

POROUS TUBE THERMODILUTER MODEL 3098



The Model 3098 Porous Tube Thermodiluter (PTT) is the next generation sample conditioning system specifically designed for the 3090 Engine Exhaust Particle Sizer™ (EEPS) to characterize advanced combustion designs and solid particle emissions from modern engines, either before or after emission control devices.

The PTT diluter employs two porous tube diluters with a catalytic stripper (CS) to remove volatile species along with advanced mass flow controllers to provide real-time dilution ratio measurement and control. The porous tube thermodiluter design has no moving parts and mimics the atmospheric dilution process eliminating the potential of particle interaction with the diluter walls. This coupled with operating at a high flow rate minimizes losses of the sub 23nm particles, improving the response time and accuracy of the number concentration measurement provided by the EEPS spectrometer. The PTT diluter can be addressed through the user friendly EEPS-Software that has been extended to fully control the complete system, or it can be integrated in the test bench host system through AK-protocol.

Applications

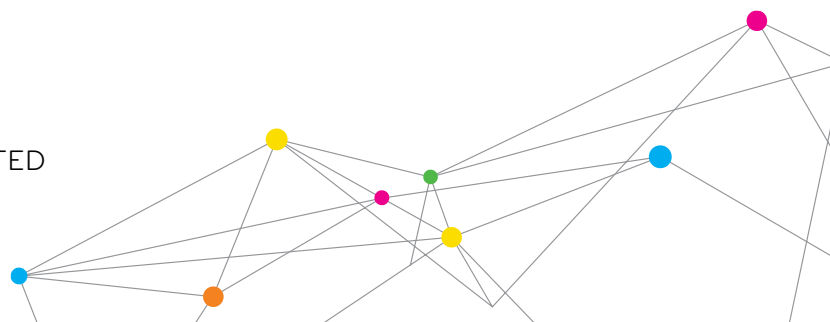
- + Sub-23nm solid particle emissions for post Euro 6/VI engines
- + Cold start engine emissions in Gasoline Direct Injection (GDI) engines
- + Exhaust after-treatment (DPF or GPF) characterization
- + Pre-DFF/GPF sampling with optional Pressure Reducing Module (PN 3098-PR)
- + Non-exhaust nanoparticle emissions (brake and tire wear)
- + Measurement of non-volatile PM emissions from aircraft turbine engines
- + Non-road mobile machinery emissions

Features and Benefits

- + Robust dilution design: porous tube diluters without moving parts to wear out or small orifices to clog
- + PMP-type (hot dilution-catalytic stripper-cold dilution) sample conditioning at ambient pressure for measurement of solid particles
- + Low thermophoretic and diffusional losses that are corrected for in the measured size distribution by the EEPS spectrometer
- + Low cost of ownership with swappable flow controller module (only flow control module needs to be calibrated annually)
- + AK-serial command protocol for integration in test cell systems with host controller
- + Reliable and accurate dilution performance: well controlled/stable/accurate dynamic dilution ratio
- + Easy to use: Integrated control of PTT diluter and EEPS spectrometer from single user interface



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SPECIFICATIONS

POROUS TUBE THERMODILUTER MODEL 3098

Particle Size Range

5 to 560nm

Particle Concentration Range

Up to 1×10^9 P/cc at inlet of primary diluter with 500:1 total dilution ratio

Inlet Sample Flow Rate

0.25 to 5 L/min (determined by dilution ratio and temperature/pressure conditions)

Diluted Flow Rate

10 L/min

Dilution Ratio Range

10:1 to 500:1

Differential Pressure

+100 to -80 mbar without pressure reducing accessory
< 3 bar with optional pressure reducing module

Raw Gas Temperature Range

0 to 500 °C (consult with factory for higher temperatures)

Response Time

< 1.8 sec T10 to T90 (complete system; response time based on total number concentration response)

Output Data Rate

10 Hz

Heated Sample Line Temperature

OFF to 200 °C (default is 150 °C)

Particle Penetration

Size dependent penetration determined experimentally from 5.6nm to 560nm for the complete system at nominal operating conditions (heated sample line at 150 °C and catalytic stripper at 350 °C). Particle penetration correction applied to EEPS spectrometer size distribution.

Volatile Particle Remover

>99% removal at 30nm with tetracontane

Operating Temperature

0 to 40 °C

Operating Ambient Pressure

70 to 103 kPa

Humidity

0-90% RH (non-condensing)

Dilution Air Supply Requirements

Air or N₂ @ 80 psi and 25 °C; ~30 SLPM

Communications

Diluter to PC: RS232 with serial commands. AK protocol via Ethernet
EEPS to Diluter: RS232 serial commands

Size at Base (H x W x D)

1.65m x 0.55m x 0.82m

Weight

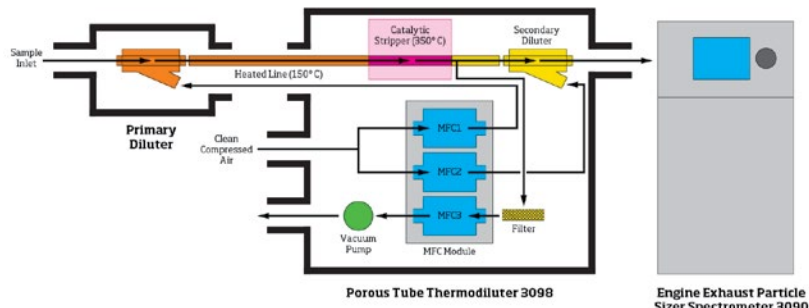
140 kg (308 lb)

Sample Inlet

1/4-in for raw undiluted gas

Power Requirements

100-120 VAC, 50/60Hz or 200-240 VAC, 50/60Hz; <1500W



TO ORDER

Porous Tube Thermodiluter

Specify	Description
3098S	Porous Tube Thermodiluter, w/2.5m sample line
3098M	Porous Tube Thermodiluter, w/4.0m sample line
3098L	Porous Tube Thermodiluter, w/6.0m sample line

Accessories

3074B	Filtered Air Supply
3098-KIT	Accessory Kit (HEPA filters)
3098-PR	Pressure Reducing Module
3098-MFC	Mass Flow Control Module (3 MFCs)
3098-2.5 MHSL	Heated Sample Line, 2.5m
3098-4.0 MHSL	Heated Sample Line, 4.0m
3098-6.0 MHSL	Heated Sample Line, 6.0m

Specifications are subject to change without notice.
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