

Scalable Measurement and Control Platform for Electromechanical Test and Measurements

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ADD ProS

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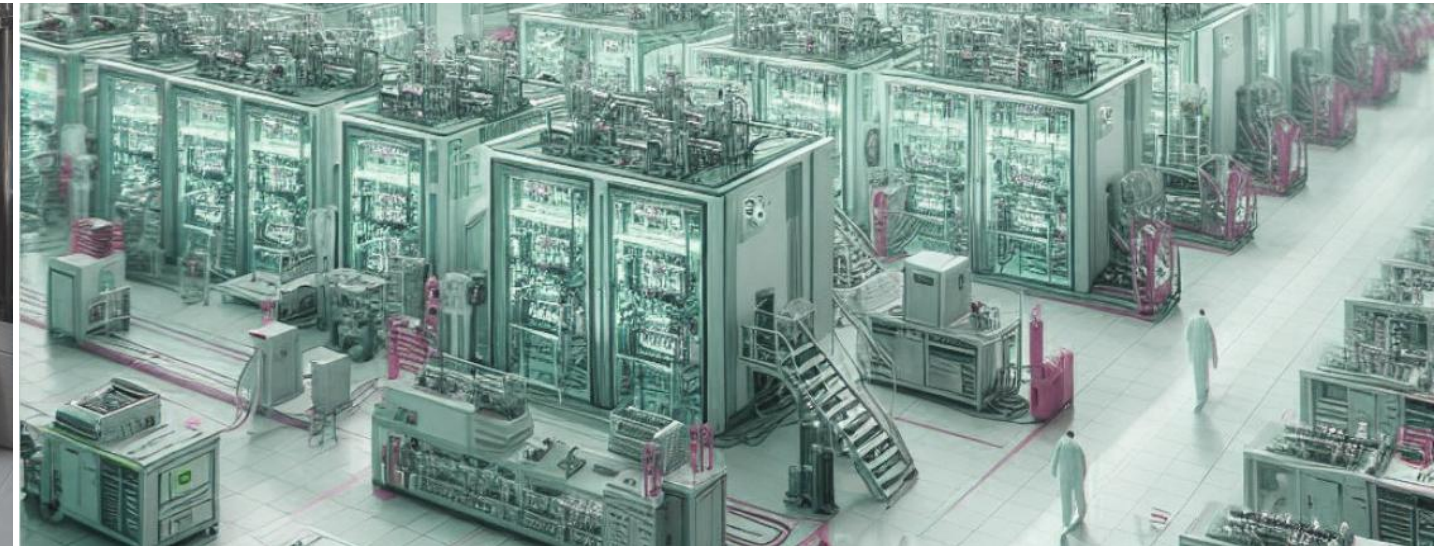
The Pace of Change Is Faster than Ever

Organizations Must Rethink Product Innovation or Risk Falling Behind



Traditional Challenges of Test

- Acquire measurements with diverse instruments and sensors
- Analysis routines and signal processing
- Data visualization and report generation



Challenges of Modern Test Organizations

- Increased complexity
- Adapting to rapidly changing product requirements
- Harnessing insights for continuous improvement

57%

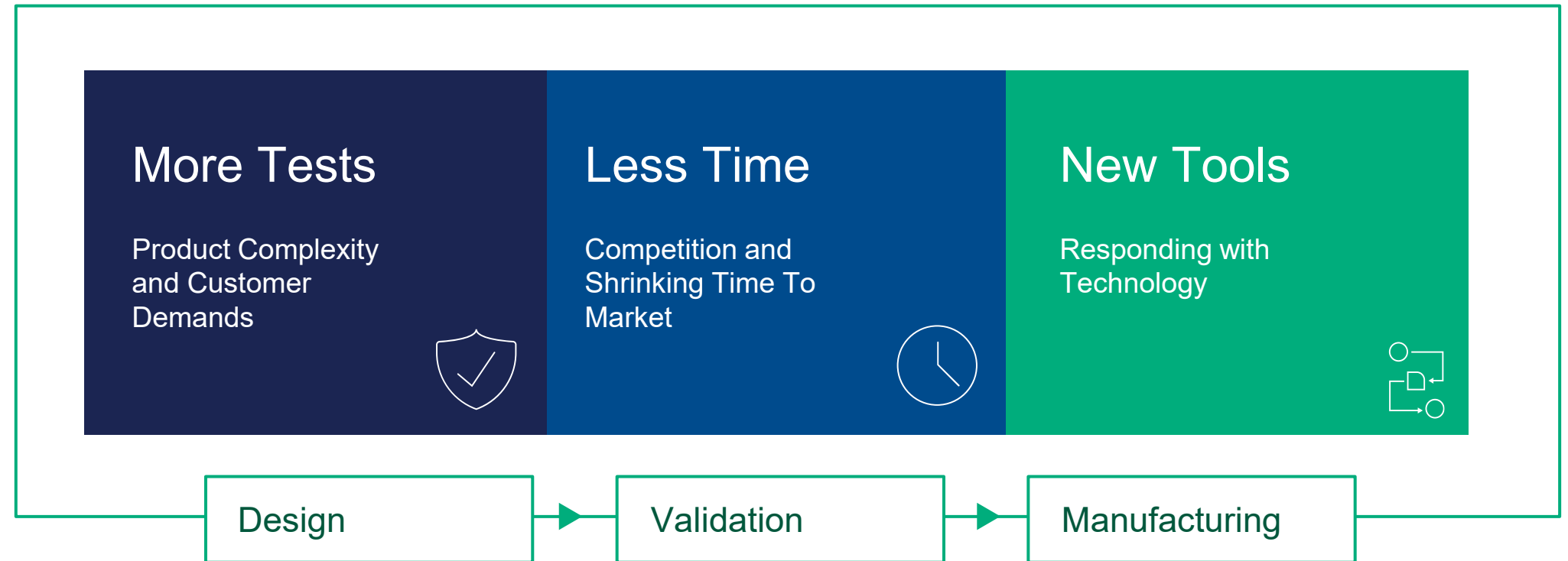
of respondents fear their production processes are outdated and cannot keep up with new business and technology trends

46%

say they will lose market share within two years unless they make significant changes to product lifecycle processes

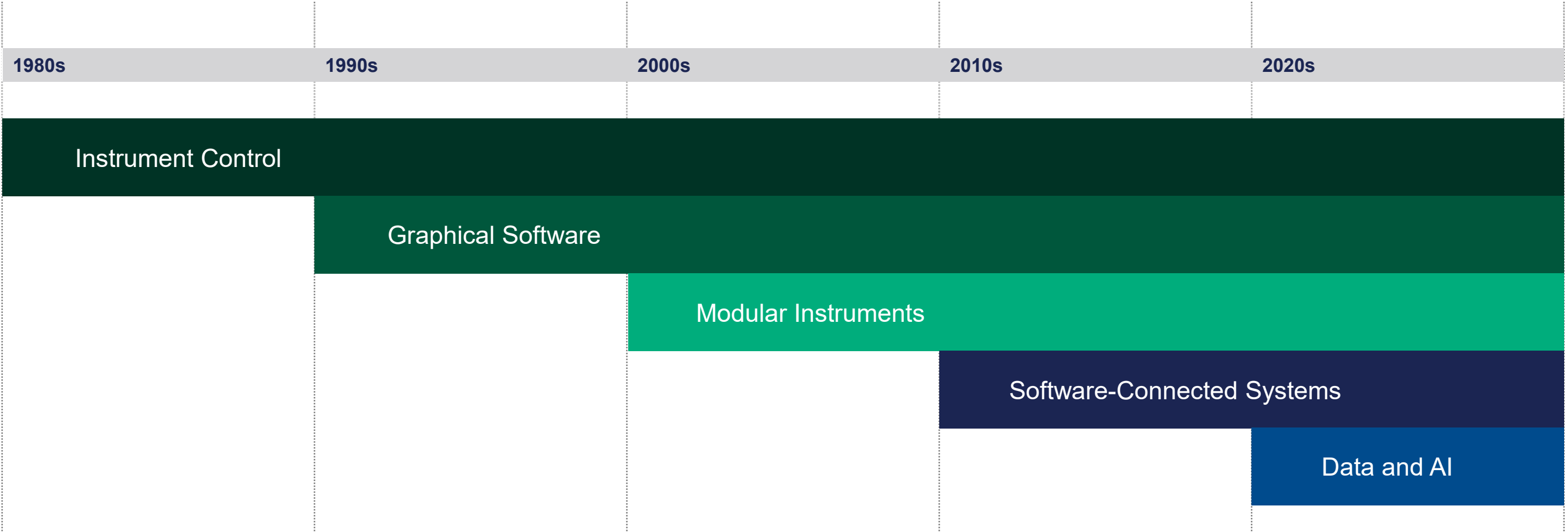
Test Needs to Evolve

Product Lifecycle



Source: NI, 2022 Research Report: *Designed to Perform* (Research conducted in partnership with the research division of the Financial Times Group.)

NI's Core Technologies Have Been Accelerating Innovation for Decades

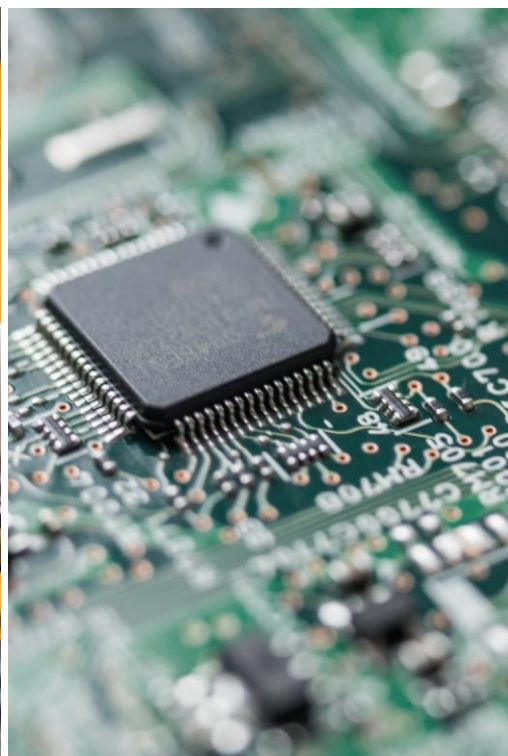


Manufacturing Success Relies on Every Component

Deliver organizational efficiency and product quality by standardizing on NI test solutions.



