

Instruction, operation and maintenance manual



For your safety

- Ensure that the installation location and environment are suitable for the apparatus.
- Allow installation, commissioning and maintenance operations to be performed only by qualified personnel with relevant knowledge of the apparatus.
- Comply with all applicable local and national codes, standards and working procedures during installation, commissioning and maintenance.
- Read and strictly follow the information and instructions provided in this manual.
- Ensure that the rated performance of the apparatus is not exceeded during service.
- Make certain this manual and the necessary information for safety intervention are available to all personnel operating the apparatus.

Table of contents

1. Introduction	4
1.1. Environmental protection program	4
1.2. End of life recycle/disposal	4
1.3. Product-related safety notices	5
1.4. Mandatory safety procedures for working on LV cabinets	6
1.5. Warning texts and symbols	6
2 Packing and transport	7
2.1 Goods marking	7
2.2 Documents	7
2.3 Transport and lifting	7
3 Receipt and storage prior to installation	8
3.1 Receipt of recloser	8
3.2 Storage of recloser LV unit	8
3.3 Handling	9
4 General description of LV cabinet of OVR-15, 27 and 38 recloser	10
4.1 LV cabinet assembly	10
4.2 Control	10
4.2.1 Low voltage control cabinet (LV cabinet)	10
4.2.2 Programmable battery charger:	10
4.2.3 Auxiliary supply	10
4.2.4 Actuator control module	11
4.2.5 Rechargeable batteries	11
4.2.6 External auxiliary supply status monitoring	12
4.2.7 SEL-751 control	12
5 Standard production tests	13
6 Installation	14
6.1 Grounding	14
6.2 Connecting the HV and LV cabinets by control cable	15
6.3 Connecting the auxiliary supply	15
6.4 Final inspections before energizing	15
6.5 Table 2: Operating procedure	16
7 Inspection and maintenance	17
7.1 Activities before performing any maintenance of the recloser LV unit	17
7.2 Additional activities before performing any maintenance of the recloser LV unit	17
7.3 Removal of SEL-751 relay	17
7.4 Removal of batteries	17
8 Common issues and troubleshooting	19
9 General OVR-15, 27 and 38 block diagram	21
9.1 Typical block diagram – OVR gang-operated system	21
10 Typical rating plate details	22
10.1 Rating plate on LV cabinet	22
11 General arrangement drawings	23
11.1 LV control cabinet general arrangement	23
12 Annex I: Typical functional characteristics of sealed lead acid batteries	24

1 Introduction

This manual contains the information needed to install the low voltage (LV) cabinet of the medium voltage OVR-15, 27 and 38 vacuum reclosers and put them into service.

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

OVR-15, 27 and 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 provided in this manual may not contain instructions for special configurations.

In addition to 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 to standardized configurations.

Only use original spare parts for maintenance operations. For further information, please refer to the ABB sales office.

All installation, commissioning, operation and maintenance must be carried out by skilled personnel with in-depth knowledge of the apparatus.

1.1. Environmental protection program

OVR-15, 27 and 38 reclosers LV cabinet is manufactured in accordance with ISO 14001 standards (guidelines for environmental management).

Production processes are carried out in compliance with 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.

1.2. End-of-life recycle/disposal

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

During disposal of the product, it is important to follow all local legal requirements in force. Disposal can be carried out either 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 and reuse processes
Iron	Yes	Separate, use instead of new source (ore)
Stainless steel	Yes	Separate, use instead of new source (ore)
Copper	Yes	Separate, use instead of new source (ore)
Brass	Yes	Separate, use instead of new source (ore)
Aluminum	Yes	Separate, use instead of new source (ore)
Zinc	Yes	Separate, use instead of new source (ore)
Thermoplastic	Yes	Make granulate, re-use or apply as energy superior
Rubber	Yes	Cut into pieces and use as high-grade energy
Packing foil	Yes	Cut into pieces and use for landfills
Wooden pallet	Yes	High-grade energy additive in refuse incineration

1.3. Product-related safety notices

The OVR-15, 27 and 38 reclosers LV cabinet should be installed within the design limitations as described on its nameplate and in this manual. In addition, always follow your company's standard safety procedures.

For the safety of personnel performing maintenance on the recloser or connecting equipment, all components should be electrically disconnected by means of a visible break and securely grounded.

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

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

These instructions do not attempt to provide the user of this equipment every possible answer to questions that may arise 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 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 from what is depicted in illustrations; however, the functionality will be equivalent.

1.4. Mandatory safety procedures for working on LV cabinets

When working on the LV cabinet, observe the following mandatory minimum procedures:

- a. Isolate the recloser from the power system on both sides. Put recloser in OPEN condition by operating the yellow emergency manual trip handle.
- b. Confirm the OPEN status of the recloser by the mechanical ON/OFF indicator, by SLD on the LCD display and by the indication LEDs on the SEL-751 HMI.
- c. Follow the safety warning instructions on various warning labels provided on the LV and HV units.
- d. Remove the control cable from both the HV and LV cabinets and cover the 24-pin male connectors with the plastic caps provided.

Although hazard warnings relate to personal injury, it is also important to understand that under certain operational conditions, operation of damaged equipment may result in degraded process performance, potentially leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.5. Warning texts and symbols

Warning texts and symbols are based on different degrees of urgency, which must be observed carefully. These are described below.



Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Notice 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

The following warning symbols may appear on warning labels on the product itself.



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 must be allowed to carry out the electrical instillation.

National and local electrical safety regulations must always be followed.

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



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



The equipment contains components that are sensitive to electrostatic discharge. Unnecessary touching of these electronic components must, therefore, be avoided.

