

## Underhood Thermal Management and Engine Cooling Analysis

### Delphin Data 64 KTM Temperature Measurement System

CHESTERLAND OH—September 13, 2011

Malaysian automobile manufacturer **Proton** needed to test the underhood thermal management and engine cooling performance in their new manual 5-speed **Proton Persona 1.6 M/T Line** test car. The thermal test program was designed to check underhood part performance in order to ensure that the parts were working within design requirements after being exposed to high temperatures during driving and climbing. Engine cooling analysis testing was performed to verify cooling performance under various types of driving patterns including high-speed runs, while idling, and hot soak and dead soak. To collect enough temperature data to get a complete picture of the Persona's thermal distribution and engine cooldown, Proton's automotive engineers needed high-performance, flexible data acquisition devices for use in their test setups, supporting large numbers of channels able to connect to the very broad range of thermocouple types the program would rely upon.



The Proton plant installed four **Delphin Data 64 KTM Temperature Measurement Systems** in its test chamber and in the trunk of the test car, with three of the units acting as slaves to increase the number of channels available to the master. These compactly-constructed measurement systems were protected within industrial-grade 19-inch rack enclosures, with 250 of their 256 available channels used for the thermal management tests. During engine cooling analysis testing, the KTM devices were used to measure the temperature of the engine cooling system, (radiator and water temperature in a water jacket), the pressure of the test car's A/C system, and engine revolution (RPM), requiring about 85 channels.

A portable, all-inclusive device for multi-channel temperature measurement, the Delphin 64-KTM data acquisition system featured 64 channels of universal thermocouple inputs of every type including types E,J,K,L,N,S,R,T,U--providing plant engineers with a great deal of flexibility for high-precision, 24-bit resolution temperature measurements and achieved, depending on thermocouple and measurement area, an absolute accuracy of < 0.2 K. The modular design enabled the other 64-KTM units to be slaved to a master by simply connecting the additional devices, potentially processing over 5,000 measurement channels this way.

The 64-KTM devices performed stand-alone data logging and recorded the test data with a partitionable 1 GB internal memory storing up to 128 million data records. The memory's independent data recording capability provided data security for long-term measurement runs. Integrated engine speed pulse measurement (rpm) was featured, as well as integrated high and low pressure measurement based on

strain measurement. The sophisticated 64-KTM systems offered many features to ensure high-accuracy measurements, including differential inputs with 110V isolation and galvanic separation to prevent measurement errors from earth loops. Inbuilt network filters for 50Hz or 60Hz networks suppressed any power supply interference, and cold junction compensation served to isolate measurements from environmental interference and ambient temperature fluctuations. Scaling was provided as required.

An Ethernet interface allowed easy integration into the plant's network. Convenient data evaluation was then made available at any PC workstation in the plant. The 64-KTM also had interfaces for Modbus and Profibus and a TCP interface to a network was also available for online measuring. Proton engineers set up many of the channels for limit values, calculations and event processing. These channels enabled the computation of characteristic values during measurement runs, and also included the calculation of moving averages and enabled monitoring and alarm functions. The master system was able to transmit e-mails or portray limit value violations within an alarm table.

Live data analysis and post-treatment was provided with the user-friendly ProfiSignal Basic evaluation software, included free with the device. Plant engineers appreciated its intuitive configuration and also utilized ProfiSignal for measurement data archiving and online/offline measurement data analysis. A driver was also available for all current measurement technology software or OCX driver.

The Proton plant's test programs benefited in several ways from installing the four Delphin data 64 KTM temperature measurement systems, the most immediate of which was the large number of channels available for the auto plant's demanding test applications. The devices' universal thermo connectors were easy to use and enabled quick and simple attachment of the many different types of thermocouples used in testing, with each measurement made at a high resolution and accuracy. Ethernet interface increased data accessibility, while the included ProfiSignal configuration software was an intuitive tool for plant engineers to archive, evaluate, and analyze the test data.

For further information on the Delphin Data 64 KTM Temperature Measurement System, other Delphin data acquisition systems, or to find the ideal solution for your application-specific needs, contact a CAS Data Logger Applications Analyst at (800) 956-4437 or visit the website at [www.DataLoggerInc.com](http://www.DataLoggerInc.com).



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