

Delphi Champion Technical Center Testing Laboratories

Measuring product success is a key component to helping meet the demands for greater safety, performance, reliability and durability in today's highly competitive global marketplace. The Delphi Champion Technical Center (CTC) offers extensive dynamic, environmental, physical properties and electro-mechanical test capabilities to help verify a product measures up to consumer demands and industry requirements.

Delphi's world-class test facility offers extensive and diverse capabilities, supported by a highly experienced technical staff to provide single-source testing for a broad range of products and industries. We provide comprehensive services that include development of specialized test programs and custom-engineered test fixtures. This expertise allows us to assist with nearly every aspect of product development and validation requirements.

From simple component measurements to complex system testing, we offer competitive, timely and reliable test services. The 94,000 square foot (8,733 square meters) facility houses more than 2000 pieces of equipment and is staffed with experienced engineers and technicians that are dedicated to continuous improvement in cost, quality, response, and technology.

The Delphi Champion Technical Center's testing laboratories are A2LA (The American Association for Laboratory Accreditation) accredited for tests listed on certificate numbers 1913.01 and 1913.02.

► Capabilities

- **Test Laboratories**

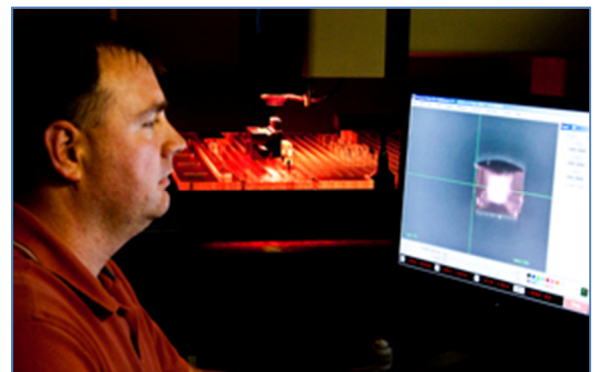
- Electrical centers
- Electrical systems
- Electrical, mechanical, and material testing
- Electromagnetic compatibility (EMC)
- Electronics
- Environmental conditioning
- Scanning electron microscopy (SEM)

- **Analysis**

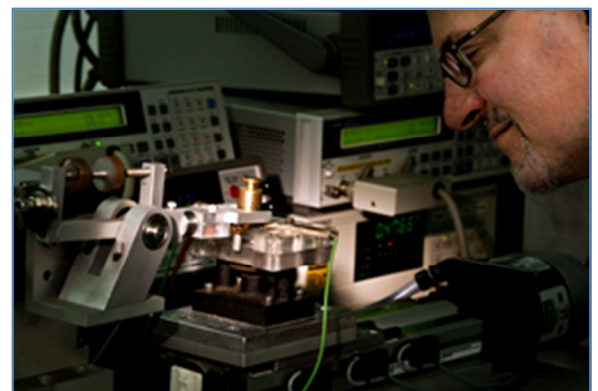
- Computer tomography (CT scanner)
- Field correlated life testing
- Precision dimensional measurements (OGP and CGI)
- Reliability
- Scanning electron microscope / EDX / micro surface analysis
- Vehicle electrical assessment
- X-ray plating, measurement and analysis



Scanning electron microscopy (SEM) services include inspection of semi-solids and non-conductors with magnifications up to 300,000 times.

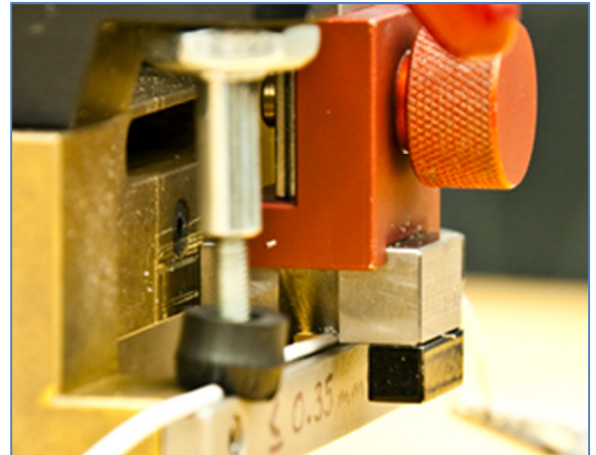


Precision dimensional analysis verifies a product measures up to consumer demands and industry requirements.



Precision resistance analysis can be done for a broad range of products.

