

DISTRIBUTION SOLUTIONS

OVR-15, 27 & 38 Outdoor Vacuum Recloser Low Voltage Unit

Instruction, operation, and maintenance manual



Copy Right

This manual and parts thereof must not be reproduced or copied without written permission from ABB, and the contents thereof must not be imparted to a third party, nor used for any unauthorized purpose.

Disclaimer

The data, examples and diagrams in this manual are included solely for the concept or product description and are not to be deemed as a statement of guaranteed properties. All persons responsible for using the equipment addressed in this manual must satisfy themselves that each intended application is suitable and acceptable, including that any applicable safety or other operational requirements are complied with. In particular, any risk in applications where a system failure and/or product failure would create a risk for harm to property or persons (including but not limited to personal injuries or death) shall be the sole responsibility of the person or entity applying the equipment and those so responsible are hereby requested to ensure that all measures are taken to exclude or mitigate such risks.

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.

This document has been carefully checked by ABB, but deviations cannot be completely ruled out. In case any errors are detected, the reader is kindly requested to notify the manufacturer. Other than under explicit contractual commitments, in no event shall ABB be responsible or liable for any loss or damage resulting from the use of this manual or the application of the equipment.

1 CONTENTS

A.	Introduction.....	6
B.	Environmental protection program	6
C.	End of life recycle/disposal.....	6
D.	Product related safety notices.....	7
E.	Working on LV cabinets and mandatory safety procedures.....	8
F.	Warning Texts and Symbols.....	9
2	Packing and transport.....	10
2.1	Goods marking.....	10
2.2	Documents.....	10
2.3	Transport and Lifting	10
3	Receipt and Storage prior to installation	11
3.1	Receipt of Recloser	11
3.2	Storage of recloser LV unit.....	12
3.3	Handling	13
4	General Description of LV cabinet of OVR-15, 27 & 38 recloser	14
4.1	LV cabinet assembly.....	14
4.2	Control	14
4.2.1	Low voltage control cabinet (LV cabinet)	14
4.2.2	Intelligent battery charger:	15
4.2.3	Auxiliary supply	15
4.2.4	Actuator Control Module	15
4.2.5	Rechargeable Batteries	16
4.2.6	SERVICE and DISCHARGE modes.....	17
4.2.7	External Auxiliary Supply Status monitoring.....	17
4.2.8	RER615 control	17
5	Standard production tests.....	19
6	Installation	19
6.1	Grounding	20
6.2	Connecting the HV & LV cabinets by Control Cable	21
6.3	Connecting the Auxiliary Supply	22
6.4	Final inspections before energizing.....	22
6.5	Table 2: Operation Procedure.....	23
7	Inspection and maintenance	25
7.1	Activities before doing any maintenance of the recloser LV unit	25
	(Perform this in conjunction with HV unit instruction manual)	25
7.2	Activities before doing any maintenance of the recloser LV unit	25
7.3	Removal of RER615 relay.....	26
7.4	Removal of Batteries	26
8	Common troubles and trouble shooting	27
9	General OVR-15, 27 & 38 Block Diagram	29

9.1	Dual voltage sensing	29
9.2	Single side voltage sensing.....	30
10	Typical rating plate details.....	31
10.1	Rating Plate on LV Cabinet.....	31
11	General Arrangement drawings	32
11.1	LV control Cabinet General Arrangement.....	32
12	Parameters to be maintained as default in RER615	33
12.1	CB condition monitoring settings (OVR-15, 27 & 38)	33
12.2	Correction Factors: Analog Inputs (Current):	34
12.3	Correction Factors: Analog Inputs (Voltage):	35
13	RER615 Settings	36
13.1	Table 5.1 : Settings for RER615 with reference to OVR-15, 27 & 38 recloser	36
14	Annexure I : Typical functional characteristics of sealed lead acid batteries	43

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 Low voltage (LV) cabinet of medium voltage OVR-15, 27 & 38 vacuum 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 high 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

OVR-15, 27 & 38 reclosers LV cabinet recloser is manufactured in accordance with the ISO 14001 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. 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
Rubber	Yes	Cut into pieces & use as high-grade energy
Packing foil	Yes	Cut into pieces & used for landfills
Wooden pallet	Yes	High grade energy additive in refuse incineration

D. PRODUCT RELATED SAFETY NOTICES

The OVR-15, 27 & 38® recloser LV cabinet 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.

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.

E. WORKING ON LV CABINETS AND MANDATORY SAFETY PROCEDURES.

Whenever it is required to work on LV Cabinet, 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).
- 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.

F. WARNING TEXTS AND SYMBOLS

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



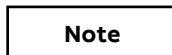
Danger Indicates an immediate risk situation that can lead to death or serious personnel injury if not avoided



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



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



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



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 installation

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 components must therefore be avoided

2 PACKING AND TRANSPORT

2.1 GOODS MARKING

The factory assembled LV cabinet transported in different packing case and its 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.

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

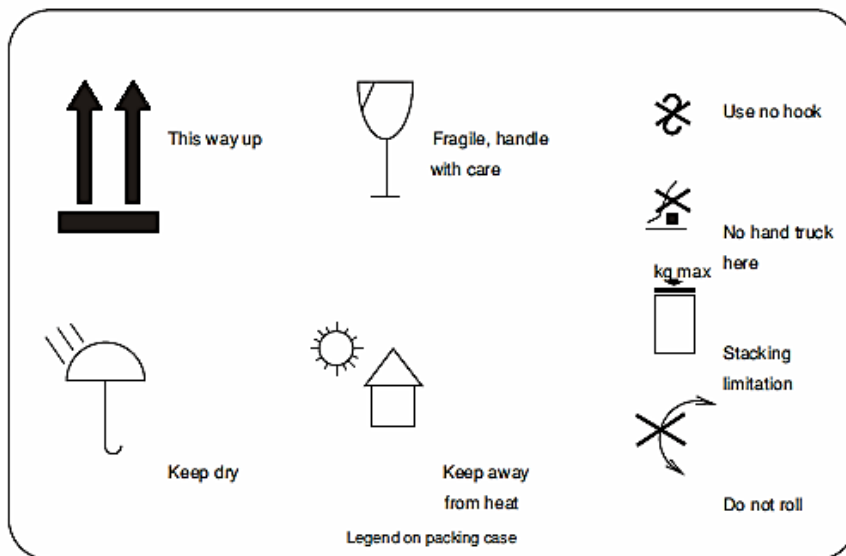


Figure-1 : General symbols on packing case

2.2 DOCUMENTS

Documents provided with the LV unit during dispatch.

- Instruction manual
- Operator's quick reference guide
- Routine test certificate
- Drawings
- Packing list
- Other documents as mutually agreed in contract with ABB

2.3 TRANSPORT AND LIFTING

The LV cabinet 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.

- LV cabinet should not be stacked one over the other.
- LV cabinet 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.

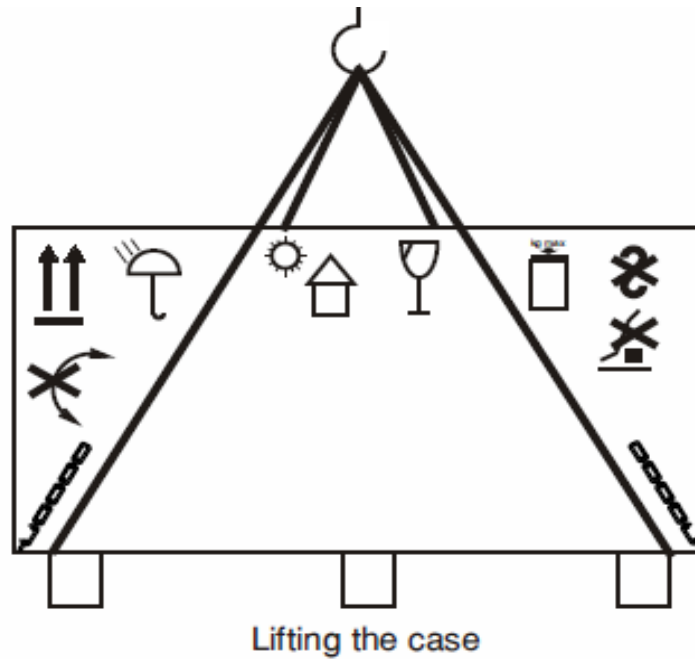


Figure-2 : Packing case lifting arrangement

3 RECEIPT AND STORAGE PRIOR TO INSTALLATION

3.1 RECEIPT OF RECLOSER

Each LV cabinet 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 LV unit 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	Low Voltage (LV) control cabinet
Optional items (only if ordered separately)	Mounting brackets
	Auxiliary power cable (2x1.5 sq.mm)
	Any additional spares

3.2 STORAGE OF RECLOSER LV UNIT

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

LV cabinet 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 °C (+10°C)
- The heating elements must be connected to the electric supply to protect the control equipment from corrosion or freezing damage.

Important

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

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

The LV control cabinet has rechargeable batteries inside. A periodic check of battery voltage (24V) & periodic charging of the batteries (typically every three months) may be required in case of prolonged storage. For the batteries in your control cabinet, refer to technical documentation of the respective battery manufacturer. Also refer the section "Inspection & Maintenance" for further information.

Note

If the LV cabinet 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

The LV cabinet come with welded 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 & LV cabinets.

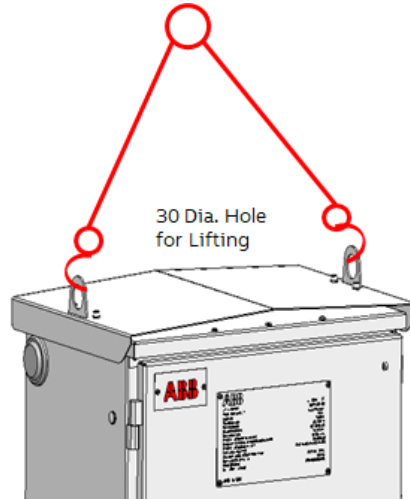


Figure-3 : LV Cabinet lifting detail



Exercise care during lifting to avoid damage to the poles



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



Exercise care during lifting to avoid damage to the poles

4 GENERAL DESCRIPTION OF LV CABINET OF OVR-15, 27 & 38 RECLOSER

RECLOSER

4.1 LV CABINET ASSEMBLY

Each LV cabinet of OVR-15, 27 & 38 Recloser has intelligent battery charger, capacitors, control modules, relay and battery with their hard-wired circuits. Please refer the LV GA for the other constructional details.

4.2 CONTROL

4.2.1 Low voltage control cabinet (LV cabinet)

A weatherproof, IP55 rated cabinet, houses the low voltage control components. The LV cabinet has an outer hinged swing door with padlocking provision. The control and protection relay RER615, is mounted on an inner hinged swing door to allow front and rear access to it. All the MCBs, service/discharge switch and auxiliary power socket for laptop charging are mounted on the front side of inner swing door for easy access to operator. Other devices including space for mounting optional radio modem is provided on the side/rear walls of the cabinet.

The floor of the LV cabinet is equipped with removable gland plate to provide entry to auxiliary power cable, communication cables, 50W thermostatically controlled heater is provided to prevent condensation in the LV cabinet.

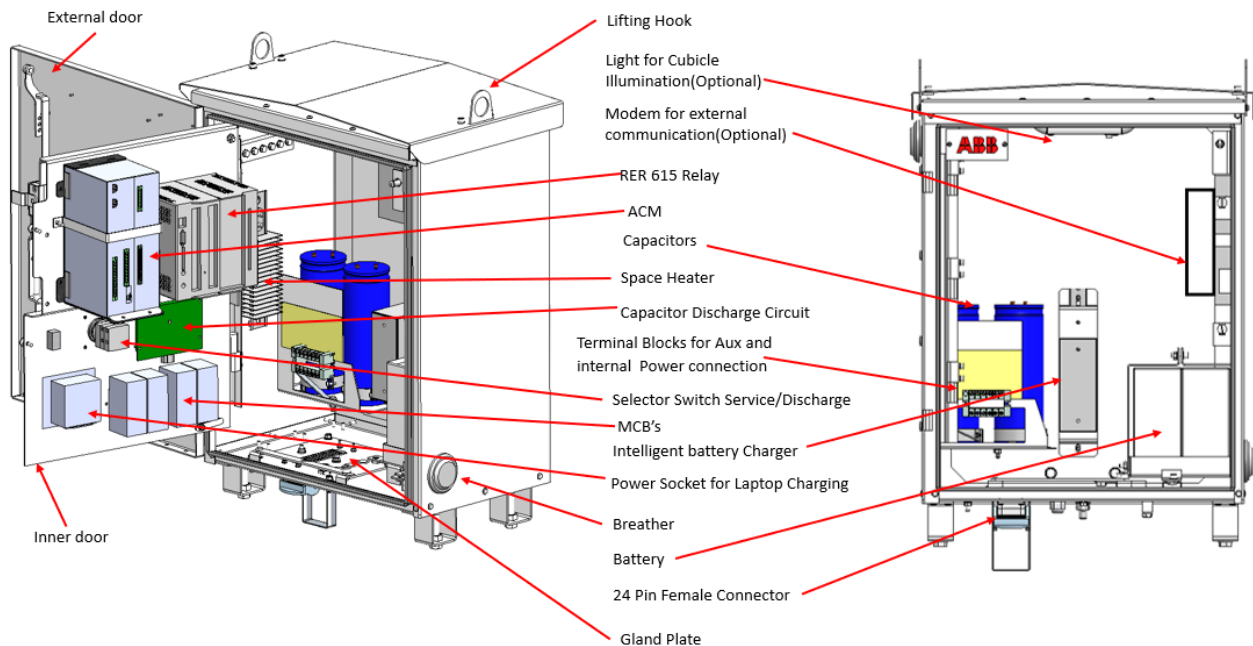


Figure-7: LV control cabinet overview

4.2.2 Intelligent battery charger:



The Intelligent battery charger indicated here is to convert the auxiliary power supply from connected from External PT or equivalent to suitable form required by components like Battery, RER615, ACM and external communication modem. This Battery charger is temperature compensated.

