

Test Lab



OVER 3 DECADES OF TESTS AND EXPERTISE

Have you ever needed to simulate the exact conditions in a system to measure the limits of its electrical protection?

Or determine the withstand of its parts to temperature rise, lightning strikes, acceleration or vibration? Or find out how they will age, how they will behave at extremely low temperatures or in a hot, damp and salty environment?

You're interested in renewables and want to get on board, but you need to test your equipment on an actual PV system?

These are some of the good reasons for calling the Mersen Test Lab and taking advantage of our resources, expertise and experience!

Electrical, dielectric, mechanical and environmental tests

Since 1981 the test lab, created by Lucien Ferraz himself, has been working out of the Mersen plant east of Lyons, in southern France, and has developed expertise in electrical, dielectric, mechanical and environmental tests. Its role is to provide testing services and expert analysis, both for the many divisions of the Mersen group and for outside customers.

The test center actually houses five labs, for high power, electrical performance, PV solar, mechanical, and environmental and process tests.

Its activity is regularly supported by investment to keep it up-to-date on new needs.

The test lab has accreditation and approvals from all the main global agencies, including COFRAC, ASEFA, LCIE, VDE, UL, etc.

Mersen develops, manufactures and sells products and services for all of the many markets in electrical engineering. Those products and services are often highly technical and must comply with many functional requirements, as well as being qualified and certified, to guarantee excellence in operation.

5
test labs
expertises

... via four
power
applications



High Power
Lab



Power Controls

- LV & HV motor controls
- Control panels
- HVAC
- Material handling



Pv Solar
Test Lab



Power Distribution

- Switchgear
- Switchboards
- Panel boards
- Load centers
- PF correction
- Surge protection
- Rail current collection
- Rail grouting



Electrical performance
Test Lab



Power Electronics

- Drives
- Soft Starters
- UPS
- Rectifiers
- Inverters
- Frequency converters
- Induction heating
- Rail propulsion
- Welding



Mechanical
Test Lab



Power Transfer for Rail Vehicles

- Substations
- Transformers
- Transmission lines
- PF correction



Environmental and Process
Test Lab



HIGH POWER TEST LAB



Simulate real life conditions

Boris Grans,
Project Manager

“We’re moving ahead on our project. Orders have been placed with our suppliers for all the equipment in the bill of requirements. Things are speeding up, but we can’t accept any risk of a disappointing start-up because we underestimated the process conditions and how to control them... which we are still in the dark about! So before we go on to assemble the system, we decided to run our electrical protection set-up through a series of high power tests at Mersen. The results showed good withstand to various voltage levels, which completely reassured our operations manager.”

Mersen’s Expertise

The lab does LV and HV electrical tests. Its dedicated professionals are focused on defining, improving, building, inspecting and checking products in compliance with international standards and customer specifications.

Fields of Activity

All LV and HV products and systems:

- parts and devices for switching and breaking,
- electrical products and systems,
- etc.

→ Standards: IEC, NF EN 60269; IEC, NF EN 60947; IEC 60077-5; HN 62 S 84, 63 S 20; UL, VDE, etc.

Types of Tests

Short circuit characteristics, transient current withstand, live making and breaking, short-circuit making and breaking, and operation in high current rate of rise conditions. All these tests can be done in a.c. or d.c.

Testing Equipment

The high power test lab has 3 different test cells to cover all the required levels of voltage, current and power, plus two capacitor banks.



• 3 MVA test cell

For single-phase or three-phase utility line short-circuit tests up to 8000 A r.m.s.. Voltage can be adjusted up to 800 V r.m.s. 50 Hz by coupling to the transformer. Triggering the test current can be synchronized or set anywhere from 0 to 90° at +/-1°. Voltage can be held for several minutes after the test.

Technical capabilities

- Single-phase r.m.s. short-circuit current (20ms):
 - max. short-circuit current: 10 kA / 300 V
 - Continuous current: 600 A / 400V.
- Three-phase r.m.s. short-circuit current (1s):
 - 6 kA / 120 V to 2.6 kA / 780 V.
- Direct current:
 - 10 kA for 100 ms at 1050 V DC

• 20 MVA test cell

An generator driven by a 400 HP asynchronous motor generates current. With this equipment, single-phase and three-phase tests can be done up to 35,000 Amperes r.m.s.. Voltage can be adjusted between 50 and 1000 V r.m.s. 50 Hz.

