



A&D TECHNOLOGY ELECTRIFICATION OVERVIEW



Introduction

WELCOME

Thank you for your interest in A&D Technology’s suite of products and solutions. We are dedicated to helping our customers integrate state-of-the-art technology into both new and existing systems.

At A&D Technology, we work to make sure each and everyone of our products can be integrated into your workflow. We believe in offering our customers solutions, meaning our products can either complete a setup or comprise the entirety of a test system. We believe strongly in our products and customer service and know that our customers will remain with A&D Technology, because we care and it shows.

We work with both industry leaders and small businesses.

We would like to work with you.

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About A&D Technology

INNOVATORS IN THE DEVELOPMENT OF TESTING TECHNOLOGY

A&D Technology delivers integrated test automation and lab management solutions to the transportation & energy markets.

A&D's open, flexible and cost-effective tools are designed to fit a wide variety of applications, from durability, performance and (HIL) simulation to hybrid/electric vehicle and battery test systems.

A&D Company, Ltd. is a world-class producer of advanced measuring, monitoring, controlling and testing instruments. Individuals with varied educational and technical skills use these instruments in a wide range of applications. Yet these products share a number of things in common:

- High performance through advanced analog-to-digital and digital-to-analog conversion technology incorporating highly accurate sensors and exceptional quality.
- Since its inception in 1977, A&D has built a reputation for high quality products, which help the user to perform his/her job more accurately and effectively.
- A&D's products have expanded into a comprehensive line that ranges widely throughout industry, education, medicine and science.

Meet Our History

THE COMPANY HISTORY

A&D Technology was founded in 2005 as an American subsidiary of A&D Company, Ltd., a global manufacturer of testing and measurement equipment with headquarters in Tokyo, Japan. The goal was to bring A&D Company's testing and measurement expertise into the automotive engine and powertrain development market.

Recognizing the need for an organization with experience in engine and powertrain test cell integration, A&D purchased the former Powertrain Technology Division of MTS Systems. Together these two companies have over 30 years of experience in supporting powertrain and vehicle development.

1984

STARTING BUSINESS

The company began in 1984 as DSP Technology, specializing in data acquisition and control for the powertrain testing market.

1999

NEW BEGINNINGS

In 1999 DSP Technology was purchased by MTS Systems. The company then became MTS Systems Powertrain Technology Division.

2005

WORLD MARKET

A&D Technology was founded in 2005 as an American subsidiary of A&D Company, Ltd., a global manufacturer of testing and measurement equipment with headquarters in Tokyo, Japan.

NOW

THE FUTURE

With A&D Company's long history of high-accuracy measurement technology, conventional and hybrid powertrain development tools and test cell integration services, A&D has established their expertise for providing complete turnkey solutions.

eMobility

ELECTRIFICATION SOLUTIONS

A&D Technology is dedicated to offering the most cutting edge electrification and eMobility solutions for both full-scale turnkey applications and small additions to an existing infrastructure. We work with customers to identify each element of their operation to select the best equipment to be easily integrated into their lab.

Whether it's a single element or a complete solution, A&D has a robust product offering that can help any customer get up and running!

Cell Module
& Pack

eMotor
Test Stand

eAxle
Solutions

eMobility

ELECTRIFICATION SOLUTIONS

A&D Technology's solution suite includes products like our state-of-the-art battery testing automation platform: iTest.BTS and our Lab Automation & Management suite: LabWorX. Combining elements like contact patch tire testing with A&D's Dynamic Contact Force Rig and our Ethernet compatible I/O: iConnect X-Series, allows customers the ability to take control of their testing environments, without having to sacrifice future upgrades or longterm compatibility.

A&D is here to provide complete solutions for your battery testing operation. Click each button to learn more about our full-scale solutions.

HIL
Simulation

Tire
Testing

Vehicle
Dynamics

(if viewing digitally, click to live chat)

LIVE CHAT NOW

iTest Battery Application

BATTERY TESTING

Understanding the challenges facing today's battery testing facilities is essential in developing effective tools and control strategies. With the wide range of test equipment in use, communication between devices is difficult, creating a huge need for an integrated test system.

