

# Typical Factory Test Procedures for Medium Voltage Products

Bulletins 1500, 6000, 7000, 7700



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## Summary of Changes

This publication contains new and updated information as indicated in the following table.

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Added Physical Inspection section	2
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## Scope

This document provides a general description of the tests performed on medium voltage products manufactured by Rockwell Automation. All testing procedures are developed and controlled under the guidelines of the Rockwell Automation quality system. This system is registered to ISO 9001, and is regularly reviewed and audited by a third-party registrar.

The tests are performed in accordance with applicable requirements and/or specifications of Canadian Standards Association (CSA), Underwriters Laboratories (UL), National Electrical Manufacturers Association (NEMA), European Standard (EN) and International Electrotechnical Commission (IEC), and to the capability of the Rockwell Automation test facility.

## Physical Inspection

1. Verify that the drawings and other project-specific documentation are correct, and make sure that the order number, customer name, and project name are consistent on all documents.
2. Verify component certifications, as required.
3. Verify that the product meets all applicable engineering and workmanship standards and specifications.
  - Verify paint quality.
  - Verify that all components are present, not damaged, and are correctly installed.
  - Verify structural integrity.
4. Verify that warning nameplates and isolation barriers are present to protect personnel and equipment.
  - Check for appropriate warning labels and nameplates to advise personnel of possible hazards.
  - Check that appropriate barriers are in place to isolate all medium voltage compartments. Barriers are to ensure that personnel cannot touch live medium voltage in a cell that is otherwise de-energized.
5. Verify that bus and bus connections have proper clearance, creepage, phasing, and torque.
  - Visually check to verify electrical clearances, creepage allowances, and bend radii.
6. Check the tightness of all control and power wires.
  - All hardware connections are torqued to standards and all crimps are proper.
  - Check for cross-threaded hardware.
7. Verify the mechanical interlocks.
  - Verify the operation of any isolation switches, mechanical interlocks, and door interlocks.

## Electrical

1. Functional checks are performed wherever possible; otherwise, inspection and continuity checks are made.
  - Continuity checks are performed on all parts of the control circuit that cannot be verified by cycling the equipment.
  - Trace or continuity checks are performed on all power wiring.
  - Verify the control wiring is identical to the electrical schematics.
2. A “HI-POT” dielectric withstand test is performed on all buswork and power cables from phase-to-phase and phase-to-ground (except solid-state components, low voltage controls, and instrument transformers). The voltage level that is used for this test depends on the nominal AC voltage of the product ([Table 1](#)).

**Table 1 - Hi-POT Tests on Medium Voltage Components**

Medium Voltage Product	Nominal AC Voltage	Hi-POT AC Voltage	Duration
Starters	2300...5000	16,000	1 s
	5000...7200	22,000	1 s
Drives/SMCs	2400	8000	1 min
	3300...5000	13,500	1 min
	5000...7200	18,500	1 min
	10,000...12,000	28,000	1 min
	12,000...15,000	36,000	1 min

3. Component devices are functionally operated in circuits as shown on electrical diagrams or as called for by specific test instructions.
  - Calibration of printed circuit boards according to specifications.
  - I/O checks
  - Programmable devices
4. Instruments, meters, protective devices, and associated controls are functionally tested by applying the specified control signals, current and/or voltages. Multi-function protective relays and like devices are not programmed – these types of devices are only functionally tested.
5. The product must function in accordance with the electrical diagram.
  - a. Medium voltage starters are inspected for the following:
    - Electrical interlocking
    - Overload protection and ground fault, if applicable
  - b. Medium voltage Smart Motor Controllers (SMCs) are inspected for the following:
    - Electrical interlocking
    - Motor protection and ground fault
    - Motor start tests at rated voltage
    - Motor stop tests (if applicable) at rated voltage

c. The following tests are performed on MV drives, as applicable:

- Control power failure test
- Rectifier gating checks
- Inverter gating checks
- Line converter tests
- Machine converter tests
- Load tests
- Power module failure tests
- Transformer over-temperature tests
- Cooling fan failure tests
- Remote control tests

Drives are accelerated to the test facility's nominal frequency of the motor, under load, and then decelerated to 10 Hz. This cycle may be repeated continuously for up to 0.5 hour.

Drives are tested under constant load at the nominal frequency of the test motor.

## Witness Test

An optional witness test is available. This test is conducted at the Rockwell Automation manufacturing facility. The witness test is hosted by a Rockwell Automation Application Engineer and/or Project Manager and Quality Control Inspector.

A review of the electrical and mechanical drawings for the purchased equipment is done with the Application Engineer and/or the Project Manager before starting the witness test. The witness test is separated into two individual elements: equipment physical inspection and electrical inspections.

### 1. Physical inspection

- All power and ground bus hardware is present and labeled.
- Engraving of unit and master nameplates are correct.
- Physical layout and dimensions of the equipment are verified against engineering documentation.
- All components are verified against engineering documentation to be present and correctly installed.
- Warning nameplates, isolation barriers, and mechanical interlocks must provide sufficient safety/isolation for personal and equipment.
- Verify operation of isolation switch handle and door interlocks.

### 2. Electrical inspection

- Control power at the rated voltage is applied to the equipment and a functional demonstration of customer purchased options and control devices is completed.
- Instruments, meters, protective devices, and associated controls are functionally tested by applying the specified control signals, current and/or voltages.
- The operation of the vacuum contactor is demonstrated, where applicable.
- IntelliCENTER® system operation is demonstrated, where applicable.

3. Medium voltage operation - MV drives and soft starters are temporarily installed in the MV test bay and operated on an MV dynamometer.
  - Applying voltage to the equipment and connecting to a test motor in the MV test facility.
  - Medium voltage soft starters will have their starting and stopping functionality demonstrated by starting and stopping the test motor.
  - Medium voltage drives are operated over a range of operating speeds and loads on a dynamometer, up to the maximum capability of the designated test facility.

## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-4.1</a>	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, <a href="http://www.rockwellautomation.com/global/certification/overview.page">http://www.rockwellautomation.com/global/certification/overview.page</a>	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/global/literature-library/overview.page>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

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## Rockwell Automation Support

Use the following resources to access support information.

<b>Technical Support Center</b>	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	<a href="http://www.rockwellautomation.com/knowledgebase">www.rockwellautomation.com/knowledgebase</a>
<b>Local Technical Support Phone Numbers</b>	Locate the phone number for your country.	<a href="http://www.rockwellautomation.com/global/support/get-support-now.page">www.rockwellautomation.com/global/support/get-support-now.page</a>
<b>Direct Dial Codes</b>	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	<a href="http://www.rockwellautomation.com/global/support/direct-dial.page">www.rockwellautomation.com/global/support/direct-dial.page</a>
<b>Literature Library</b>	Installation Instructions, Manuals, Brochures, and Technical Data.	<a href="http://www.rockwellautomation.com/literature">www.rockwellautomation.com/literature</a>
<b>Product Compatibility and Download Center (PCDC)</b>	Get help determining how products interact, check features and capabilities, and find associated firmware.	<a href="http://www.rockwellautomation.com/global/support/pcdc.page">www.rockwellautomation.com/global/support/pcdc.page</a>

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Publication 1500-TD220F-EN-E - June 2016

Supersedes Publication 1500-TD220E-EN-E - August 2014

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