



# **IB-50010A PowlVac<sup>®</sup> Type M Ground & Test Device Manually Operated**

All Ratings Up To and Including  
15kV, 50kA/1000MVA, 3000A

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## **Contact Information**

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## Signal Words

As stated in ANSI Z535.4-2002, § 4.13-4.13.3 the signal word is a word that calls attention to the safety sign and designates a degree or level of hazard seriousness. The signal words for product safety signs are “**Danger**”, “**Warning**”, and “**Caution**”. These words are defined as:



### **DANGER**

**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



### **WARNING**

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



### **CAUTION**

**CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Not stated in ANSI Z535.4-2002, § 4.13-4.13.3 as a signal word but used in this manual is “**IMPORTANT**”. This is defined as:



### **IMPORTANT**

**IMPORTANT** indicates a section of the manual that Powell deems necessary to draw attention to which is not a potentially hazardous situation.

## Qualified Person

For the purposes of this manual, a qualified person, as stated in NFPA 70®, is one familiar with the construction and operation of the equipment and the hazards involved.

In addition to the above qualifications, one must also be:

- 1) trained and authorized to energize, deenergize, clear, ground, and tag circuits and equipment in accordance with established safety practices.
- 2) trained in the proper care and use of personal protective equipment (PPE) such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.
3. trained in rendering first aid if necessary.



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**WARNING**

***The equipment described in this document may contain high voltages and currents which may cause serious injury or death.***

***The equipment is designed for use, installation, and maintenance by knowledgeable users of such equipment having experience and training in the field of high voltage electricity. This document and all other documentation shall be fully read, understood, and all warnings and cautions shall be abided by. If there are any discrepancies or questions, the user shall contact Powell immediately at 1.800.480.7273.***

**WARNING**

***Before any adjustment, servicing, part replacement, or any other act is performed requiring physical contact with the electrical working components or wiring of this equipment, the power supply must be disconnected. Failure to follow this warning may result in injury or death.***

**IMPORTANT**

***The information in this instruction bulletin is not intended to explain all details or variations of the PowIVac Type M Ground & Test Devices, nor to provide for every possible contingency or hazard to be met in connection with installation, testing, operation, and maintenance of the equipment. For additional information and instructions for particular problems which are not presented sufficiently for the user's purposes contact Powell at 1.800.480.7273.***

## I. INTRODUCTION

### A. SCOPE

The information in this instruction bulletin describes the following PowIVac Type M Ground & Test Devices Manually Operated (***also Type PV-M Ground & Test Device Manually Operated equipment manufactured prior to January 2007***):

15kV, 3000A, 50kA/1000MVA

- 50330-G4 - 6 Stud Device
- 50330-G5 - 3 Stud Device, Upper Studs Only
- 50330-G6 - 3 Stud Device, Lower Studs Only

### B. PURPOSE

The information in this instruction bulletin is intended to provide information required to properly operate and maintain the PowIVac Type M Ground & Test Devices described in Section A. SCOPE.

This instruction bulletin provides:

- 1) Safety guidelines
- 2) General descriptions of the operation and maintenance of the PowIVac Type M Ground & Test Devices Manually Operated
- 3) Instructions for installation and placing the ground and test device into service
- 4) Instructions for part replacement
- 5) Information for ordering renewal parts
- 6) Illustrations, photographs, and description of the ground and test device

The illustrations contained in this document may not represent the exact construction details of each particular type of ground and test device. The illustrations in this document are provided as general information to aid in showing component locations.

To the extent required, the products described herein meet the applicable ANSI, IEEE, and NEMA Standards; however, no such assurance is given with respect to local codes and ordinances which may vary greatly.

The PowIVac Type M Ground and Test Device provides a means for obtaining access to the primary disconnect devices of the switchgear cell. The purpose of accessing the disconnects is to ground the primary circuits or conduct certain high voltage test procedures such as phasing out circuits or conducting high voltage withstand (hipot) tests.

### C. INSTRUCTION BULLETINS AVAILABLE ELECTRONICALLY

For more information visit [www.powellind.com](http://www.powellind.com). To contact the Powell Service Division call 1.800.480.7273 or 713.944.6900, or email [info@powellservice.com](mailto:info@powellservice.com).

