

ADVAC® Model 3

Medium Voltage Vacuum Circuit Breaker Installation and Operation Manual



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| ADVAC | | | | | | | | | | | | | | | | | | |
|----------------------------|--------------------|-----------------------|----------------------|---------------------------|----------------|----------------------------|-------------------------------------|-------------------------|---|--|---------------------------|-------------------------|--------------|-------------------------|---------------------|------------------------------|--|-----------|
| | Voltage Class (kV) | I _r (Amps) | I _{sc} (kA) | Style Code first 5 digits | Type/Rating | Max Wave voltage (Kv, rms) | Max. Sym. Interrupt & STC (kA, rms) | Close & Latch (kA, rms) | Lightning Impulse Withstand (BiL) (kV, Crest) | Low Frequency Withstand (Hi-Pot) (kV, rms) | Cap Switch | Interrupt Time (cycles) | Closing time | Contact Resistance < μΩ | Rated Reclose Duty | No Load Mechanical Endurance | Momentary Short Time Testing (ANSI Std. = 2 sec) | Mechanism |
| Draw Out and Roll ON floor | 5 kV | 1200 | 63 | AA3U1 | ADVAC 5.12.63 | 4.76 | 63 | 164 | 95 | 36 | 1770A C1, 15kA, 2KHz | 3 | 50-80 | 12.5 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |
| | | 2000 | 63 | AA3U2 | ADVAC 5.20.63 | 4.76 | 63 | 164 | 95 | 36 | 1770A C1 rated 15kA, 2KHz | 3 | 50-80 | 12.5 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |
| | | 3000 | 63 | AA3U3 | ADVAC 5.30.63 | 4.76 | 63 | 164 | 95 | 36 | 1770A C1 rated 15kA, 2KHz | 3 | 50-80 | 12.5 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |
| | 15 kV | 1200 | 63 | AA3V1 | ADVAC 15.12.63 | 15 | 63 | 164 | 95 | 36 | 1770A C1 rated 15kA, 2KHz | 3 | 50-80 | 12.5 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |
| | | 2000 | 63 | AA3V2 | ADVAC 15.20.63 | 15 | 63 | 164 | 95 | 36 | 1770A C1 rated 15kA, 2KHz | 3 | 50-80 | 12.5 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |
| | | 3000 | 63 | AA3V3 | ADVAC 15.30.63 | 15 | 63 | 164 | 95 | 36 | 1770A C1 rated 15kA, 2KHz | 3 | 50-80 | 12.5 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |

SafeGear HD™ ADVAC Breakers

| | | | | | | | | | | | | | | | | | | |
|----------------|-------|------|----|-------|----------------|----|----|-----|----|----|---------------------------|---|-------|-------|---------------------|-------|-------|---------|
| Draw out. only | 15 kV | 1200 | 63 | AA3M1 | ADVAC 15.12.63 | 15 | 63 | 170 | 95 | 36 | 1770A C1 rated 15kA, 2KHz | 3 | 50-80 | 12.51 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |
| | | 2000 | 63 | AA3M2 | ADVAC 15.20.63 | 15 | 63 | 170 | 95 | 36 | 1770A C1 rated 15kA, 2KHz | 3 | 50-80 | 12.51 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |
| | | 3000 | 63 | AA3M3 | ADVAC 15.30.63 | 15 | 63 | 170 | 95 | 36 | 1770A C1 rated 15kA, 2KHz | 3 | 50-80 | 12.51 | O-0.3s, CO-3min, CO | 2,000 | 2 sec | Classic |

Forward

This booklet provides information for the ADVAC breakers as described below. Not all sections of the bulletin apply to all types of ADVAC circuit breakers. For example, the racking and interlock sections do not apply to the fixed mount breaker styles. All information in this booklet was current at the time of printing.

The 63kA ADVAC breakers has a panel width of 772mm (30.4 inches) and come in to available Drawout configuration only. Below is a table of the 63kA ADVAC breaker product line.

DRAWOUT

Removable circuit breaker unit. Intended for use in SafeGear™, Advance, or abbreviated versions of these switchgear designs. Contains all racking interlocks and racking features required by ANSI standards. Automatic primary and secondary disconnects. Provides three operating positions: disconnect, test, and connect. Meets all applicable ANSI standards, C37.09, C37.04 and C37.06.

FIXED-MOUNT

Intended to be mounted as a stationary device. No racking related interlocks. Primary connections are hard bus. Secondary wiring terminates in stripped wire leads to be connected to the user's terminals.

Introduction & Safe practices

Introduction

The purpose of this manual is to provide instructions for unpacking, storage, installation, operation and maintenance for the ADVAC vacuum circuit breakers. This manual should be carefully read and used as a guide during installation, initial operation, and maintenance.

The specific ratings of each model circuit breaker are listed on the individual nameplates. The ADVAC breakers are protective devices. As such, they are maximum rated devices. Therefore, they should not under any circumstances be applied outside of their nameplate ratings.



DANGER

THE CIRCUIT BREAKERS DESCRIBED IN THIS BOOK ARE DESIGNED AND TESTED TO OPERATE WITHIN THEIR NAMEPLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS MAY CAUSE EQUIPMENT TO FAIL, RESULTING IN PROPERTY DAMAGE, BODILY INJURY AND/OR DEATH. ALL SAFETY CODES, SAFETY STANDARDS AND/OR REGULATIONS AS THEY MAY BE APPLIED TO THIS TYPE OF EQUIPMENT MUST BE ADHERED TO STRICTLY.

Safe practices

ADVAC circuit breakers are equipped with high energy/high speed mechanisms. The design includes several interlocks and safety features which help ensure safe and proper operating sequences. To ensure safety of personnel associated with installation, operation and maintenance of these breakers, the following recommendations must be followed: Only qualified persons, as defined in the National Electric Safety Code, who are familiar with the installation and maintenance of medium voltage circuits and equipment should be permitted to work on these breakers.

Read these instructions carefully before attempting any installation, operation or maintenance of these breakers.

DO NOT work on an energized breaker.

DO NOT work on a breaker unless all components are disconnected by means of a visible break and securely grounded.

DO NOT work on a breaker with power supplied to the secondary control circuit.

DO NOT defeat safety interlocks. This may result in bodily injury, death and/or equipment damage.

DO NOT work on a closed breaker.

DO NOT work on a breaker with a charged closing spring.

DO NOT use a circuit breaker by itself as the sole means of isolating a high voltage circuit.

DO NOT leave a breaker in an intermediate position in a cell. Always place the breaker in the disconnect, test or connected position.



NOTICE

FAILURE TO OBSERVE THE REQUIREMENTS OF OSHA STANDARD 1910.269 CAN CAUSE DEATH OR SEVERE BURNS AND DISFIGUREMENT. THIS STANDARD SPECIFICALLY PROHIBITS THE WEARING OF POLYESTER, ACETATE, NYLON, OR RAYON CLOTHING BY EMPLOYEES WORKING WITH EXPOSURE TO ELECTRIC ARCS OR FLAMES.

Receiving, handling, and storage

Receiving, handling, and storage

ADVAC circuit breakers are subject to complete factory production tests and inspection prior to packaging and shipment. The shipping package is designed to provide reasonable protection during shipment and to provide convenient handling. Accessories such as charging handles and racking handles are shipped separately from the circuit breaker.

Receiving

Immediately upon receipt of the circuit breakers, examine the cartons to determine if any damage or loss was sustained during transit. If damage or indication of rough handling is evident, file a damage claim at once with the carrier and promptly notify the nearest District Office. ABB is not responsible for damage of goods after delivery to the carrier. However, ABB will lend assistance if notified of claims. Use care in unpacking to avoid damaging any circuit breaker parts. Unpack circuit breakers as soon as possible after receipt. If unpacking is delayed, difficulty may be experienced in making a claim for damages not evident upon receipt. Check the contents of each carton against the packing list before discarding any packing material. If any discrepancy is discovered, promptly notify the nearest District Office. Information specifying the purchase order number, carton number and part numbers of damaged or missing parts should accompany the claim.

Handling

ADVAC circuit breaker shipping containers are designed to be handled by a fork lift. Once removed from the shipping container, the circuit breaker wheels are designed to move the breaker across a smooth, paved surface. Care must be taken not to damage the secondary locking tab (item 6, page Fig.5) when transporting, rolling, or handling the ADVAC breakers. DO NOT pull the circuit breaker truck by the front handles with the breaker in any position other than full disconnect. Handles lock in place when breaker is racked in.

Storage

Circuit breakers should be installed in their permanent location as soon as possible. If the breakers are not placed in service for some time, it is advisable to provide adequate means of environmental protection. This may be done by keeping the breaker in its original shipping container and storing in a warm, dry and uncontaminated atmosphere. The breakers should be stored to minimize condensation. Moisture can cause deterioration of metal parts and high voltage insulation. Prior to storage of the breaker, verification should be made that the breaker is free from shipping damage and is in satisfactory operating condition.



CAUTION

DO NOT STACK CRATED BREAKERS MORE THAN 2 HIGH. CONTAINERS WILL COLLAPSE CAUSING DAMAGE TO BREAKERS!

Accessories

Lifting hook

The lifting hook is specifically designed for general lifting and lowering of the Vacuum circuit breaker, from shipping pallets or for lifting onto and off of work tables. The lifting hook is not designed to be used for insertion or removal of the circuit breaker from the switchgear compartment, instead, the use of an appropriate lift truck is required or serious damage to the breaker may occur.



(*) Chain hook: Attach one lifting hook to each side of the circuit breaker on lifting hook angle.

Note: Lifting angles must be removed before breaker is inserted into switchgear compartment.

Figure 6: Lifting Hook Detail

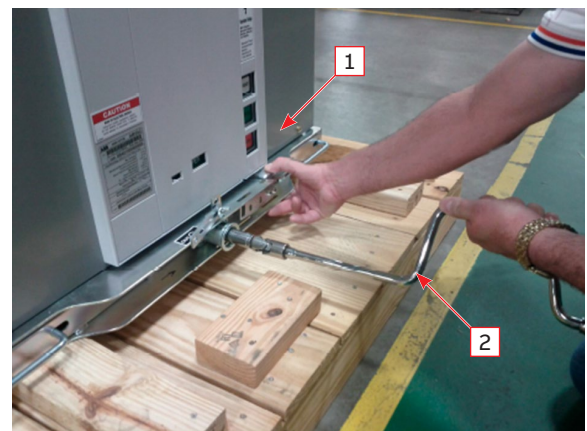


CAUTION



• ALWAYS FOLLOW SAFE WORK PRACTICES WHEN LIFTING THE CIRCUIT BREAKERS TO PROTECT THE SAFETY OF PERSONNEL AND EQUIPMENT.

