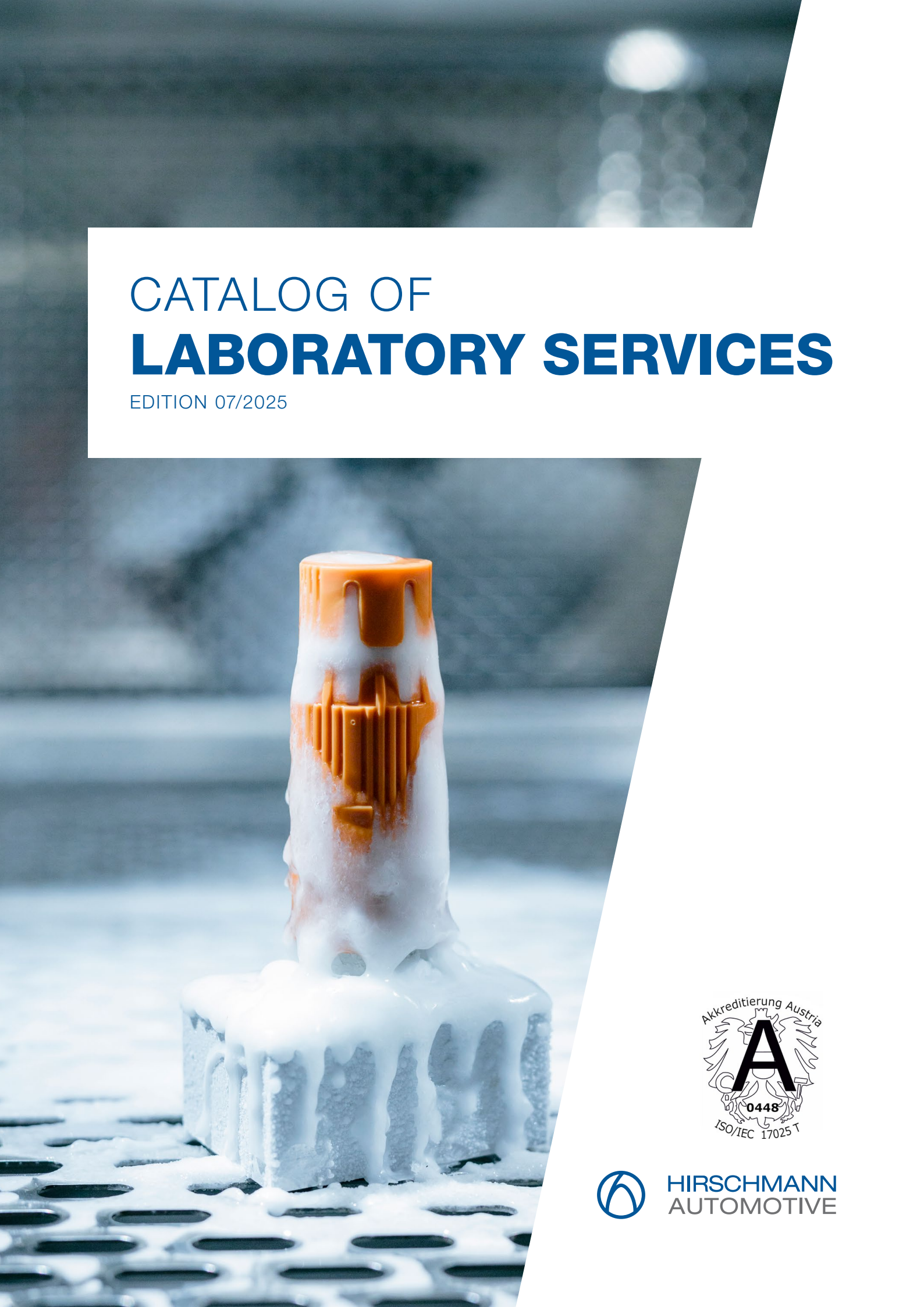

CATALOG OF
LABORATORY SERVICES

EDITION 07/2025

Akkreditierung Austria
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ISO/IEC 17025 T

HIRSCHMANN
AUTOMOTIVE

Content

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1 Introduction

At Hirschmann Automotive, precision and reliability are at the heart of everything we do. The quality laboratory offers a comprehensive range of testing and analysis services that meet the highest industry standards. The state-of-the-art facilities and experienced team ensure that your products reach their full potential.

Explore the Hirschmann Automotive Catalog of Laboratory Services to find out how these services can help you with your quality requirements.

2 Testing Laboratory

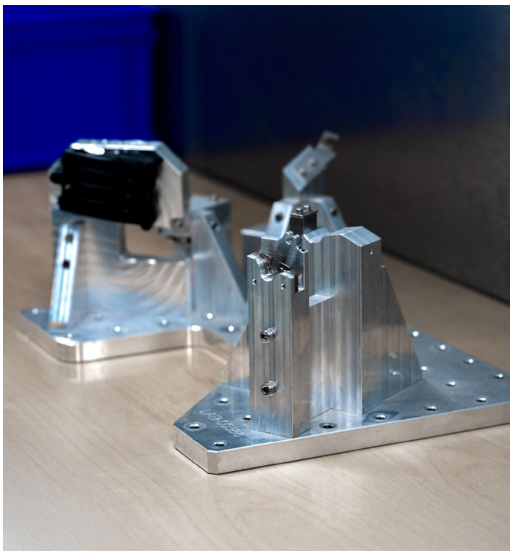
At Hirschmann Automotive's Testing Laboratory, products are subjected to extreme conditions. Mechanical stress tests, environmental simulations, and advanced analyses ensure that your components perform reliably under even the harshest conditions. Learn more about the high-precision testing methods.

Equipped with the latest testing technology, the laboratory offers optimum conditions for reliable and precise tests that meet the highest quality standards.

Here is an insight into the premises of the testing laboratory:

2. 1 Mechanical Environmental Simulation

Mechanical environmental simulation is used to investigate the loads to which a product is exposed during operation. These tests simulate real conditions to ensure that the components can withstand the mechanical requirements.



2. 1. 1 Vibration and Dynamic Loads

During the vibration test, the product is subjected to vibrations (load changes) in order to assess the effects on performance and durability. This can be relevant for both field operation and transportation conditions. The test typically includes different frequencies and amplitudes to get a comprehensive picture of the possible loads.

By simulating these dynamic loads, potential weak points can be identified and weaknesses in the design or materials can be uncovered. This is crucial to ensure the reliability and safety of the product in real-life application scenarios and to avoid potential damage during transportation.

2. 1. 2 Vibration Test Types

- Sinusoidal Oszillation (Sine)
- Broadband Noise (Random)
- Mechanical Shocks (Classical shock)
- Sine Resonance Dwell (Sine-Dwell)
- Sine on Random (Sine-on-Random)

Simulation of Operating and Transportation Conditions

2. 1. 3 An Extract of the Facilities

Vibration Unit 1 with Integrated Climate Chamber

Vibration System	A74 – IMV – 74 kN
Dimensions Vibration Table	cube with 350 mm edge length
Hole Grid	M8 threaded inserts on 50 mm hole grid
Climate Chamber	temperature range: -70° C up to +180° C
	temperature change: heating 5.5 K/min cooling 4.5 K/min
	volume: approx. 1,150 Liter

Vibration Unit 2 with Integrated Climate Chamber

Vibration System	SAI60 – Unholtz Dickie – 35 kN
Dimensions Vibration Table	cube with 300 mm edge length
Hole Grid	M8 threaded inserts on 50 mm hole grid
Climate Chamber	temperature range: -70° C up to +180° C
	temperature change: heating 5.5 K/min cooling 4.5 K/min
	volume: approx. 1,150 Liter

Vibration Unit 3 with Integrated Climate Chamber and Sliding Table

Vibration System	K080-CE / IMV – 80 kN
Dimensions Vibration Table	cube with 350 mm edge length sliding table and headexpander with 900 mm edge length
Hole Grid	M8 threaded inserts on 50 mm hole grid
Climate Chamber	temperature range: -70° C up to +180° C
	temperature change: 5 K/min
	volume: approx. 1,150 Liter

2. 2 Environmental Simulation

Environmental simulation tests whether materials and components can withstand extreme temperatures, changing climatic conditions and the ageing process. These tests are designed to ensure that a product functions reliably at both high and low temperatures as well as under various humidity and weather conditions.

2. 2. 1 Environmental Simulation Tests

These tests check whether a product functions reliably at high and low temperatures and under various humidity and weather conditions. The test is carried out by simulating environmental stresses such as temperature shock tests, heat or cold tests, salt spray tests and simulation of liquid shocks.

These comprehensive tests can ensure the reliability and longevity of a product in different environments and over its entire service life.

