

# Choosing the Right DAQ Multiplexer Modules for Voltage Measurement

Achieve Safer, More Accurate, and Scalable Data Acquisition



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# Getting Voltage Measurements Right

Voltage is one of the most common signals measured in test environments, from delicate millivolt-level sensor outputs to high-voltage power supply rails. Yet these two categories of measurements require very different handling. A module optimized for precision at low voltages may not survive exposure to high voltages. In contrast, a module designed for robust high-voltage switching may not offer the accuracy and protection required for sensitive measurements. For engineers, educators, and researchers, this creates a practical challenge: how do you decide which module is the right fit for your application?

This application note addresses that question. It explains why a Data Acquisition (DAQ) system is often the preferred tool for voltage measurement, why choosing the right multiplexer module is critical, and how to decide between the DAQM910A, optimized for low-voltage precision, and the DAQM901A, designed for higher-voltage general-purpose use.



**Figure 1.** DAQ970A and its modules

## Why Do We Use a DAQ for Voltage Measurement?

It is possible to measure voltage with a digital multimeter or a bench instrument, but these tools become impractical when more than a handful of signals must be monitored. Modern applications often involve dozens of channels, sometimes spread across different types of signals, and require long-term logging that cannot be managed efficiently with single-point instruments. This is where a DAQ system becomes the preferred solution.

A DAQ mainframe, such as the Keysight DAQ970A or DAQ973A, combines flexibility and scalability by allowing multiple multiplexer modules to be installed in a single chassis. Both systems feature a built-in 6.5-digit Digital Multimeter (DMM), enabling precise measurement of a wide variety of signals. Beyond voltage, they can also measure resistance, temperature, current, frequency, and continuity, all within the same setup. This integrated approach reduces complexity while improving efficiency and accuracy.

The value of a DAQ becomes clear when considering what it enables:

- **Multi-channel measurement:** Capture dozens or even hundreds of voltages in a single setup.
- **Mixed measurement capability:** Combine voltage with other signal types without adding instruments.
- **Automated scanning and logging:** Run long-duration or unattended tests with confidence.
- **Scalable expansion:** Increase channel count as your project grows without redesigning your setup.

By consolidating measurements into a single platform, a DAQ system enables engineers, researchers, and educators to perform complex voltage measurements with confidence, safety, and efficiency.



**Figure 2.** Rear panel of the DAQ970A mainframe



**Figure 3.** DAQ970A's modules that fit into the rear panel of DAQ970A mainframe

## Why is Module Selection Important?

The DAQ mainframe provides the measurement engine, but the multiplexer module determines which signal types the engine can accept. The module acts as the gateway between the device under test and the measurement hardware. If the wrong module is chosen, several problems can arise, for example, low-level signals may be drowned out by noise or measurement error, higher voltages may exceed the module's safe operating limits and cause damage, and the system's overall efficiency may be reduced.

For low-voltage signals or resistance measurements such as thermocouples, RTDs, strain gauges, or milliohm-level resistors, accuracy and protection are paramount. In these scenarios, a module optimized for sensitive measurements ensures that valuable data is not lost to external noise interference or wiring loading errors. For higher-voltage environments, such as monitoring industrial power rails or switching mixed-signal systems, robustness and safe isolation matter more than fine precision. Choosing the right multiplexer module is therefore not simply a matter of convenience; it is a safeguard for both your equipment and the integrity of your data.

### For More Information

The DAQ970A and DAQ973A are versatile DAQ systems that support measurements of voltage, current, resistance, temperature, and frequency.

For low-voltage applications, the DAQM910A provides precision and protection, while the DAQM901A is better suited for higher-voltage signals up to 300 V.

For larger systems needing more than 100 channels or faster scanning speeds, the 34980A offers a scalable alternative.

# Making the Right Choice

Choosing the right multiplexer is not about deciding which module is “better or worse.” Instead, it is about matching the right tool for the job. Different applications place different demands on your measurement system, from handling high voltages in power supply testing to capturing low-level signals from sensors or precision components. By understanding the strengths of each module, engineers can select the configuration that ensures safety, maximizes accuracy, and streamlines their test workflow.

While Keysight offers several multiplexer modules in the DAQ970A/973A family, the choice for voltage measurement typically comes down to:

## DAQM910A (Low-Voltage Optimized)

The DAQM910A is designed for precision at low voltage levels, making it the right choice when safety and measurement integrity are top priorities. Typical applications include:

- Sensor Measurements: Thermocouples, RTDs, strain gauges, and low-level transducers.
- Low-Ohm Resistance Testing: Precision resistors, interconnects, PCB traces, and contact resistance.
- Temperature Monitoring: Built-in cold junction reference simplifies thermocouple wiring.
- Educational & Research Labs: Where safety, error-proofing, and ease of setup are critical.
- Long-Term Monitoring: Where unattended operation demands robust overvoltage protection.

## DAQM901A (High-Voltage Optimized)

The DAQM901A handles higher voltage signals with flexibility and robustness, making it well-suited for general-purpose and mixed-signal test environments. Typical applications include:

- General-Purpose Voltage Measurements: Up to 300 V, including power rails and industrial signals.
- Mixed-Signal Systems: Environments with higher-voltage levels across multiple test points.
- Switching & Routing: Applications where high-voltage isolation is more critical than precision at millivolt levels

This comparison highlights the strengths of different multiplexer modules in the DAQ970A/973A family. While modules such as DAQM900A, DAQM902A, and DAQM908A provide high-speed scanning or large channel counts, the choice for voltage measurement typically comes down to the DAQM910A and DAQM901A. The DAQM910A is purpose-built for low-voltage precision applications, while the DAQM901A is optimized for general-purpose testing and higher-voltage signals up to 300 V.

	DAQM900A	DAQM901A	DAQM902A	DAQM908A	DAQM910A
Number of channels	20	20+2	16	40	20
Max scan speed	450 ch/s	80 ch/s	250 ch/s	80 ch/s	80 ch/s
Voltage range	120 V	300V	300V	300V	40Vpk
Low-level precision					■
High-voltage handling	■	■	■	■	
Temperature measurement	■	■	■	■	■
Resistance (2-/4-wire)	■	■	■	■	■
Typical applications	Sensors, low-ohm resistance precision testing	Power rails, mixed signals, industrial	High-speed scanning, general purpose	Mixed environments, faster scanning	Large channel count, cost-efficient setups

**Table 1.** Comparison of Keysight's multiplexer cards: DAQM900A, DAQM901A, DAQM902A, DAQM908A and DAQM910A.

# Conclusion

The DAQM910A is more than just another multiplexer. It is a purpose-built solution for engineers and researchers working with low-voltage signals who need robust protection, trusted accuracy, and a simple setup. By integrating smart protection and measurement flexibility, the DAQM910A ensures that DAQ970A/973A systems can be confidently deployed in R&D labs, production environments, and academic institutions.



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