

Mercury Stack Monitor SM-4

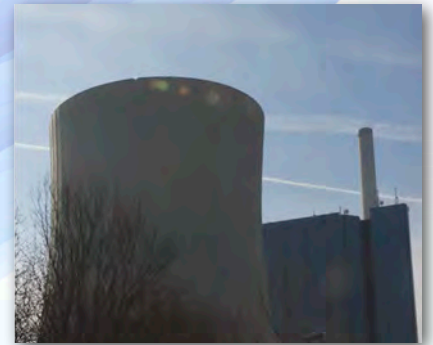
EMISSIONS

Automatic continuous emission monitor (CEM)
for mercury



- Continuous operation
- Sample dilution directly at stack - works with virtually any sample matrix
- Maintenance free converter
- Thermocatalytic principle - no wet chemistry
- Detects elemental, ionic and bound mercury
- Automatic calibration systems available (ionic and elemental mercury)

The **Mercury Stack Monitor SM-4** has been specifically designed to meet the requirements when measuring very low Hg concentrations in stack gases with a matrix containing SO₂, NO_x, HCl and others. Applications for the **Mercury Stack Monitor SM-4** include coal-fired plants, waste incinerators, cement kilns and all other applications that involve process gases containing mercury traces in a complex matrix.



Applications

- Compliance monitoring, mercury removal control, stack testing
- Coal-fired power plants
- Waste incinerators (municipal, industrial, hazardous waste)
- Sewage sludge incinerators
- Cement kilns
- Thermal treatment plants (soil, hazardous waste and others)
- Metallurgical plants

Operating principle

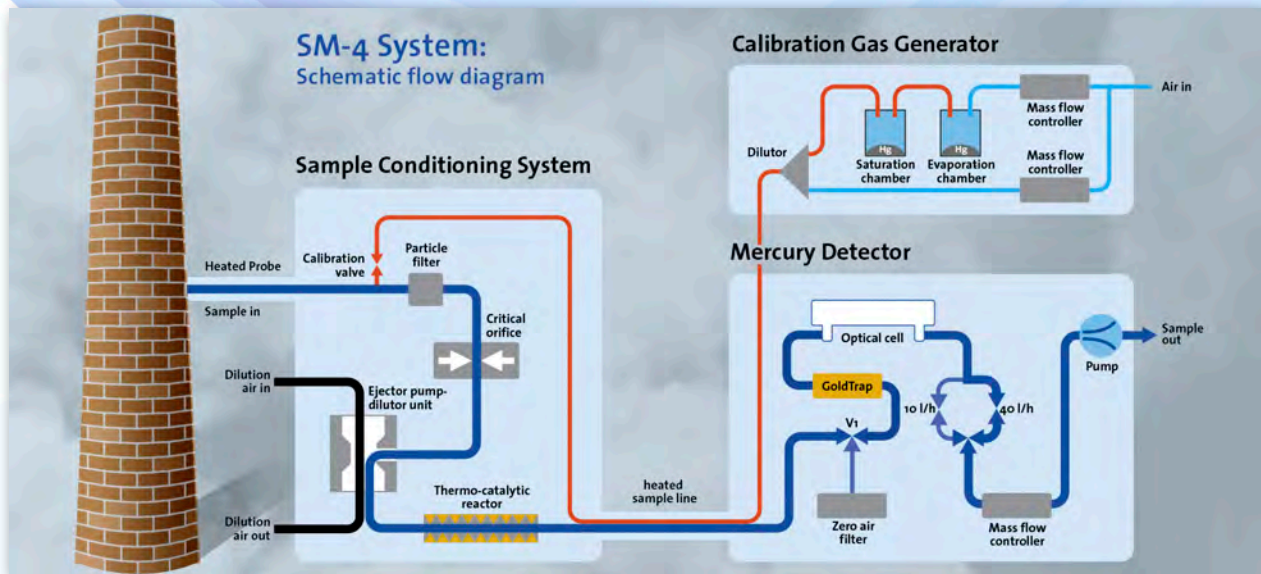
The heated sampling probe is mounted at the stack. A maintenance-free injector pump continuously draws sample gas into a dilution unit and past a heated particle filter. The sample flow - stabilized by a critical orifice - is independent of the pressure in the stack. The suction vacuum is continuously controlled by a sensor.