Current solutions often require multiple technicians to both run tests and define new ones. The test results are then potentially generated in a different format for each piece of test equipment, and time-consuming manual data crunching may be required to fully understand the test results. Above all, safety is a major concern, and test facilities require manned operation in case of faults that required manual shutdown of the test.



iTest Battery Application

BATTERY TESTING

A&D Technology battery test systems are designed specifically for the development, optimization and validation of batteries, including the battery system components. Based on iTest, our flagship test automation platform, iTest.Battery includes proven drivers for seamless integration with best-in-class testing components, such as power process systems, air coolant systems, battery ECUs (BMS), chiller systems and environmental chambers.

iTest.Battery triggers the measurement instruments and sub-systems to gather data to compile test results and generate standard test reports.

HIGHLIGHTS

- Significantly improves test throughput by providing immediate feedback of test results used as set-points in the current test
- Enables safe and secure 24/7 unattended operation when coupled with integrated lab management system
- Ensures error-proof testing through minimal programming changes
- Convenient offline simulation for test development verification
- Quick and easy installation with pre-configured instrument and test cycle modules (system is typically fully operational in less than two days)
- Fully integrated lab and data management systems
- Open architecture for I/O hardware integration
- 150+ existing interfaces to common third-party measurement instruments
- Integrated reporting package provides reports at the test cell or remote location
- Expandable with lab growth

LIVE CHAT NOW

iTest Application

TEST AUTOMATION

Our iTest family of test automation systems provide a full range of capabilities, allowing you to purchase just the right solution for your application without having to overbuy.

Testing applications vary greatly, from simple component testing to complex systems such as e-motor hybrid test stands that include simulation and calibration. The test automation requirements for these systems also vary. In most cases these systems need to integrate and acquire data from a variety of measurement devices from different vendors, all while following a defined test schedule.

ITEST LAB AUTOMATION

iTest.LA is a standard application for engine testing and includes the AutomationPanel operating interface and FlexEdit workflow editing tool. iTest.LA has a large library of standard modules used in engine testing. Even after the solution is adapted to a test cell, updates to A&D standard modules can be applied.



iConnect I/O X-Series

TEST AUTOMATION

An evolution in the development of I/O solutions, A&D is offering a plug-n-play solution through our iConnect X-Series I/O modules. An important piece of test automation equipment, iConnect X-Series offers easy integration, using EtherCAT for high-performance measurement and control applications.

EtherCAT also provides flexibility with a simple and robust architecture. The iConnect X-Series I/O system can be used with A&D's iTest data acquisition and control software as well as any EtherCAT data acquisition system. Custom wiring at the module end is NOT required with iConnect X-Series.



HIGHLIGHTS

- EtherCAT can be used with other systems
- Mix and match functions in the same rack – more flexibility in configurations
- Support for AD7314 and standard Gantner modules – customers can use any Gantner Q.bloxx XE module
- AD7314 modules USE M12 connections – readily available connector and harnesses
- Same I/O specifications as GI Q series XE
- No customer driver to modify
- GI Bench® and TwinCAT® support – use standard GI and Beckhoff® software for configuration
- Rack-mounted chassis (mounts directly to ADT Boom Box, up to 6 chassis)
- I/O Module / Test Automation Equipment for multiple uses

BMS HILS

HIL SIMULATION

The testing of Battery Management Systems (BMS) with real Li-ion batteries can be costly and time consuming. Using a system such as A&D's BMS Hardware-in-the-Loop (HIL) system will help shorten the development cycle of a BMS system. In addition to reducing the cost and time it also makes BMS testing more flexible and traceable, easier to reproduce and safer when testing beyond the normal range of battery operation.

HIGHLIGHTS

- Supports up to simulation of 192 cells
- Voltage output function of 0-5V with an accuracy of +/-0.1% of full scale per cell.
- Voltage and Current measurement function of 0-5V with an accuracy of +/-0.1% of full scale.
- Fault insertion capability.
- Noise contamination functionality
- MATLAB/Simulink compatible.
- Flexible and open modeling environment on Real-Time Linux Operating System.
- Running Battery Models or even entire Vehicle Models is possible.
- CAN Communication
- BMS storage space
- User interface via A&D VirtualConsole GUI interface for signal display and parameter tuning.
- Writing of test sequences



Procyon | Real-time Simulation - Lab Setting

HIL SIMULATION

Procyon is a high-speed real-time simulation and control platform, customizable for a diverse range of applications. The open and configurable system architecture supports multiple CPUs with multiple cores as well as HyperTransport, PCI Express and conventional PCI interconnections.

Procyon uses A&D's VirtualDSPConsole as a visual front end for system monitoring and parameter setting. MATLAB/ Simulink is used for modeling and control development. Simulink blocksets for the function boards are provided and can be easily integrated in the solution.

