SAL
SILICON AUSTRIA LABS

VALIDATION LAB

Testing, Verification & Reliability Services by Silicon Austria Labs

www.silicon-austria-labs.com

Silicon Austria Labs (SAL) is a leading European research center specializing in Electronics and Software Based Systems (ESBS). SAL conducts industry- and application-driven research across the entire ESBS value chain, from wafer to intelligent system, developing innovative solutions for sectors such as industrial production, health, energy, mobility, and safety. The research center aims to strengthen the ESBS ecosystem in Austria, attract top talents to Austria and Europe, and achieve technological breakthroughs to support the triple transition.

LOCATIONS

Sandgasse 34
8010 Graz

Europastraße 12
9524 Villach

Altenberger Straße 66c
4040 Linz

LOCATION VALIDATION LAB

Sandgasse 34
8010 Graz

WHY SAL?

Silicon Austria Labs offers one of Austria's most advanced validation environments — combining precision, reliability, and scientific excellence.

CUTTING-EDGE VALIDATION FOR CUTTING-EDGE INNOVATION

With high-end testing systems and specialized measurement setups, SAL provides one of the most comprehensive validation infrastructures in Austria.
Our labs in Graz, Villach and Linz meet the highest industry and research standards — enabling detailed environmental, electrical, mechanical, and material testing under real-world conditions.

Every device, every setup, and every measurement follows one principle: **quality without compromise.**

STATE-OF-THE-ART TESTING & ANALYSIS

Our Validation Lab provides state-of-the-art testing and analysis for electronic systems, materials, and components. Industrial partners benefit from precise results, top quality, and reliable insights for development and production.

VALIDATION CATEGORIES

- Environmental & Reliability Testing
- Mechanical & Packaging Testing
- Electrical & Electromagnetic Testing
- HW/SW Testing & Formal Verification

EXPLORE OUR VALIDATION CAPABILITIES

HIGHLY ACCELERATED STRESS TESTING (HAST)

Dual-Chamber HAST system

The HAST Chamber is an essential tool in reliability and validation labs for rapidly simulating the effects of long-term environmental exposure. By applying high temperature, humidity, and pressure, it accelerates aging processes such as corrosion, insulation failure, and moisture-induced degradation in electronic components and assemblies. HAST technology is based on unsaturated pressurized vapor testing, which intensifies stress conditions while maintaining precise control. This allows researchers and engineers to uncover potential failure mechanisms early in development, reducing time-to-market and improving product durability.

Typical applications include testing semiconductors, circuit boards, sensors, and other moisture-sensitive materials, particularly in sectors like automotive, aerospace, and consumer electronics. The method supports both biased and unbiased testing, making it versatile for a range of use cases. The main advantages of HAST chambers include faster test cycles, compliance with international standards (e.g., IEC, JEDEC), and highly reproducible results. They are especially effective in simulating field conditions that would otherwise take months or years to replicate.

TECHNICAL SPECIFICATIONS

Dimensions of Testroom:
- Diameter: 39 cm
- Depth: 40 cm

Temperature: 105 °C to + 142.9 °C

Humidity: 75 %rh to 100 %rh

Pressure Range: 1,18 bar to 2,16 bar

Customized feedthrough to allow high-current supply

SUN CHAMBER

The Sun Chamber enables the replication of the full spectrum of natural sunlight - including ultraviolet (UV), visible, and infrared radiation - within a controlled environment. This method is essential for assessing how materials, components, and systems respond to solar exposure over time. By combining adjustable irradiance with precise temperature and humidity control, sun simulation allows for accelerated aging studies and environmental performance evaluations. It provides a reliable basis for simulating real-world conditions, supporting the development and validation of products intended for outdoor or light-intensive applications. Sun simulation is essential for validating the durability of electronic systems, sensors, photovoltaic devices, automotive parts, plastics, coatings, and construction materials.

TECHNICAL SPECIFICATIONS

Dimensions of Testroom:
- Width: 58 cm
- Depth: 76 cm
- Height: 77 cm

- Spectral Irradiation: 280 nm to 3000 nm
- Irradiation Intensity: 600 W/m² to 1120 W/m²

- Climate Tests with Irradiation
- Temperature: 15 °C to 80 °C
- Humidity: 10 %rh to 80 %rh

- Temperature Tests with Irradiation
- Temperature: -20 °C to 100 °C

ALTITUDE CHAMBER

Altitude Chamber: SkyEvent TAH

The Altitude Chamber creates a controlled under-pressure environment designed to simulate high-altitude conditions. It is typically a sealed chamber in which air pressure can be adjusted to replicate atmospheric pressure conditions found at different altitudes.

