LINK Testing **Services**

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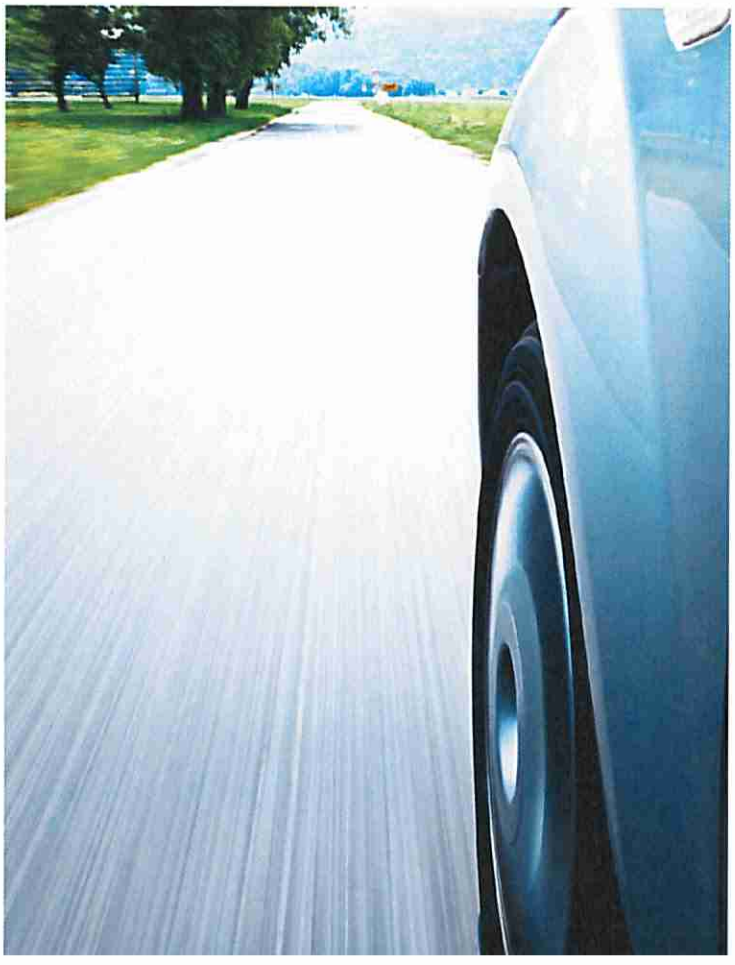

LINK Testing Services

Overview

- Premier third-party testing for the global transportation industry
- Laboratory, proving ground, and field testing for component, sub-system, and full-vehicle level on passenger cars and commercial vehicles
- Testing Laboratories and access to proving grounds in North America, Brazil, China, Europe and Korea

The ART^2 of **Testing**

The vehicle's braking and steering systems (with increasing interaction with the vehicle electronics, software and the road) allow you to remain in control and to avoid external hazards. They work together as the two most significant active safety systems to prevent fatalities, injuries, and property damage every time you are on the road. Accurate prediction and evaluation of brake system behavior and performance are critical activities for design and application engineers. That is why LINK's testing services use the latest technology in brake system testing to provide **accurate** results. Since 1935, LINK has been supporting sound brake system design in equipment used by LINK testing services around the globe.

Whether it is a brand-new test system designed to measure brake drag or the development of innovative test procedures, V2X developments, or securing product/system certification, LINK possesses the pedigree to get the job done. This expertise ensures **reliable** test data to the customer. Over 30 engineers are available at LINK to guarantee **technical** results expected by the customer, and ultimately, the end user. To ensure the **timely** testing services, LINK has resources that include more than 40 brake inertia-dynamometers and 100 in-vehicle data acquisition systems specifically designed and built for brake components and system testing.

Sample Testing for **Friction Materials**

- AK compressibility and thermal conductivity
- AMECA (VESC-V3 SAE J661A) certification for edge code
- CHASE speed, pressure, and temperature sensitivity
- CHASE wear and friction behavior for clutch facing materials
- ISO 6310 & SAE J2468 ambient and elevated temperature compressibility
- ISO 6311 and JASO C444 internal shear strength
- ISO 6312, SAE J840, and Global Spec shear strength (including thermal aging)
- ISO 6314 corrosion and contamination resistance
- SAE J160 swell & growth
- Physical properties under ISO 15484
- SAE J866 & J2975 for copper and heavy metals certifications in California and Washington
- GMW 15334 and SAE J3079-2 for low preload compressibility and creep
- INMETRO (Brazil) friction material certification
- ICONTEC (Colombia) friction material certification
- ECE R90 physical properties
- ISO 2039 and ASTM E18 for Rockwell hardness

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Friction Materials for **Automatic Transmissions**