FINAL
ASSEMBLED



CONTROL
UNIT



INVERTER



VALVE/
ACTUATORS/
ELECTRIC
MOTORS

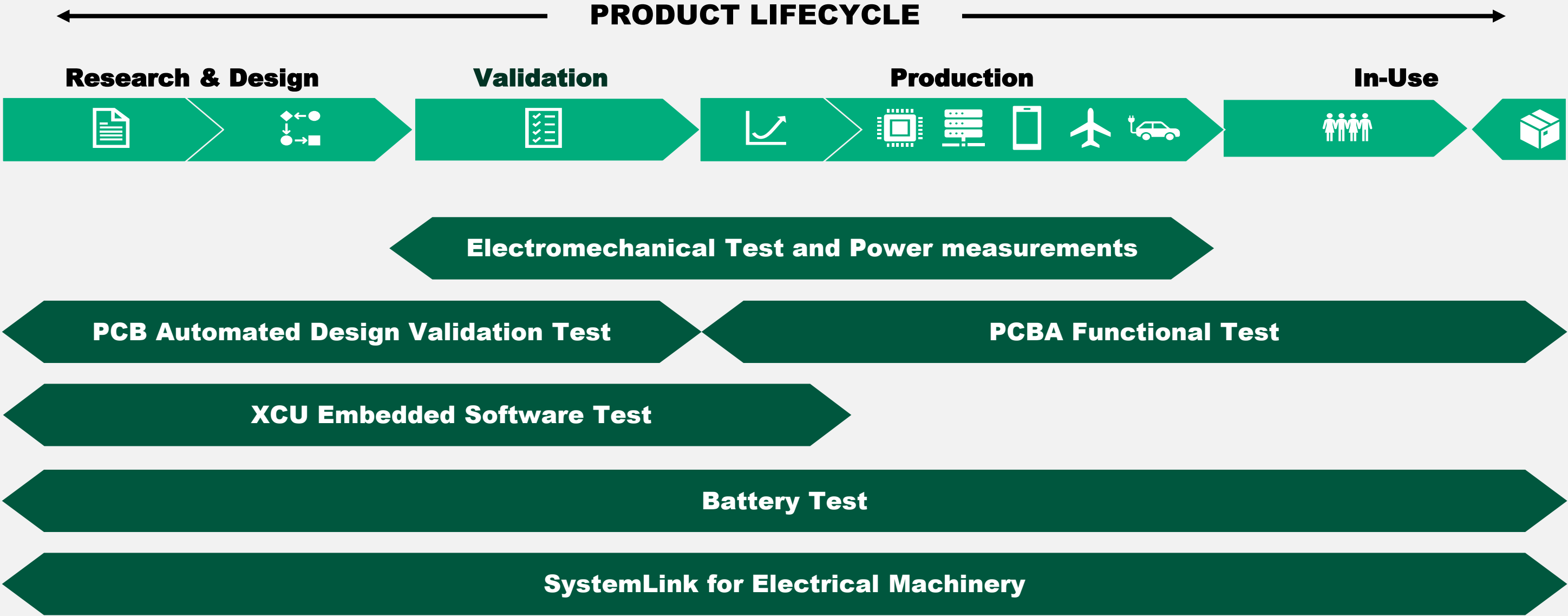


SWITCHGEAR/
POWER DEVICES

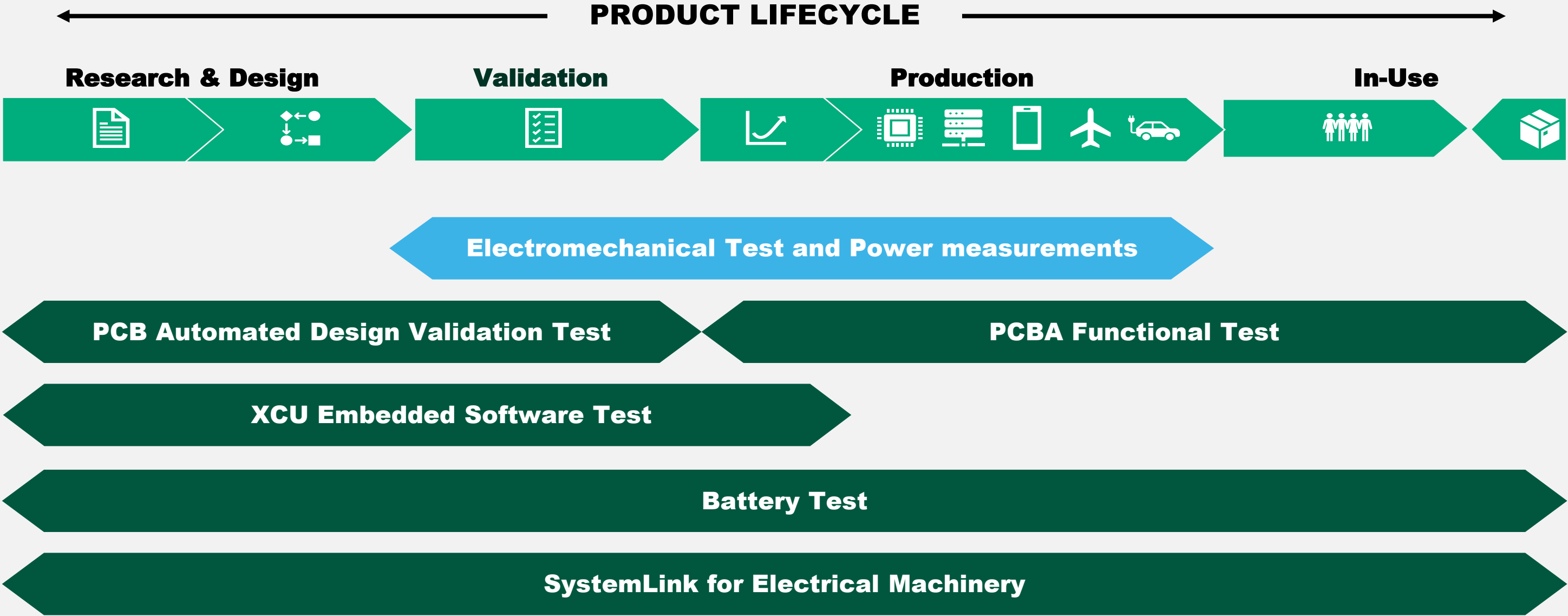


BATTERY

NI Target Applications



NI Target Applications



Type of Test Accross Industries

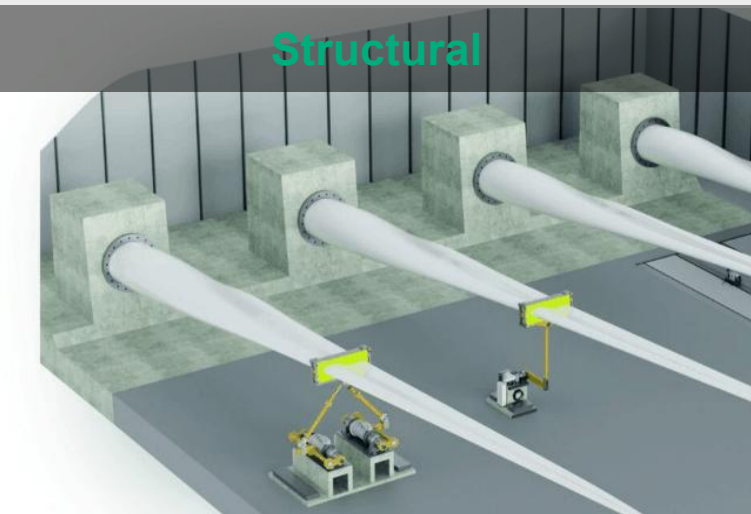
Test control board for heat, cold, humidity, and pressure

Environmental Lab



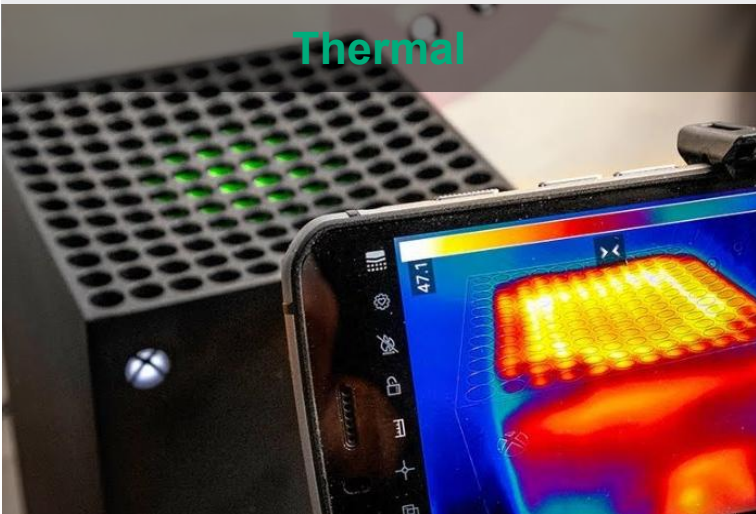
Validate the structural design (wind turbine blades, HVAC boilers...)

