

INNOVA 1403

Reliable and easy-to-use multipoint sampler and doser



The Innova® 1403 Multipoint Sampler and Doser is designed to be remote-controlled from a PC using a USB interface with an Innova 1512 or 1412i Photoacoustic Gas Monitor to provide a flexible, sensitive, and accurate monitoring system. The 1403 greatly increases the area monitoring capabilities of the gas monitor by drawing air samples through tubing from up to six sampling points, up to 50 m away, and delivering the samples to the gas monitor.

PRODUCT HIGHLIGHTS

- Full remote-control from a PC with 7650 Basic Ventilation Software or 7651 Advanced Ventilation Software
- Automatic calculation of the amount of tracer-gas delivered, to the dosing location
- Factory calibrated dosing system
- Self-test function
- Pneumatic system constructed of AISI-316 Stainless Steel and PTFE tubing to minimize gas absorption

TYPICAL APPLICATIONS

- Air sampling in six locations and delivery to an Innova 1512 or a 1412i Photoacoustic Gas Monitor
- Delivery of tracer gas to up to three locations for ventilation and air-exchange analysis with the Innova 1512 or the 1412i Photoacoustic Gas Monitor

OVERVIEW

Comprehensive air exchange analysis and ventilation efficiency checks are easily performed using the 1403's dosing facilities. Tracer gas is delivered through tubing to "label" the air. The amount of tracer gas delivered is automatically calculated by the 1403. The labeled air is then sampled by the 1403 and delivered to the Gas Monitor for analysis.

The 1403 factory calibration and self-checking routines allow for easy verification of the unit's operation and ensure reliable functioning.

The Innova 1403's pneumatic system is shown in Figure 1. The sampler system is constructed of AISI-316 stainless steel and poly tetrafluoroethylene (PTFE) tubing to minimize absorption of samples. The system has six inlet channels, each with a solenoid valve. Each inlet channel has a tube-mounting stub on the 1403's front plate. Six tubes of up to 50 m connect each

channel to the respective sampling point. The six inlet channels converge into one; a three-way valve then directs the gas sample to the 1512 or the 1412i for analysis or through the pump to the waste-air outlet on the 1403's backplate. A pressure transducer checks the efficiency of the sampling pump and allows checks for blocked airways. It is recommended that an air filter is attached to the end of each sampling tube to keep the samples free of particles.

Reliability is ensured by automatic self-tests using both hardware and software. A check of the pneumatic system can be performed on request by the controlling computer. The 1403's operating status is reported to the User Software and any error or warning will be given in a status window on the PC.