High-altitude environments can impact various materials used in electronics or sensors, such as adhesives, seals, and circuit board substrates. Testing electronics in an altitude chamber ensures that they can withstand the extreme conditions encountered during high-altitude operations.

Identifying potential issues and weaknesses caused by pressure is especially valuable for testing electronic devices intended for use in aerospace, aviation, and high-altitude applications.

TECHNICAL SPECIFICATIONS

Dimensions of Testroom:
- Width: 95 cm
- Depth: 100 cm
- Height: 90 cm

Pressure Range: ambient pressure to 5 mbar

Temperature (at ambient pressure to 150 mbar):
-60 °C to 120 °C

Humidity (at ambient pressure): 15 %rh to 95 %rh

CLIMATE CHAMBER

The Climate Chamber is used to simulate specific temperature and humidity conditions and to test product durability and performance. It can be used to test whether components can withstand extreme environmental conditions such as heat, cold and humidity.

For simultaneous exposure to climate conditions and vibration, the Climate Chamber can be combined with the Shaker (see p. 14), providing more accurate and realistic testing.

Climate chambers are essential to test the reliability and robustness of products over time, especially in the automotive, aerospace and electronics industries. By exposing samples to accelerated aging conditions, engineers can predict long-term performance and identify potential failure points. It is also used in research and development to optimize material selection and product design. Overall, the climatic chamber plays a crucial role in ensuring product safety, quality, and validation.

TECHNICAL SPECIFICATIONS

Dimensions of Testroom:
- Width: 80 cm
- Depth: 80 cm
- Height: 95 cm

Temperature: -70 °C to 180 °C

Humidity: 10 %rh to 95 %rh

Temperature Ramp Speed: 15 °C / min

Compatible with Shaker

Climate Chamber combined with the Shaker

CORROSION CHAMBER

The Corrosion Chamber is used to perform salt spray testing to analyze the corrosion resistance of industrial materials. Corrosion can lead to considerable impairment of the function of metals, their environment, or the technical system of which it forms a part.

By generating a controlled saline mist atmosphere, the corrosion behavior of materials under salty, aggressive conditions is simulated.

The system features a sealed chamber, programmable temperature control, and continuous salt mist generation ensuring compliance with relevant international testing standards. In addition, we offer the flexibility to run customized test programs tailored to specific customer requirements, enabling practical and application-oriented results. During testing, corrosion, surface degradation, and coating failure are monitored and documented.

Such testing is particularly recommended for coatings, metals, and surface treatments in industries like automotive, aerospace, and construction.

TECHNICAL SPECIFICATIONS

Dimensions of Testroom:
- Width: 100 cm
- Depth: 60 cm
- Height: 85 cm

Available Test Methods:
- Salt Spray
- Condensation Climate (“Sweating” conditions)
- Fixed Humidity Environment (50 %rh)

Temperature: 10 °C to 50 °C

GAS TEST STAND

Gas Test Stand by DEMCON Convergence with machine part (left) and sample chamber in water bath (right)

The Gas Test Stand in our Validation Lab enables the precise evaluation of gas sensor performance throughout the development phase. Carefully controlling key environmental parameters, such as gas mixtures, gas flow, temperature, and humidity, enables a detailed investigation of sensor behavior under defined conditions.

A key feature of the test stand is its unique gas mixing chamber, which allows for the generation of specific gas mixtures and extremely low analyte concentrations. This makes it especially effective for evaluating sensor cross-sensitivity during early-stage development. This enables highly sensitive and reproducible measurements, simulating real-world conditions.