4.2.3 Auxiliary supply

The LV control cabinet requires auxiliary power to operate the Recloser, Actuator control Module (ACM), HV & LV cubicle heating, illumination, etc. A separate outdoor type 2 x1.5 Sq.mm jacketed cable is required to connect the external auxiliary power to the LV cabinet. PI refer the Recloser quick reference guide for details.

For the auxiliary supply voltage / frequency applicable for your recloser, please refer the approved / as built drawings.

MCB is provided inside the cubicle for protection of Intelligent Battery charger, cubicle heating, illumination, and auxiliary power socket outlet.

Note

The auxiliary power outlet on the inner swing door is only meant for laptop charging in emergency situations. It should not be used for any other means as it may burden the external auxiliary power source.

4.2.4 Actuator Control Module



The Actuator Control Module (ACM) module gets its power supply from Intelligent battery charger.

ACM regulates the closing and tripping signals to magnetic actuator as per the feedback from HV unit and interaction with relay by charging/discharging the capacitors.

ACM is hardwired to RER615 relay to perform operations.

Figure-8: Actuator Control Module

4.2.5 Rechargeable Batteries

The LV unit is supplied with two 12 V batteries connected in series and securely mounted in the LV cabinet for providing back up power to recloser in case of external auxiliary power failure. The batteries are protected by separate MCB.

Typically, the battery bank ensures minimal stand-by back up for 24 hours at 20 °C from a fully charged initial condition. However, the actual backup duration depends upon various site conditions such as:

- Ambient temperature & initial condition of the battery (temperature & storage period before commissioning, periodic charge/discharge, battery maintenance)
- Frequency of external auxiliary power outages & duration of each outage (i.e. the number of charging/discharging cycles) and depth of each discharge.
- Percent charging (terminal voltage) of the battery at the time of outage of external auxiliary power.

For additional details it is recommended to refer battery manufacturer documentation. Please also refer the section “Inspection & Maintenance” of this manual.

A battery temperature sensor is provided near the battery bank terminals. Battery Charging temperature range is -20 + 50°C.

We are providing Valve Regulated Lead Acid (VRLA) batteries which are temperature & charging voltage sensitive. Although maintenance by way of water topping up is not required, regular checking and assurance of proper charging voltage, depth of discharge and operating temperature is needed.

In case of loss of external auxiliary supply, the intelligent battery charger switches over to battery bank for power and continues to conduct its function. Recloser will work as long as the battery bank voltage remains above 20.5V. Below 20.5 V load management algorithm activates within intelligent battery charger and disconnects the power feed to ACM, RER615 and optional radio modem. This is done to prolong the batteries going into deep discharge mode. With relay not being powered, the recloser will not be able to perform any operation.



- *Due to frequent and long duration external power outages, battery frequently undergoes discharge and charge cycles. This reduces battery capacity, charging efficiency & overall service life.*
- *During consistent long duration outage, the battery bank voltage may drop below 18V (9V per battery) indicating battery might have deep discharged & now cannot be charged again. At this point, the battery needs complete replacement by a brand new, fully charged equivalent battery.*
- *Connection of any additional load to battery is strictly prohibited, and ABB will not be liable for any adverse impact it can create to recloser performance including life of battery.*
- **Handling reclosers during long outages**
 1. *If battery bank is healthy and in fully charge condition i.e. ≥ 24 Vdc, for the power outage can be of < 24 Hrs. without any special attention required.*
 2. *If power outage is for more than 24 Hrs OR typically > 10 CO operations after power failure, then it is considered as long power outage requiring special attention of batteries.*
 3. *During long outages, the batteries might get drained to such a level that it might go into deep discharge stage i.e. battery bank voltage goes below 18 V.*
 4. *In this situation recloser will not be able to recharge the batteries automatically and external charging may be required. Such situation might also damage batteries permanently and thus required to be replaced.*
 5. *To avoid such situation, in case of power outage is expected to be more than 24 Hrs. switch OFF the battery MCB in the beginning of the outage and when the power resumes, switch it back to ON.*
 6. *If power outage is more than a month, then charge the batteries on regular interval externally to ensure the battery bank voltage is always more than 21 VDC.*

4.2.6 SERVICE and DISCHARGE modes

A two position (Service & Discharge) selector switch is provided in the LV cabinet. For normal situations when the recloser is in service, this switch should be in Service position. In case, any maintenance is to be conducted inside the LV cabinet, the switch should be moved to Discharge position to ensure operator's safety from charged capacitors.

SERVICE Mode: For normal operation of recloser; the selector switch must be put in service mode. All the MCBs are in ON condition and the capacitors are kept fully charged by the ACM.

DISCHARGE Mode: Since the LV cabinet houses charged capacitors, it is mandatory that the operator should properly discharge them before conducting any maintenance inside the LV cabinet. For safely discharging the capacitors, a capacitor discharge circuit is provided in the LV cabinet.

The operator has to put the selector switch into Discharge mode upon which, the capacitors get connected to the discharge circuit. In Discharge mode, the capacitors are no more charged.

A red LED is provided on the discharge circuit to indicate the process of capacitor discharge. It takes few minutes for the capacitors to get safely discharged. This red LED starts glowing as soon as the switch is put in discharge mode and continues to glow until the capacitors are discharged to a safe level (around 2V).

Operator should wait until this red LED indication is turned OFF before touching any component inside the LV cabinet. In discharge mode protection & control are not available for the recloser.

4.2.7 External Auxiliary Supply Status monitoring

In the event of loss of external auxiliary supply, the Intelligent battery Charger sends signal to RER615 relay over an independent binary input. Thus, the status of availability of external auxiliary power to the LV unit can be monitored remotely in case communication set-up is made available.

4.2.8 RER615 control

OVR-15, 27 & 38 recloser LV cabinet is supplied with the microprocessor-based RER615 Intelligent Electronic Device (IED) from ABB's Relion family. This technologically advanced relay integrates all traditional recloser control functions with new advanced functions, such as three phase inrush and programming flexibility, providing a wide range of metering and remote control options.

For details on relay programming, operations, and testing, refer to technical documentation at www.abb.com. For details on the overall control circuit, refer to the approved/as built wiring diagram supplied with the recloser.

The RER615 implements a draw out case design for easy removal and internal upgrades. This design has two main parts: the frame and the case. The frame is fixed on the inner swing door of the LV cabinet. The case is removable via a handle and houses various cards. All card connections are made with terminal blocks that are affixed to the frame of the IED. This is powered by the charging device.

3 dedicated LED's

- ① Ready
- ② Start / Pickup
- ③ Trip
- ④ Display (LCD)
Large LCD, mono-spaced up to 10 × 20 characters
 - Single line diagram (SLD)
 - User configurable with PCM600
 - Background light with power-saving mode
- ⑤ 11 programmable LED's
- ⑥ RJ45 - Front communication port

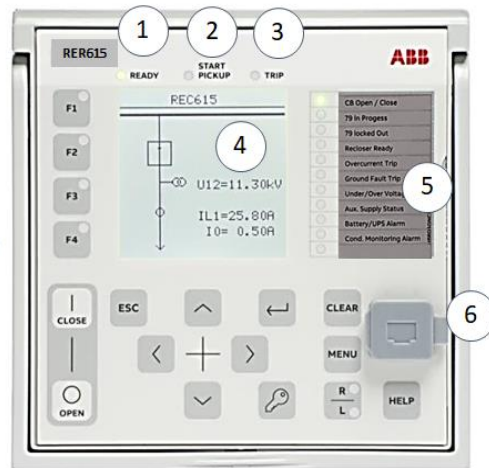


Figure-9 : RER615 Display screen and LEDs on front facia

- ① Clear
- ② Menu
- ③ Help
- ④ Local/Remote
- ⑤ Enter
- ⑥ Authorization
- ⑦ Navigation buttons
- ⑧ ESC
- ⑨ CB Control: Open/Close
- ⑩ 4 Functional buttons

Functional buttons default configuration

- | | |
|---------------------------------|------------------------------|
| F1 79 Enabled / Disabled | F3 SEF Protection OFF |
| F2 Hot Line Tag ON | F4 Setting Group 2 ON |

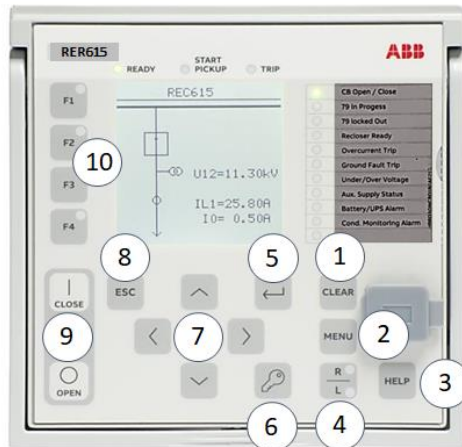


Figure-10 : RER615 Buttons / Keys on front facia

- ① **[X000]** Communication module
- ② **[X100]** Power supply and binary output module
- ③ **[X110]** Binary I/O module
- ④ **[X120]** Analog input module (4CT + 4BI)
- ⑤ **[X130]** Analog input module (6U/Us)

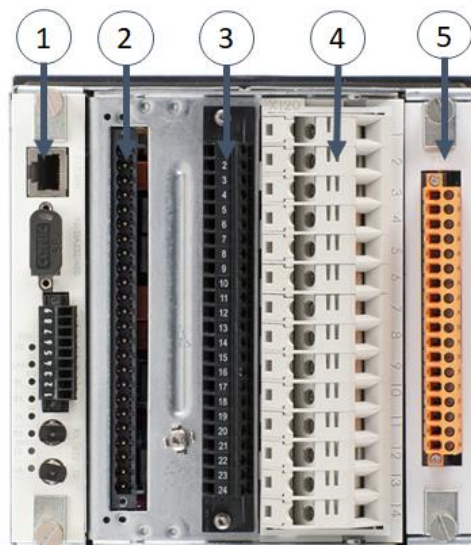


Figure-11 : RER615 Modules for OVR reclosers - configuration 'D'

Note

The RER615 is not intended for “hot swapping.” Read section 8.1 before removing the relay from its case. When the RER615 is removed from its case, the current (I) input terminals automatically short circuit the CT inputs. No card should be removed from the RER615 in the field. If removal is required, contact the ABB Customer Service Group

Important

The LV unit is shipped duly calibrated with the current /voltage correction factors (as applicable) already applied and set in the RER615 relay. It is mandatory that these correction factors are not modified after shipment.

Important

RER615 Parameter Settings at the time of shipment from factory:

Other than the “Parameters to be maintained as default in RER615” listed in Section-13 & the rated reclosing cycle in DARREC1 functional block, rest all parameter settings in RER615 are the “default settings” as per RER615 technical manual on ABB website.

5 STANDARD PRODUCTION TESTS

OVR-15, 27 & 38 recloser LV cabinet is tested thoroughly in factory before supplying. 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. Minimum Trip and Time-Current Test
5. No load mechanical operation test.

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

6 INSTALLATION

The OVR-15, 27 & 38 recloser LV unit 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 LV unit be vertical, levelled and securely fastened.

Before shipping from factory, the OVR-15, 27 & 38 recloser LV control cabinet are tested as a system in factory. It is mandatory that during installation, the HV unit and LV control cabinet should be 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.

6.1 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 LV cabinet includes two stainless steel welded grounding pads for grounding and M8 stud as shown in below figure. 80 Sq.mm cross-section, solid copper strip/equivalent is recommended for grounding.

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 (1Ω). 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.

