Vacuum Circuit Breakers (Vehicle)
Type AMR For Allis Chalmers
5kV
DANGER

Hazardous voltages and high-speed moving parts.
Will cause death, serious injury or equipment damage.

De-energize and ground the equipment before maintenance. Maintenance should be performed only by qualified personnel.
The use of unauthorized parts should not be used in the repair of the equipment.

Follow all safety instructions contained herein.

IMPORTANT

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. Siemens reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence.

QUALIFIED PERSON

For the purpose of this manual a qualified person is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

(a) is trained and authorized to de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.
(b) is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.
(c) is trained in rendering first aid.

SUMMARY

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser’s purposes, the matter should be referred to the local sales office.
The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens Power Transmission & Distribution, Inc. The warranty contained in the contract between the parties is the sole warranty of Siemens Power Transmission & Distribution, Inc. Any statements contained herein do not create new warranties or modify the existing warranty.
Vacuum Circuit Breakers (Vehicle)

Table of Contents

Introduction and Safety ................................................................. 2
  Introduction .............................................................................. 2
  Qualified Person ....................................................................... 2
  Signal Words ......................................................................... 2
  Dangerous Procedures ............................................................. 2
  Field Service Operation ............................................................. 2

Receiving, Handling and Storage .................................................. 3
  Introduction .............................................................................. 3
  Receiving Procedure ............................................................... 3
  Shipping Damage Claims (when applicable) ............................... 3
  Handling Procedure (Refer to Figure 1) ...................................... 4
  Storage Procedure ................................................................... 4
  Space Heating ......................................................................... 4

Vehicle Description ....................................................................... 4
  Vehicle Function and Operational Interlocks ............................ 4
  Alignment ............................................................................... 4
  Checking in Compartment ....................................................... 4
  Grounding Contact (Refer to Figure 1) ....................................... 4
  Engagement of Primary and Secondary Contacts ...................... 4
  Recommended Tools .................................................................. 4
  Installing Circuit Breaker Into Compartment ............................ 4
  Circuit Breaker in Disconnect/Test Position (Refer to Figure 2) ... 4
  Trip-Free In Racking Procedure ................................................. 5
  Circuit Breaker in Connect Position (Refer to Figure 3) .......... 5
  Adjustment Procedure — Trip-Free/Closing Spring Dump ............ 6
  Adjustment Procedure — Interlock Mechanism (Refer to Figure 4) ................................. 6
  Continuous Current Interlock .................................................... 7

Maintenance .................................................................................. 8
  Introduction and Maintenance Intervals ................................... 8
  Recommended Maintenance and Lubrication ........................... 8
  Removal from Switchgear ....................................................... 8
  Circuit Breaker Operator Tasks ............................................... 9
  Checks of the Primary Power Path (Refer to Figure 5) ............. 9
  Cleanliness Check ................................................................... 9
  Primary Disconnects (Refer to Figure 5) .................................... 9
  Fastener Check ....................................................................... 10
  Electrical Control Checks ....................................................... 10
    Wiring and Terminals Checks ............................................... 10
    Secondary Disconnect Check ................................................. 10
    Automatic Spring Charging Check ........................................ 10
    Electrical Close and Trip Check ............................................ 10
    Vacuum Integrity Check ....................................................... 10
    High Potential Test ............................................................ 10
  Insulation and Contact Resistance Test ..................................... 10
  Inspection and Cleaning of Circuit Breaker ............................ 10
  Functional Tests ...................................................................... 10
  Periodic Maintenance and Lubrication tasks ........................... 10

Figures:
  Figure 1. Circuit breaker Side View ........................................ 3
  Figure 2. Circuit Breaker in Disconnect/Test Position ................ 4
  Figure 3. Circuit Breaker in Connect Position ........................... 5
  Figure 4. Interlock Mechanism ............................................... 7
  Figure 5. Primary Power Path .................................................. 9

Tables:
  Table 1—Maintenance Tasks ................................................. 8
  Table 2—Periodic Maintenance and Lubrication Tasks ............. 10
Introduction

The AMR family of vacuum circuit breakers is designed to meet all the applicable ANSI, NEMA and IEEE standards. Successful application and operation of this equipment depends as much upon proper installation and maintenance by the user as it does upon the careful design and fabrication by Siemens.

The purpose of this Instruction Manual is to assist the user in developing safe and efficient procedures for the installation, maintenance and use of the equipment.

