01.4IB.60025C
Powell Vacuum Integrity Tester

For Use With PowlVac® & Power/Vac® Vacuum Circuit Breakers
Rated Up To And Including 15kV
Contact Information

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Signal Words

As stated in ANSI Z535.4-2007, 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”, “Caution” and “Notice”. 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**, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

- **CAUTION**, used without the safety alert symbol, is used to address practices not related to personal injury.

- **NOTICE** is used to address practices not related to personal injury.

Qualified Person

For the purposes of this manual, a qualified person, as stated in NFPA 70E®, is one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid 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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## Contents

**Ch 1  General Information** ............................................................................................................................... 1  
  A. **Scope** .......................................................................................................................................................... 2  
  B. **Purpose** ..................................................................................................................................................... 2  
  C. **Instruction Bulletins Available Electronically** .......................................................................................... 2  

**Ch 2  Safety** ......................................................................................................................................................... 3  
  A. **Safe Work Condition** ................................................................................................................................ 3  
  B. **Safety Guidelines** ........................................................................................................................................ 3  
  C. **General** ...................................................................................................................................................... 4  
  D. **Specific** ...................................................................................................................................................... 4  
  E. **X-Rays** ....................................................................................................................................................... 4  
  F. **Safety Labels** ............................................................................................................................................... 4  

**Ch 3  Equipment Description** ............................................................................................................................. 5  

**Ch 4  Installation** .................................................................................................................................................. 7  

**Ch 5  Operation** .................................................................................................................................................. 8  

**Ch 6  Maintenance** .............................................................................................................................................. 11  

**Ch 7  Powell Vacuum Integrity Tester Specifications** .......................................................................................... 12
Figures

Figure 1  Powell Vacuum Integrity Tester ................................................................. 5
Figure 2  Control Module ......................................................................................... 6
Figure 3  High Voltage Module ............................................................................... 6
Figure 4  Vacuum Integrity Tester Typical Connections ........................................... 9
Figure 5  Control Module and Circuit Breaker Connections - Front View ............. 9
Figure 6  High Voltage Module and Circuit Breaker Connections - Rear View ....... 9

Tables

Table A  Specifications ............................................................................................. 12
Ch 1 General Information

**WARNING**

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

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**

*Prior to adjustments, servicing, maintenance, or any act requiring the operator to make physical contact with the equipment, the power source must be disconnected and the equipment grounded. Failure to do so may result in death or serious injury.*

**NOTICE**

*The information in this instruction bulletin is not intended to explain all details or variations of the Powell equipment, 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.*

**NOTICE**

*Powell reserves the right to discontinue and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.*
A. Scope

The information in this instruction bulletin describes the following Powell Vacuum Integrity Testers for use with PowlVac® and Power/Vac® vacuum interrupters rated up to 15kV.

- 60900G04 - 60Hz
- 60900G06 - 50Hz

B. Purpose

The information in this instruction bulletin is intended to provide details required to properly operate the Powell Vacuum Integrity Testers described in Ch 1 General Information, A. Scope.

This instruction bulletin provides:

1. Safety guidelines
2. General descriptions of the operation of the Powell Vacuum Integrity Tester
3. Illustrations, photographs, and description of the vacuum integrity tester

The illustrations contained in this document may not represent the exact construction details of the Powell Vacuum Integrity Tester. The illustrations in this document are provided as general information to aid in showing component locations.

All illustrations and photos are shown using deenergized equipment.

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.

C. Instruction Bulletins Available Electronically

Changes to the instruction bulletin may be implemented at any time and without notice. Go to powellind.com to ensure use of the current instruction bulletin for Powell equipment.

For more information visit powellind.com. To contact the Powell Service Division call 1.800.480.7273 or 713.944.6900, or email info@powellservice.com.

For specific questions or comments pertaining to this instruction bulletin email documents@powellind.com with the IB number in the subject line.
Ch 2 Safety

A. Safe Work Condition

The information in Section A is quoted from NFPA 70E 2012 - 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 blades of the disconnecting devices are fully OPEN or that drawout type circuit breakers 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.

B. Safety Guidelines

Study this instruction bulletin and all other associated documentation before operating the vacuum integrity tester.

Each user has the responsibility to instruct and supervise all personnel associated with usage, installation, operation, and maintenance of this equipment on all safety procedures.

Furthermore, each user has the responsibility of establishing a safety program for each type of equipment encountered.

The safety rules in this instruction bulletin are not intended to be a complete safety program. The rules are intended to cover only some of the important aspects of personnel safety related to Powell Vacuum Integrity Tester.