A partial flow of the diluted sample is passed through a catalyst where the different forms of mercury contained in the sample are converted to the elemental state. This treated sample is then transported through slightly heated PFA tubing to the mercury detector, which may be tens or even some hundreds of feet away from the sampling probe. The detector uses a pre-concentration technique featuring the unique **ENVEA GmbH GoldTrap**, one of the most sensitive mercury detection devices in the market.



Thermocatalytic reactor

Mercury in stack gases is mostly elemental, although ionic and bound mercury may also occur. To measure total mercury, all these different speciations must be successfully detected. To this end the **Mercury Stack Monitor SM-4** uses a thermocatalytic method to convert all mercury to its elemental form. The reactor works without wet chemistry and therefore assures high reliability with low demand for maintenance.

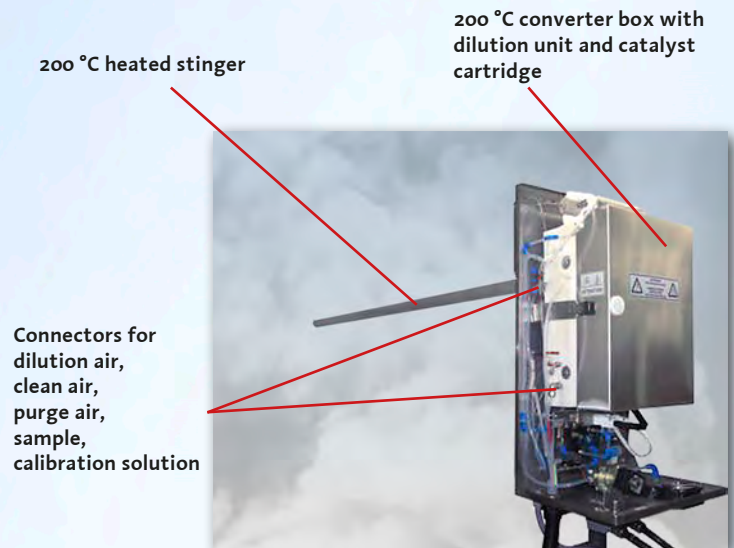


Detector

The **Mercury Stack Monitor SM-4** features a highly sensitive detector (**Mercury Ultratracer UT-3000**) based on the atomic absorption principle, and an upstream amalgamation unit (**GoldTrap**). The ultrapure gold surface captures the mercury which is then abruptly released when the gold trap is rapidly heated to approximately 700° C. Purified air is used as a carrier, which produces a self-cleaning effect, avoids passivation, and results in prolonged life for the GoldTrap.

Sampling probe

The sampling probe has a key role: to extract a representative sample of gas and supply it to the sample conditioning system. All parts that come into contact with the sample are made of PFA (perfluoralkoxy) or silica coated, guaranteeing a minimum memory effect. All parts are heated so no mercury is retained in the probe. An automatically backflushed filter keeps particles away from the analytical pathway of the sample. An automatic valve allows calibration gas to be introduced upstream of the sample filter. Both the dilution unit and the catalyst are integral to the sampling probe, thus ensuring minimum length for their connecting lines.



Interference prevention

SO₂, NO_x, HCl, and VOCs all interfere with standard mercury measurement techniques. The most up-to-date mercury CEMs try to minimize this negative effect with an amalgamation step or sample dilution. Amalgamation alone, however, reaches its limit when the gold surface is affected by matrix constituents, whereas sample dilution alone may not reduce interference to tolerable levels. The **Mercury Stack Monitor SM-4** uses both sample dilution and gold trap amalgamation to completely eliminate interference.

