ADVANCED
TEST SYSTEMS

Around the world, six sigma standards have become the new hallmark of top-quality engineering. This excellence by design—which requires that even the worst of the worst outcomes still pass manufacturing requirements—has been made possible only by the type of advanced test systems we offer at Eagle Technologies.

CORE CAPABILITIES

Mechanical concept, design, and build for product test configurations; axle, transmission, trans-axle, engine, PTO, and EV/EV battery systems.

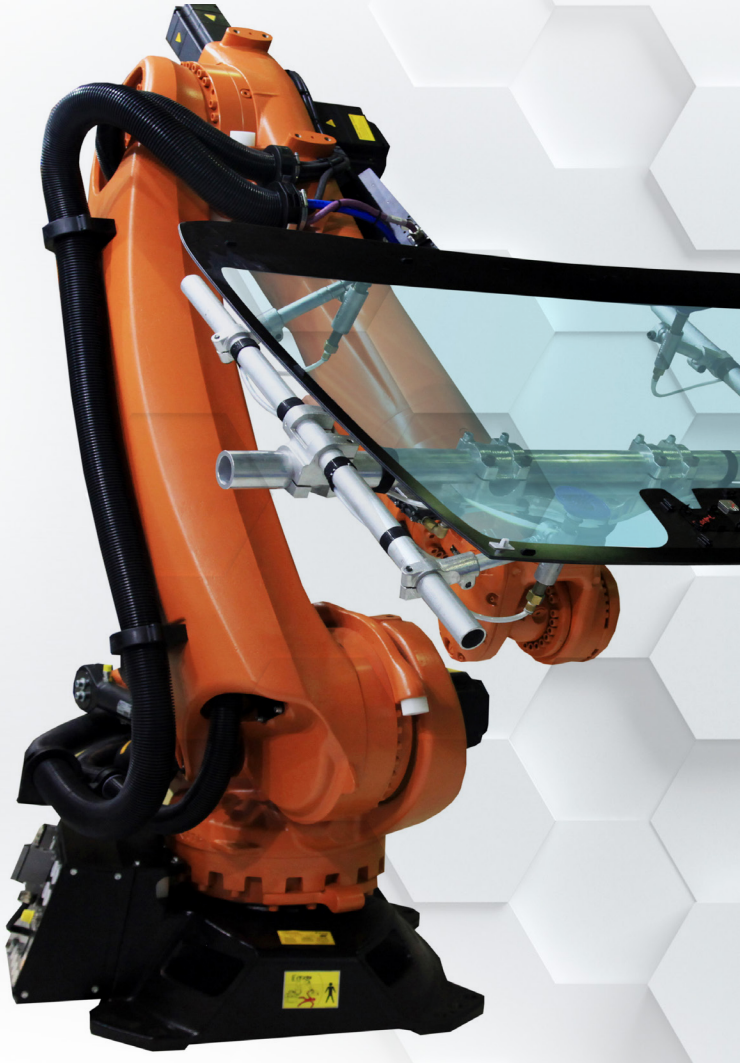
- 3D Design and FEA
- Modeling validation using SolidWorks, MSC or ADAMS
- NVH design validation & stress/strain validation to insure robust machine designs

Controls concept, design, and complete panel build along with test pod (test computer/UPS/hardware/CAN BUS).

- Test Software Design & Support (NI LabVIEW, NI TestStand, DISCOM, BauerControls, WMA, AB Plato, other)
- PLC (Allen Bradley, Siemens, Mitsubishi, Omron)
- Drives/Motors (Rockwell, Rexroth, Siemens, Yaskawa, Unico, KEB, ABB)
- Serial/Digital Controllers (VECTOR CANape, other)

SPECIAL DESIGNS

- Time/Frequency/Order Domain Analysis (NICK, Torque to Turn, Backlash, other)
- Angular Based Analysis (Dynamic torque/Angular Acceleration)
- Leak Test/Mass Spec
- Vision Systems (Area Scan-Line Scan)
- Integrated Robotic Systems Supporting EOLT / Final Test



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ELECTRIC VEHICLES

In the past decade, innovations in fuel cell technology, autonomous driving, and rapid charging have transformed the electric vehicle market. To maintain the rapid pace of development, EV manufacturers depend on the high-level testing we provide.