Contact the nearest Siemens representative if any additional information is desired.

Qualified Person

For the purpose of this manual a Qualified Person is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

- Training and authorization to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- Training in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses, face shields, flash clothing, etc., in accordance with established safety procedures.
- Training in rendering first aid.

Signal Words

The signal words “Danger”, “Warning” and “Caution” used in this manual indicate the degree of hazard that may be encountered by the user. These words are defined as:

- **Danger** - Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
- **Warning** - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- **Caution** - Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Dangerous Procedures

In addition to other procedures described in this manual as dangerous, user personnel must adhere to the following:

1. Always work on de-energized equipment. Always de-energize a breaker, and remove it from the switchgear before performing any tests, maintenance or repair.
2. Always perform maintenance on the breaker after the spring-charged mechanisms are discharged.
3. Always let an interlock device or safety mechanism perform its function without forcing or defeating the device.

Field Service Operation

Siemens can provide competent, well-trained Field Service Representatives to provide technical guidance and advisory assistance for the installation, overhaul, repair and maintenance of Siemens equipment, processes and systems. Contact regional service centers, sales offices or the factory for details, or telephone Siemens Field Service at 1-800-241-4453.
Receiving, Handling and Storage

Introduction
This manual covers the Receiving, Handling and Storage instructions for vacuum circuit breakers shipped separately from the switchgear. This section of the manual is intended to help the user identify, inspect and protect the circuit breaker prior to its installation.

Receiving Procedure
Make a physical inspection of the shipping container before removing or unpacking the circuit breaker. Check for shipment damage or indications of rough handling by the carrier. Check each item against the manifest to identify any shortages.

Accessories such as the manual charging crank, the racking crank and the split plug jumper are shipped separately.

Shipping Damage Claims (when applicable) - Follow normal shipment damage procedures, which should include:

1. Check for visible damage upon arrival.
2. Visible damage must be noted on delivery receipt, and acknowledged with driver’s signature. Notation, “Possible internal damage, subject to inspection” must be on delivery receipt.
3. Notify the Siemens Sales office immediately of any shipment damage.
4. Arrange for carrier’s inspection. Do not move the unit from its unloading point.

Handling Procedure
1. Carefully remove the shipping carton from the circuit breaker. Keep the shipping pallet for later use if the breaker is to be stored prior to its installation.
2. Inspect for concealed damage. Notification to carrier must take place within 15 days to assure prompt resolution of claims.
3. The circuit breaker shall be appropriately lifted with a 6 ft. long lifting sling rated for at least 2,000 lbs. on the two lift hooks (Figure 1). Avoid short hitches which could place strain on lifting hooks and could damage it.

4. The palleted circuit breaker can also be moved using a properly rated fork-lift vehicle. The pallets are designed for movement by a standard fork-lift vehicle.

Storage Procedure
When the circuit breaker is placed on its pallet for storage, be sure the unit is securely bolted to the pallet and covered with polyethylene film at least 10 mils thick.

Indoor Storage - Whenever possible, store the circuit breaker indoors. The storage environment must be clean, dry and free of such items as construction dust, corrosive atmosphere, mechanical abuse and rapid temperature variations.

Outdoor Storage - Outdoor storage is not recommended. When no other option is available, the circuit breaker must be completely covered and protected from rain, snow, dirt and all other contaminants.

Space Heating - Space heating must be used for both indoor and outdoor storage to prevent condensation and corrosion. When stored outdoors, 250 watts per breaker of space heating is recommended.

WARNING
Heavy weight. Can cause death, serious injury, or property damage.
Use of a qualified rigger to hoist the circuit breaker.

Figure 1. Circuit breaker Side View
Vehicle Description

Vehicle Function and Operational Interlocks
Type AMR vacuum circuit breakers are comprised of the interrupter/operator module fitted to a vehicle. This interrupter/operator module is an integral arrangement of operating mechanism, dielectric system, vacuum interrupters, and means of connecting the primary circuit. The vehicle supports the interrupter/operator module, providing mobility and fully coordinated application in the Allis Chalmers Type H switchgear.

This manual should be used jointly with the Circuit Breaker Operator manual, E50001-F710-A251-V1-4A00.

Alignment
All aspects of the circuit breaker structure which impact alignment and interchangeability are checked at the factory. Field adjustment will not normally be required, but variations in existing switchgear may require field adjustment.