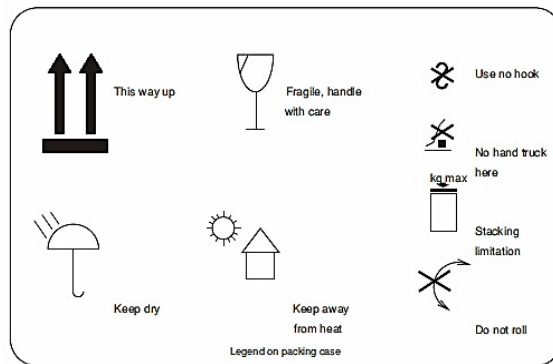
2 Packing and transport

—
01 General symbols
on packing case
—
02 Packing case
lifting arrangement

2.1 Goods marking

The factory-assembled LV cabinet is transported in a different packing case than its mounting brackets. Each case is marked on two sides with indelible black ink. Case markings include information such as 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.



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2.2 Documents

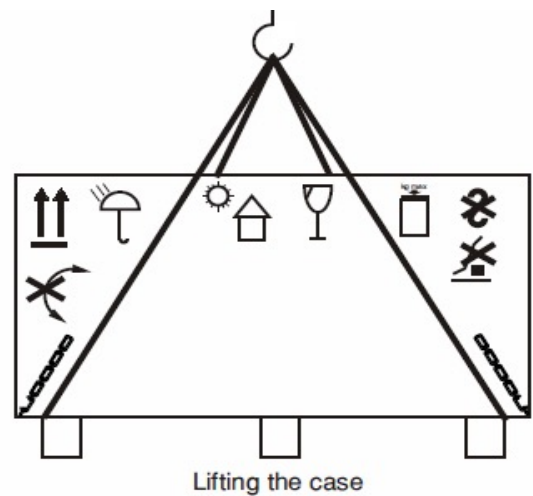
Documents provided with the LV unit during dispatch include:

- 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.). The following precautions are to be taken during lifting:

- Ensure that packing cases are not placed on wet surfaces/waterlogged areas.
- LV cabinets should not be stacked on top of one another.
- The 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.



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02

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 or material losses.

Abnormality, if any, must be reported 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 with which reclosers are generally shipped from the factory.

Default shipment	Low voltage (LV) control cabinet
Optional items (only if ordered separately)	Mounting brackets
	Auxiliary power cable (2 x 1.5 sq. mm)
	Any additional spares

3.2 Storage of recloser LV unit

The LV cabinet with complete packing should always be stored indoors to protect it from direct sunlight, rain or snow. LV cabinets should be stored in their original transport units, where they are well protected from damage.

LV cabinets can be stored up to three months from date of shipment from the factory. For longer storage, the packing must be removed and the recloser must be kept under controlled environmental conditions.

We define storage in controlled conditions as a location 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 cabinet must be stored in the upright position to avoid moisture accumulation.

Recommended storage temperature range is 0 °C to +45 °C.

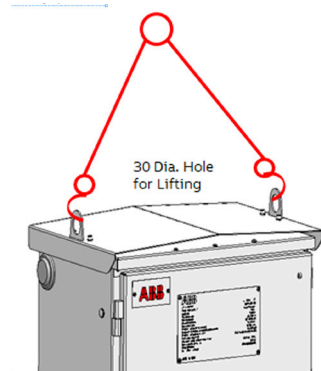
The LV control cabinet has rechargeable batteries inside. A periodic check of battery voltage (24 V) and periodic charging of the batteries (typically every three months) may be required in case of prolonged storage. For the batteries in your control cabinet, refer to technical documentation of the respective battery manufacturer. In addition, refer to the “inspection and maintenance” section of this manual for more information.

NOTICE

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 comes with welded lifting brackets on the sides of the cabinet for lifting. A four-point lift using the loops in these brackets is highly recommended. The approximate mass in kg is indicated on rating plates on HV and LV cabinets.



03

NOTICE

Exercise care during lifting to avoid damage to the poles.

CAUTION

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 LV unit, causing damage to the equipment and injuries to nearby personnel.

4 General description of OVR-15, 27 and 38 recloser LV cabinet

04 LV control cabinet overview

4.1 LV cabinet assembly

Each OVR-15, 27 and 38 recloser LV cabinet has an intelligent battery charger, capacitors, control modules, relay and battery with their hard-wired circuits. Please refer to the LV GA for 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 swinging door with padlocking provision. The SEL-751 control and protection relay is mounted on an inner hinged swinging door to allow front and rear access to it. All the MCBs and auxiliary power socket for laptop charging are mounted on the front side of the inner swinging door for easy operator access. Space for mounting other devices, including optional radio modem, is provided on the side/rear walls of the cabinet.

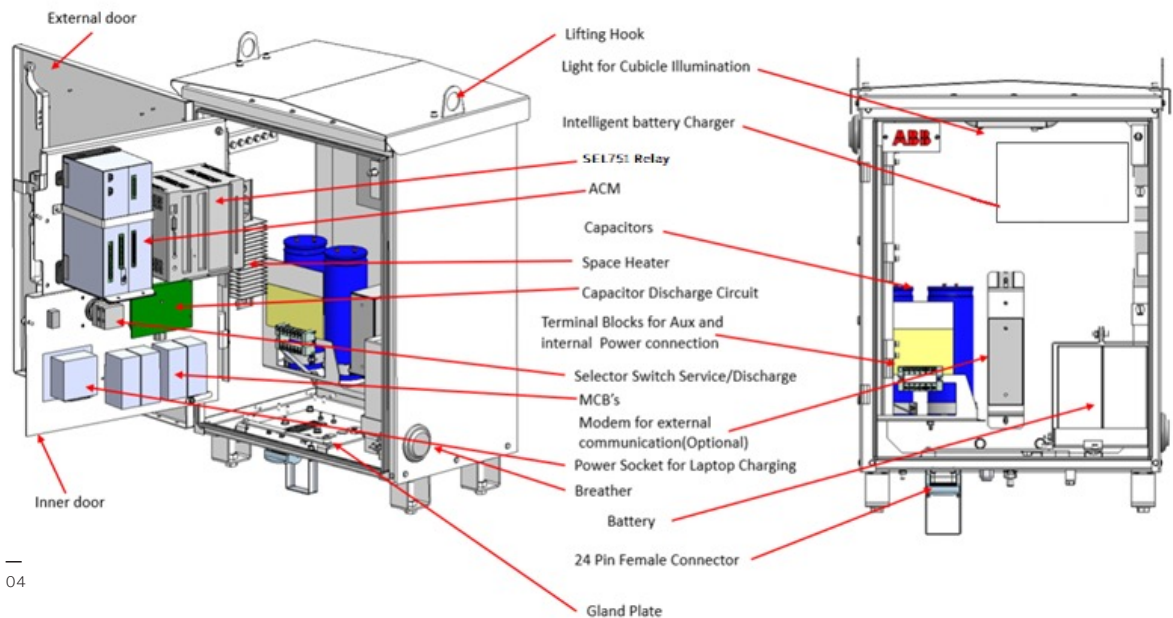
The LV cabinet floor is equipped with a removable gland plate to provide entry for auxiliary power cable and communication cables. A 50 W thermostatically controlled heater is provided to prevent condensation inside the LV cabinet.

