

Application Note Series

Engine Compartment and Heat Exchanger Airflow Performance Testing



Product Platform:	Airflow Research and Development Instrumentation
Product:	°C Grid with Datalogging Software
Purpose:	Multi-Point Velocity and Air Temperature Sensing Across Planar Regions of Space
Available Testing Range:	0.25 m/s to 40.0 m/s [50 fpm to 8000 fpm]

ABSTRACT:

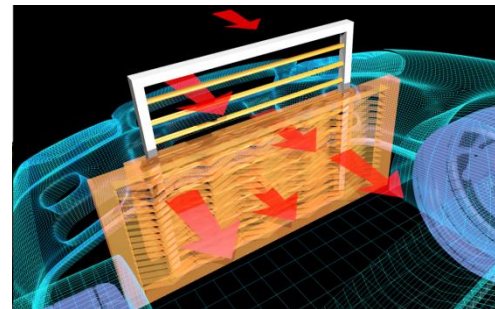
Analyzing the airflow profile within the engine compartment of a vehicle has become an important process required to optimize heat exchange of the radiator and condenser. Understanding the air velocity and air temperature at many points across this planar area is the only way to properly evaluate the maximum heat extraction capability of the system, and the uniformity of heat exchange across the heat exchangers.

Exterior design engineers are working to exploit new materials and improved aerodynamic concepts, and the impact of these design ideas to engine cooling must be well understood with thorough testing. Using a test system which can measure the velocity and temperature of the cooling air at many points, in real-time, back feeds the design process to improve air intake designs, the effects of active grille designs, engine compartment design, and radiator and condenser design as well.

As more vehicles use active grille shutters which open and close in real-time, the margin for error in developing adequate cooling flow is being reduced, in order to maximize fuel efficiency gains. Multi-point air velocity testing has never been so important.

SOLUTION:

To quantify the airflow cooling performance of vehicle engine compartments, from both the perspective of radiator and condenser design, and total engine compartment airflow profiling, a grid array of multiple air velocity and temperature sensors is required. This is not feasible with single point measurement devices such as vein anemometers or hand-held probe style anemometers which are cumbersome, interfere with the airflow profile, and are generally non-repeatable due to the nature of the hand-held setup.



Using patented sensor technology, degreeC builds space-efficient multipoint airflow systems, which precisely measure the air velocity and the air temperature at hundreds of points, simultaneously, all recorded to a PC over a single USB connection in real-time.

It is called °C Grid, and it is revolutionizing automotive engine compartment testing.

Using the °C Grid, clients are able to design a customized frame, which contains a digital array of sensors, and place it into the engine compartment. Each sensor location in the °C Grid provides real-time velocity and temperature of the airflow. Paired with the datalogging software, users can change the data polling rate, unit of measure, and enjoy multiple point readings acquired real-time by their PC with the simplicity of pressing a button. A real-time graphical interface toggles between velocity and air temperature across the planar region.

The sensor layout, quantity, and frame are built to client specification, and may have virtually any profile. The profile can match a specific engine platform design, to fit many vehicles.

Application Note Series

Engine Compartment and Heat Exchanger Airflow Performance Testing



FEATURES AND BENEFITS:

Planar area airflow mapping:	The °C Grid is the only fully customizable and single wire interface tool, for measuring airflow distribution across a planar area, with simultaneous polling of multiple (up to 300) sensors.
Datalogging Software:	The °C Grid comes with datalogging software which allows the user to change polling intervals, user preferences, and stores data in convenient format for instant importing into spreadsheet and mathematical tools.
Real-time display:	The °C Grid provides real-time, visual gradient mapping of both velocity and temperature.
Flexible:	For use in engine compartment and heat exchanger testing, cabin comfort, window glass defrost and airflow uniformity testing.
Custom calibration ranges:	For increased accuracy, constrained calibration ranges available. Certificate of calibration included.
Manufacturing excellence:	Degree Controls has more than 25 years of airflow sensor experience and is used by many Fortune 500 companies. RoHS Compliant.

PERFORMANCE CHARACTERISTICS:

Operating Temperature:	0-85 °C [32 to 185 °F]
Total Velocity Range Available:	0.25 m/s to 40.0 m/s [50 fpm to 8000 fpm] Compensated Range 15 – 35°C
Temperature Accuracy:	± 1°C above 0.5 m/s, ± 2°C below 0.5 m/s,
Velocity Accuracy:	greater of 5% of reading or 0.05 m/s [10 fpm] in compensated range
PC requirements:	Windows 7 or higher, USB 2.0/3.0 Interface.

CONTACT:

To find out more about Degree Controls sensor and control products, contact us at 1-877-degreeC, or visit our website at www.degreeC.com. Email inquiries to sales@degreeC.com.

Degree Controls Inc.
18 Meadowbrook Drive
Milford New Hampshire 03055
USA