ADVANCING THE CUTTING EDGE OF EV TESTING SYSTEMS

Every part of an electric vehicle, from the powertrain to the autonomous systems, requires rigorous testing and validation to ensure proper functioning and prevent the need for a costly recall.

Our investment in the EV industry leaves us uniquely positioned to run verification tests on our machines that demonstrate the reliability and repeatability of our methods. Our facilities include both an advanced testing center in the Detroit Metro area and an EV Innovation Center in San Jose, California featuring our Electric Battery Assembly Machine.

INVERTERS

As the component used both to convert DC to AC energy, and to control speed and torque, the inverter plays an essential role in the EV powertrain. Our testing validates the individual components, and ensures they function properly within the final assembled powertrain module.

BATTERIES

As companies compete to engineer more powerful batteries for electric vehicles, our testing verifies that the new systems meet the design standards. We offer specialized test systems for battery assemblies for EV powertrains that monitor heat transfer, charge efficiency, and energy transfer to the inverter.

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STATORS/MOTORS/ROTORS

The EV motor is one of the most finely-tuned components in an electric vehicle. With rotors running at up to 20,000 RPM, and stators that require complex wiring to function, each part needs to be properly validated before it can be integrated into the final assembly.

DRIVE UNITS

In an electric vehicle, the drive unit is what translates driver input from the accelerator pedal into speed adjustments in the motor inverter. Our testing verifies that these signals are transmitted appropriately.

FUEL CELLS

Fuel cells are an alternative to batteries for producing energy for electric vehicles. A zero-emissions technology, they rely on the chemical reaction of hydrogen and oxygen to create a charge for the electric engine.

BATTERIES

As companies compete to engineer more powerful batteries for electric vehicles, our testing verifies that the new systems meet the design standards. We offer specialized test systems for battery assemblies for EV powertrains that monitor heat transfer, charge efficiency, and energy transfer to the inverter.

AUTONOMOUS

The sensor technology powering autonomous vehicles demands highly accurate input data that can monitor and respond in real-time to rapidly changing driving conditions. These systems must be tested extensively to demonstrate that they can safely replace human control of a vehicle.

MIRROR ACCESSORIES

The next generation of auto technology integrates additional sensors and monitoring systems to relay traffic information to the driver or the autonomous controller. Our test systems check the quality of this data to ascertain its reliability.

NVH

Electric vehicles are quieter than their combustion-fueled counterparts, and so naturally lower levels of noise, vibration, and harshness are expected. In some cases, this has raised new problems related to pedestrian safety.

ADVANCED DRIVER ASSIST SYSTEMS

While fully autonomous vehicles are still rare, vehicles with advanced driver assist systems are the new standard for the latest range of models. These features include parking assistance, collision warnings, and object tracking.

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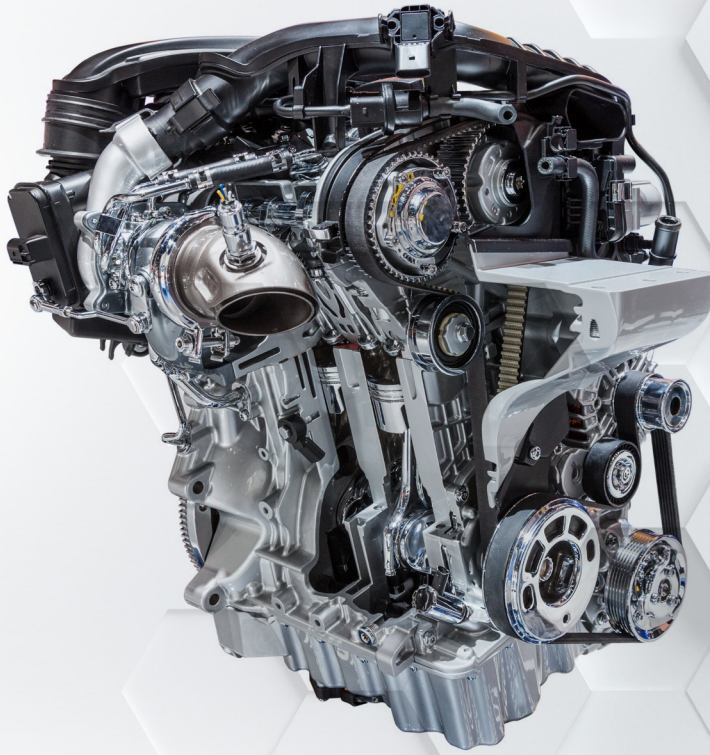
ENGINES