A programmable battery charger is included to convert the auxiliary power supply connected from an external PT or equivalent to a suitable form required for components such as battery, SEL-751, actuator control module (ACM) and external communication modem, if applicable. Proper handling is mandatory.



4.2.3 Auxiliary supply

The LV control cabinet requires auxiliary power to operate the recloser, ACM, HV and LV cubicle heating, illumination, etc. A separate outdoor type 2 x 1.5 sq. mm jacketed cable is required to connect the external auxiliary power to the LV cabinet. See the recloser quick reference guide for details.



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05 Actuator control
module (ACM)

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

An MCB is provided inside the cubicle for protection of the intelligent battery charger, cubicle heating, illumination and auxiliary power socket outlet.

NOTICE

The auxiliary power outlet on the inner swinging door is intended only for laptop charging in an emergency. It should not be used for any other purpose because it may burden the external auxiliary power source.

4.2.4 Actuator control module

The actuator control module (ACM) gets its power supply from the intelligent battery charger.

Hardwired to the SEL-751 relay, the ACM regulates closing and tripping signals to the magnetic actuator in accordance with feedback from the HV unit and interaction with the relay by charging/discharging the capacitors.



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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 backup power to the recloser in case of external auxiliary power failure.

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

- Ambient temperature and initial condition of the battery (temperature and storage period before commissioning, periodic charge/discharge, battery maintenance)
- Frequency of external auxiliary power outages and 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, refer to the battery manufacturer's documentation. Also, see the inspection and maintenance section of this manual.

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

The batteries provided are valve-regulated lead acid (VRLA) batteries, which are temperature and charging voltage sensitive. Although maintenance by way of water topping is not required, a regular check 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 the battery bank for power and continues to conduct its function. The recloser will operate if the battery bank voltage remains above 20.5 V. Below 20.5 V, a load management algorithm activates within the intelligent battery charger and disconnects the power feed to the ACM, SEL-751 and optional radio modem. The purpose of this is to delay the batteries going into deep discharge mode. With the relay not being powered, the recloser will not be able to perform any operation.

ACM LED status				Description
1	2	3	4	
OFF	Blinking fast	OFF	OFF	Normal condition — ACM ready to perform operations
Blinking slowly	Blinking fast	OFF	OFF	Close operation is not allowed
ON	Blinking fast	OFF	OFF	Neither open nor close operations are allowed
Any		Blinking slowly		Boot loader started, but FW is missing
ON	OFF	ON	OFF	File system error
OFF	OFF	ON	ON	Initial condition at start-up; if LEDs remain in this condition, the CPI has not started
ON	ON	ON	ON	This state shows for three seconds, indicating ACM can receive FW upgrades

—
06 SEL-751 display screen
and front-facing LEDs
—
07 SEL-751 modules

NOTICE

- In the case of frequent and long duration external power outages, the battery frequently undergoes discharge and charge cycles. This reduces battery capacity, charging efficiency and overall service life.
- During consistent long duration outages, the battery bank voltage may drop below 18 V (9 V per battery), indicating battery may have deep discharged and cannot be charged again. At this point, the battery must be completely replaced with a brand new, fully charged, equivalent battery.
- Connection of any additional load to the battery is strictly prohibited, and ABB will not be liable for any adverse impact this can cause to recloser performance, including battery life.

Handling reclosers during long outages

1. If the battery bank is healthy and in fully charged condition (i.e., ≥ 24 V DC), no special attention is required if the power outage is less than 24 hours in duration.
2. If a power outage lasts more than 24 hours OR typically >10 CO operations after power failure, then it is considered a long duration power outage requiring special attention to the batteries.
3. During long outages, the batteries may become drained to such a level that they go into deep discharge stage (i.e., battery bank voltage goes below 18 V).
4. In this situation, the recloser will not be able to recharge the batteries automatically and external charging may be required. Such a situation may also damage the batteries permanently, thus requiring battery replacement.
5. To avoid this, if a power outage is expected to last more than 24 hours, disconnect the batteries from the circuit at the beginning of the outage. When the outage ends and power resumes, reconnect the batteries to the circuit.
6. If a power outage lasts more than a month, charge the batteries externally at regular intervals to ensure the battery bank voltage is always higher than 21 V DC.

4.2.6 External auxiliary supply status monitoring

In the event of loss of external auxiliary supply, the programmable battery charger sends a signal to the SEL-751 relay over an independent binary input. Thus, the status of availability of external auxiliary power to the LV unit can be monitored remotely if communication setup is available.

4.2.7 SEL-751 control

The OVR-15, 27 and 38 recloser LV cabinet is supplied with the microprocessor-based SEL-751 intelligent electronic device (IED).

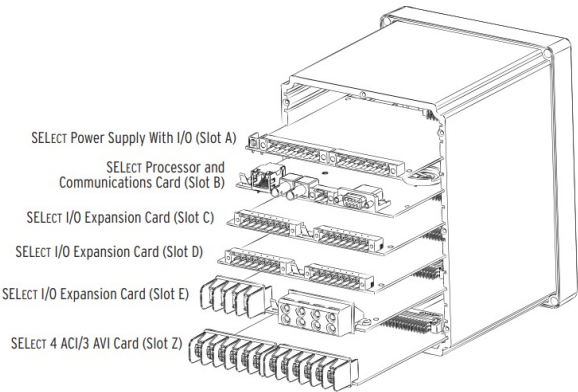
In the SEL-751, all card slots connections are made with terminal blocks that are affixed to the frame of the IED. This is powered by the charging device.