Checking In Compartment:
Check to see that when installing the circuit breaker into cubicle that the lift pins and hooks on circuit breaker frame engage properly with mating parts of the lifting gear.

Grounding Contact:
Check to see that the grounding contact at rear of circuit breaker (Figure1) makes proper contact with stationary contact in cubicle.

Engagement of Primary and Secondary Contacts:
As the circuit breaker is raised into final position, check to see that the primary and secondary contacts are aligned for proper contact engagement. With circuit breaker fully raised against stop in cubicle there should be 5/16” plus or minus 1/16” clearance between secondary disconnect mounting plates.

Recommended Tools
• Racking crank: Original circuit breaker racking crank may be used.
• Circuit Breaker closing spring charging crank:15-172-816-344.

Installing Circuit Breaker Into Compartment
The Trip-Free/Spring Dump interlock is of primary importance in the safe and effective operation of the type AMR Vertical Lift Replacement circuit breaker. This interlock provides safety to both personnel and equipment during the racking procedure, as it prevents the electrical or manual closing and/or electrical closing spring charging of the circuit breaker until the circuit breaker is in either the Disconnect/Test position or the Connect position.

Circuit Breaker in Disconnect/Test Position (Refer to Figure2)
Figure 2 is a picture of the circuit breaker in the Disconnect/Test position. The Disconnect/Test positions on the AMR circuit breaker are the same. The position is reached when inserting the circuit breaker fully into cubicle to the racking position.

Figure 2. Circuit Breaker in Disconnect/Test Position
In this condition, circuit breaker interlock mechanism is not engaged with the cubicle mounted interlock operating cam.

It is recommended that the trip-free/closing spring dump interlock be tested while the circuit breaker resides in the Disconnect/Test position. Follow the procedure below to verify the function of the trip-free/closing spring dump interlock:

1. On a de-energized bus, with the circuit breaker in the Disconnect/Test position, manually charge the circuit breaker closing spring, and bring the circuit breaker to a CLOSED condition.

2. With the circuit breaker closed and the closing spring charged, start racking the circuit breaker towards connect position.

3. As the interlock roller is actuated by the cubicle mounted interlock cam, the circuit breaker will trip (open). The circuit breaker is now “trip-free”. The circuit breaker closing spring will discharge during the racking operation.

Trip-Free in Racking Procedure
During racking the circuit breaker from Disconnect/Test to Connect or Connect to Disconnect/Test, the interlock roller is displaced and “rides” along the face of the cubicle mounted cam.

The effectiveness of the trip-free interlock can and should be tested during the racking procedure by following the steps below:

1. On a de-energized bus, rack circuit breaker to any position were interlock roller touches straight surface of cubicle mounted interlock cam.

2. Attempt to electrically charge the closing spring. As the motor cutoff switch (normally closed for operation), is being held open by the displacement of the interlock roller, no spring charging should be observed, therefore, no electrical close may be initiated.

3. Attempt to manually charge the closing spring. The closing spring should extend as expected, but fail to latch in the extended position due to the displacement of the close latch lever.

As the closing spring can not maintain a latched condition, and the trip latch lever is displaced, it is impossible to charge the closing spring and close the circuit breaker during the racking cycle.

Circuit Breaker in Connect Position (Refer to Figure 3)
Figure 3 is a picture of the circuit breaker in the Connect position.
In this position, the interlock roller resides in the cavity of the cubicle mounted cam. It is important to note that interlock roller shall slightly touch the cubicle mounted cam.

In the Connect position with the interlock roller residing in the cavity and touching slightly the cubicle mounted cam, the circuit breaker is now free to perform all required functions.

It is important to verify that the circuit breaker will perform as expected in the fully connected position. Follow the following procedure to test the functioning of the operating mechanism in the fully connect position.

**Adjustment Procedure — Trip-Free/Closing Spring Dump**

If the existing manufacturer’s cubicle is properly maintained and adjusted, no adjustment to the trip-free/closing spring dump interlock should be necessary.

Should problems with this interlock arise the first step is to verify that the cubicle is arranged as required by the original manufacturer’s specifications.

If problems still exist after reviewing this information and making any required adjustments to the cubicle, the trip-free/closing spring dump interlock can be adjusted by following the steps listed below.