- ALWAYS INSPECT LIFTING HOOK FOR SIGNS OF WEAR OR DAMAGE BEFORE USE.
- DO NOT USE A LIFTING HOOK THAT IS DAMAGED OR WORN.
- THE LIFTING DEVICE (I.E. HOIST, WENCH) SHOULD BE SUITABLY RATED FOR LIFTING THE CIRCUIT BREAKER LOAD.



Racking Handle

The racking handle is designed to easily adjust the breaker into and out of a switchgear enclosure. It is also used to change the position of the device from the Disconnect, Test, and Connect positions. Press down on the release lever (1) and rotate racking handle (2) clockwise to rack in (toward Connect) and counter clockwise to rack out (from Connect).



Figure 7: Racking Handle

Insertion and removal

Insertion and removal

This section describes the necessary steps for inserting and removing a circuit breaker to and from the switchgear's "Disconnect" position. Racking the circuit breaker to and from Disconnect, Test and Connected positions is covered in the next section. The following rules should always be observed when inserting a circuit breaker into the switchgear compartment.

- NOTE ABB has specific accessories to be used with ABB breakers.
- ALWAYS compare the breaker ratings nameplate with the switchgear ratings nameplate. Verify breaker secondary control voltage ratings are in agreement with the switchgear control voltage ratings.
- ALWAYS make sure lifting angles (see photo below) are removed prior to inserting breaker into cell.
- DO NOT attempt to insert the circuit breaker prior to a complete inspection of both breaker and switchgear compartment.
- Breaker and compartment must be free of tools, obstructions or foreign objects.

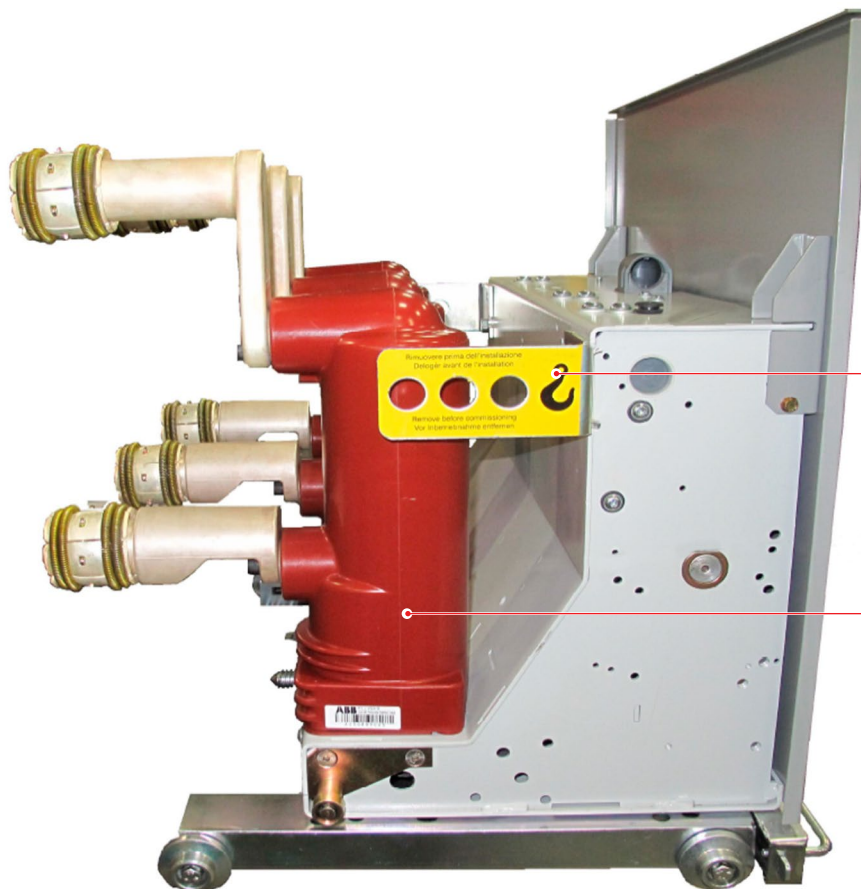
- DO NOT attempt to insert or rack a closed circuit breaker.
- DO NOT force a breaker into or out of the cell.
- DO NOT remove or rotate interference blocking plate in switchgear compartment. Interference plate prevents improper rating circuit breaker from being inserted into switchgear compartment.



WARNING



DO NOT ATTEMPT TO REMOVE THE BREAKER FROM THE CIRCUIT BREAKER COMPARTMENT WITHOUT THE REQUIRED RAMP, DOLLY OR LIFT TRUCK. REFER TO THE SPECIFIC SWITCHGEAR INSTALLATION AND MAINTENANCE MANUAL FOR DETAILS.



Remove the lifting angle before inserting breaker in cell

DO NOT use Embedded pole assemblies to move or lift breaker



Insertion: (Refer to [Figure 1] for compartment detail, [Appendix A] for breaker detail)

1. Open switchgear breaker compartment door [H] to its fully opened position.
2. Align lift truck left & right platform guides with switchgear latch openings.
3. Raise platform for easy insertion of platform guides, then lower lift truck until platform guides are fully engaged and hooked into switchgear compartment cell.
4. Pull back on lift truck to insure platform is fully engaged & level.
5. Grasp lower truck handles [10] on both sides of breaker and pull handles inward to unlatch the breaker from the lift truck platform.
6. Push breaker into breaker compartment, pulling handles inward before front of breaker truck reaches front of switchgear frame or damage to cell interlock tabs [11] will occur. Interlocks may prevent or restrict insertion (Refer to Page 11 [Interlocks]).
7. Align cell interlock tabs with breaker compartment slots and push handles out to fully engage tabs into slots (breaker truck will be flush with switchgear frame).

Removal: (Refer to [Figure 1] for compartment detail, [Appendix A] for breaker detail)

1. Confirm (through window) that breaker has been opened and racked to the disconnect position.
2. Open switchgear breaker compartment door to its fully opened position.
3. Align lift truck left & right platform guides with switchgear latch openings.
4. Raise platform for easy insertion of platform guides, then lower lift truck until platform guides are fully engaged and hooked into switchgear compartment cell.
5. Pull back on lift truck to insure platform is fully engaged & level.
6. Grasp lower truck handles [10] on both sides of breaker and pull handles inward to unlatch the breaker from the switchgear frame.
7. Pull breaker from compartment onto lift platform insuring cell interlock tabs [11] are engaged into the platform slots and breaker truck handles are fully extended.

Racking

ADVAC circuit breakers are designed with three positive racking positions. The Disconnect position allows only manual operation of the breaker without control power and with the shutters closed. The Test Position allows manual and electrical operation of the breaker with control power supplied through the secondary contacts with the shutters closed. As the breaker approaches the Connected position, an increase in racking force is required to lift the shutters and to engage the primary contacts. In the Connected position, the primary disconnects are fully engaged with the shutters open, electrical operation of the breaker through the secondary contacts remains enabled.

1. Engage Racking Handle onto Racking Screw (7)
2. Actuate Position Release Lever (9) to begin racking breaker.
 - a. CLOCKWISE (cw) rotation inserts the breaker towards the primary contacts.
 - b. COUNTER-CLOCKWISE (ccw) rotation withdraws the breaker away from the primary contacts.

Insertion and removal

Test through connect

(Refer to Appendix A and Fig. 1)

1. Perform visual inspection of the Circuit Breaker:
 - a. Verify Close/Open Indicator shows OPEN
 - b. Verify Charged/Discharged Indicator shows CHARGED
 - c. Verify switchgear door is CLOSED.
2. Actuate (push down) Position Release Lever (9) to begin racking from Test position:
 - a. Begin racking in the CLOCKWISE direction
 - b. Release Position Release Lever once racking has begun (after approx. 1/2 turn)
 - c. Approximately 21 revolutions (210mm) will move the breaker between the Test and Connect positions
 - The Connect Position is indicated by a positive lock, preventing further racking shaft rotation.
 - Closing of the breaker is prevented between Test and Connect positions

Connect through test

(Refer to Appendix A and Fig. 1)

1. Perform visual inspection Circuit Breaker:
 - a. Verify Close/Open Indicator shows OPEN
 - b. Verify switchgear door is CLOSED.
2. Actuate (push down) Position Release Lever (9) to begin racking from Connect position:
 - a. Begin racking in the COUNTER-CLOCKWISE direction
 - b. Release Position Release Lever once racking has begun (after 1/2 turn)
 - c. Approximately 21 revolutions (210mm) will move the breaker between the Connect and Test positions

Test → disconnect

1. Perform visual inspection of the circuit breaker.
 - a. Verify breaker is OPEN (push open button or initiate external electric trip if CLOSED).
 - b. Verify switchgear breaker door is closed and secured.
2. Begin racking procedure using approved racking crank.
 - a. Insert racking crank socket into breaker door access port and rotate until socket slides into position.
 - b. Hold racking crank with left hand and depress position lever with right hand.
 - c. Turn racking crank counter-clockwise for a ¼ turn before releasing position lever.
 - d. Continue racking counter-clockwise (approx. 16 turns) until "Disconnect" position is reached.
 - e. A positive stop will be felt and the position release lever will snap into the up position.
 - f. Relieve tension on the racking pin and mechanical/electrical interlocks by reversing the racking crank slightly.

Disconnect through test

(Refer to Appendix A and Fig. 1)

1. Perform visual inspection of the Circuit Breaker:
 - a. Verify Close/Open Indicator shows OPEN
 - b. Verify Charged/Discharged Indicator shows DISCHARGED
 - c. Breaker is prevented from closing by a mechanical interlock in the truck .
 - d. Verify switchgear door is CLOSED.
2. Actuate (push down) Position Release Lever (9) to begin racking from Disconnect position
 - a. Begin racking in the CLOCKWISE direction
 - b. Release Position Release Lever once racking has begun (after Approx. 1/2 turn)

