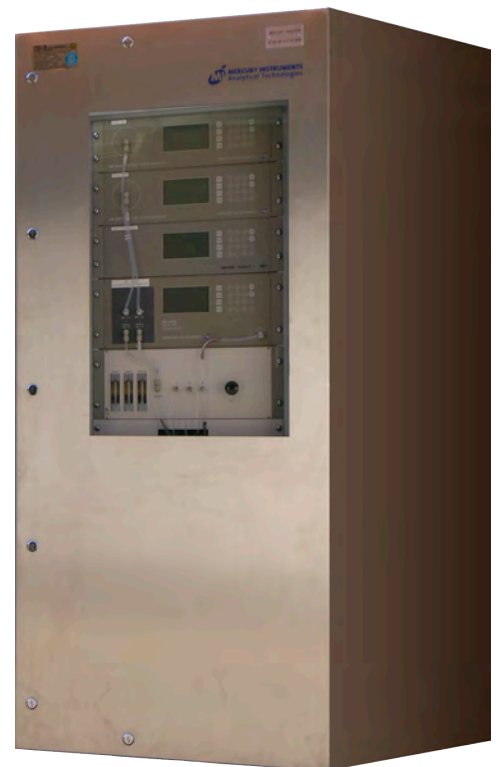


Mercury Monitoring System MMS-NG for Natural Gas

PROCESS

Continuous and automatic measuring of
mercury in natural gas

- Automatic and continuous measurement
- Fast and reliable results
- Detects elemental and bound mercury
- Automatic calibration
- Sample point multiplexer
- Sample dilution for high concentrations
- No carrier gases required
- Certified for hazardous zones



Mercury Monitoring System for Natural Gas (MMS-NG)

Natural gas often contains mercury at concentrations that vary from below 1 to above 10000 $\mu\text{g}/\text{m}^3$. Mercury is both toxic and potentially damaging: it can corrode or embrittle common gas plant components.

Gas plants reduce mercury in natural gas with mercury removal units (MRUs). MRUs use fixed bed absorbers, often with sulfur-impregnated carbon or other chemisorbents as the active material.

The **Mercury Monitoring System for Natural Gas (MMS-NG)** is an ideal tool to determine the efficiency of each MRU in real time, and necessary to successfully monitor and control mercury concentrations during natural gas production and processing.



Continuous measurement of mercury in natural gas

ENVEA GmbH has engineered a system for automatic and continuous monitoring of mercury levels in natural gas and other flammable gases. We install the mercury analyzer (and accessories such as an automatic calibrator) in a pressurized enclosure that is approved for use even in hazardous zones (ATEX, IEC-Ex).

A heated system takes the sample and guides it to the analyzer via stainless steel tubing that has been surface-treated for ultra-low adsorptivity.

A built-in gas sensor will shut the system down and stop the sample gas flow if any leakage is detected.

Customized solutions

Each mercury on-line system for natural gas will differ in sample characteristics as well as installation conditions and operating environment (natural gas processing plants, offshore drilling platforms...).

Therefore the need for a customized solution !

ENVEA GmbH has the experience to design systems that fully meet the requirements of your particular mercury monitoring task.