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NOTICE

Definite time setting of 0 ms shall not be used with OVR-15/27/38.



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5 Standard production tests

The OVR-15, 27 and 38 recloser LV cabinets are tested thoroughly at the factory before shipping.

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) and associated electrical and 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 with the product as part of the documentation package.

6 Installation

08 Provisions for
grounding connections
on LV cabinet

The OVR-15, 27 and 38 recloser LV unit can be installed in a substation frame or pole-mounting frame, or it can be mounted into a customer-supplied structure. Regardless of the mounting method, it is imperative that the LV unit be vertical, leveled and securely fastened.

Before shipping from the factory, the OVR-15, 27 and 38 recloser LV control cabinets are tested as part of a system. The HV unit and LV control cabinet that were tested together must be installed together as a set. The units must be properly matched by the serial numbers listed on the rating plates provided on each unit.

NOTICE

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

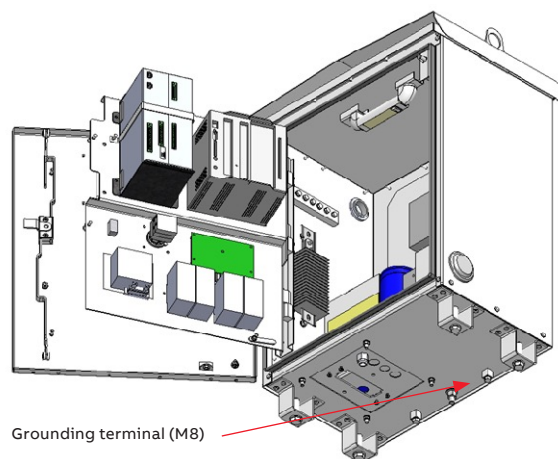
6.1 Grounding

IMPORTANT

Always follow international, national, local and company-specific regulations when grounding the equipment.

All metal mounting frames and structures must be commonly grounded to the grounding grid at the installation 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 (SEL-751 relay, ACM, radios, etc.). Each LV cabinet includes two stainless steel welded grounding pads for grounding and an M8 stud as shown in figure 8. For grounding, an 80 sq. mm solid copper strip/equivalent is recommended.

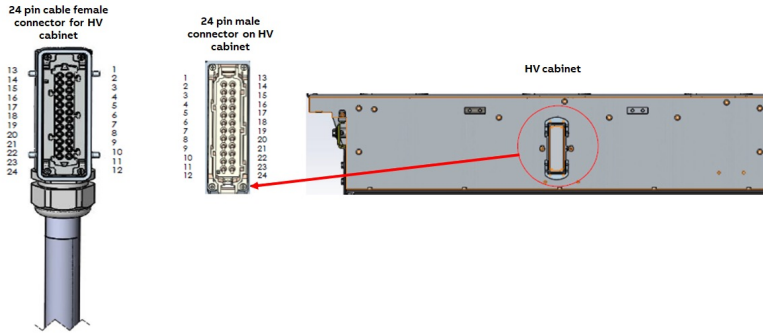
For the proper operation of electronic components, it is mandatory that the total impedance of the grounding grid on site be less than one ohm ($1\ \Omega$). It is also mandatory to ensure that all grounding connections to the welded star grounding pad inside the LV cabinet are always intact and secured.



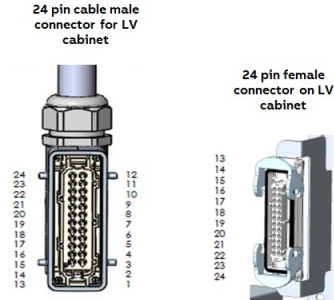
—
09 Control cable
connection to HV cabinet
—
10 Control cable
connection to LV cabinet

6.2 Connecting the HV and LV cabinets by control cable

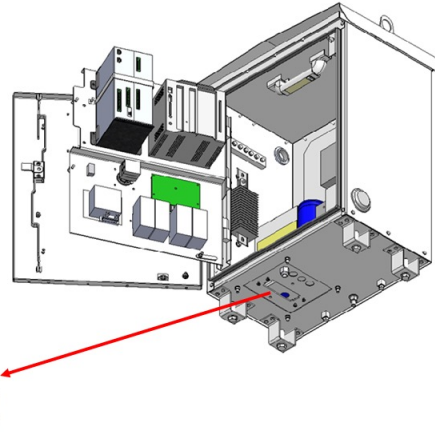
For normal operation, the HV and LV units are required to be connected with a shielded control cable. The control cable is supplied as per specified length, with 24-pin connectors and locking clips on both ends for connection to 24-pin connector counterparts on the HV and LV cabinets.



09



10



NOTICE

1. Minimum bending radius for the control cable is 12 inches. Bending the cable beyond a 12-inch radius may damage the cable.
2. As a best practice, the control cable must be clamped to the pole at regular intervals along its length.

6.3 Connecting the auxiliary supply

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

If specified during the ordering stage, an optional auxiliary supply cable can be supplied with the recloser. It is a black jacketed, 2 x 1.5 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 to be obtained from a pole-mounted VT (PT), the power rating of the VT (PT) should be a minimum of 250 VA. Unless specified, ABB will not supply the VT (PT) with the recloser.

CAUTION

- Before connecting the external auxiliary power source to the LV cabinet, make sure all MCBs on the inner swinging door are switched off.
- Follow instructions on the warning label provided on the inner swinging door panel.

6.4 Final inspections before energizing

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

NOTICE

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 both LV cabinet and HV cabinet are installed completely with all mechanical and electrical connections completed, conduct the following mandatory inspection before energizing the recloser on the main lines.