**Adjustment Procedure — Interlock Mechanism** (Refer to Figure 4)

The mechanical interlock roller located at the front right hand side of the circuit breaker has been properly adjusted at the factory and no further adjustment should be necessary. For reference the circuit breaker should trip within the first 5/16" of movement as the circuit breaker is lowered from its fully raised position in cubicle. Should circuit breaker fail to trip in the first 5/16" as it is lowered from fully raised position in cubicle, slightly earlier tripping can be obtained by lengthening the interlock roller adjusting rod.

To adjust the interlock roller, first loosen both locking nuts located on the adjustable rod. When nuts are loosened, the interlock roller may be adjusted in/out by turning the adjustable rod. Interlock roller should slightly touch the cubicle mounted cam. When in adjustment lock in position with the 2 lock nuts.

After adjusting interlock mechanism repeat steps 4, 5 and 6 listed in the “Circuit Breaker in Connect Position” procedure.

If the circuit breaker still does not function as required, contact local Siemens office for information.

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**Hazardous voltages and high-speed moving parts. Will cause death, serious injury, and property damage.**

De-energize before working on this equipment.

Do not by-pass interlocks or otherwise make interlocks inoperative.
Continuous Current Interlock
The continuous current interlock functions to ensure that circuit breakers and cubicle of like continuous rating are applied and that circuit breakers with dissimilar continuous current ratings are excluded from cubicles of unlike continuous current ratings.

The continuous current interlocks are designed to match in detail and mounting location those of the interlocks applied on the original manufacturer’s circuit breaker.
Introduction and Maintenance Intervals

Periodic inspections and maintenance are essential to obtain safe and reliable operation of the circuit breaker as well as the switchgear.

When circuit breakers and/or the switchgear are operated under “Usual Service Conditions”, maintenance and lubrication is recommended at ten year intervals or at the number of operations indicated in Table 2. “Usual” and “Unusual” service conditions for Medium Voltage Metal-Clad Switchgear are defined in ANSI C37.20.2, section 8.1. Generally, “usual service conditions” are defined as an environment in which the equipment is not exposed to excessive dust, acid fumes, damaging chemicals, salt air, rapid or frequent changes in temperature, vibration, high humidity, and extremes of temperature.

The definition of “usual service conditions” is subject to a variety of interpretations. Because of this, you are best served by adjusting maintenance and lubrication intervals based on your experience with the equipment in the actual service environment.

Regardless of the length of the maintenance and lubrication interval, Siemens recommends that circuit breakers and switchgear should be inspected and exercised annually.

Recommended Maintenance and Lubrication

Periodic maintenance and lubrication should include all the tasks shown in Table 1. Recommended procedures for each of the listed tasks are provided in this section of the manual.

Table 1 — Maintenance Tasks

- Circuit breaker operator tasks
- Checks of the primary power path
  - Cleanliness check
  - Primary disconnects
- Fastener check
- Electrical control checks
  - Wiring and terminals check
  - Secondary disconnect check
  - Automatic spring charging check
  - Electrical close and trip check
- Vacuum integrity check
- High potential test
- Insulation and contact resistance tests
- Inspection and cleaning of circuit breaker insulation
- Interlock mechanism
- Functional tests
- Periodic maintenance intervals

The list of tasks in Table 1 does not represent an exhaustive survey of maintenance steps necessary to ensure safe operation of the equipment. Particular applications may require further procedures. Should further information be desired or should particular problems arise which are not covered sufficiently for the Purchaser’s purposes, the matter should be referred to the local Siemens sales office.

Removal from Switchgear

Prior to performing any inspection or maintenance checks or tests, the circuit breaker must be removed from the switchgear. Principal steps are provided here, but without the details of the preceding Installing Circuit Breaker Into Compartment section.

DANGER

Hazardous voltages and high-speed moving parts.
Will cause death, personal injury, and property damage.
De-energize before working on this equipment.
Read instruction manuals, observe safety instructions contained herein.

WARNING

Failure to properly maintain the equipment could result in death, serious injury or product failure, and can prevent successful functioning of connected apparatus.

Instructions should be carefully reviewed, understood, and followed.

The maintenance tasks in Table 1 must be performed regularly.

Removal from Switchgear

Prior to performing any inspection or maintenance checks or tests, the circuit breaker must be removed from the switchgear. Principal steps are provided here, but without the details of the preceding Installing Circuit Breaker Into Compartment section.
1. De-energize the circuit breaker by pressing the Trip pushbutton to open the circuit breaker prior to removal from the switchgear (Refer to Circuit Breaker Operator / Manual E50001-F710-A251-V1-4A00).

