PAS Sense 1403

Photoacoustic Infrared Spectroscopy (PAS) Analyzers

MULTIPOINT SAMPLER AND DOSER

SPECIFIC FEATURES:

- 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

An increasing number of legislative measures are aimed at improving air quality in workplace environments. These improvements require gas monitoring equipment with the flexibility to provide sensitive and accurate monitoring in a variety of environments.

The PAS Sense 1403 Multipoint Sampler and Doser from CAI ENVEA Group is designed to be remote-controlled from a PC using a USB interface with an PAS Sense 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 them to the Gas Monitor.

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.

Functions

The 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.

Application areas:

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

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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.

Reliability

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.

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.

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..

7650 Basic Ventilation Software

CAI ENVEA Group's PAS Sense 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 Multipoint Sampler and Doser PAS Sense 1403 and the Gas Monitor PAS Sense 1512 or 1412i.

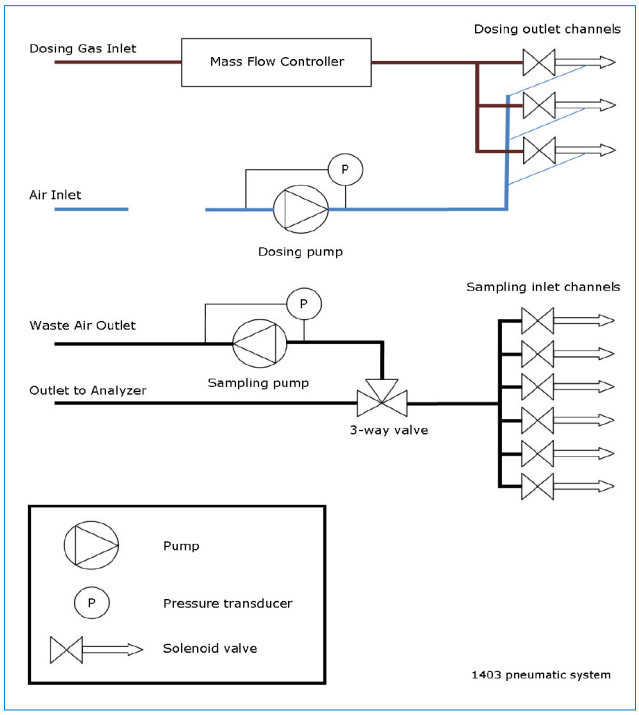

Fig. 1. A schematic diagram of the 1403's pneumatic system: the sampler system is depicted at the bottom, the doser system at the top.

The user sets up the sampler and the doser unit by selecting up to 6 sample channels and 1 out of 3 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.

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.

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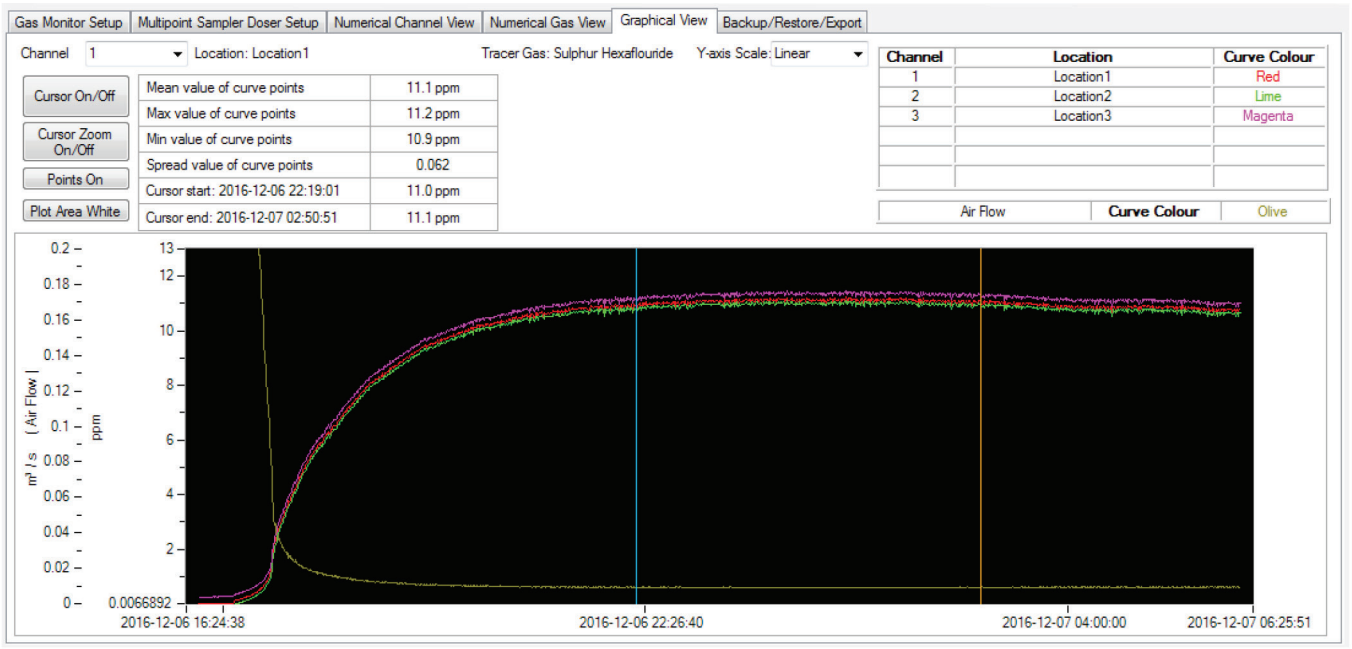

