

# Stack Mercury Continuous Monitoring System

**GA-Hg**



# Stack Mercury Continuous Emission Monitoring System

## System introduction

Based on Cold Vapor Atomic Fluorescence Spectrophotometer technology, Brix has developed stack mercury continuous monitoring system to detect the real time concentration of emission mercury and its cumulate emission rate. It is able to monitor gaseous elemental mercury, ionic mercury and total gaseous mercury. Its detection limit is low to 0.05ug/m<sup>3</sup>. This system is widely applied to measure mercury concentration in the tail gas of many industries, such as mercury minerals refining process, mercuric chloride catalyst recycling, coal-fired power plant and etc.

## Application

- ✔ Power plant boilers
- ✔ Industrial/civil boilers
- ✔ Industrial furnaces
- ✔ Domestic refuse incinerator
- ✔ Hazardous waste incinerator
- ✔ The extraction and distillation of mercury.
- ✔ Recovery and regeneration of mercury catalyst .



stack mercury continuously monitoring system



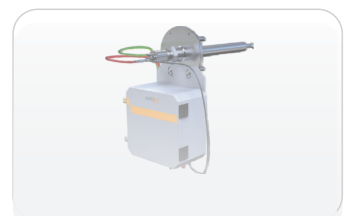
Stack mercury analyzer



Elemental mercury generator



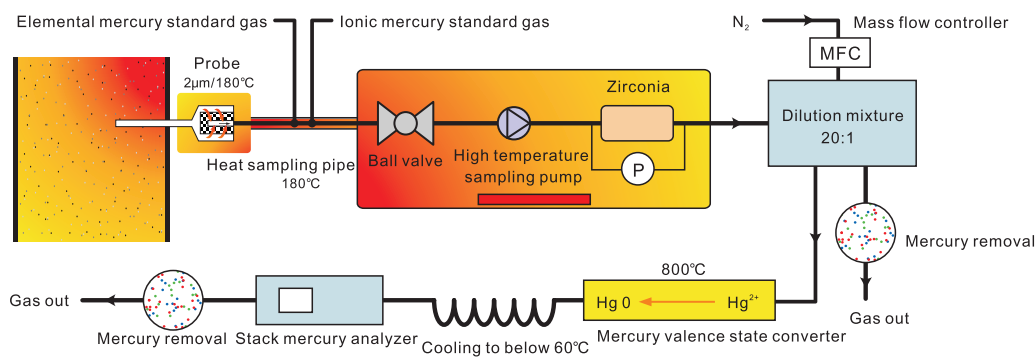
Ion mercury generator



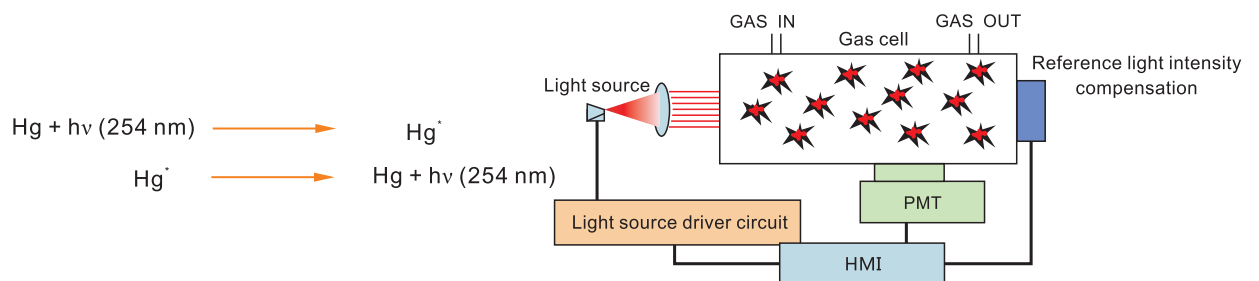
Temperature, pressure and flow integrated monitor

# Technology Principle

Under the action of high temperature sampling pump, sample gas passes through sampling probe, heat sampling pipe and high temperature ball valve and diluted with high purity nitrogen under precise control. The dilution ratio is 20:1. After adjusting the flow, the diluted gas enters mercury valence state converter. By catalyzing at 800°C, the mercury ions is converted to mercury atoms and enters mercury analyzer to measure the concentration of total mercury after cooling down. The gas will be treated with mercury removal and emptied at last.