HIGHLIGHTS

- Multi-core/multi-CPU support (Can be extended up to a 32-core system with 8 Intel® Xeon® 3.5GHz processors)
- Direct connection of I/O interface to CPU
- Real-time application development environment with MATLAB/Simulink.
- Open system.
- Easy system setup and configuration
- Model division among CPU cores and parallel processing.



LIVE CHAT NOW

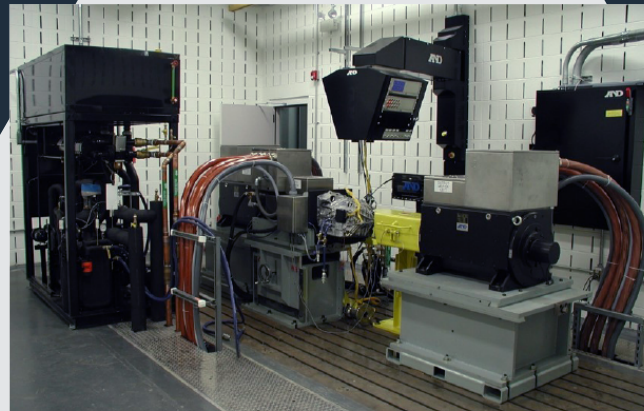
PerformanceLine by A&D

DYNAMOMETERS

The comprehensive PerformanceLine includes a solution for all of the tasks of a modern and efficient test field, from durability, vehicle simulation, and high dynamic transient to high-speed e-motors. When accuracy, reliability and performance matter look to the name that means dependability: A&D Technology. Choose from a variety of field-proven models from the PerformanceLine family with proven performance to meet your testing needs.

HIGHLIGHTS

- Suitable for high speed, transient and steady state
- Development of powertrain system with multiple drive axle combinations
- Angular-speed variation for simulation of IC firing pulses
- Both AC and EC models available



State-of-the-Art

CYCLERS & CHAMBERS

Our Cyclor Solutions are designed for both standalone and portable configurations, optimized for R&D testing in the battery, automotive, solar and aerospace industries. Our Cyclor Solutions offer ultra-high performance and experimental power converters to take advantage of the next generation of power semiconductors.

Our Chamber Solutions are unique to your testing environment. A&D will provide the best and easiest solution for simple integration. Standard specifications for our provided chamber solutions are listed below.

CYCLER HIGHLIGHTS:

- Standard models from 36kW to 2.64MW available
- 600, 1000, 1200, and 2000V models available
- World-class measurement accuracy
- Profile mode built-in for user-written test sequences
- BMS and Environmental Chamber integration built-in
- SiC and GaN power semiconductor designs
- High and ultra-high switching frequencies (100 kHz to 10+ MHz)
- Magnetics and gatedrive design
- Hard switched and resonant topologies
- High performance control techniques and controller architectures
- Designs in the 10 kW to 10 MW range

CHAMBER HIGHLIGHTS:

- Temperature Range: -45 °C – 85 °C
- Humidity Range: 5% to 98%
- Interior Dimensions: 48"W X 72"D X 48"H
- Exterior Dimensions: 60.5"W X 104.5"D X 101.5"H
- Weight: 3,200 lbs.
- Chamber Air Flow: 2,000 CFM
- Cooling Performance (Empty): 2 °C/min
- Heating Performance (Empty): 2 °C/min
- Explosion Relief: Yes, Door Tether: Yes
- Fire Suppression & Gas Detection (H2 & CO): Yes
- Electrical: 460 V, 60 hz, 3 PH, 40 FLA, 50 amp
- Water Connection: 1" NPT
- Compressed Air: ≥ 30 SCFM @ 90 psig

LabWorX Suite

LAB MANAGEMENT SYSTEM

LabWorX by A&D Technology has been designed to work seamlessly to transform a collection of test systems into one managed lab. Not only can you manage, monitor and automate your test systems reliably, you can do it from anywhere. LabWorX gives you the control.

LABWORX SUITE

Centralized Server

Enables test lab managers to monitor and manage the activity of multiple test cells from a single web page interface.

Automated Notification and Response

Standalone lab-wide system that supports 24/7/365 unattended operation by providing automated notification and response capabilities when no operator is present.

Automated Reporting

Automated report generation tool that provides centralized report configuration management.

