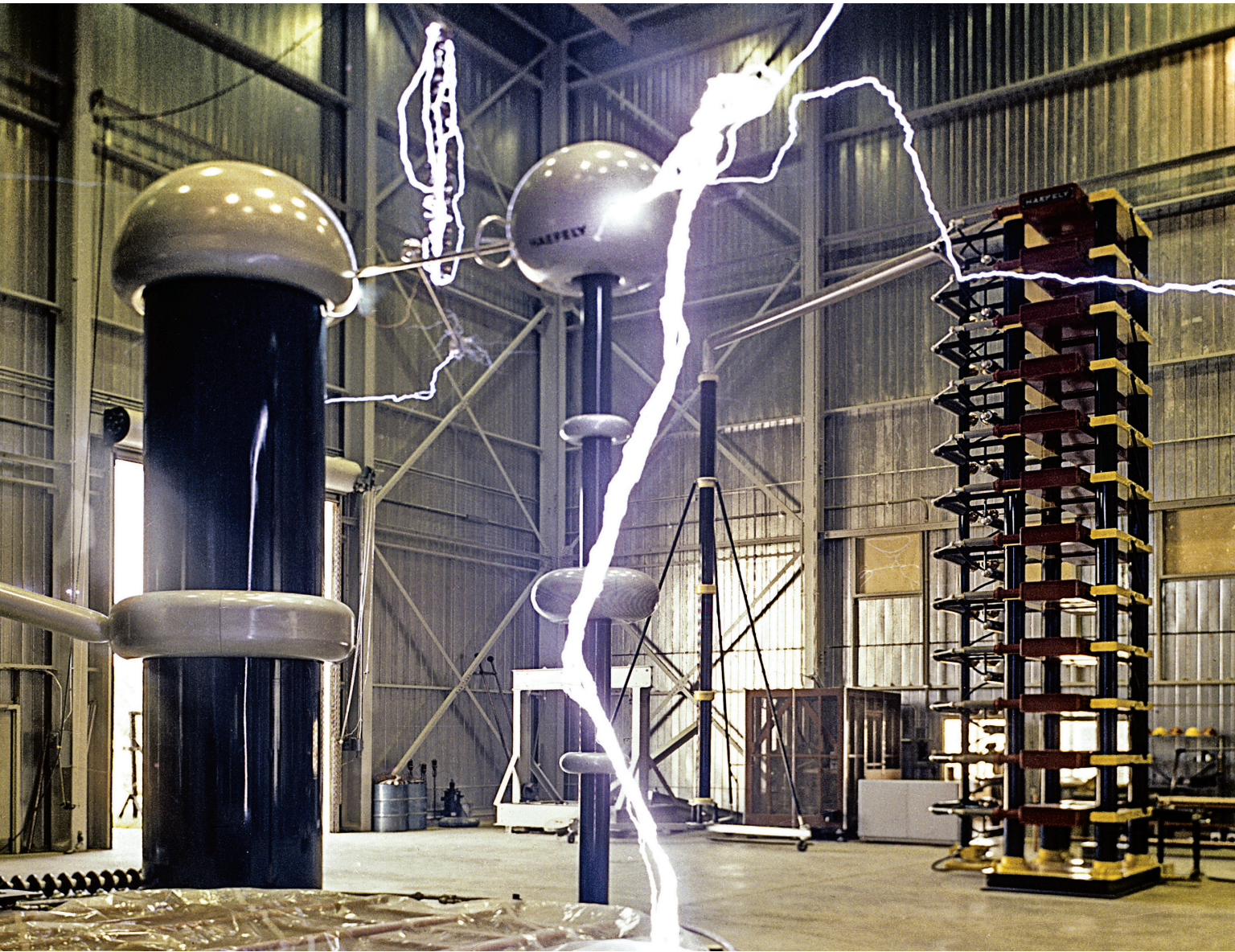


HUBBELL LABORATORIES

CAPABILITY GUIDE



INTRODUCTION

Hubbell Power Systems, Inc. manufactures a wide variety of products for the electric utility, telecommunications, civil construction, transportation, gas and water industries. Hubbell operates two engineering test laboratories, providing testing services in support of internal engineering research and product development. The Hubbell Laboratories are also contracted by third-party customers and manufacturers for confidential testing.