Technical capabilities

- Single-phase r.m.s. short-circuit current (20ms):
 - 300 V 22 kA power factor 0.38;
 - 520 V 21 kA power factor 0.21;
 - 600 V 21 kA power factor 0.19;
 - 1000 V 14 kA power factor 0.12.
- Three-phase r.m.s. short-circuit current (20ms):
 - 300 V 34 kA $\cos\phi$ 0.36 ;
 - 520 V 33 kA $\cos\phi$ 0,25 ;
 - 600 V 32 kA $\cos\phi$ 0.18;
 - 1000 V 23 kA $\cos\phi$ 0.12.
- Direct current under 50 to 4400 V DC:
 - 1 250 VDC 14 kA 100 ms ;
 - 2 400 VDC 7.0 kA 100 ms ;
 - 4 400 VDC 3.5 kA 100 ms.

• 400 MVA test cell

A turbo-generator driven by a 1,300 kVA synchronous converter delivers the current. Test voltages can be adjusted from 100 V to 45 kV by means of step-down and step-up voltage transformers and different couplings of the power generator. Maximum r.m.s. short-circuit current can be up to 305 kA r.m.s., which at 400 V means a peak at 750 kA!

Technical capabilities

- Generator alone:
 - 3 500 V 50 kA power factor 0.06;
 - 12 000 V 16 kA.
- With step-down transformer:
 - 400 V 300 kA power factor 0.07-0.15;
 - 440 V 185 kA power factor 0.07-0.15;
 - 550 V 118 kA power factor 0.07-0.15;
- 725 V 165 kA power factor 0.07-0.15.
- With step-up transformer:
 - 45 kV 500 A power factor 0.1;
 - 24 kV 1000 A power factor 0.1.
- Direct current under 1550 to 4400 V DC:
 - 2400 VDC 5.5 kA 100 ms
 - 4400 VDC 3.5 kA 100 ms

• Two capacitor banks

To simulate and test faults with a high current rate of rise in semiconductor based power conversion systems.

Technical capabilities

- 100mF at 1200V to deliver a current of 100 kA for 1 ms with a current rate of rise of 200 A per μ s.
- 30 mF under 2000 V or 7 mF under 4000 V; 100 kA at 100 μ s with a max. current rate of rise of 5000 A per μ s.



PV SOLAR TEST LAB



Power of the future being tamed today

*Hélène Li,
Product manager*

“To keep up with the market, we recently decided to create a renewables department, installing and servicing commercial PV solar systems. Our designers and technicians are experienced professionals but their knowledge of that field is not perfect. We discovered that Mersen can not only supply specific equipment, but is also our partner in running tests under real-life conditions and supporting our teams in exploring these new applications.”

Mersen’s Expertise

The PV test lab offers a versatile test resource in actual current generating conditions. Equipment can be tested in a number of fault and operating configurations. This lab is unique in its capability to run specific tests in real-life operating and fault conditions.

Fields Of Activity

All equipment for PV solar arrays: panels, switches, fuses, junction boxes, monitoring systems, inverters, etc.

→ *Standards: IEC, NF EN 60269-6, application of DC arc detection standards (UL 1699B, TIL M-07) etc.*





Types of Tests

Measurement of short-circuit characteristics of electrical protection gear, certification tests, tests on monitoring systems and inverters, tests of **faults (to ground, between panels, between strings of panels)** and their impact on equipment.

All other usual tests on actual systems.

Testing Equipment

144 panels of polycrystalline silicon at 240Wp (30 to 37V, 8A, 18 kg) for a total of approx. 35 kW with two possible configurations:

- 400 V DC wiring, 12 parallel strings of 12 panels in series;
- 800 V DC wiring, 6 parallel strings of 24 panels in series.



ELECTRICAL PERFORMANCE TEST LAB



Shooting for reliability, customer satisfaction and reputation

*Richard Durand,
Quality manager*

“We’re gearing up to launch a new series that is supposed to definitively erase the bad press of the last one, which was prone to heating and early breakage. We put our trust in Mersen. Their engineering department studied our specifications and their Electrical Performance Lab ran temperature rise tests, aging simulations and impulse current withstand tests to check them. The results confirmed that we were borderline on tolerances and enabled us to make the necessary changes.”