Cloud-Based Lab Management

Allows users the ability to transform a collection of test stations into one managed lab without requiring on-site IT support.

Mobile Access

User interface is optimized for mobile devices, both iOS and Android, providing easy navigation and clear, readable display of data.

Test Schedule Management

Triggers personnel who have an action to perform and provides feedback to the original test requester.

LabWorX Suite

LAB MANAGEMENT SYSTEM

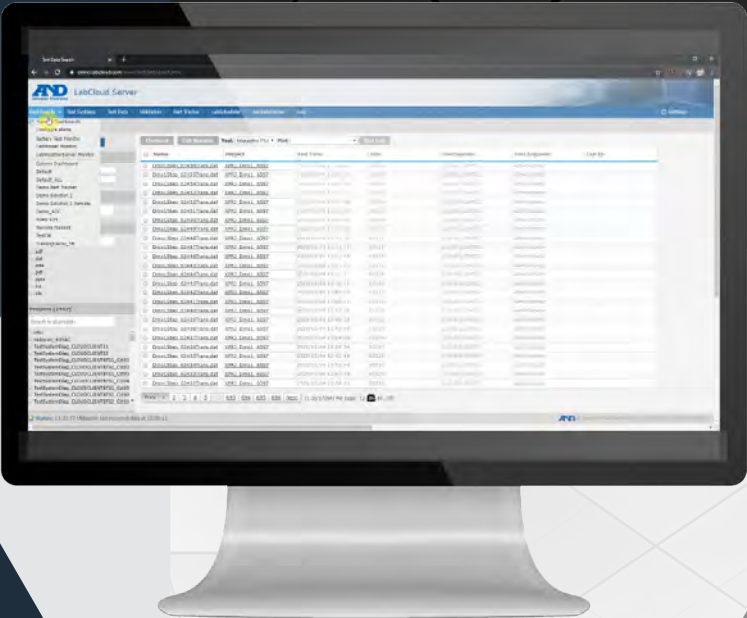


Test System Interface

Allows users the ability to set and retrieve the value of all available data parameters, execute procedures on the test system, and upload test data.

Calculation Software

A&D Technology's LabCalc Calculation Software allows the user to read data files, do calculations on this data and generate reports which visualize the results. The software also comes with LabCalc Calculation Tracker which allows the user to debug equations via an easy to use graphical interface



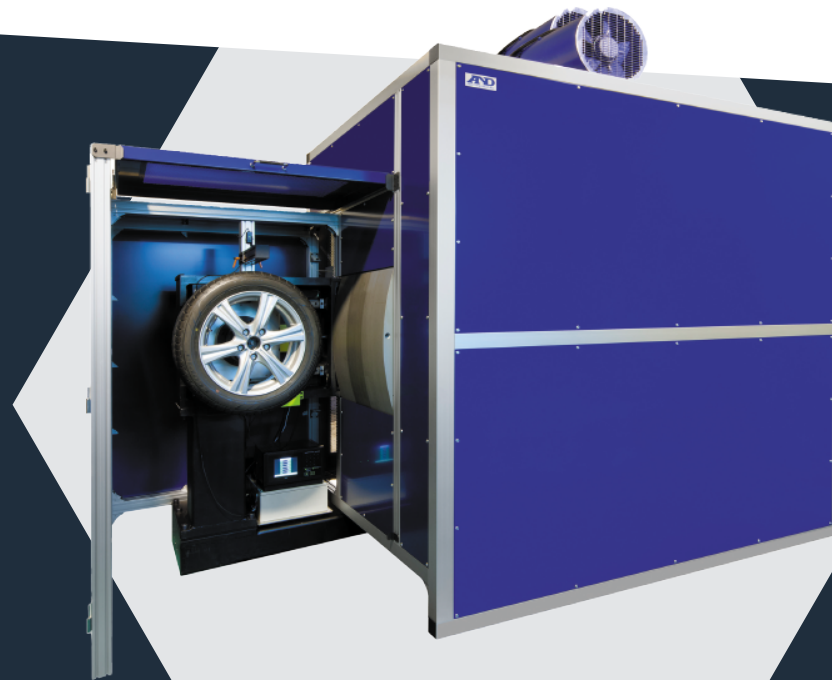
Rolling Resistance Test Rig

TIRE TESTING

The A&D Rolling Resistance Test Rig (RRTR) is a high-accuracy drum-based rolling resistance test machine. The RRTR offers world class repeatability and accuracy through its rigid design and a customized load-cell developed using our Model-Based Sensor (MBS) technology. Built with consideration for ease of use, maintenance and calibration, it offers automated and manual test scheduling along with a user-friendly operator interface. The RRTR is available in a variety of configurations and sizes for passenger car (PC) and truck and bus (TB) tires, so that customers choose the machine that best fits their needs. Customization is possible depending upon customer needs.