- **Dynamic / Vibration Testing**
 - Drop
 - Flex
 - Mechanical shock
 - Vibration
- **Environmental Conditioning**
 - Dust
 - Fluid exposure
 - Salt fog
 - Salt spray
 - Temperature
 - Temperature / humidity
 - Thermal shock / cycling
- **Electrical Testing**
 - Circuit protection
 - Current cycling
 - Dielectric strength
 - Intermittency
 - Isolation resistance
 - Pulse height analysis
 - Resistivity / conductivity
 - Temperature rise
 - Voltage drop
- **Electronic Testing**
 - Contact chatter / intermittency
 - Functional testing
 - Insertion loss
 - Operating durability
 - Parameter measurement
 - Sound measurement
 - Solderability
 - Voltage extremes
- **Mechanical Testing**
 - Dimensions
 - Engage / disengage
 - Flex
 - Sealing integrity
- **Microscopy**
 - Infrared imaging
 - Optical microscopy
 - Scanning electron microscopy (SEM)
 - Inspection of semi-solids and non-conductors
 - Magnifications to 300,000x
 - X-ray micro analysis of elements within sample
 - Used to identify test and field anomalies
- **Computer Tomography X-ray Scanning**
 - 2D slice reconstruction
 - 3D internal and external surface scanning
 - Advanced x-ray inspection
 - CT volume reconstruction for 3D inspection
 - Non-destructive sample analysis



Cable abrasion analysis shown above is one of many material tests that are available.



Environmental chambers enable testing in many conditions, including dust, salt, extreme temperatures, and more.

- **Material / Cable Testing**

- Abrasion
- Adhesion
- Brittleness
- Cold bend
- Compression
- Density
- Flammability
- Flex modulus
- Flex strength
- Hardness
- Heat deflection
- Melt flow
- Notched izod
- Oxygen index
- Pinch
- Recovery
- Tensile / flex strength elongation

- **Vehicle Electrical Systems Testing**

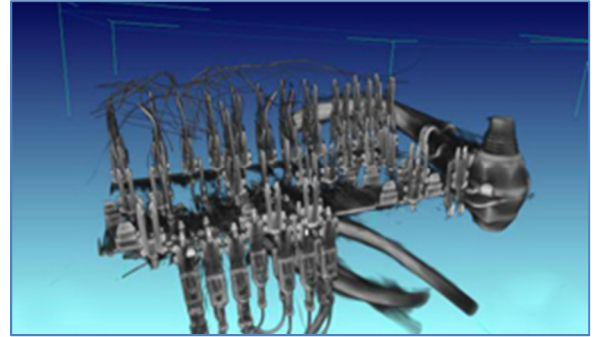
- Current overload test
- Customized test capabilities
- Full load test
- Ground voltage profile
- Individual load test
- Parasitic load test
- Short circuit test
- Voltage and current load characterization

- **Component-Level Electromagnetic Compatibility (EMC) Testing**

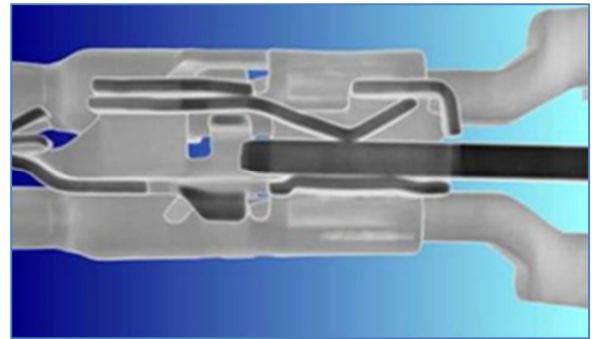
- Conducted transient emissions
- Electrostatic discharge
- Immunity to conducted transients
- Immunity to radiated electric fields
- Immunity to radiated magnetic fields
- Radiated emissions

- **Lab-to-Field Correlation Testing USCAR-20**

- Field correlated life test (FCLT)
- Represents actual performance for crimps and interfaces
- Reliability demonstrated to 150,000 miles (241,401 km) / 10 years
- Adopted as an industry standard
- Demonstrates excellent sensitivity to design variables
- FCLT facts and figures
- Samples installed on 10 vehicles in 5 locations
- Resistance of 4000+ crimps and interfaces
 - Measured daily for 5 years
- Over 720 million product and environmental measurements
- Averaged 160,000 miles (257,495 km) per test vehicle



Computer tomography x-ray scanning shows a CT volume reconstruction for 3D inspection.



▶ The Delphi Advantage

Through the development of world class products for the global vehicle market, Delphi's Champion Technical Center provides diverse testing services to support a customer's product development requirements. The center's vast capabilities can expose products to the most stringent transportation, military, and other standards. Delphi offers quick turnaround time and maintains customer confidentiality. The Champion Technical Center is part of Delphi's network of state-of-the-art technical centers around the world.

▶ Contact Information

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