Ensuring Reliability under Extreme Conditions

2. 2. 2 Equipment

Heating Cabinet

Temperature Range	+5° C above ambient temperature up to +300° C
Convection	natural circulating air
Interior Volume	5 cabinets with 240 liters 2 cabinets with 255 liters 2 cabinets with 743 liters

Temperature Chamber

Temperature Range	-70° C up to +180° C
Interior Volume	200 liters up to 350 liters
Temperature Change	heating 3.1 K/min up to 3.5 K/min cooling 2.5 K/min up to 3.5 K/min

Temperature Shock Chambers

Temperature Range	warm chamber +50° C up to +220° C cold chamber -80° C up to +70° C/+100° C
Transfering Time	<10 s between warm and cold chamber
Interior Volume	125 liters
Sample Weight	max. 50 kg

Climate Chambers

Temperature Range	-70° C up to +180° C
Interior Volume	up to 600 liters
Temperature Change	heating 3 K/min up to 7 K/min cooling 3 K/min up to 6.7 K/min
Humidity Range	10 % up to 98 % r. humidity at +10° C up to +95° C

Fluid Shock Test

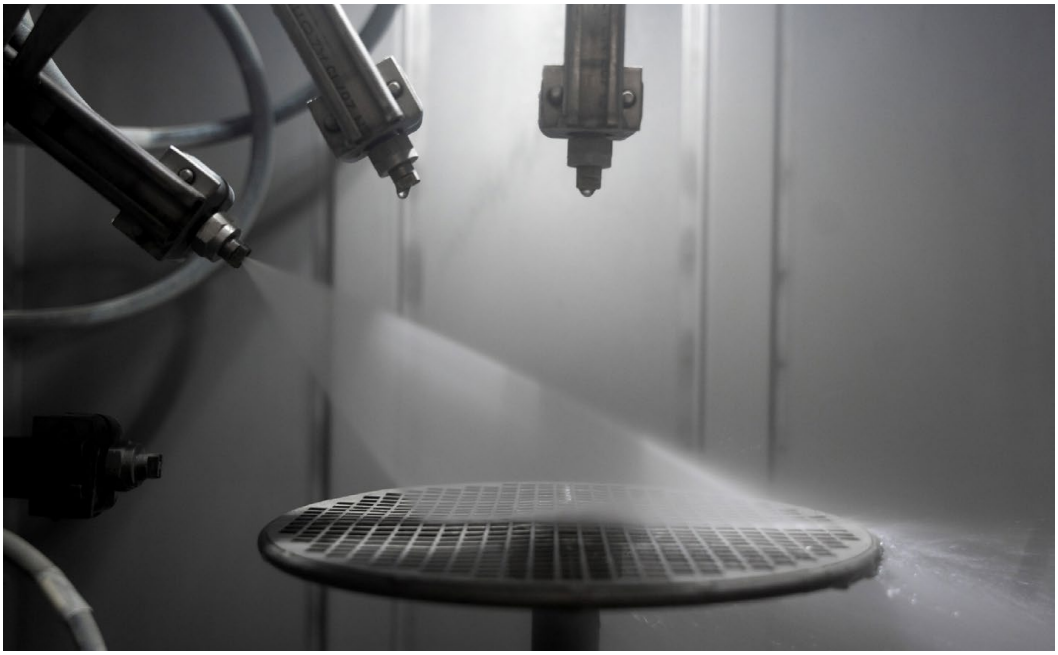
Fluid	5 % Na-Cl-solution
Cold Bath	0° C to +10° C
Warm Chamber	up to +180° C
Transfering Time	<10 s
Sample Weight	max. 20 kg

2. 3 IP – Degree of Protection Tests and Protection Class Tests

IPX9K – Resistance to High-Pressure and High-Temperature Water Jets

Test Pressure washer test – directly onto the test specimen, which is located on an automatically rotating plate.

- » fully automated chamber
- » nozzles freely programmable (0°/30°/60°/90°)
- » max. water pressure 80 to 100 bar
- » water temperature up to 80° C
- » water volume flow per nozzle 14 to 16 l/min



IPX7 / IPX8 – Water Temporary Immersion

Test Temporary/permanent immersion of the test specimens.

- » usual water depth of 1 m
- » immersion time usually 30 minutes or by appointment

IPX6K – Protection against High-Pressure Water Jets

Test Protection against powerful jets of water under increased pressure.

- » water volume flow: 100 l/min
- » minimum test duration: 3 minutes
- » distance from jet nozzle to housing surface: 2.5 m bis 3 m

IP5X / IP6X – Dust Test

Test Fully automatic dust test chamber with a chamber equipped with under pressure device.

- » test dust: arizona dust A2

Solid Protection Test

IPXXB Contact with a Rigid Test Finger with a Compression Spring

Access probe for determining the mechanical strength of accessible parts, with an integrated compression spring and a force scale from 0-50 N in 5 N increments. The 80 mm long test finger is made of stainless steel. According to regulations, the fingertip corresponds to the dimensions of the movable test finger.

IPXXD Contact with a Test Probe 100 mm Long/1 mm Diameter

Access and object probe for verifying the protection of persons against access to hazardous parts and against access with a tool. The probe is also used to determine the degree of protection of enclosures against the ingress of solid foreign bodies ≥ 1.0 mm.

2. 4 Corrosion Salt Spray Tests

The Hirschmann Automotive Central Laboratory is accredited according to DIN EN ISO/IEC 17025 for the following standard on optical product properties:

» EN 60068-2-11 – Salt Spray Test
» EN 60068-2-52 – Cyclic Salt Spray Test
» EN 9227 Corrosion Tests in Artificial Atmospheres

Interior Volume	up to 1,450 liters
Temperature Range	23° C up to -70° C
Dew-Point Range	12° C up to 69° C
Humidity Range	20 to 98 % r.H.
Device	Model SC/KKWT 1000/1500

2. 5 Electrical Investigation Tests

The Hirschmann Automotive central laboratory is accredited by DIN EN ISO / IEC 17025 for extensive testing of electrical product characteristics, including

» EN 60512-2-1 – Contact Resistance (Millivolt Level Method)
» EN 60512-2-2 – Contact Resistance (Specified Current)
» EN 60512-3-1 – Insulation Resistance
» EN 60512-5-1 – Temperature Rise Due to Current Load
» EN 60512-5-2 – Current-Temperature Derating

Derating Test Facilities

The derating test evaluates the Current-Temperature Derating of contacts and the influence of the housing by simultaneously energizing all secondary contacts. Short-term current peaks are evaluated. Continuous monitoring of temperature and current is possible during the test.

Temperature Measurements

Temperature Sensor	Type K TT KI 36 SLE	Measuring Range	-40° C up to 1,000° C

Size of Test Chamber Derating Position 1+2

86x46x30 cm with cover

Operating Area Derating 1+2

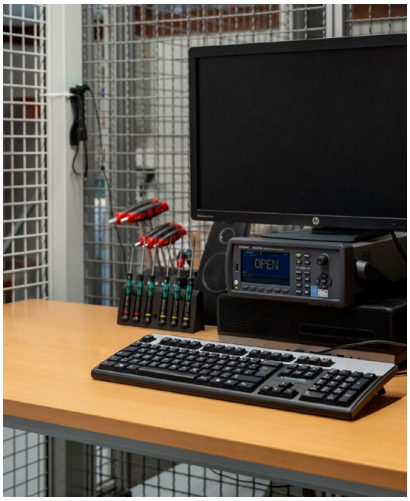
Power Supplies	PCE Chroma 62024P-40-120	Tension	max. 40 V DC
		Electricity	max. 120 A DC
	TDK – Lambda Gen 20-500	Tension	max. 20 V DC
		Electricity	max. 500 A DC
Data Logger	Keysight DAQ 970A	Sampling Rate	max. 450 channels per second

Size of Test Chamber Derating Position

115x80x35 cm with cover

Operating Area Derating 3

Power Supplies	SorensenSGX 20 X750D	Tension Electricity	max. 20 V DC max. 4,500 A DC
Data Logger	Keysight DAQ 970A	Sampling Rate	max. 450 channels per second



Slow Motion Test According to LV214-2 Edition 2007-10

Our slow motion test measures the characteristics of the cable connection (up to a maximum of 4 mm^2) to the contact (crimp) using specific load tests.