Fig. 2. The graphical view with 2 vertical cursors marking a range of measurements

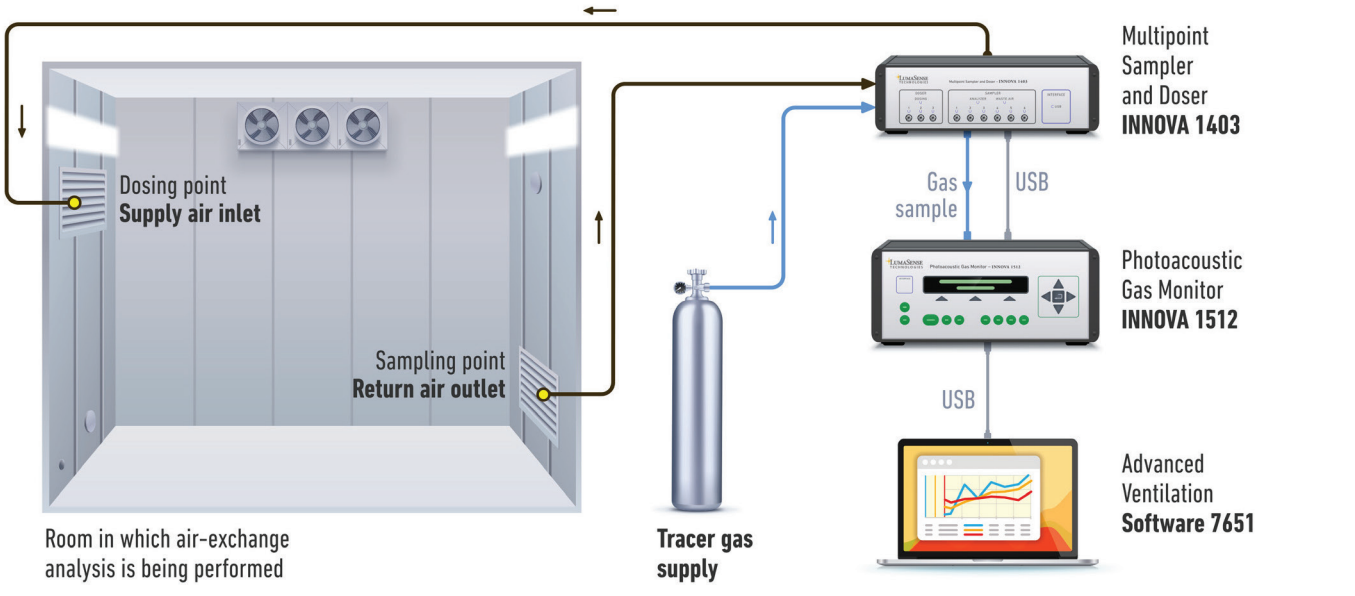

Fig. 3. A typical air exchange analysis system shown with an application example. The aim of the analysis is to determine the size of the air change in the mechanically ventilated room. The diagram shows only the dosing and one sampling point for clarity. All functions of the system are controlled by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