Structural



Evaluate thermal performance to ensure the product design

Thermal



Measure vibration around the machine

Shock and Vibe



Functional Software

Characterize the functionality of software on the board



Endurance

Long term (months) testing to validate durability of a DUT



Power

Measure power parameters and perform quality measurements



Acoustic

Measure sound from microphones places around the chamber



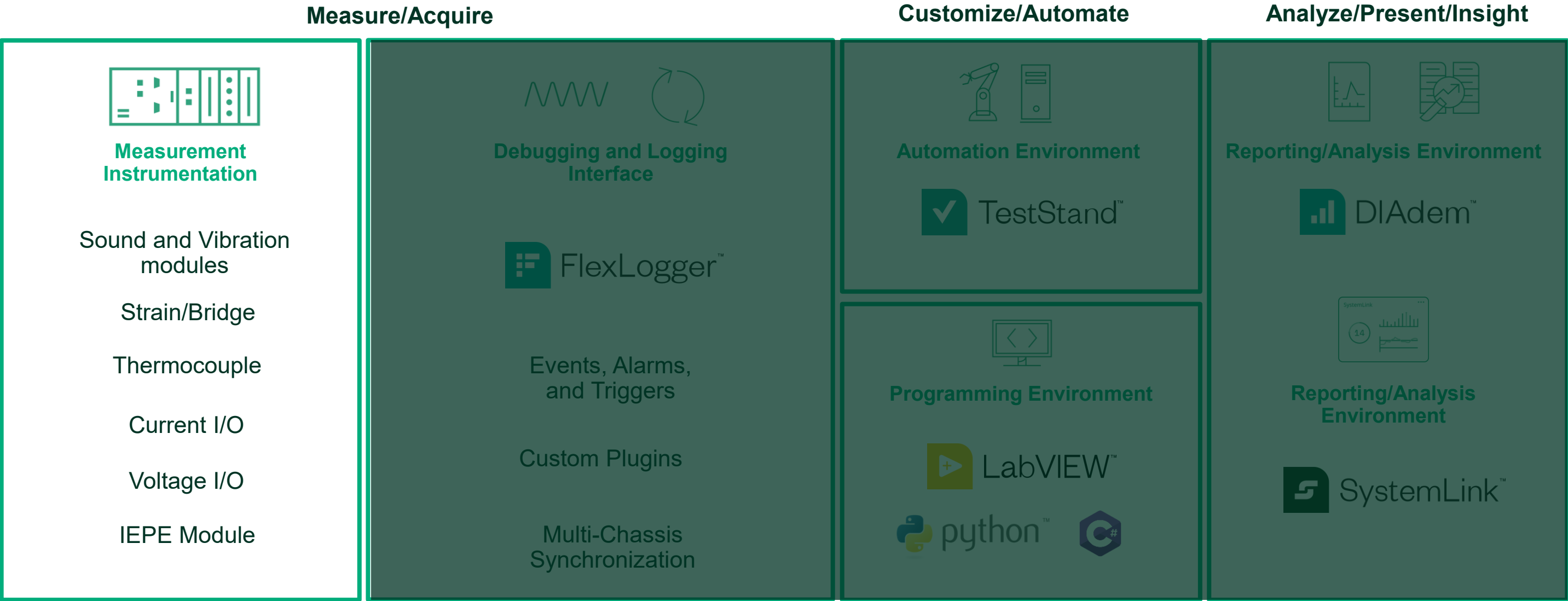


Electromechanical Test and Control

Challenges

- Multiple signals – physical sensors and electrical signals
- Tests are expensive
- Not always in a controlled environment or lab

NI Solution



SOFTWARE AND HARDWARE TOOLS

NI Data Acquisition (DAQ) Hardware

Multifunction (all-in-one) DAQ Devices



Low-cost USB



mioDAQ

- More performance
- Similar price



Install Inside Computers and PXI Systems

NI DAQ Devices

If your needs fit within +/- 10V and TTL digital, the all-in-one devices are more measurement tech for the price.

Modular DAQ System



USB or Ethernet connection to computer or laptop

NI CompactDAQ

For:

- Modularity
- More Measurement Options
- Rugged Operating Specs
- Ethernet expansion with synchronization

mioDAQ

High-performance. Bus-powered. USB DAQ device.



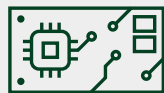
Up to 20-bit resolution @ 1 MS/s/ch

Up to 16 channels. Select from four gain settings (± 200 mV to ± 10 V) on a per-channel basis



250 kS/s/ch Analog Outputs

Generate waveforms, set control points, or simulate signals for control board debug and validation.



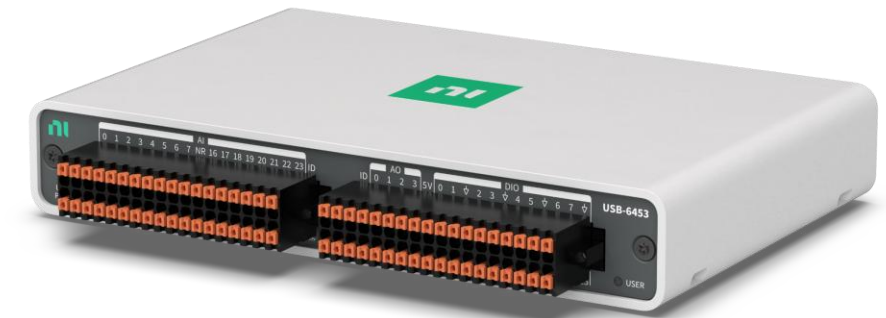
Four Counter/Timers

Measure events, pulses, indexed quadrature encoders, and measure/generate PWM signals.



16 Flexible DIO Lines

Set DIO lines for static or clocked input/output, clock, trigger, or route to a counter.



Quality and Confidence

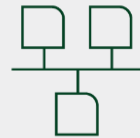
- Two- and ten-year accuracy specifications
- Multipoint, polynomial self-calibration
- External calibration support
- 1-year of phone/email support
- Over-voltage protection

NI CompactDAQ

A compact, rugged, modular data acquisition system that connects to a computer by USB or Ethernet. Key features include:



Over 70 I/O modules

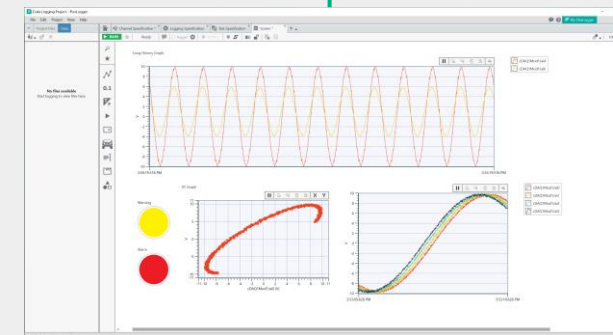


Expand and synchronize over Ethernet

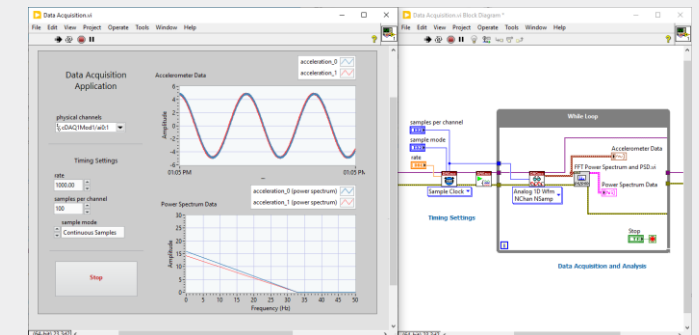


Rugged Operating Specs

FlexLogger Lite (*Free DAQ SW*)



Drivers for LabVIEW,
Python, C/C+, and VB.NET



Chassis



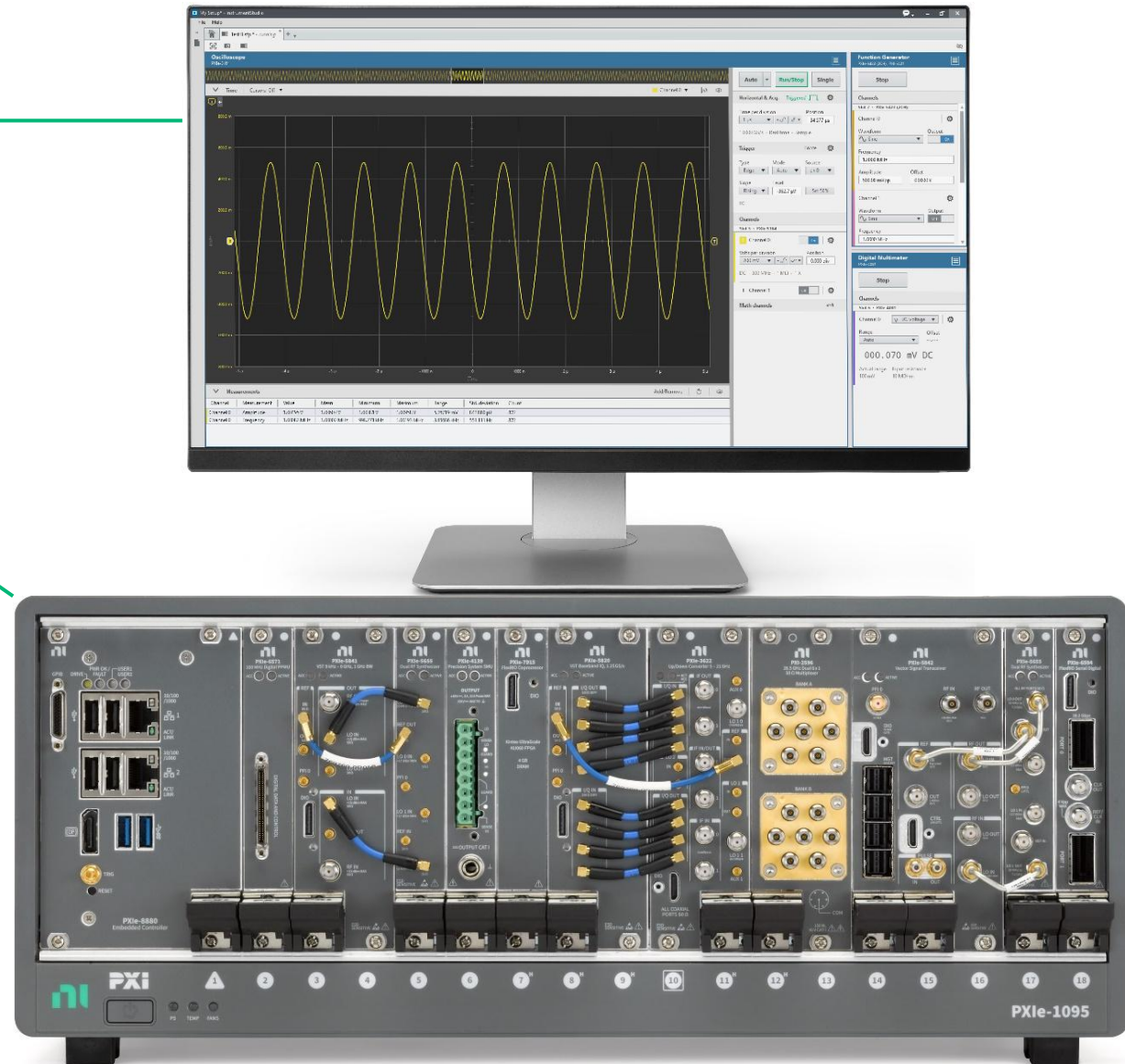
Modules

PXI System

Software
Test Management and Code
Development

Timing and
Synchronization
PXI Chassis

Computer
PXI Embedded Controller



Instrumentation

PXI Modules:

- Multifunctional I/O
- Counter/Timer/Clock
- Digital I/O
- Analog Input/Output
- Vision and Motion
- FPGA/Reconfigurable I/O
- Oscilloscopes
- High-Speed Digital I/O
- DMM and SMU
- Signal Generators
- Switching
- RF Analyzers and Generators
- GPIB, USB, LAN
- RS232/RS485
- CAN, LIN, DeviceNet
- SCSI, Ethernet
- VXI/VME
- Boundary Scan/JTAG

NI Data Acquisition (DAQ) Hardware

Reconfigurable I/O Systems



NI CompactRIO



RIO devices (PCI Express, USB)

For:

- Advanced systems that require onboard coprocessor(FPGA) connected to the measurement pins
- Offload processing for real-time data analysis
- Prototyping control systems
- Input/output applications where timing is crucial

What can you do with NI DAQ devices?