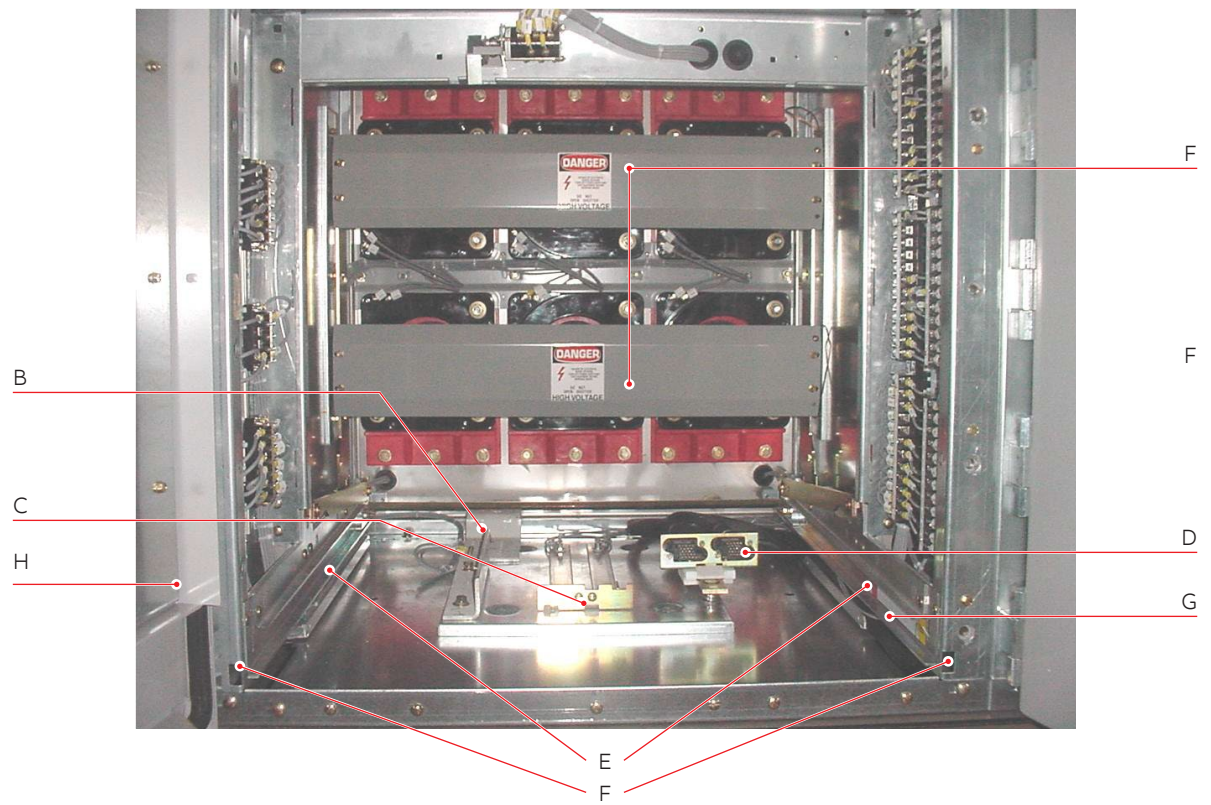
| | Disconnect | Test | Connect |
|--|--|--|--|
| Approximate Distance from | | 160 mm 16 Revolutions 6.29 Inches | 370 mm 37 Revolutions 14.57 Inches |
| Manual Operation | Yes | Yes | Not recommended |
| Electrical Operation | No | Yes | Yes |
| Control Power Available | No | Yes | Yes |
| Shutter | CLOSED | Closed | Open |
| Primary Contacts Engaged | No | No | Yes |
| Position Indication | Positive lock & cell decal | Positive lock & cell decal | Positive lock & cell decal |
| Interlocks | Interference blocking prevents insertion release lever | Release lever closing prevented between position | Closing prevented between position release lever |
| Requirements To Rack breaker from Position | Breaker open position release lever actuated | Breaker open position release lever actuated | Breaker open position release lever actuated |

Notes:

A. Closed door racking is recommended between ALL positions.

B. The circuit breaker position is also indicated by a decal– see Fig 1, Item G

Table 1: Summary Racking Data



Description

- A Compartment slot
- B Ground bar
- C Interference blocking plate
- D Secondary disconnects
- E Wheel rails
- F Shutters
- G Breaker position label disconnect / test / connect
- H Compartment door

Figure 1: Basic Cell

Insertion and removal

Mechanism and operation

(Refer to Fig. 2)

The ADVAC medium voltage circuit breaker uses a spring for stored energy. The closing spring (11) is a toroidal spring. This spring supplies the energy necessary to close the breaker and assists with the opening. During the closing operation, opening springs (6) (compression type) are charged along with contact springs (4) (also compression type) in the pole assembly. During the opening operation, the contact springs and opening springs supply the driving force to open the interrupter contacts.

Description of mechanism and operation

(Refer to Fig. 2)

1. Manual or electrical charging rotates the closing spring (11) 360° to charge.
 - a. Motor limit switch (17) changes state and removes control power from the motor.
 - b. Closing spring charged/discharged indicator (28) changes to show "CHARGED".
 - c. Close trigger (20) is set against half shaft (19b).
2. Manual or electric close rotates half shaft to release close trigger.
 - a. Close trigger releases stop disk (9) through a series of linkages.
 - b. The closing spring (11) rotates main shaft (12) 270°.
 - c. The cams (8) fixed on main shaft actuate rocker arms (7) for each pole.
 - Rocker arms compress opening springs (6).
 - Rocker arms drive interrupter push rods (5).
 - Push rods close moving contact in the vacuum interrupter (3).
 - Push rods charge contact springs (4).
 - d. Main shaft actuates auxiliary shaft (15) changing auxiliary contacts (16).
 - 52a contacts close.
 - 52b contacts open.
3. Manual or electric opening rotates other half shaft (19a) to release open trigger (21).
 - a. Open trigger releases stop disk through a series of linkages.
 - b. Opening springs, contact springs and closing spring discharge, rotating the main shaft 90° (discharging the 360° charge on the closing spring).
 - c. Contact springs discharge driving push rod to begin opening the vacuum interrupter contacts.
 - d. Opening springs discharge driving the rocker arms to fully open the vacuum interrupter contacts.
 - e. Closing spring discharges, rotating the cams 90°.
 - f. Main shaft actuates auxiliary shaft changing auxiliary contacts.
 - 52a contacts open, 52b contacts close.

Mechanism Major Components

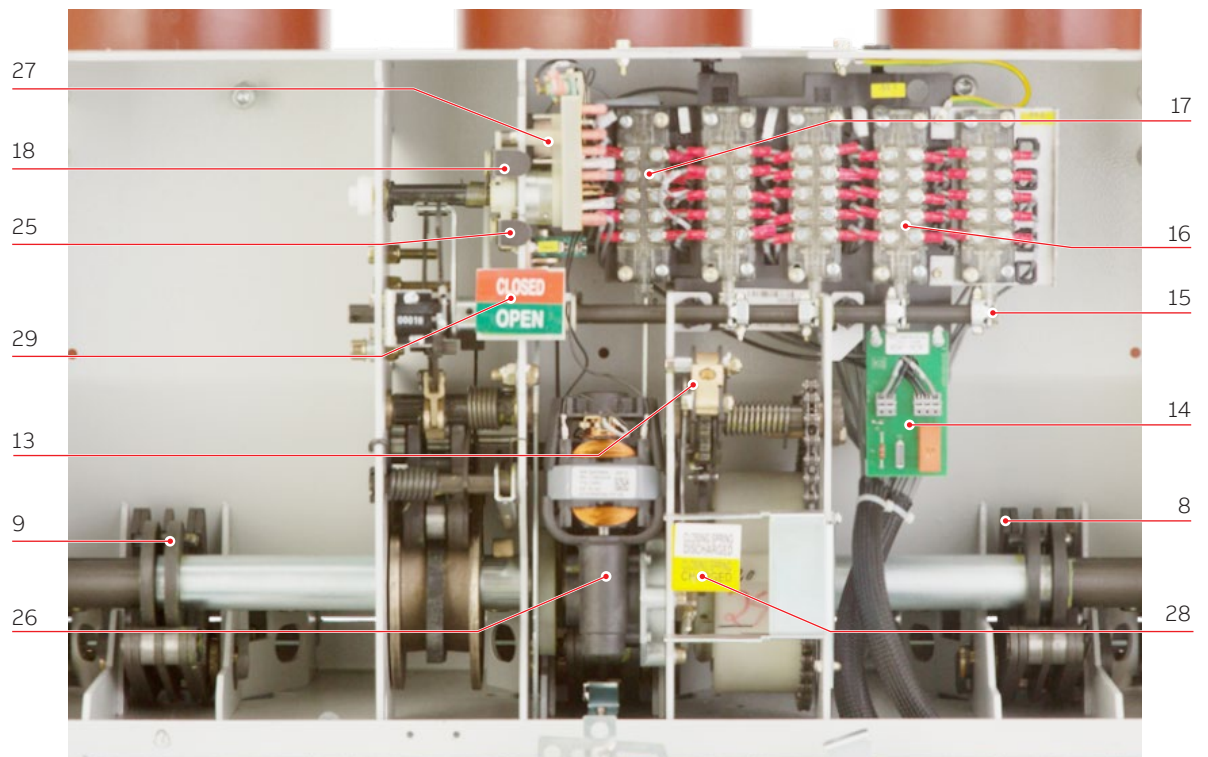
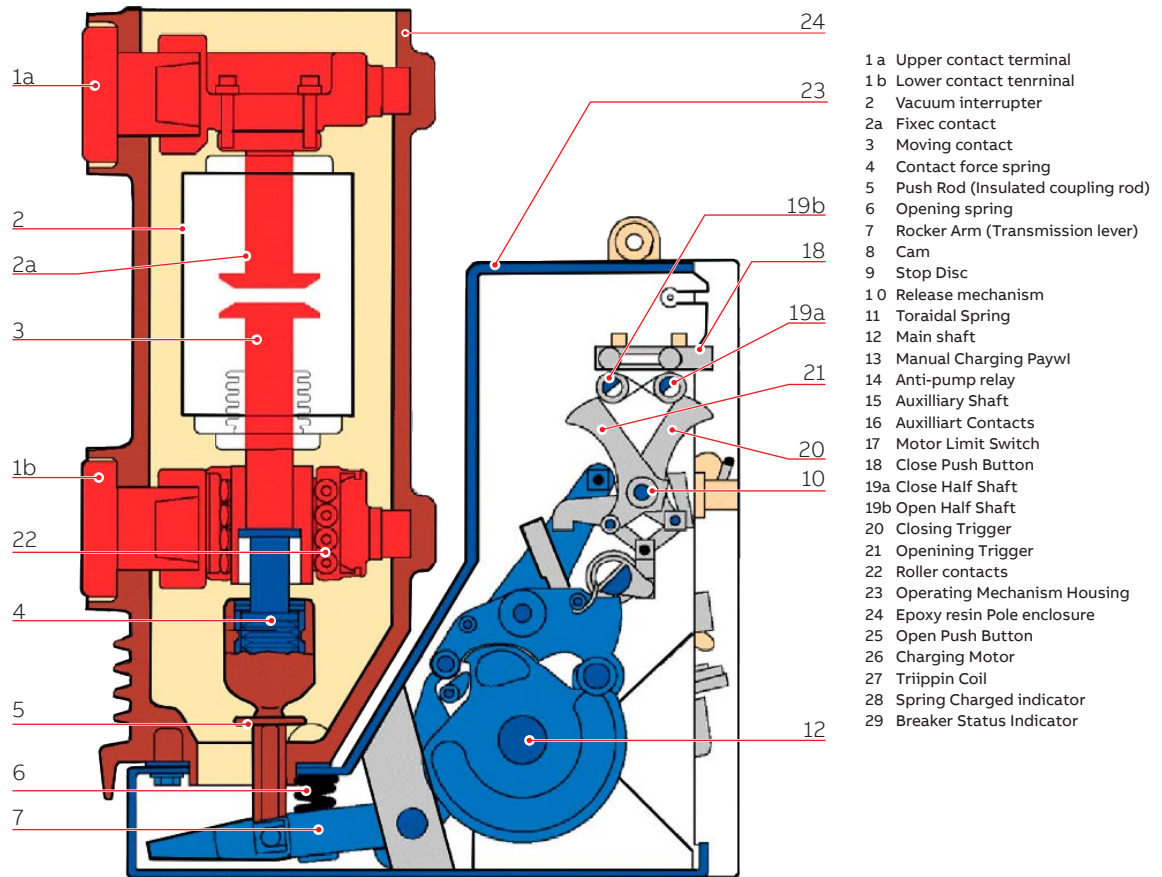


Figure 2: Mechand controls

Mechanism and operation

Interlocks

The ADVAC breaker contains a number of interlocks. A description of each interlock follows as encountered during racking of the breaker into the breaker compartment.