1. Ensure the LV cabinet is properly leveled and securely anchored.
2. Recheck the tightness of all hardware.
3. Securely tighten terminals and ground connections.
4. Check that the control cable is properly connected, routed and secured.
5. Ensure that both the HV and LV cabinets are grounded as described in this manual.

6.5 Table 2: Operating procedure

1. Initial conditions at the time of shipping	OVR-15, 27 and 38 reclosers are shipped from the factory with the following status: <ul style="list-style-type: none"> Recloser interrupter contacts in OPEN (OFF) condition. All MCBs in LV cabinet in OFF position. Battery physically disconnected from main circuit.
2. Preparation before powering ON	<ol style="list-style-type: none"> Complete installation of LV and HV units. Install optional equipment, such as surge arrestors, auxiliary control transformer (PT), etc. Connect and properly route the control cable between the LV and HV units. Check that all male/female connections are firmly secured on both the HV and LV units. Connect and route all the ground connections. Ensure that the emergency manual trip (K69) handle is reset and BLOCK CLOSE is released. Connect 12 V batteries physically as instructed.
3. To power ON the LV cabinet with auxiliary power	<ol style="list-style-type: none"> Connect auxiliary power cable to the dedicated terminals inside the LV cabinet. Check wiring diagram provided in order bound drawings. Switch ON the auxiliary power from the source. Check availability of auxiliary power on terminals in the LV cabinet. Switch ON main MCB (AUX SUPPLY MAINS) on the inner swinging door of the LV cabinet. With the front door of the LV cabinet open, the cubicle illumination lamp (if provided and controlled by door limit switch) should glow. The auxiliary power outlet socket is also powered.
4. To connect auxiliary supply to charging device and ACM	<ul style="list-style-type: none"> Switch ON the MCB dedicated to the external charger and AC circuits. With auxiliary power ON, the thermostatically controlled heaters in the HV and LV cabinets may also turn ON.
5. To connect batteries to charging device	<ol style="list-style-type: none"> Check and firmly connect the 2-pin male/female battery connectors in the battery circuit. Check schematic diagram supplied with the documents for details. This will connect the two 12 V batteries in series. Confirm that voltage across battery terminals is approximately 24 V. Switch ON the battery MCB to connect the batteries to the charging device.
6. If a radio modem is provided or added later on site, follow these instructions to power it ON	<p>If a radio modem is factory supplied with the recloser, it will come already wired 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. Otherwise, to connect a separately procured radio modem on site, follow these steps:</p> <ol style="list-style-type: none"> Check the schematic diagram provided with the documents to confirm the pins on the charging device for powering the radio modem. It can support up to 7 W at a DC voltage between 19 V and 29 V. Complete the physical wiring for the power supply with the addition of 2-pole DC MCB of suitable rating in the circuit. Hardwire the modem to a suitable port of the SEL-751 relay as per the requirements of the communication protocol. The modem antenna can be connected outside the LV box by routing the antenna wire through the LV box's bottom gland plate.
7. Observations when ACM power is ON	<p>When the AC MCB of the charging device is turned on:</p> <ul style="list-style-type: none"> ACM will conduct internal tests initially with both RED and GREEN LEDs blinking. It may take about two minutes for the recloser to become ready from each initial energization. Successful energization will be indicated by the GREEN LED becoming steady and red LED continuously OFF. This indicates that the ACM (recloser) is ready for operation. The SEL-751 relay (on inner swinging door) is fully powered up when the LCD screen and LEDs on its HMI are fully lit.
8. AR Ready indication on relay LED	<p>When the ACM completes all internal tests and fully charges the capacitors, the "AR Ready" LED on the SEL-751 relay turns GREEN, indicating that the recloser is ready for operation. (Please refer to the approved/as-built wiring diagram for a detailed description of the SEL-751 LED indications applicable to your unit.)</p>
9. CLOSE operation	<p>To close 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) and the ON/OFF position indicator on HV unit. Press the CLOSE button on relay HMI to close the recloser.
10. OPEN operation	<p>To open/trip the recloser:</p> <ul style="list-style-type: none"> Confirm the recloser status as CLOSED by referring to relay HMI (dedicated LED) and the mechanical ON/OFF indicator on HV unit. Press the OPEN button on relay HMI to open the recloser.

7 Inspection and maintenance

The OVR-15, 27 and 38 LV unit will require minimal maintenance if handled properly. The frequency of operation and local environmental conditions should be considered when determining a 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 should guide you in establishing a maintenance schedule.

Maintenance work must only be carried out by trained personnel who know and respect all safety regulations. In addition, it is recommended that ABB service personnel should be called in to check the service performance and for repair work.

7.1 Activities before performing any maintenance on the recloser LV unit

(Perform this in conjunction with instructions in the 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 the SEL-751 relay HMI and on the mechanical ON/OFF indicator on the HV cabinet.
3. Switch OFF all MCBs to disconnect AC auxiliary power and battery backup. This will connect the capacitors to the discharge circuit.
4. Wait until the capacitors are discharged to a safe level (when the RED LED on the discharge circuit stops glowing).
5. Thus, all the electrical controls/measurements and protections/communications of the recloser are switched OFF, and the recloser LV cabinet is ready for maintenance.

7.2 Additional activities before performing any maintenance on the recloser LV unit

1. Complete all activities described in section 7.1.
2. Ensure that the main circuit is properly grounded.
3. Follow all safety practices required by national and local codes as well as company policies.

7.3 Removal of the SEL-751 relay

Once the SEL-751 relay is powered OFF, open the inner door. Remove the connector with wiring. Loosen the four screws from the back of the relay. Gently remove the relay and gasket.