HIGHLIGHTS

- High accuracy robust measurement
- Test standards compliance
- Fully automated
- Energy saving aluminum cast drum (about 30% compared to steel drum)
- Optional temperature chamber



Flat Belt Tire Test Rig

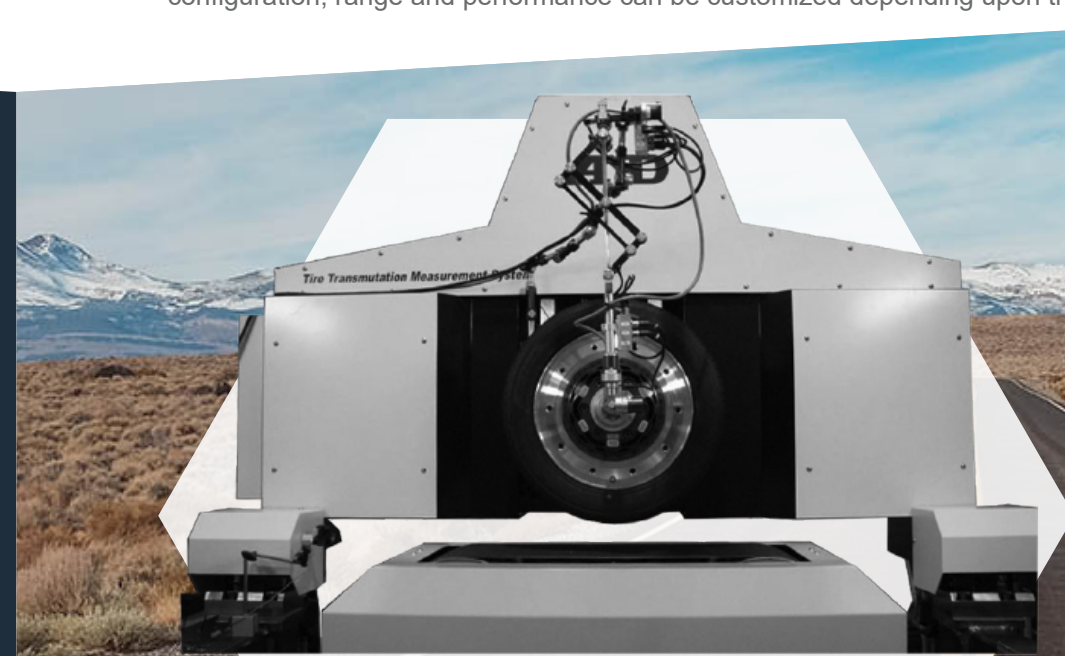
TIRE TESTING

The A&D Flat Belt Tire Test Rig is an indoor tire force and moment testing machine. It allows the tire to be tested against a flat surface under dynamic conditions. The flat surface is emulated by an electrically controlled belt-pulley assembly while the tire load is supported by an air bearing (for passenger cars loads) or a water bearing (for higher loads) that is present under the belt.

This belt-pulley assembly rests over a hydraulic shaker system that can emulate tire vertical motion and slip-angle generation in a highly dynamic fashion. The tire stand itself is capable of changing the tire vertical load and camber angle during the test run. Forces and moments experienced by the tire are measured at a high sample rate using A&D's 6-component Plate Force Sensor (PFS) mounted on the tire stand. The configuration, range and performance can be customized depending upon the intended application.

HIGHLIGHTS:

- Six degrees of freedom enable various tire setups
- Numerous safety features such as belt health monitoring and crack detection
- Belt and tire fully driven by electric motors
- Accurate steel belt control reproduces realistic road conditions
- Compact size
- Optional shaker simulation



Dynamic Contact Force Rig (DCFR)

TIRE TESTING

The A&D Dynamic Contact Force Rig (DCFR) is a new testing technology that combines a fully dynamic tire test rig with contact tire patch measurement sensors. This new technology provides a unique opportunity to the customer by measuring the dynamic contact patch shape with a 3-component force transducer embedded into a 3.2 m diameter drum machine.