Measure

- Voltage input ranges from ± 0.25 VDC up to 480 VAC
 - 12-bit, 16-bit, 24-bit options
 - High speed transient capture at up to 1MS/s/ch
 - Dynamic Voltage (waveform) signals with 24-bit resolution
- Current inputs (0-20mA, 5 A_{RMS} direct or from CT secondaries)
- Temperature (Thermocouples and RTDs)
- Load, pressure, torque sensors
- Strain gages ($\frac{1}{4}$, $\frac{1}{2}$, and full-bridge)
- Accelerometers (IEPE)
- Microphones (IEPE)
- Pulse and event counting
- Galvanically isolated measurements
- Digital (TTL, 24VDC, sinking/sourcing)
- Quadrature encoder
- Resolvers
- Proximity probes
- Tachometers (analog/digital pulse)
- String pots, line pots

Generate and Control

- Voltage output (± 10 V)
- Current output (0-20mA)
- Digital output (TTL/24VDC)
- Relay Module (250 V_{RMS} @ 2A, 60 VDC @ 1A)
- External Relay (control with digital lines)
- Generate PWM (pulse-width modulated) signals
- Simulate sensors/signals

Temperature Measurements

Environmental Test

Thermal Test

Endurance / Lifecycle



NI 9213

High-density, most popular TC input module



NI 9214

High-density like NI 9213, but more accurate



NI 9212

Ch-Ch isolation, miniature TC connection option, best accuracy (screw terminal option)



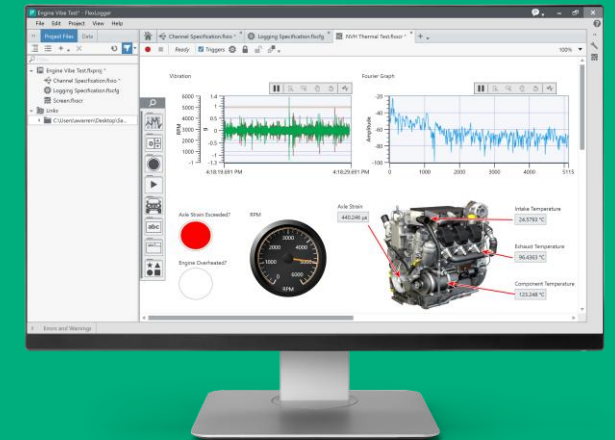
NI 9219

Universal module with Ch-Ch Isolation



NI 9210

Miniature TC input (mini jack), lowest cost



NI FlexLogger, Turnkey Software for datalogging

NI LabVIEW, Programming Environment for deeper analysis and customization

NI TestStand, Automation environment for test sequences

Temperature Measurements

Environmental Test

Thermal Test

Endurance / Lifecycle



PXIe-4357

20-Channel, 24-Bit PXI Temperature Input Module (RTD)



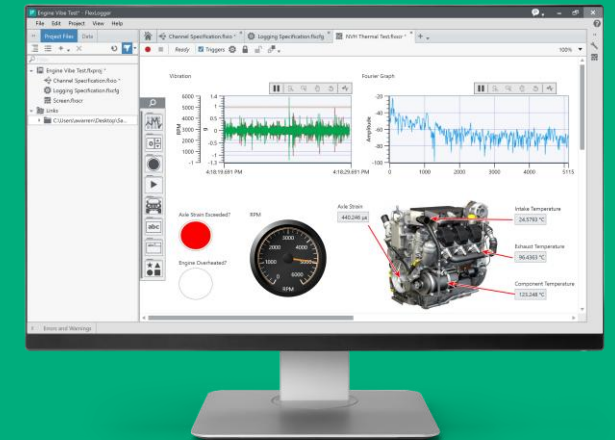
PXIe-4353

32-Channel, 24-Bit PXI Temperature Input Module (Thermocouple)



PXIe-4080

PXIe, 6½-Digit, ± 300 V, Onboard 1.8 MS/s Isolated Digitizer, PXI Digital Multimeter



NI FlexLogger, Turnkey Software for datalogging

NI LabVIEW, Programming Environment for deeper analysis and customization

NI TestStand, Automation environment for test sequences

Sound and Vibration Measurements

Vibration / Harshness Test

Acoustic Test

Endurance / Lifecycle



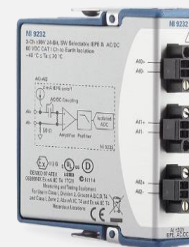
NI 9234
Most popular IEPE module



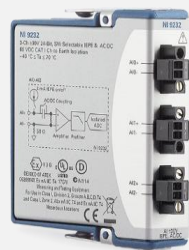
NI 9250
Designed for NVH applications



NI 9231
High channel-count

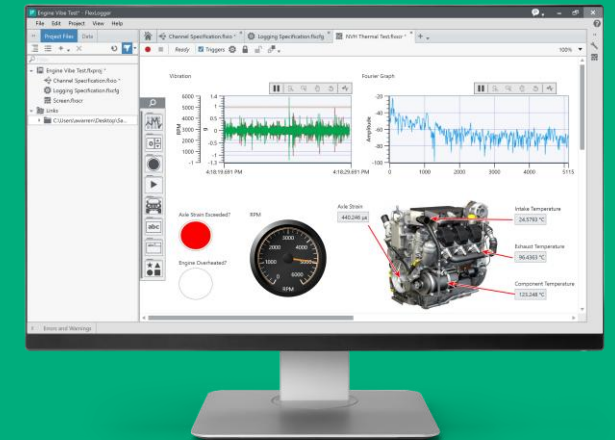


NI 9230
Low-cost version of NI 9232



NI 9232
Designed for turbomachinery.
Higher speed with $\pm 30V$ range.

- All sound and vibration modules have:
- 24-bit resolution input circuitry
 - Built-in excitation for sensors (IEPE)
 - Sample rates between 12ks/s/ch and 102.4 ks/s/ch



NI FlexLogger, Turnkey Software for datalogging

NI LabVIEW, Programming Environment for deeper analysis and customization

Sound and Vibration Toolkit for LabVIEW

NI TestStand, Automation environment for test sequences

Sound and Vibration Measurements

Vibration / Harshness Test

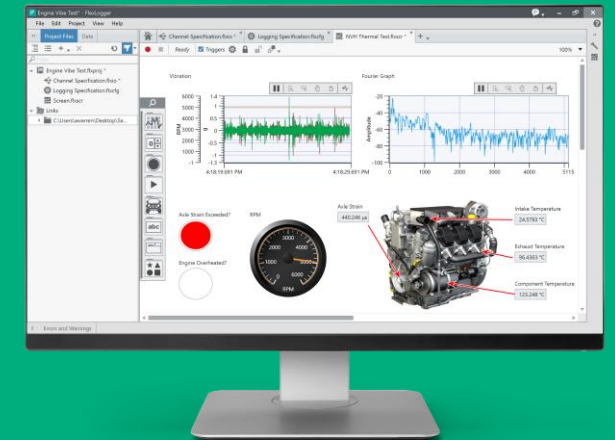
Acoustic Test

Endurance / Lifecycle



PXIe-4463, PXIe-4464
PXIe-4468, PXIe-4480
PXIe-4497, PXIe-4499

- Dynamic sensor measurements at 51.2 kS/s, 102.4 kS/s, 204.8 kS/s, 1.25 MS/s, or 250 kS/s
- Built-in highpass filtering and parallel testing to increase throughput
- Per-channel software-selectable AC input coupling and input gain settings
- Select modules available with analog output channels for dynamic signal generation
- Included NI-DAQmx driver and configuration utility that simplifies configuration and measurements
- Supported environments include LabVIEW, Python, ANSI C, C#.NET, and MathWorks® MATLAB® software



NI FlexLogger, Turnkey Software for datalogging

NI LabVIEW, Programming Environment for deeper analysis and customization

Sound and Vibration Toolkit for LabVIEW

NI TestStand, Automation environment for test sequences

Load/Force, Pressure, Strain, Torque Measurements

(Bridge Measurements)



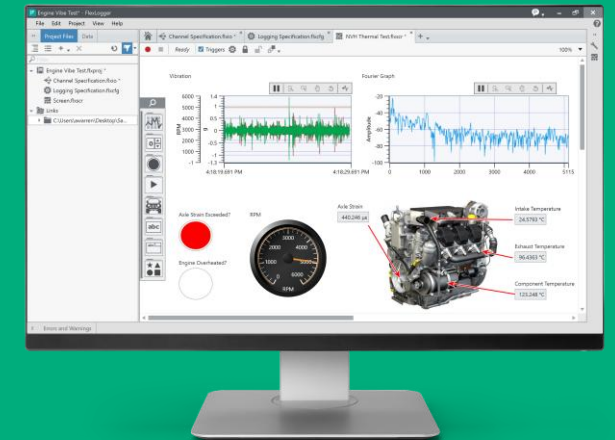
NI 9237
4-Channel, 24-bit
50kS/s/ch
1/2, 1/4, Full Bridge



NI 9219
Universal module
with Ch-Ch Isolation



NI 9235/9236
8-Channel, 24-bit
50kS/s/ch
1/4 bridge 120/350 Ohm Variants



NI FlexLogger, Turnkey Software for datalogging

NI LabVIEW, Programming Environment for deeper analysis and customization

NI TestStand, Automation environment for test sequences

Load/Force, Pressure, Strain, Torque Measurements

(Bridge Measurements)



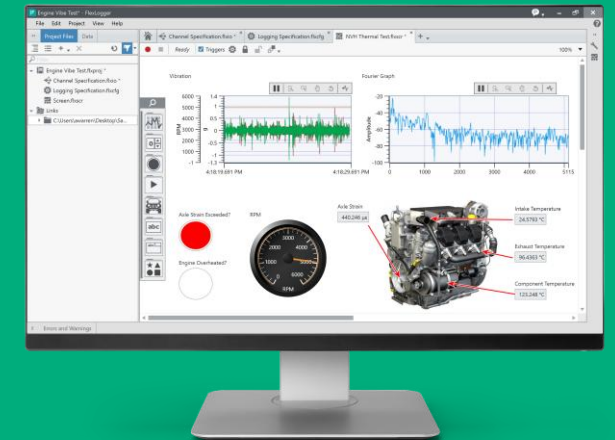
PXIe-4339, PXI 4330

25 kS/s, 24-Bit, 8-Channel PXI Strain/Bridge Input Module



PXIe-4331

102.4 kS/s, 24-Bit, 8-Channel PXI Strain/Bridge Input Module



NI FlexLogger, Turnkey Software for datalogging

NI LabVIEW, Programming Environment for deeper analysis and customization

NI TestStand, Automation environment for test sequences

Power Measurements

Voltage



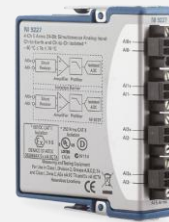
NI 9242/44

3-phase inputs (L1,L2,L3,N)
for 220/440 VAC networks



NI 9225 (no EMEA*)