2. De-energize control power to the circuit breaker by opening control power disconnect device(s).

3. Rack the circuit breaker to the “DISCONNECT” position.

4. Perform the spring discharge check. This is done by first pressing the red Trip pushbutton. Second, press the black Close pushbutton. Third, press the red Trip pushbutton again, and observe the spring condition indicator. It should read Discharged (Refer to Circuit Breaker Operator / Manual SGIM-9918).

Remove the circuit breaker from the switchgear.

Circuit Breaker Operator Tasks
Perform tests as described in manual E50001-F710-A251-V1-4A00.

Checks of the Primary Power Path
Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00 and Figure 5.

![Primary Disconnects](image)

**Figure 5.** Primary Power Path

Cleaning Check
Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.

In addition to the circuit breaker operator, Figure 5 shows a side view of the circuit breaker with the insulating barriers removed in order to show the circuit breaker components.

These components must be clean and free of dirt and any foreign objects. Use a dry lint free cloth. For stubborn dirt, use a clean cloth saturated with isopropyl or isobutyl alcohol (except for the vacuum interrupters). For stubborn dirt on a vacuum interrupter use a damp cloth and then thoroughly dry using a dry lint free cloth.

The phase barriers are plates of insulating material which are attached to the circuit breaker to provide suitable electrical insulation between the vacuum interrupter primary circuits and the switchgear.

Always re-install the phase barriers carefully to their original location prior to inserting the circuit breaker into the switchgear.

**Primary Disconnects**

Figure 5 is a side view of the circuit breaker showing the primary disconnects.

Inspect the primary disconnects for physical integrity and absence of mechanical damage. Any evidence of burning or pitting would indicate weakness of the contact finger springs.

Using a clean cloth saturated with isopropyl or isobutyl alcohol, clean old lubricant from primary disconnects, and apply contact lubricant (part #15-172-791-214) in a thin layer.

**Fastener Check**
Inspect all fasteners for tightness. Replace any fasteners that appear to have been frequently removed, show damage or are missing.

**Electrical Control Checks:**

- **Wiring and Terminals Check**
  Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.

- **Secondary Disconnect Check**
  Check the terminals of the secondary disconnect.

- **Automatic Spring Charging Check**
  Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.

- **Electrical Close and Trip Check**
  Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.

**Vacuum Integrity Check**
Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.

**High Potential Test**
Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.

**Insulation and Contact Resistance Test**
Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.

*Note: Maximum Contact Resistance is read from primary bus stab to primary bus stab with primary disconnects removed. A value of 30 micro-ohms should be added to the maximum contact resistance specified in the Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.*

**Inspection and Cleaning of Circuit Breaker Insulation**
Refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00.
Table 2. Periodic Maintenance and Lubrication Tasks

<table>
<thead>
<tr>
<th>Sub-Assembly</th>
<th>Item</th>
<th>Inspect For</th>
</tr>
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| Primary Power Path         | Primary Disconnects                       | 1. Burnt or damaged fingers  
                             |                                                                           | 2. Lubrication of contact surfaces  
                             |                                                                           | 3. Tightness of nuts and other locking devices |
| Electrical Controls        | Wiring                                     | 1. Mechanical damage or abrasion |
|                            | Terminals and Connectors                  | 1. Tightness and absence of mechanical damage |
|                            | Close and Trip Solenoids, Anti-Pump Relay, Auxiliary Switches, Secondary Disconnect | 1. Automatic charging  
                             |                                                                           | 2. Close and trip with control power |
| High Potential Test        | Primary Circuit to Ground and between Primary Disconnects | 1. 60 second withstand, refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00 for ratings. |
|                           | Control Circuit to Ground                 | 1. 60 second withstand, refer to Circuit Breaker Operator Manual E50001-F710-A251-V1-4A00, |
| Insulation                | Barriers and all Insulating Components    | 1. Cleanliness  
                             |                                                                           | 2. Cracking, crazing, tracking, or other sign of deterioration |
| Interlock Mechanism        |                                           | 1. Cleanliness  
                             |                                                                           | 2. Lubrication of sliding, rotating, and articulating surfaces. Apply Anderol 732 aerosol synthetic fluid grease (part number 15-172-816-058) or Beacon #325 (part number 15-337-131-001) |