## II. SAFETY

Proper use of the ground and test device described in this instruction bulletin requires use of high voltage testing equipment and procedures. Only qualified personnel experienced in such testing should operate this device.



The PowlVac® Type M Ground & Test Device is designed for use in PowlVac Metal-Clad Switchgear manufactured by Powell.

**CAUTION**

***Do NOT attempt to use this device in any other class of electrical equipment manufactured by Powell or by any other manufacturer.***

**CAUTION**

***Because of the construction of bus sectionalizing units, upper units in two-high equipment and other special types of construction, it is NOT possible to make a general statement about which set of primary disconnects is connected to the switchgear main bus and which is connected to the outgoing conductors. Before using the ground and test device, the operator must determine the physical location of the primary disconnects to be grounded or tested. This can be determined by referencing the equipment drawings or by examining the equipment.***

**WARNING**

***Do NOT attempt to use the PowlVac Type M Ground & Test Device to ground an energized circuit. An attempt to do so will result in severe damage to the device and the switchgear in which it is being used, and may result in serious injury to operating personnel.***

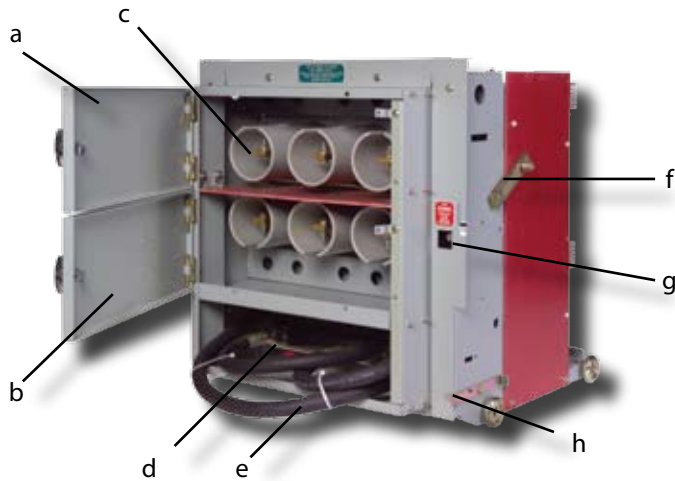
**A. SAFE WORK CONDITION**

The information in Section A is quoted from *NFPA 70E 2004 - Article 120, 120.1 Establishing an Electrically Safe Work Condition.*

**120.1 Process of Achieving an Electrically Safe Work Condition**

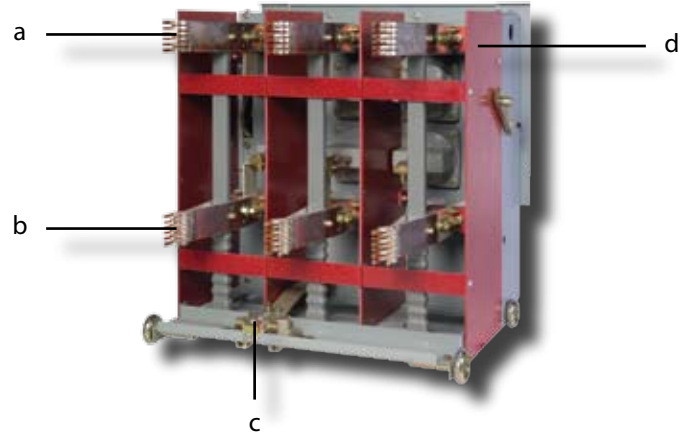
- 1) Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.
- 2) After properly interrupting the load current, OPEN the disconnecting device(s) for each source.
- 3) Wherever possible, visually verify that all drawout type ground and test devices are withdrawn to the fully disconnected position.
- 4) Apply lockout/tagout devices in accordance with a documented and established policy
- 5) Use an adequately rated voltage detector to test each phase conductor or circuit part to verify they are deenergized. Test each phase conductor or circuit part both phase-to-phase, and phase-to-ground. Before and after each test, determine that the voltage detector is operating satisfactorily.
- 6) Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being deenergized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

