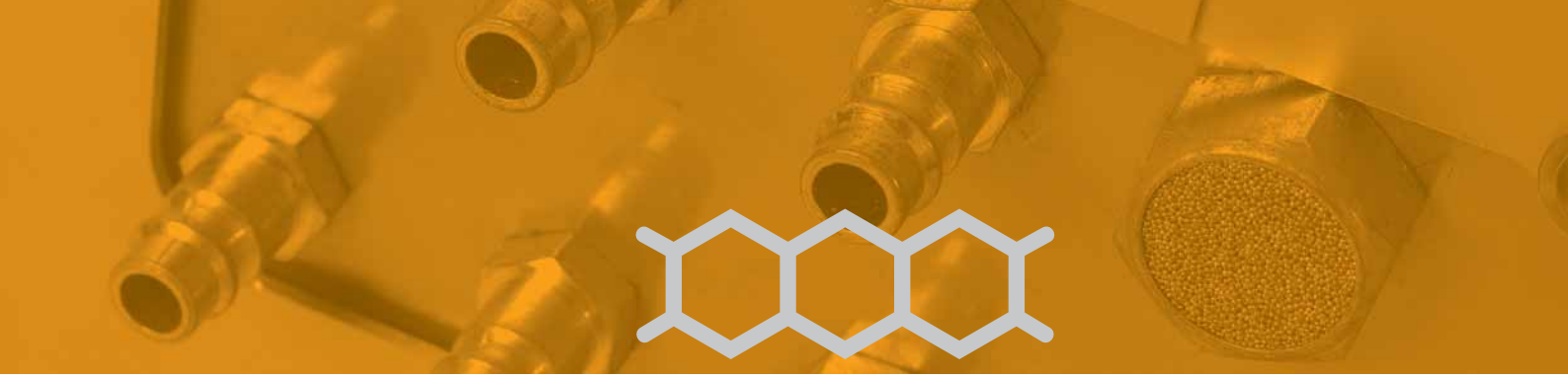


Monitoring Systems GmbH

Product overview

Sophisticated sampling technologies

The Company

MonitoringSystems GmbH manufactures and supplies sampling devices and equipment for fine dust, POP (dioxins, PCBs, PAHs,...) and other environmentally hazardous pollutants to enable gaining of accurate data for stationary sources and ambient air, for long-term and short-term sampling each in accordance to various standards.

The DioxinMonitoringSystem® has been developed due to the demand for a device for application of fully automated sampling of hazardous organic pollutants in industrial and domestic waste incineration plant emissions.

New developments in the field of waste processing, waste management and energy generation forced the communities to combust waste for easier disposal and to use these "renewable" materials for e. g. district heating plants. By the additional demand for the protection of the environment, sophisticated measurement technologies like our products are needed.

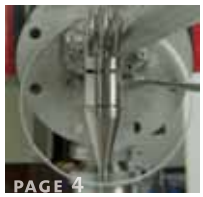
The DioxinMonitoringSystem® device has been developed in the early '90s by the present owners of the company. This equipment is available on the market since 1993 with remarkable growing success.

Due to several requests from the market, products for additional applications, especially for ambient air and fine dust sampling, have been developed to complete the product range.

The Product Line

DioxinMonitoringSystem®

Long-term emission sampling of dioxins and other POPs as well as fine dust (PM10, PM2.5, PM1)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ParTrace® Emission

Combined impactor and filter cartridge for emission sampling of fine dust (PM10, PM2.5, PM1) and POPs


PAGE 9

Ambient air sampling

Long term ambient air sampling of dioxins, BaP and other POPs as well as fine dust (PM10, PM2,5)


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Ambient air cartridges

Different configuration of the cartridges enables versatile applications


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Genius 5®

General purpose short-term isokinetic stack sampling and constant flow sampling


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POPs – persistant organic pollutants

POPs have been discovered to be the relevant part of emissions to the environment causing health effects, including dioxins (PCCD/F), polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), hexachlorobenzine (HCB) and others.

These compounds have a high stability, low volatility and are degraded very slowly. Due to the lipophilic character, an accumulation in the human body takes place.

Fine dust

Fine dust is the portion of solids in gases being the focus of concern for pulmonary health effects. ParTrace® cartridges trace the fine dust fraction of general concern, PM10, PM2.5, PM1, and splits them in the respective fractions within one sampling run.

DioxinMonitoringSyste

Long-term emission sampling of dioxins and other POPs as well as fine dust (PM10, PM2.5, PM1)

The DioxinMonitoringSystem® is a permanent installed isokinetic sampler developed for continuous monitoring of dioxin emissions, fulfilling all the requirements of the dioxin measurement standard set EN 1948.

With the optional ParTrace® emission cartridges fine dust (i. e. PM 2.5 following ISO/FDIS 23210:2009) and persistant organic compounds (POPs) can be sampled at the same time.