300 V_{rms}, ch-ch isolated



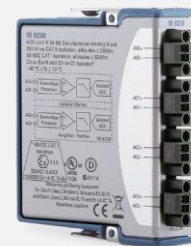
NI 9227

Good accuracy for low current
(5 Arms) measurements
Minimal over-range



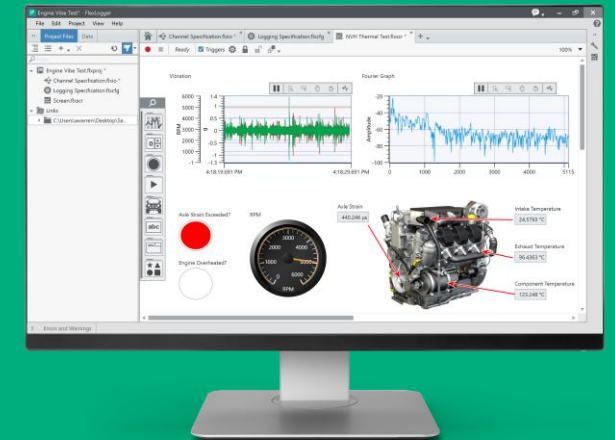
NI 9245/46

Use for CTs with 5A secondary
outputs and large over-range



NI 9238/29

Use with CTs that have a low-
voltage output (0.333V or 10V)



NI FlexLogger, Turnkey Software for
datalogging

NI LabVIEW, Programming Environment
for deeper analysis and customization

Electrical Power Suite for LabVIEW

NI TestStand, Automation environment
for test sequences

*No in EMEA

RM-26999

Power Measurements Conditioner

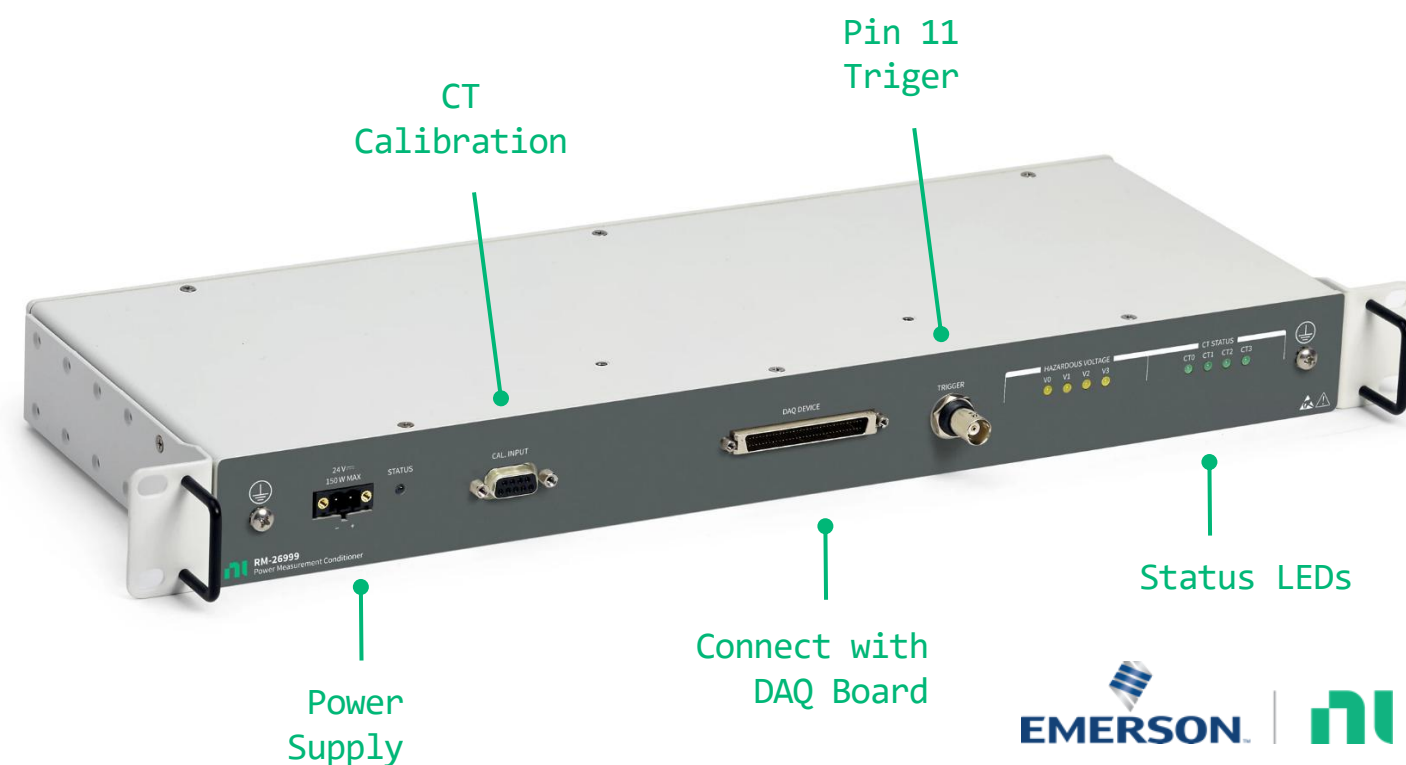
Features

- High power measurement capabilities (1000 Vrms CAT II, 2000 V peak)
- Four power measurement channels
- 2 kV voltage input (UL 61010-1, UL 61010-2-30 Cert)
 - Four input ranges: $\pm 200\text{V}$, $\pm 400\text{V}$, $\pm 1000\text{V}$, $\pm 2000\text{V}$
- Current sensor support with options up to 2,000 A
- Single cable sensor connectivity
- Integrated sensor communication and power supply
- Up to 3.5 MS/s/ch simultaneous measurements
 - Compatible with PXIe-6356, PXIe-6366, PXIe-6376



Software

- Getting started examples for common configurations
- RM-26999 API with NI-DAQmx



Functional Software Measurements

Input



NI 9205

± 10 V, 250 kS/s, 16-Bit, 32-Channel C Series Voltage Input Module



NI 9203

200 kS/s, ± 20 mA, 8-Channel C Series Current Input Module



NI 9411

± 5 V to 24 V, 6 Di/SE Channels, 500 ns C Series Digital Module

Output



NI 9263

100 kS/s/ch Simultaneous, ± 10 V, 4-Channel C Series Voltage Output Module



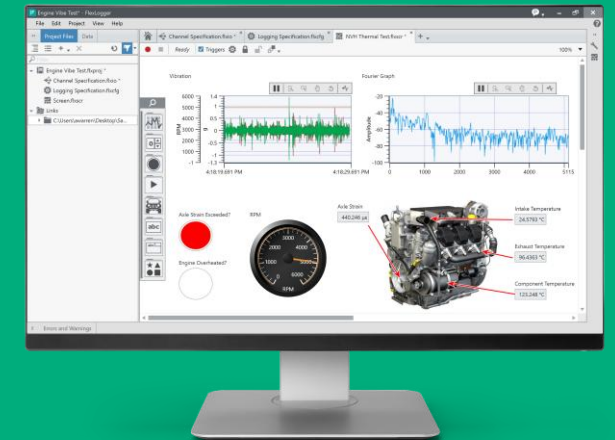
NI 9265

4-Channel C Series Current Output Module



NI 9470

5 VDC to 30 VDC, 8-Channel (Sourcing Output), 2 kHz C Series Digital Module



NI FlexLogger, Turnkey Software for datalogging

NI LabVIEW, Programming Environment for deeper analysis and customization

NI TestStand, Automation environment for test sequences

PXI Multifunction I/O



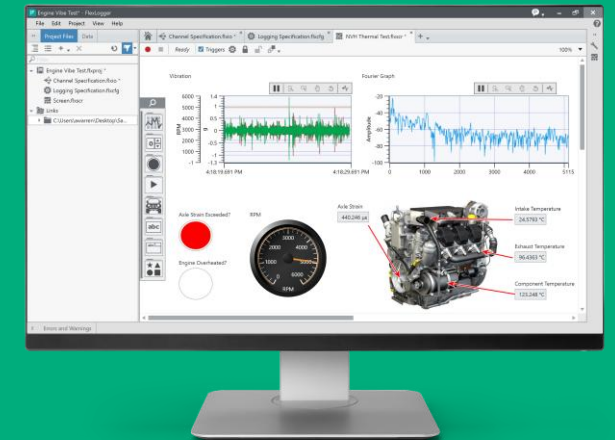
PXIe-6345

PXIe, 80 AI (16-Bit, 500 kS/s), 2 AO, 24 DIO,
PXI Multifunction I/O Module



PXIe-6363

PXIe, 32 AI (16-Bit, 2 MS/s), 4 AO, 48 DIO,
PXI Multifunction I/O Module



NI FlexLogger, Turnkey Software for
datalogging

NI LabVIEW, Programming Environment
for deeper analysis and customization

NI TestStand, Automation environment
for test sequences

NI Solution

Measure/Acquire



Measurement Instrumentation

Sound and Vibration modules

Strain/Bridge

Thermocouple

Current I/O

Voltage I/O

IEPE Module



Debugging and Logging Interface



Events, Alarms, and Triggers

Custom Plugins

Multi-Chassis Synchronization

Customize/Automate



Automation Environment



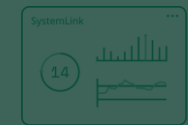
Programming Environment



Analyze/Present/Insight



Reporting/Analysis Environment



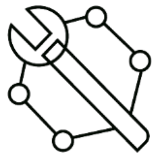
Reporting/Analysis Environment



SOFTWARE AND HARDWARE TOOLS



A no-/low-code data acquisition software engineers use to build validation and verification test applications.