CHANCE® ENGINEERING RESEARCH LABORATORY

The F. Gano Chance Engineering Research Laboratory, located in Centralia, Missouri, was constructed in 1961 by the then A.B. Chance Company. Today the fully renovated building hosts the Engineering Laboratory and the HPS Customer Service Center and is located across the street from the Distribution Center.

The facility consists of four primary test laboratories: Short Circuit, High Voltage, Mechanical, and Environmental. Additionally, machine shop facilities are located on site. The building contains 26,000 sq-ft of laboratory space under roof and is surrounded by acres of green field space used for various outdoor testing.

FRANK B. BLACK RESEARCH CENTER

The Frank B. Black Research Center, conveniently located in Wadsworth, Ohio south of Cleveland, was opened in 1968 by the Ohio Brass Company with the primary purpose of developing and testing world-class insulators, surge arresters and cable accessories for underground systems.

Today the Research Center is the home for Hubbell's state of the art High Voltage Test Laboratory in addition to facilities for arrester MOV block testing, mechanical, environmental and polymer development testing.



SHORT CIRCUIT LABORATORY

Located in Centralia, Missouri, the Short Circuit Laboratory is used to establish high current withstand and interruption ratings on Hubbell made switchgear, fusing, arresters, insulators, connectors and grounding products. In 2014, Hubbell completed a 5 million dollar upgrade to the laboratory, which consisted of re-manufacturing the generator rotor, installation of solid state control equipment, and improvements in digital data acquisition and facilities.

GENERATOR FEATURES INCLUDE:

- Rated 1,000 MVA / 575 MVA Three /Single-Phase
- Terminal Voltages from 2.4 kV to 18 kV
- 1,500 HP Drive Motor Prime Mover
- Test Frequency Controlled by MV4000 Variable Speed Drive
- Generator Voltage Regulation by Solid State Ex2100e Generator Excitation System

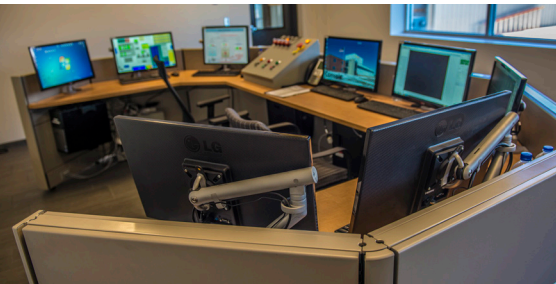
TEST TRANSFORMERS

- Power Transformers to increase voltage up to 69kV
- High Current Stepdown Transformer to create fault current up to 120kA for 3 seconds.

ADDITIONAL FEATURES

- Synchronous Closing Switch for Peak and Asymmetrical Offset Control
- Digital Data Acquisition and Waveform Processing
- Full-Color High Speed Video, full HD up to 3,600 fps, reduced resolution up to 500,000 fps
- Modern Customer-Focused Control Room with Private Customer Conference Room

TEST VOLTAGE	MAXIMUM SYMMETRICAL CURRENT (A)	MAX DURATION AT MAX CURRENT (CYCLES)
600	120,000	180
9,000	50,000	15
15,500	30,000	15
27,000	12,000	15
38,000	5,000	15
69,000	2,000	15



SHORT CIRCUIT TESTS PERFORMED

FAULT INTERRUPTING & LOAD SWITCHING TESTS FOR:

- High-Voltage Switchgear
- High-Voltage Fuses
- Distribution Cutouts
- Vacuum and Oil Reclosers
- Separable Connectors
- Circuit Breakers

FAULT CLOSING TESTS FOR:

- Separable Connectors
- Vacuum and Oil Reclosers
- High-Voltage Switchgear
- Circuit Breakers

HIGH CURRENT GROUNDING / MOMENTARY TESTS FOR:

- Smart Grid Sensors
- Current Transformers
- Temporary Protective Grounding
- Permanent Substation Grounding
- High-Voltage Switchgear
- Connectors
- Grounding Busswork / Studs
- Bushings
- Under Oil Tap Changers and Switches
- Arc Flash Protection Equipment
- Insulating Meter Pullers

POWER ARC & TRAVELING ARC TESTS FOR:

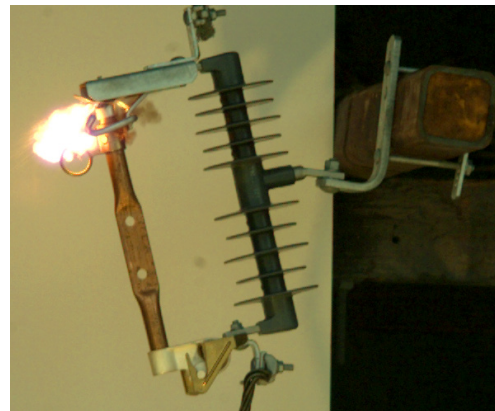
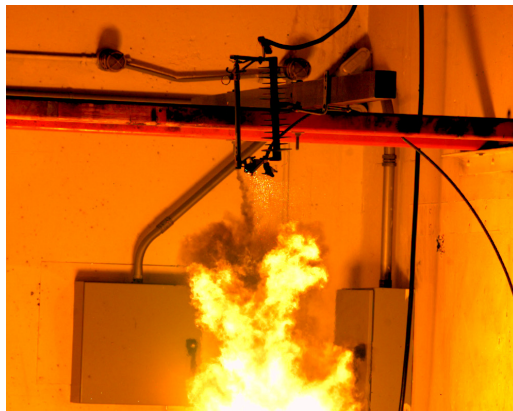
- Smart-Grid Sensors
- Insulators
- Arresters
- Conductor Cables
- Animal Guards
- Arc-Flash Clothing and PPE

TRANSFORMER SHORT-CIRCUIT TESTS

- Distribution Transformers
- Instrumentation Transformers
- Station Service Transformers
- Current Transformers

CONTINUOUS CURRENT TESTS

- Connectors and Splices
- Under-Oil Tap Changers and Components
- Bushings
- Conductor Cables



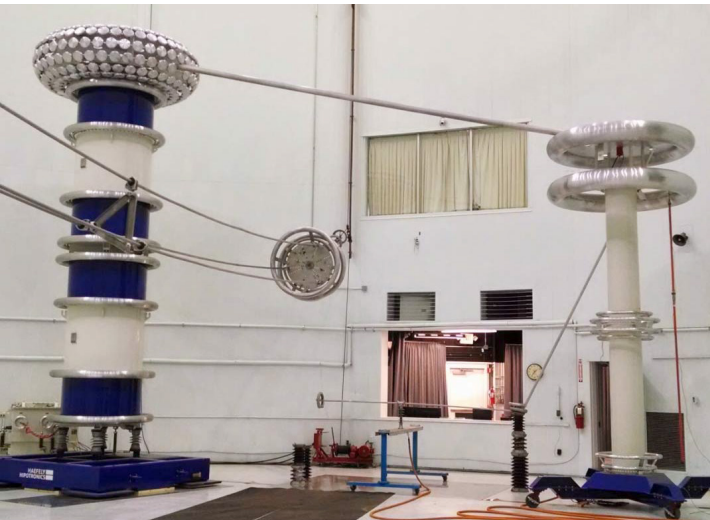
HIGH VOLTAGE TEST LABORATORIES

The High Voltage Test Laboratory in Wadsworth, Ohio is one of the premiere test locations in North America for performing High Voltage AC and Impulse testing. In 2014, the laboratory completed the installation of a Haefely / Hipotronics 800kV Series-Resonant Test Set in addition to a Haefely DDX 9121 Partial Discharge and RIV Detector Measurement System for the corona tests on insulators, arresters and transmission grade smart grid products.

The laboratory has multiple high voltage impulse generators with capability up to 5,000kV peak voltage.