**Figure 1 - PowlVac Type M Ground & Test Device Front View**



- |                      |                              |
|----------------------|------------------------------|
| a. Upper Access Door | e. Grounding Cables          |
| b. Lower Access Door | f. Racking Arm               |
| c. Test Ports        | g. Racking Crank Access Port |
| d. Ground Bar        | h. Anti-Rollout Latch        |

**Figure 2 - PowlVac Type M Ground & Test Device Rear View**



- |                                  |
|----------------------------------|
| a. Upper Primary Disconnect Stab |
| b. Lower Primary Disconnect Stab |
| c. Ground Shoe                   |
| d. Barrier                       |

### III. DESCRIPTION

The PowlVac Type M Ground & Test Device is similar to the PowlVac circuit breaker and can be substituted for a circuit breaker in a metal-clad switchgear cell. Both six stab and three stab models are available.

The six stab ground and test device consists of a wheeled frame on which are mounted six primary disconnect stabs. The front of the device (Figure 1) has two access doors, upper and lower. Three test ports are mounted behind each door. Each test port is connected to one of the six primary disconnect stabs (Figure 2). The upper test ports are connected to the upper disconnect stabs and the lower test ports are connected to the lower disconnect stabs. In each group of test ports, the left, center and right test ports are connected to the left, center and right disconnect stabs respectively.

Insulation/isolation barriers between phases and between phase and ground are also provided where required.

The three stab ground and test device is similar to the six stab model except that only three primary disconnect stabs, three test ports, and one access door are furnished. Models are available with upper stabs or with lower stabs. If desired by the user, interference plates may be furnished to limit the usage of the ground and test device to specific breaker cells.

The ground and test device is equipped with a ground shoe (Figure 2) which engages the ground bus to the equipment. Three flexible grounding cables are supplied (Figure 1). One end of each cable is bolted to the ground bar. The other end may be bolted to the primary contact bar in either the upper



or the lower test port. See Section V. OPERATION, A. GROUNDING of this instruction bulletin for proper use of these cables.

The ground and test device is equipped with a racking mechanism to engage and disengage it in the cell. This mechanism is operated by the hand crank used to operate the racking mechanism on the PowlVac® circuit breakers. The ground and test device is also equipped with a rollout latch to prevent inadvertent removal from the cell.

**(Table A) Equipment Ratings**

G&T Device Number	Voltage (kV)	Amperes (kA/MVA)	Continuous Current (Amperes)
50330-G4	15	50/1000	3000
50330-G5	15	50/1000	3000
50330-G6	15	50/1000	3000

#### **A. COMPARTMENT COMPATIBILITY (APPLICATION)**

For grounding and testing purposed PowlVac Type M Ground and Test Devices can be temporarily applied in any PowlVac Switchgear circuit breaker compartment rated up to and including 15kV Rated Maximum Voltage, 50kA Rated Short Circuit Current<sup>1</sup> and 3000A Rated Continuous Current.

- 1) Also includes circuit breaker compartments rated up to and including 1000MVA.

### **IV. RECEIVING, HANDLING, & STORAGE**

#### **A. RECEIVING**

Check the shipping container for signs of damage, which could indicate possible damage to the ground and test device. If damage is found or suspected, file claims as soon as possible with the transportation company and notify the nearest Powell Representative.

#### **B. HANDLING**

The ground and test device can be handled by a forklift truck if care is taken to avoid the ground contact located under the floor pan. The forks on the truck should be set for a dimension over the forks of 28". The forks should then ride under the wheel axles. If a circuit breaker lift truck is supplied, it may also be used to lift the ground and test device. For detailed lifting procedures, refer to IB-51000B, Section IV, INSTALLATION, D. HANDLING.

#### **C. STORAGE**

Since the ground and test device is an accessory not normally in continuous use, proper storage between uses is essential to maintain the quality and usefulness of the device. The following precautions must be taken to assure the proper storage of the device:

- 1) The ground and test device should be carefully protected against condensation, preferably by storing it in a warm dry room of moderate temperature (40°F - 100°F). Devices for outdoor metal-clad switchgear should be stored in the equipment only when power is available and the heaters are in operation to prevent condensation.
- 2) The device should be stored in a clean location, free from corrosive gases or fumes. Particular care should be taken to protect the equipment from moisture and cement dust, as this combination has a very corrosive effect on many parts. For long storage periods a dust cover is recommended regardless of the atmosphere.
- 3) Unplated surfaces of rollers, latches, etc., of the racking mechanism should be coated with grease to prevent rusting.

