



AP 128

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Technical card

## EMIOTEST<sup>®</sup> 3114 Gravimetric dust meter set

### 1. Purpose and scope of application

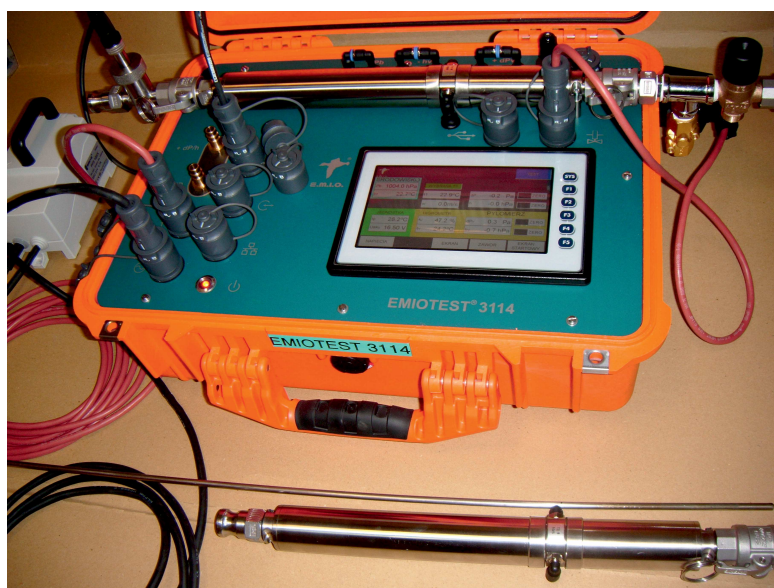
Automatic dust meter EMIOTEST 3114, in its innovative technical solution, is a portable device designed to perform, in closed channels, periodic measurements of dust concentration in the flue gases and a dust mass stream (eg. in the exhaust) to define the emission of dust into the atmosphere. The measurement method is based on the isokinetic collection of gas partial flow and separating collected particulate matter on the filter material. The measurement can be performed on either the inner or the outer filter.

Extensive equipment, exterior, dust meter kit also allows for independent measurement of volume flow of gas in the test channel and independent measurement of gas humidity.

Technical equipments solutions, algorithm controlling measurement and calculations are in accordance with the applicable standards: national standard PN-Z-04030-7, PN-EN-13284-1 and ISO 9096.

Dust meter EMIOTEST 3114, *in full equipment*, according to the reference measurement methods, is prepared to perform:

- periodic control measurements of the concentration and the mass flow of particulate matter from stationary sources of emission;
- measurements of the concentration of dust in the gas;
- test of the dedusting equipment effectiveness;
- measuring the flow rate of gas;
- calibration and periodic control of automatic systems (AMS) measuring emission and mass stream of dust
- sampling dust from the waste gas stream in order to determine their content of dioxins / furans, PAHs, mercury;
- sampling dust from the waste gas stream to determine the content of heavy metals, HCl, HF and hardware controls to parallel (using aspirator, for example EAS) sampling the gas in order to determine their content of these substances;
- measurements of concentrations of dust, air flow and degree of humidity in ventilation systems, air conditioning and wherever there is a need to make such a measurement.



EMIOTEST 3114 control unit

## 2. Measurement functions

In terms of data EMIOTEST 3114 dust meter provides:

\* continuous measurement and recording of measured directly values:

- atmospheric pressure
- the static pressure of the gas in the channel
- stagnation pressure (the pitot tube) of gas in the duct
- temperature of the gas in the channel
- the ambient temperature
- the temperature of the gas aspirated
- the relative humidity of the gas aspirated
- relative pressure before venturi
- differential pressure orifice

\* continuous, automatic registration of calculated / captured values during aspirations:

- dynamic pressure of the gas in the channel
- gas velocity in the channel
- gas volume flow in the channel
- gas velocity at the inlet to aspiration tip
- aspirated gas volume flow
- factor isokinetic aspiration (H)
- the degree of humidity of aspirated gas
- the oxygen and carbon dioxide "capture" from the gas analyzer PG250 (optional)
- gas velocity in the channel measured by connected fan anemometer (optional)

Degree of gas humidity in the channel can be determined:

- by condensing filter
- in the acute measurement of relative humidity using a hygrometer module