Despite recent investments in EV technology, the combustion engine remains the most common choice for automotive applications. Yet advances in design and engineering make it far from traditional. Let us help you achieve the next big step forward.

ENHANCED ENGINE EFFICIENCY AND PERFORMANCE

Horse power and fuel efficiency are two of the main factors related to engine performance that influence consumer purchasing decisions. The desire to improve these metrics has driven innovations in engine design. However, these advances must be verified through careful testing to certify that each new improvement meets engineering specifications and passes quality control measures.

We run both hot and cold tests to gain the clearest understanding of how our engines are performing. Our tests either verify that the product is ready to go to market, or else identify production flaws that need to be addressed before production.



COLD

A cold engine test allows for more controlled performance measurements at both high and low speeds. Our cold test validates the engines primary functions, as well as sensors, cams, and pressures, while our advanced signature analyst systems provide a full characterization of the motor.

HOT

A hot test runs the engine regular operating conditions, measuring fuel efficiency, drivability, and torque speed performance. Metrics from this test can be measured against design requirements to ensure they meet quality control standards.

STATIC SPARK

Without a functioning spark plug, the engine won't run. Static spark testing allows us to isolate a firing circuit to check timing and analyze its characteristics.

WIRE HARNESS

The wire harness is essential for relaying both electrical power and critical sensor data throughout the vehicle. Our advanced signature analysis allows testers to run both hot and cold validations and characterizations of engine wiring circuits.

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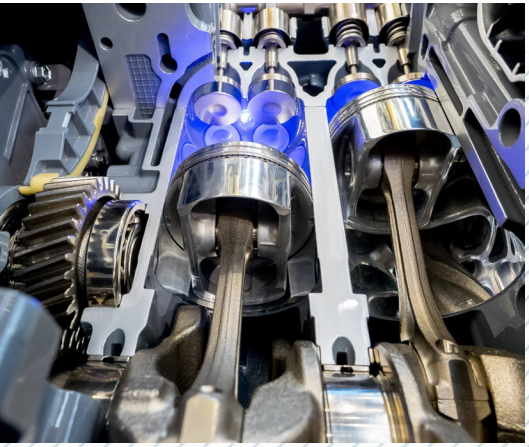
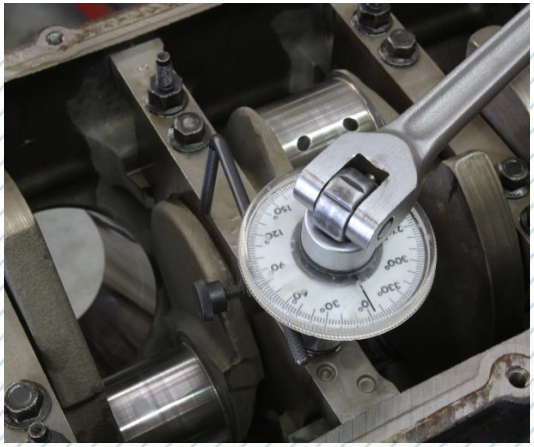

CAMSHAFT

Engine camshaft validation checks for out-of-specification lobes, incorrect cam functioning, and other cam defects that can affect engine performance. We run both hot and cold tests to provide characterization of the camshaft.

TTT/NO PISTONS

We use dynamic torque-to-turn evaluations to check for possible issues with the crankshaft prior to full motor assembly. This allows us to check for binding errors, bent shafts, or even missing bearings.

