

# In-vehicle device temperature acquisition

*Hongke (China) is a company providing automotive technology solutions and acting as a distributor of Peak-System and other CiA members, for example, in China, Japan, and Korea.*

With the advancement of the automotive industry, the importance of monitoring and acquiring temperature data from in-vehicle devices has increased. Hongke provides a solution for monitoring and acquiring in-vehicle device temperatures, utilizing a thermocouple module to achieve accurate and real-time temperature measurement and transmission, thereby ensuring the safe and reliable operation of the vehicle system.

The MU-Thermocouple1 CAN FD module from Peak-System is a temperature measurement sensor based on the thermoelectric effect. It converts the measured temperature into electrical signals. It is widely used in automotive, industrial, aerospace, and scientific application fields. The module offers eight measurement channels and supports both CAN CC (classic) as well as CAN FD transmission. The device provides different temperature range options with T, K, and J thermocouple type models, depending on the specific requirements.

## Thermocouple modules in automotive applications

To ensure the normal operation and safety of the vehicle system in the automotive manufacturing process, it is necessary to monitor and collect real-time temperature data of various devices within the vehicle. The thermocouple modules are applied in three main sections:

- 1. Avoid damage from high engine temperatures:** Thermocouple modules can detect the temperature of the engine, such as coolant temperature and oil temperature, to avoid abnormal conditions such as overheating. This prevents engine damage and improves the internal performance parameters of the ECU (electronic control unit).
- 2. Optimizing exhaust system performance:** Replacing traditional temperature sensors with thermocouple modules not only prevents failures at high temperatures but also optimizes the performance of exhaust gas treatment devices (e.g., catalysts) and reduces exhaust emissions, thus ensuring the stable operation of the exhaust system.
- 3. Ensure safe operation of the braking system:** Thermocouple modules can be used to monitor the temperature of brake discs and pads, ensuring the safety performance of the brake system at high speeds or under high load conditions.

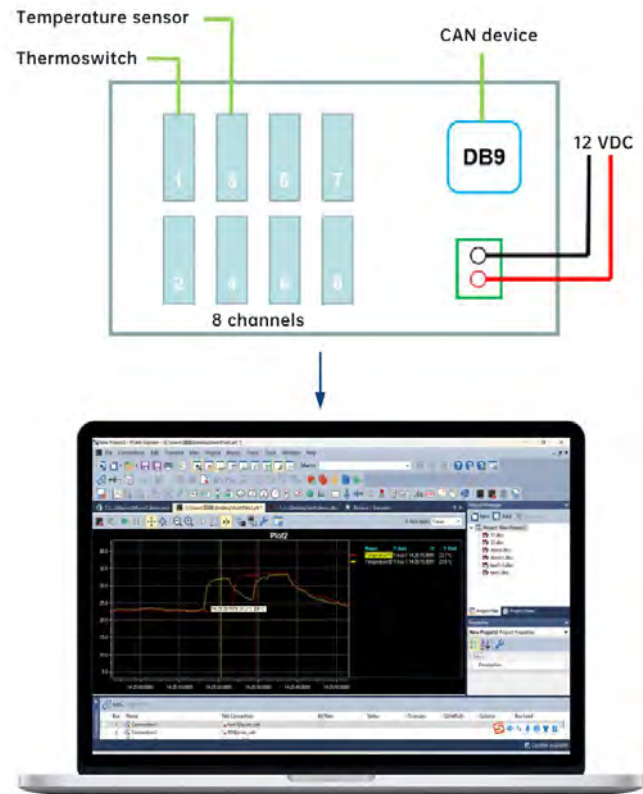


Figure 1: Vehicle battery system temperature monitoring (Source: Hongke)

## Temperature monitoring of vehicle battery systems

For electric and hybrid vehicle manufacturers, monitoring and updating the temperature of the battery pack in real time is crucial to ensure the safety and performance of the vehicle's battery system. To achieve this, the thermocouple module enables stable and rapid temperature monitoring.

By integrating the thermocouple module with CAN CC and CAN FD connectivity, the measured temperature value can be packed into a CAN-based message, enabling real-time updates of the temperature change curve. This integration not only ensures the safety and stability of the vehicle battery system but also provides manufacturers with critical data for optimizing battery performance and extending its lifespan.

Thus, the electric and hybrid vehicle manufacturers can monitor and maintain their battery systems, ensuring peak performance and safety for their customers. ▶

## MU-Thermocouple1 CAN FD

Depending on the product version, eight connectors for thermocouples of the types J, K, or T are available for temperature measurement. Temperatures can be captured in Celsius, Fahrenheit, or Kelvin and processed with an individual scale and offset. The CAN communication is done via a D-Sub connector. The measuring unit supports CAN FD with data bit rates up to 10 Mbit/s and is at the same time downward compatible to CAN CC (classic). With the product, temperature measurement can be integrated directly into automotive test benches or industrial plants using CAN FD communication.

A router for the conversion from CAN CC to CAN FD is no longer necessary. The configuration of data processing, CAN communication, and LED indication is done with the company's free Windows software. Several devices can be operated and configured independently on a single CAN network.



of (Source: Peak-System)

## Sensor monitoring in extreme conditions

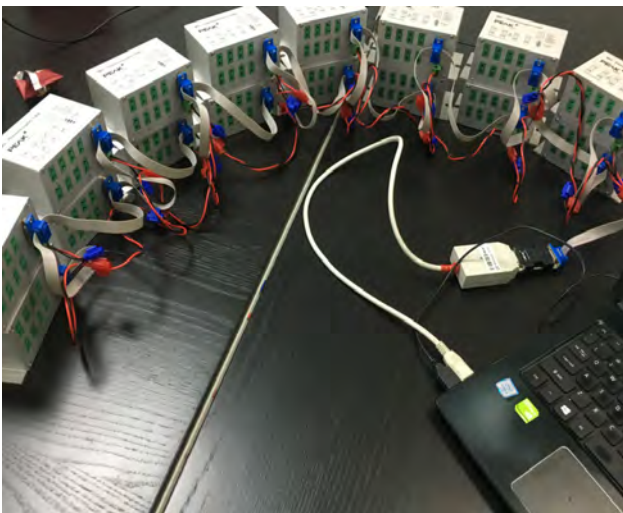


Figure 2: Simultaneous temperature measurement of eight sensors (Source: Hongke)

Monitoring the temperature of vehicle sensors in hot, high-pressure, and extremely cold environments is crucial for ensuring their reliability and performance. Engineers face significant challenges in such conditions, as temperatures can vary widely and affect the sensor performance.

The MU-Thermocouple1 CAN FD addresses these challenges with an operating temperature range of  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ , an aluminum casing, a measurement accuracy of 0,2 %, and support of multiple parallel acquisition channels. Thus, the module is capable of measuring the temperature changes of multiple sensors simultaneously. This allows engineers to make on-site adjustments and controls, ensuring the stability and high quality of the production process. By monitoring the temperature of critical systems and devices in real-time, engineers can anticipate and mitigate potential issues, thus improving the overall safety and reliability of the vehicle system.

## Conclusion

The thermocouple modules enable real-time temperature data acquisition and monitoring of key in-vehicle systems and devices. It enhances the safety and stability of the vehicle system and also offers flexible configuration options to adapt to different environmental and application requirements. By leveraging the capabilities of the MU-Thermocouple1 CAN FD, engineers can monitor vehicle sensor temperatures in extreme environments, ensuring reliable performance and safety of the vehicles. ◀

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