This device opens the opportunity to measure representative mean values. The design is done for long-term sampling up to 6 weeks, enabling short-term sampling as well.

The design and the use of the dilution method further offer versatile applications by sampling at moderate temperature, as needed for PCBs, metals, HCB and fine dust.

Features

- **Continuous long-term emission sampling**
  of fine dust as well as of POPs (dioxins, PCBs, PAHs) gaining e. g. weekly, biweekly or monthly mean values
- **Short-term emission sampling**
  check measurements e. g. 6 to 8 hours according to European council directive 2000/76/EC
- **Emission inventory**
  determination of the exact impact on the environment, supports UNEP toolkit
- **Methods**
  Dioxins: EN 1948, PAH: ISO 11338, PM2.5/PM10: ISO 23210
- **Experience**
  The first DioxinMonitoringSystem® was put in operation in 1993.
- **Industrial design**
  Ensuring low maintainance requirements and low operation costs. Construction free from glass parts (except the front door using security glass)
- **Universal use**
  One device version covers the whole range of possible applications.
- **Network remote access**
  for operator comfort

m®

The control unit

The control unit, which is the major device part, does all the control adjustments during the sampling process and serves as interface to the user. It is placed closed to the stack, usually in an instrument room.

Features

- complete automatic operation
- accordance to EN 1948
- automatic self checks
- documentation of all measurement parameters
- configurable automatic stand by and stand by recognition in case of plant shut-downs
- logical menu structure for configuration, calibration and operation
- color terminal with function keys as user interface
- multi level password protection
- function keys for device start and stop
- automatic probe cleaning
- calibration routines

- **mcerts and etv certified**
  In Europe the device was tested in the laboratory and at field conditions based on the "mcerts performance standards for continuous isokinetic samplers for dioxins". In US the performance was evaluated in terms of relative accuracy, range, data completeness and operational factors. RA and range were determined by comparing DioxinMonitoringSystem results to those from method 23 reference samples collected simultaneously.
- **compatibility with existing devices**
  All DioxinMonitoringSystem® devices can be updated easily for the use of the ParTrace® option for the measurement of PM10, PM2.5, PM1.

DioxinMonitoringSyste

The sampling unit

The sampling unit is mounted permanently to the stack using a flange plate of large dimension enabling the use of one or two probes (DN 250, DN 150, NFX, ASTM 10"). For smaller flange dimensions, a single probe version only is available (DN100, ASTM 4"), however, for highest accuracy the use of a two-probe version is recommended.

The sampling unit is mounted directly at the stack. The accurate sampling precipitation and the control of the sampling conditions are done there. For the connection to the control unit a special heated tube and several cables are used.

Features

- dilution method according to EN 1948
- complete precipitation of dust and fine dust including adsorbed POPs
- optional fine dust fractioning (using ParTrace® options)
- complete absorption of gaseous POPs
- sophisticated termal controller
- optional outdoor case

m®

Legislation

The protocol on persistent organic pollutants signed by the European Community within the framework of the United Nations Economic Commission for Europe (UN-ECE) convention on long-range trans-boundary air pollution sets legally binding limit values for the emissions of dioxins of 0.1 ng TEQ/m³.

Results

Samples from the stack show the actual pollution situation directly from the source. Dependent on the operating conditions, peak emissions of the plant, especially on dioxins, PCBs and fine dust emissions, can show high variation. The results of the measurements are the average gas concentrations of the sampling period, weighted by the volume flow of the sampled source.

Fine dust sampling

The standard cartridges already precipitate the dust fraction separately.

ParTrace® impactor cartridges additionally separate the dust fractions particle size depending.

Stage	Cut point [µm]
Preseparator	10.0
Stage 1	2.5
Stage 2	1.0
Final Filter	<1.0

The standard filter cartridge

This part is exchanged periodically and processed by the laboratory and following prepared for the next measurement.

The results are provided with the laboratory report. The construction enables easy exchange within shortest time and a quick device restart.

Features

- titanium construction for safe transport
- corrosion resistant
- suitable for highest dust concentrations
- suitable for monitoring of POPs (dioxins, PCBs, PAHs,...)

Each stack is equipped with one sampling unit and one control unit. This offers independent measurements of all emission sources of a plant at the same time. For permanent sampling two filter cartridges are needed for each device, where one of them is in operation for the sampling and the other one is in processing at the laboratory.

