

# HIGH POWER TEST LAB

SOLUTIONS GUIDE

Offering accurate and confidential test lab services to improve product safety & reliability.



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# High Power Test Lab

The Mersen Test Lab maintains UL third party accreditation and is compliant with ISO/IEC 17025. We offer customers an accurate, reliable and confidential process for testing and qualifying products, applications and design concepts, as well as testing to a wide variety of regulatory standards.

A focus on efficiency makes the Mersen test facilities extremely productive and affordable for all your testing needs. Customers turn to us to avoid the inconveniences of long lead-times for test dates, and to gain the advantages of rapid set-up and change-over times allowing us to provide you with more “shots” per day. Our customers expect flexibility, and we make every effort to accommodate their unique testing requirements.

Mersen offers our customers global test capabilities for testing products in North America (Newburyport, Massachusetts) and in Europe (Saint Bonnet de Mure, France). Our labs are complementary regarding AC versus DC capabilities, and UL-CSA testing versus IEC testing.



## Testing for whom, for what?

### You are...

- Purchaser
- Technician/designer
- R & D
- Quality, approval, entry inspection manager
- Engineer
- Insurance company
- Official approval or listing agency

### You design and manufacture...

- Semiconductors or equipment incorporating SCs: soft starters, rectifiers, inverters, drives
- Transformers
- Disconnects, circuit breakers, switches
- Electrical boards
- Surge protection devices (SPDs)

### You want to run tests...

- To qualify products or a design concept, to check selectivity, to validate a critical step in a project
- To inspect production
- For a customer checking procedure
- For approval

# High Power Test Lab Services

## High-Power Test

- Short-circuit tests
- Short-line fault tests
- Out-of-phase making and breaking tests
- Short-time withstand current and peak withstand current tests
- Capacitive current switching tests
- Magnetizing and small inductive current switching tests
- Making tests
- Mainly active load current switching tests
- Bus transfer current switching tests
- Cable discharge tests
- Shunt-reactor current switching tests
- Internal arcing tests
- Pressure relief tests
- Electromagnetically current switching tests
- Electrostatically current switching tests
- Line discharge tests
- Temporary over-voltage tests

## High Voltage Test

- DC voltage test
- AC voltage test
- Lightning impulse test
- Switching impulse test
- Fast transit surge voltage test
- Wet test
- Artificial pollution test
- Measuring surge
- Measuring partial discharge
- Measuring space charge
- Measuring RIV

## Low Power Tests

- Clearing test
- Cycling test
- Temperature test
- Verification to regulatory standards

## Surge Lab tests

- Tests of lightning current and surge arresters
- Tests of external lightning protection components
- Complete test of low voltage distribution boards
- Tests of components of wind power systems, photovoltaic systems, and cell sites



# Newburyport Test Lab Facilities

## High-Power Facility

All testing is controlled and can be observed in the safety of a separate, isolated control room. The test cells and operators are segregated for safety, and operators control all test functions via state-of-the-art digital or fiber optic links to the test station cells. Short circuit test data is conveniently collected via the control room in a variety of ways:

Acquired by Digital Storage Scopes through:

- Coaxial shielded double-cable
- Fiber Optic isolation transmitters and receivers

High fault currents and voltages are linearly stepped-down, or transduced to low level signals that can be measured by the scopes by using:

- Resistive shunts
- Current transformers
- Isolation transformers

All signal analysis equipment is calibrated with a tolerance of +/- 1%.

## Test Cells/Device Connection

The test area is comprised of a 3-cell configuration.

**Cell 1:** Primarily used for single-phase testing – fuses, single-pole breaker, mov's, cable connectors, etc.

**Cell 2:** All 3-phase testing is completed in this location – 3-phase switch-gear, motor controllers, transformers, circuit-breaker etc.

**Cell 3:** This is our medium-voltage cell (max. – 38,000 volts) All devices under test are connected directly to the associated cell's copper bus-bar.



# Newburyport Test Lab Facilities

## High-Power Testing Capabilities

### Power

Our test station uses two 3600 RPM synchronous alternators used in parallel to produce the high currents for short-circuit testing. Each alternator is driven by a 4160 volt, 536 hp electric motor.

### Load

Currents from the generators are fed to Mersen's custom made load banks consisting of high power resistors and concrete reinforced inductors. The load banks are quickly adjustable to allow short circuit current regulation from 1 – 100,000 amperes with a full range of power factors for AC circuits and time constants for DC circuits .

### Output

A wide variety of test voltages can be produced, allowing a corresponding range of short circuit test-currents. To acquire desired test voltages, test lab engineers monitor and adjust generator excitation current via remote control.

### DC Rectifier

Direct Current test circuits are energized by a highspeed, bounce-free synchronized closing switches. DC capabilities include currents + 100,000 amps and below, at a variety of voltage ratings.

## Newburyport Surge Lab Capabilities

- UL 1449 compliant, 20kA – 8/20 $\mu$ S nominal discharge generator
- 200kA - 8/20 $\mu$ S surge generator
- 20kA - 10/350 $\mu$ S surge generator

## Low Power Testing Capabilities

### Clearing Test

0 – 6000 Amps continuous

### Cycling Test

- Simulates starting and stopping of a system
- 0 – 3000 Amps for a given cycling rate – not a continuous rating

### Temperature Test

Custom system used to monitor and store temperature data over a required time – system utilizes software to analyze and chart the rates of change.

- Thermal couples transmit data to analyzing software
- Voltage drop is continuously monitored by the system to produce time/voltage charts

### Verification

At test completion, all temperature values and time of clearing will be verified using U.L., MSHA, CSA, and EIC standards. The Low Power Lab utilizes variable transformers to produce currents which restrict voltage levels to less than 10VAC.