DANGER

MODIFICATION TO INTERLOCKS CAN RESULT IN HAZARDOUS CONDITIONS TO PERSONNEL AND EQUIPMENT. DO NOT OVERRIDE, BY-PASS OR ADJUST INTERLOCKS.

Interference blocking: A code plate in the breaker compartment prevents underrated breakers from being inserted into higher rated compartments. The code plate rating includes continuous current, interrupting current, close and latch capability and maximum voltage. Breakers with the same or higher code plate rating can be inserted into a compartment of equal or lower value.

POSITIVE POSITION FOR RACKING: The racking mechanism is blocked unless the interlock tabs are fully extended into the compartment slots.

POSITIVE POSITION FOR REMOVAL: The handle release pin prevents withdrawing the breaker from the compartment by blocking withdrawal of the locking tabs. The handle release pin blocks the handles unless the breaker is in the Disconnect position.



CAUTION

THE CLOSING SPRING MAY BE MANUALLY RECHARGED IN THE DISCONNECT AND WITHDRAWN POSITIONS. VERIFY THAT THE BREAKER IS OPEN AND THE CLOSING SPRING IS DISCHARGED BEFORE REMOVING THE FRONT COVER.

Position interlocks: The Position Release Lever must be depressed in order to begin racking the breaker in any direction from any positive position (Disconnect, Test, or Connect). The release lever is blocked from actuation when the breaker is CLOSED. The ability to close the breaker is blocked unless the breaker is in one of the three positive positions.



CAUTION

THE CLOSING SPRING MUST BE MANUALLY DISCHARGED BEFORE THE BREAKER CAN BE REMOVED FROM THE CELL. THIS CAN BE ACCOMPLISHED BY CLOSING AND OPENING THE BREAKER WHILE IT IS IN THE DISCONNECT POSITION.

Manual operation

(Refer to Figure 2 & Appendix A)

The breaker can be operated manually or electrically. The manual Charging Handle is required for manual operation.

1. Inspect initial state of the breaker to determine the operations available.
 - a. Close/open indicator (29).
 - b. Closing spring charged/discharged Indicator (28).

| Charging Spring Indicator (6) | Mechanism (4) | Operations Available | Proceed to Step |
|-------------------------------|---------------|----------------------|-----------------|
| Discharged | Open | None Available | 2 |
| Discharged | Closed | Open | 6 |
| Charged | Open | Close-Open | 5 |
| Charged | Closed | Open-Close-Open | 7 |

Table 2: Operations

2. Insert manual charge handle into charging pawl (13).
3. Charge breaker by up and down motions (approximately 25 times).
 - a. Closing spring completely charged.
 - Charge handle has free movement.
 - Closing spring charged/discharged indicator changes to "CHARGE".
4. Remove charging handle.
 - a. Breaker ready to perform Close-Open (C-O) operation.
5. Manual close breaker via close push button (18).
 - a. Breaker closes.
 - Close/Open Indicator changes to "CLOSED".
 - Closing spring charged/discharged indicator changes to "DISCHARGED".
 - b. Breaker ready to perform Open (O) operation (if O-C-O is desired, see Step 7).
6. Manual open breaker via open push button (25).
 - a. Breaker opens
 - Close/Open Indicator changes to "OPEN".
 - Closing spring charged/discharged indicator remains "DISCHARGED".
 - b. No additional operations available, return to Step 3 if additional operation is desired.
7. If an Open-Close-Open (O-C-O) operation is desired:
 - a. Recharge the breaker after step 5 (Steps 3,4).
 - b. Breaker now ready to perform (O-C-O) (Steps 6,5,6).
 - Closing spring charged/discharged indicator will remain CHARGED after first Open.

Electrical operation

To operate the breaker electrically, control power must be available. The section entitled Racking describes the application of control power through the secondary disconnect when the breaker is in the Test and Connect positions.

Optional test jumpers and test cabinets to connect control power to a withdrawn circuit breaker are available (contact the local ABB sales office for details).

1. Inspect initial state of the breaker to determine the operations available.
 - a. Close/open indicator.
 - b. Closing spring charged/discharged indicator.
 - c. Circuit breaker position test or connect (or control power applied externally, if withdrawn).
2. Energize control power source.
 - a. Charging motor energizes.
 - Charge time approximately 8-10 seconds (at nominal voltage).
 - Closing spring charged/discharged indicator shows "CHARGED".
 - b. Breaker ready to perform C-O operation.
3. Close breaker using manual close push-button or by electrical signal to the rotary close coil (after close operation the motor charges unless control power is removed).
 - a. Close coil rotates half shaft and closes breaker.
 - Close/open indicator changes to "CLOSED".
 - Closing spring charged/discharged indicator changes to "DISCHARGED".
 - Charging motor energizes.
 - Charge time approximately 8-10 seconds (at nominal voltage).
 - Closing spring charged/discharged indicator shows "CHARGED".
 - b. Breaker ready to perform O-C-O operation.
4. Open breaker using manual open push-button or by electrical signal to the rotary open coil.
 - a. Open coil rotates half shaft and opens breaker.
 - Close/open indicator changes to "OPEN".
 - Closing spring charged/discharged indicator remains "CHARGED".
 - b. Breaker ready to perform C-O operation.
5. Breaker ready to continue operations returning to step 3 above until the source of the control power is deactivated. Once control power is removed from the charging motor, the Closing Spring will not recharge after a close operation.

Mechanism and operation

Control scheme

ADVAC circuit breakers are available with two control packages. The standard package (see Appendix D) includes charge, close, and open functions, and 4a and 4b auxiliary contacts for customer use. The optional package (see Appendix D) adds to the standard package 5a and 4b auxiliary contacts for customer use as well as an optional second open coil and/or under voltage (UV) open/trip device if required. Refer to wiring diagrams in Appendix D and Figure 3: Sequence of Operation.

1. Initial state.
 - a. Closing spring discharged (33LSa Open/33LSb Closed).
 - b. Breaker open (52a Open/52b Closed).
2. Upon available control power.
 - a. Secondary engaged.
 - b. Motor charges through 33LSb.
3. Closing spring charged.
 - a. 33LSa closes.
 - b. 33LSb opens (removing control power to motor).
 - c. Breaker ready to close.
4. Electrical control pulse sent to close circuit.
 - a. Current energizes close coil 52X (Close Coil is not rated for continuous duty).
 - Coil rotates half shaft and closes breaker.
 - 52a closes. – 52b opens.
 - Coil de-energizes with release of signal and as 52b opens.
 - b. Current energizes 52TC (Trip Coil is not rated for continuous duty).
 - 52TCa closes.
 - 52TCb opens.
 - c. Closing spring discharges.
 - 33LSa closes.
 - 33LSb opens.
 - d. Closing spring charges.
 - 33LSa closes.
 - 33LSb opens (removing control power to motor).
 - Breaker ready to perform O-C-O operation.

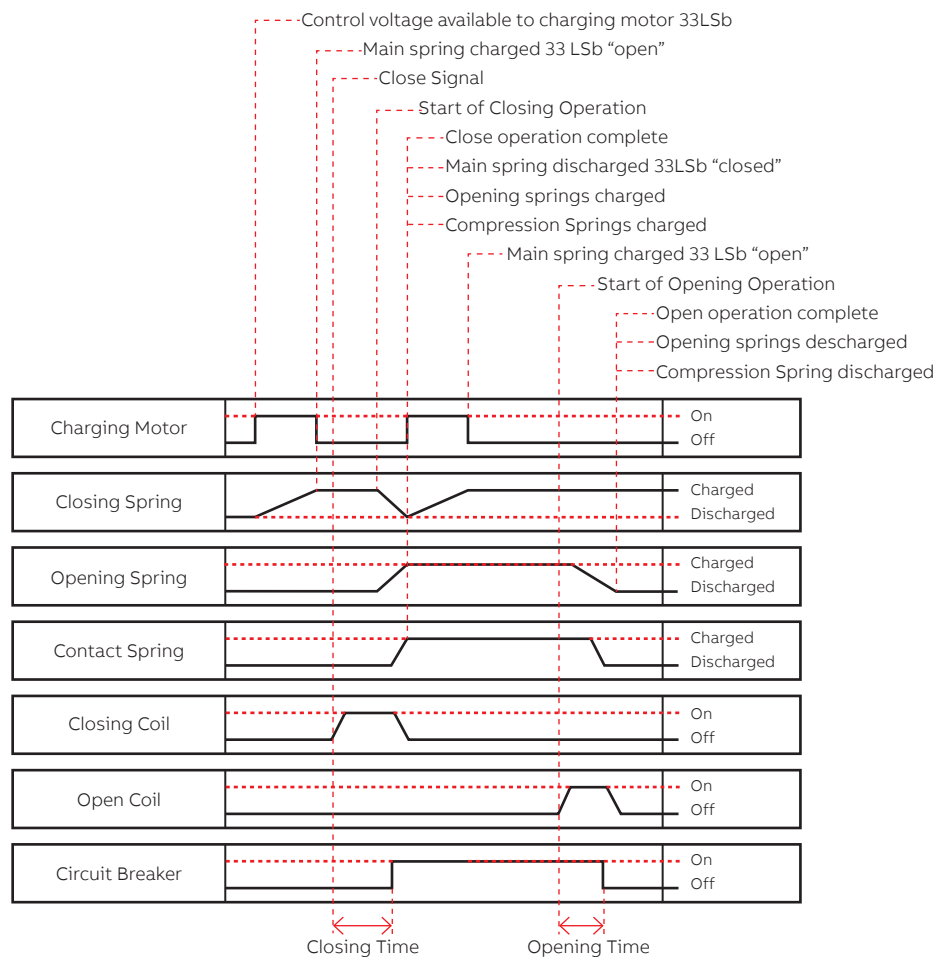


Figure 3: Sequence of operation (not to scale)

Maintenance

Maintenance

ADVAC circuit breakers are designed for a minimum amount of maintenance. Circuit breakers in a clean, noncorrosive environment require only annual inspection. Dusty or corrosive environments require inspection more often at the discretion of the user. Inspection is required following each interrupted fault.