Scope of Testing pre-aging by means of temperature shock and slow motion test

Test Parameters

» measuring stations: 55 (50 test samples + 5 reference test samples)
» horizontal movement: ±25 mm with 1 Hz
» measuring current: 100 mA

Further Electrical Testing Options

» high voltage test up to 6 kV DC/5 kV AC
» insulation test with up to 1,000 V
» milli-ohm- and micro-ohm-meter for exact resistance determination
» electrical stress tests

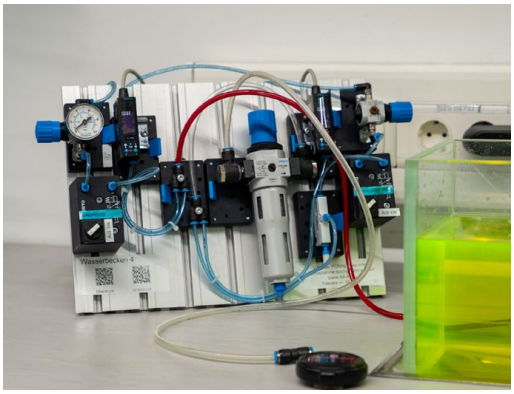
2. 6 Leakage Analyses

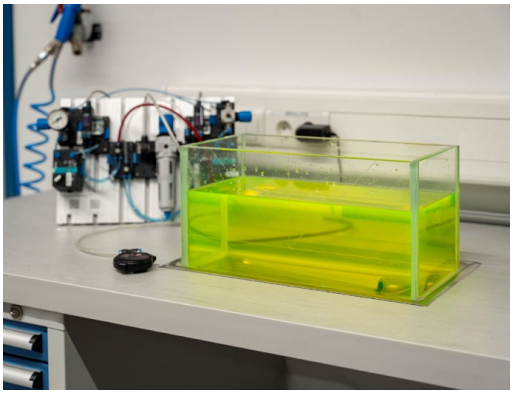
Leaking connections are not an option!

Hirschmann Automotive‘s precision leak tests ensure that systems meet the highest standards of tightness. These advanced methods detect even the most minor leaks using helium leak testing with a vacuum method, differential pressure measurement, or water bath tests.

Leakage analyses of systems using

» helium leak test with vacuum method, accuracy up to 1^-10 mbar*l/sec
» leak test computer with differential pressure method in Pa or ml/min at negative and positive pressure (up to 1 bar)
» overpressure test in water bath (air bubble method)
» underpressure test in a water bath with monitoring for water ingress





2. 7 Tensile and Compression Tests

The state-of-the-art tensile and compression tests ensure your components can withstand mechanical loads – from insertion and withdrawal forces to actuation cycles. With PC-controlled testing machines and a force range of up to 20 kN, material strength, locking mechanisms, and coding efficiencies are analyzed to the highest standards.

The Hirschmann Automotive central laboratory is accredited for the standards (see text) according to ISO/IEC 17025 and tests by EN 60512-13-5 and EN 60512-15-6. Rely on solid testing for durable and safe products.

» EN 60512-13-5 – Mechanical Operability, Polarization, and Coding
» EN 60512-15-6 – Mechanical Tests on Connectors, Effectiveness of Locking Devices

Facilities

» PC-controlled tensile testing machine
» force range up to 20 kN
» tensile or compression tests
» constant force tests
» plug-in and pull-out forces
» hysteresis loads
» step-like loads
» relaxation/retardation
» activation cycles

2. 8 Chemical Resistance Tests

From spraying to immersion – Hirschmann Automotive tests materials for chemical resistance.

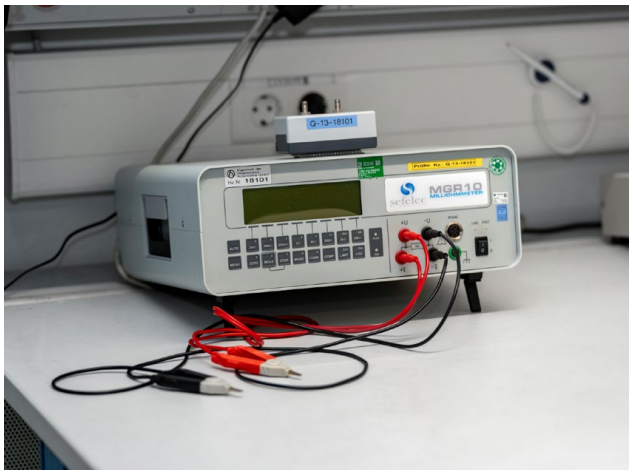
Chemical exposure challenges material durability. Hirschmann Automotive simulates real-world conditions using methods such as spraying, wiping, and immersion. With additional temperature storage from -40° C to 150° C, these tests determine whether materials can withstand extreme environments and ensure long-term reliability.

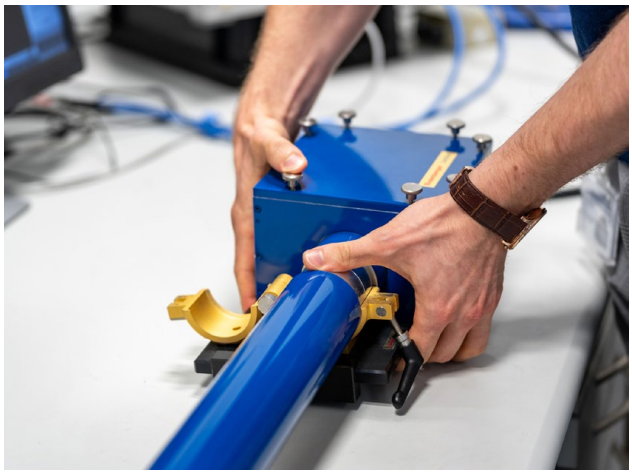
Application Methods

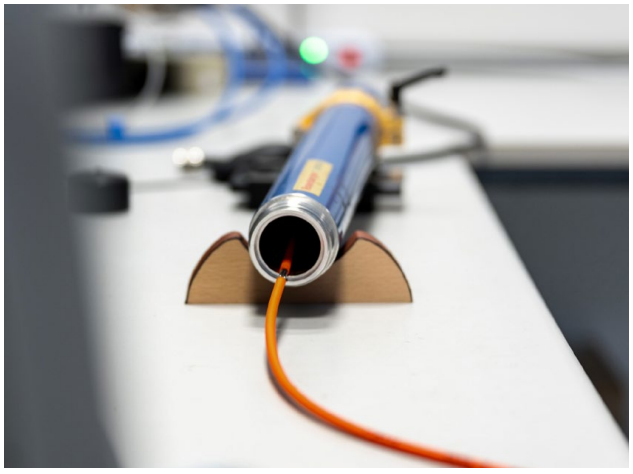
» spraying
» brushing
» wiping
» pouring
» dipping

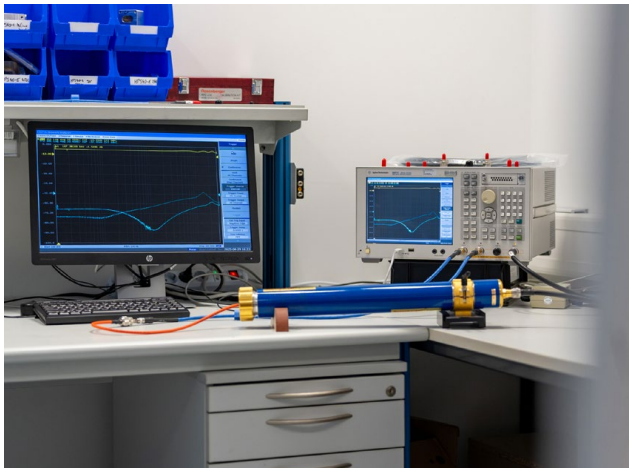
2. 9 Electromagnetic Compatibility Measurement

Electromagnetic interference can impair the functionality and safety of electrical systems. These electromagnetic compatibility tests (EMC tests) detect emissions from high-voltage connections and evaluate resistance, shielding effectiveness, and signal transmission. Using state-of-the-art measurement methods such as time domain reflectometry (TDR) and network analyses, the Hirschmann Automotive central laboratory ensures that your components function without interference – even in demanding environments.









TDR- Time Domain Reflectometer

Measurement	characteristic resistance
Bandwidth	35 GHz
Edge Speed	18 ps

VNA-Vector Network Analyzer

Measuring the scattering matrix of 4-pole switching systems

- Element S11 is the reflected component (from channel 1)
- Element S21 is the transmitted component (from channel 1 to channel 2)

→ This allows the transfer impedance and shielding effectiveness to be determined.

Frequency Range	100 kHz to 8.5 GHz
IF-Bandwidth	10 Hz to 1.5 MHz
Measurement Points	2 – 20.001
Outputs	4 channels

Electrical Calibration Device E-Cal

Calibration of the test leads for the specific test setup

Frequency Range	9 kHz to 13.5 GHz

Parallel Wire Method

Measurement	transmission from parallel wire to inner conductor
Parallel Wire	copper adhesive strip (width: 3 mm – 50 mm)
Coupling	500 mm

Triaxial Process

Measurement	transmission from inner conductor to metallic cell/tube
Small Cell	10x15x15 mm^3
Large Cell	15x15x1,000 mm^3
Measuring Tube Length	500 – 3,000 mm

2. 10 Non-Destructive Testing

2. 10. 1 SEM and EDX Technology

Scanning electron microscopy (SEM) from Hirschmann Automotive enables the detailed imaging of surface and fracture structures with high depth of field, a large magnification range and maximum resolution.

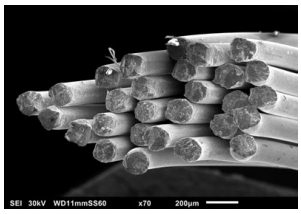
In addition, energy-dispersive X-ray microanalysis (EDX) offers precise element analysis directly on the surface imaged by SEM. Various analysis methods such as point and multi-point analyses, line scans and element mappings are used to determine the material composition in a targeted manner and detect possible deviations at an early stage.