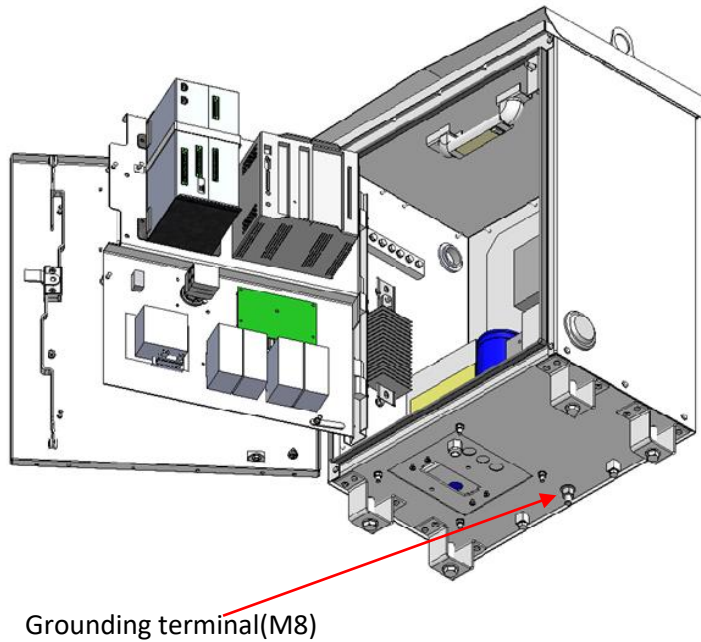


Figure -13: Provisions for Grounding Connections on LV cabinet

6.2 CONNECTING THE HV & LV CABINETS BY CONTROL CABLE

For normal operation, the HV & LV units are required to be connected through a shielded control cable. The control cable is supplied as per specified length, with 24 pin connectors & locking clips on both ends for connection to 24 pin connector counterparts on the HV & LV cabinets.

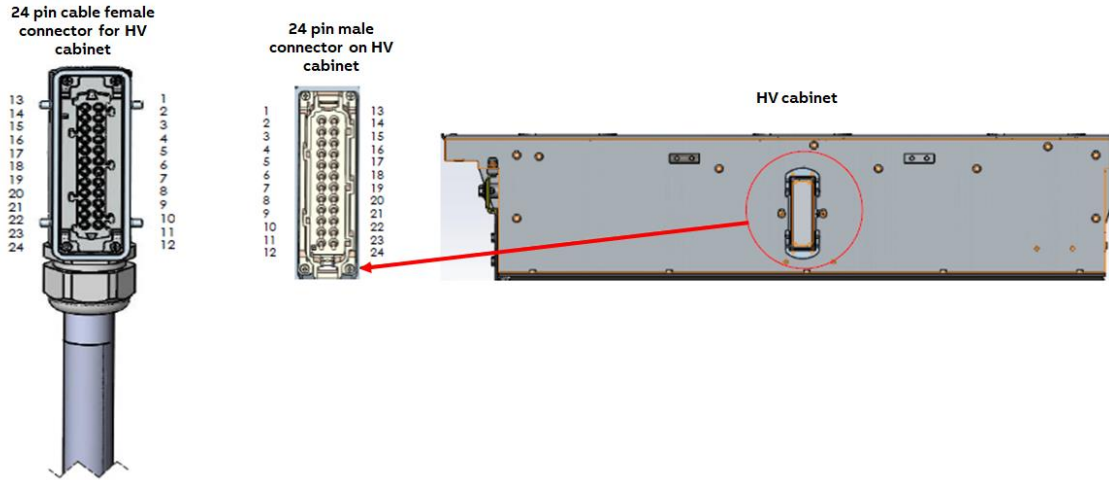


Figure 15 : Control cable connection to HV cabinet

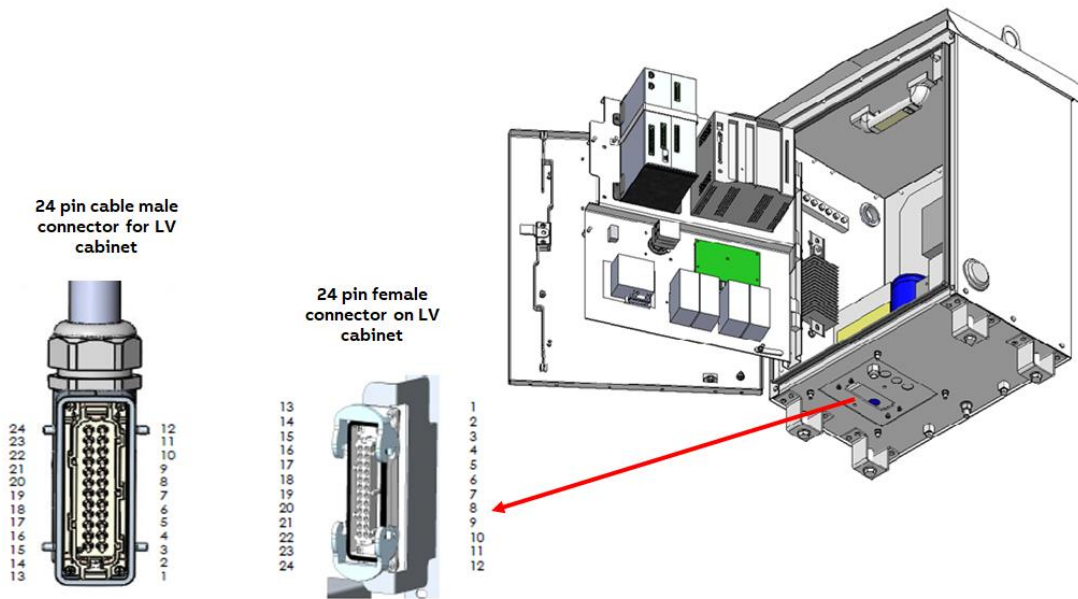


Figure 16 : Control cable connection between HV and LV cabinet

Note

1. Minimum Bending Radius for the control cable is 12 inches. Please do not bend the cable with radius at bending less than 12 inches . This may damage the cable.
2. The control cable has to be clamped to the pole throughout the length at regular intervals as per best practices

6.3 CONNECTING THE AUXILIARY SUPPLY

The control cabinet requires external two wire aux supply. Please refer the approved/as built drawings for the aux. supply voltage/frequency applicable to your recloser.

If agreed during ordering stage, an optional auxiliary supply cable can be supplied with the recloser. It is a black colored, jacketed, 2x1.5 Sq.mm auxiliary power cable with a gland and nut on one end to bring it inside the LV cabinet.

If the auxiliary control power is desired to be obtained from a pole mounted VT (PT), then the power rating of VT (PT) should be minimum 250 VA . Unless specified such VT (PT) will not be in ABB's scope of supply.



- Before connecting the external auxiliary power source to the LV cabinet, make sure that the *SERVICE/DISCHARGE* selector switch in the LV cabinet is in *DISCHARGE* mode.
- Follow instructions on the warning label provided on the inner swing panel (door).

6.4 FINAL INSPECTIONS BEFORE ENERGIZING

The LV unit 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.



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 LV cabinet 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 LV cabinet 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.

6.5 TABLE 2: OPERATION PROCEDURE

1. Initial Conditions at the time of Shipping	<p>When shipped from factory, OVR-15, 27 & 38 recloser is having following status;</p> <ul style="list-style-type: none"> - Recloser interrupter contacts in OPEN (OFF) condition - All MCBs in LV cabinet in OFF position. - Service/Discharge selector switch in "DISCHARGE" position thus capacitors are in "fully discharged" condition. - Battery physically disconnected from main circuit.
2. Checks and preparations before Powering ON.	<ol style="list-style-type: none"> 1. Complete installation of LV & HV Units 2. Install other optional equipment such as surge arrestors, auxiliary control transformer (PT), etc. 3. Connect & properly route the control cable between LV & HV Units. Check that the male female connections are firmly secured on both HV and LV units 4. Connect & route all the ground connections 5. Ensure that the emergency manual trip (k69) handle is reset & BLOCK CLOSE is released 6. Connect 12V batteries physically as instructed.
3. To Power ON the LV Cabinet with Auxiliary power	<ol style="list-style-type: none"> 1. Connect auxiliary power cable to the dedicated terminals inside the LV Cabinet. Check wiring diagram provided in order bound drawings. 2. Switch ON the auxiliary power from the source 3. Check availability of auxiliary power on terminals in LV cabinet 4. Switch ON the main MCB (AUX SUPPLY MAINS) on the inner swing door of LV Cabinet 5. With front door of LV cabinet opened, the cubicle Illumination lamp (if provided & controlled by door limit switch) should glow. 6. The auxiliary power outlet socket also gets powered up
4. To connect Auxiliary Supply to Charging device and ACM.	<ul style="list-style-type: none"> - Switch ON the MCB dedicated for External charger and AC circuits. - With auxiliary power ON, the thermostatically controlled heaters in HV and LV cabinets may also get ON.
5. To connect batteries to Charging device	<ol style="list-style-type: none"> 1. Check and firmly connect the 2 Pin Male-Female battery connectors in the battery circuit. Check schematic diagram supplied with the documents for details. 2. This will connect the two 12V batteries in series . Check the voltage across Battery Terminals to be around 24 V 3. Switch ON the battery MCB to connect batteries to charging device.
6. If a radio modem is provided or added later at site, follow the instructions to power it ON	<p>If, radio modem is part of the factory supply, it would be already wired up to the radio modem MCB. Switch ON this radio MCB to Power it ON. Check and connect the hardwired connection between relay and radio modem.</p> <p>If customer wants to connect radio modem at site, following steps are to be followed.</p> <ol style="list-style-type: none"> 1. Check the schematic diagram provided with the documents to understand the pins on charging device for power on radio modem. It can support up to 7W at a dc voltage between 19 V to 29V.

	<ol style="list-style-type: none"> 2. Complete the physical wiring for power supply with an addition of 2 pole DC MCB of suitable rating in the circuit. Space is allocated on the inner swing door of the LV cabinet for mounting the MCB. 3. Hardwire the modem with suitable port of RER615 relay as per requirement of communication protocol. Modem Antenna can be connected outside the LV box by routing the Antenna wire thru bottom gland plate of LV box.
7. To start capacitor charging	Put the Service/Discharge selector in the LV cabinet from "Discharge" position" to "Service" position
8. Checks and observations on ACM power ON.	<p>When the AC MCB of Charging device is turned on;</p> <ul style="list-style-type: none"> - ACM will conduct internal checks Initially with both RED and GREEN LEDs blinking on ACM. It may take around 2 minutes for recloser to become ready from each initial energization. - Successful energization will be indicated by GREEN LED becoming steady and red LED continuously OFF. It indicates that the ACM (recloser) is ready for operations. <p>RER615 relay (on inner swing door) gets powered up with complete lighting of LCD screen & LEDs on RER615 relay HMI.</p>
9. AR Ready Indication on Relay LED	<p>When ACM completes all the internal checks and fully charges the capacitors; the LED "AR Ready" on RER615 relay turns GREEN, indicating that the recloser is ready for operations.</p> <p>(Please refer the approved/as built wiring diagram for detailed description on RER615 LED indications applicable for your unit)</p>
10. CLOSE Operation.	<p>For closing the recloser;</p> <ul style="list-style-type: none"> - Confirm the emergency manual trip (K69) handle is reset - Confirm the recloser status as OPEN by referring to relay HMI (dedicated LED or recloser OPEN symbol of the SLD on LCD screen) and the ON/OFF position indicator on HV unit) - Press the (I) button on relay HMI. Relay will display a message "CLOSE CBXCBR1? YES/NO". - Press the ENTER push button on YES option. This closes the recloser.
11. OPEN Operation	<p>For Opening/Tripping the recloser;</p> <ul style="list-style-type: none"> - Confirm the recloser status as CLOSE by referring to relay HMI (dedicated LED or recloser CLOSE symbol of the SLD on LCD screen) and the mechanical ON/OFF indicator on HV unit) - Press the (O) button on relay HMI. Relay will display a message "OPEN CBXCBR1? YES/NO". - Press the ENTER push button on YES option. This opens the recloser.
12. Hot line tag and Close blocking	<ul style="list-style-type: none"> - RER615 relay provides a facility to activate a HOTLINE TAG (HLT), which if activated, blocks all the possible close commands given from local (through relay) AND / OR given remotely through SCADA. However, recloser is free to open by commands from Local / Remote, as well as on protection trip commands initiated by RER615 relay. - When HLT is deactivated, close block is disabled. - The activation and deactivation of HLT can be locally done via dedicated function key 'F2' on the RER615 HMI or via remote thru SCADA. Its status is indicated by the LED placed near the function key.

7 INSPECTION AND MAINTENANCE

The OVR-15, 27 & 38 LV unit 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 LV unit should be inspected at regular intervals. Operating experience, environmental conditions, the number of operations, 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.

7.1 ACTIVITIES BEFORE DOING ANY MAINTENANCE OF THE RECLOSER LV UNIT

(Perform this in conjunction with HV unit instruction manual)

1. OPEN the recloser with the emergency manual trip (K69) handle .This enables the mechanical as well as electrical BLOCK CLOSE (recloser cannot be closed unless the K69 handle is manually reset).
2. Confirm the recloser OPEN status on RER615 relay HMI and on the mechanical ON/OFF Indicator on HV cabinet.
3. Switch OFF all the MCBs to disconnects AC Aux Power and battery back up.
4. Put the Service/DISCHARGE selector switch in the LV cabinet to "DISCHARGE" position. This will connect capacitors to the discharge circuit.
5. Wait till the capacitors are discharged to safe level (until the RED LED on discharge circuit stops glowing)
6. Since RER615 relay and optional Radio modem are supplied by charging device, switching OFF of power supply also switches OFF the charging device, RER615 relay and any connected radio modem.
7. Thus, all the electrical controls/measurements & protections/communications of the recloser are switched OFF and recloser LV cabinet is ready to for maintenance.