- DO NOT work on an energized breaker.
- DO NOT work on a breaker unless all components are disconnected by means of a visible break and securely grounded.
- DO NOT work on a breaker with power supplied to the secondary control circuit.
- DO NOT defeat safety interlocks. This may result in bodily injury, death and/or equipment damage.
- DO NOT work on a closed breaker.
- DO NOT work on a breaker with a charged closing spring.
- DO NOT use a circuit breaker by itself as the sole means of isolating a high voltage circuit.
- DO NOT leave a breaker in an intermediate position in a cell. Always have the breaker in the disconnect, test or connected position.



CAUTION

LUBRICATION SHOULD ONLY BE PERFORMED USING ISOFLEX TOPAS NB52. THE USE OF ANY OTHER LUBRICANT CAN VOID THE WARRANTY AND HAVE A DETRIMENTAL EFFECT ON THE OPERATION OF THIS DEVICE.

Mechanism (Refer to Fig. 4a & 4b)

The mechanism requires visual inspection of hardware, lubrication and operation during routine inspection.

Before beginning any maintenance, turn the Motor Disconnect Switch to OFF, discharge the Closing Springs by pressing the Manual Close Button. Open the breaker by pushing the Manual Open Button. Press the Close and Open buttons again to ensure the breaker is fully discharged. Verify springs are discharged by inspection of the Spring Charge Indicator. Remove the front cover with a Phillips screwdriver. Correct any loose or missing hardware. Always lubricate the working surface of the Cams (B) and the entire Motor Linkage Assembly (Q). Verify lubrication on latching surfaces located above the Charging Motor (D) in the mechanism (See Fig 4b). Remove any grease on the breaker frame. Use flex Topas NB52 grease for lubrication (ABB No. GCE0007249P0100, 1kg tub). If the grease becomes caked and dirty, remove with a clean cloth and reapply lubrication. Use of incorrect lubricant may cause breaker to malfunction.

Verify that the operation of the Manual Close and Open Push Buttons is free and smooth. Replace the front cover before operation. Manually operate the mechanism a minimum of 2-5 operations to exercise the mechanism.



DANGER



HIGH SPEED MECHANICAL PARTS. SERIOUS INJURY MAY OCCUR.

KEEP HANDS AND TOOLS CLEAR OF THE MECHANISM DURING OPENING AND CLOSING OPERATIONS AND ANYTIME THE CLOSING OR OPENING SPRINGS ARE CHARGED. BEFORE MAINTENANCE VERIFY CLOSING SPRING INDICATOR READS "DISCHARGED". OPENING SPRINGS ARE ALWAYS CHARGED WHEN THE CIRCUIT BREAKER IS CLOSED.

Maintenance

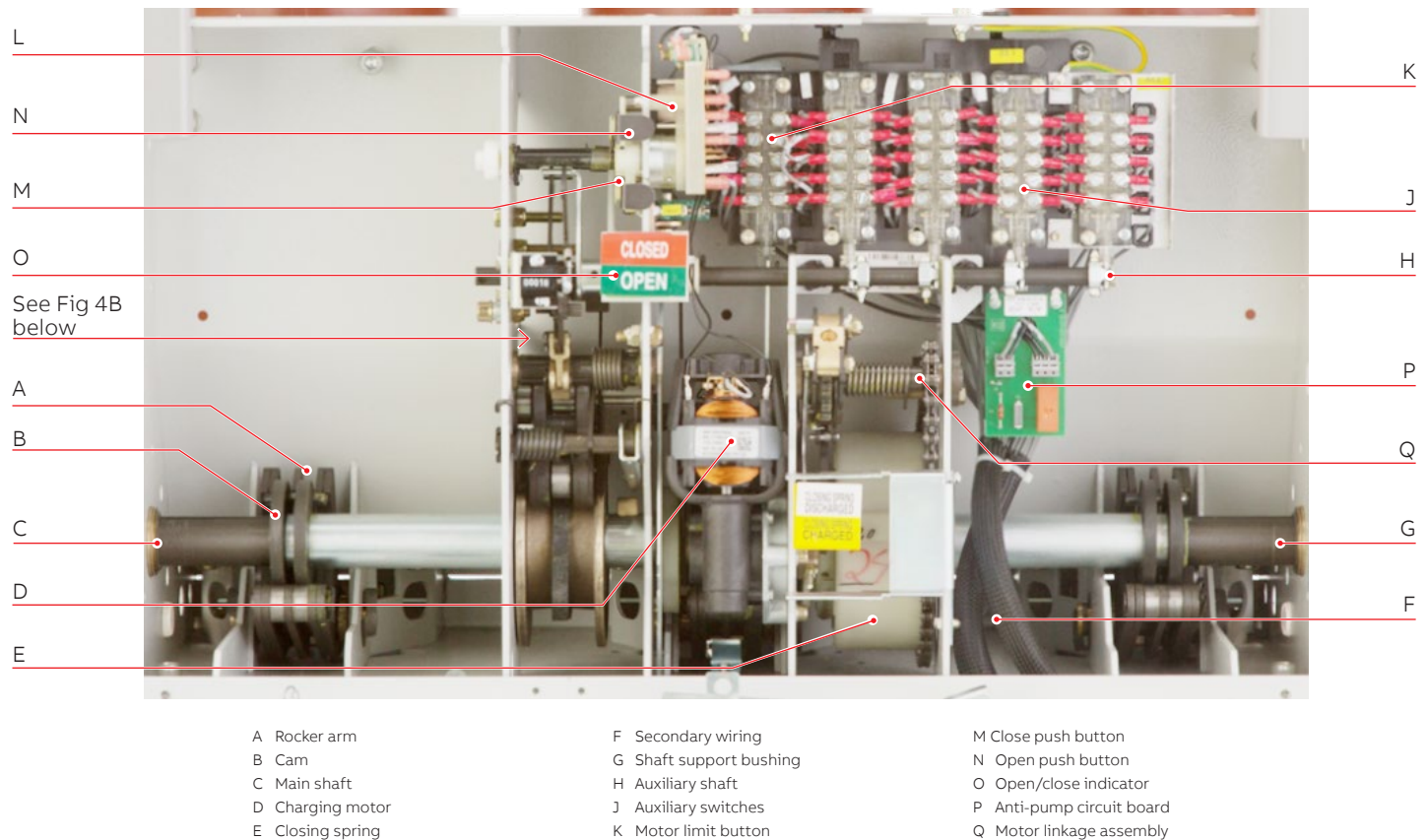


Fig. 4a Breaker without front cover



Figure 4b: Latching surfaces

TRUCK (Refer to Fig. 5)

The truck requires visual inspection of hardware, lubrication and operations during routine maintenance.

With the breaker outside the cell, verify all visible hardware tightness, including handles (1) and wheels (6).

Wheels should rotate freely by hand movement.

Replace or tighten any missing or loose hardware.

With the breaker outside the cell, rotate the racking screw as though racking the breaker to the connect position.

This process will expose surfaces inside the truck that need to be inspected and lubricated. Lubricate the exposed parts; specifically the entire Racking

Screw (2) and Position Release Shaft (3) assemblies during the operation. Inspect breaker locking tabs (3) and Secondary Locking Tab (4) for any damage. Use ISOFLEX TOPAS NB52 grease for lubrication (ABB No. GCE0007249P0100, 1kg tub). If the grease becomes caked and dirty, remove with a clean cloth and reapply lubrication. Use of incorrect lubricant may cause breaker to malfunction. Return truck to disconnect position. Place breaker and truck on flat surface outside of the cell and rack truck out to expose the racking screw for lubrication access.

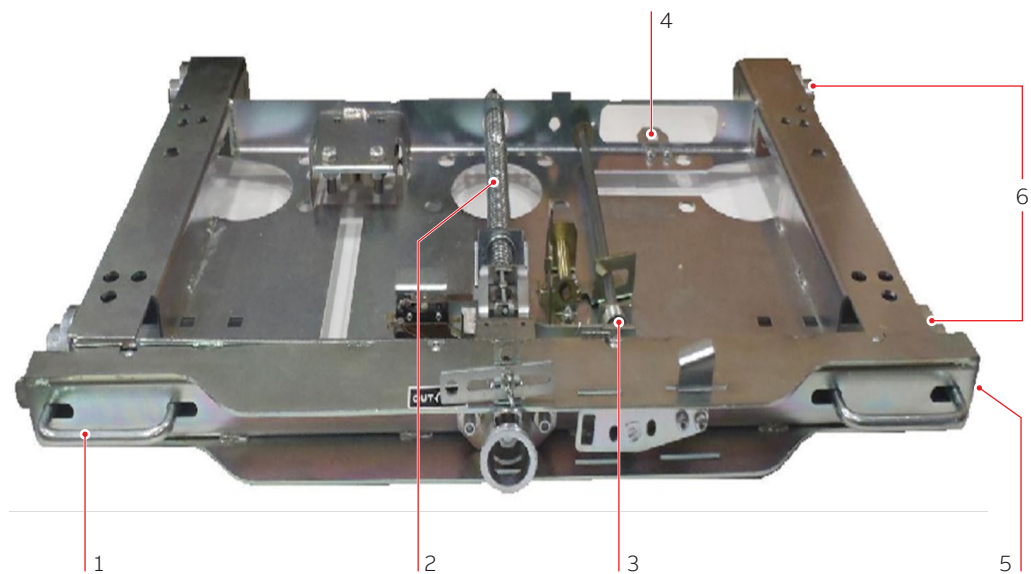


Figure 5: TRUCK

Maintenance

Control wiring

The control wiring requires visual inspection of hardware, low-frequency withstand voltage testing and 2-5 manual operations during routine maintenance. Disconnect control power before verifying secondary hardware and before low-frequency withstand voltage testing.

Remove the front cover with a screwdriver. Correct any loose or missing mounting hardware. Verify the ground wire connection to the frame and all connectors' alignment and snugness on the electrical components. Visually inspect the secondary plug and correct any pins that may have become displaced.

To verify the integrity of the secondary insulation, perform the following low-frequency withstand voltage test:

1. Connect all pins from the secondary to a test wire.
2. Connect test wire to the high potential lead of the test machine.
3. Ground the breaker frame.
4. Start machine with output potential at 0 (zero) VAC RMS.
5. Increase the potential to the required insulation test voltage (1125VAC RMS).
6. Hold for one minute.
7. Reduce potential to 0 (zero) VAC and turn off machine.