Informational Note: See ANSI/ISA-61010-1 (82.02.01)/UL 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements, for rating and design requirements for voltage measurement and test instruments intended for use on electrical systems 1000 V and below.
C. General

1. Only supervised and qualified personnel trained in the usage, installation, operation, and maintenance of a circuit breaker shall be allowed to work on this equipment. It is mandatory that the appropriate instruction bulletins, supplements, and service advisories be studied, understood, and followed.

2. Maintenance programs must be consistent with both customer experience and manufacturer's recommendations, including service advisories and instruction bulletin(s). A well planned and executed routine maintenance program is essential for circuit breaker’s reliability and safety.

3. Service conditions and circuit breaker applications shall also be considered in the development of safety programs. Variables include ambient temperature; humidity; actual continuous current; thermal cycling; number of operations; interrupting duty; and any adverse local conditions including excessive dust, ash, corrosive atmosphere, vermin and insect infestations.

D. Specific

1. **DO NOT WORK ON ENERGIZED EQUIPMENT.** If work must be performed, remove the equipment from service.

2. **ALL CONDUCTORS MUST BE ASSUMED TO BE ENERGIZED UNLESS THEIR POTENTIAL HAS BEEN MEASURED AS GROUND AND SUITABLE GROUNDING CONDUCTORS HAVE BEEN APPLIED TO PREVENT ENERGIZING.** Many accidents have been caused by back feeds from a wide variety of sources.

3. **ALL COMPONENTS SHALL BE DISCONNECTED BY MEANS OF A VISIBLE BREAK AND SECURELY GROUNDED FOR SAFETY OF PERSONNEL PERFORMING OPERATIONS.**

E. X-Rays

When high voltage is applied across the contacts of a vacuum interrupter, there is the possibility of generation of X-rays. The intensity of the X-radiation is dependent on the peak voltage and the contact gap. At the normal operating voltage for this type of equipment, the radiation levels are negligible. At the voltages specified for testing, test personnel shall be in front of the circuit breaker such that the two layers of steel used in the frame and front cover construction are between the test personnel and the vacuum interrupters, and that the test personnel be no closer than one meter (3’) from the front of the circuit breaker. **THE CIRCUIT BREAKER SHALL BE FULLY OPEN WHEN MAKING HIGH POTENTIAL TESTS.**

F. Safety Labels

The equipment described in this document has **DANGER, WARNING, CAUTION,** and instruction labels attached to various locations. All equipment **DANGER, WARNING, CAUTION,** and instruction labels shall be observed when the vacuum integrity tester is handled or operated.

**NOTICE**

*Warning and Caution labels are located in various places. Do not remove or deface any of these warning/caution labels.*
Ch 3  Equipment Description

NOTICE

Powell is committed to continuous product improvement.

It is possible that improvements occurred between revisions to this document and therefore, may not be described in these instructions. If the equipment does not resemble the photographs and descriptions contained herein, contact Powell before attempting to perform any actions.

The Powell Vacuum Integrity Tester is designed to apply a high voltage AC signal across the open contacts of a vacuum interrupter for approximately 10 seconds. It is calibrated to automatically shut down if a current of approximately 55mA is detected flowing across the vacuum interrupter contacts.

It should be noted that because the vacuum interrupter is mounted on a circuit breaker, there will be leakage current associated with the circuit breaker insulation system. This leakage current may give a false indication of interrupter failure. For this reason, the circuit breaker must be cleaned in accordance with the instructions found in the appropriate instruction bulletin for the circuit breaker prior to testing. Refer to Ch 5 Operation for specific details on evaluating failure indications.
Figure 2  Control Module

a. Power Indicator (Amber LED)
b. Control Power Output Connection
c. Fail Indicator (Red LED)
d. Pass Indicator (Green LED)
e. High Voltage Indicator (Red)
f. Test Push Button
g. Fuse Drawer
h. Reset Push Button
i. Power Inlet/On-Off Switch

Figure 3  High Voltage Module

a. High Voltage Output Lead for Upper VI Terminal (HV-1)
b. High Voltage Output Lead for Lower VI Terminal (HV-2)
c. Incoming AC Control Cable
d. Earth Ground Connection
Ch 4 Installation

The vacuum integrity tester requires no installation other than the connection procedure described in *Ch 5 Operation*. 
Ch 5  Operation

The vacuum integrity tester is internally protected by BUSS type MDL 5 fuses.

CAUTION
Do not substitute fuse types or operate without fuse protection.

Note: Always clean the circuit breaker in accordance with the recommended maintenance procedures prior to this test.