7.2 ACTIVITIES BEFORE DOING ANY MAINTENANCE OF THE RECLOSER LV UNIT

1. Follow all activities mentioned in previous clause
2. Ensure that the main circuit is properly earthed
3. Ensure that all the safety norms are followed as per your country and company's policy

7.3 REMOVAL OF RER615 RELAY

The RER615 is not intended for “hot swapping. When the RER615 is removed from its case, the current (I) input terminals automatically short circuit the CT inputs. No card should be removed from the RER615 in the field. If removal of cards is required, contact the ABB Customer Service Group.

Please follow the mandatory safety procedures as mentioned under section 1.0 of this document.

Once RER615 relay is powered OFF, with the inner door closed, move the relay handle upward by 90 Deg. Then pull the handle in horizontal plane .This removes the relay from its case. The movement is guided by the guide rails.

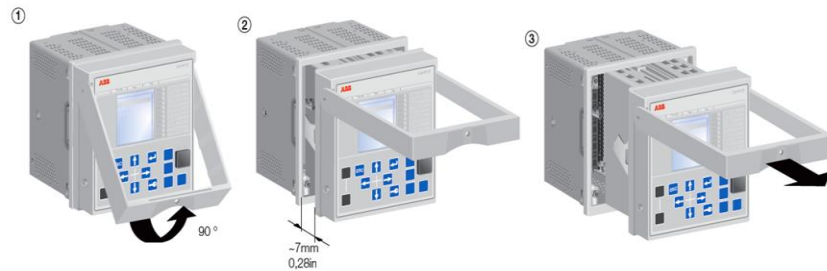
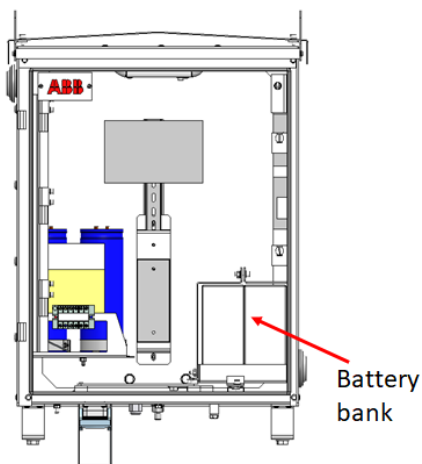


Figure-19 : Removal of RER615 from its case

7.4 REMOVAL OF BATTERIES

Please follow the mandatory safety procedures as mentioned under section 1.0 of this document. Below figure describes the steps to be followed when it is required to remove the batteries.

Before physically removing the batteries from LV unit, ensure that the battery MCB is OFF and the battery connections are totally removed from battery terminals



1. Switch off the Battery MCB
2. Disengage Male-Female connectors inside the battery wiring conduit
3. Remove the M6 Hex Head Screws A, B and C
4. Now, Remove the battery temperature sensor, by disengaging the male-female connectors
5. Remove the whole Battery assembly and then remove the clamps by removing M6 Hex head Screws D and E
6. Now, Remove the Batteries B1 and B2 in the direction as shown

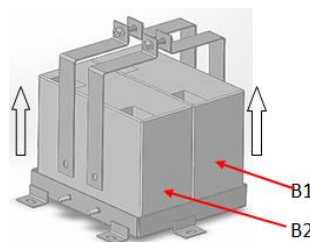
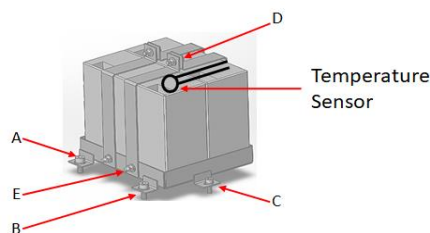


Figure - 20 : Removal of Batteries

8 COMMON TROUBLES AND TROUBLE SHOOTING

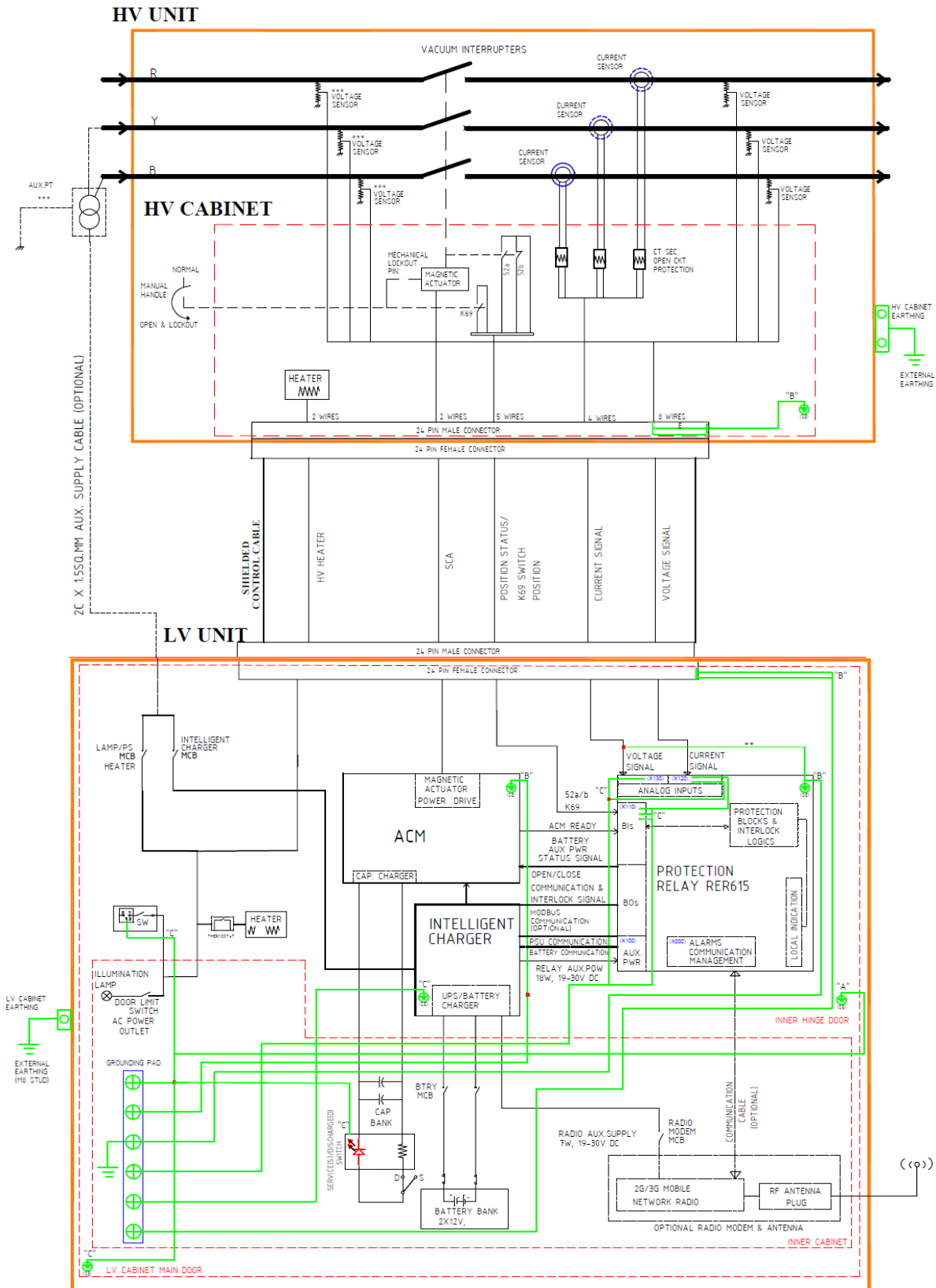
Table 4: Trouble shooting chart for OVR reclosers (Please read this table in conjunction with the approved/ as built wiring diagram)

Sr. No.	Trouble / Malfunction	Indication / Observation	Possible Causes	Remedy / Trouble Shooting
1	Auxiliary Power failure	No voltage across auxiliary supply terminals in LV Unit	<ul style="list-style-type: none"> - External Auxiliary power connection to LV Unit is loosely connected - External Auxiliary Power may be OFF 	<ul style="list-style-type: none"> - Properly connect the Auxiliary Power supply cable to the plug inside LV Unit - Check & correct the status of the external power supply.
		Voltage is present across auxiliary power terminals in LV unit but cubicle light & aux. power outlet, heater(s), do not have power.	Auxiliary Supply Mains MCB is OFF	Switch ON the MCB for Auxiliary Supply Mains
2	ACM/RER615 does not power up even after main Aux. MCB is ON & Aux Supply is available for more than 60s	Charging device is defective (its LED is not glowing continuously)	If LED is blinking. If LED is not Glowing Check the resistance between NTC + & NTC – for the values in between 8 to 10 k.Ohm @ 35°C Ambient.	Charging device needs to be reprogrammed. Charging device is defective. Consult ABB representative. If found open or no values of resistance could be measured, temperature sensing cable is defective. Consult ABB representative.
		None of the LEDs (RED/GREEN) on ACM glow	MCB for ACM is OFF	Switch ON the MCB for ACM
		No LEDs on RER615 HMI glow and LCD screen does not light up		
		One or more blinking RED LED on ACM	Manual Lock out activated. Emergency manual trip (k69) handle has been operated and is locked in operated/tripped position.	Reset the emergency manual trip handle & release the manual lock out
3	Recloser (AR) is NOT ready; OPEN & CLOSE operations not possible from RER615 or from remote	AR Ready LED on Relay glowing RED	Control cable between LV & HV units loose / not connected	Connect and secure the control cable between HV & LV units
			Capacitors not sufficiently charged	<ul style="list-style-type: none"> - Put selector switch in DISCHARGE position - Allow capacitors to fully discharge (follow warning label text guidelines) - Check capacitor connections to ACM for loose contact and correct polarity as per wiring diagram - Check the capacitor health; replace capacitors if needed

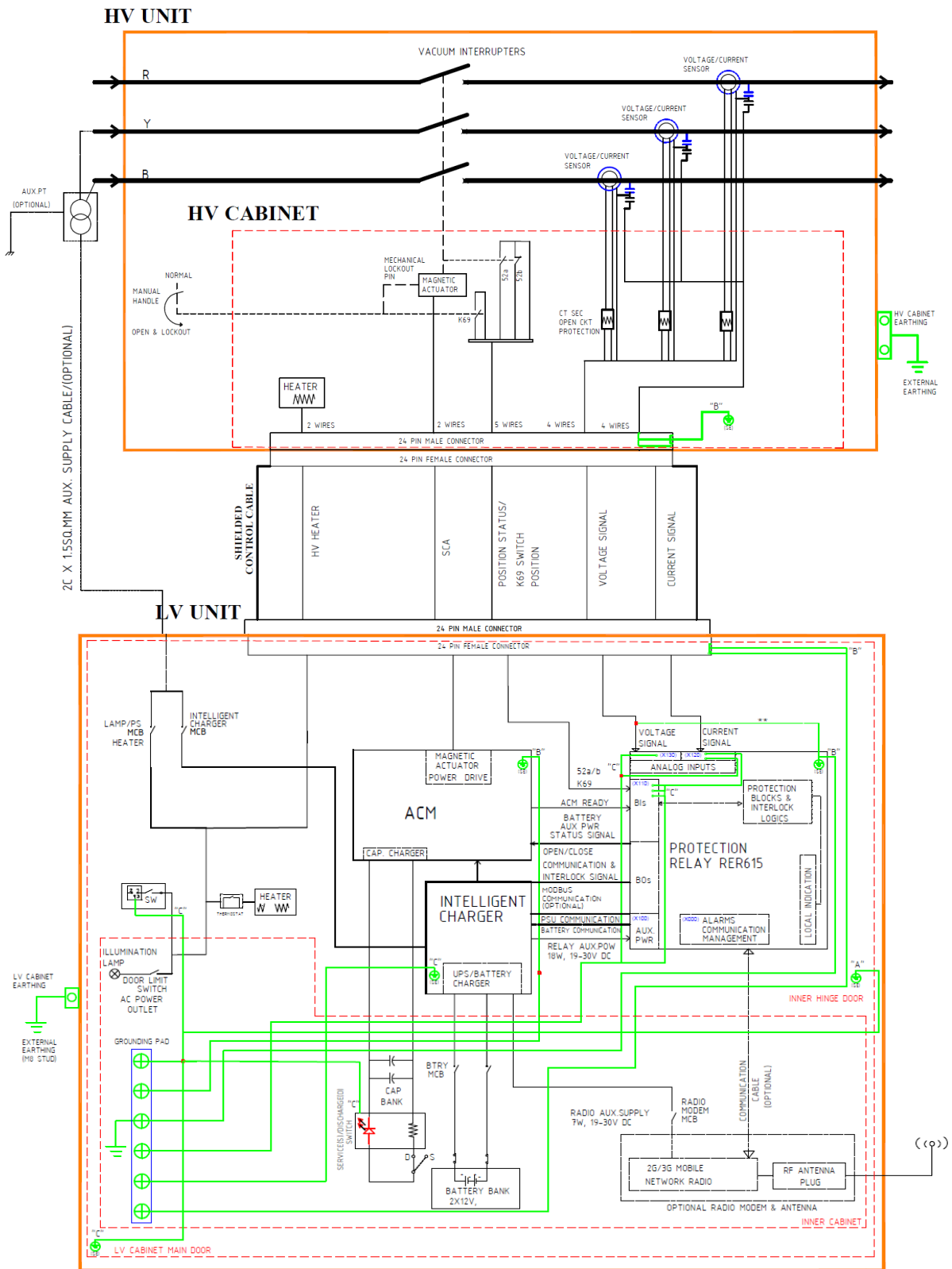
		Wrong recloser ON/OFF status on SLD of RER615 HMI (mismatch with mechanical ON/OFF indicator/ LEDs on RER615) -OR- Relay LED or SLD on relay LCD shows both (ON/OFF) or no status	The wiring of the 52a/b aux. limit switch may be loose or wrong (52a/b aux. limit switch is mounted in HV unit) The mounting/setting of the 52a/b aux. limit switch may be wrong/ loose -OR- The 52a/b aux limit switch is faulty/ damaged (52a/b aux. limit switch is mounted in HV unit)	Check, secure and correct the wiring of 52a/b aux. limit switch as per approved /as built schematic - Check and correct the mounting/setting of the 52a/b aux. limit switch - Replacement of the 52a/b switch may be needed if found faulty/damaged - Contact ABB Customer Service Group
4	Recloser (AR) is Ready but CLOSE operation is not possible from RER615 Local HMI or remote	SYN CHECK LED (if applicable) on relay HMI turns RED	The phase sequence of the MV power connections on both sides of the recloser are not matching to each other Synchronizing and Energization check conditions are not being satisfied as per settings of SECRSYN function block.	Check & correct the phase sequence of the MV power cable connections to the recloser terminals Check the system voltage parameter and network status
5	Battery Failure	Battery Status LED on relay HMI turning RED	MCB for Battery is OFF Battery connections to charging device loose or with wrong polarity Battery unhealthy (Battery may have undergone deep discharge; excessive temperatures; or exceeded working life)	Switch ON the MCB for Battery Check, correct and secure battery connections to charging device with correct polarities Check battery health and replace the battery if needed.
6	Condition monitoring alarm activated. This is proactive alarm about recloser condition which may need attention in near future	Condition monitoring alarm on relay HMI turning RED	ACM is taking more than 20 seconds to become ready Out of the rated life of 10000 CO operations , 9500 CO operations completed and last 1000 CO operations are remaining Recloser has completed a greater number of open operations on higher currents (fault currents) Recloser is in "inactive " (no close/open operations) stage for more than 2000 days ; after the latest ON/OFF operation while LV unit powered ON	Follow steps in point no. 3.0 above Contact the nearest ABB Customer Service Group for further advice