\* Automatic adjustment of isokinetic process of gas suction

\* Automatic selection of aspiration tip

\* Automatic control of the correct device operation, indicated by messages on the display

\* The current graphical presentation on the color display vectors of gas velocity profile in the measurement axis

\* Developed reports of the measurements

\* Developed reports of final results (of dust mass flow, volume flow)

In technical terms EMIOTEST 3114 dust meter provides:

\* Safe power supply

\* Thermal protection of the electronics

\* Suppression protection

\* Easy operation of the control unit via a graphical touch screen, simultaneous control of all measurement parameters or selected, calculated on an ongoing basis, access to recorded data when viewing and deleting

\* Collaborate with computer

\* Collaborate with programs like spreadsheets and databases

\* The registration of the measured data in the internal memory CSV

\* The ability to transfer recorded data and reports to external memory "stick"

\* Configurable set equipment in the equipment and accessories according to individual needs

\* Possibility of sampling dust filtration in internal or external mode

\* Ability to choose from different types of aspiration/heads/velocity probes, stacking tubes, dust separators.

### 3. Construction and way of working

During the aspiration dust meter is measuring and recording continuously values representing pressure and temperature, relative humidity and the time of aspiration. The values of these variables are used for current calculations of parameters necessary to maintain isokinetic suction of flue gas and to calculate the results of concentration and mass flow of particulate matter (after entering weight values of collected dust). During measuring dust meter gives the operator information in the form of on-screen display and buzzer about the progress of the measurement process, with any possible irregularities and warnings about possibility of its occurrence.

After the measurement, user can check received result on exposure screen.

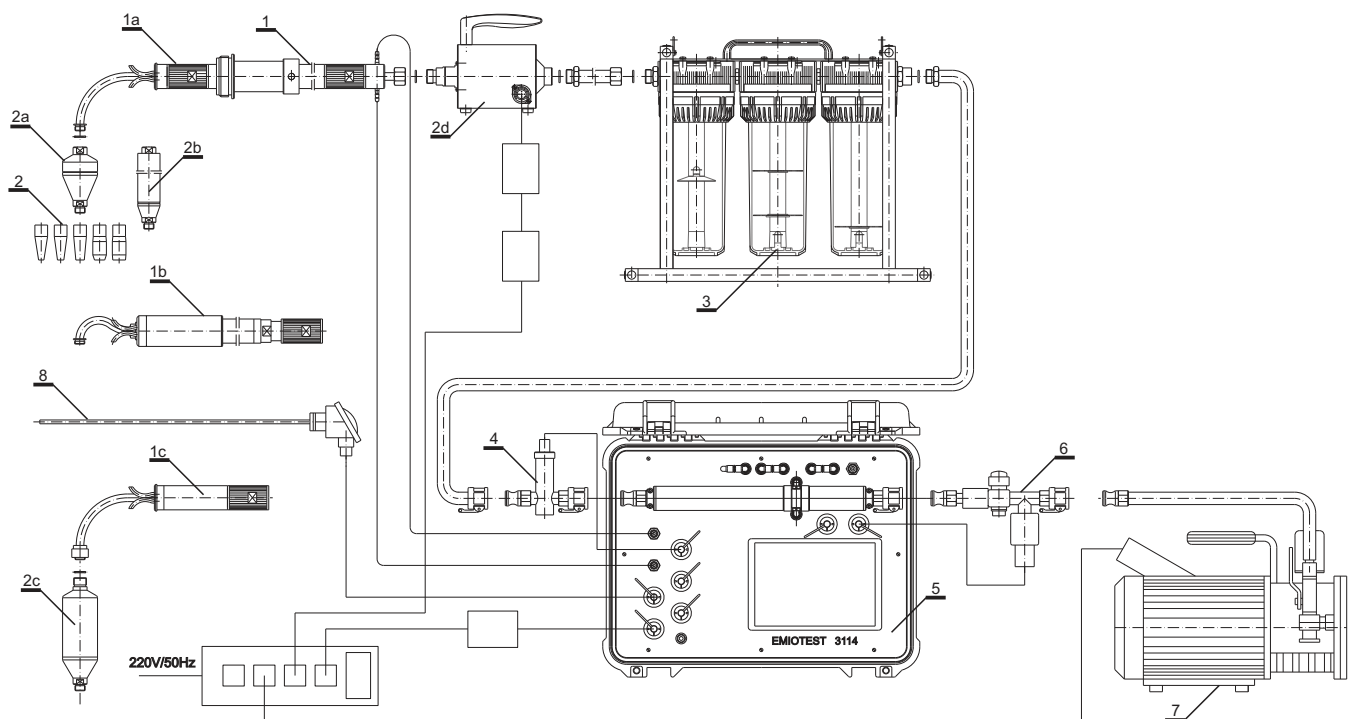
Supplied pump, priming high damming, allows to perform aspiration of gas with the use of long cables (up to 30 m), which allows easy distribution of components, for example: probe at the measurement point, and the control unit with suction unit may be located at ground level in a sheltered place.