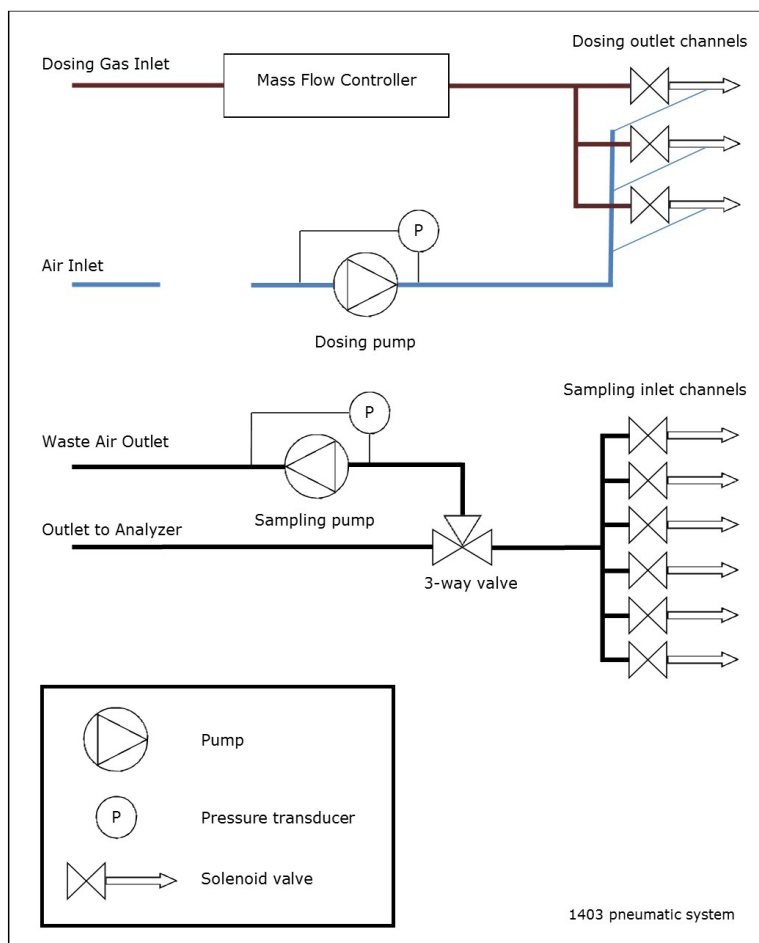


Figure 1: A schematic diagram of the 1403's pneumatic system: the sampler system is depicted at the bottom, the doser system at the top.

SYSTEM DETAILS

The Doser System

The doser system has three outlet channels, each with a solenoid valve. Up to three channels can be selected at a time depending on the given dosing task. The flow through the outlet channel is determined by the Mass Flow Controller (MFC) and is controlled by the User Software. Calibration data for SF₆ and Freon 134a is stored in the User Software.

The dosed amount is determined by the MFC setting. The dosing-gas inlet is pressurized by the tracer gas supply cylinder, which is connected by tubing to the inlet on the 1403's backplate.

The carrier-air inlet pumps extra air to the dosing outlets to speed delivery of the tracer gas to the dosing point. This inlet has a coarse air filter, a pump, and a pressure transducer for checking the efficiency of the pump. Delivering a dose of tracer gas to a dosing point 50 m distant takes one minute. The dosing system can deliver an uninterrupted flow of tracer gas over a period of time. If communication between the system components fails, the selected doser valve will be closed after 60 s.

Calibrating the Doser System

The 1403 is factory calibrated for SF₆ and Freon 134a. By selecting the correct gas, the amount of tracer gas delivered during a dosing procedure can be accurately determined by the Mass Flow Controller in the 1403.

Control of the 1403

The 1403 is fully remote-controlled from a PC using the 7650 Basic Ventilation Software or the 7651 Advanced Ventilation Software. Via the software, the controlling computer communicates with the Gas Monitor over the USB interface. Commands and information requests are sent over the interface to the 1403 to control the sampler system; to setup, and control the dosing system; and to read-out data and command the performance of self tests.

7650 Basic Ventilation Software

The Innova 7650 Basic Ventilation Software allows full coordination and control of all the dosing/sampling and monitoring functions of such systems. The 7650 can control one 1512 or 1412i and a 1403 unit. The 7650 Basic Ventilation Software is able to perform

ventilation measurements by controlling both hardware and software in the Innova 1403 Multipoint Sampler and Doser and the Innova 1512 or 1412i Gas Monitor. The user sets up the sampler and the doser unit by selecting up to six sample channels and one out of three doser channels.

Dosing can be either of type pulsed injection for decay measurements or of type constant dose for flow measurements. Measurement is run automatically and the measurement results are presented in numerical and graphical curve views. A graphical curve view is shown in Figure 2.

7651 Advanced Ventilation Software

The optional 7651 Advanced Ventilation Software adds the possibility to use the Constant Concentration Method. It also adds the possibility to use up to three dosing valves when using the Decay or the Constant Concentration Method. The user can select measurement results for further processing by marking a range of measurements in the curve display with two vertical cursors. The marked measurements can be used to calculate parameters like Age of Air, Air Exchange and others.

System Use

The 1403 combined with the 1512 or the 1412i and a controlling computer with 7650 or 7651 Application Software offers wide ranging monitoring capabilities. The 1403 makes it possible to perform air exchange analysis and multi-point monitoring tasks in many different situations and environments, without changing the system components. An example air exchange analysis system is shown in Fig. 3. In such a system, the doser/sampler systems of the 1403 are used as follows. The doser system marks the supply air of the room with a known amount of tracer gas. The sampler system then takes a sample of the return air from the room, and delivers the sample to the Gas Monitor for analysis. While the Gas Monitor performs one analysis, the 1403 takes the next sample for analysis from the room. As the amount of tracer gas delivered to the room is known, and the remaining concentration of tracer gas in the samples is determined by the Gas Monitor, the ventilation system performance can be calculated.