Features and benefits of the Mercury Stack Monitor SM-4

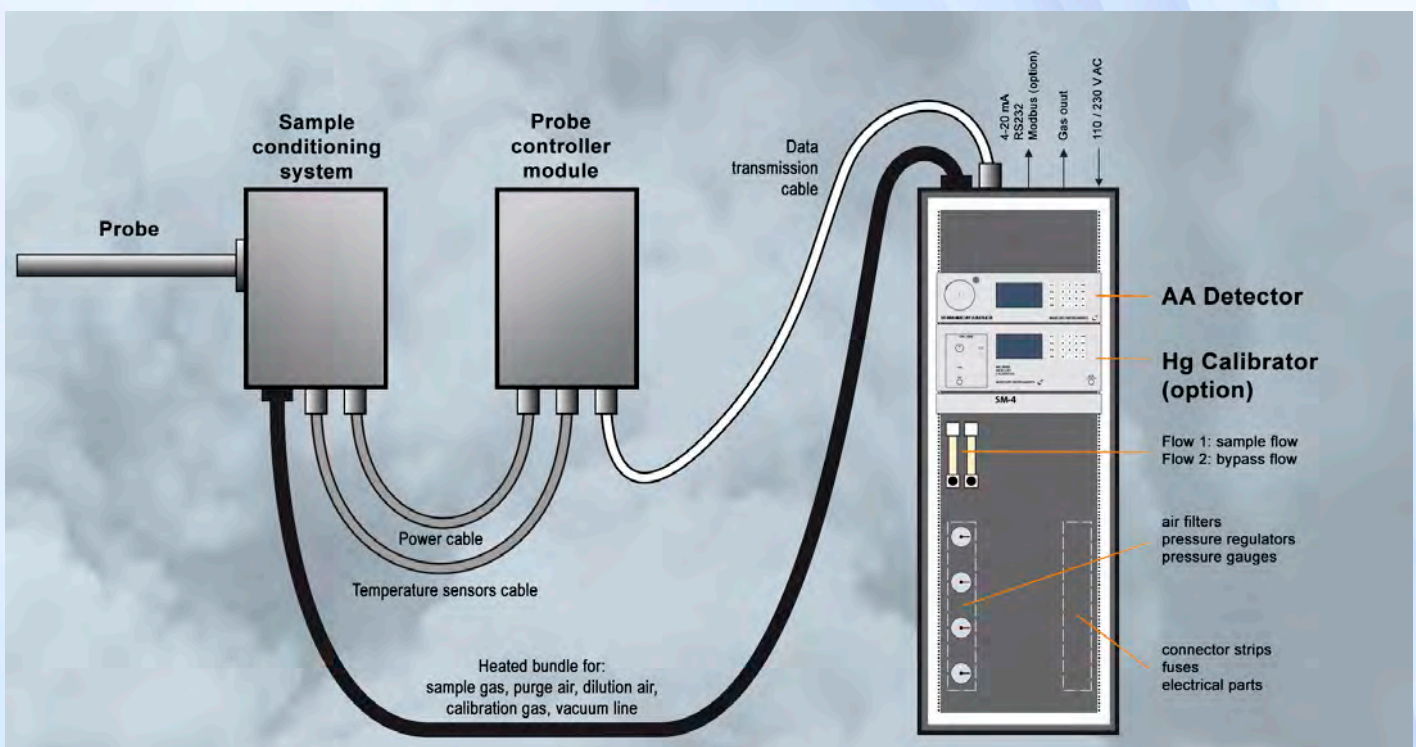
- Dry thermocatalytic method: no need for reagents, water refills or solid reagent cartridge replacements
- Sample dilution eliminates interference from matrix gases such as SO₂, NO_x, and HCl and results in a large measuring range
- No generation of liquid waste or condensate
- Extreme high sensitivity: low measuring range is 0.05 µg/m³
- Automatic backflush of particulate filter
- Fast response time: t(90) typically 180-360 sec
- Sample line length up to 300 feet
- Ready for temporary or fixed installation of an ionic calibration gas source (HOVACAL[®], HOVAQUICK[®])
- Option to install an elemental mercury calibration gas generator, NIST traceable, inside the analyzer cabinet
- Very low maintenance