The High Voltage Laboratory in Centralia, Missouri has a 1,000kV voltage generator in addition to impulse capability up to 2,000kV peak voltage.

Both high voltage laboratories are contained in large indoor test bays, providing an ideal test environment independent of weather conditions, critical for corona testing and certification testing of aerial devices.



HIGH VOLTAGE TESTS PERFORMED

HIGH VOLTAGE AC TESTS PERFORMED:

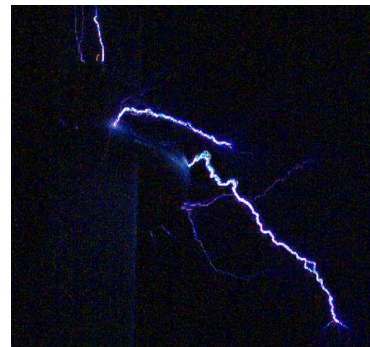
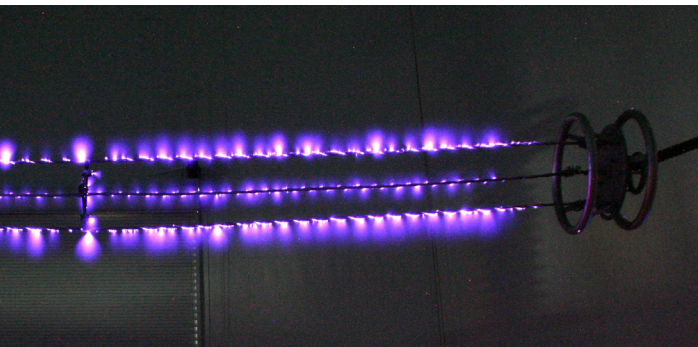
- Dry/Wet Withstand and Flashover Tests for Insulators, Arresters, Switchgear up to 1,000kV
- Leakage Current Tests on Insulating Materials and Hotline Tools
- Corona, Partial Discharge, and Radio Interference Voltage (RIV) Tests for Transmission Grade Connectors, Insulators, Arresters and Smart Grid Products
- Electrical Qualification Tests for Insulating Aerial Devices (Bucket Trucks)
- Ozone and Corona Testing for Insulating Cover-up Equipment and Tools
- Arrester Disconnecter Detonation Tests up to 800A

HIGH VOLTAGE IMPULSE TESTS

- Lightning and Switching Impulse Tests up to 5,000kV

HIGH CURRENT IMPULSE TESTS

- 4/10Qs, 8/20Qs Impulse Current Test up to 200kA
- 36/90Qs Switching Impulse Current Test up to 10kA
- 1/2Qs Front-of-wave/Steep Impulse Current Test up to 20kA
- Low-current Long-duration Impulse Current Test up to 3000A
- IEC and IEEE Combined Operating Duty Type Tests



MECHANICAL AND ENVIRONMENTAL TEST CAPABILITIES

TRANSMISSION INSULATOR CANTILEVER TESTS

- Max Sample Height 14'
- Max Tension 46,000 Lbs, 60" stroke
- Cyclic Loading 7,530 Lbs, 16" stroke,

POLYMER MATERIAL ACCELERATED WEATHERING TESTING PER IEC 61109 AND IEC 60099-4

- Chamber 8' x 10' x 8'
- Up to 6' long samples
- Applied Voltage 44kV
- Ultraviolet Light UVA-240, UVB-313
- Xenon Arc - UV Source
- Applied Heat up to 50C
- Humidity up to 100%
- Simulated Rain
- Salt Fog

SALT FOG TESTING PER ASTM B117

ULTRAVIOLET TESTING PER ASTM G154

VERTICAL TENSION / COMPRESSION TESTS

- 300,000 Lbs, 12" Stroke
- 160,000 Lbs, 72" Stroke

THERMAL CYCLING TESTS

- -77C to 177C
- Volume 34" x 30" x 32"
- High-Temperature Testing Up to 325C



CONTACT INFORMATION

To arrange a tour of Hubbell Laboratories, contact your local Hubbell Power Systems Representative.
To discuss contracted third-party testing, please contact the following laboratory managers:

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