# Data Acquisition & Analysis

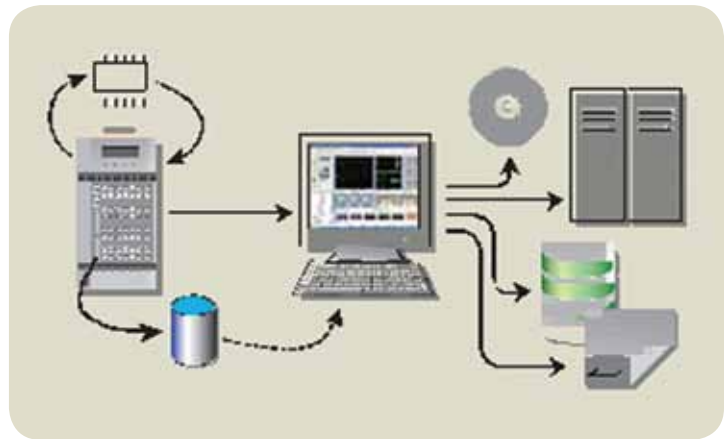
## High-Power Facility

### HBM Genesis Tower

- Complete software support with HBM's Perception software
- Sample rates from 200 kS/s to 100 MS/s per channel
- Variable input filters
- 16 bit ADC resolution
- 11 channels are available

### HBM Perception Software

- Control of measurement hardware
- Visualization of measurement data
- Navigation through the hardware and data archives
- Measurement
- Analysis
- Reporting
- Data export
- Automation & batch processing



When a test date has been arranged, the client will be sent an Engineering Test Agreement which must be filled out and returned prior to the test date. This agreement verifies the test date, and sets forth contract conditions for the client and the lab. Liability and responsibility are explained in the test agreement.

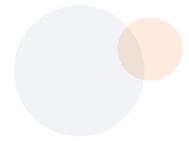
### Requirements

- Client Purchase Order
- All witnesses to test must conform to Test Lab Visitor's Safety Policy
- Clients must read and sign Visitor's Safety Policy
- Test Lab recommends that the client have an engineer present during actual testing to ensure compliance to any special requirements

### Testing

- Summary sheet of test lab charges is available on request and will be sent with the Engineering Test Agreement
- Testing is normally run in accordance with recognized standards such as UL, CSA, MSHA, and EIC
- All testing is treated with the strictest confidential awareness

# High-Power Test Lab Capabilities



## Single phase/Three phase

### 125 VAC

0 – 45,000 Amps 12% Power Factor

### 250 VAC

0 – 100,000 Amps 12% Power Factor

### 277 VAC

0 – 100,000 Amps 9% Power Factor

### 480 VAC

0 – 100,000 Amps 9% Power Factor

### 500 VAC

0 – 100,000 Amps 9% Power Factor

### 600 VAC

0 – 100,000 Amps 7% Power Factor

### 700 VAC

0 – 50,000 Amps 5% Power Factor

### 1000 VAC

0 – 75,000 Amps 5% Power Factor

*All Power Factors are available*

## Direct current

### 130 VDC

0 – 50,000 Amps 13mS Time Constant

### 300 VDC

0 – 100,000 Amps 10mS Time Constant

### 600 VDC

0 – 100,000 Amps 10 mS Time Constant

### 700 VDC

0 – 100,000 Amps 10 mS Time Constant

### 1000 VDC

0 – 85,000 Amps 8mS Time Constant

### 1250 VDC

0 – 140,000 Amps 3mS Time Constant

## Circuit Values AC/DC

### Primary

Inductance: max .0029h - min .0000242h

Resistance: max .38 ohms - min .000002 ohm

*Specific Circuit Values Can Be Fabricated To Meet Customer Needs*

### Secondary

Inductance: max .079h - min .00018h

Resistance: max 78 ohms - min .035 ohms

### Bypass Pri/Sec

Values approach zero

## System Description

**Generators:** 10 MVA continuous-rated alternator (shortcircuit rated 68 MVA) generating 2400 volts @ 60hz

**Backup Breakers:** HK type circuit-breaker to interrupt test voltage after preset

**Primary Inductors:** Continuous-duty primary inductors from 0 to 1.12 ohms

**Primary Resistors:** Continuous-duty primary resistor from 0 to .6 ohms

**Transformers:** 10MVA continuous-rated (68 MVA shortcircuit) transformer with tap and voltage selection

**Making Switches:** Specially designed 100KA Making Switch – the closing angle may be controlled +/- 1 degree of a possible 180 degrees

**Secondary Inductors:** Continuous-duty secondary inductors from 0 to 1k ohms per phase

**Secondary Resistors:** Continuous-duty secondary resistor from 0 to 1k ohms

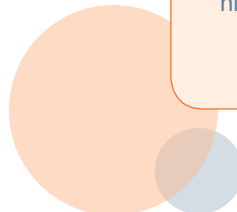
**Data Acquisition:** G.E. current-transformers and resistive shunts transmit interruption to digital oscilloscopes via coaxial cable or fiber optics

**To schedule test time, contact the Test Lab Manager via e mail, telephone, or in writing, at:**

**North America  
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**A WORLD LEADER**  
**in safety & reliability**  
**for electrical power**

## A GLOBAL PLAYER

Since its foundation in 1892, MERSEN has built an international reputation by creating subsidiaries on all continents. Today with industrial and commercial plants scattered in more than 30 countries, agencies

and representatives in more than 70 countries and 250 commercial contacts throughout the world, MERSEN offers its customers everywhere reliable, high technology products and services backed by its expert technicians.

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