Dust meter EMIOTEST 3114 is a set of devices and equipment that is configured according to individual needs. It may include the following elements:

- The operation control system (5)
- The hygrometer (4)
- The valves and actuator to control automatic isokinetic aspiration (6)
- High suction pump (7)
- Temperature probe (8) with the ability to select a range of temperature measurement.
- One piece aspiration (integrated with the pitot tube to measure gas velocity) velocity probe (1) or sectional probe with removable head (1a,1b,1c, depending on the construction of measuring connectors and the method of filtering dust) and replaceable aspiration tips (2)
- Dust separators for use in filtration within the channel (2a, 2b, 2c) or outside the channel (2d), heated and unheated
- Three- or four-chamber moisture separator (3)
- Heated aspiration hose combining moisture separator with hygrometer module.

Strong PC software, which supports functions performed by the dust meter, allows to:

- \* easy measurement set-up (test of measuring circuits, typing the "fixed" values, automatic selection of aspiration tip, the leak control of aspirations circuit, etc.)
- \* automatic control the crossings of agreed levels of selected quantities in order to prevent measurement errors
- \* current presentation of all parameters required during the aspirations of gas
- \* action trends visualization of automatic suction adjustments
- \* current calculation and sending results in a report form to your computer or display
- \* friendly introduction of constant values for the selected type of measurement (step leading through the various options).



Scheme of EMIOTEST dust meter set to sampling for determination concentration and mass flow of dust

Dust meter set can be equipped with modules consisting of:

- Chest cooler, with adjustable temperatures (from minus 12 ° C) for accommodating removable shelves
- Frame for taking gas samples to determine the content of such substances as PAH, PCDD / PCDF, equipped with condenser, sorption column and condensate cylinder or rack for gas sampling in order to determine the amount of substances such as heavy metals, mercury, HCl, HF, SO<sub>2</sub> method equipped with a scrubber.
- Preliminary drying rack for isokinetically sucked gas flow in case of measurements of dust concentration and its mass flow, particularly in installations with significant moisture content in waste gases and for the precise measurement of the degree of humidity, equipped with bottle with collecting condensate peristaltic pump.
- Heated hose with the aspiration tube 4/6 mm made of PTFE, length L = 3 m (5 m) with a temperature controller, for connection to a stream distribution tee
- Titanium distribution tee of the sample stream, with optional components arranged in the module.

#### Technical data

Measured quantity	Measurement method	Measurement range	Display resolution
• <b>barometric pressure</b>	piezoresistive	150 hPa ÷ 1150 hPa	0,1 hPa
• <b>differential pressure on pitot tube</b>	piezoresistive	0 Pa ÷ 1250 Pa	0,1 Pa
• <b>differential pressure on measuring orifice</b>	piezoresistive	0 Pa ÷ 2500 Pa	0,1 Pa
• <b>static pressure in the duct</b>	piezoresistive	-60 hPa ÷ 10 hPa (option 330 hPa ÷ 10 hPa)	0,1 Pa
• <b>relative pressure before measuring orifice</b>	piezoresistive	-500 hPa ÷ 0 hPa	0,1 Pa
• <b>suction gas volume flow (normal conditions) - ZT1</b>	computational	3 m <sub>N</sub> <sup>3</sup> /h ÷ 11 m <sub>N</sub> <sup>3</sup> /h	0,001 m <sub>N</sub> <sup>3</sup> /h
• <b>suction gas volume flow (normal conditions) – ZT2</b>	computational	1 m <sub>N</sub> <sup>3</sup> /h ÷ 3,5 m <sub>N</sub> <sup>3</sup> /h	0,001 m <sub>N</sub> <sup>3</sup> /h
• <b>gas temperature (hygrometer):</b>	resistive	-20 °C ÷ +80 °C	0,1 °C
• <b>gas temperature (thermocouple):</b>	thermoelectric	0 °C ÷ 600 °C option(0 °C ÷ 1100 °C)	0,1 °C
• <b>ambient temperature</b>	resistive	-50 °C ÷ 100 °C	0,1 °C
• <b>internal temperature</b>	semiconducting	0 °C ÷ 100 °C	0,1 °C
• <b>relative humidity</b>	capacitive	0 %RH ÷ 100 %rh without condensation	0,1 %rh
• <b>voltage of the internal battery</b>	voltage	0 V ÷ 20 V	0,01 V
• <b>gas velocity (vane anemometric probe)</b>	computational	0,5 m/s ÷ 40 m/s	0,01 m/s
• <b>time measurement</b>	directly	1 s ÷ 86400s (1 s ÷ 24 h)	1 s