Technical data

Design	for industrial use
Sampling Method	
Standard reference	dilution method in full accordance to EN1948
Filter system	3 stage dry solid filters, separating dust and gas fraction
Sampling probes	1 or 2 special heated titanium zero-pressure probes
Sampling interval	to measure I-TEQ PCDD/F usually 2 or 4 weeks (2 hours to 6 weeks)
Range of method	6 hours 0.01–100 ng TEQ/m³ 6 weeks 0.0001–10 ng TEQ/m³ (depending on laboratory parameters)
Isokinetic control	direct at each actual sampling position
Remote control	Internet-TCP/IP
Operating environment	
Temperature	–10 to +45 °C
Humidity	10–90 % relative, not condensing
Physical dimensions	
Control unit	w/d/h 620/620/1710 mm (25/25/68")
Outer sampling unit	
outside the stack	w/d/h 520/280/600 mm (21/11/24")
Inner sampling unit	
inside the stack	depending on length of probes
Heated tube	length up to 70 m

Gas parameters	
Velocity	2 to 20 m/s (up to 35 m/s)
Temperature	up to 250 °C (up to 450 °C) *)
Humidity	up to 350 g/m³ *)
Dust content	0–20 mg/m³ (up to 150 mg/m³)
Corrosive gases	limited according to layout
External supply	
Main power	400 V 16 A, 3 phases + neutral + ground alternatively 230 V 16 A, 1 phase + neutral + ground (for a maximum length of the heated tube of 12 meters only)
Compressed air	typical consumption 2–6 m³/h dependent on humidity
Other	
Maintenance interval	typically 12 months (dependent on application)
Installation	outdoor or indoor
Signals and connections	
Incoming	
to the device	flue gas oxygen (analogue) 3 external standby contacts
Outgoing	
from the device	3 device status contacts Up to 2 optional free definable analogue signals

*) due to interdependence cross influence, these parameters have to be taken into consideration together

ParTrace® Emission

Combined impactor and filter cartridge for emission sampling of fine dust (PM10, PM2.5) and POPs

These modified cartridges use impactors for the fractioning of the dust.

The user can select between 2 types of ParTrace® cartridges, the compact version enabling one cutpoint and the full version enabeling up to 3 cutpoints.

This opens the opportunity to gain information about the complete environmental impact portion from the side of the emitter. The results can be easily correlated to respective ambient air measurements.

Guideline 2008/50/EG
This Guideline defines air quality targets, e. g. 18 µg/m³ in ambient air for PM 2.5.

Technical data

Device use	stack sampling in non-saturated gases
Sampling target	particulates PM10, PM2.5 (optional PM1), POPs (dioxins, PCBs, PAHs, ...)
Separation principle	impactor combined with filter and PUF
Cartridge material	titanium

Applications

- Accurate measurement of very low dust concentrations
- PM 10 and PM 2.5
- PM 1 optional
- Efficiency check of flue gas treatment performance
- Calibration of optical dust measurement devices
- ISO/FDIS 23210:2009 conform

Ambient air sampling

Long term ambient air sampling of POPs and fine dust

This system is a mobile ambient air sampling device for POPs (dioxins, PCBs, BaP) as well as fine dust (PM10, PM2.5).

Different cartridge types are available for different applications. Typical sampling periods differ from 24 hours to two months.

The WindSelect$^{+®}$ controller extends the device for sophisticated separated sampling to different cartridges, depending on wind direction or day time.

By this concept the impact of sources in correlation to back ground levels can be measured in one step.

Advantages

- enables to start quick measurements at the location of interest
- quick identification of pollutant sources
- modular sampling system
- versatile use

Single cartridge use

Features

- different cartridges are available for different sampling tasks
- sampling periods from 24 hours to 1 month
- robust construction
- distance cartridge/sampler up to 20 m

Typical operation

step 1: preparation of cartridges in the lab
step 2: transportation of the device to the sampling site
step 3: installation at site within 10 minutes
step 4: start of the measurement
step 5: automatic operation until stop

General technical data

Target use	long term sampling of persistant organic compounds (POPs) like dioxins (PCDD/PCDF), dioxinlike PCBs, PAHs especially BaP, PM10, PM2.5, heavy metals
Sampling volume	adjustable from 2 to 4.5 m³/h measured by gasmeter (automatical temperature compensation; certificate valid for 5 years)
Electrical supply	220 – 240 V (120 V), 50 or 60 Hz 350 W (50 Hz), 420 W (60 Hz)
Operating range	–10 to 40 °C 10 – 90 % rH not condensing
Protection class	IP54, rainroof at sampler
Dimensions	sampler 660/480/360 mm controller 300/400/150 mm mast 2000 mm height total weight 30 kg

WindSelect+®: Wind direction depending or day time controlled sampling

The WindSelect+® extends the mobile ambient air sampler for multi cartridge use. One of up to three cartridges is selected in dependence of the actual wind direction, wind speed or timer controlled.