A successful withstand indicates satisfactory insulation strength of the secondary circuit. Failing insulation will not sustain the voltage across the secondary. Replace the breaker control wiring if the insulation fails during lowfrequency withstand voltage testing. Refer to ABB replacement parts manual for replacement wiring part numbers. Replace the front cover before operation. Verify the operation with 2-5 electrical operations in the Test position or with a remote power supply.



DANGER



THE INTERNAL SHIELD OF A VACUUM INTERRUPTER CAN ACQUIRE AN ELECTRIC CHARGE WHICH CAN BE RETAINED EVEN AFTER THE VOLTAGE IS REMOVED.

DISCHARGE THE MID-BAND RING WITH A GROUNDING STICK BEFORE WORKING ON ANY PART OF THE CIRCUIT BREAKER.

Primary circuit assembly (Pole)

The primary circuit requires visual inspection of hardware, low-frequency withstand voltage testing and lubrication during routine maintenance. All insulation material should be clean and free of structural cracks. Inspect for structural cracks and replace damaged parts.

Dirt or dust may create a dielectric path to ground on the insulation. Remove dust and dirt with a clean, lint-free cloth. Apply distilled water to the cloth to remove any difficult dirt. DO NOT return the breaker into service until the insulation surfaces are completely dry.

Lubrication on the primary contacts should be inspected during routine maintenance. Use NO-OX-ID special grade-A grease for the lubrication of primary contacts (ABB No. 713222A, 1 Pt. can).



CAUTION



APPLYING ABNORMALLY HIGH VOLTAGE ACROSS A PAIR OF OPEN CONTACTS IN VACUUM MAY PRODUCE X-RADIATION. THE RADIATION MAY INCREASE WITH

THE INCREASE IN VOLTAGE AND/OR DECREASE IN CONTACT SPACING. IT IS RECOMMENDED THAT ALL OPERATING PERSONNEL STAND AT LEAST ONE METER AWAY AND IN FRONT OF THE CIRCUIT BREAKER DURING TESTING.

To verify the integrity of the primary insulation, perform the following low-frequency withstand voltage test:

1. Close the breaker (no control power supplied to breaker)
 - a. Connect the high potential lead to one pole
 - b. Ground the remaining poles and breaker frame
2. Start machine with output potential at 0 (zero) VAC.
3. Increase the potential to the required voltage (see Table 3)
4. Hold for one minute
5. Decrease potential to 0 (zero) VAC and turn off machine
6. Repeat for the remaining poles

A successful withstand indicates satisfactory insulation strength of the primary circuit.

To verify the integrity of the vacuum interrupters perform the following low-frequency withstand voltage test:

1. Open the breaker (no control power supplied to breaker)
 - a. Connect the high potential lead to one terminal
 - b. Ground the remaining 5 terminals and breaker frame
2. Start machine with output potential at 0 (zero) VAC
3. Increase the potential to the required voltage (see Table 3)
4. Hold for one minute
5. Decrease potential to 0 (zero) and turn off machine
6. Repeat for the remaining 5 terminals

A successful withstand indicates satisfactory vacuum integrity.

If flashover occurs, contact ABB.

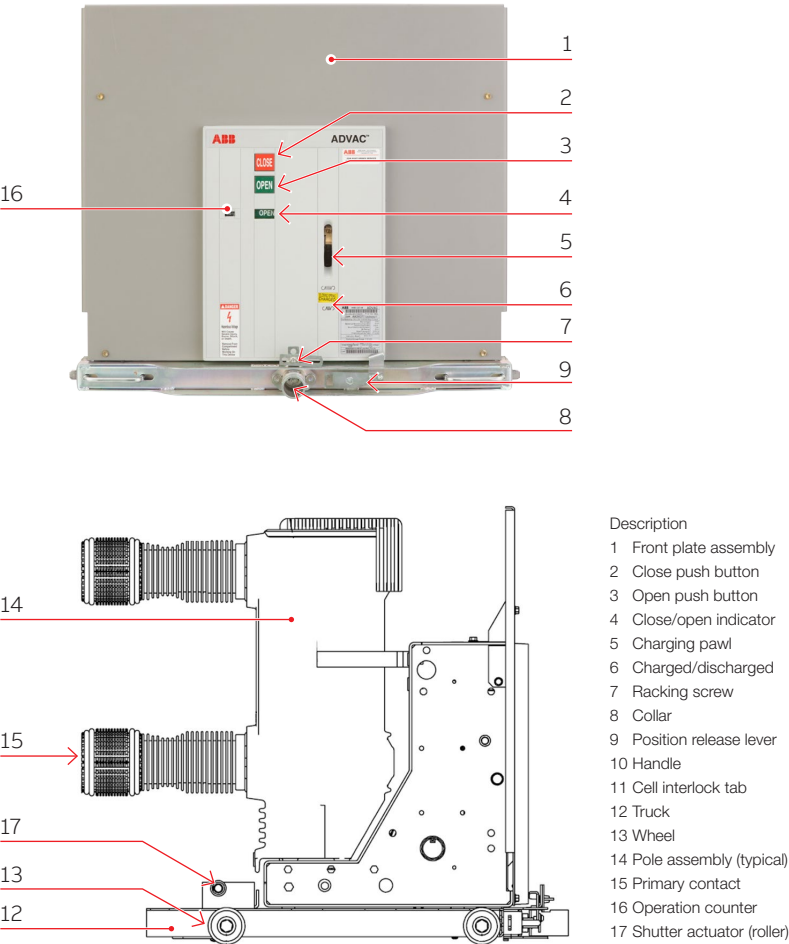
Testing should be done with an AC source only. DC testing is not considered a valid test for vacuum integrity. If DC is the only available option, the peak DC voltage should not exceed the corresponding AC RMS test voltage.

Additionally, a failure during DC testing should only be considered preliminary. Additional AC testing should be completed before replacement of the pole is considered to be warranted. Testing with meggers or other similar devices is not considered valid under any circumstances.

Appendices

Appendix A

All ADVAC breakers have the same basic layout regardless of rating or pole configuration.

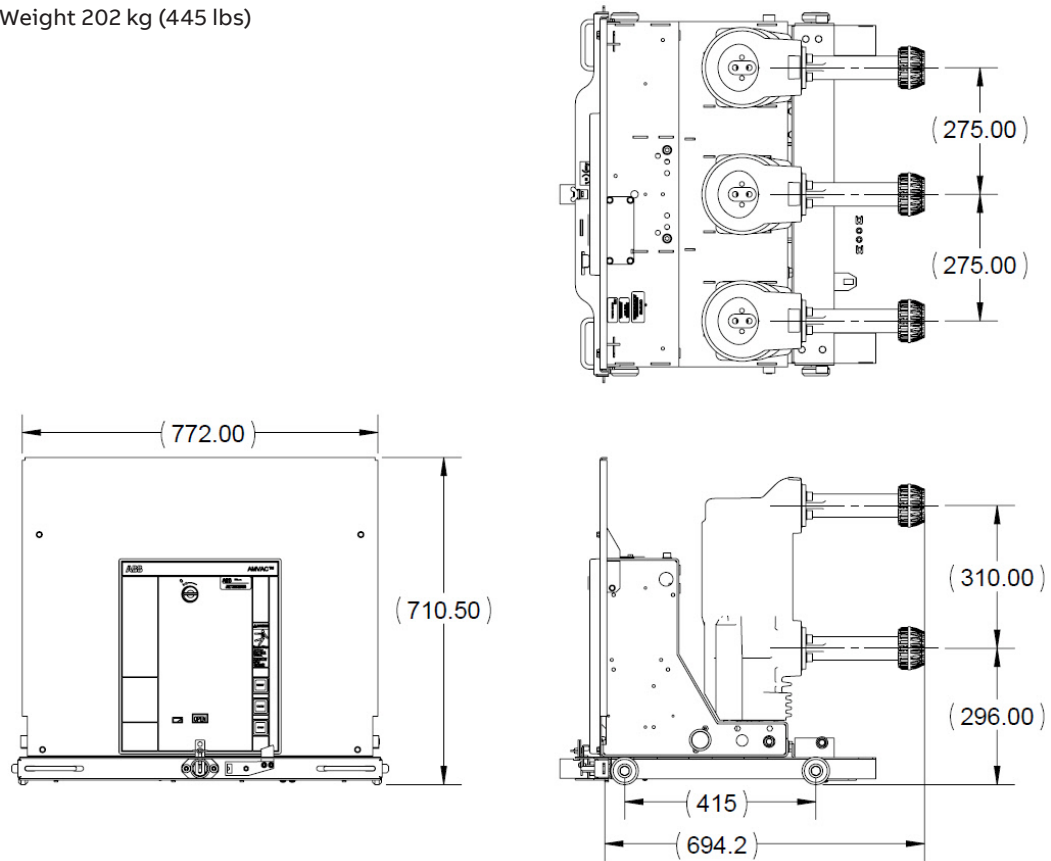


Basic Breaker Layout

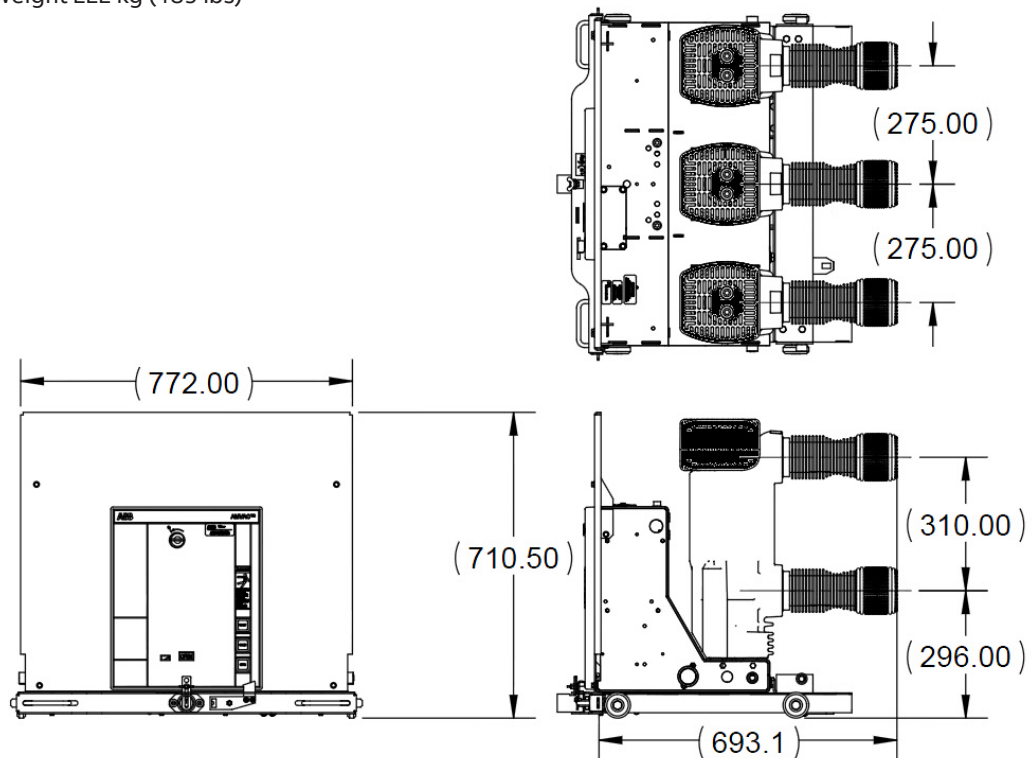
Appendix B

ADVAC HD for Safegear HD**Basic breaker dimensions and weight 1200 & 2000 A**

Weight 202 kg (445 lbs)