TECHNICAL SPECIFICATIONS

Temperature: 0 °C to 60 °C

Humidity: 0 %rh to 90 %rh
(adjustable above 10 °C)

Carrier gas: N_2 or synthetic air

Total flow: 100 ml/min to 2500 ml/min

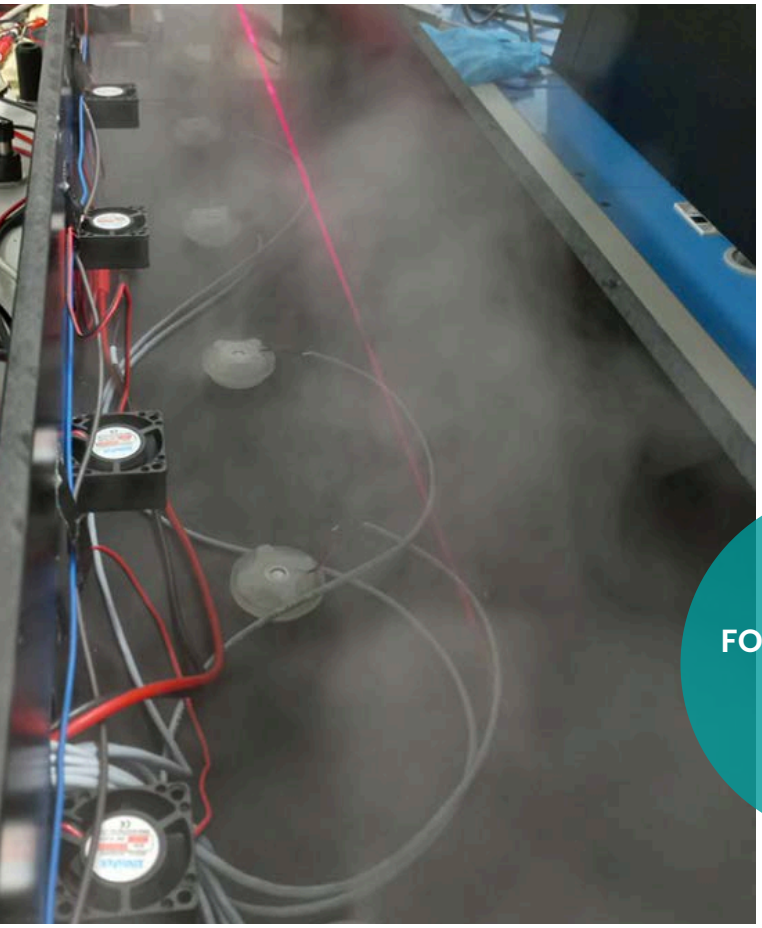
Analyte Gases:

- CO_2: 200 ppm - 4000 ppm
- CO: 3 ppm – 840 ppm
- NH_3: 50 ppb – 270 ppm
- H_2S: 20 ppb – 700 ppm
- SO_2: 0.5 ppm – 700 ppm

VISIBILITY FOG CHAMBER

The compact Visibility Fog Chamber, developed at Silicon Austria Labs, enables testing of optical sensors under reduced-visibility conditions, ranging from a few meters up to 1 km. This includes visibility sensors, imaging sensors, ranging sensors, as well as image recovery algorithms. The chamber operates in conjunction with a transmissometer, allowing measurement of the meteorological optical range in real-time during sensor evaluation. The transmissometer supports different wavelengths to prevent interference with the optical sensor under test.

The main benefit of this apparatus is that it provides a fast, cost-effective, and quantitative assessment of an optical visibility sensor's performance in fog, prior to undertaking costly, large-scale validation tests in large-scale environmental chambers.



