

FEATURES SHEET

HI-RES™ SERIES 6100 MICRO DILUTER

The HI-RES Series 6100 Micro Diluter offers a compact, flexible means of sampling and conditioning hot and moist exhaust streams containing particles. The High-performance Integrated Raw Exhaust Sampler employs a two-stage dilution scheme to condition the sample stream effectively. The primary dilution stage uses a jacketed radial inflow design and the second stage contains an ejector diluter. This unique configuration allows users to sample from high temperature, high pressure sources without transmitting those thermodynamic conditions to the downstream particulate measurement device.

Combustion aerosols produced from automotive and industrial processes generally have a wide range of characteristics. The particle concentration, temperature, and relative humidity can undergo significant changes during a test. Depending on these aerosol properties, particle distributions can change through coagulation, condensation and nucleation during sampling. Attaining a representative sample from such processes poses many challenges for dilution and sampling systems. The dilution ratio, temperatures and residence times must be well controlled to obtain representative results.

The HI-RES diluter is a well-characterized, compact system that runs under computer control to provide high quality diluted samples for sampling and analysis by downstream hardware. The unit is designed to be used in conjunction with a TEOM® Series 1105 Diesel Particulate Monitor and with the Model 6186 FRM Exhaust Filter Holder System.

The dilution tunnel section has the following features:

- Dilution is carried out in two stages to maximize the conditioning effect and consistency of the diluted sample stream.

- The first dilution stage employs a “radial inflow design,” a well accepted dilution geometry whose performance has been validated in aerosol studies.
- The dilution ratio and temperature of the first dilution stage are adjustable and controlled. Dilution using heated air reduces the potential effect of volatile and semi-volatile vapors, while cooled dilution maximizes the effect of nucleation and condensation.
- The first dilution stage is jacketed, permitting the use of a Vortex air cooler to reduce the sample temperature in high temperature applications. If further cooling is desired, chilled water can be directed through the jacket of the first stage instead of air to cool the sample stream.
- Optional first stage heater to minimize condensation from wet sources.
- The second dilution stage is an ejector diluter that uses pressurized air. The injection of air in this dilution stage acts as a pump and returns the sample to ambient pressure. The dilution ratio of the ejector diluter is also controlled and adjustable.
- The HI-RES System's dilution ratio is measured and computed in near real time (1 Hz), and makes automatic adjustments for temperature and pressure of the local sampling conditions.
- A flow splitter downstream of the ejector diluter provides up to 150 l/min of diluted sample flow through its six outlets, and allows for the connection of up to three on-line analyzers (TEOM monitor or Condensation Particle Counter) or filter holders to the diluted air stream (TEOM monitor plus 2 additional devices).
- A residence chamber is normally located between the second stage diluter and the flow splitter, and can be installed between the first and second stage dilution hardware for specialized applications.

Thermo
ELECTRON CORPORATION

Air Quality Instruments
rp Products
www.thermo.com/air

26 Tech Valley Drive (518)452-0065
East Greenbush, NY 12061 (518)452-0067 fax

ISO 9001:2000
Certified

FEATURES SHEET: SERIES 6100 MICRO DILUTER

The system's support modules provide the following features:

- All electrical and pneumatic connections are located on the back of the control and valve units.
- The control unit monitors up to 8 temperature and 4 pressure zones. It also provides a user analog output of the dilution ratio, as well as two analog inputs from external sources. The unit contains firmware for calibrating and controlling the dilution valves, with access to these functions provided by a menu-driven interface. A serial communications port enables data interchange with the Windows®-based software operating on a PC.
- The valve unit houses the magnetic valves that control the dilution air flowing to the first stage radial inflow diluter and the second stage ejector diluter. Inputs and outputs for the dilution air supply, as well as the cooling air or water supply for the first stage jacket, are located on this unit. A multi-line control cable connects to the valve unit.
- The pressure control module is installed between the external dilution air supply and the HI-RES valve unit. Using an active feedback loop, it maintains the proper, constant pressure for the dilution system to ensure accurate dilution ratios. This function is controlled and monitored by the Windows operating software.

The HI-RES System provides the following software features:

- The operating software for the HI-RES System is incorporated in the Windows-based software of the TEOM Series 1105 Diesel Particulate Monitor. This provides seamless operating, control and data storage capabilities for both the dilution unit and the TEOM monitor. A dedicated window within the program contains the calibration, set points, alarms, and control functions of the HI-RES dilution system.
- Computes the dilution ratio on a second-by-second basis, and allows corrected and uncorrected mass concentration to be generated by the TEOM monitor.
- Provides automatic pressure control of the input dilution air and reporting of all system pressures.

- Calculates the sample flow rate (0-20 l/min) entering the first stage diluter.
- Monitors pressure, dilution flow rates and temperatures for the radial inflow and ejector diluters.
- Displays and records the cumulative volume passing out of the ejector diluter outlet, and the sample volume analyzed by the TEOM monitor.
- The user may select a desired dilution ratio. The system automatically determines the appropriate valve and dilution air flow settings to achieve the target dilution ratio.
- Full TCP/IP control of major functions and data reporting. Start, stop, flush, and other functions can be controlled remotely over the test cell network. Remote computers connected to the network can also record total mass, mass concentration and mass rate information, corrected and uncorrected for the dilution ratio.
- The software contains calibration wizards for conducting audits on the temperatures, flows and dilution ratios on the HI-RES System. The user can also set alarm thresholds for temperatures and pressures, and for indicators that the system requires routine maintenance.

The system can be used for the following applications with mobile and stationary sources, as well as other industrial or combustion related processes.

Mobile Sources

- Sampling of particulate matter from before and after catalyst or diesel particulate filter treatment devices to determine particle removal efficiencies.
- Emissions calibrations for engine mapping and component evaluations.
- Emission test cycles.
- Fuel and lubricant studies.

Stationary Sources

- USEPA Method 5 condensables measurements.
- PM-10 and PM-2.5 test methods similar to 201A.

-
- HI-RES™ is a trademark of Thermo Electron Corporation.
 - TEOM® is a registered trademark of Thermo.
 - Other trademarks are the property of their respective holders.
 - Specifications subject to change without notice.