SYSTEM DETAILS (CONTINUED)

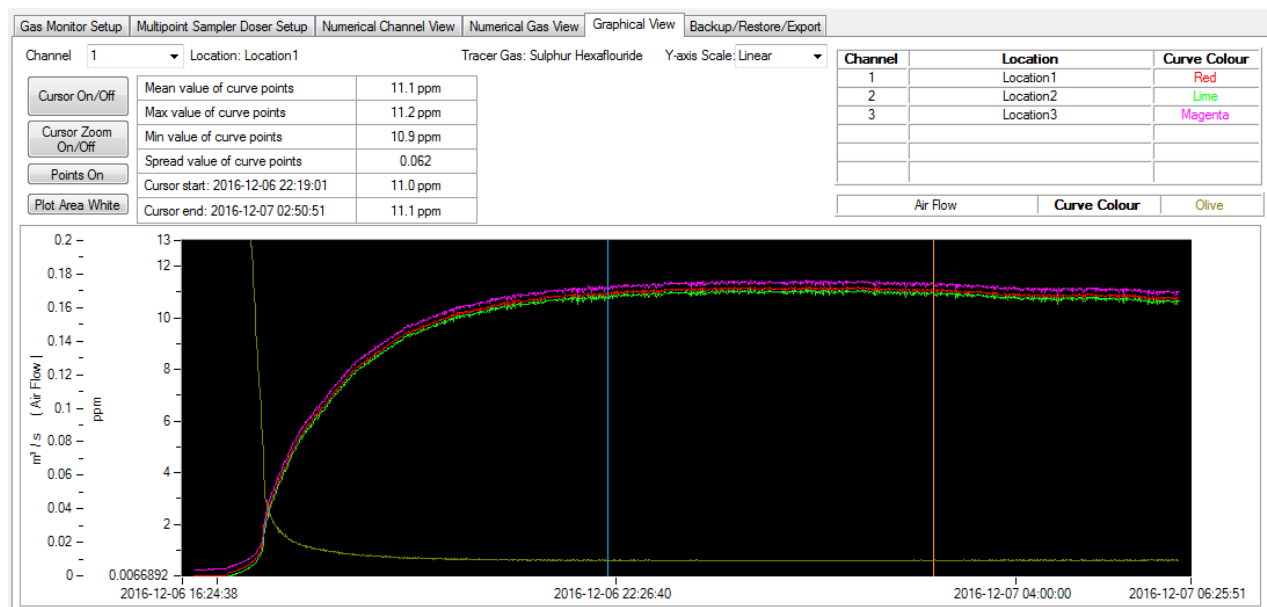


Figure 2: The graphical view with 2 vertical cursors marking a range of measurements