**Basic breaker dimensions and weight 3000 A**

Weight 222 kg (489 lbs)



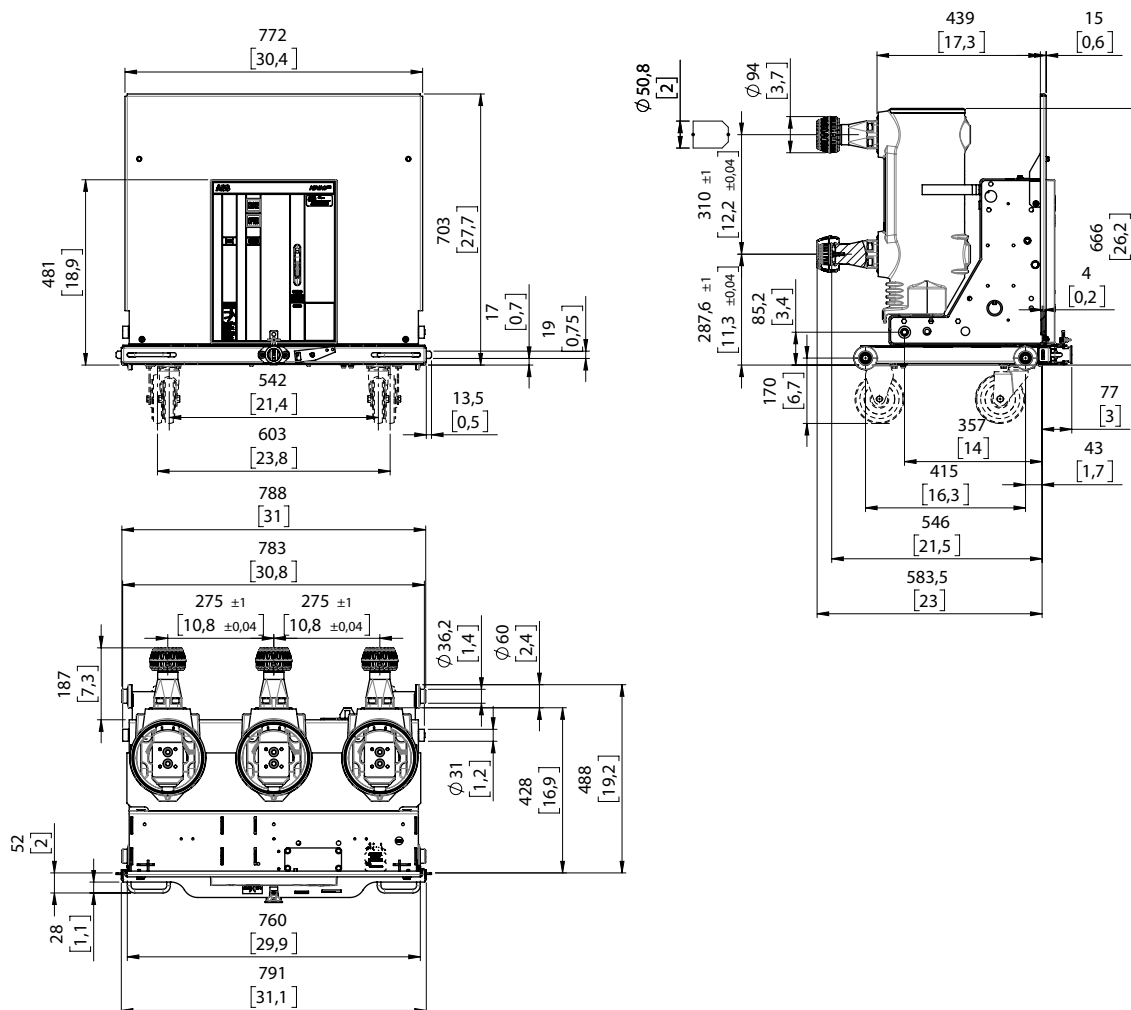
Appendices

Appendix B

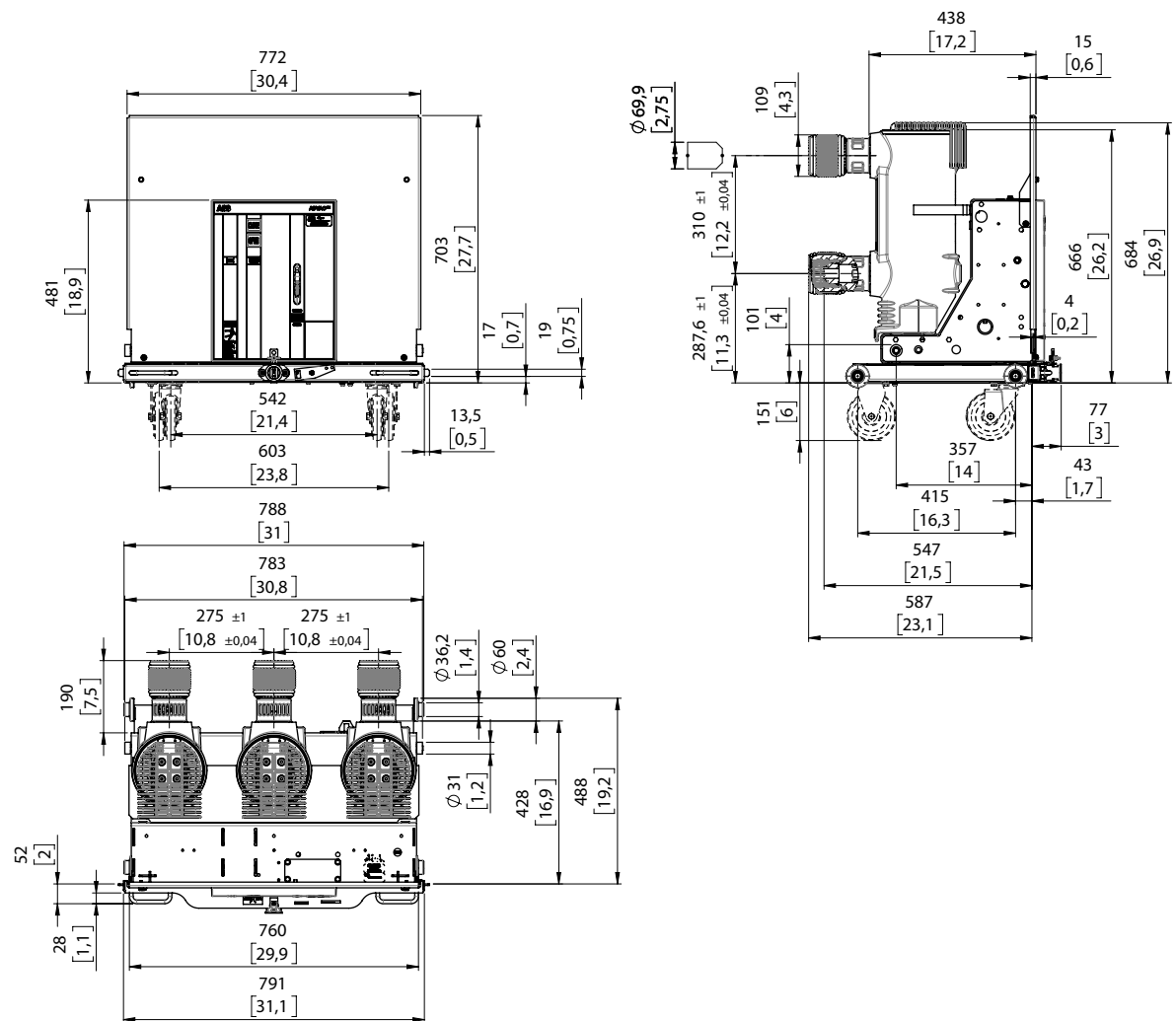
ADVAC for Advance and SafeGear

Basic breakers dimensions and weight 2000A

Weight 222 kg (489 lbs)



Basic breakers dimensions and weight 3000 A




Appendices

Appendix C

Close/open coil data

Following are the basic characteristics for the CLOSE and OPEN coils used on the ADVAC breakers. Resistance ranges may be used to identify the nominal voltage rating of a coil. All coils are DC voltage coils. AC power is rectified in the coil mounting assembly.



WARNING

THE USE OF THE WRONG CONTROL COILS IN A CIRCUIT BREAKER WILL CAUSE IMPROPER OPERATION AND MAY CAUSE EQUIPMENT TO FAIL TESTING CRITERIA.

| Close Coils | | |
|------------------------------------|---------------------------|----------------------|
| Nominal control voltage of breaker | Voltage range | Resistance range (W) |
| 48 V DC | 35-56 V DC | 9.5 ± 4.2% |
| 125 V DC/120 V AC | 100-140 V DC/104-127 V AC | 48 ± 4.0% |
| 250 V DC/240 V AC | 200-280 V DC/208-254 V AC | 174 ± 5.2% |

| Open/Trip Coils | | |
|------------------------------------|---------------------------|----------------------|
| Nominal control voltage of breaker | Voltage range | Resistance range (W) |
| 24 V DC | 14-28 V DC | 3.5 ± 4.2% |
| 48 V DC | 28-56 V DC | 9.5 ± 4.2% |
| 125 V DC/120 V AC | 70-140 V DC/104-127 V AC | 48 ± 4.0% |
| 250 V DC/240 V AC | 140-280 V DC/208-254 V AC | 174 ± 5.2% |

