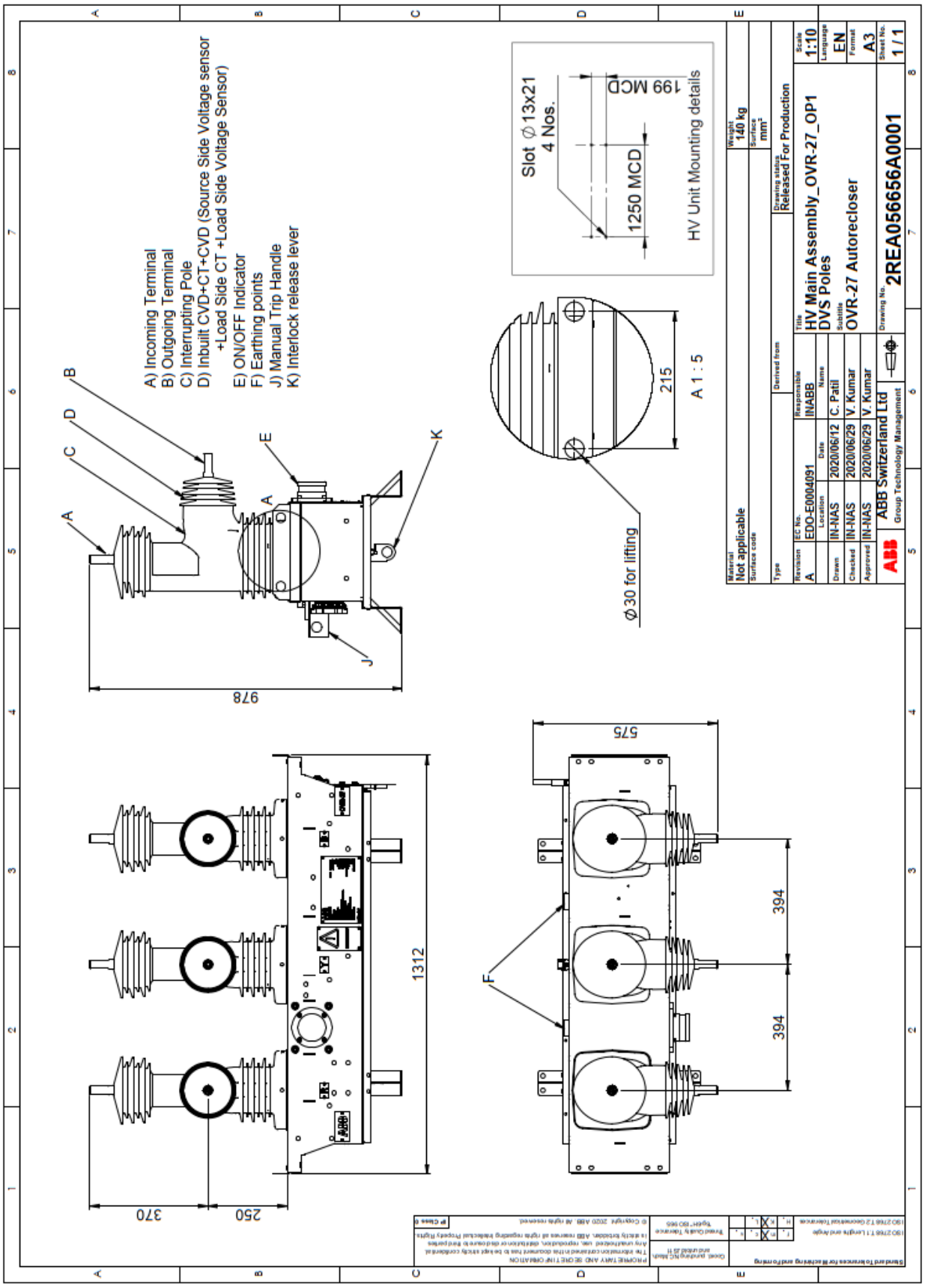
11.1.1 OVR-15 HV Cabinet General Arrangement:



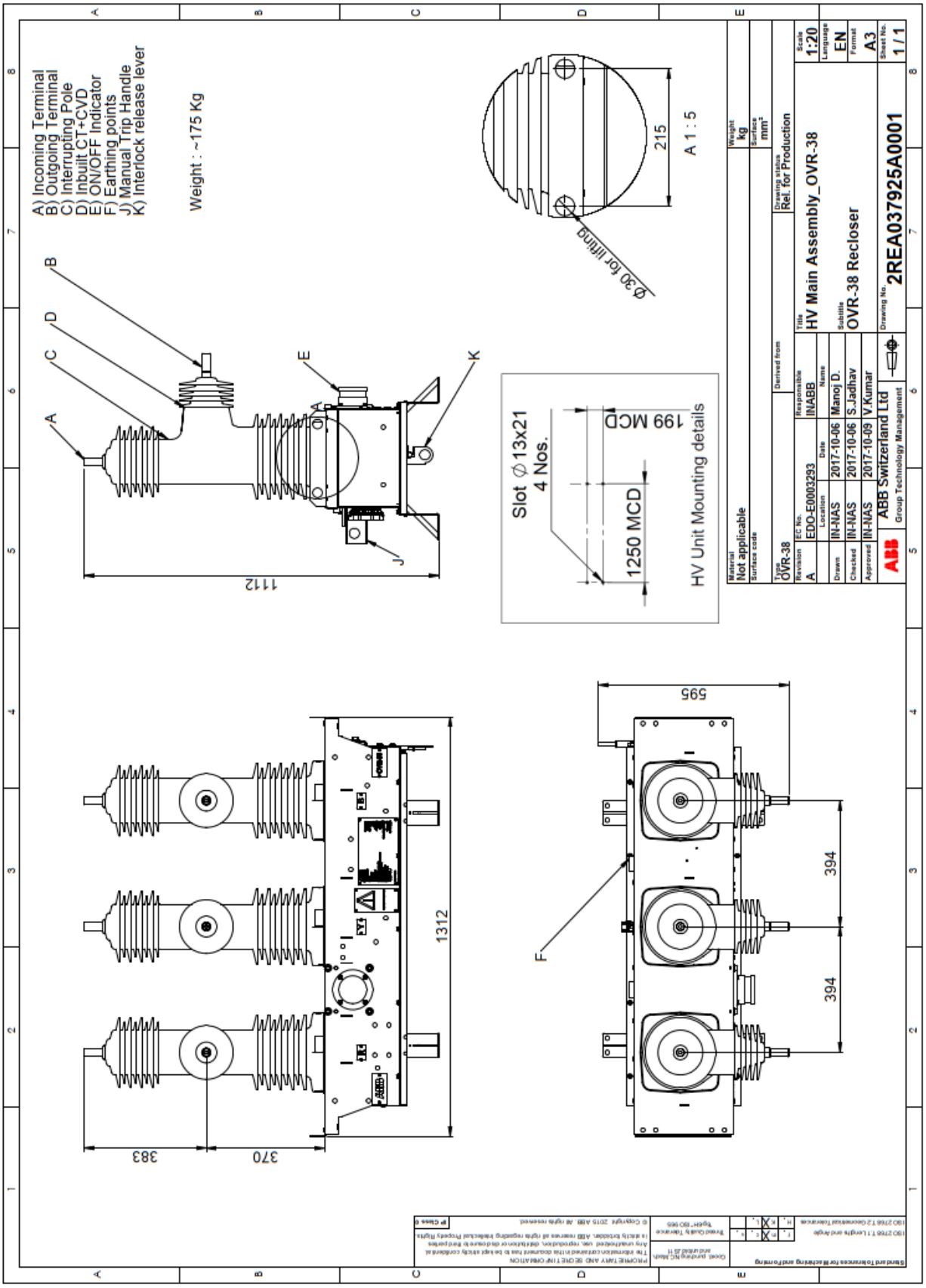
11.1.2 OVR-27 HV Cabinet with Single Voltage Sensing General Arrangement:



11.1.3 OVR-27 HV Cabinet with Double Voltage Sensing General Arrangement:



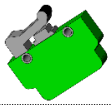
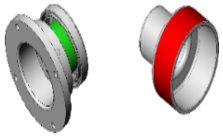
11.1.4 OVR-38 HV Cabinet General Arrangement:



12 RECOMMENDED SPARE PARTS

The following spares shall be kept in stock to take care of any contingency

12.1 TABLE 7 : LIST OF RECOMMENDED SPARE PARTS FOR OVR-15, 27 & 38 RECLOSER

Sr. No.	Description	Part No	Displayed as
1.	Aux limit switch for position indication, 1NO+1NC	LXW22A-11MB	
2.	Composite cable with counter Phoenix connectors, gland plate and cable gland a) 6 meter length b) 9 meter length c) 12 meter length d) 15 meter length	a) 2REA033941A0001 b) 2REA037869A0001 c) 2REA033932A0001 d) 2REA033933A0001	
3.	Heater 230V AC, 50W	GCE0990162P0101	
4.	Oil damper	2REA026181P0001	
5.	Indicator assembly & ON indicator cap	2REA028893A0001 2REA028553P0001	
6.	CT protection resistor 25W, 25Ohm resistor	2REA029829A0001	
7.	ACM with counterpart connectors	2REA033084A0002	
8.	Intelligent Battery Charger	IVYN401701-BV	

Apart from above we recommend to regularly monitor battery health (since, batteries have limited lifetime depending on environmental conditions), and procure them in advance whenever, they are nearing their end of life.

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Revision Table:

Rev.	Description	Date	Remarks
A	New Releases	29.06.2021	