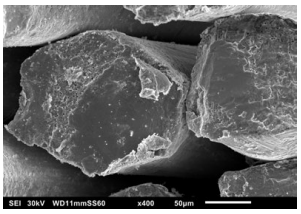
Application Examples
Application examples include the mapping of the topography of material surfaces and fractures, the investigation of layer structures, the measurement of layer thickness on fractures, the identification and visualization of material defects or inclusions using elemental analysis as well as the elemental analysis of surfaces and coatings.

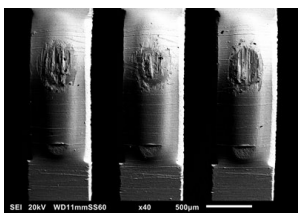
Device JEOL JSM 6010Plus/LV

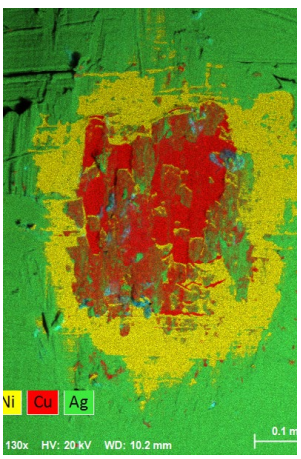
Technical Specification

» **Resolution**	4 nm bei 20 kV und 3 nm bei 30 kV (Hochvakuum) 5 nm bei 20 kV und 4 nm bei 30 kV (Niedervakuum)
» **Power Class**	0.5 – 30 kV
» **Magnification**	x5 – 300,000
» **Sample Size**	max. 100 x 100 mm









2. 10. 2 X-Ray Analysis

Hirschmann Automotive‘s X-ray analyses enable a precise examination of material density and integrity to detect hidden defects reliably. This allows even the finest irregularities in components to be uncovered.

Highest Precision with the Latest Technology

The DAGE RUBY X-ray system captures details down to 0.5 µm with a magnification of up to 23,400x (digital zoom). Automatic inspection sequences optimize the entire analysis process for maximum efficiency.

X-Ray Device DAGE RUBY

Technical Specification

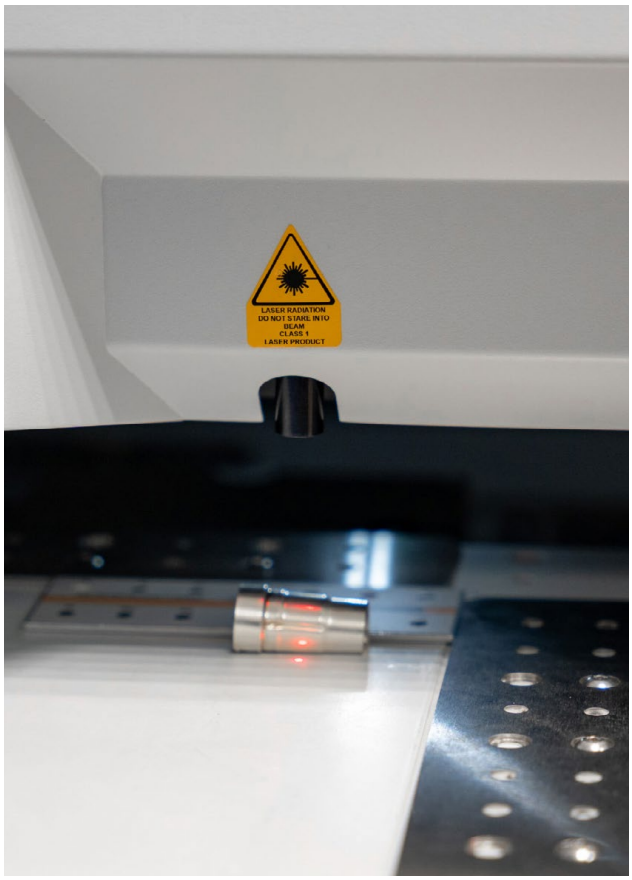
- active x-ray image stabilization
- detail detectability of 0.5 µm
- filament- and maintenance-free closed transmission x-ray tube
- highest real-time image quality
- 160 kV tube with up to 10 W power
- system magnification 7,800x; total 23,400x (with digital zoom)
- maximum stage size: 736 x 580 mm
- 16-bit image processing
- 70° oblique angle views
- 25 fps full-frame real-time image recognition
- automatic inspection sequences via program memory

2. 10. 3 Fisher Scope for Layer Thickness Measurements

The Fisher Scope uses energy-dispersive X-ray fluorescence (EDXRF) to precisely determine thin layers, small structures, trace elements, and alloys. This allows coating thicknesses and material compositions to be analyzed.

Technical Specification

» **Element Range**	Aluminum Al (13) to Uranium U (92) – up to 24 elements simultaneously
» **X-Ray Tube**	microfocus tube with Tungsten anode and Beryllium window
» **High Voltage**	stepped adjustable (10 kV, 30 kV, 50 kV)
» **Spot Size**	dependent on measuring distance and aperture, smallest spot approx. Ø 0.25 mm
» **X-Ray Detector**	silicon drift detector (SDD) with Peltier cooling
» **Resolution**	≤ 140 eV
» **Measuring Distance**	0 to 80 mm
» **Stage Size**	370 x 300 mm
» **Sample Weight**	max. 5 kg
» **Sample Height**	max. 140 mm



2. 10. 4 Optical Investigations

Hirschmann Automotive‘s microscopic examinations enable the precise analysis of surface structures and material defects on a microscopic level.

State-of-the-Art Microscopy Technology

Hirschmann Automotive uses the Leica MC205 stereo microscope, the Leica DM6000 M light microscope or the Leica DVM6 digital microscope for detailed material analyses. Thanks to motorized zoom modules, LED illumination, integrated measuring functions and autofocus options, even the finest details are captured. With these technologies, high-precision optical analyses of components and materials can be carried out.

Precise sample preparation enables detailed examination of the material structure to evaluate quality, workmanship, and potential defects. The Hirschmann Automotive Central Laboratory is accredited according to DIN EN ISO/IEC 17025 for optical testing according to EN 60512-1-1 – Visual Inspection.

Stereo Microscope Leica MC205

Features

- LED circle light or vertical lighting
- automatic motorized multifocus
  - captures a series of images across a depth of field to create an image with infinite depth of field
  - manual and automatic modes, supporting all cameras and automated microscopes.
- HDR module
  - Blends the optimal image components obtained from multiple, different exposure times to create a contrast-corrected, balanced image
- measure and label
  - the most important functions for interactively measuring and labeling images, with automated calibration, transfer of measured values to archive fields, and direct export to Excel

Light Microscope Leica DM6000 M

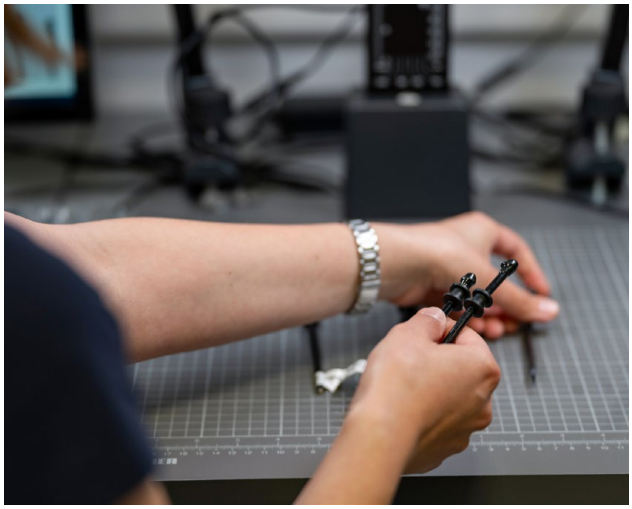
Features

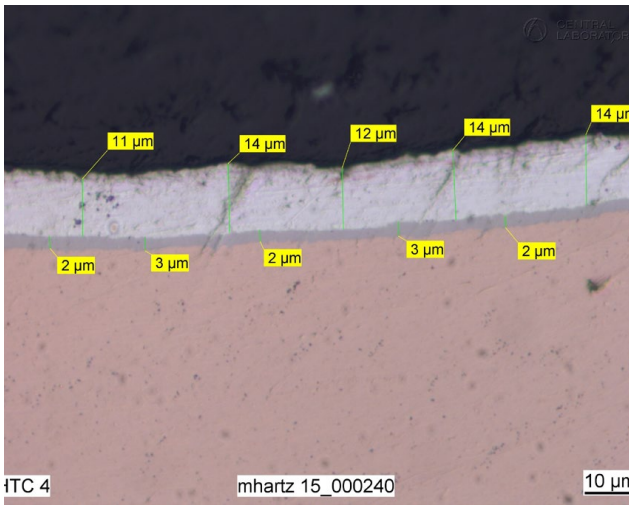
- objective nosepiece
- automatic motorized multifocus
  - captures a series of images across a depth of field to create an image with infinite depth of field
  - manual and automatic modes, supporting all cameras and automated microscopes.
- automatically reproducible acquisition positions
- fully automated transmitted light axis
- fully automated industrial axis for various aperture settings

Digital Microscope Leica DVM6

Features

» motorized version (can also be operated manually for quick rough positioning)
» zoom module with 16:1 zoom range
» integrated high-resolution 10 megapixel camera
» PlanApo-corrected Leica optics with long working distance
» iris diaphragm with automatic FlexAperture
» integrated ring light and coaxial LED illumination
» plug-on adapter for ring light contrast (polarizer, diffuser, grazing light illumination)
» backlight for transparent specimens
» tilt function operable with one hand for viewing angles between -60° and +60°
» focus drive with a travel range of 60 mm
» XY stage with a travel range of 70 mm x 50 mm
» autofocus with two options: single focus or continuous tracking of the focus each in the selected image section





2. 10. 5 Infrared thermal analysis in the range from -40° C – 500° C

Hirschmann Automotive's infrared thermal analysis measures temperature changes and heat distributions to evaluate the thermal behavior of materials under different conditions.