The calibration certificate laboratory AP 128 out of range		Expanded measurement uncertainty
• relative humidity	10 %RH ÷ 80 %rh	3 %rh
• gas temperature (hygrometer):	0 °C ÷ +80 °C	0,7 °C
• gas temperature ( probe with thermocouple):	0 °C ÷ 160 °C 160 °C ÷ 400 °C	0,7 °C 1,5 °C
• barometric pressure	700 hPa ÷ 1034 hPa	0,7 hPa
• differential pressure on pitot tube	0 Pa ÷ 1250 Pa	1 Pa
• differential pressure on measuring orifice	0 Pa ÷ 2200 Pa	1 Pa
• static pressure in the duct	-60 hPa ÷ 5 hPa (option 330 hPa ÷ 10 hPa)	0,6 Pa
• static pressure before measuring orifice	-450 hPa ÷ 0 hPa	0,6 Pa
• suction gas volume flow (normal conditions) - ZT1	(3 ÷ 11) m <sub>N</sub> <sup>3</sup> /h	1 % of measured value
• suction gas volume flow (normal conditions) – ZT2	(1 ÷ 3,5) m <sub>N</sub> <sup>3</sup> /h	1 % of measured value
• gas velocity (vane anemometric probe)	1 m/s ÷ 6 m/s	0,4 m/s ÷ 1,0 m/s
• time measurement	1 ÷ 3600 s (1 s ÷ 1h)	1 s

Data visualization	graphic display LCD 7" (800 x 480)
Data input	resistive touchscreen screen keyboard 5 function keys
Output connectors	RS232 (in developing)
	USB 2.0 – for pendrive connection FAT32 ( to 2TB)
	Ethernet 10/100Mb (in developing)
Reports:	<ul style="list-style-type: none"> <li>• Humidity report</li> <li>• Volume flow report</li> <li>• Aspiration report</li> <li>• Emission report</li> </ul>
Memory:	min. 1GB
• Maximum number of series:	99
• Maximum number of measurements:	999
• Maximum number of registrations:	999
Power supply:	PFS 100 230V 50Hz/21V Li-ion 14,4 V

<b>Operating conditions:</b>	
* <b>Operating temperature:</b>	-10 °C ÷ 50 °C
* <b>Maximum internal temperature:</b>	+ 50 °C
* <b>Relative humidity:</b>	3 %RH ÷ 80 %RH
* <b>Operating time on battery power:</b>	approx. 6 h.
<b>Unit EMIOTEST 3114 equipment:</b>	Transformer PFS 100/x
	Measuring track with orifice ZT1 Measuring track with orifice ZT2
	Temperature probe – type K thermocouple
	Probe for humidity measurement - hygrometer module EE 071 (can not be used in chemically aggressive environment)
	Set of valves for isokinetic regulation
<b>Weight:</b>	
* <b>Control unit:</b>	approx. 15 kg
* <b>Power transformer PFS 100</b>	approx. 2 kg
* <b>Hygrometer module</b>	approx. 0,5kg
* <b>Set of valves</b>	approx. 1kg
<b>Dimensions:</b>	
– <b>Control unit:</b>	500 x 392 x 192 mm
* <b>Power transformer PFS 100</b>	90 x 175 x 125 mm



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