Automatic calibration

The Mercury Stack Monitor SM-4 can be packaged with daily calibration sources as per EPA and other national and international quality control requirements. It is available with built-in span calibration sources for elemental or ionic mercury and can also perform a baseline check automatically. The latest development is a calibration gas generator that produces ionic mercury reference gas and can be integrated into the Mercury Stack Monitor SM-4 system for automatic operation. Quality assurance during operation as required by the European Regulation EN 14181 (QUAL3) can be performed automatically.

System components

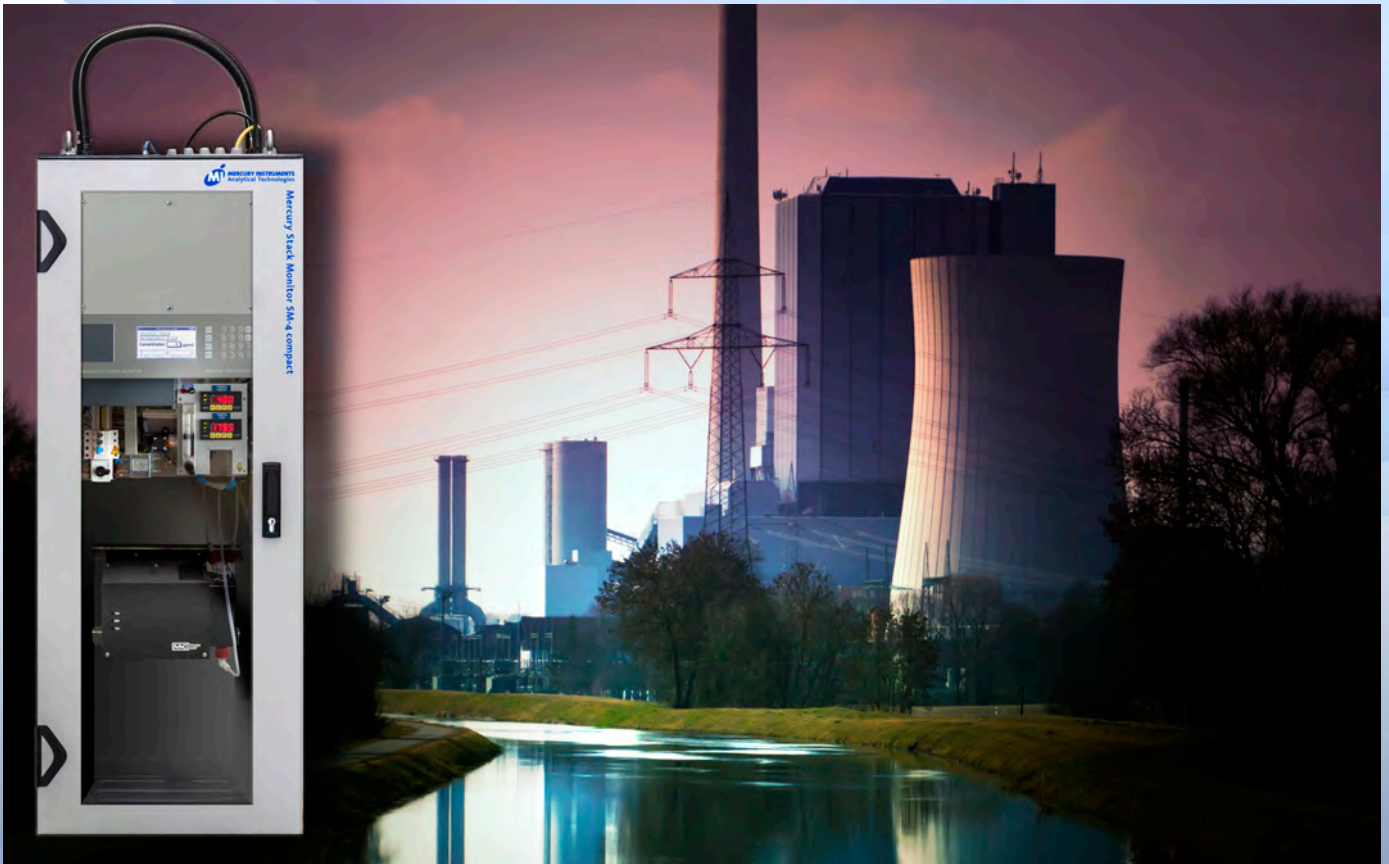
- Sample conditioning system with detachable sampling probe
- Heated bundle containing sample line, air supply line, calibration gas feed line
- Probe controller module
- Analyzer cabinet with detector and calibrator (option)