TTTW/PISTONS

Torque-to-turn tests including pistons are essential to be sure that the final engine assembly meets quality control standards. We use a combination of our advanced signature analysis along with torque signals and NVH probes to validate short block assemblies.

NVH

We measure NVH characterizations using dynamic torque, linear acceleration, and dynamic angular acceleration to certify engines meet design specifications. When necessary, our advanced testing tools include laser vibrometers and microphone arrays to help characterize dynamic noise from the motor.

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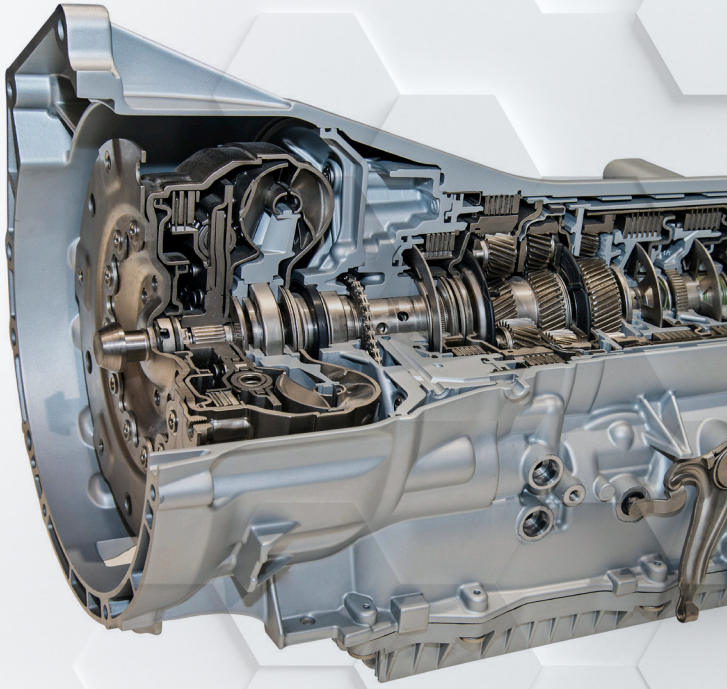
TRANSMISSIONS

The transmission transfers energy from the engine through the powertrain, meaning their performance has a direct impact on engine efficiency. From manual to automatic, multi-speed to dual clutch, we can test your transmission systems to ensure peak performance.

BETTER HANDLING, GREATER EFFICIENCY.

Many gains in engine performance are tied to transmission efficiency, from continuously variable transmissions which operate without a fixed gear ratio, to higher production standards that reduce manufacturing flaws.

However, transmissions don't just affect engine performance; they also impact the driver's experience while handling the vehicle. For automotive enthusiasts, the sound of an engine shifting gears, or the feel of a clutch making a smooth transition, are essential for their enjoyment. Our testing can check for handling and driver experience metrics, as well as for performance.



SOLENOID CHARACTERIZATION

In a transmissions and fuel injection systems, precise control over pressure and flow is what allows for smooth handling of a vehicle. Solenoid testing of the final assembly validates factors such as volume in a circuit or the positioning of a clutch.

VALVE BODY WET TEST

Following the air test, we use a wet test using the appropriate fluids and the right temperatures for a full working assessment of the final assembly. This also allows for a full characterization of the solenoid circuits.

VALVE BODY AIR TEST

High-pressure air tests provide preliminary validation before a full wet test. The air test can be conducted at lower pressures and with fewer tools than a wet test, and can indicate if there are any leaks in the system that would impede functioning.

FWD/RWD/AWD

During this test, we conduct a full assessment of the final powertrain assembly for front-, rear-, and all-wheel-drive systems. The systems check review electrical integrity, pumps and pump noise, the final characterization of sub systems, kiss point calibration, shifting, NVH, and parking pawl.