Configure Measurements

Set up your system in minutes by interactively selecting devices and measurement channels



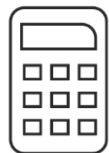
Create Dashboards

Monitor and control tests with drag-and-drop visualization and interactive elements



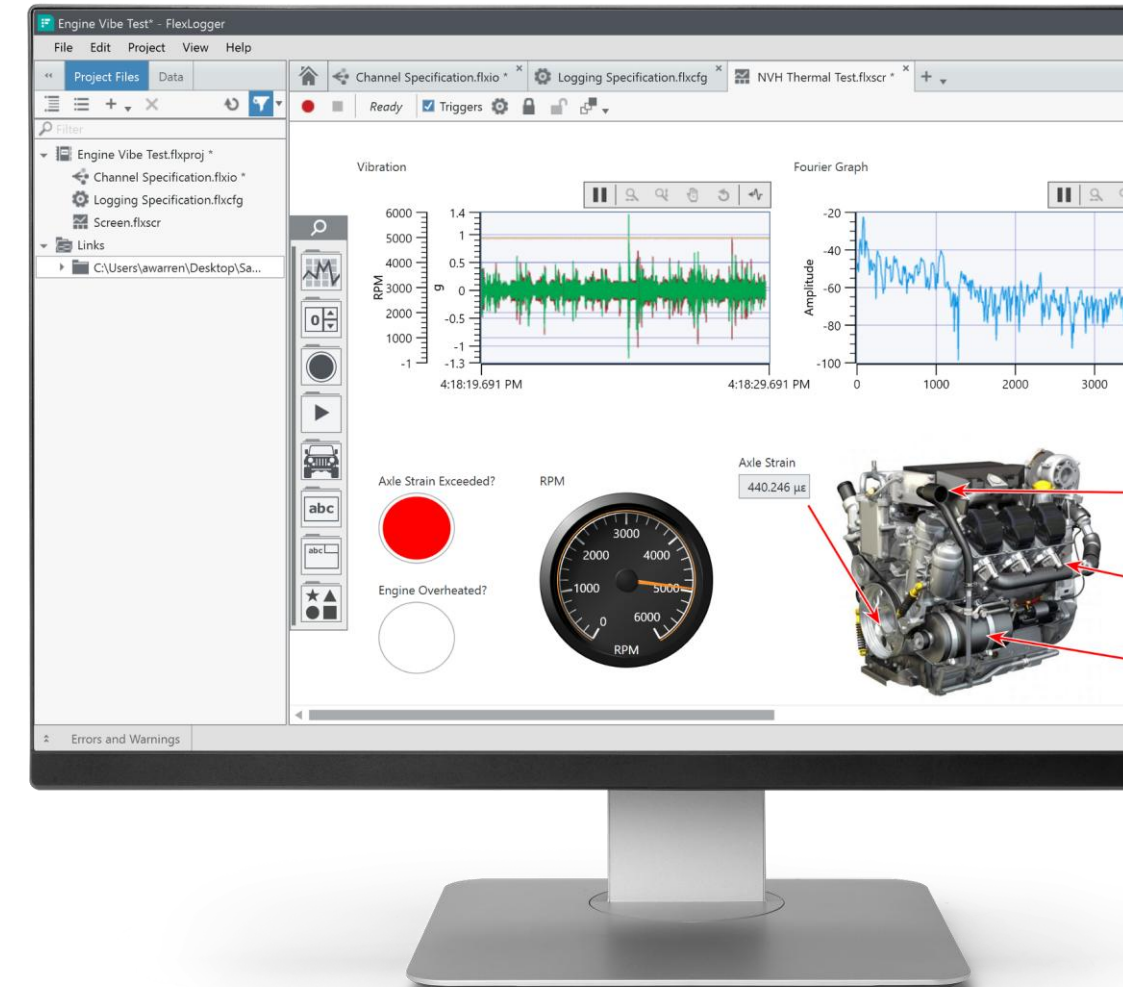
Store Results

Configure data storage preferences to automatically partition files and store to multiple locations



Automate Tests

Use events, alarms, logging triggers, and a fully-featured API to automate execution of tests



Connect FlexLogger



With **LabVIEW** to integrate custom measurements and control logic



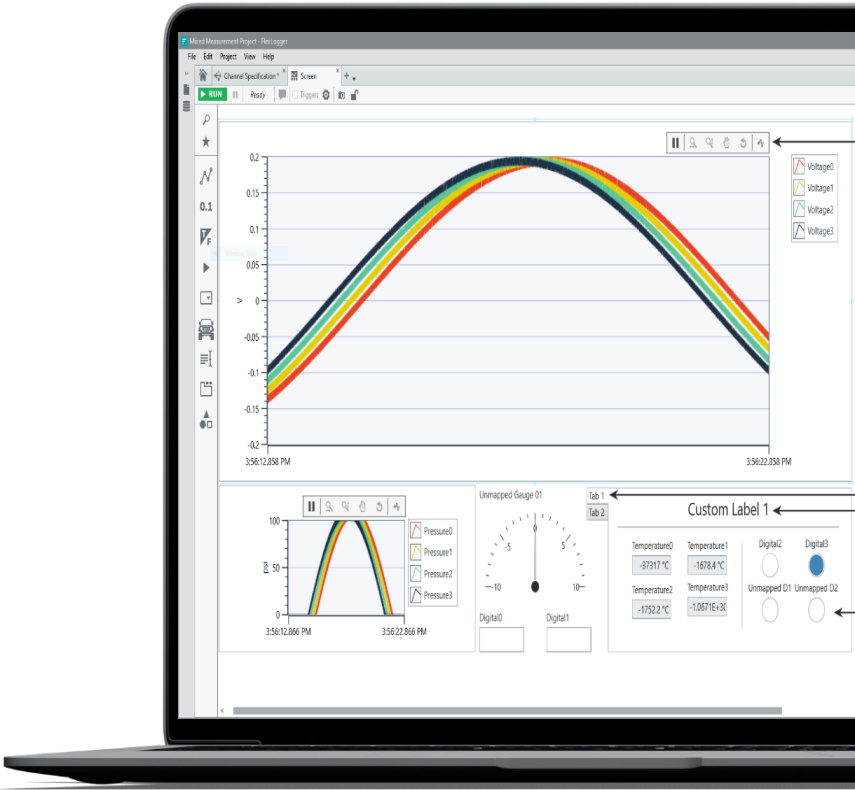
With **DIAdem** to quickly search, visualize, analyze, and generate reports on logged data



With **TestStand** to quickly build complex test sequences and generate reports

FlexLogger Edition Comparison

	FlexLogger Lite (Free Companion)	FlexLogger (Paid – Enhanced) 
Configure and validate DAQ measurements		
Manually log to standard data formats		
Monitor tests with customizable dashboards		
Visually inspect data using TDMS Viewer		
XNET and TEDs support		
Python integration		
Configure events, alarms, and triggers		
Connect data to SystemLink		
Create plug-ins to extend capabilities (3 rd party hw, custom)		
Scale with multi-chassis synchronization		
Preview		
Operator mode		





A graphical programming language and environment engineers use to develop automated research, validation, and production test systems.



Create Professional User Interfaces

View data and control your test system via an interactive UI built from drag-and-drop UI elements



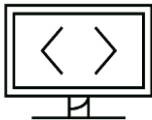
Integrate All Your Instruments

Acquire data from and control any instrument with 1000s of device drivers and industry-standard protocols



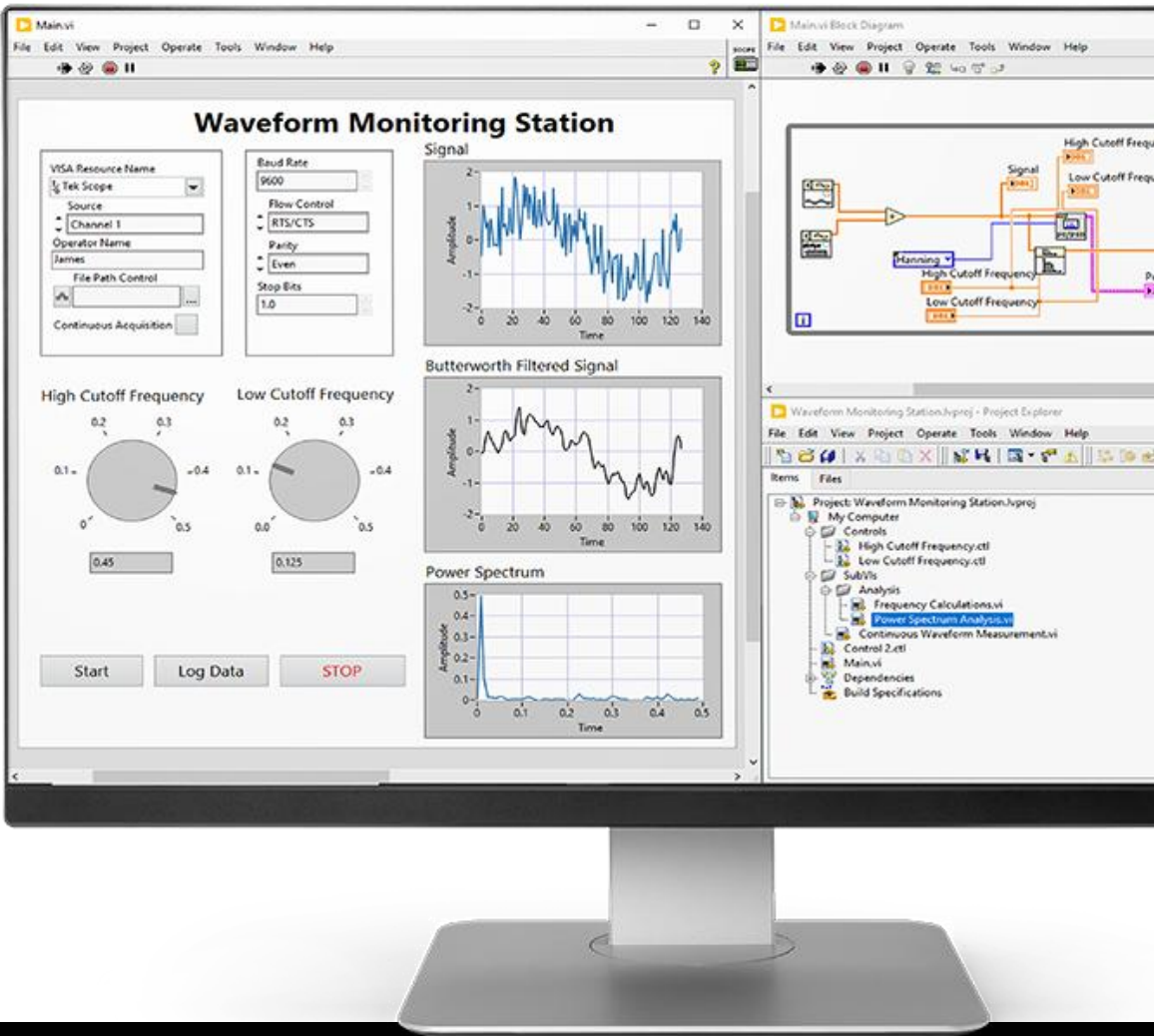
Program Like You Think

Save development time by creating and visualizing applications using data flow programming



Use Other Code

Leverage other and existing code written in Python, C/C++, MATLAB®, and .NET



Connect LabVIEW



With **TestStand** to quickly build complex test sequences and generate reports



With **Flexlogger** to build a customized configuration based datalogger



With **InstrumentStudio** to centralize and share interactive measurements

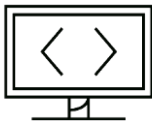


A test executive software that accelerates system development and deployment for engineers in validation and production.