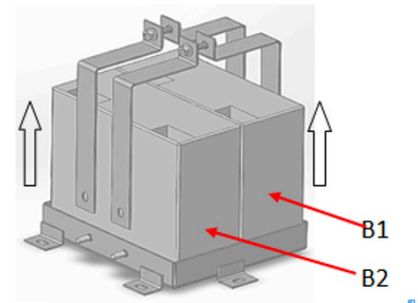
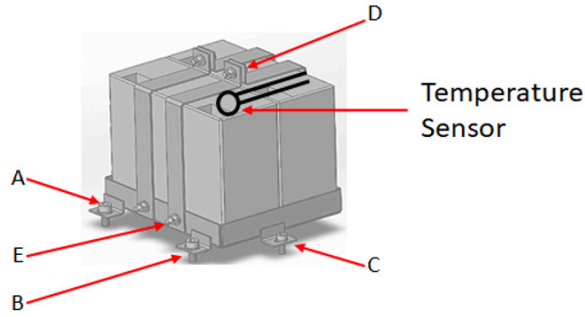
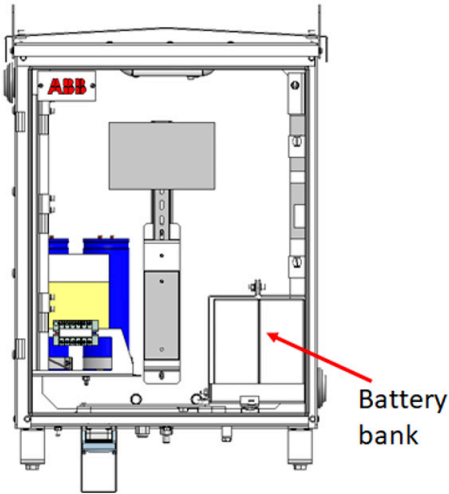
7.4 Removal of batteries

Adhere to the mandatory safety procedures as outlined in section 1.0 of this document. Follow the steps outlined below if required to remove the batteries.

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

1. Switch off the battery MCB.
2. Disengage male/female in the battery circuit.
3. Remove the M6 hex head screws A, B and C.
4. Remove the battery temperature sensor by disengaging the male/female connectors.
5. Remove the entire battery assembly and then remove the clamps by removing M6 hex head screws D and E.
6. Remove batteries B1 and B2 in the direction shown in figure 11.

11 Removal of batteries



8 Common issues and troubleshooting

Table 3: Troubleshooting chart for OVR reclosers

(Please use this table in conjunction with the approved/as-built wiring diagram.)

No.	Trouble/malfunction	Indication/observation	Possible causes	Remedy/troubleshooting
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 terminal connectors inside the LV unit Check and correct the status of the external power supply
		Voltage is present across auxiliary power terminals in LV unit, but cubicle light and auxiliary power outlet, heater(s), do not have power	Auxiliary supply mains MCB is OFF	Switch ON the MCB for auxiliary supply mains
2	ACM/SEL-751 does not power up even after main auxiliary MCB is ON and auxiliary supply is available for more than 60 seconds	Charging device is defective (its LED is not glowing continuously)	If LED is not glowing	Charging device is defective; consult ABB representative
		None of the LEDs (RED/GREEN) on ACM glow No LEDs on SEL-751 HMI glow and LCD screen does not light up	MCB for ACM is OFF	Switch ON MCB for ACM
3	Recloser (AR) is NOT ready; OPEN and CLOSE operations not possible from SEL-751 or from remote	One or more blinking RED LEDs 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 and release the manual lock-out
		AR Ready LED on relay glowing RED	Control cable between LV and HV units is loose or not connected Capacitors not sufficiently charged	Connect and secure the control cable between the HV and LV units <ul style="list-style-type: none"> Turn off DC supply MCB and 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 SEL-751 HMI (mismatch with mechanical ON/OFF indicator/ LEDs on SEL-751) -OR- Relay LED or SLD on relay LCD shows both (ON/OFF) or no status	The wiring of the 52a/b auxiliary limit switch may be loose or wrong (52a/b auxiliary limit switch is mounted in HV unit) The mounting/setting of the 52a/b auxiliary limit switch may be wrong or loose -OR- The 52a/b auxiliary limit switch is faulty/ damaged (52a/b auxiliary limit switch is mounted in HV unit)	Check, secure and correct the wiring of 52a/b auxiliary limit switch as per approved /as-built schematic <ul style="list-style-type: none"> Check and correct the mounting/setting of the 52a/b auxiliary limit switch Replacement of the 52a/b switch may be needed if found to be faulty/ damaged Contact ABB Customer Service Group

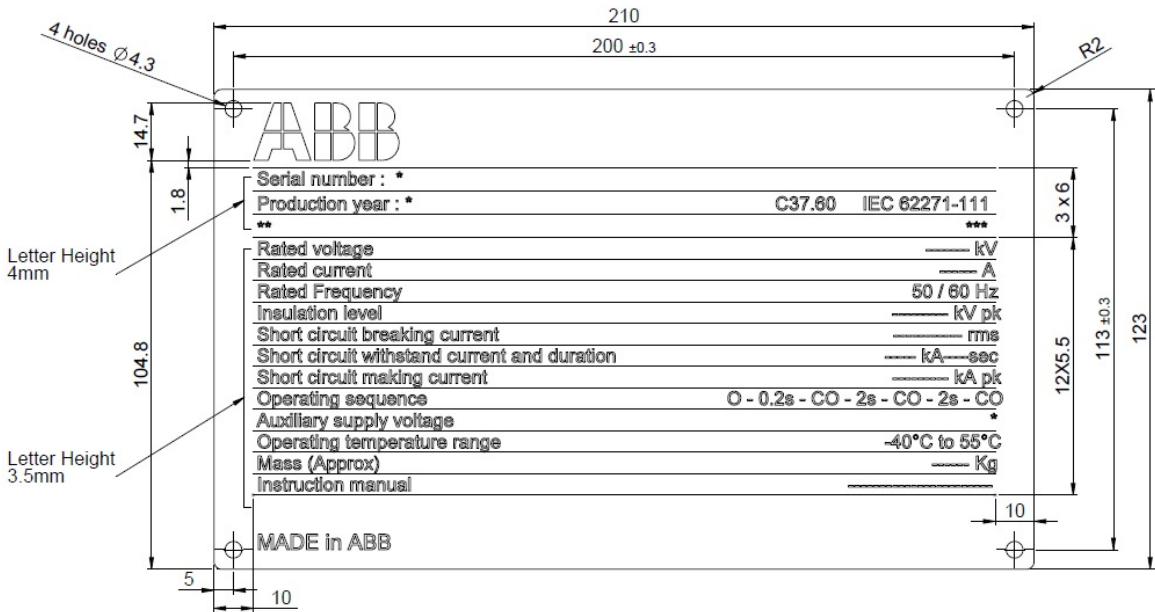
No.	Trouble/malfunction	Indication/observation	Possible causes	Remedy/troubleshooting
4	Recloser (AR) is ready, but CLOSE operation is not possible from SEL-751 local HMI or remote	SYN CHECK LED (if applicable) on relay HMI turns RED	The phase sequence of the MV power connections on both sides of the recloser do not match each other	Check and correct the phase sequence of the MV power cable connections to the recloser terminals
			Synchronizing and energization check conditions are not being satisfied as per settings of SECRSYN function block	Check system voltage parameter and network status
5	Battery failure	Battery status LED on relay HMI turning RED	MCB for battery is OFF	Switch ON the MCB for battery
			Battery connections to charging device are loose or have wrong polarity	Check, correct and secure battery connections to charging device with correct polarities
			Battery unhealthy (battery may have undergone deep discharge or excessive temperatures or exceeded working life)	Check battery health and replace the battery if needed
6	Condition monitoring alarm activated (This is a proactive alarm about a recloser condition that may require attention in the near future)	Condition monitoring alarm on relay HMI turning RED	Out of the rated life of 10,000 CO operations, 9000 operations have been completed and last 1000 operations remain	Contact the nearest ABB Customer Service Group for further advice
			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	