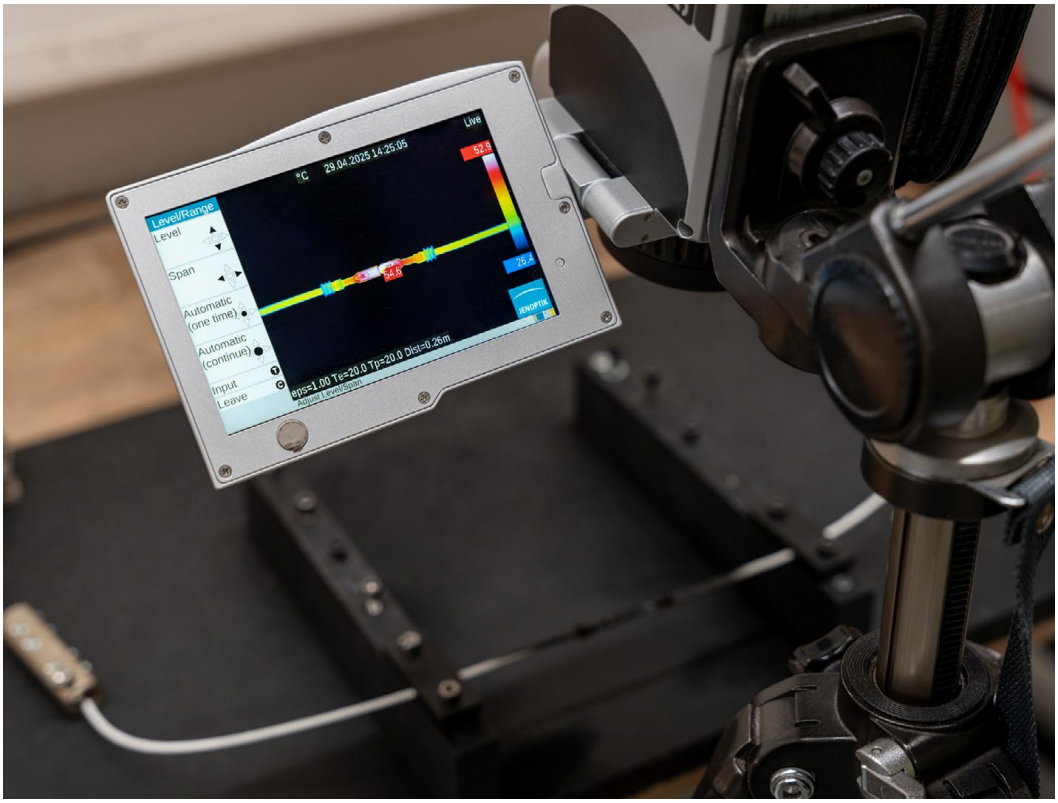
Device VarioCAM

Documentation

For documentation, Hirschmann Automotive offers a FireWire real-time interface (IEEE 1394) for digitally capturing thermal data. This is complemented by powerful PC thermal imaging software from InfraTec's IRBIS® family, which offers comprehensive analysis and evaluation options.

Technical Specification

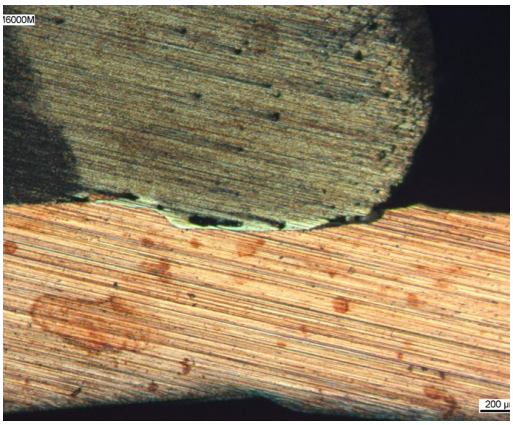
- **Temperature Measurement Range** -40° C to 500° C
- **Temperature Resolution at 30° C** better than 0.05 K
- **Measurement Accuracy** ±1.5 K in the range from 0° C to 100° C, otherwise ±1.5 %
- **Detector Type** uncooled microbolometer focal plane array
- **Detector Format** 640x480 infrared pixels
- **IR Frame Rate** 60 Hz
- **Zoom Function** up to 32x digital
- **Screen Function** merging of thermographic and color video image

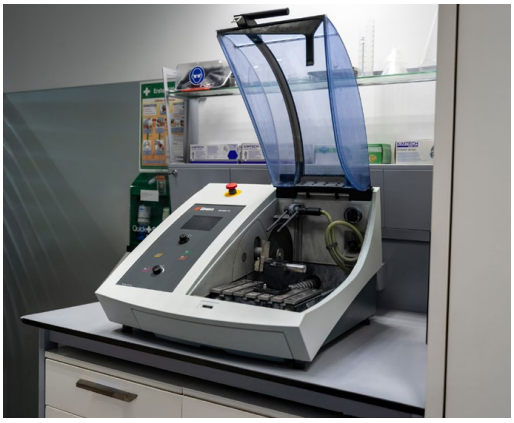


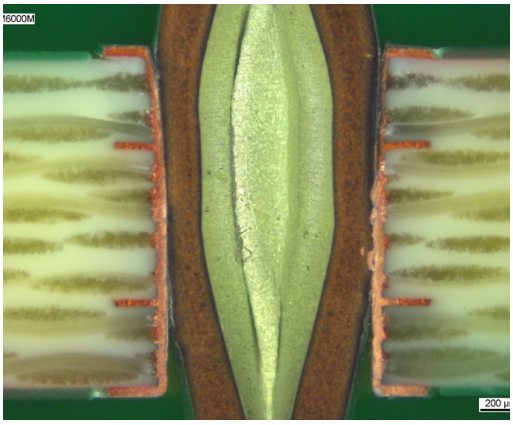
2. 11 Metallographic Investigations

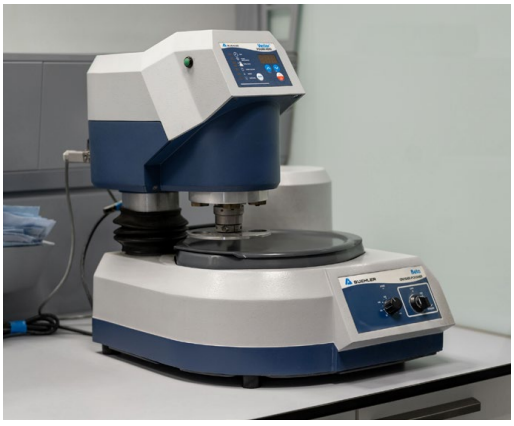
The quality is in the detail – metallographic tests from Hirschmann Automotive provide precise insights into the microstructure of the components. State-of-the-art analysis technology ensures that materials meet the highest requirements and that potential weak points are detected at an early stage. Using micrograph preparation and optical analyses, contacts, plastics, printed circuit boards, soldered and welded joints are inspected down to the smallest detail.

This allows material defects to be detected at an early stage and ensures the highest quality and reliability of the components.









2. 12 Monitoring of Test Samples

Data Logger

The data logger continuously monitors temperature (temperature sensor type K (-100° C to 260° C)), voltage, current and resistance. A sampling rate of up to 450 channels per second (Keysight DAQ 970A) enables detailed analyses.

Insulation Resistance

The insulation resistance is monitored with voltages of 500 to 1,000 V per channel, although only one channel is currently available. The measured values are recorded at intervals of six seconds.