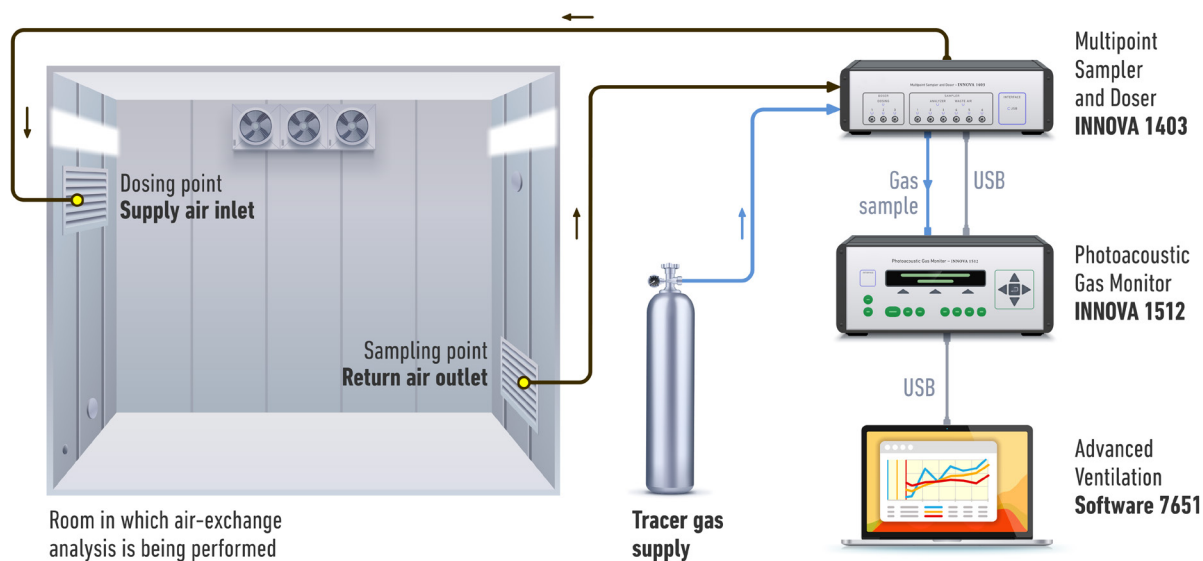


Figure 3: A typical air exchange analysis system shown with an application example. The aim of the analysis is to determine the size of the air change in the mechanically ventilated room. The diagram shows only the dosing and one sampling point for clarity. All functions of the system are controlled by the Application Software. 7650 or 7651.

TECHNICAL DATA

Sampling System (Pump Performance)¹

Working Pump Suction	20 kPa
Volume Flow Rate	15 ml/s
Sample Transport Speed	2 m/s
Routing	Three-way valve routes samples either to waste air outlet or to the connected 1512 or 1412i
Minimum Pressure	40 kPa (blocked airways)

Dosing System (Pump Performance)²

Minimum Working Pump Pressure	10 kPa Volume flow rate of supplementary air per dosing channel: 4 ml/s	
Tracer Gas Supply	From pressurized cylinder	
	Supply pressure: 300 k Pa \pm 10 % absolute	
Delivery of Tracer Gas	The delivery of tracer gas is controlled by a Mass Flow Controller (3400 Nml/min in N ₂)	
Volume Flow Rate	The volume flowrate is variable and is dependent on the selected tracer gas	
	@SF ₆	Min approximately 1.4 ml/s
		Max approximately 17.5 ml/s
	@Freon 134a	Min approximately 1.5 ml/s
		Max approximately 18.5 ml/s
Max Delivery Time	1 min (to deliver a dose of tracer gas over a 50 m distance through standard tubing)	
Accuracy of Dosing Calculation	\pm 2%	

Environmental Specifications

Operating Temperature	5 to 40°C (41 to 104°F)
Storage Temperature	-25 to 55°C (-13 to 131°F)
Humidity	Max relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity @ 40°C
Altitude	Up to 2000 m
Other Environment	UL 61010A-1: Environmental conditions.
	Pollution Degree 2
	Overvoltage Category II
	Indoor Use
Enclosure	IP 40
Dimensions (W x H x D)	445 mm x 155 mm x 260 mm (17.5" x 6.10" x 10.2")
Weight	10 kg (22 lb)

¹ Pressure and volume flow data assumes the use of tubing of length 50 m and internal diameter 3 mm

² Pressure and volume flow data assume the use of Sulphur Hexafluoride (SF₆) or Freon134a (R134a) as tracer gas and Nylon tubing of a length 50 m and internal diameter of 3 mm.

TECHNICAL DATA (CONTINUED)

Electrical and Safety Specifications	
Power Requirement	100 to 240 VAC 50 to 60 Hz
Power Consumption	0.9 A
Safety	EN/IEC 61010-1 3rd Edition
EMC Emission	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use – EMC requirements; Part 1: General requirements
Standard Compliance	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive

Included Accessories

- Knurled nuts to secure tubing to nozzles (3xYM0652)
- USB interface cable (AS0001)
- 7650 Basic Ventilation Software
- Mains cable
- Instruction manual

Warning

The 1403 must not be placed in areas with flammable gases/vapors in explosive concentrations, or be used for tasks in which explosive concentrations of these gases/vapors are monitored. Also note that certain aggressive gases could damage the internal airways of the 1403. Contact your Advanced Energy sales representative for further information.

ACCESSORIES

PN	Description
7651	Advanced Ventilation Software
AF0614	PTFE tubing
AF0005	Red nylon tubing
AF0006	Green nylon tubing
AF0007	Nylon tubing
UD5023	External air-filter
DS0759	Filters (25) for airfilter unit (UD5023)
AT2247	Nylon tubing for connection of tracer gas supply (1.5 m)
DS2306	Air filter
UD5041	Fitting for DS2306
UM1126	Mass flow controller 700 nml/min in N ₂
UM1127	Mass flow controller 5500 nml/min in N ₂



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ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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