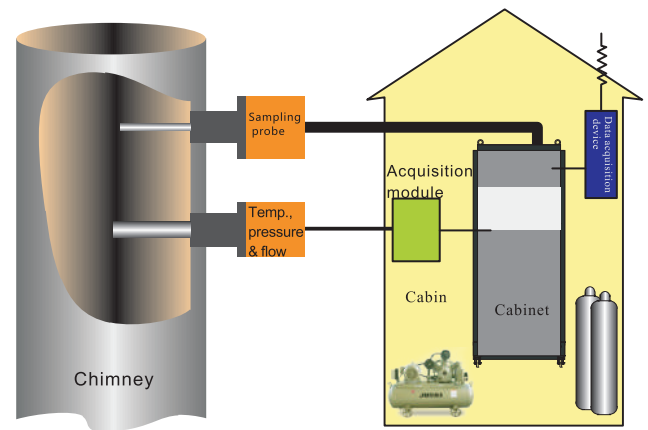
The system adopts the technology of Cold Vapor Atomic Fluorescence Spectrophotometer (CV AFS). The low voltage mercury lamp shots 254nm ultra-violet light on measured object with mercury vapor; the mercury atom absorbs energy and is transited to excited state from steady state. When mercury atom is transited from unstable excited state to steady state, it will radiate 254nm fluorescence and the fluorescence intensity is proportional to mercury atom. The fluorescence intensity is converted into electrical signals by the photomultiplier tube. After amplification and A/D conversion, the micro controller is used for data processing to work out the concentration of mercury atoms. The measured result will be displayed and printed.



# GA-Hg Stack Mercury Continuous Emission Monitoring System

## Structural Composition

Based on CV AFS technology, has developed stack mercury continuous monitoring system to detect the real time concentration of emission mercury and its cumulate emission rate. It consists of sampling probe, heat sampling pipe, pretreatment system, stack mercury analyzer, elemental mercury generator, ionic mercury generator and nitrogen



## Feature

- ★ Cold Vapor Atomic Fluorescence Spectrophotometer technology
- ★ Fast response time
- ★ Low detection limit and low temperature drift
- ★ Strong resistance to adsorbability
- ★ Combining internal and external purge--long maintenance intervals
- ★ Real time monitoring the dilution ratio, restore the concentration of Hg and reflecting true working condition
- ★ Mercury valence state catalyzed and converted at 800°C-- Converting rate up to 95%
- ★ Support automatic zeroing for whole system
- ★ Self-diagnosis function, send alarming signal of temperature control, flow and etc
- ★ Low velocity measurement technology--to resolve the velocity limit of regular product
- ★ Key components imported and ensured with high quality
- ★ Self-developed core modules and algorithm--obvious competitive advantages
- ★ Compact structure of high integration
- ★ Anti-explosion during transportation and installation

## System index

Dimension	800mm×800mm×1800mm	Power Supply	220VAC, 8000W
Heating Temperature	140°C ~ 180°C	Operating Temperature	-20°C ~ +50°C
Enclosure Rating	Cabinet IP42, other IP	Operating Humidity	0 ~ 95%RH ( non condensing )
External Output	5×4-20mA, 6×RS232( support Modbus protocol , GB 212 agreement, local custom protocols, etc. )		
Compressed Air	(0.9 ~ 1.0)MPa, 0.25m <sup>3</sup> /min, clean and free of oil and water(dew point -40°C )		

# Subsystem measuring instrument profile

— Stack mercury analyzer

— Elemental mercury generator

— Ionic mercury generator

— Temperature, pressure, flowrate integrated monitor



Stack mercury analyzer

## ◆ Product description

Based on Cold Vapor Atomic Fluorescence Spectrophotometer technology, this analyzer is able to monitor the concentration of gaseous elemental mercury, ionic mercury and total gaseous mercury. The system is with high sensitivity and stability, fast repose time and wide measuring range. Its operation cost is quite low. All indexes are comparable or even beyond the similar of domestic and

## ◆ Technical index

- |  |   |   |
|--|---|---|
| ★ Measurement Technology                             | Principle : Cold Atomic Fluorescence Spectrometry | ★ Span Drift : No more than±1% F.S.                             |
| ★ Range : 0~5µg/m <sup>3</sup> ~200µg/m <sup>3</sup> |   | ★ Response Time(T <sub>90</sub> ) : < 90s                       |
| ★ Detection Limit: <0.05ug/m <sup>3</sup>            |   | ★ Relay Output : 4, output can be flexible configuration, 24VDC |
| ★ Indication Error: ≤±5%                             |   | ★ Analog Output : 2×4-20mA,flexible configuration,max load 800Ω |
| ★ Stability: ≤ 1 hour change±1%                      |   | ★ Digital Comm. : 1×RS485 , 1×RS232                             |
| ★ Repeatability:<1%                                  |   | ★ Power : 220VAC/100W   |
| ★ Zero Drift:≤ ±1% F.S.                              |   | ★ Working Temp. : -20°C ~ +50°C                                 |