Automate Your System

Create, execute, and debug test sequences using an interactive environment



Leverage Existing Code

Use code from LabVIEW, Python, C/C++, or .NET



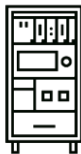
Test More, Faster

Use native parallel execution to reduce test time and functionality for advanced tasks such as sweeping and looping



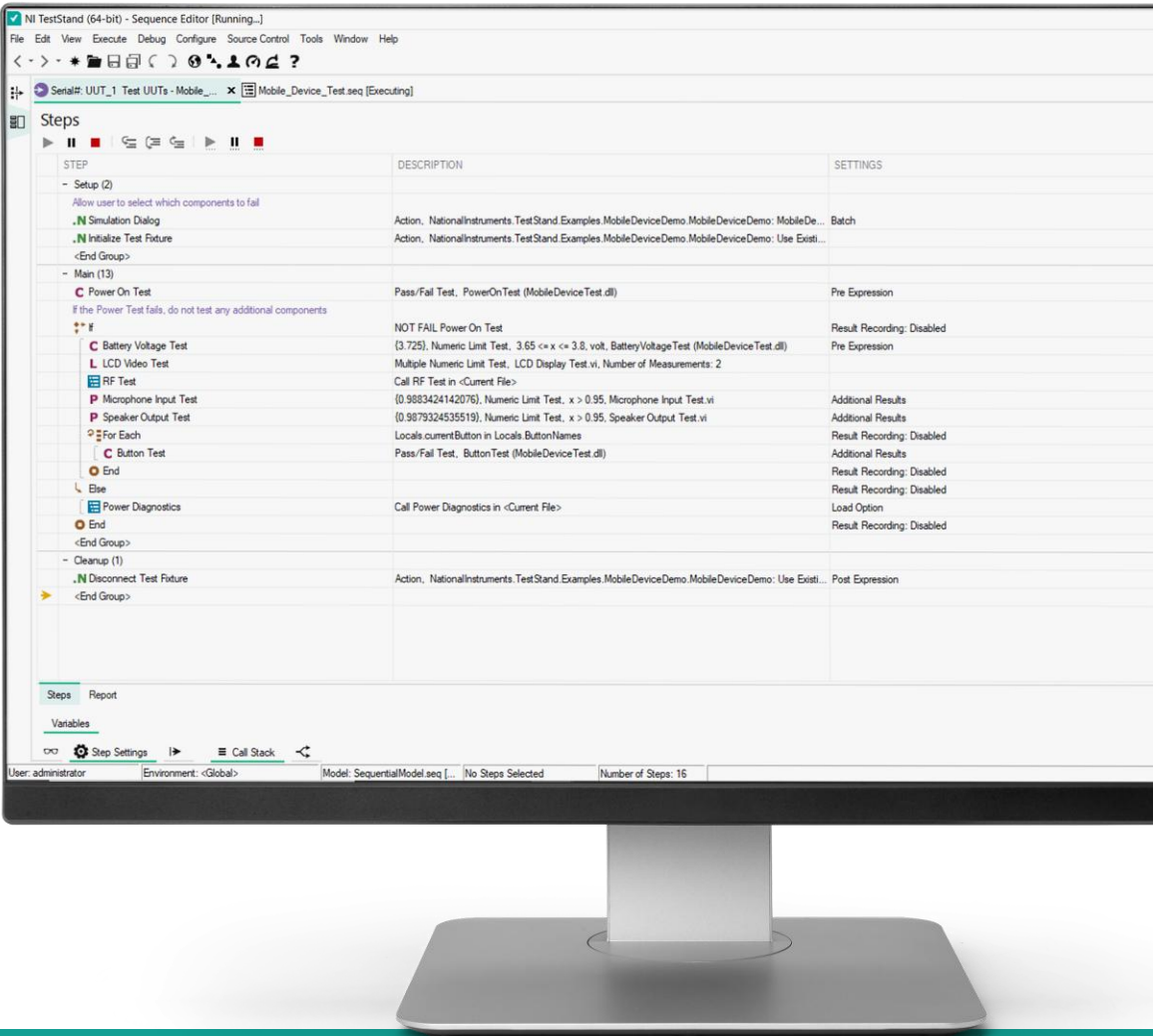
Keep Track of Results

Track units, automatically generate reports, and store results to local or network databases



Deploy To Your Testers

Scale your operations by deploying sequences to numerous test stations with custom or pre-built operator interfaces



Connect TestStand



With **LabVIEW** to quickly develop complex reusable tests



With **Flexlogger** to efficiently acquire and log data from your DAQ hardware



With **InstrumentStudio** for interactive instrument control

NI Solution

Measure/Acquire



Measurement Instrumentation

Sound and Vibration modules

Strain/Bridge

Thermocouple

Current I/O

Voltage I/O

IEPE Module



Debugging and Logging Interface



Events, Alarms, and Triggers

Custom Plugins

Multi-Chassis Synchronization

Customize/Automate



Automation Environment



TestStand™



Programming Environment



LabVIEW™



python™



C#

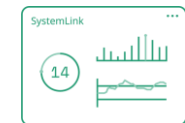
Analyze/Present/Insight



Reporting/Analysis Environment



DIAdem™



Reporting/Analysis Environment



SystemLink™

SOFTWARE AND HARDWARE TOOLS



Data analytics software for measurement data search, inspection, analysis, and automated reporting.



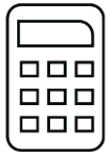
Data Search and Inspection

Access any type of data and search through metadata to find data in local or network locations



Visualization

Display data in multiple 2D-axis systems, play video data, and more



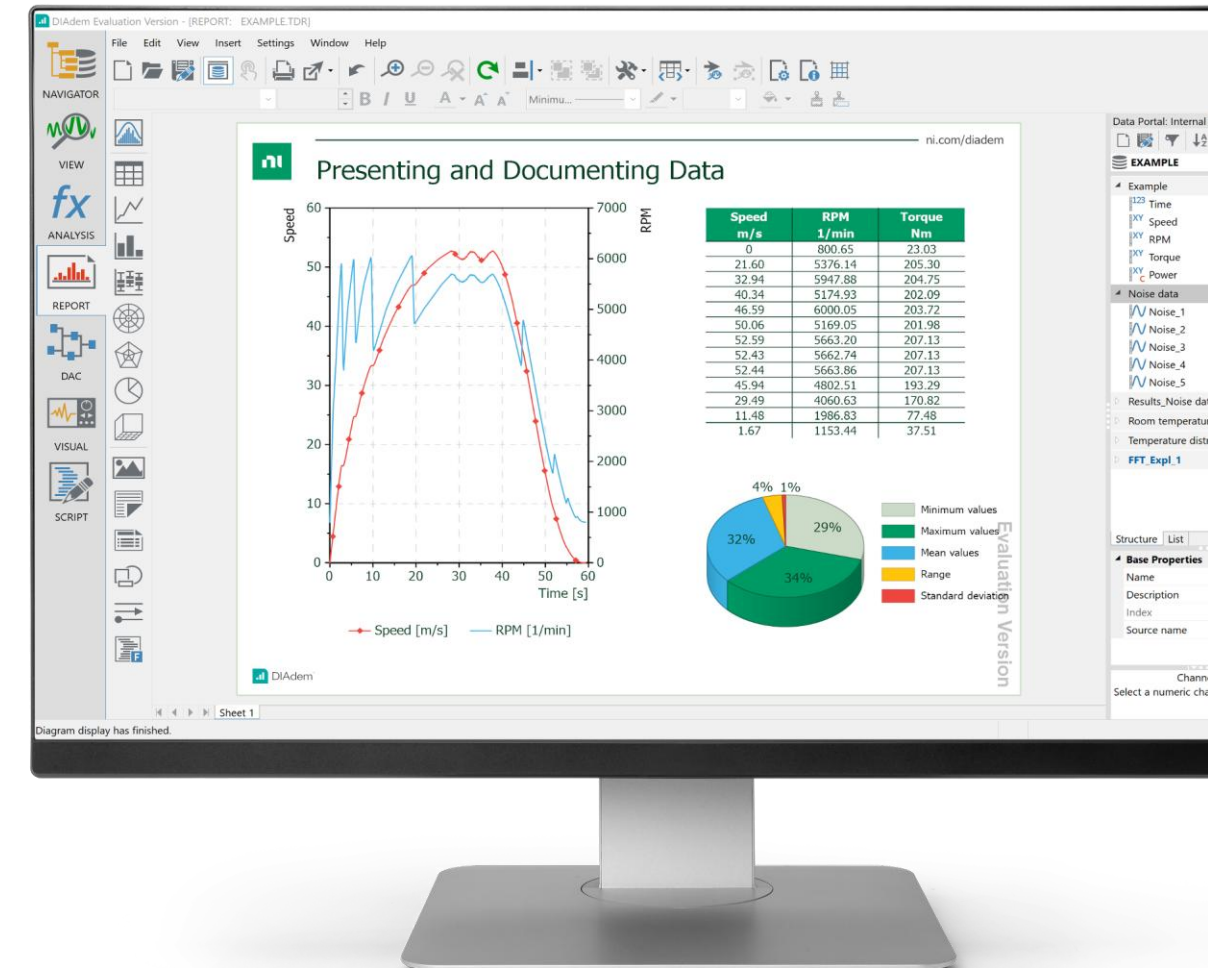
Advanced Analysis

Utilize hundreds of built-in advanced analysis functions (bode order tracking, order and rain flow analysis, etc.) in addition to custom reusable formulas



Automated Reporting

Automate your measurement data analysis workflow, from import to analysis to report



Connect DIAdem



With **LabVIEW** to acquire measurement and test data



With **SystemLink** to serve as a centralized data storage source



With **Flexlogger** to acquire data from sensors

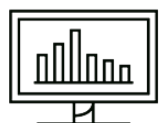


Streamline lab operations and amplify engineering insights in an integrated, scalable, enterprise solution.