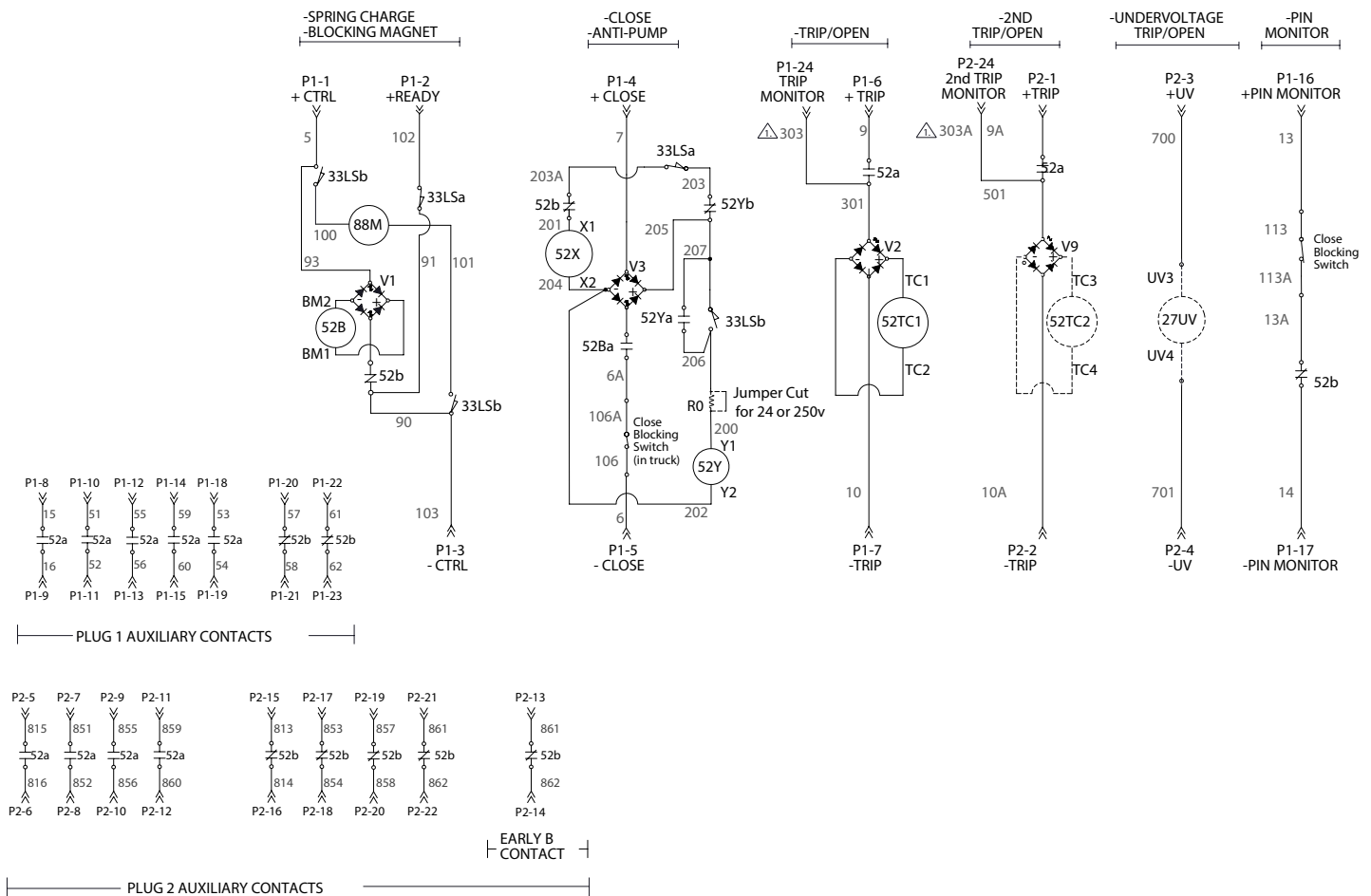
Appendix D

Wiring diagrams

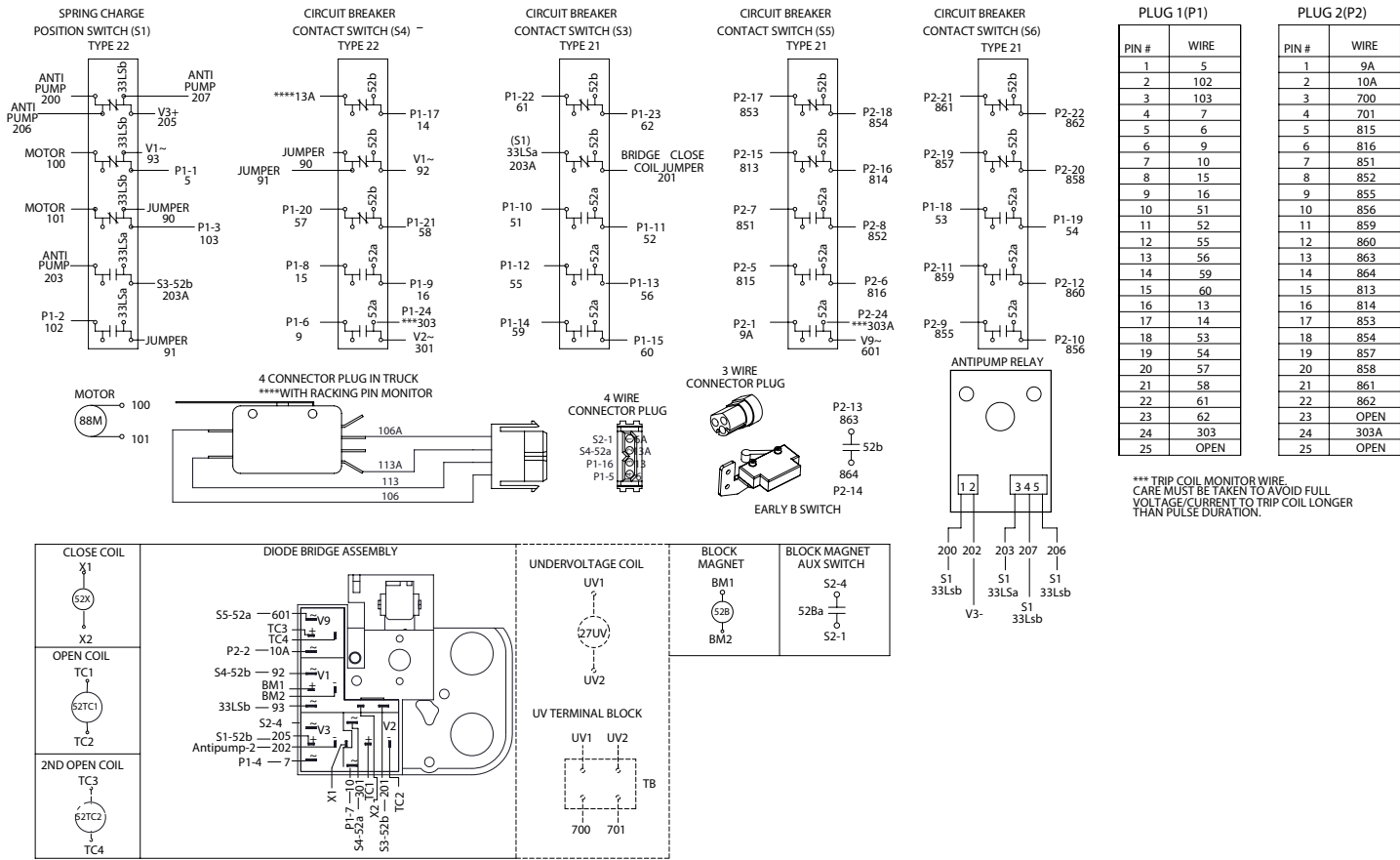
Drawout wiring

The schematic shows the basic wiring scheme for drawout breaker. This wiring includes nine “a”, six “b” and one “Early B” auxiliary contacts.

The point-to-point diagram shows the physical connections and wire numbers used in the wiring harness.



Appendices



Appendix E

| Auxiliary contacts of the circuit breaker | |
|--|----------------------|
| Rated insulation voltage according to VDE 0110, Group C | 660 V AC 800 V DC |
| Rated voltage | 24 V~ ... 660 V |
| Insulation-test test voltage | 2.5 kV |
| Maximum rated current | 10 A |
| Number of contacts | 5 |
| Stroke | 16 mm ... 7 mm |
| Contact force | 26 N |
| On resistance | 3 mΩ |
| Storing temperature range | - 20° C ... + 120 °C |
| Operating temperature range | - 20° C ... + 70 °C |
| Contact over temperature | 20 K |
| Operating cycles | 30.000 |
| Unlimited short circuit stability by using fuses of max. 10 A time-lag | |

| | cosφ | Rated current | Breaking capacity |
|----------------------|-------------|----------------------|--------------------------|
| 220 V AC | 0.7 | 2.5 A | 25 A |
| 380 V AC | 0.7 | 1.5 A | 15 A |
| 500 V AC | 0.7 | 1.5 A | 15 A |
| 660 V AC | 0.7 | 1.2 A | 15 A |
| Time constant | | | |
| 24 V DC | 1 ms | 10 A | 12 A |
| | 15 ms | 10 A | 12 A |
| | 50 ms | 8 A | 10 A |
| | 200 ms | 4 A | 7.7 A |
| 60 V DC | 1 ms | 8 A | 10 A |
| | 15 ms | 6 A | 8 A |
| | 50 ms | 5 A | 6 A |
| | 200 ms | 4 A | 5.4 A |
| 110 V DC | 1 ms | 6 A | 8 A |
| | 15 ms | 4 A | 5 A |
| | 50 ms | 2 A | 4.6 A |
| | 200 ms | 1 A | 2.2 A |
| 220 V DC | 1 ms | 1.5 A | 2 A |
| | 15 ms | 1 A | 1.4 A |
| | 50 ms | 0.75 A | 1.2 A |
| | 200 ms | 0.5 A | 1 A |

Appendices

Ambient temperature

| | |
|---------|---------|
| Maximum | + 40 °C |
|---------|---------|

| | |
|-------------------------------|---------|
| Average maximum over 24 hours | + 35 °C |
|-------------------------------|---------|

| | |
|---|---------|
| Minimum (according to class-5), apparatus for indoor installation | – 30 °C |
|---|---------|

Humidity

The average value of the relative humidity, measured for a period longer than 24 hours, must not exceed 95%

The average value of the pressure of the water vapor without condensation, measured for a period longer than 24 hours, must not exceed 2.2 kPa.

The average value of the relative humidity, measured for a period longer than 1 month, must not exceed 90%.

The average value of the pressure of the water vapor, measured for a period longer than 1 month, must not exceed 1.8 kPa.

Altitude

≤1000 (3300 ft.) m above sea level.

For application above 1000 m (3300 ft.) C37.20.2 is applicable

Climate

To avoid the risk of corrosion or other damage in areas:

- with a high level of humidity, and/or
 - with rapid and large temperature variations, take appropriate steps (for example, by using suitable electric heaters) to prevent condensatic phenomena.
-

For special installation requirements or other operating conditions, please contact ABB.



Notes

Grid of dots for notes

For more information please contact:



More product information:
abb.com/mediumvoltage
Your contact center:
abb.com/contactcenters
More service information:
abb.com/service

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