Technical data

Wind parameters	wind speed 0.0 to 60.0 m/sec wind direction 0° to 360°
User interface	touchscreen terminal, graphic display, LAN interface, ready for remote access
Data storage	3 defined volumes wind speed, wind direction
Data download	ftp file transfer
Operating range	–10 to 40 °C 10 – 90 % rH not condensing

Modes

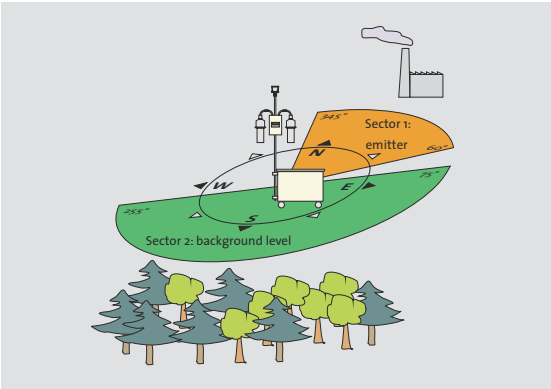
Windselective mode

The user defines wind direction sectors (e.g. for a source, for the background) and assings different cartridges to them. The sampled volumes of the sectors are counted separately.

Additionalyl, a threshold level for the calm, (e.g. 0.5 m/sec) can be defined and a further cartridge is assigned to wind conditions below this threshold level.

Timeselective mode

The user defines time windows (e.g. 7:00 to 9:00) and assings different cartridges to them, where more than one window can be assigned to each cartridge. The sampled volumes of the cartridges are counted separately.



Ambient air cartridges

Different configuration of the cartridges enables versatile applications

The modular concept enables the user to configure the cartridges depending on his sampling tasks. Large filter surfaces enable long term sampling up to two months. The optional catalyst module inhibits reaction with ozone and protects the sample.

This option is important for the sampling of PAHs.

The standard material used for cartridges is aluminum with low lead content. Cartridges made from pure titanium are available optionally.

Cartridge configurations

	WindSelect+® standard	ParTrace® compact	ParTrace® standard	ParTrace® complete
adsorber stages	3	2	2	3
dioxins	yes	yes	yes	yes
PCBs	yes	yes	yes	yes
BaP (with catalyst)	—	yes	yes	yes
PM10	—	yes*	yes	yes
PM2.5	—	yes*	yes	yes
PM1	—	—	—	yes

* one of both only




Technical data

PM10 cartridge	PM10 impactor, 120 mm filter, 2 stage PUF adsorber or PUF sandwich + XAD2, 1" quick connector, light weight aluminum
Catalyst tube	5 catalyst layers
Add. impactor stages	stages PM2.5, PM 1

Genius 5®

General purpose short-term isokinetic stack sampling and constant flow sampling

Pollutant emissions are limited in many countries. Gaseous pollutants are monitored with continuous monitoring systems. Components like dust, metals and dioxins need to be monitored periodically using isokinetic sampling equipment.

Genius 5® was developed to reduce the usual uncertainty and to increase the quality of these measurements. It is a portable automatic isokinetic sampling device suitable for short-term sampling. Genius 5® can be used both for isokinetic and for constant flow sampling.

Genius 5® is available including the front end sampling equipment as well as a replacement for existing sampling controllers. In the second case the back plate is configured with plug types as customer requested.

Technical data

Sampling	
Application	manual stack emission sampling
Target compounds	dust, metals, dioxins, POPs, HCl, HF, etc.
Sampling flow	0.4–3 m³/h, measured and controlled by calibrated gas meter
Operation modes	isokinetic sampling (pitot tube or zero pressure probe) constant flow sampling
Temperature controlers	3 (probe, filter, cooler)
Timer control	start and stop
Sampling Methods	
Configuration	loadable methods, individually adjustable
Documentation of measurement	
Reporting	sampling reports and data logger
Operation data	
Physical dimensions	w/d/h 600/240/340 mm (24/14/11.5")
Weight	23 kg–51 lbs/26 kg–57 lbs (device type depending)
Power supply	230 VAC or 115 V AC, 50 Hz or 60 Hz
Power consumption	170 VA (without external devices) max. 2,400 VA, dependent on connected equipment
Noise	<70 dB(A) in operation
Protection class	IP 54
Operating condition	0–40 °C
Operation panel	touchscreen-terminal, size 3.8" or 5.8", providing configuration wizard

Features

- versatile pollutant sampling of e.g.
  - dioxins using EN1948-1 and 4 and EPA 23A
  - heavy metals using EN14385 and EPA 60
  - dust using EN 13284-1 and EPA 5
  - PM10 and PM2.5 using ISO 23210, VDI 2066/10
  - HCl using EN 1911 and EPA 50,51
- isokinetic and constant flow mode
- fully automatic operation
- preconfigured and user defined method storage
- graphic display user interface with touch screen
- compact construction with all parts in one box
- light-weight
- sophisticated configuration wizard including traverse module, nozzle size calculation
- timer control configuration
- included calibration capability
- remote control capability
- replacement opportunity of existing sampling controllers

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