Special customized version: **Mercury Stack Monitor SM-4 compact**

The **Mercury Stack Monitor SM-4 compact** is a special version of the Mercury Stack Monitor SM-4. Compared to the standard version it has a smaller footprint and features the VM-3000 Vapor Monitor as analyzer instead of the **Mercury Ultratracer UT-3000**.

For more details please refer to our separate data sheet.



The Challenge: Mercury Analysis
The Response: ENVEA GmbH

Even nowadays quantitative trace analysis of mercury is still a challenging task for the analyst. ENVEA GmbH is at all times striving to develop leading edge products for mercury analysis at the highest technical level. The range of applications for our mercury analyzers is unique world-wide.

Technical Specifications Mercury Stack Monitor SM-4

Measuring principle:	Mercury dilution probe with thermocatalytic converter at stack, Cold Vapor Atom Absorption Spectrometry (CVAAS) with GoldTrap amalgamation; Wavelength: 253.7 nm
Measured component:	HgTotal (oxidised, bound, elemental)
Measuring range:	0.05 µg/m ³ to 500 µg/m ³ Hg; (optionally up to 1000 µg/m ³)
Response time:	Approx. 60 sec
T (max. sample gas):	250 °C (482 °F)
Ambient temperature range allowed:	-5 °C to 40 °C (23 °F to 104 °F)
Sample line length:	Up to 30 m; >30 m (300 feet) optionally
Signal output:	4-20 mA (500 Ohms); RS232; modbus RTU/RS485 (option); ethernet (option)
Status output:	3 x pairs of relay contacts (dry contacts)
Remote access:	Modem and SM-4 communication software (option)
Electrical power consumption:	230 V/50-60 Hz (115 V AC/50-60 Hz as option); analyzer cabinet max. 450 VA, probe/converter unit: 1000VA sample line 30 VA per meter (10 VA per foot)
Dimensions [Hx W x D]:	Analyzer: 161 x 80 x 60 cm (63.6" x 31.5" x 23.6") Probe/Converter unit: 36 x 36 x 66 cm (14.2" x 14.2" x 28") Probe controller: 48 x 44 x 27 cm (19" x 17" x 11")
Weight:	Analyzer: approx. 130 kg (285 lbs); Probe/Converter unit: 28 kg (62 lbs) Probe controller: 14 kg (30 lbs)
Air consumption:	6 bar (87 PSI); 16l/min approx.
Calibration / span check:	Automatically with calibration gas from a cylinder or with an integrated calibration gas generator (option). A heated fitting is installed at the probe for span check and converter efficiency check with ionic mercury.
Certifications:	Conforms to US EPA 40CFR60 PS-12A Mercury CEMs

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As a leading supplier of high precision analytical equipment, we strive at all times to offer top quality solutions. Our products are manufactured according to the ISO 9001 quality regulations.

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