CompactDAQ Temperature Measurement Hardware

Modular Data Acquisition Options for Measuring Temperature sensors

Use this hardware for:

- Thermal chamber tests
- Board-level thermal characterization
- System-level validation
- Temperature field tests
- Quick temperature logging systems

Navigation

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CompactDAQ Temperature Measurement Hardware

This is a high-level comparison. If there are certain specifications you need to meet your application, please review the datasheet for each module.

Mixed Sensor C Series Module – Connects RTD, Thermocouples, and More

C Series modules for measuring thermocouples, RTs, and other sensors. Includes built-in signal conditioning such as cold-junction compensation and excitation.

System Need	Model	Image	Part Number	Front Connection Type*	Differential Channels	Sample Rate
Lowest module cost	NI-9219**		785994-01	Spring Terminal	4	100 S/s/ch

Thermocouple Sensor Measurement C Series Modules

C Series modules for measuring Thermocouple Sensors. Includes built-in signal conditioning such as cold-junction compensation.

System Need	Model	Image	Part Number	Front Connection Type*	Differential Channels	Sample Rate
Lowest module cost	NI-9210**		784788-01	Miniature Thermocouple (mini-TC)	4	14 S/s
Ch-Ch isolated and simultaneous sampling	NI-9212		785259-01	Miniature Thermocouple (mini-TC)	8	95 S/s/ch
			782975-01	Screw Terminal		
Lowest cost per channel	NI-9213**		785185-01	Spring Terminal	16	75 S/s
Better accuracy	NI-9214		781510-01	Screw Terminal	16	68 S/s

*Some modules have multiple options based on how you can connect sensors – **Learn More**

This module is part of a CompactDAQ Measurement Bundle – **View Bundle Options

RTD Sensor Measurement C Series Modules

C Series modules for measuring PT100 and PT1000 RTDs. Includes built-in signal conditioning such as excitation.

System Need	Model	Image	Part Number	Front Connection Type*	Differential Channels	Sample Rate
PT100 RTD Sensor Compatible + More Channels	NI-9216		785186-01	Spring Terminal	8	400 S/s
			783863-01	D-SUB		
PT100 RTD Sensor Compatible	NI-9217		779592-01	Screw Terminal	4	
PT1000 RTD Sensor Compatible	NI-9226		785189-01	Spring Terminal	8	400 S/s
			783864-01	D-SUB		

*Some modules have multiple options based on how you can connect sensors – **Learn Below**

Sensor Connectivity – Module Front Connection Type Options

Some modules have various options based on how you can connect sensors (Front Connection Type). The model number will be the same but will have a different part number based on the front connector type.

• Ideal for low channel count as they do not provide a quick multi-channel connect/disconnect solution.
  • **Spring Terminals:** Connect bare-wired sensors via a spring locking mechanism.
  • **Miniature Thermocouple (Mini-TC):** Subset of spring terminals, designed for a 2-prong thermocouple sensor to plug into.
  • **Screw Terminal:** Connect bare-wired sensors by tightening a screw.
• Can be good for quick multi-channel connect/disconnect solutions.
  • **D-SUB:** Contains two or more parallel rows of pins or sockets surrounded by a D-shaped metal. Widely used for serial communication. **Note:** NI offers D-SUB to Screw Terminal accessories.

Complete Your Test System

You can either build your own system or purchase a pre-configured hardware bundle (**view below**) and add relevant software. Along with the modules for measuring temperature, consider the following to complete your test system:
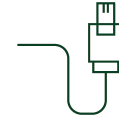
CompactDAQ Chassis

Modules need to be in a CompactDAQ Chassis to have power and send data.

Software

The software will collect, store, and analyze the data. NI has options based on your testing needs.

Accessories

Cables, mounts, or other accessories may be helpful or needed for your system.

CompactDAQ Temperature Measurement Bundles

Bundles include a CompactDAQ Chassis, C Series Module(s), and any relevant accessories. Switch out or add more C Series measurement modules and pair them with compatible DAQ software for a complete system.

Needs	Model	Image	Part Number	Module	Chassis	Empty Slots
Lowest Cost + Mini TC Jack Thermocouple	cDAQ-T1100		865662-01	NI-9210	cDAQ-9171	0
High-Channel Thermocouple Measurement	cDAQ-T1101		865682-01	NI-9213	cDAQ-9171	0
High-Channel Thermocouple Measurement + Expandable	cDAQ-T4202		868014-01	NI-9213 (x2)	cDAQ-9174	2*
Mixed Sensor + Expandable	cDAQ-T4202		868016-01	NI-9219 (x2)	cDAQ-9174	2*

*You can add other measurement modules for your tests – **View Popular C Series Measurement Modules**

CompactDAQ Chassis Options and Comparisons

NI C Series modules need to be inside a chassis to collect and log data.