9 GENERAL OVR-15, 27 & 38 BLOCK DIAGRAM

9.1 DUAL VOLTAGE SENSING



9.2 SINGLE SIDE VOLTAGE SENSING



NOTE: KINDLY FOLLOW GREEN COLOR WIRES FOR EARTHING

*** OPTIONAL

⊕ SCREW EARTHING (SE)

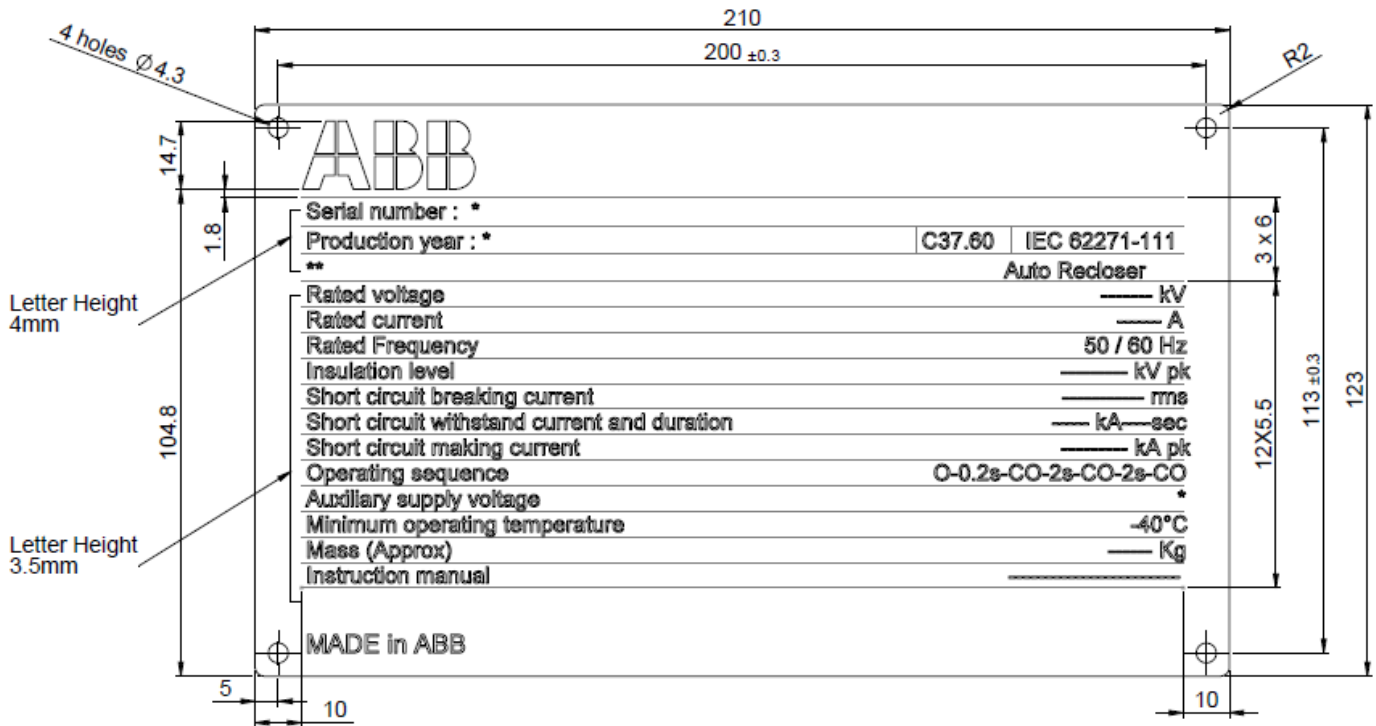
⊕ GROUNDING THROUGH SS PADS

** S-RVD SIGNAL LOOPED INTERNALLY & EARTHING TO RELAY SE POINT

CODE	MATERIAL
"B"	BRAID-SMALL 6 SQMM
"C"	YELLOW-GREEN WIRE 2.5 SQMM

10 TYPICAL RATING PLATE DETAILS

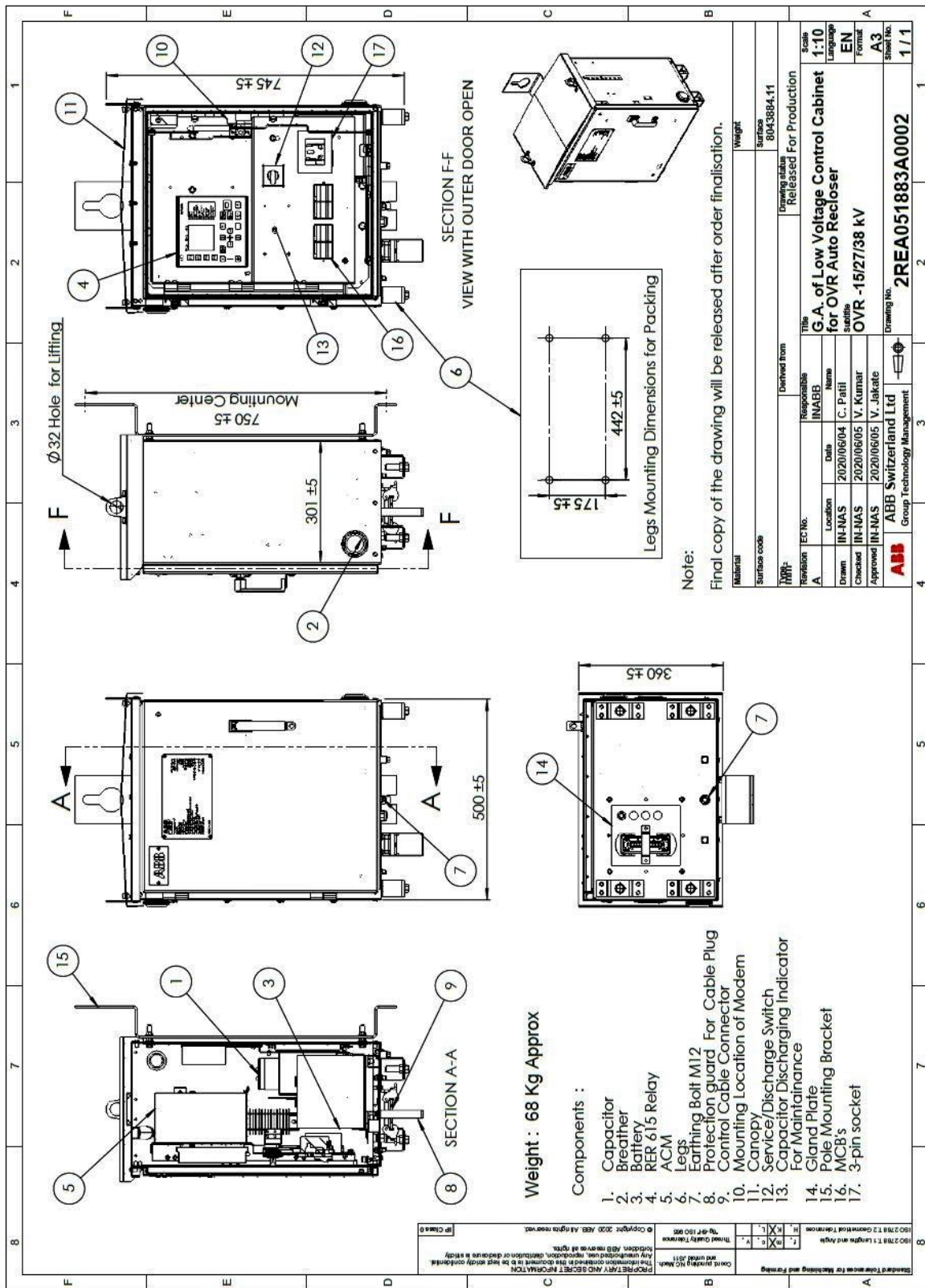
10.1 RATING PLATE ON LV CABINET



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 GENERAL ARRANGEMENT DRAWINGS

11.1 LV CONTROL CABINET GENERAL ARRANGEMENT



12 PARAMETERS TO BE MAINTAINED AS DEFAULT IN RER615

Following parameter settings ensure correct integrated performance of ACM & RER615 for any OVR three phase recloser model.

Hence following settings SHOULD NOT BE CHANGED during the lifetime of the recloser, without prior permission from ABB.

12.1 CB CONDITION MONITORING SETTINGS (OVR-15, 27 & 38)

Group / Parameter Name	Value (Range)	Unit	Step	Default RER615	OVR-15	OVR-27	OVR-38
Current (3I,CT): 1							
Current (3I,CT)							
Operation	1=on 5=off			1=on	1	1	1
Acc stop current	5...500	A	0.01	10.00	500	500	500
Open alarm time	0...200	ms	1	40	80	80	80
Close alarm time	0...200	ms	1	40	90	90	90
Opening time Cor	0...100	ms	1	10	10	10	10
Closing time Cor	0...100	ms	1	10	10	10	10
Spring charge time	0...60000	ms	10	20000	20000	20000	20000
Counter initial Val	0...9999		1	0	0	0	0
Alarm Op number	0...9999		1	9999	9500	9500	9500
Lockout Op number	0...9999		1	9999	9999	9999	9999
Current exponent	0.00...2.00		0.01	2.00	2.00	2.00	2.00
Difference Cor time	-10...10	ms	1	5	-2	-2	-2
Alm Acc currents Pwr	0...20000		0.01	20000.00	20000.00	20000.00	20000.00
LO Acc currents Pwr	0...20000		0.01	20000.00	20000.00	20000.00	20000.00
Ini Acc currents Pwr	0...20000		0.01	0.00	0.00	0.00	0.00
Directional Coef	-3.00...-0.50		0.01	-2.87	-2.31	-2.31	-2
Initial CB Rmn life	0...9999		1	9999	9999	9999	9999
Rated Op current	100...5000	A	0.01	1250.00	630	1000	1200
Rated fault current	500...75000	A	0.01	16000.00	12500	12500	16000
Op number rated	1...99999		1	30000	10000	10000	10000
Op number fault	1...10000		1	22	30	30	30
Life alarm level	0...99999		1	1000			
Pressure alarm time	0...60000	ms	1	10	10	10	10
Pres lockout time	0...60000	ms	10	10	10	10	10
Inactive Alm days	0...9999		1	2000	1825	1825	1825
Ini inactive days	0...9999		1	0	0	0	0
Inactive Alm hours	0...23	h	1	9	23	23	23
Travel time Clc mode	From Pos to Pos						

Trip logic

TRPPTRC: 1	PC Value	Unit	Min	Max
Master Trip (1)				
Operation	On			
Trip pulse time	70	ms	20	60000
Trip output mode	Non-latched			

Trip circuit supervision

Group / Parameter Name	PC Value	Unit	Min	Max
TCSSCBR1: 1				
TCS (1)				
Operation	off			
Operate delay time	3000	ms	20	300000
Reset delay time	1000	ms	20	60000
Group / Parameter Name				
TPGAPC1: 1				
TP (1)				
Pulse time	150	ms	0	60000
Group / Parameter Name				
TOFGAPC1: 1				
TOF (1)				
Off delay time 1	1000	ms	0	3600000
Off delay time 2	0	ms	0	3600000
Off delay time 3	0	ms	0	3600000
Off delay time 4	0	ms	0	3600000
Off delay time 5	0	ms	0	3600000
Off delay time 6	0	ms	0	3600000
Off delay time 7	0	ms	0	3600000
Off delay time 8	0	ms	0	3600000

Generic Timers

Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
SPCGGIO1: 1					
General					
Loc Rem restriction		False			
Output 1					
Operation mode		Toggle			
Pulse length		1000	ms	10	3600000
Description		SPCGGIO1 Output 1			64 character
Output 2					
Operation mode		Toggle			
Pulse length		1000	ms	10	3600000
Description		SPCGGIO1 Output 2			64 character
Output 3					

Generic Logic

Similarly following settings decide the accuracy of current/voltage measurements for the product configuration applicable to your recloser. These settings also SHOULD NOT BE CHANGED during the lifetime of the recloser, without prior permission from ABB.