Perform the following steps to operate the Powell Vacuum Integrity Tester:

1. Place the circuit breaker in a location for testing which is inaccessible to personnel other than the tester and/or barrier a test perimeter with caution labels.
2. Open the tester and perform the following:
   a. Place the high voltage module close to the test sample primary disconnects.
   b. Connect the HV-1 lead (Figure 3, a) to the upper primary disconnects, or upper stem of the vacuum interrupter to be tested.
   c. Connect the HV-2 lead (Figure 3, b) to the lower primary disconnects, or lower stem of the vacuum interrupter to be tested. Note that it is at ground potential.
   d. Connect the earth ground cable (Figure 3, d) to a known ground source.
   e. Move the control module to the front of the circuit breaker, approximately one meter away from the front cover, as shown in Figure 4.
   f. Connect the AC control cable (Figure 3, c) from the high voltage module to the control module.
   g. Connect the control module to a 120VAC source capable of a minimum output of 15 amperes. Be certain the frequency of the source is correct for the test device. Incorrect source frequency can produce erroneous test results.
3. Ensure that the circuit breaker is open and press the power "ON" push button on the control panel (Figure 2, i). The power light will illuminate. If the "PASS" or "FAIL" lights illuminate on the power up cycle, press the "RESET" push button (Figure 2, h) to clear the circuit.
4. To Test:
   a. Press the "RESET" push button to clear the circuit, only the "POWER" (Figure 2, a) light should be illuminated.
   b. Press the "TEST" push button (Figure 2, f) to initiate the test. The high voltage indicator (Figure 2, e) will illuminate.
Figure 4  Vacuum Integrity Tester Typical Connections

- a. Voltage Lead (Red)
- b. Circuit Breaker
- c. High Voltage Module
- d. Control Power Cable
- e. AC Power Cord
- f. Control Module High
- g. Earth Ground
- h. High Voltage Lead (Black)

Figure 5  Control Module and Circuit Breaker Connections - Front View

Figure 6  High Voltage Module and Circuit Breaker Connections - Rear View
c. The test will apply high voltage across the vacuum interrupter contact gap for approximately 10 seconds.
   i. PASS is indicated by the extinguishing of the high voltage indicator and the "PASS" light illuminating (Figure 2, d).
   ii. "FAIL" is indicated by the extinguishing of the high voltage indicator and the "FAIL" light illuminating (Figure 2, c). A failed condition will lock the circuit for approximately 1 minute. Reset is not possible until the lock out timer has released. This allows the high voltage transformer to cool prior to the next test.

**Note:** A "FAIL" indication is not always indicative of a failed vacuum interrupter. When a failure occurs, it is advisable to thoroughly clean that phase that has failed and retest. If a second failure is indicated, a test of the circuit breaker insulation with the circuit breaker in the "CLOSED" position is recommended to verify that failure is not due to damaged insulation.

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**CAUTION**

Ground the vacuum interrupter upper stem and midband ring, if present, prior to touching the interrupter.

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5. To test other phases, move the HV-1 lead and HV-2 lead to the desired phase and repeat Steps 2 through 4.
Ch 6  Maintenance

There are no user serviceable parts on the Powell Vacuum Integrity Tester. Should the device fail, contact the Powell Service Division for assistance at 1.800.480.7273 or 713.944.6900, or email info@powellservice.com.

Follow these steps to ensure the proper function of the vacuum integrity tester:

1. Store in a clean, climate controlled area when not in use. Note that local conditions such as humidity, salt-laden atmosphere, corrosive gases, or excessive dust are considered to be abnormal service conditions and may adversely affect the performance of the vacuum integrity tester.

2. Clean after each use. Specifically the high voltage leads and the high voltage module should be cleaned, removing any dirt, or contaminates, which may have been contacted during use. A dry lint-free cloth or an industrial wiper can be used to clean the vacuum integrity tester. If dirt adheres, and cannot be removed by wiping, clean with a mild solvent such as denatured alcohol. Be sure that the equipment is thoroughly dry before returning to service.

   **CAUTION**

   *Do not use any detergent to wash the insulators as detergent may leave an electrically conducting residue when it dries.*

3. Check for abnormal mechanical wear and any reduction in spring force that would reduce the ability of the alligator clips on the high voltage leads and the ground lead to remain attached during operation.
# Table A Specifications

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<th>Description</th>
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<td>&lt;10 A</td>
<td>&lt;10A during passing test</td>
<td>&lt;10A during passing test</td>
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<td>&gt;11.5A at</td>
<td>&gt;11.5A at failure/100A MAX for 0.06 s</td>
<td>&gt;11.5A at failure/100A MAX for 0.06 s</td>
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<td></td>
<td>failure/100A MAX for 0.06 s</td>
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<tr>
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<tr>
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<td></td>
<td>@ fail</td>
<td>&gt;0.55mA @ fail indication</td>
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<td></td>
<td>indication</td>
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<td>0.5A MAX for 0.06 s (fuse protection)</td>
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<td><strong>Weight</strong></td>
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