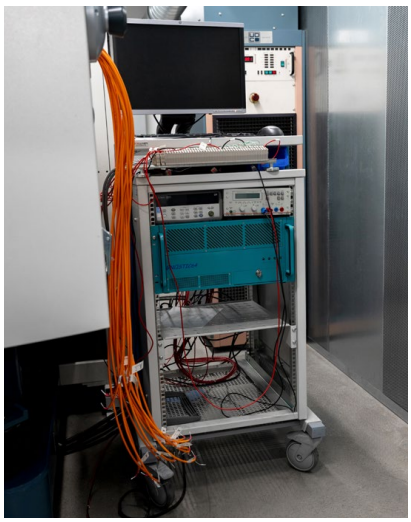
Gnostic 64 – Short Interruption System

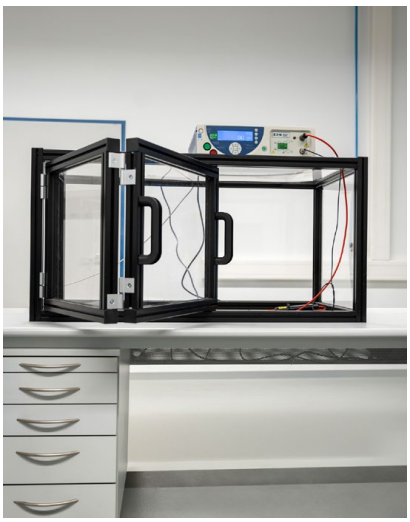
The Gnostic-64 interruption system offers a solution for monitoring short interruptions in electrical connections.

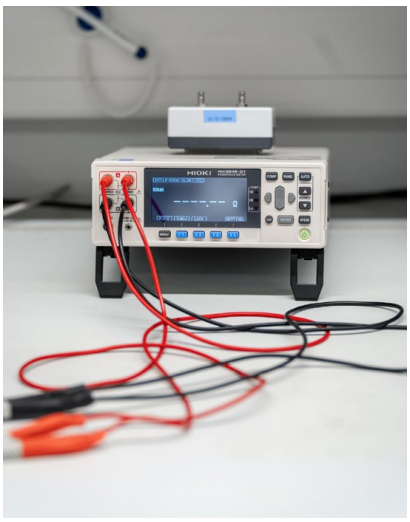
The following technical features make it an indispensable tool for quality assurance and troubleshooting in complex electrical systems.

Technical Specification

» time resolution: 25 ns (nano-seconds)
» trend recording
» 10 independent measuring channels for interruption (2 devices)
» 24 independent measuring channels for interruption (1 device)
» measurable interruption period > 25 ns
» one measurement channel for frequency and one measurement channel for temperature
» several trigger signals measurable at the same time
» 4-wire measurement
» min. resistance adjustable (> 1 Ω)





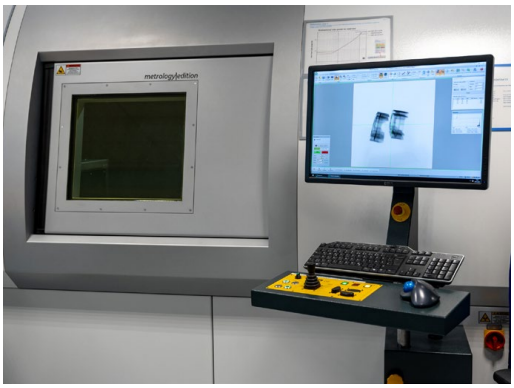


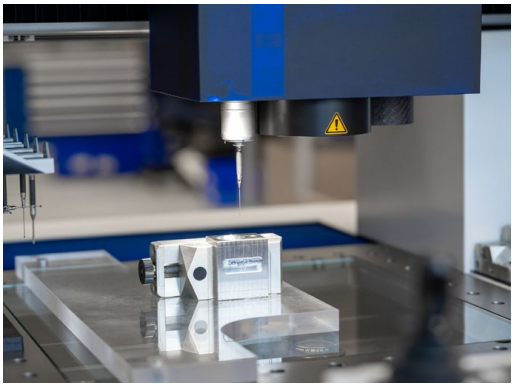
3 Measurement Laboratory

The measurement process at Hirschmann Automotive offers a wide range of evaluation and documentation options. Both optical and tactile measuring methods are available, enabling precise dimensional measurement of components through various measuring strategies and component orientations. The findings can be documented in multiple formats, ensuring detailed analysis and traceability of the measurement results.

Equipped with the latest testing technology, the laboratory offers optimal conditions for reliable and precise tests that meet the highest quality standards.

Here‘s a glimpse into the test laboratory‘s facilities:





3. 1 3D Coordinate Measuring Machines

Industrial measurement technology enables the precise acquisition of spatial data from objects. Using modern measuring systems, three-dimensional coordinate points are captured to create exact digital models. This technology is crucial for quality assurance and the development of complex products, as it provides detailed information about the geometry and dimensions of an object.

3D Measurement for High-Resolution Analysis

The measurement process at Hirschmann Automotive offers a wide range of evaluation and documentation options. Both optical and tactile measuring methods are available, enabling precise dimensional measurement of components through various measuring strategies and component orientations. The findings can be documented in multiple formats, ensuring detailed analysis and traceability of the measurement results.

3. 1. 1 3D Coordinate Measuring Machines

The Hirschmann Automotive measuring laboratory is accredited according to DIN EN ISO / IEC 17025 for the following internal test procedure for optical-tactile measurements: HA-PV-QLM-00001_V02 – the test procedure for determining geometric dimensional and form deviations on components made of various materials, as well as for performing and documenting tests using multisensor measuring devices.

Optical and Tactile Methods for Comprehensive Measurement and Documentation

ZEISS / O-Inspect 332

Test Equipment Number Q-50-12812
Inventory Number 12812

Type of Measuring Equipment 3D measuring machine optical/tactile

Calibration Frequency/Month 12 months, maintenance 12 months
Name of the Calibration Service Cal Zeiss Germany

Equipment for Internal Review KMG-Check Q-44-0231

Specification
- **Measuring Range** 300x300x200 mm
- **Resolution/mm** 0.00001 mm
- **System Accuracy** (manufacturer's data at 20° C) MPE = 2.4 µm + (L/200) (optical and tactile)
- **Standard** according to VDI/VDE 2617, DIN EN ISO 10360

Possible Applications
3D metrology optical and tactile, scan function, comparison with 3D model

Special Accessories, Software, Clamping Options
integrated damping system, integrated temperature sensor, automatic sensor replacement, 8-segment ring light, 12x zoom

ZEISS / O-Inspect 442

Test Equipment Number Q-50-14349
Inventory Number 14349

Type of Measuring Equipment 3D measuring machine optical/tactile

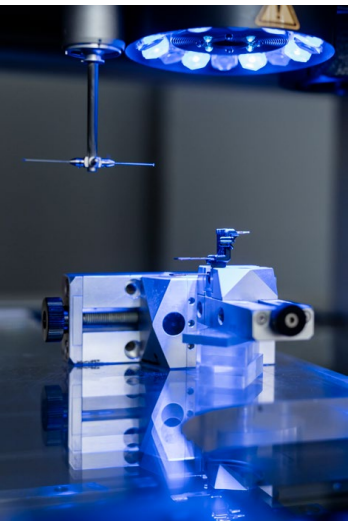
Calibration Frequency/Month 12 months, maintenance 12 months
Name of the Calibration Service Cal Zeiss Germany

Equipment for Internal Review KMG-Check Q-44-0231

Specification
- **Measuring Range** 400x400x200 mm
- **Resolution/mm** 0.00001 mm
- **System Accuracy** (manufacturer's data at 20° C) MPE = 2.4 µm + (L/200) (optical and tactile)
- **Standard** according to VDI/VDE 2617, DIN EN ISO 10360

Possible Applications
3D metrology optical and tactile, scan function, comparison with 3D model

Special Accessories, Software, Clamping Options
integrated damping system, integrated temperature sensor, automatic sensor replacement, 8-segment ring light, 12x zoom



ZEISS / O-Inspect 442

Test Equipment Number Q-50-12811
Inventory Number 12811

Type of Measuring Equipment 3D measuring machine optical/tactile

Calibration Frequency/Month 12 months, maintenance 12 months
Name of the Calibration Service Cal Zeiss Germany

Equipment for Internal Review KMG-Check Q-44-0231

Specification
- **Measuring Range** 400x400x200 mm
- **Resolution/mm** 0.00001 mm
- **System Accuracy** (manufacturer's data at 20° C) MPE = 2.4 µm + (L/200) (optical and tactile)
- **Standard** according to VDI/VDE 2617, DIN EN ISO 10360

Possible Applications
3D metrology optical and tactile, scan function, comparison with 3D model

Special Accessories, Software, Clamping Options
integrated damping system, integrated temperature sensor,
automatic sensor replacement, 8-segment ring light, 12x zoom, white light sensor

ZEISS / O-Inspect 543

Test Equipment Number Q-60-17023
Inventory Number 17023

Type of Measuring Equipment 3D measuring machine optical/tactile

Calibration Frequency/Month 12 months, maintenance 12 months
Name of the Calibration Service Cal Zeiss Germany

Equipment for Internal Review KMG-Check Q-44-0231

Specification
- **Measuring Range** 500x400x300 mm
- **Resolution/mm** 0.00001 mm
- **System Accuracy** (manufacturer's data at 20°C) MPE = 1.6 µm + (L/250) (optical and tactile)
- **Standard** according to VDI/VDE 2617, DIN EN ISO 10360

Possible Applications
3D metrology optical and tactile, scan function, comparison with 3D model

Special Accessories, Software, Clamping Options
integrated damping system, integrated temperature sensor,
automatic sensor replacement, 8-segment ring light, 12x zoom

3. 1. 2 Comprehensive Documentation for Detailed Analysis

The 3D measurement methods at Hirschmann Automotive offer versatile evaluation and documentation options.