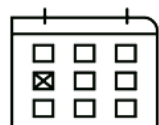
Manage Systems and Assets

Manage and install software for your entire test fleet, monitor test system health, and manage and track NI and 3rd Party instrument utilization



Monitor and Analyze Parametric Tests

Collect and view test results, files and parametric data; filter data for additional insights and track KPIs with dashboards and ad-hoc analysis



Plan Tests and Work Orders

Track incoming test requests, define test requirements, schedule, deploy, and remotely execute tests



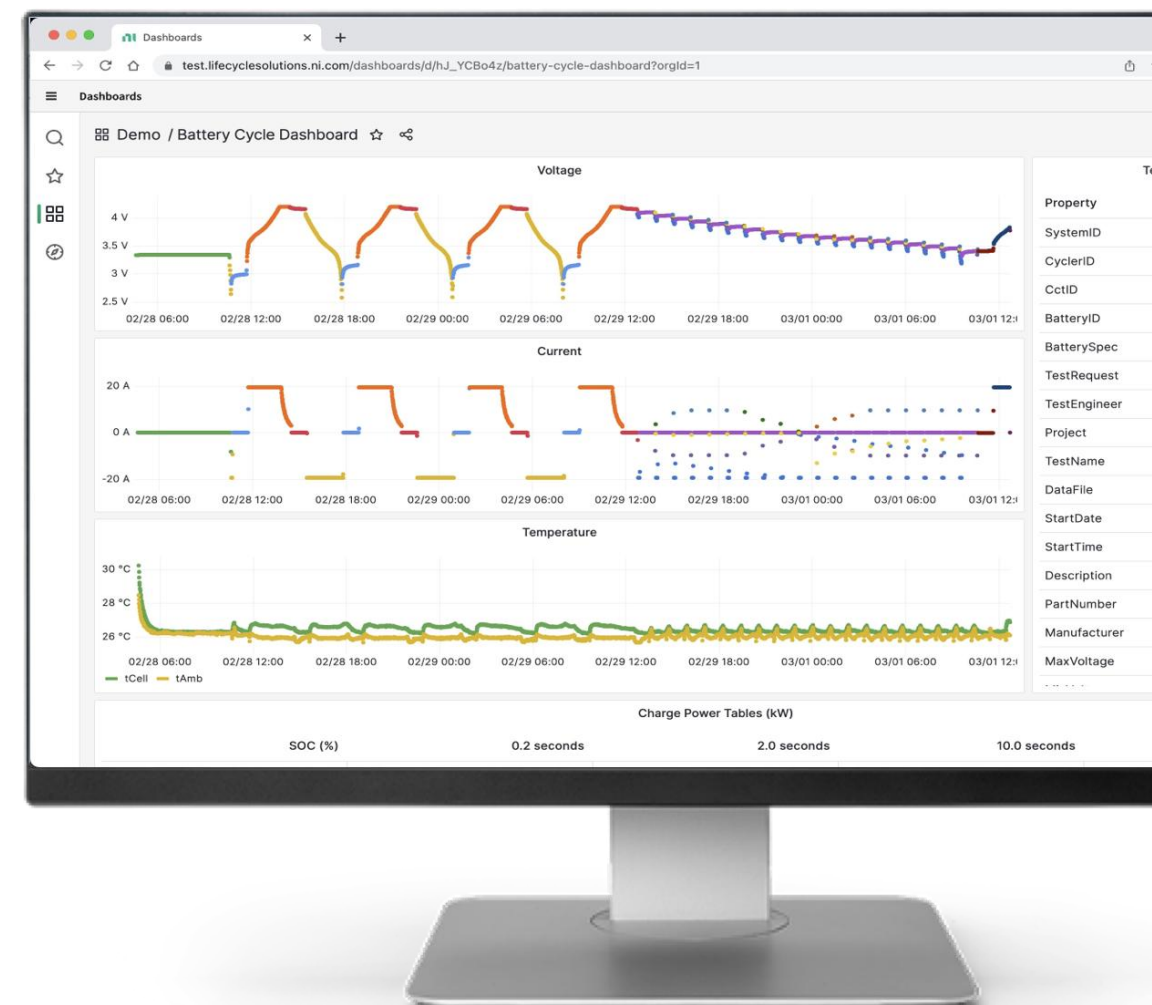
Track Product Specification Compliance

Elaborate requirements into engineering specifications to drive test consistency, quickly discover product issues, and track test progress



Automate Analysis and Reporting

Fully integrated Jupyter Notebook development environment to create Python scripts to extract, transform, and analyze data



Connect SystemLink



With **TestStand** to complete the loop from specifications to measurement



With **LabVIEW** to centrally manage test data and test system status



With **DIAdem** for further analysis and powerful report generation

25

LABORATORIES WORLDWIDE

>50%

QUALITY IMPROVEMENT IN
10 YEARS

-25%

WARRANTY COST SAVING

+100%

STAR RATING CUSTOMER
SATISFACTION



ELECTROLUX CUSTOMER STORY

Business Growth with Test Standardization

Challenge

Increased consumer expectations and complexity in managing laboratories worldwide with different test procedures and technical background

Solution

Process, systems, and data standardization across validation and production teams using PXI, LabVIEW, and TestStand

Value

The software connected ecosystem of NI provide the most productive test workflow on the market, standardizing all Electrolux laboratories worldwide.

>900

THERMOCOUPLES IN REAL-TIME

8

CONNECTED TEST WALLS

+

ISO CERTIFICATION

4

LABORATORIES WORLDWIDE



NI SUCCESS STORY

Cooking Safety Test

Challenge

Verify cooking appliance normative compliance over standards and define temperature wall maps and electrical power measurements.

Solution

Measure and visualize up to 900 thermocouples with energy consumption in real time during the cooking process, verifying cooking appliance normative compliance over standards.

Value

The flexibility of the PXI platform allows a rugged system to be easily positioned near thermal chamber ports. Easy use of LabVIEW for sensor setup, real-time trending, and alarm condition setting.

30

TEST STANDS ACROSS MULTIPLE
SITES

90%

AUTOMATED VALIDATION TESTING

1

STANDARDIZE TEST PLATFORM
FROM DESIGN & VALIDATION TO
PRODUCTION



INFINITUM CUSTOMER STORY

One Platform for Long-term Success

Challenge

Infinitem's initial traditional lab setup was prone to human error and lacked scalability. Engineers relied on custom setups with numerous cables, resulting in inconsistent and non-repeatable results.

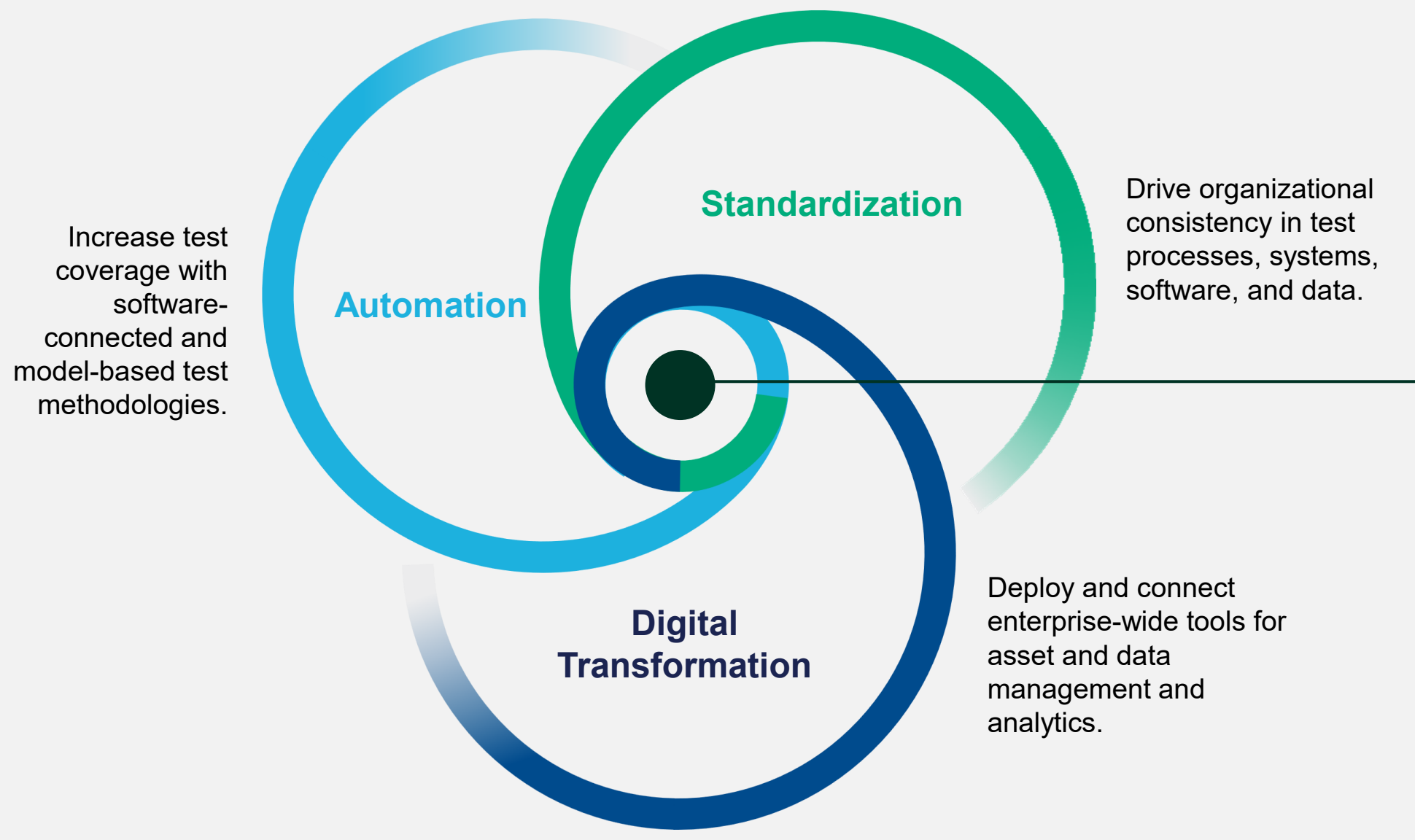
Solution

Infinitem developed test solutions alongside product testing, establishing a standardized platform for product tests across various development sites.

Value

Best in class measurement systems with CompactDAQ. This strategy enabled them to obtain consistent, repeatable data and streamline testing processes.

Make Test a Strategic Differentiator for Your Business



Business Performance

Realize the benefits of an intentional test strategy.



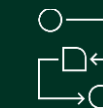
Reduce time to market



Deliver customer satisfaction



Improve the bottom line



Prepare for the future

Thanks



NI is now part of Emerson.