12.2 CORRECTION FACTORS: ANALOG INPUTS (CURRENT):

Group / Parameter Name	PC Value	Unit	Min	Max
✓ Current (3I,CT): 1				
✓ Current (3I,CT)				
Primary current	600*	A	1.0	6000.0
Secondary current	1A			
Amplitude corr. A	1.0000		0.9000	1.1000

Amplitude corr. B	1.0000		0.9000	1.1000
Amplitude corr. C	1.0000		0.9000	1.1000
Reverse Polarity	False			
Angle corr. A	0.0000	deg	-20.000	20.000
Angle corr. B	0.0000	deg	-20.000	20.000
Angle corr. C	0.0000	deg	-20.000	20.000

Group / Parameter Name	PC Value	Unit	Min	Max
✓ Current (Io.CT): 1				
✓ Current (Io.CT)				
Amplitude corr.	1.0000		0.9000	1.1000

* Primary current 300:1 available on OP1 DVS Pole

12.3 CORRECTION FACTORS: ANALOG INPUTS (VOLTAGE):

Group / Parameter Name	PC Value	Unit	Min	Max
Voltage (3U.VT): 1				
Voltage (3U.VT)				
Primary voltage	*****	kV	0.100	440.00
VT Connection	Wye			
Amplitude corr. A			0.900	1.100
Amplitude corr. B	As per routine test		0.900	1.100
Amplitude corr. C	result provided by		0.900	1.100
	factory		1000	20000
Division ratio				
Voltage input type	RVD/CVD Sensor			
Angle corr. A	0	deg	-20.000	20.000
Angle corr. B	0	deg	-20.000	20.000
Angle corr. C	0	deg	-20.000	20.000

Below additional table is applicable for six voltage sensor solution only (with additional sensors on H1 side)

Group / Parameter Name	PC Value	Unit	Min	Max
Voltage (3UB.VT): 1				
Voltage (3UB.VT)				
Primary voltage	*****	kV	0.100	440.00
VT Connection	Wye			
Amplitude corr. A	As per routine test		0.900	1.100
Amplitude corr. B	result provided by		0.900	1.100
Amplitude corr. C	factory		0.900	1.100
Division ratio			1000	20000
Voltage input type	RVD/CVD Sensor			
Angle corr. A	0	deg	-20.000	20.000
Angle corr. B	0	deg	-20.000	20.000
Angle corr. C	0	deg	-20.000	20.000

***** System voltage as per approved drawings

13 RER615 SETTINGS

13.1 TABLE 5.1 : SETTINGS FOR RER615 WITH REFERENCE TO OVR-15, 27 & 38 RECLOSER

Sr. No.	Protection	IEC61850 Identification	Setting range available in RER615	For OVR-15 Recloser 600/1A CT & 15.5kV System Voltage		For OVR-27 Recloser 600/1A CT & 27kV System Voltage		For OVR-38 Recloser 600/1A CT & 38kV System Voltage	
				Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used
				(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)
Three-phase non-directional overcurrent protection (FPHxPTOC) main settings									
1	Start Value	FPHLPTOC	0.05...5.00 × In	0.05...5.00 × In	30-3000A	0.05...5.00 × In	30-3000A	0.05...5.00 × In	30-3000A
		PHHPTOC	0.10...40.00 × In	0.10...20.83 × In	60-12500A	0.10...20.83 × In	60-12500A	0.10...26.6 × In	60-16000A
	Time multiplier	PHIPTOC	1.00...40.00 × In	1.00...20.83 × In	600-12500A	1.00...20.83 × In	600-12500A	1.00...26.6 × In	600-16000A
		FPHLPTOC	0.05...15.00	0.05...15.00	30-9000A	0.05...15.00	30-9000A	0.05...15.00	30-9000A
	Operate delay time	PHHPTOC	0.05...15.00	0.05...15.00	30-9000A	0.05...15.00	30-9000A	0.05...15.00	30-9000A
		FPHLPTOC	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms
		PHHPTOC	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	
		PHIPTOC	20...200000 ms	20...200000 ms	20...200000 ms	20...200000 ms	20...200000 ms	20...200000 ms	
Optional Three-phase directional overcurrent protection (FDPHxPDOC) main settings									
2	Start Value	FDPHLPDOC	0.05...5.00 × In	0.05...5.00 × In	30-3000A	0.05...5.00 × In	30-3000A	0.05...5.00 × In	30-3000A
		DPHHPDOC	0.10...40.00 × In	0.10...20.83 × In	60-12500A	0.10...20.83 × In	60-12500A	0.10...26.6 × In	60-16000A
	Operate delay time	DPHxPDOC	0.05...15.00	0.05...15.00	30-9000A	0.05...15.00	30-9000A	0.05...15.00	30-9000A
		DPHxPDOC	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms
Directional mode	DPHxPDOC	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	
		2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	
		3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	
Characteristic angle	DPHxPDOC	-179...180°	-179...180°	-179...180°	-179...180°	-179...180°	-179...180°	-179...180°	
Non-directional earth-fault protection (FEFxpTOC) main settings									
3	Start Value	FEFLPTOC	0.010...5.000 × In	0.010...5.000 × In	6-3000A	0.010...5.000 × In	6-3000A	0.010...5.000 × In	6-3000A
		EFHPTOC	0.10...40.00 × In	0.10...20.83 × In	60-12500A	0.10...20.83 × In	60-12500A	0.10...26.6 × In	60-16000A
		EFIPTOC	1.00...40.00 × In	1.00...20.83 × In	600-12500A	1.00...20.83 × In	600-12500A	1.00...26.6 × In	600-16000A
	Time multiplier	FEFLPTOC	0.05...15.00	0.05...15.00	30-9000A	0.05...15.00	30-9000A	0.05...15.00	30-9000A

Sr. No.	Protection	IEC61850 Identification	Setting range available in RER615	For OVR-15 Recloser 600/1A CT & 15.5kV System Voltage		For OVR-27 Recloser 600/1A CT & 27kV System Voltage		For OVR-38 Recloser 600/1A CT & 38kV System Voltage		
				Setting Range to be used (in Nominal Values)	Setting Range to be used (in Absolute Values)	Setting Range to be used (in Nominal Values)	Setting Range to be used (in Absolute Values)	Setting Range to be used (in Nominal Values)	Setting Range to be used (in Absolute Values)	
		EFHPTOC	0.05...15.00	0.05...15.00	30-9000A	0.05...15.00	30-9000A	0.05...15.00	30-9000A	
	Operate delay time	FEFLPTOC	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	
		EFHPTOC	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	
		EFIPTOC	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	
	Optional Directional earth-fault protection (FDEFxPDEF) main settings									
	Start Value	FDEFHPDEF	0.010...5.000 × In	0.010...5.000 × In	6-3000A	0.010...5.000 × In	6-3000A	0.010...5.000 × In	6-3000A	
		DEFHPDEF	0.10...40.00 × In	0.10...20.83 × In	60-12500A	0.10...20.83 × In	60-12500A	0.10...26.6 × In	60-16000A	
4	Directional mode	FDEFHPDEF and DEFHPDEF	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	
			2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	
			3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	
	Time multiplier	FDEFHPDEF	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	
		DEFHPDEF	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	
	Operate delay time	FDEFHPDEF	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	
		DEFHPDEF	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	
	Transient/intermittent earth-fault protection (INTRPTEF) main settings									
	Directional mode	INTRPTEF	1=Non-directional	1=Non-directional	1=Non-directional	1=Non-directional	1=Non-directional	1=Non-directional	1=Non-directional	
			2=Forward	2=Forward	2=Forward	2=Forward	2=Forward	2=Forward	2=Forward	
			3=Reverse	3=Reverse	3=Reverse	3=Reverse	3=Reverse	3=Reverse	3=Reverse	
	Operate delay time	INTRPTEF	40...1200000 ms	40...1200000 ms	40...1200000 ms	40...1200000 ms	40...1200000 ms	40...1200000 ms	40...1200000 ms	
5	Voltage start value (voltage start value for transient EF)	INTRPTEF	0.01...0.50 × Un	0.01...0.50 × Un	155V-7750V	0.01...0.50 × Un	270V-13500V	0.01...0.50 × Un	380-16000V	
	Operation mode	INTRPTEF	1=Intermittent EF	1=Intermittent EF	1=Intermittent EF	1=Intermittent EF	1=Intermittent EF	1=Intermittent EF	1=Intermittent EF	
		INTRPTEF	2=Transient EF	2=Transient EF	2=Transient EF	2=Transient EF	2=Transient EF	2=Transient EF	2=Transient EF	
	Peak counter limit (Min requirement for peak counter before start in IEF mode)	INTRPTEF	2...20	2...20	2...20	2...20	2...20	2...20	2...20	
	Min operate current	INTRPTEF	0.01...1.00 × In	0.01...1.00 × In	6A-600A	0.01...1.00 × In	6A-600A	0.01...1.00 × In	6A-600A	
	Optional Admittance-based earth-fault protection (EFPADM) main settings									
	Voltage start value	EFPADM	0.01...5.00 × Un	0.01...1.00 × Un	155V-15500V	0.01...1.00 × Un	270V-27000V	0.01...1.00 × Un	380-38000V	
6	Directional mode	EFPADM	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	1 = Non-directional	
			2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	2 = Forward	
			3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	3 = Reverse	
	Operation mode	EFPADM	1 = Yo	1 = Yo	1 = Yo	1 = Yo	1 = Yo	1 = Yo	1 = Yo	

Sr. No.	Protection	IEC61850 Identification	Setting range available in RER615	For OVR-15 Recloser 600/1A CT & 15.5kV System Voltage		For OVR-27 Recloser 600/1A CT & 27kV System Voltage		For OVR-38 Recloser 600/1A CT & 38kV System Voltage	
				Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used
				(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)
			2 = Go	2 = Go	2 = Go	2 = Go	2 = Go	2 = Go	2 = Go
			3 = Bo	3 = Bo	3 = Bo	3 = Bo	3 = Bo	3 = Bo	3 = Bo
			4 = Yo, Go	4 = Yo, Go	4 = Yo, Go	4 = Yo, Go	4 = Yo, Go	4 = Yo, Go	4 = Yo, Go
			5 = Yo, Bo	5 = Yo, Bo	5 = Yo, Bo	5 = Yo, Bo	5 = Yo, Bo	5 = Yo, Bo	5 = Yo, Bo
			6 = Go, Bo	6 = Go, Bo	6 = Go, Bo	6 = Go, Bo	6 = Go, Bo	6 = Go, Bo	6 = Go, Bo
			7 = Yo, Go, Bo	7 = Yo, Go, Bo	7 = Yo, Go, Bo	7 = Yo, Go, Bo	7 = Yo, Go, Bo	7 = Yo, Go, Bo	7 = Yo, Go, Bo
	Operate delay time	EFPADM	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms
	Circle radius	EFPADM	0.05...500.00 mS	0.05...500.00 mS	0.05...500.00 mS	0.05...500.00 mS	0.05...500.00 mS	0.05...500.00 mS	0.05...500.00 mS
	Circle conductance	EFPADM	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS
	Circle susceptance	EFPADM	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS
	Conductance forward	EFPADM	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS
	Conductance reverse	EFPADM	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS
	Conductance tilt Ang	EFPADM	-30...30°	-30...30°	-30...30°	-30...30°	-30...30°	-30...30°	-30...30°
	Susceptance forward	EFPADM	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS
	Susceptance reverse	EFPADM	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS	-500.00...500.00 mS
	Susceptance tilt Ang	EFPADM	-30...30°	-30...30°	-30...30°	-30...30°	-30...30°	-30...30°	-30...30°
Optional Wattmetric based earth-fault protection (WPWDE) main settings									
	Directional mode	WPWDE	2 = Forward 3 = Reverse	2 = Forward 3 = Reverse	2 = Forward 3 = Reverse	2 = Forward 3 = Reverse	2 = Forward 3 = Reverse	2 = Forward 3 = Reverse	2 = Forward 3 = Reverse
	Current start value	WPWDE	0.010...5.000 × In	0.010...5.000 × In	6-3000A	0.010...5.000 × In	6-3000A	0.010...5.000 × In	6-3000A
	Voltage start value	WPWDE	0.010...1.000 × Un	0.010...1.000 × Un	6-600A	0.010...1.000 × Un	6-600A	0.010...1.000 × Un	6-600A
7	Power start value	WPWDE	0.003...1.000 × Pn	0.003...1.000 × Pn	Internally calculated based on Un (Max 38kV), In (max 600A)	0.003...1.000 × Pn	Internally calculated based on Un (Max 38kV), In (max 600A)	0.003...1.000 × Pn	Internally calculated based on Un (Max 38kV), In (max 600A)
	Reference power	WPWDE	0.050...1.000 × Pn	0.050...1.000 × Pn	Internally calculated based on Un (Max 38kV), In (max 600A)	0.050...1.000 × Pn	Internally calculated based on Un (Max 38kV), In (max 600A)	0.050...1.000 × Pn	Internally calculated based on Un (Max 38kV), In (max 600A)
	Characteristic angle	WPWDE	-179...180°	-179...180°	-179...180°	-179...180°	-179...180°	-179...180°	-179...180°