9.1 Typical block diagram — OVR gang-operated system



10 Typical rating plate details

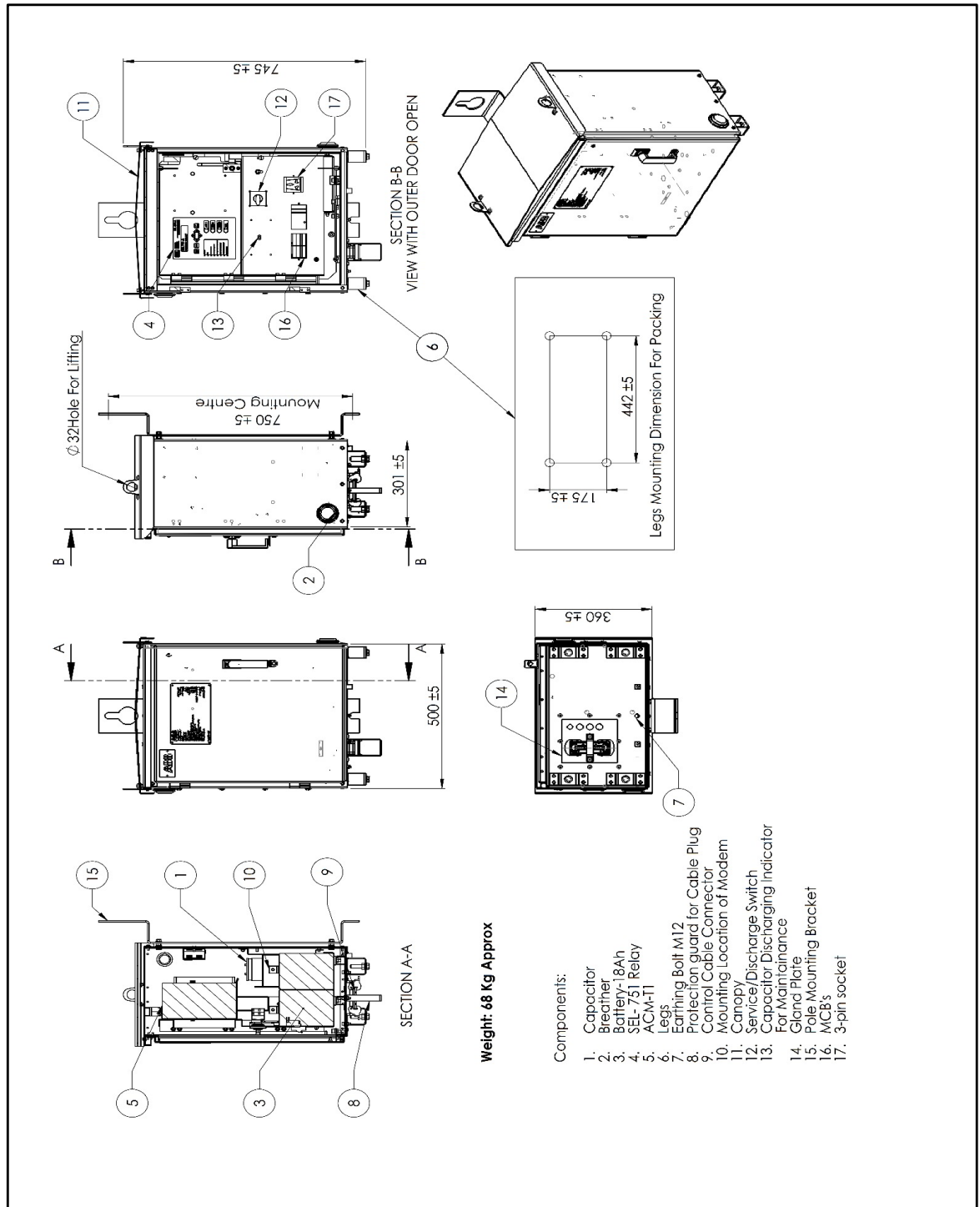
10.1 Rating plate on LV cabinet



Description			Product
Product name	OVR-15 LV cabinet	OVR-27 LV cabinet	OVR-38 LV cabinet
Rated voltage	15.5 kV	27 kV	38 kV
Rated current	630 A	1000 A	1200 A
Insulation level	50 kV rms/110 kV pk	60 kV rms/125 kV pk	70 kV rms/170 kV pk
Short circuit breaking current	12.5 kA rms	12.5 kA rms	16 kA rms
Short circuit withstand current and duration	12.5 kA 3 sec.	12.5 kA 3 sec.	16 kA 3 sec.
Short circuit making current (peak)	31.25 kA pk	31.25 kA pk	41.6 kA pk
Mass (approx.) (kg)			70
Instruction manual			1VYN301701-CO