FOG CHAMBER IN OPERATION

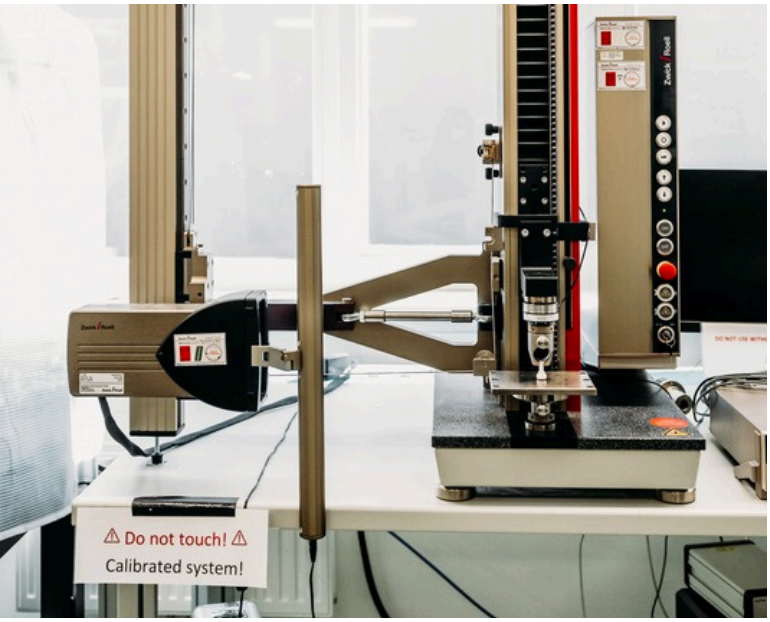
TECHNICAL SPECIFICATIONS

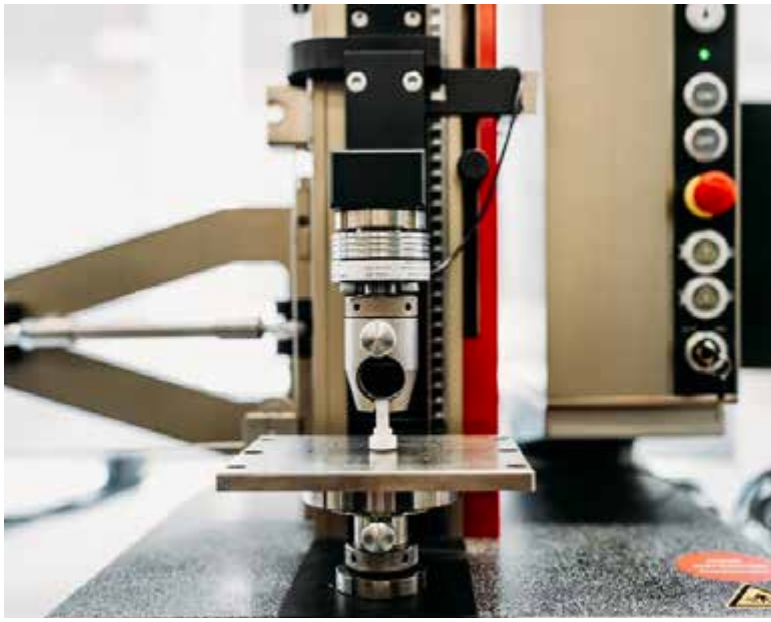
Dimensions of Testroom:
- Width: 19 cm
- Height: 19 cm
- Length : 210 cm

Test Volume: 0.076 m³

Visibility range: 1 m – 1 km

PUSH- & PULL-TESTS





Test setup of the 2.5 kN ZwickiLine, equipped with video extensometer

With our Zwick-Roell ZwickiLine 2.5 kN universal testing machine, we offer mechanical testing as a service – precise, reliable, and versatile. Available tests include tensile, compression, bending, as well as adhesion and peel tests (e.g., 90° peel and dolly tests) on materials, components, and printed structures. Thanks to a high-resolution video extensometer, we can accurately capture even minimal strains in stiff materials.

Our testing services enable the determination of strength values, elongation, adhesive strength, and mechanical behavior under defined loading conditions. Suitable clamping tools and test setups are available for 3-point bending and other standardized methods.

Whether for quality assurance, material development, or to support your research, we test your samples in the force range from 0.1 to 2.5 kN and deliver well-founded results.

TECHNICAL SPECIFICATIONS

Test Area Dimensions:
- Height: 106,5 cm
- Depth: 10,5 cm
- Width: no limitation

Drive System
- Crosshead speed (min): 0.0005 mm/min
- Crosshead speed (max): 1000 mm/min
- Travel resolution: 0.0277 µm

Maximum test force: 2.5 kN

Accuracy
- Class 1: from 0.4% of nominal force (Fnom)
- Class 0.5: from 2% of nominal force (Fnom)

VideoXtens
- Resolution: 0.9 µm

SEALING TEST FOR PACKAGING

Custom-designed sealing tester with the pressure chamber (left side) and the chamber for leakage testing (on the right side).

With the “He Leakage Tester”, leak tightness and durability of hermetic enclosed electronic components with inner cavities (e.g. MEMS, IC- housing, transistors, laser diodes, inert gas relays, reed contacts, piezo crystals, ...) can be tested and verified. By exposing the device to a pressured helium test gas, it is expected that a leak will cause an enrichment (also called bombing) of helium inside the cavity. After that, the device's outgassing of helium is tracked at a vacuum level, which gives information about possible leaks of the enclosure.