Sr. No.	Protection	IEC61850 Identification	Setting range available in RER615	For OVR-15 Recloser 600/1A CT & 15.5kV System Voltage		For OVR-27 Recloser 600/1A CT & 27kV System Voltage		For OVR-38 Recloser 600/1A CT & 38kV System Voltage		
				Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	
				(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)	
	Time multiplier	WPWDE	0.05...2.00	0.05...2.00	0.05...2.00	0.05...2.00	0.05...2.00	0.05...2.00	0.05...2.00	
	Operate delay time	WPWDE	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	60...200000 ms	
	Min operate current	WPWDE	0.010...1.000 × In	0.010...1.000 × In	6-600A	0.010...1.000 × In	6-600A	0.010...1.000 × In	6-600A	
	Min operate voltage	WPWDE	0.01...1.00 × Un	0.01...1.00 × Un	6-600A	0.01...1.00 × Un	6-600A	0.01...1.00 × Un	6-600A	
	Optional Harmonics earth-fault protection (HAEFPTOC) main settings									
	Start value	HAEFPTOC	0.05...5.00 × In	0.05...5.00 × In	30-3000A	0.05...5.00 × In	30-3000A	0.05...5.00 × In	30-3000A	
8	Time multiplier	HAEFPTOC	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	
	Operate delay time	HAEFPTOC	100...200000 ms	100...200000 ms	100...200000 ms	100...200000 ms	100...200000 ms	100...200000 ms	100...200000 ms	
	Minimum operate time	HAEFPTOC	100...200000 ms	100...200000 ms	100...200000 ms	100...200000 ms	100...200000 ms	100...200000 ms	100...200000 ms	
	Three-phase overvoltage protection (PHPTOV) main settings									
	Start value	PHPTOV	0.05...1.60 × Un	0.05...1.60 × Un	775-24800V	0.05...1.60 × Un	1350-43200V	0.05...1.60 × Un	1900-60800V	
9	Time multiplier	PHPTOV	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	
	Operate delay time	PHPTOV	40...300000 ms	40...300000 ms	40...300000 ms for setting max upto 24800V	40...300000 ms	40...300000 ms for setting max upto 43200V	40...300000 ms	40...300000 ms for setting max upto 45600V	
	Three-phase undervoltage protection (PHPTUV) main settings									
	Start value	PHPTUV	0.05...1.20 × Un	0.05...1.20 × Un	775-18600 V	0.05...1.20 × Un	1350-32400 V	0.05...1.20 × Un	1900-45600 V	
10	Time multiplier	PHPTUV	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	
	Operate delay time	PHPTUV	60...300000 ms	60...300000 ms	60...300000 ms	60...300000 ms	60...300000 ms	60...300000 ms	60...300000 ms	
	Positive-sequence undervoltage protection (PSPTUV) main settings									
	Start value	PSPTUV	0.010...1.200 × Un	0.010...1.200 × Un	155-18600V	0.010...1.200 × Un	270-32400V	0.010...1.200 × Un	380-45600V	
11	Operate delay time	PSPTUV	40...120000 ms	40...120000 ms	40...120000 ms	40...120000 ms	40...120000 ms	40...120000 ms	40...120000 ms	
	Voltage block value	PSPTUV	0.01...1.0 × Un	0.01...1.0 × Un	0.01...1.0 × Un	0.01...1.0 × Un	0.01...1.0 × Un	0.01...1.0 × Un	0.01...1.0 × Un	
	Frequency protection (FRPFRQ) main settings									
	Operation mode	FRPFRQ	1 = Freq<	1 = Freq<	1 = Freq<	1 = Freq<	1 = Freq<	1 = Freq<	1 = Freq<	
			2 = Freq>	2 = Freq>	2 = Freq>	2 = Freq>	2 = Freq>	2 = Freq>	2 = Freq>	2 = Freq>
			3 = df/dt	3 = df/dt	3 = df/dt	3 = df/dt	3 = df/dt	3 = df/dt	3 = df/dt	3 = df/dt
			4 = Freq< + df/dt	4 = Freq< + df/dt	4 = Freq< + df/dt	4 = Freq< + df/dt	4 = Freq< + df/dt	4 = Freq< + df/dt	4 = Freq< + df/dt	4 = Freq< + df/dt
			5 = Freq> + df/dt	5 = Freq> + df/dt	5 = Freq> + df/dt	5 = Freq> + df/dt	5 = Freq> + df/dt	5 = Freq> + df/dt	5 = Freq> + df/dt	5 = Freq> + df/dt
			6 = Freq< OR df/dt	6 = Freq< OR df/dt	6 = Freq< OR df/dt	6 = Freq< OR df/dt	6 = Freq< OR df/dt	6 = Freq< OR df/dt	6 = Freq< OR df/dt	6 = Freq< OR df/dt
			7 = Freq> OR df/dt	7 = Freq> OR df/dt	7 = Freq> OR df/dt	7 = Freq> OR df/dt	7 = Freq> OR df/dt	7 = Freq> OR df/dt	7 = Freq> OR df/dt	7 = Freq> OR df/dt

Sr. No.	Protection	IEC61850 Identification	Setting range available in RER615	For OVR-15 Recloser 600/1A CT & 15.5kV System Voltage		For OVR-27 Recloser 600/1A CT & 27kV System Voltage		For OVR-38 Recloser 600/1A CT & 38kV System Voltage	
				Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used
				(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)
	Start value Freq>	FRPFRQ	0.9000...1.2000 × fn	0.9000...1.2000 × fn	0.9000...1.2000 × fn : Calculate with Fn=50 or 60Hz as per requirement	0.9000...1.2000 × fn	0.9000...1.2000 × fn : Calculate with Fn=50 or 60Hz as per requirement	0.9000...1.2000 × fn	0.9000...1.2000 × fn : Calculate with Fn=50 or 60Hz as per requirement
	Start value Freq<	FRPFRQ	0.8000...1.1000 × fn	0.8000...1.1000 × fn	0.8000...1.1000 × fn : Calculate with Fn=50 or 60Hz as per requirement	0.8000...1.1000 × fn	0.8000...1.1000 × fn : Calculate with Fn=50 or 60Hz as per requirement	0.8000...1.1000 × fn	0.8000...1.1000 × fn : Calculate with Fn=50 or 60Hz as per requirement
	Start value df/dt	FRPFRQ	-0.200...0.200 × fn/s	-0.200...0.200 × fn/s	-0.200...0.200 × fn/s : Calculate with Fn=50 or 60Hz as per requirement	-0.200...0.200 × fn/s	-0.200...0.200 × fn/s : Calculate with Fn=50 or 60Hz as per requirement	-0.200...0.200 × fn/s	-0.200...0.200 × fn/s : Calculate with Fn=50 or 60Hz as per requirement
	Operate Tm Freq	FRPFRQ	80...200000 ms	80...200000 ms	80...200000 ms	80...200000 ms	80...200000 ms	80...200000 ms	80...200000 ms
	Operate Tm df/dt	FRPFRQ	120...200000 ms	120...200000 ms	120...200000 ms	120...200000 ms	120...200000 ms	120...200000 ms	120...200000 ms
Negative-sequence overvoltage protection (NSPTOV) main settings									
13	Start value	NSPTOV	0.010...1.000 × Un	0.010...1.000 × Un	155-15500	0.010...1.000 × Un	270-27000V	0.010...1.000 × Un	380-38000V
	Operate delay time	NSPTOV	40...120000 ms	40...120000 ms	40...120000 ms	40...120000 ms	40...120000 ms	40...120000 ms	40...120000 ms
Residual overvoltage protection (ROVPTOV) main settings									
14	Start value	ROVPTOV	0.010...1.000 × Un	0.010...1.000 × Un	155-15500	0.010...1.000 × Un	270-27000V	0.010...1.000 × Un	380-38000V
	Operate delay time	ROVPTOV	40...300000 ms	40...300000 ms	40...120000 ms	40...300000 ms	40...120000 ms	40...300000 ms	40...120000 ms
Negative phase-sequence overcurrent protection (NSPTOC) main settings									
15	Start value	NSPTOC	0.01...5.00 × In	0.01...5.00 × In	6-3000A	0.01...5.00 × In	6-3000A	0.01...5.00 × In	6-3000A
	Time multiplier	NSPTOC	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00	0.05...15.00
	Operate delay time	NSPTOC	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms	40...200000 ms
Phase discontinuity protection (PDNSPTOC) main settings									
16	Start value (Current ratio setting I2/I1)	PDNSPTOC	10...100%	10...100%	10...100%	10...100%	10...100%	10...100%	10...100%
	Operate delay time	PDNSPTOC	100...30000 ms	100...30000 ms	100...30000 ms	100...30000 ms	100...30000 ms	100...30000 ms	100...30000 ms
	Min phase current	PDNSPTOC	0.05...0.30 × In	0.05...0.30 × In	30-180A	0.05...0.30 × In	30-180A	0.05...0.30 × In	30-180A
Circuit breaker failure protection (CCBRBRF) main settings									
17	Current value (Operating phase current)	CCBRBRF	0.05...1.00 × In	0.05...1.00 × In	30-600A	0.05...1.00 × In	30-600A	0.05...1.00 × In	30-600A
	Current value Res (Operating residual current)	CCBRBRF	0.05...1.00 × In	0.05...1.00 × In	30-600A (with I0 setting=1A) ; 6-120A (with I0 setting=0.2A)	0.05...1.00 × In	30-600A (with I0 setting=1A) ; 6-120A (with I0 setting=0.2A)	0.05...1.00 × In	30-600A (with I0 setting=1A) ; 6-120A (with I0 setting=0.2A)

Sr. No.	Protection	IEC61850 Identification	Setting range available in RER615	For OVR-15 Recloser 600/1A CT & 15.5kV System Voltage		For OVR-27 Recloser 600/1A CT & 27kV System Voltage		For OVR-38 Recloser 600/1A CT & 38kV System Voltage	
				Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used	Setting Range to be used
				(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)	(in Nominal Values)	(in Absolute Values)
	CB failure mode (Operating mode of function)	CCBRBRF	1 = Current 2 = Breaker status 3 = Both	1 = Current 2 = Breaker status 3 = Both	1 = Current 2 = Breaker status 3 = Both	1 = Current 2 = Breaker status 3 = Both	1 = Current 2 = Breaker status 3 = Both	1 = Current 2 = Breaker status 3 = Both	1 = Current 2 = Breaker status 3 = Both
	CB fail trip mode	CCBRBRF	1 = Off 2 = Without check 3 = Current check	1 = Off 2 = Without check 3 = Current check	1 = Off 2 = Without check 3 = Current check	1 = Off 2 = Without check 3 = Current check	1 = Off 2 = Without check 3 = Current check	1 = Off 2 = Without check 3 = Current check	1 = Off 2 = Without check 3 = Current check
	Retrip time	CCBRBRF	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms
	CB failure delay	CCBRBRF	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms
	CB fault delay	CCBRBRF	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms	0...60000 ms
	Three-phase thermal overload (T1PTTR) main settings								
	Env temperature Set (Ambient temperature used when the AmbSens is set to Off)	T1PTTR	-50...100°C	-50...100°C	-50...100°C	-50...100°C	-50...100°C	-50...100°C	-50...100°C
	Current multiplier (Current multiplier when function is used for parallel lines)	T1PTTR	1...5	1...5	1...5	1...5	1...5	1...5	1...5
	Current reference	T1PTTR	0.05...4.00 × In	0.05...4.00 × In	30A-2400A	0.05...4.00 × In	30A-2400A	0.05...4.00 × In	30A-2400A
	Temperature rise (End temperature rise above ambient)	T1PTTR	0.0...200.0°C	0.0...200.0°C	0.0...200.0°C	0.0...200.0°C	0.0...200.0°C	0.0...200.0°C	0.0...200.0°C
18	Time constant (Time constant of the line in seconds)	T1PTTR	60...60000 s	60...60000 s	60...60000 s	60...60000 s	60...60000 s	60...60000 s	60...60000 s
	Maximum temperature (temperature level for operate)	T1PTTR	20.0...200.0°C	20.0...200.0°C	20.0...200.0°C	20.0...200.0°C	20.0...200.0°C	20.0...200.0°C	20.0...200.0°C
	Alarm value (Temperature level for start (alarm))	T1PTTR	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C
	Reclose temperature (Temperature for reset of block reclose after operate)	T1PTTR	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C	20.0...150.0°C
	Initial temperature (Temperature raise above ambient temperature at startup)	T1PTTR	-50.0...100.0°C	-50.0...100.0°C	-50.0...100.0°C	-50.0...100.0°C	-50.0...100.0°C	-50.0...100.0°C	-50.0...100.0°C
	Three-phase inrush detection (INRPHAR) main settings								
19	Start value (Ratio of the 2nd to the 1st harmonic leading to restraint)	INRPHAR	5...100%	5...100%	5...100%	5...100%	5...100%	5...100%	5...100%
	Operate delay time	INRPHAR	20...60000 ms	20...60000 ms	20...60000 ms	20...60000 ms	20...60000 ms	20...60000 ms	20...60000 ms
20	Multipurpose analog protection (MAPGAPC) main settings								