- optical/tactile measuring method
- various measuring strategies/component orientations are possible
- dimensional measurement of components
- various documentation options like 2D images of the component, etc.
- creation of a point cloud (scan contour) → data format: .dxf
- creation of measurement reports (EMPB)

The 3D measurement processes at Hirschmann Automotive offer a wide range of evaluation and documentation options. The processing of 3D data includes the analysis and interpretation of the captured points to ensure that the product meets the given specifications. This comprehensive information enables accurate defect detection, improved manufacturing accuracy and efficient optimization of the design process.

3. 2 Computer Tomography (CT)

Advanced 3D Imaging and Analysis Capabilities

3. 2. 1 Computer Tomography (CT) Facilities

Waygate / Vtomex m 240

Test Equipment Number Q-60-15495
Inventory Number 15495

Type of Measuring Equipment X-Ray system

Calibration Frequency/Month 12 months, maintenance 6 months
Name of the Calibration Service GE Wunstorf Germany

Equipment for Internal Review Q-44-0254 / Q-44-0255

Specification

- 240 kV X-ray tube (unipolar) with longlife filament technology
- digital detector 16“, 4 megapixel with excellent contrast resolution
- 5-axis sample manipulation, granite based incl. X-axis
- temperature stabilized radiation protection cabin
- extension possibilities regarding automation (handling)
- prepared for installation of a second X-ray tube
- anti vibrations system

- **Measuring Range** 420x420x400 mm
- **Resolution/mm** 0.002 mm
- **System Accuracy** 4 µm + (L/100)
- **Standard** according to VDI 2630

Possible Applications
3D metrology, lunker analyses, wall thickness analyses, target-actual comparison, defect analyses, fiber composite analyses

Special Accessories, Software, Clamping Options
phoenix datos x3D CT acquisition and reconstruction Software,
5 Workplaces with VG-StudioMax for evaluation of the scan data

Werth Messtechnik GmbH / TomoScope XS

Test Equipment Number Q-60-50782
Inventory Number 00179

Type of Measuring Equipment X-Ray system

Calibration Frequency/Month 12 months, maintenance 12 months
Name of the Calibration Service Werth Messtechnik GmbH

Equipment for Internal Review Q-44-0254 / Q-44-0255

Specification

- tube voltage up to 200 kV and power up to 80 watts
- 16-inch, 4-megapixel digital detector with excellent contrast resolution
- transmission target with a focal spot size of approximately 1 µm (at 6 watts of power) Temperature-stabilized radiation protection cabinet
- expansion options for automation (handling)
- long-life target
- workpiece changer

- **Measuring Range** 420x420x400 mm
- **Resolution/mm** 0.002 mm
- **System Accurancy** 4 µm

Possible Applications
3D metrology, lunker analyses, wall thickness analyses, target-actual comparison, defect analyses, fiber composite analyses

Special Accessories, Software, Clamping Options
phoenix datos x3D CT acquisition and reconstruction software, 5 workplaces with VG-StudioMax for evaluation of the scan data

Reconstruction workstation for accelerated data reconstruction measuring range/ axis dimension: D 125x150 mm

3. 2. 2 Comprehensive Documentation for Detailed Analysis

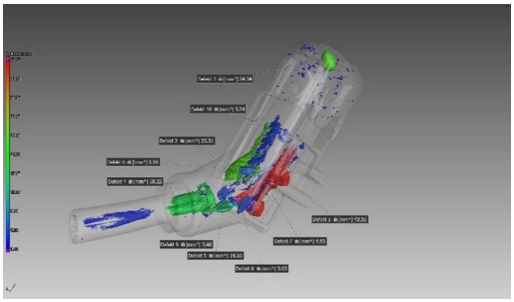
Hirschmann Automotive offers various documentation options for analyzing and visualizing measurement results. These include the standard measurement report (EMPB) and a computed tomography part inspection video, providing detailed views in all axes. A false-color 2D report highlights deviations visually as a screenshot. For the 3D target/actual comparison, a free viewer is provided, which also allows you to review the measurement strategy and individual positions. The computed tomography dataset is available as an .stl file.

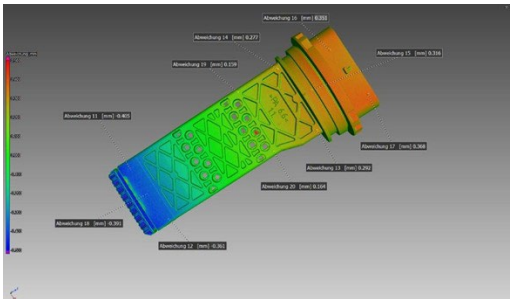
Visualization of CT data (Volume Graphics/Zeiss Inspect Pro)

» visualization
» analyses
» alignment of data records
» measuring instruments
» videos/animations
» display of analyses & reports
» data import/export

Non-Destructive Testing Technique

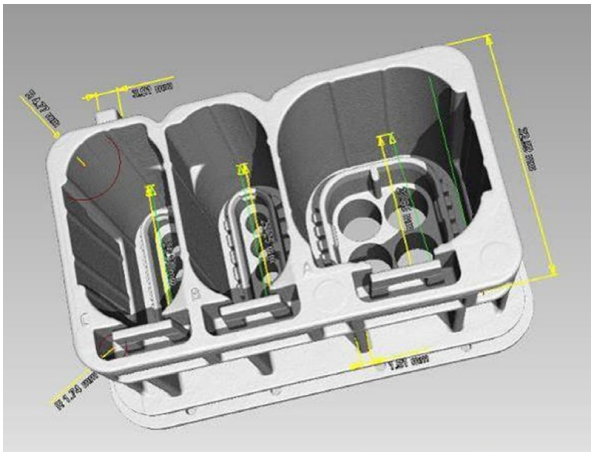
» defect analysis (air pockets, voids, foreign particles)
» porosity analysis
» material testing
» 100 % statement of the complete geometry of the component
» wall thickness analysis





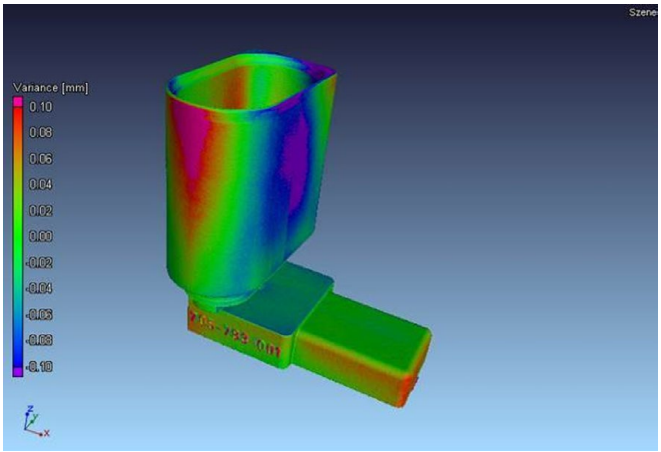
Non-Destructive Coordinate Measuring Technique

» measuring method on 3D digitized data record
» various measuring strategies possible (+ inner contours)
» flexible part alignments possible
  » according to references/drawing, 3-2-1 alignment
  » alignment according to CAD
» »Bestfit« alignment
» dimensional measurement of parts
» creation of measurement reports (EMPB)
» 100 % statement of the complete geometry of the component