Mersen’s Expertise

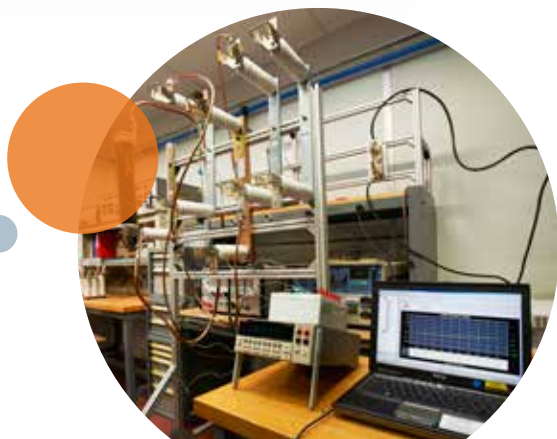
The test lab, staffed by experienced professionals, can characterize, develop and qualify or certify products according to their electrical performances: temperature rise, melting, electrical aging and endurance, impulse withstand (current or voltage), dielectric strength and partial discharges.

Fields Of Activity

All LV and HV products and systems:

- parts and devices for switching and breaking,
- electrical products and systems,
- etc.

→ *Standards: IEC, NF EN 60269; IEC, NF EN 60947; IEC 60077-5; IEC, NF EN 60060; HN 62 S 84, 63 S 20; UL, VDE, etc.*

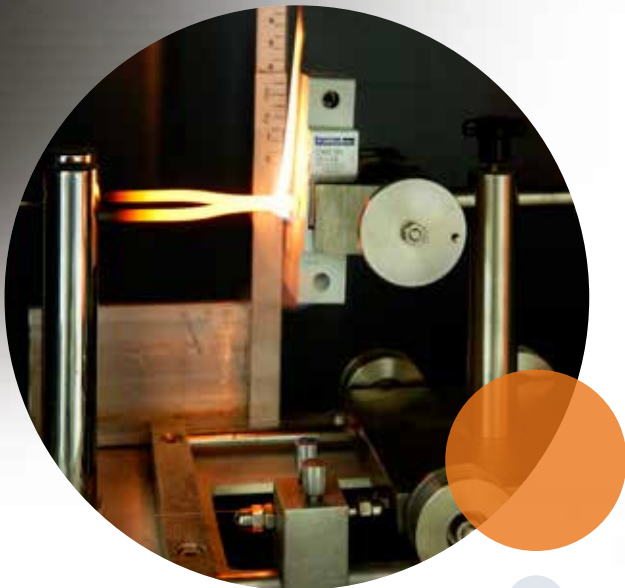




Testing Equipment

Fuses and fusegear are temperature rise and aging tested on low voltage stations, the current sources. Those sources are installed in an air conditioned room at 23 °C. Voltage, current and temperature values are recorded during the tests.

- 50Hz AC sources stabilized or cycled up to 9200 A r.m.s. at 6 to 12 V.
- DC sources programmed up to 2500 A DC under 10 to 100 V.
- digital recorders (40 acquisition channels) for voltage, current and temperature readings from the tests.
- Lightning impulse voltage generator to a peak of 20 kV for LV products.
- 50Hz voltage generator for up to 5 kV r.m.s. and d.c. up to 6 kV DC for LV products.
- Two 50 Hz voltage generators for up to 40 and 100 kV r.m.s. for HV products.
- Faraday cage with a 50 Hz 100 kV r.m.s. voltage transformer and a coupling circuit to measure partial discharges with background noise of 5 pC.
- Impulse current generator (shock capacitors) for up to 65 kA at 100 kV.



Types of Tests

Measurement of resistances, Watts losses, insulating resistances; tests of temperature rise, withstand at rated current or to small overload currents; test cycles of current to simulate actual operation or accelerated aging; tests of dielectric strength at industrial frequency voltage or lightning impulse voltage; measurement of partial discharge, withstand or residual voltage measurement under current impulse waves standardized at 4/10 or 8/20 μ s.



MECHANICAL TEST LAB



Keeping bad news at bay in the future

*Sophie Lorès,
Designer*

“Top-notch electrical performances are not enough. An electrical protection system has to support the extreme mechanical stresses involved in everyday operation. We’ve discovered that to our own dismay in the past. To maintain our status as a reference supplier, we now make sure all the parts in our tripping devices not only comply with standards but also run the full gauntlet of Mersen’s mechanical tests, guaranteeing our customers a product lifespan conform to the bill of requirements.”

Mersen’s Expertise

The mechanical test lab is used to check and approve equipment according to the mechanical stresses it will be subjected to in operation (forces, torques, vibrations, accelerations).

Fields of Activity

Any equipment that is expected to withstand mechanical force, torque, vibration or acceleration.