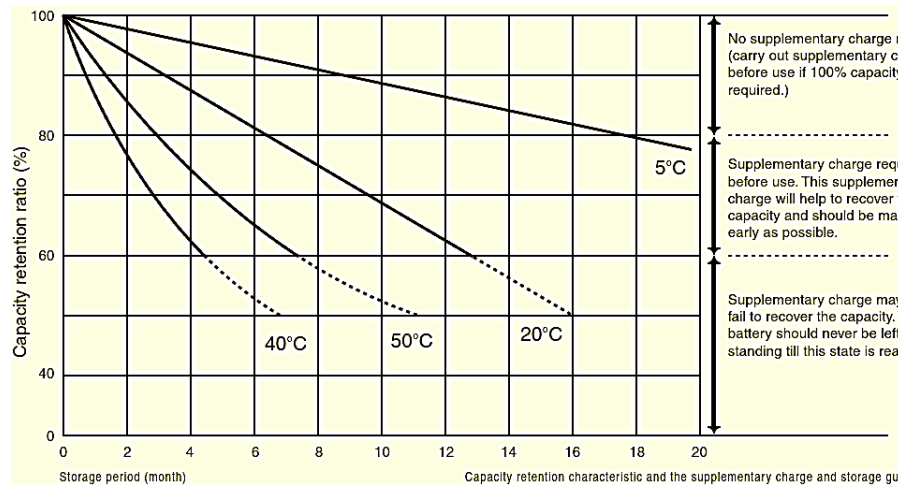
Sr. No.	Protection	IEC61850 Identification	Setting range available in RER615	For OVR-15 Recloser 600/1A CT & 15.5kV System Voltage		For OVR-27 Recloser 600/1A CT & 27kV System Voltage		For OVR-38 Recloser 600/1A CT & 38kV System Voltage	
				Setting Range to be used (in Nominal Values)	Setting Range to be used (in Absolute Values)	Setting Range to be used (in Nominal Values)	Setting Range to be used (in Absolute Values)	Setting Range to be used (in Nominal Values)	Setting Range to be used (in Absolute Values)
	Start value	MAPGAPC	- 10000.0...10000.0	-10000.0...10000.0	- 10000.0...10000.0	- 10000.0...10000.0	- 10000.0...10000.0	- 10000.0...10000.0	- 10000.0...10000.0
	Operate delay time	MAPGAPC	0...200000 ms	0...200000 ms	0...200000 ms	0...200000 ms	0...200000 ms	0...200000 ms	0...200000 ms
	Operation mode	MAPGAPC	Over Under	Over Under	Over Under	Over Under	Over Under	Over Under	Over Under
	Fault locator (SCEFRFLO) main settings								
	Z Max phase load	SCEFRFLO	1.0...10000.00 Ω	1.0...10000.00 Ω	1.0...10000.00 Ω	1.0...10000.00 Ω	1.0...10000.00 Ω	1.0...10000.00 Ω	1.0...10000.00 Ω
	Ph leakage Ris	SCEFRFLO	20...1000000 Ω	20...1000000 Ω	20...1000000 Ω	20...1000000 Ω	20...1000000 Ω	20...1000000 Ω	20...1000000 Ω
	Ph capacitive React	SCEFRFLO	10...1000000 Ω	10...1000000 Ω	10...1000000 Ω	10...1000000 Ω	10...1000000 Ω	10...1000000 Ω	10...1000000 Ω
21	R1 line section A	SCEFRFLO	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu
	X1 line section A	SCEFRFLO	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu
	R0 line section A	SCEFRFLO	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu
	X0 line section A	SCEFRFLO	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu	0.000...1000.000 Ω/pu
	Line Len section A	SCEFRFLO	0.000...1000.000 pu	0.000...1000.000 pu	0.000...1000.000 pu	0.000...1000.000 pu	0.000...1000.000 pu	0.000...1000.000 pu	0.000...1000.000 pu

14 ANNEXURE I: TYPICAL FUNCTIONAL CHARACTERISTICS OF SEALED LEAD ACID BATTERIES

This Annexure belongs to the typical functional characteristics of the batteries used in OVR three phase reclosers. There are two 12 V batteries connected in series in each LV control cabinet of the OVR reclosers. Please check the AH rating pertaining to your recloser from the order related drawings.

Storage Characteristics /Self Discharge Characteristics:

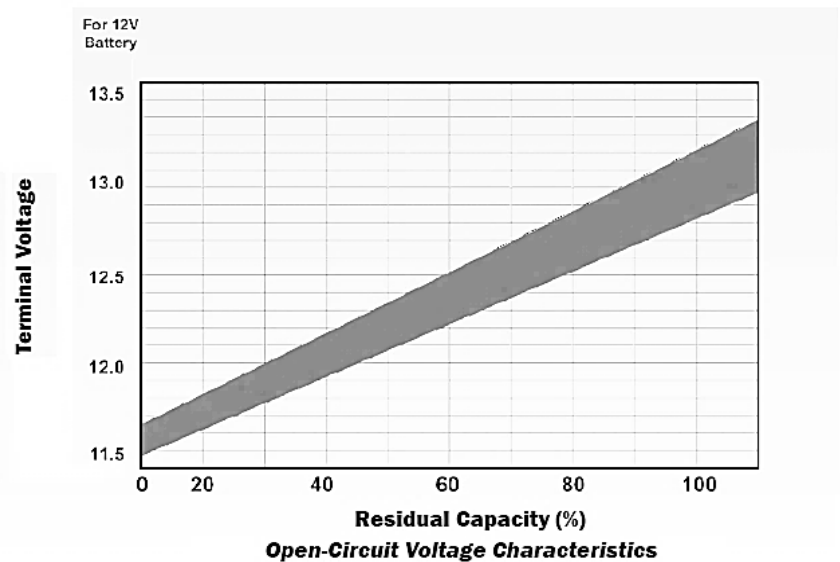
In case of delay in commissioning of the reclosers, the battery should not be left unattended as the self-discharge characteristic of battery limits the storage period. Storage temperature has significant impact on the storage period as shown in adjacent graph. Hence, under circumstances of extended storage of recloser control cabinet, it is recommended to charge the batteries typically after every three months.



Open Circuit Voltage Characteristics:

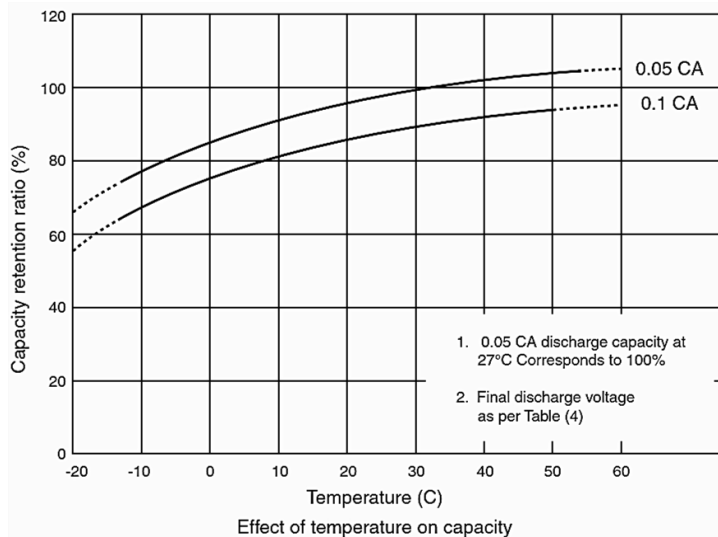
When the batteries provided with OVR recloser are in healthy condition, the remaining capacity on the battery at different open circuit voltage across each battery terminal is indicated in the adjacent graph.

OVR will continue to function on the battery back-up as long as the combined battery voltage is above 21.5 V (10.75 V per battery). If battery bank voltage falls below 21.5 V, OVR will provide a BATTERY NOT OK indication and will initiate load management algorithm with disconnection of loads like relay and communication modem to avoid battery going into deep discharge mode.

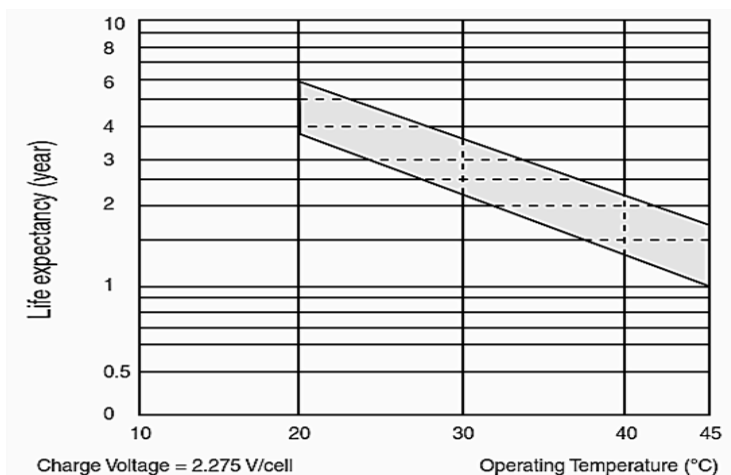


Temperature (Thermal) Characteristics (Effect of Temperature)

Operating temperature also has effect on battery capacity as rate of discharge is a function of ambient temperature for supplied batteries. At 20°C (68°F) battery capacity is 100%. The capacity increases slowly above this temperature and decreases as the temperature falls. Higher the rate of discharge, lower is the available capacity. While raising ambient temperature increases capacity, it also reduces useful service life.



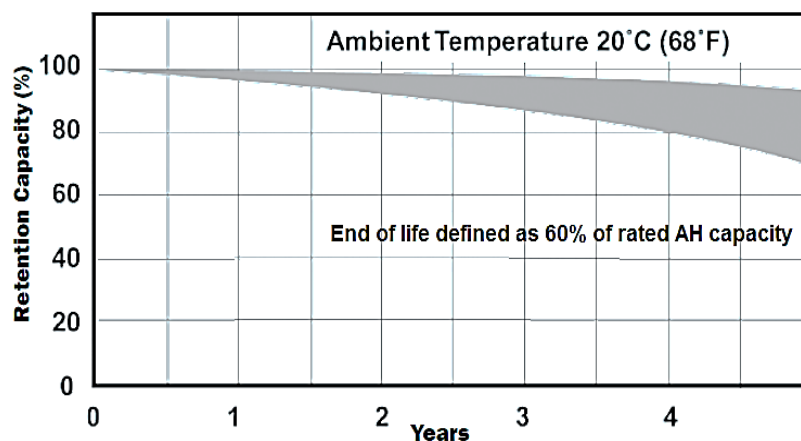
Adjacent graph provides the effect of temperature with on capacity and service life for ready reference. It is estimated that battery life is halved for each 10°C (18°F) above normal room temperature.



Service life at various ambient

Service life:

Every battery will see reduction in AH capacity with increasing service life. General characteristic of the battery shows that with usage at 20Deg, in 5 years the battery will reach its end of life (60% of AH capacity) & will need replacement. Considering the cyclic use (charge and discharge cycle), higher ambient temperature at site, for batteries in recloser control cubicle, replacement period of 3 years is recommended.



capacity change over time.



For more information, please contact:

ABB India Limited

Plot No.34, Street No.1
MIDC Industrial Area, Satpur
Nashik 422007
Maharashtra
India

Customer support: 18004200707
Customer support: ppmvsupport@in.abb.com
customer.service.group@in.abb.com

ABB US

680 Century Point
Suite 1050
Lake Mary, Florida 32746, USA

Customer Service 1-800-929-7947
Customer.Service.Group@us.abb.com

ABB de México S.A. de C.V.

Av. Central 310 Parque Logístico CP. 78395 San Luis
Potosí, SLP, México
Tel: +52 444 870 8000

ABB Argentina S.A.U.

Norberto López 3600
B1805ABT, El Jagüel, Buenos Aires
Aftersales Support: ar-epdsгарantia@abb.com

Revision Table:

Rev.	Description	Date	Remarks
A	New Releases	29.06.2021	