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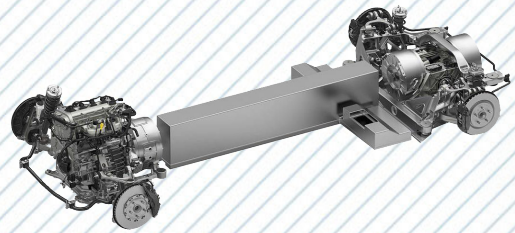

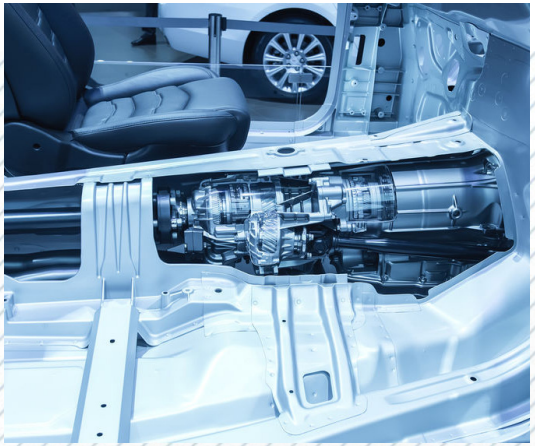

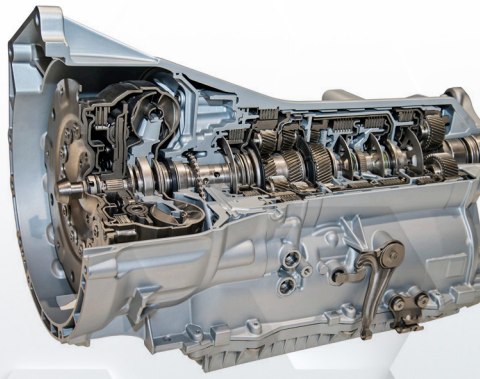

4–10 SPEED

In cars with automatic transmissions, higher-speed gearboxes can lead to increased engine efficiency and performance. Our multi-speed transmission tests include high-speed, precision balancing tools and testers which include the CANBUS interface.

HYBRID ELECTRIC

Hybrid transmissions combine a smaller electric battery system with the standard combustion engine resulting in a vehicle that has tremendous gains in fuel efficiency without the range limitations of an electric vehicle.

DUAL CLUTCH

Dual clutch transmissions allow for quick shifts while maintaining the power train within its peak torque band range. As these systems are essentially three transmissions in one, they require additional checks to be sure all parts function harmoniously.

NVH

Noise, vibration, and harshness testing is critical for end-of-line testing in transmissions. We used advanced linear, torsional, and dynamic torque sensors to ensure proper validation, and include nicked gears, PLRO, and gross imbalance as part of our standard testing.

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AEROSPACE & MILITARY

Aerospace and military technologies represent a class of high-tech products that must operate under conditions far beyond everyday applications. Our test systems ensure that they measure up.

DEVELOP AND DEPLOY THE NEXT GENERATION OF ADVANCED TECHNOLOGY

From jets traveling several times the speed of sound to armored vehicles that must hold up under explosions and heavy fire, components designed for aerospace and military applications must be reliable above all else.

We bring decades of experience in automotive and ballistics manufacturing, as well as new VR, 3D additive manufacturing, and advanced simulations to help your team move projects from proof of concept to final production.

DEVELOPMENT

Our range of cross-industry experience means we can work with you to develop premium-grade equipment for aerospace and military applications. From material sciences to heat treating to advanced signature analysis, we have the resources to support your project.

ASSEMBLY TEST

Having demonstrated proof of concept in the development and validation stages, we can complete your project through our assembly and test systems. Whether you need a manual or fully automated process, we can deliver according to your requirements.

VALIDATION

Aerospace and military technologies must be able to withstand intense pressures and extreme conditions. We validate variables from dynes to durability to ensure your technology continues to operate at peak performance.

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LIFE SCIENCES

Advances in medical technology have revolutionized modern medicine, offering new procedures, treatments, and medical devices to hospitals and patients. Our advanced testing systems help these products reach the market quickly and safely.

ENHANCING THE PRODUCTION OF LIFE-SAVING EQUIPMENT

Now more than ever, the life sciences industry is seeking reliable partners in their supply chain to increase the production of essential medical supplies. However, these supplies must meet the high standards set by the FDA in cleanliness and safety before they can be approved for mass production.