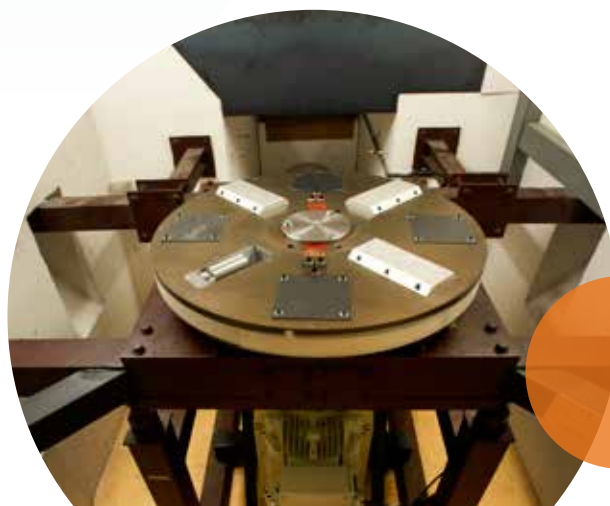
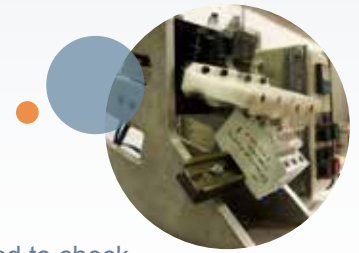
→ *Standards: IEC, NF EN 60269; IEC, NF EN 60947, etc.*

Types of Tests

- Measurement of failure torque or force.
- Bending, tensile or compressive strength.
- Withstand to vibrations.
- Withstand to centrifugal acceleration.

Testing Equipment

- A bending/traction test bench for switchgear.
- A digitally controlled 16 Nm power screw driver.
- A 100 kN press.
- A 250 N sinusoidal vibrating bowl.
- A 450 x 450 mm vibrating table (2.7 kN sinusoidal, 2 kN random, 4 kN shock).
- A centrifugal acceleration test wheel (6000g).



ENVIRONMENTAL AND PROCESS TEST LAB



From one climate to another

*Jocelyne Pogba,
Sales engineer*

“Last year we and one of our partners in French Guyana were involved in an industrial-scale project to study a control system for a salt water pump. In our usual European context that would have been routine. But in South America, the heat, the high salt concentration, and the distance from the maintenance people gave it a whole new dimension! The elements in the electrical protection system spent some time immersed in a really salty bath at the Mersen climate test lab before we shipped them off to the Equator.”



Mersen’s Expertise

The environmental test lab is used to check and confirm the equipment’s performances under extreme conditions of temperature, humidity, corrosive atmosphere, etc.

Fields of Activity

Any equipment that must be demonstrated to operate in or withstand extreme temperatures or humidity, corrosive atmospheres, or that requires a drying procedure.

→ *Standards: IEC, NF EN 60269; IEC, NF EN 60947; IEC 60077-5; IEC, NF EN 60068; HN 62 S 84, 63 S 20; UL, VDE, etc.*

Types of Tests

- Extreme temperature withstand
- Temperature cycle withstand
- Dampness withstand
- Salt mist test
- Drying in a forced air or microwave oven
- X-ray inspection to check internal make-up

Testing Equipment

- Programmable hot/cold thermal test enclosure -40 to +200°C (200 l).
- Programmable hot/cold/damp climate test enclosure -40 to 200°C, 0 to 100% relative humidity (200 l)
- Metallurgical-grade ovens for up to 1000 °C (50 l).
- Salt mist enclosure (400 l).
- 200°C oven with 5 kW forced air and 2450 MHz 1250 W microwave.
- X-ray apparatus.





MERSEN
 Expertise, our source of energy

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

A GLOBAL PLAYER

Global expert in materials and equipment for extreme environments and in the safety and reliability of electrical equipment.

Mersen designs innovative solutions to address its clients' specific needs to enable them to optimize their manufacturing process in sectors such as Energy, Transportation, Electronics, Chemical, Pharmaceutical and Process Industries.

MERSEN France SB S.A.S.
 Rue Jacques de Vaucanson
 F-69720 Saint-Bonnet-de-Mure
 Tel: + 33 4 72 22 66 11
www.mersen.com

MERSEN Shanghai Co. Ltd.
 No.55-A6. Shu Shan Road,
 Songjiang 201611 Shanghai
 Tel: +8621 67602388
www.mersen.com

**MERSEN USA
 Newburyport-MA L.L.C.**
 374 Merrimac Street
 Newburyport, MA 01950
 Phone: 978-462-6662
www.mersen.com