If the device is stored for any length of time, it should be inspected periodically to see that rusting has not started and to insure good mechanical condition. Should the device be stored under unfavorable atmospheric conditions, it should be cleaned and dried out before being placed in service.

## V. OPERATION

As stated in *IEEE C37.20.6-1997, §9.5*, "Ground and test devices are used infrequently and therefore are stored for long periods of time. They should be stored in a clean, dry area, free from dust, dirt, moisture, and the like. However, even though it is assumed that the G&T device was stored properly, it should be carefully inspected and maintained before each use.

The following procedure is recommended before each use of the G&T device. The manufactures' instruction manual must be followed for specific guidance.

- a) All insulating surfaces, including but not limited to the primary support insulation, voltage probes, and isolation barriers, should be clean and dry.
- b) All primary circuits, including cables and connections, should be clean and tight.
- c) All primary and ground disconnect contacts (including terminal selector switch, if provided) should be clean, with the correct contacts in place and properly lubricated.
- d) The electrical G&T device mechanism(s), including terminal selector switch if provided, should be in proper mechanical and electrical operating condition.
- e) All locks and interlocks should be fully functional in accordance with the instruction manual of the G&T device.
- f) A 1 min power frequency voltage withstand test should be conducted on the complete G&T device in accordance with 7.4.2, except at 75% of the rated values.

**Note:** *Field tests may be conducted with dc voltage sources provided that the instantaneous dc voltage is no more than 1.414 times 75% of the normal frequency withstand ac rms voltage listed in Table 1 of IEEE Std C37.20.2-1993."*

<b>(Table B) Field Dielectric Test Values</b>	
<b>Rated Maximum Voltages (kV rms)</b>	<b>Power Frequency Withstand (kV)</b>
15	27kVAC (preferred) 38kVDC (optional)

### **DO NOT DIELECTRIC TEST THE CABLE ASSEMBLY!**

The ground and test device may be used for both grounding and testing functions. The procedures for these two types of operations differ, and are described separately below.



***Because of the construction of bus sectionalizing units, upper units in two-high equipment and other special types of construction, it is NOT possible to make a general statement about which set of primary disconnects is connected to the switchgear main bus and which is connected to the outgoing conductors. Before using the ground and test device, the operator must determine the physical location of the primary disconnects to be grounded or tested. This can be determined by referencing the equipment drawings or by examining the equipment.***



## A. GROUNDING



### **WARNING**

***Do NOT attempt to use the PowlVac® Type M Ground & Test Device to ground an energized circuit. An attempt to do so will result in severe damage to the device and the switchgear in which it is being used, and may result in serious injury to operating personnel.***

To ground a circuit, follow these steps:

- 1) Deenergize the circuit to be grounded. If there are power sources to this circuit other than the circuit breaker where the ground and test device is to be used, the switching devices at these alternate sources shall be locked or tagged open in accordance with the user's standard safety procedures to ensure that they will not be closed during the grounding operation.
- 2) Remove the circuit breaker from the switchgear cell.
- 3) With the upper ends of the grounding cables disconnected and the grounding cables stored, and with the access door or doors closed, insert the ground and test device into the breaker cell, leaving the cell door open and rack it into the connected position.
- 4) Open the access door over the test ports connected to the terminals to be grounded. Using a high voltage voltmeter and test probe rated for the system voltage, or another safe voltage measuring method, verify that the three terminals to be grounded are not energized. In a six stud application, the appropriate top or bottom access door to the energized ports which will not be grounded shall be locked or tagged for safety.
- 5) Rack the ground and test device to the disconnected position.

- 6) Bolt the free ends of the three grounding cables to the studs in the three test ports to be grounded.
- 7) Rack the ground and test device into the fully engaged position. The circuit is now grounded.
- 8) To remove the ground, rack the device to the disconnect position and remove it from the cell.