Our experience in the life sciences industry positions us to exceed regulatory guidelines, while providing the requisite documentation to validate our procedures.

LABORATORY

When producing prescription drugs in a laboratory setting, a number of tests must be conducted to demonstrate product safety. We can measure temperature, volume, pressure, and force, along with other metrics, to meet your project specifications.

VISION SYSTEMS

We have specialized in optical manufacturing for decades. Our advanced testing capabilities in this field include area scan, line scan, surface finish, and surface topography. From contact lenses to eye glasses, we can support your vision system requirements.

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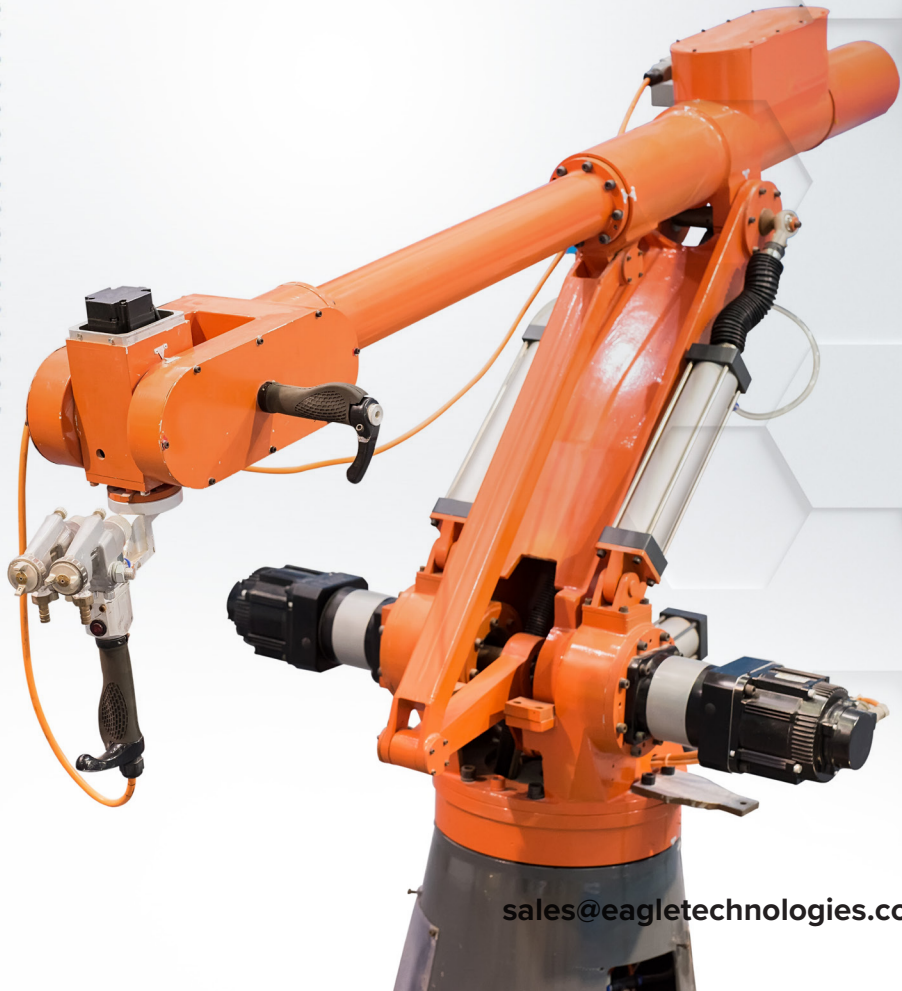
WE CAN BE YOUR ADVANCED TESTING PARTNERS

Our job is to choose the right sensor to measure the right measurement to report the right data. By conducing advanced testing at key points in the manufacturing process, we can identify potential production failures before they reach consumers, saving businesses hundreds of thousands of dollars in costly recalls that damage the bottom line and lead to tarnished reputations.

We are not satisfied by passing tests under perfect lab conditions. Rather, we bring our testing equipment into the field, to each manufacturing plant, so that we can run correlation tests that show our machines achieve the same high production standards as the baseline no matter where they are deployed.



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