Chassis Considerations

- What bus communication do you need (**USB or Ethernet**)?
- How many different measurement modules will you need in a specific location (**Slot Count**)?
- Do you need an **onboard trigger**?
- What is the **temperature range of the environment** you will be testing in?
- Is **synchronization** of measurements across multiple test systems a test requirement?

USB Bus Connected Chassis

USB is practical for portable measurements and convenient because connectivity is easy and ubiquitous. USB devices are not recommended for closed-loop control applications.

Model	Image	Part number	Slot Count	Onboard Trigger	Synchronization Enabled	Operating Temperature Range
cDAQ-9171**		781425-01	1	No	No	-20 °C to 55 °C
cDAQ-917**		781157-01	4	No	No	-20 °C to 55 °C
cDAQ-9178		781156-01	8	Yes	No	-20 °C to 55 °C
cDAQ-9179		783597-01	14	Yes	No	-20 °C to 55 °C

Ethernet Bus Connected Chassis

Ethernet is ideal for remote and distributed measurements, particularly those that extend beyond the reach of a 5 m USB cable.

Model	Image	Part number	Slot Count	Onboard Trigger	Synchronization Enabled	Operating Temperature Range
cDAQ-9181		781496-01	1	No	No	0 °C to 55 °C
cDAQ-9185		785064-01	4	Yes	Yes	-40 °C to 70 °C
cDAQ-9189		785065-01	8	Yes	Yes	-40 °C to 70 °C

This chassis is part of a CompactDAQ Measurement Bundle – **Learn More

Popular C Series Measurement Modules - Quick Selection Guide

This section lists some of the most popular C Series measurement modules by category so you can quickly match your needs to the module.

Temperature (RTD) Sensor Measurement C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Start here. General purpose	8-Ch, 400 S/s, 0 Ω – 400 Ω, PT100	NI-9216	RJ50, D- Sub

Temperature (Thermocouple) Sensor Measurement C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Start here. General purpose	16-ch	NI-9213*	Spring Terminal
More accuracy (0.37 ºC benchmark)	More accurate version of NI-9213	NI-9214	Spring Terminal
Ch-ch Isolation or TC minijack connectors	8-channel, ch-ch iso, mini-TC jacks	NI-9212	TC minijacks, screw terminals

Sound and Vibration Sensor Measurement C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Start here.	4-ch, 51.2 kS/s/ch, ±5 V	NI-9234*	BNC
2x Faster Sample Rate. 30 V range	3-ch, 102.4 kS/s/ch, ±30 V	NI-9232	Screw Terminal, BNC
More channels/module	8-ch, 51.2 kS/s/ch, ±5 V	NI-9231*	10-32 Coaxial Jack
Lower Cost	12.8 kS/s/ch version of NI-9232	NI-9230	Screw Terminal, BNC

Bridge, Strain, Load, Pressure, Torque Sensor Measurement C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Start here. General purpose. 4-ch,	4-ch, 50 kS/s/ch, 1/4, 1/2, Full-bridge	NI-9237*	RJ50, D-Sub
More than 2x 120 Ohm 1/4 bridge sensors	8-channels	NI-9235	Spring Terminal

Multi-Sensor Measurement C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Start here. General purpose.	4-ch, ch-ch iso, 100 S/s/ch, strain gages, RTD, Thermocouple, Load Cell, 1/2-, 1/4-, Full-bridge completion	NI-9219*	Spring Terminals

*This module is part of a CompactDAQ Measurement Bundle

Current Input C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Start here. General purpose	±20 mA, 8-ch, 200 kS/s	NI-9203	Spring Terminal, Screw Terminal
More ch/module, 24-bit, 50/60 Hz rejection	±20 mA, 16-ch, 500 S/s	NI-9208	Spring Terminal, D-Sub
Simultaneous sampling and LED indicators	±20 mA, 8-ch, 200 kS/s	NI-9253	Spring Terminal

Digital Input/Output C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Industrial DIO	32-ch (16I/16O), 12 V/24 V industrial level	NI-9375	D-Sub, Spring Terminal
High Channel-count 24 V DO 3	32-ch, 12 V/24 V industrial level DO	NI-9476	D-Sub, Spring Terminal
TTL	8-ch, 5 V TTL	NI-9401*	D-Sub
High Channel-count TTL	32-ch, 5 V TTL	NI-9403	D-Sub
High Channel-count 24 V DI	32-ch, 12 V/24 V industrial level DI	NI-9425	D-Sub, Spring Terminal
Relay	250 VAC, 60 VDC, 4 relays	NI-9482	Screw Terminal, Spring Terminal
Industrial DI	8-ch, 12 V/24 V DI	NI-9421	D-Sub, Spring Terminal, Screw Terminal
Industrial DO	8-ch, 12 V/24 V DO	NI-9472	D-Sub, Spring Terminal, Screw Terminal