- Limited slip differential for performance, chatter, and moan

Brake **Components**

- ASTM B117 static corrosion
- ECE R13 air actuators performance
- EKB 1102 corrosion test for shims
- EKB 1103, torque endurance, EKB 1104 static endurance, EKB 1107 & SAE J2694 T-pull test, and EKB 1108 compressibility for noise shim
- JASO C463 proportioning valves performance
- JASO C419, C421, C448, C568 comprehensive caliper performance
- JASO C452 vacuum servo units
- SAE J1908 brake vacuum assist booster
- SAE J2598 natural frequency and damping for brake pads
- SAE J2933 brake rotor modal frequencies
- SAE J3001 brake insulator damping
- Brake rotor mapping for DTV
- Natural frequency and damping characterization
- VDA 311 and SAE J2995 fatigue and strength of hydraulic components

Suspension, Wheels, and **Wheel End Components**

- OE and aftermarket knuckle fatigue and durability under braking, J-turns, and panic loading conditions
- OE and aftermarket durability, spalling, highway durability, cornering fatigue, contamination, and lateral stiffness for wheel hub assemblies
- OE, SAE, and JASO 615 ball joint and tie-rod fatigue and performance
- OE, JASO C602, and NBR 13308 for shock absorbers
- SAE J175 and ISO 7141 lateral impact testing
- SAE J328 dynamic radial and cornering fatigue
- SAE J1095 cornering fatigue for CV wheels
- SAE J3010 & J2530 aftermarket wheel certification testing
- SAE J2562 biaxial wheel testing
- Gristmill wheel testing
- FMVSS 109 and 119 tire testing
- AK-LH08 wheel requirements and tests
- ECE R124 type approval for wheels and their trailers

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Inertia Dynamometer Testing

- AMS high speed fade
- BEEP™ certification using SAE J2784
- Brake Torque Variation - BTV
- Corrosion removal behavior
- Drum-in-hat performance
- DTV generation and correction
- ECE R13 and R90 type approval for categories N, M, and O
- ISO 11157-ECE R13 performance
- ISO 26867 friction behavior assessment
- JASO C406 passenger car brake performance
- JASO C419 and C459 caliper performance and durability
- JASO C427 wear vs. temperature
- JASO C436 in-line parking brake performance
- JASO C442 parking brake structural integrity
- JASO C443 mountain descent simulation
- JASO C456 wear indicator noise
- LACT noise and wear simulation
- Laurel Mountain durability
- OE, tier-1, tier-2, corporate, or special-purpose procedures
- Parking brake drive-away
- Parking brake performance
- Rotor thermal deflection
- Rotor thermal fatigue
- SAE J2784 for FMVSS 105 & 135 dyno testing below 4 450 kg GVWR
- SAE J2928 rotor crack for aftermarket
- APTA conformance for transit bus using SAE J2115
- ATPD 2354A for brake systems on military vehicles above 4 540 kg GVWR
- CTEA-TP 121D static torque performance
- ISO 26865 performance for air brake systems
- ISO 26866 wear vs. temperature for air brake systems
- JASO C407 truck and bus brake performance
- Rotor thermal fatigue, shock, and strength testing
- RP628C qualification for commercial vehicles using SAE J2115 for RSD
- SAE J2115 commercial vehicles performance and wear
- SAE J2521 noise squeal matrix
- SAE J2522 AK-Master
- SAE J2684 FMVSS 105 dyno testing above 4 450 kg GVWR
- SAE J2707 wear vs. temperature and block wear
- Dynamometer testing under ISO 15484
- Police Declaration of Conformity for brake pads, brake rotors, and brake kits
- European DTV generation and correction schedules
- European City Traffic schedules
- DTV and NVH with dynamic road load inputs

Proving Ground and **Field Testing**

- 290 km/h (180 mph) stopping distance
- ABS operation
- AMS fade
- Atlanta corrosion cycle
- Brake balance
- Brake pedal feel
- Brake roller testing for passenger cars and commercial vehicles
- City traffic circuit mapping for inertia dynamometer simulation (with road load and movement mappings)
- Cold judder evaluation
- Cold weather noise and braking performance
- Detroit City/Los Angeles Traffic on-brake DTV, dust, noise and wear
- Detroit Suburban Traffic off-brake DTV
- ECE R13 vehicles M, N and O type approval (passenger cars, cargo vehicles, trailers and semi-trailers)
- Performance and durability for hybrid, plug-in hybrid, and electric vehicles
- ECE R58 drive-by noise
- ECE R78 vehicles L type approval (motorcycles)
- ECE R90 M and N type approval (passenger and cargo)
- FMVSS 105 hydraulic and electric brake systems above 3 500 kg GVWR
- Mountain descent for brake fluid boil (Death Valley, Pikes Peak, Utah)
- PBBT performance for brake output and balance
- Special vehicles test protocols for: refuse, dolly, city bus, mining, articulated and military vehicles
- Adaptive cruise control characterization and evaluation
- Validation of active safety systems
- Benchmarking for braking, steering, and ride & handling
- Floor-checks for vehicle and braking system characterization
- Center of gravity measurement for passenger cars and light trucks