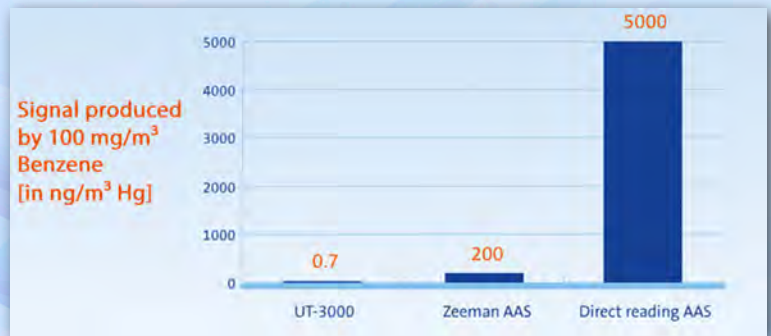


Highly Selective and Sensitive Detector

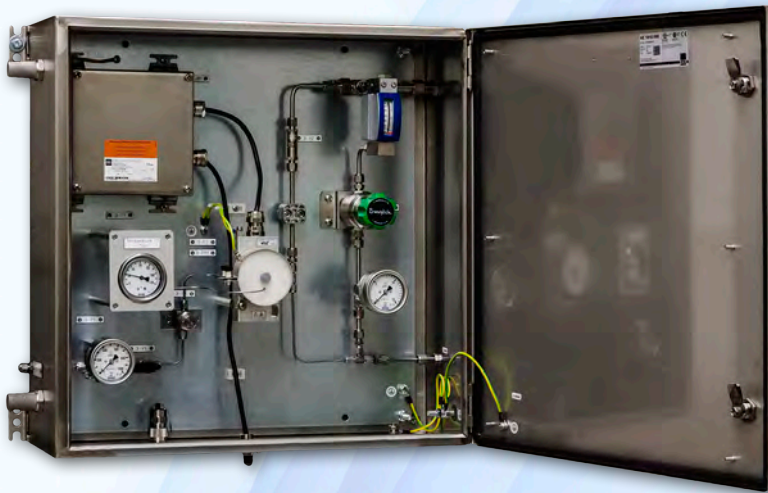
The **UT-3000 Mercury Ultratracer** is used to detect and precisely measure mercury levels in natural gas. A proprietary gold collector selectively absorbs mercury from a constant sample volume. The collector is then rapidly heated for a short period of time releasing the mercury into an optical cell where it is quantitatively detected using atomic absorption measurement (AAS).

In contrast to atomic fluorescence systems, the **UT-3000** does not require special carrier gases. Air is used as a carrier gas, thus keeping the gold surface clean and enhancing the collector lifetime compared to other systems.

The **UT-3000 Mercury Ultratracer** shows no significant interference from hydrocarbons or other gaseous components.



Sampling System for Natural Gas



The integrity of the sampling system is as important as the analyzer itself. To sample natural gas from a pipeline, the sampling system must reduce pressure and guide the sample from the sampling point to the analyzer, leaving the mercury concentration unchanged. Plus it should show a minimum lag time and be suited to hard use in hazardous zones.

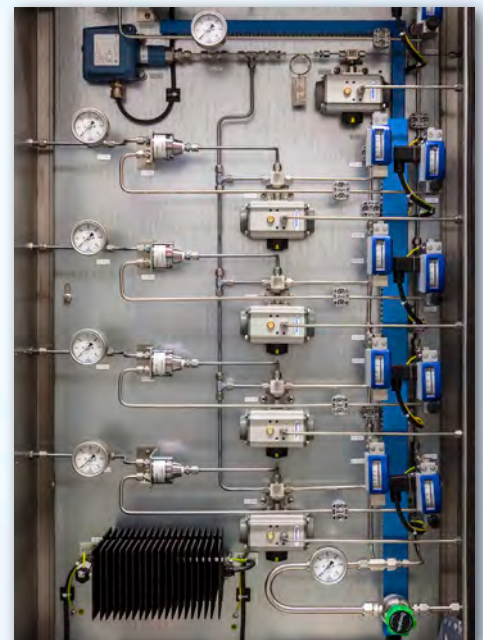
The MMS sample conditioning system by ENVEA GmbH fulfills these requirements. The surface of the pressure-reduction system is electrically heated to obviate condensation and

mercury loss caused by the Joule-Thomson cooling effect. A specially coated coalescing filter effectively removes aqueous mist as well as hydrocarbon condensate. Tubing and filter surfaces are specially coated for ultra-low adsorption and constantly conditioned with sample gas. Our system design allows a maximum input pressure of 3480 psi (240 bar) and the output pressure is adjustable from 1 to 28 psi (0.07 to 2 bar).

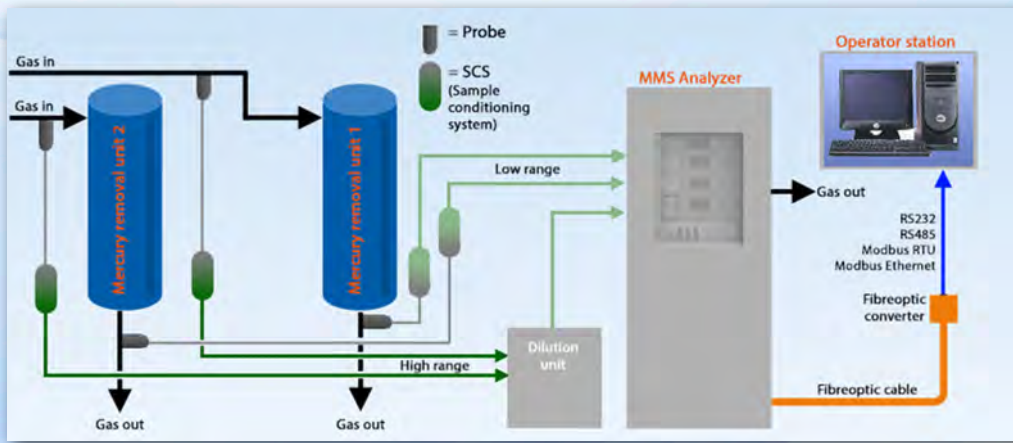
Sampling Point Multiplexer

For process control it is often useful to monitor mercury levels at different process points, e. g. the inlets and outlets of each mercury removal system. Our microprocessor controlled multiplexer unit feeds samples from up to 16 sampling points to the analyzer for sequential measurement. Using the fast loop principle all sample lines, including those currently not being measured, are continuously purged with sample gas and thereby constantly preconditioned. A short response time is the result.