Voltage Output C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Start here. General purpose.	±10 V, 16-ch, 25 kS/s/ch	NI-9264	D-Sub, Spring Terminal
Lower cost and channels. Faster.	±10 V, 4-ch, 100 kS/s/ch	NI-9263	Spring Terminal, Screw Terminal
Ch-ch Isolated Output, 40 V range.	±10 V or ±40 V, 4-ch, 100 kS/s/ch	NI-9269*	Screw Terminal

*This module is part of a CompactDAQ Measurement Bundle

Voltage Input Measurement C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Start here. General purpose.	±10 V, 16-ch DI, 32-ch SE, 16-bit, 250 kS mux, gain settings	NI-9205*	D-Sub, Spring Terminal
Faster rate. Still high-density.	±10 V, 16-ch, 100 kS/s/ch simultaneous. No gain.	NI-9220*	D-Sub, Spring Terminal
24-bit resolution. 250 V ch-ch isolation.	±10 V, 4-ch, 50 kS/s/ch	NI-9239	Screw Terminal, BNC
60 V input range	±60 V version of NI-9239	NI-9229	Screw Terminal, BNC
Lowest cost simultaneous sampling	±10 V, 4-ch, 100 kS/s/ch	NI-9215*	Screw Terminal, Spring Terminal
Highest-speed simultaneous sampling	±10 V, 4-ch, 1 MS/s/ch	NI-9223	Screw Terminal, BNC
Medium speed. Medium cost.	±10 V, 4-ch, 500 kS/s/ch	NI-9222	Screw Terminal, BNC
Selectable filter, noise rejection	±10 V, 16-ch, 24-bit, 10 kS/s/ch	NI-9202	D-Sub, Spring Terminal
Digitizer functionality	±20 MS/s/ch digitizer. 14-bit. NI	NI-9775	BNC
Low cost, high-speed 12-bit	±10 V, 8-ch, 12-bit	NI-9201	D-Sub, Screw Terminal, Spring Terminal

Power C Series Modules

Test System Need	Module Specifications	Module	Front Connection Options
Voltage: start here	3-ph 250 VAC L-N (400 VAC L-L) 50 kS/s/ch	NI-9242	Screw Terminal
Voltage: 480 VAC	3-ph 400 VAC L-N (800 VAC L-L) 50 kS/s/ch	NI-9244	Screw Terminal
Voltage: ch-ch iso Voltage	3 channels, 300 V Pk, 50 kS/s/ch	NI-9225	Screw Terminal
Current Low Voltage Transformer input	Voltage module that connects to 0.33 V CTs	NI-9238	Screw Terminal
Current Low Voltage Transformer input	Voltage module that connects to 0.33 V CTs	NI-9246	Screw Terminal
Current high accuracy, low range	Built-in shunt, 5 A RMS input	NI-9246	Screw Terminal

*This module is part of a CompactDAQ Measurement Bundle

Improve Test Performance with NI Software for CompactDAQ

FlexLogger: No-code or out-of-the-box data logging

- **Configure** quick tests with alarms, test properties, and real-time data displays

- Simplify **sensor measurement** with sensor-specific templates

- **Log test results** to .tdms or .csv files

- **Add calculations** for simple math, filtering, Boolean logic, and more

- **Review data** with an included interactive TDMS file viewer

### LabVIEW: Control multiple test systems and more analysis

- **Acquire data** from NI hardware, 3rd party instruments, and many other protocols

- **Create interactive UIs** for monitoring and control.

- **Process** with standard math, probability, and statistical functions.

- **Integrate code** written in Python, C/C++, .NET, and MathWorks MATLAB® software.

- **Save data** to .csv, .tdms, or any custom-defined binary file

NI DAQmx Driver: Develop with Your Preferred Programming Language

- Python

- C, C+, C#

- .NET

- MATLAB® (Contact MathWorks® for the Data Acquisition Toolbox)

MATLAB is a registered trademark of The MathWorks, Inc.
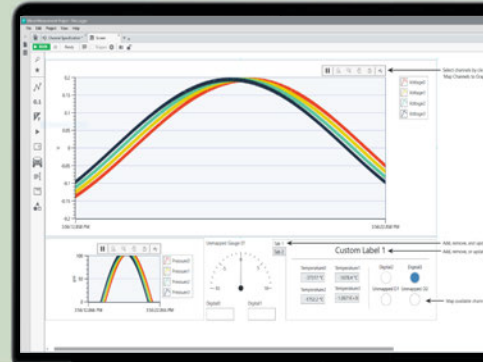
""FlexLogger makes it easier to troubleshoot and verify that the raw data from different sensors are correct before I start my test. This helps shorten test development by saving time typically wasted on redoing configurations."

- Andy Tarman,
Lab Test Engineer
CNH Industrial

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