## B. TESTING

The ground and test device may be used to gain access to switchgear connections for high voltage testing. Follow these steps:

- 1) Remove the circuit breaker from the cell to be tested.
- 2) With the upper ends of the grounding cables disconnected and the grounding cables stored, and with the access door or doors closed, insert the ground and test device into the breaker cell, leaving the cell door open and rack it into the connected position.
- 3) If the testing to be done involves measurement of system voltages, such as verifying the proper phase relationship between circuits on the two sides of the device:
  - a. Open the necessary access doors.
  - b. Using proper high voltage instrumentation and observing all safety rules, make the desired measurements.

- 4) If the testing to be done involves application of test voltages, such as for high potential testing (hipot):
  - a. Insure that the circuit to be tested is deenergized. If there are power sources to this circuit other than the circuit breaker where the ground and test device is to be used, the switching devices at these alternate sources shall be locked or tagged open in accordance with the user's standard safety procedures to ensure that they will not be closed during the grounding operation.
  - b. Verify that the circuit is deenergized. Open the access door over the test ports connected to the terminals to be tested. Using a high voltage voltmeter and test probe rated for the system voltage, or another safe voltage measuring method, verify that the three terminals to be tested are not energized. In a six stud application, the appropriate top or bottom access door to the energized ports which will not be grounded shall be locked or tagged for safety.
  - c. Attach the test power leads to the appropriate test studs and conduct tests.
- 5) When testing is completed:
  - a. Remove the ground and test device from the CONNECTED position to the TEST position.
  - b. Remove the grounding cables.
  - c. Close access door or doors.

## VI. MAINTENANCE

The ground and test device requires little routine maintenance. Proper storage when the device is not in use is essential. See Section IV RECEIVING, HANDLING, AND STORAGE, C. STORAGE for storage procedures.

The contact surfaces of the primary disconnect stabs and the fingers of the ground shoe should be lubricated with a thin film of Mobilgrease 28. Before use, particularly if the device has been in storage for a long period of time, wipe these surfaces clean and apply fresh lubricant.

The levering-in device and wheels require the same lubrication as on the circuit breakers. See IB-60200A for details.

## VII. RECOMMENDED RENEWAL PARTS AND REPAIR PROCEDURES

### A. ORDERING INSTRUCTIONS

- 1) Order Renewal Parts from the Powell Service Division at [www.powellservice.com](http://www.powellservice.com) or call 1.800.480.7273.
- 2) Always specify complete nameplate information, including:
  - a. Ground and Test Device Type
  - b. Serial Number
  - c. Rated Voltage
  - d. Rated Amps
  - e. Impulse Withstand
- 3) Specify the quantity and description of the part and the instruction bulletin number. If the part is in any of the recommended renewal parts tables, specify the catalog number. If the part is not in any of the tables, a description should be accompanied by a marked illustration from this instruction bulletin or photo.



**B. RECOMMENDED RENEWAL PARTS**

A sufficient amount of renewal parts should be stored to enable the prompt replacement of any worn, broken or damaged part. A sufficient amount of stocked parts minimizes service interruptions caused by breakdowns and saves time and expense. When continuous operation is a primary consideration, a greater amount of renewal parts should be stocked, the quantity depending on the severity of the service and the time required to secure replacements.

Spare or replacement parts which are furnished may not be identical to the original parts since improvements are made from time to time. The parts which are furnished, however, will be interchangeable. See *Table C, Renewal Part Numbers* in this instruction bulletin for the recommended spare parts to be carried in stock by the user. This must be determined by the user based on the application. As a minimum, it is recommended that one set of parts be stocked per ten ground and test devices or fraction thereof.

Powell recommends that only qualified technicians perform maintenance on these units. If these ground and test devices are installed in a location where they are not maintained by a qualified technician, a spare ground and test device should be on site ready for replacement. The malfunctioning unit can then be returned to the factory for reconditioning.

**(Table C) Renewal Part Numbers**

Quantity	Description	Part Number
3	Ground Cable Assembly	50326G01P
2	Ground Shoe Finger Assembly	50952G02P
9	Primary Contact Spring Assembly (3 Stud device)	50740G02
18	Primary Contact Spring Assembly (6 Stud device)	50740G02



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