Specially coated bypass filters retain entrained liquids (coalescing filters can also be used).



An example for the set-up of the system



A MMS-NG Mercury Monitoring System for Natural Gas installed in a gas separation plant, where mercury must be removed from the gas to avoid corrosion of aluminum heat exchangers and to produce mercury-free product streams.

Calibration and Quality Assurance

For quality assurance a regular calibration check is recommended. Calibration can be performed manually using the Manual Calibration Set or automatically with the Automatic Calibration Unit. Both units use the principle of static calibration with mercury-saturated air. These devices are maintenance-free and unlike permeation devices do not require re-weighing.

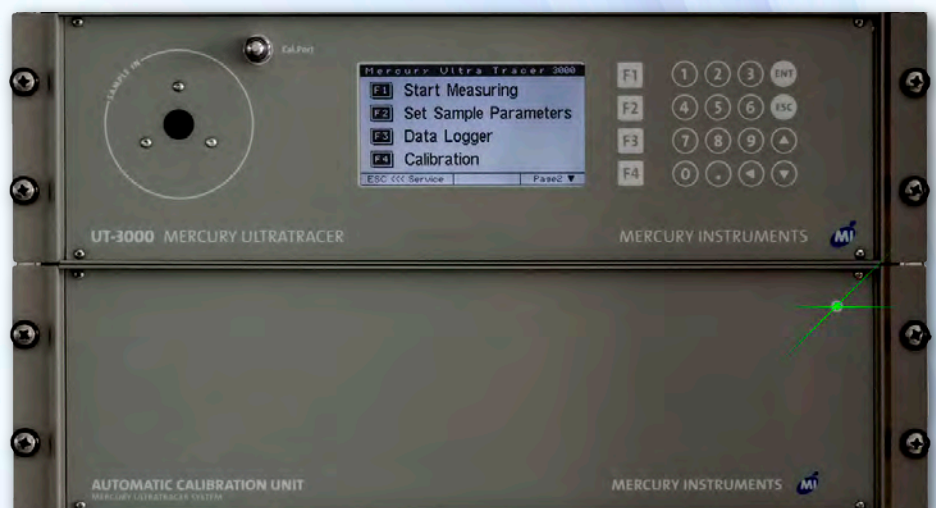


Manual calibration:

Calibration gas is generated in a mercury chamber surrounded by a thermoelectrically cooled aluminum jacket. The chamber contains highly pure elemental mercury, and the temperature of the mercury is precisely measured by a sensor. The UT-3000 analyzer uses this temperature signal to calculate the true mercury concentration via the mercury vapor pressure equation recommended by the NIST (National Institute of Standards and Technology). A small volume of air is extracted from the mercury chamber with a syringe and injected into the analyzer's calibration port.

Automatic calibration:

The Automatic Calibration Unit is permanently installed in the analyzer cabinet, it extracts the mercury vapor and injects it into the calibration port by means of a digital syringe. Up to 12 calibration points can be programmed, and automatic calibration can be set to repeat at a fixed time interval or at a fixed daily hour.



Technical Specifications

Mercury Monitoring System MMS-NG for Natural Gas

Detector	
Measuring principle	Cold Vapor Atom Absorption Spectrometry (CVAAS) with GoldTrap amalgamation; Wavelength: 253.7 nm
Matrix effect elimination:	GoldTrap technique
Measuring range	0.001 µg/m ³ to 50 µg/m ³ Hg; (with sample dilution system up to 2000 µg/m ³)
Signal output	analogue: 4-20 mA serial: RS232 Modbus RTU RS485 (option) Ethernet (option)
Multiplexer	
Number of sample points:	2 ... 16
Measuring duration per channel:	approx. 3 minutes
Purge of sample lines:	-5 °C to 40 °C (23 °F to 104 °F)
Sample Conditioning System (SCS)	
Max. inlet pressure:	240 bar (3480 psi)
Pressure regulator:	heated (EEx certified)
Sample wetted surfaces:	coated to minimize mercury adsorption
Automatic Calibrator	
Operating principle:	Mercury vapor saturation, injection of a constant volume
Calculation of mercury vapor pressure:	according to NIST recommended equation
Certification and applied standards	
Hazardous zone certification:	ATEX 2G IIC T4 EExp (or equivalent)
Calibration:	ISO/DIS 6978-3, ASTM D 5954, VDI 2267 Part 8, NIST recommendations
Sampling and mercury determination:	ISO 6978-1 ASTM 5954



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.



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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