Ordering Information		Optional Accessories			
1403 Multipoint Sampler and Doser Includes the following accessories:		7651	Advanced Ventilation Software	**DS0759**	Filters (25) for airfilter unit
3xYM0652	Knurled nuts to secure tubing to nozzles	AF0614	PTFE tubing	**AT2247**	Nylon tubing for Connection of tracer gas supply (1.5 m)
AS0001	USB interface cable	AF0005	Red nylon tubing	**DS2306**	Air filter
Mains cable Instruction Manual 7650 Basic Ventilation Software		AF0006	Green nylon tubing	**UD5041**	Fitting for DS2306
		AF0007	Nylon tubing	**UM1126**	Mass Flow controller 700 Nml/min in N_2
		UD5023	External air filter	**UM1127**	Mass Flow controller 5500 Nml/min in N_2

TECHNICAL SPECIFICATIONS

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 CAI ENVEA Group representative for more information.

SAMPLING SYSTEM
The following pressure and volume flow data assumes the use of tubing of length 50 m and internal diameter 3 mm.

Pump Performance
Working pump suction: 20 kPa
Volume flow rate: 15 ml/s
Sample transport speed: 2 m/s
Three-way valve routes samples either to waste air outlet or to the connected 1512 or 1412i.
Minimum pressure, blocked airways: 40kPa

DOSING SYSTEM
The following pressure and volume flow data assume the use of Sulphur Hexafluoride (SF6) or Freon 134a (R134a) as tracer gas, and Nylon tubing of a length 50 m and internal diameter of 3 mm.

Pump Performance:
Minimum working pump pressure: 10kPa Volume flow rate of supplementary air per dosing channel: 4 ml/s

Tracer Gas Supply:
From pressurized cylinder
Supply pressure: 300 kPa +/- 10 % absolute

Mass Flow Controller
The delivery of tracer gas is controlled by a Mass Flow Controller.
The volume flowrate is variable and is dependent on the selected tracer gas.

Volume Flowrate of tracer gas at a supply pressure of 300 kPa absolute:
@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. time taken to deliver a dose of tracer gas over a 50 m distance through standard tubing: 1 minute

Accuracy of Dosage Calculation:
± 2%

Power Supply
Voltage:
100 – 240 VAC 50-60 Hz Power consumption: 0.9 A
Mass Flow Controller
The delivery of tracer gas is controlled by a Mass Flow Controller.
The volume flowrate is variable and is dependent on the selected tracer gas.
Volume Flowrate of tracer gas at a supply pressure of 300 kPa absolute:
@SF6
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. time taken to deliver a dose of tracer gas over a 50 m distance through standard tubing: 1 minute
Accuracy of Dosage Calculation:
3 2%
Power Supply
Voltage: 100 – 240 VAC 50-60 Hz Power consumption: 0.9 A

Height: 155mm (6.1 in.)
Width: 445mm (17.5 in.)
Depth: 260mm (10.2mm)
Weight: 10kg (22 lbs)

7650 Computer Requirements	
Processor	Intel dual-core i3 or compatible
Operating System	Windows 7 Windows 8.1 Windows 10
RAM	Minimum 4 GB
Hard Disk	Up to 500 MB of available space may be required.
Display	HD resolution monitor 1366 x 768 pixel or higher with small fonts
Total port connections	1 USB port

CE	**COMPLIANCE WITH STANDARDS:** CE-mark indicates compliance with: EMC Directive and Low Voltage Directive.
Safety	**EN 61010-1 3rd Ed. (2010):** Safety requirements for electrical equipment for measurement, control and laboratory use.
EMC Emission	**N 61326-1:2013:** Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
Environment	**IEC 61010-1:** Environmental conditions. Altitude: up to 2000 m Operating Temperature: 5 °C to 40 °C Storage Temperature: –25 °C to 55 °C Humidity: Maximum relative humidity 80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C Pollution Degree 2 Overvoltage Category II Indoor Use
Enclosure	**IP40**

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