TECHNICAL SPECIFICATIONS

Pressures up to 6 bar

Test Volume: Cylinder with 10 cm diameter and 3 cm height

SHAKER

The Shaker is used to simulate vibration conditions that products may encounter during transportation, or operational conditions. It is needed to determine whether components, electronics or materials can withstand mechanical stresses such as shaking, jolting, or continuous vibration. In industries such as automotive, aerospace, and electronics, vibration can significantly impact performance and safety. Replicating real-world vibration profile tests the reliability and robustness of products. It also plays a role in the development phases, refining product design and improving mechanical durability. Ultimately, shaker testing helps manufacturers meet industry standards and deliver durable, high-quality products.

Shaker: IMV A11

TECHNICAL SPECIFICATIONS

Frequency: 5 Hz to 4500 Hz

Force (sine): 11 kN

Force (shock): 22 kN

Max Displacement: 55 mm

Max Load: 200 kg

IMPEDANCE & VECTOR NETWORK ANALYSIS

Measurement of impedance enables precise characterization of electronic components, interconnects, and materials. Impedance-based analysis is a non-destructive method for detecting degradation after environmental stress testing, revealing deterioration mechanisms that are otherwise difficult to observe. Our testing services include single- to multiport impedance and vector network measurements from DC to 70 GHz under various biasing conditions, including voltage, current, and temperature. High-precision impedance analysis is performed from 20 Hz to 120 MHz using the auto-balancing bridge method, and from 1 MHz to 3 GHz using an RF-IV analyzer. For higher frequencies, 2-port and 4-port vector network analyzers enable measurements from 9 kHz to 70 GHz.

For insights into electrical transmission properties of cables, interconnects, and PCB traces and for failure diagnostics, we are offering Time-Domain Reflectometry (TDR) powered by a 16 GHz high-performance oscilloscope with real-time de-embedding.

Impedance Analyzers Keysight E4990A and E4991B for measuring single-port impedance over a broad frequency range

TECHNICAL SPECIFICATIONS

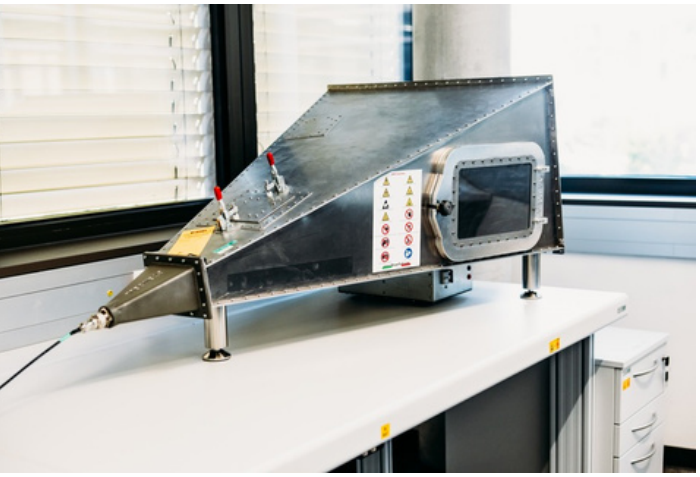
Impedance Analyzer:
- Keysight E4990A (20 Hz - 120 MHz)
- Keysight E4991B (1 MHz – 3 GHz)
- OMICRON Lab Bode 100 (1 Hz – 50 MHz)

Time Domain Reflectometry (TDR):
- R&S RTP164B (16GHz, 40Gsample/s)

Vector Network Analyzer:
- 2-Port Copper Mountain S5085 (9 kHz - 8.5 GHz)
- 2-Port Anritsu MS4647B (10 MHz - 70 GHz)
- 4-Port Keysight PNA-X N5244B (10 MHz - 43.5 GHz)

ELECTROMAGNETIC EMISSION & IMMUNITY

EMI Receiver used for measuring the electromagnetic emission spectrum.



GTEM cell used for measuring the radiated electromagnetic emissions.

State-of-the-art equipment is available for pre-compliance validation of conducted electromagnetic emission according industrial and automotive standards for 3-phase and DC systems.

Bulk Current Injection (CBI) tests to assess conducted immunity of automotive devices can be performed with in-house available artificial networks, signal generators, power amplifier and coupling devices.

Radiated immunity testing is carried out using Transverse Electromagnetic (TEM) and Gigahertz Transverse Electromagnetic (GTEM) cells, enabling quick tests without the need for an anechoic chamber. The GTEM cell is applied for both radiated immunity and emission testing, allowing the influence of high field strengths on DUTs to be assessed, including tests with DUT cutouts positioned close to the GTEM cell septum.