## ◆ Feature

1. Cold Atomic fluorescence technology with high sensitivity.
2. The detection limit is low to 0.05µg/m<sup>3</sup>
3. Wide measuring range, high accuracy
4. Continuous monitoring with fast response
5. Long service life of the light source
6. With reference detector--real-time compensate the concentration deviation caused by light intensity attenuation
7. Key components imported and ensured with high quality

## ◆ Product description

Elemental mercury generator is used to produce mercury gas with stable concentration, which is used for mercury system pretreatment and calibration of mercury analyzer. The basic principle of elemental mercury analyzer is permeation tube. To produce accurate elemental mercury concentration, the temperature controller will control the permeation tube below 50°C±0.1°C, and the high precision MFC will accurately control the gas flow. After a period of preheating, the stable concentration of elemental

## ◆ Technical index

- |  |  |
|--|--|
| ★ Temp. controller : 50°C                  | ★ Range of gas flowmeter: 0~20L/min    |
| ★ Precision of temp. controller : ≤0.1°C   | ★ Gas flow error : ≤ ±0.5%F.S.         |
| ★ Temp. absolute error: no more than±0.5°C | ★ Concentration of output Hg: 70µg/min |

## ◆ Feature

1. High precision control pump of gas flow, the flow accuracy reaches 0.35%
2. High precision temperature control system, small temperature control fluctuation ,even temperature distribution
3. Permeation tube adopted--easy to maintain and replace
4. Generate elemental mercury of wide range and high accuracy
5. Self-diagnosis function, temperature control and flow alarming
6. Non-metallic anti-adsorption materials are used in the whole gas path



Elemental mercury generator



# Subsystem measuring instrument profile

## ◆ Product description

Ionic mercury generator is used to produce a stable concentration of mercury ion gas. It is used to calibrate the conversion efficiency of mercury valence state converter. In order to produce accurate ion mercury concentration, the high precision MFC will control the gas flow, and the high precision liquid pump will pump the mercury chloride solution into the evaporator. Two medium will be heated to 180 °C



Ionic mercury generator

## ◆ Technical index

- ★ Gas Flow Meter Range : 0~20L/min
- ★ Gas Flow Error: No more than±0.5%F.S.
- ★ Minimum Control Flow of Liquid Flow Pump: 0.55μ L/min
- ★ Liquid Flow Error: No more than±0.35%
- ★ Temperature Control Precision : ≤0.1°C
- ★ Temperature Absolute Error: no more than±0.5°C
- ★ Output Mercury Concentration Range:5μg/m<sup>3</sup>~200μ g/m<sup>3</sup>
- ★ Digital Output : RS232

## ◆ Feature

1. High precision liquid/gas flow control pump with a flow accuracy of 0.35%
2. Self-diagnosis function, temperature control and flow alarming
3. Generate ionic mercury of wide range and high accuracy
4. The evaporator adopts hysteretic gas path, the ion mercury vapour is evenly mixed with nitrogen and the concentration is stable
5. Non-metallic anti-adsorption materials are used in the whole gas circuit

## ◆ Product description

PT-500 is designed for low velocity (2m/s~5m/s) applications. The instrument uses precision micro-differential pressure/static pressure sensor and unique pitot tube structural design, combining with auto. calibration and cleaning function. It can be widely used for real-time and continuous measurement of flue gas temperature, pressure and velocity.



Temperature, pressure, flowrate integrated monitor

## ◆ Technical index

- ★ Velocity : 0 ~ 15.5m/s , 0 ~ 40m/s(customizable)
- ★ Temperature : 0 ~ 300°C , 0 ~ 800°C(customizable)
- ★ Pressure : -10kPa ~ +10kPa(customizable)
- ★ Measuring Accuracy : ±2%F.S.
- ★ Signal Output : 3×isolation4-20mA, 1×RS485 , 1×RS232
- ★ Material of Pitot Tube : 316L steel, PTFE (optional)
- ★ Power Supply of Blowback Electromagnetic Valve: 220VAC , 50/60Hz

## ◆ Feature

1. Ultra-high-precision pressure sensor achieves the measurement of low-flow(2m/s)
2. LCD operating unit provides good human-machine interaction interface
3. Settable timing backblow interval, Pitot coefficient and etc.
4. Overpressure protection effectively avoids pressure sensor being damaged and reducing operating costs
5. Strengthen output signal protection

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