SPECIFICATIONS

- Drum outer diameter: 2-3.2m
- Rotational Power: 300kW AC Motor
- Position resolution: 18,000 P/R
- Ground Speed: Max. 180 km/h
- Speed Accuracy: 0.10%
- Conformity Tire: PC, LT
- Tire Speed: Max. 180 km/h
- Movable Axis:
- Steering Angle: $\pm 20^\circ$, 50° / sec
- Camber Angle: $\pm 10^\circ$, 20° / sec
- Load: Max 10 kN, 40,000 N/sec

HIGHLIGHTS

- 3.2m diameter drum emulates a flat road surface
- Advanced rotation synchronization and slip ratio setting
- Built-in 6-component force sensor (Fx, Fy, Fz, Mx, My, Mz)
- Simulated road surface can be applied to drum

Dynamic Contact Force Rig (DCFR)

TIRE TESTING

The 6 force components include three force measurements in the X, Y and Z direction along with measuring the Moments of the X, Y and Z axis. The measurements can be recorded while adjusting the road force, camber angle, slip angle, tire speed, longitudinal slip and tire pressure. The adjustability of the tire machine and the performance of the sensor allow the capture of the true tire patch.



Vehicle Measurement System (VMS)

MODEL-BASED SENSORS

The A&D Vehicle Measurement System is a collection of embedded controllers and high-accuracy sensors acquiring synchronized vehicle dynamics test data under various real-world conditions. It is completely modular and scalable, and can be configured to include only the sensors required for a specific application. Third-party sensors can also be incorporated.

VEHICLE MEASUREMENT SYSTEM

Wheel Force Sensor (WFS)

Obtains all six components of forces/moments acting on the wheels.

Wheel Position Sensor (WPS)

Obtains the motion of the wheel in all six degrees of freedom.

Laser Ground Speed Sensor (LGS)

Obtains ground speed, effective wheel radius and side-slip angles.

GPS Sensor

Obtains latitude, longitude and altitude position of the vehicle.

Inertial Sensor

Obtains roll, pitch and yaw accelerations of vehicle.

Wind Sensor

Obtains the direction of wind with respect to the vehicle, wind speed and wind temperature.

In-Vehicle Network

Obtains information from vehicle ECU such as engine speed, throttle and brake information, current gear, coolant temperature, etc.

Temperature Sensors

Obtain ambient, vehicle and tire temperatures.

Vehicle Measurement System (VMS)

MODEL-BASED SENSORS



HIGHLIGHTS

- Calculation of road slope
- Road coefficient of friction estimation
- Road load coefficients estimation including on-road rolling resistance
- Data for tire modeling
- Vehicle parameter estimation
- Vehicle benchmarking
- Rapid control prototyping of vehicle controllers
- Vehicle performance testing: torque vectoring, brake testing, hybrid powertrain testing, etc.



Additional Services & Offerings

TESTING & DEVELOPMENT

A&D Technology delivers integrated test lab management solutions and services to the transportation & energy markets for a wide range of applications, from engine and transmission development to vehicle electrification and hardware-in-the-loop simulation. With over 30 years of experience and more than 1000 installations worldwide, A&D has the expertise and proven technology to help you implement the most advanced and cost-effective solution for your testing challenge.

AREAS OF TESTING & DEVELOPMENT

HEV Powertrain

A&D Technology provides complete turnkey solutions for HEV applications, including component testing, controls validation, and component performance simulation.

Combustion Analysis

A&D's systems include all the software necessary to perform standard tests required to properly evaluate combustion processes in two or four stroke, spark or compression ignited engines.

HIL Simulation

A&D's various platforms are high-speed, real-time systems that can be configured for a wide variety of applications.

Engine

A&D Technology can provide a complete turnkey solution or individual components that can be easily integrated into your existing system.

Transmission

With a complete line of low-inertia dynamometers and a family of high-performance AC drive systems available, A&D can design a wide variety of transmission test systems.

Battery

A&D Technology can provide a complete turnkey solution for both battery and EV/HEV testing applications, including design, project management, installation, commissioning, and service plans.

Services & Offerings

RESIDENT ENGINEER

A&D Technology offers on-site support service with our resident engineer program. Not only can you get your project up and running immediately, we will help you develop solutions on-site, FAST. Whether you're getting staff up-to-speed or your project requires a dedicated expert, A&D can offer support when you need it.



A&D
Discover Precision

Questions?

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