TECHNICAL SPECIFICATIONS

Conducted Emission
Automotive and industrial DC and 3-phase systems

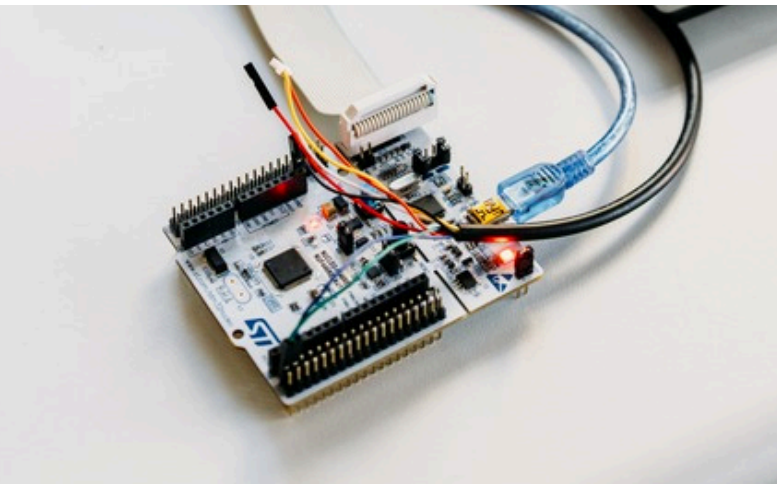
Conducted Immunity
Bulk Current Injection (9 kHz – 400MHz, up to 100W)

Radiated Immunity & Emission
TEM / GTEM cell

ADVANCED HARDWARE & SOFTWARE VERIFICATION

Verifying modern embedded systems requires more than traditional testing alone. We offer a comprehensive and flexible approach based on our expertise in formal methods, model-based and automated testing, and software engineering. Our approach ensures that embedded systems, including AI components, function as intended in the real world without requiring excessive verification effort.

For most demanding systems, we create behavioral models using formal methods and machine learning techniques. These models are automatically verified against requirements, allowing us to systematically evaluate correctness, robustness, and long-term reliability. By integrating automated testing with model checking, we detect defects early. For AI components, we go further by testing ML models for stability, edge cases, and robustness. We offer testing during ongoing environmental stress (i.e., device in test chamber). This way, we ensure that the systems under test operate reliably and efficiently in real-world environments.



CAPABILITIES & SPECIFICATIONS

AI/ML Testing: Stability checks after pruning/quantization, edge-case generation, reinforcement learning validation

Formal Specification & Verification: State-of-art languages, e.g., TLA+, model-checking, model learning with in-house tool AALpy

Test Types / Methods: Unit, integration, regression, property-based, mutation testing, adaptive testing, classic black-box/white-box approaches, robustness (e.g., fuzzing, HW/SW-fault injection)

Automation: Continuous integration (CI/CD), automated pipelines for reproducibility

Focus Areas: Functional safety, robustness, performance validation, explainability

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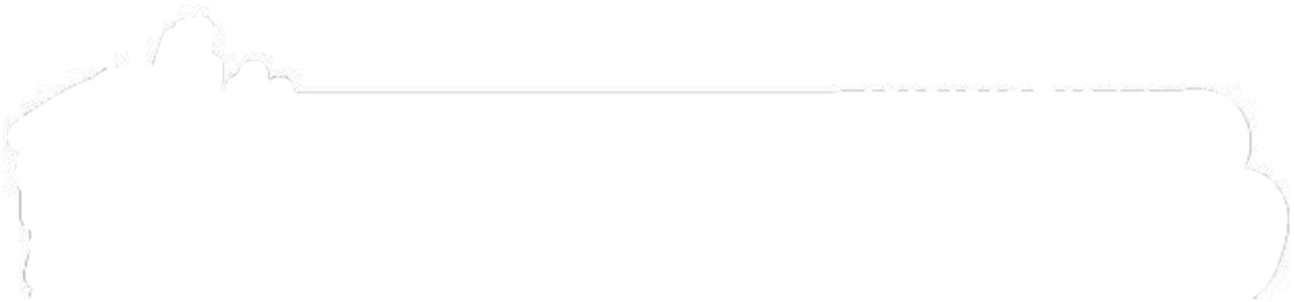

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