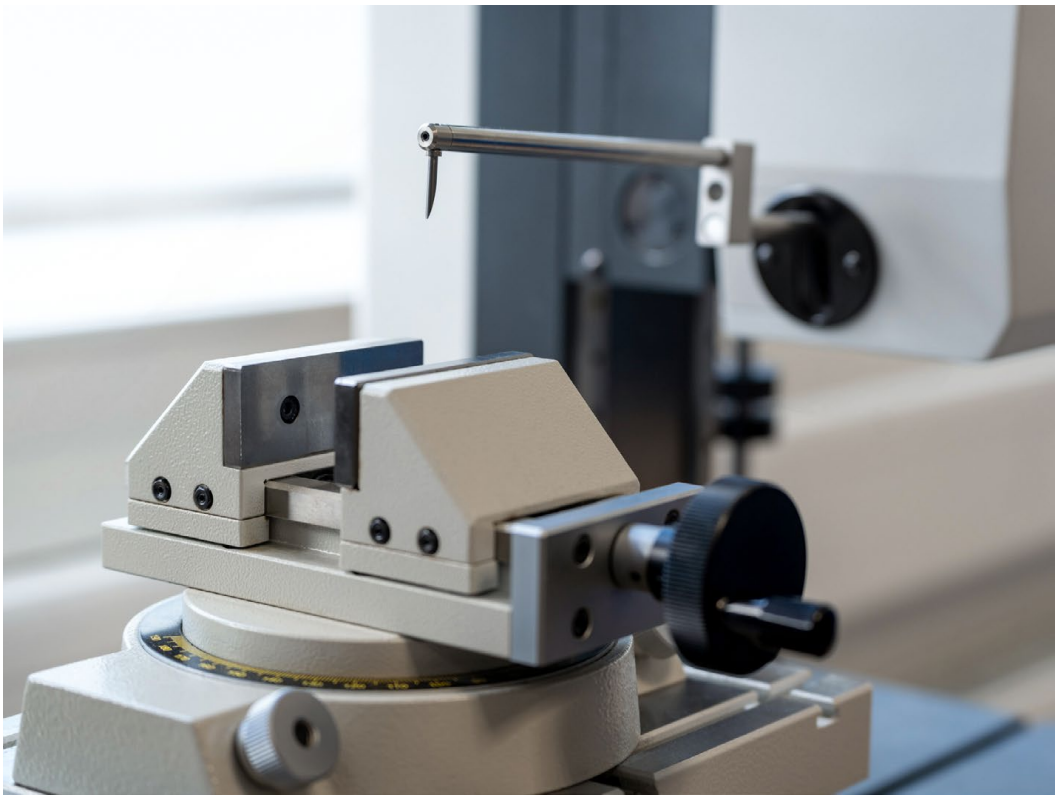
Non-Destructive Geometry Comparison

» generation of voxels => point clouds for reconstruction to a 3D model (→ .stl file)
» target / actual comparison (2D contour plot and 3D possible), CAD data to CT scan data with flexible result representation (tolerance band) as color representation
» generation of 3D volume data (→ .stl file)
» display of deviations from CAD (shrink marks, distortion, etc. of the geometry)
» 100 % statement of the complete geometry of the component



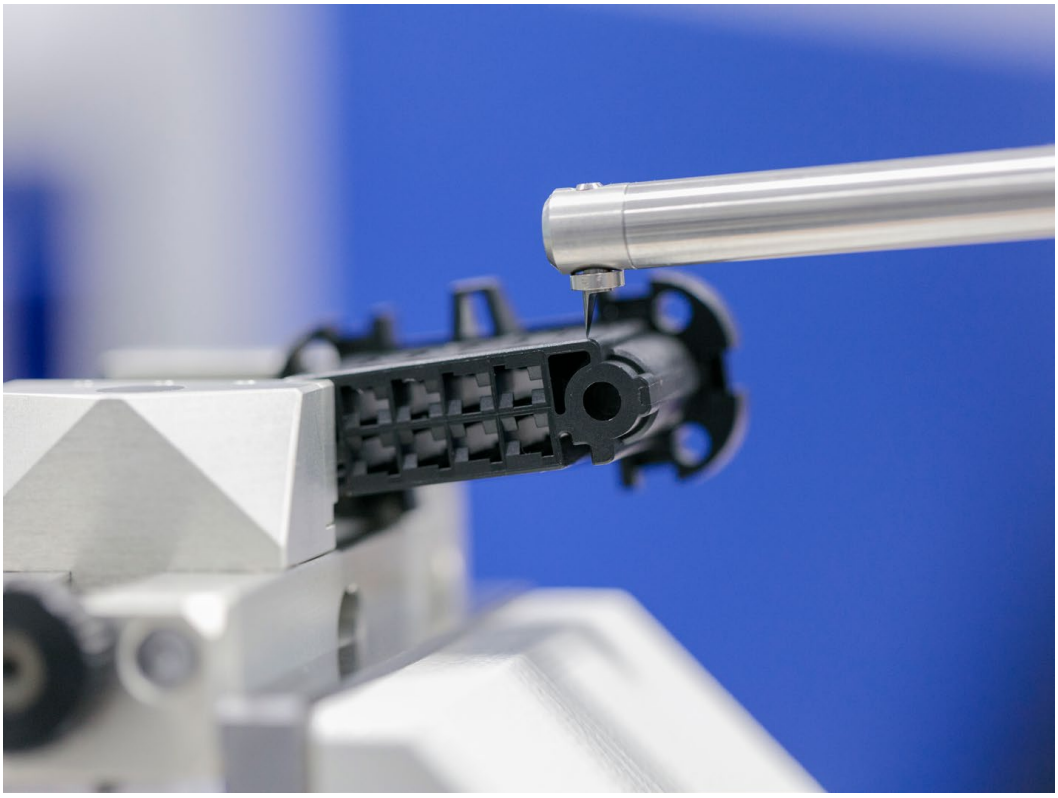
3. 3 Surface Roughness Measurement

Hirschmann Automotive performs surface roughness measurements in accordance with DIN EN ISO 4288. These evaluations ensure that surface quality is accurately measured and documented according to the required standards.



3. 4 Contour Measurements

At Hirschmann Automotive, the contours of workpieces are measured two-dimensionally using a contour measuring device. This device features a touch probe that tactically traverses the workpiece to measure points along its contour. The Mitutoyo Formtracer provides a measuring range of 100 mm on the x-axis and 350 mm on the z1-axis.



4 Normative and Customer-Specific Basics

4. 1 Standards and Procedures Applied (Selection)

*** for standards and procedures marked in bold, accreditation according to ISO 17025 exists**

EN 40050-9	Protection Class Test
EN 60068-2-1	Cold Storage
EN 60068-2-2	Storage in Dry Heat
EN 60068-2-6	Dynamic Stress, Sinusoidal
EN 60068-2-11	**Salt Spray**
EN 60068-2-13	Low Air Pressure
EN 60068-2-14	Temperature Shock
EN 60068-2-27	Constant Shock
EN60068-2-30	Damp Heat Cyclical
EN 60068-2-31	Drop Test
EN 60068-2-52	**Salt Spray Cyclical**
EN 60068-2-64	Dynamic Stress, Broadband Noise
EN 60512-1-1	**Visual Examination**
EN 60512-1-2	Mass
EN 60512-1-3	Contact Coverage
EN 60512-1-4	Koshiri Savety
EN 60512-2-1	**Contact Resistance (Millivolt Level Method)**
EN 60512-2-2	**Contact Resistance (with Prescribed Current)**
EN 60512-3-1	**Insulation Resistance**
EN 60512-5-1	**Temperature Increase Due to Current Load**
EN 60512-5-2	**Current-Temperature Derating**
EN 60512-13-5	**Mechanical Operation Tests, Polarizing & Keying Method**
EN 60512-14-5	**Diving with a Pressure Difference**
EN 60512-15-6	**Mechanical Connector Tests, Effectiveness of Connector Coupling Devices**
EN 9227	**Corrosion Testing in Artificial Atmospheres**
HA-PV-QLM-00001_V02	**Hirschmann Automotive test procedure for the determination of geometric dimensional and form deviations on components made of various material, performance and documentation of tests using multisensor measuring devices (e.g. as required in EN 60512-1-2)**

4. 2 Test Specifications – Customer Specifications

- MBN 10 384 Test specification for automotive connectors & their derivatives MBN 10 384-1,-2,-3
- MBN LV 215 Test specification for automotive high voltage contacting
- MBN 10306 Test specification for electrical and electronic components in motor vehicles
- GS 95006-7-1 Tests for connectors in motor vehicles and their derivatives GS 95006-7-2,-3,-4
- GS 95031 Test standard for automotive high voltage contacting
- GS 95024-3-1 Tests for electrical and electronic components in motor vehicles
- VW 75174 Test specification for automotive connectors and their derivatives VW 75174-1,-2,-3
- VW 80332 Test standard for automotive high voltage contacting
- VW 80000 Test standard for electrical and electronic components in motor vehicles up to 3.5 t (03/2017)
- PF.90012 Performance specification for automotive electrical connector systems
- GMW3191 Connector test and validation specification
- SAE/USCAR-2 Performance specification for automotive electrical connector systems
- SAE/USCAR-37 High voltage connector performance supplement to SAE/USCAR-2

5 Pricing and Conditions

The Hirschmann Automotive test laboratory offers services according to customer-specific requirements, adhering to national and international standards.

Matthias Bell, Director of Quality, will be happy to provide you with a detailed quote.

6 Contact

From vibration testing to environmental simulations to 3D measurement technology, the service catalog covers a wide range of testing and analysis solutions. Browse our catalog and find the right service for your needs.

Do you have any questions? Contact us!

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