11 General arrangement drawings

11.1 LV control cabinet general arrangement

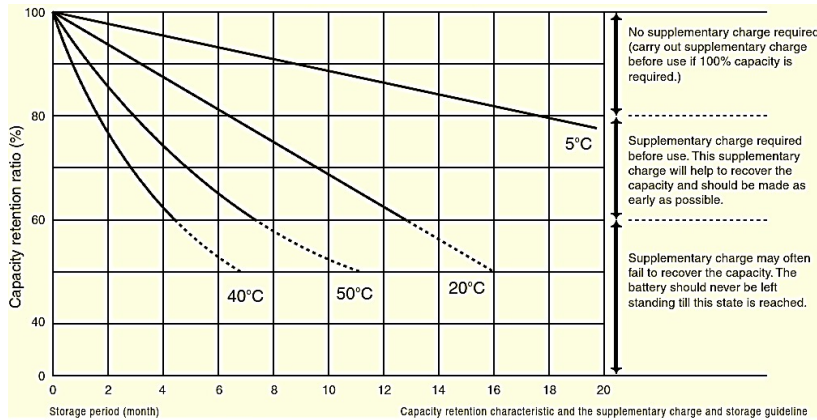


12 Annex I: Typical functional characteristics of sealed lead acid batteries

This annex covers the typical functional characteristics of the batteries used in OVR three-phase reclosers. Each LV control cabinet for the OVR reclosers contains two 12 V batteries connected in series. Please confirm the Ah rating for your recloser from the order-related drawings.

Storage and self-discharge characteristics

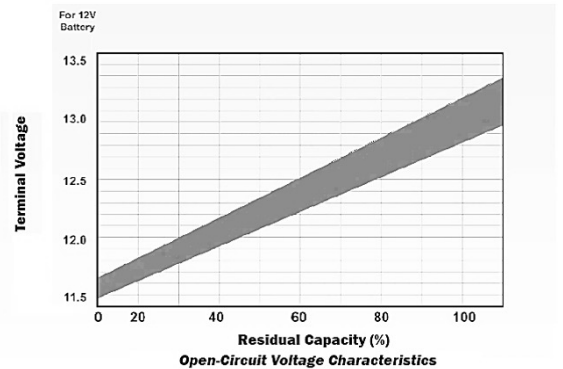
If commissioning of the recloser is delayed, the batteries should not be left unattended because their self-discharge characteristic limits the storage period. Storage temperature has significant impact on the storage period as shown in following graph. In cases of extended storage of the recloser control cabinet, the batteries should be charged 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 following graph.

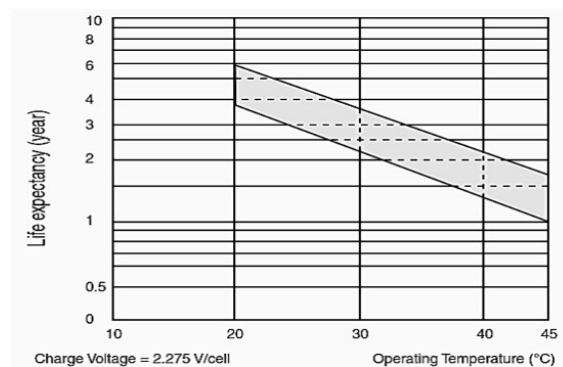
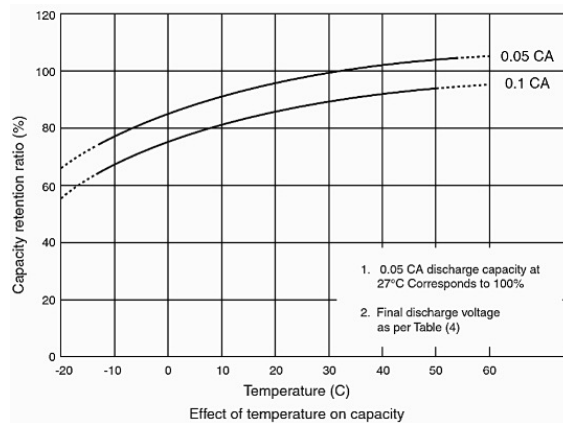
The OVR recloser will continue to function on battery backup as long as the combined battery voltage is above 21.5 V (10.75 V per battery). If the battery bank voltage falls below 21.5 V, the OVR recloser will provide a BATTERY NOT OK indication and will initiate a load management algorithm with disconnection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



Temperature (thermal) characteristics (effect of temperature)

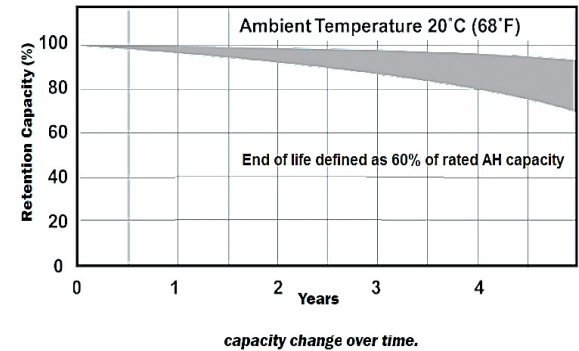
Operating temperature also has effect on battery capacity because rate of discharge is a function of ambient temperature for supplied batteries. At 20 °C (68 °F), battery capacity is 100%. The capacity increases slowly above this temperature and decreases as the temperature falls. The higher the rate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

This graph shows the effect of temperature 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

Every battery will see reduction in Ah capacity with increasing service life. General characteristics of the battery show that with usage at 20 °C, the battery will reach its end of life (60% of Ah capacity) in five years and will require replacement. Considering the cyclical use (charge and discharge cycle) and higher ambient temperature for batteries in the recloser LV control cubicle, a replacement period of three years is recommended.



Additional information

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