

# Continuous Mercury Monitoring System (CMM)

## Gaset Continuous Mercury Monitoring System (CMM)

Gaset CMM is a complete emission monitoring system designed to meet the regulations for continuous mercury measurement standards in different combustion sources, such as coal fired power plants or waste incinerators. Relying on proven technologies it is a robust, reliable, and cost-effective measurement system to meet the latest standards. The system has low need for maintenance and provides an excellent solution for demanding industrial measurement conditions like other Gaset analyzers.

The Gaset CMM is an extractive continuous mercury emission monitoring system. A sample flow is extracted from the waste gas using an electronically heated probe tube and diluted with nitrogen in the probe. The diluted sample gas is then transported to the analyser cabinet via a heated test gas line where it first passes through a thermal catalytic converter which converts chemically bound mercury present in the waste gas into atomic mercury. The mercury present in the waste gas is then measured with the help of a spectrometer using atomic fluorescence spectroscopy. Gaset CMM employs atomic fluorescence spectroscopy and thermal conversion of ionic mercury compounds to atomic mercury. It measures hot, wet and corrosive gas streams. No wet chemistry or gold amalgamation trap is needed. High inherent sensitivity of the atomic fluorescence spectroscopy enables extensive dilution of the sample gas. The diluted sample gas is transported to the analyser. Calibration of the whole system is performed with an automatic calibration unit capable of producing constant flow of atomic and (as an option) oxidised mercury.

### General parameters

<b>Measuring principle:</b>	Cold vapour atomic fluorescence (CVAF) with extractive filtration, dilution, and thermal conversion
<b>Performance:</b>	Minimum range 0 – 5 µg/m <sup>3</sup> . Minimum detection limit for total mercury 0.02 µg/m <sup>3</sup> (complete system, with dilution). Maximum range 0 - 1000 µg/m <sup>3</sup> .
<b>Operating temperature:</b>	5 – 40 °C, non-condensing, dust free ambient air
<b>Storage temperature:</b>	-20 – 60 °C, non-condensing
<b>Response time, T<sub>90</sub>:</b>	Typically < 120 s, depending on the sample line length and measurement time
<b>Power supply:</b>	100 – 115 or 230 V / 50 – 60 Hz
<b>Operating system:</b>	Microsoft Windows CE
<b>Application software:</b>	MAUI

### Spectrometer with integrated thermal converter

<b>Operation principle:</b>	Direct cold vapour atomic fluorescence (CVAF) in vacuum pressure
<b>Detector:</b>	Photon detection unit with photon counting
<b>Source:</b>	Low pressure mercury vapour lamp
<b>Operation wavelength:</b>	253.7 nm
<b>Sample conversion:</b>	Integrated high temperature thermal converter

### Calibrator for Hg<sup>0</sup>

<b>Operation principle (Hg<sup>0</sup>):</b>	Vapour generation from saturated source and dilution
<b>Calibration gas:</b>	Dried, and Hg scrubbed instrument air
<b>Dilution gas flow control:</b>	MFC 0 – 20 l/min
<b>Span gas flow control:</b>	MFC 0 – 20 ml/min
<b>Hg source temperature:</b>	1 – 10 °C
<b>Calibration concentration ranges converted to Hg<sup>0</sup>:</b>	
<b>Saturated Hg source:</b>	1 – 50 µg/m <sup>3</sup>

### Measurement parameters

<b>Zero point calibration:</b>	24 hours
<b>Span calibration:</b>	24 hours
<b>Zero-point drift:</b>	< 2% of measuring range per

	calibration interval
<b>Sensitivity drift:</b>	< 2% of measuring range per calibration interval
<b>Linearity deviation:</b>	< 2% of measuring range

### Instrument air preparation

<b>Instrument air inlet:</b>	6 – 10 bar, 60 NI/min, 8 mm Swagelok fittings
<b>Instrument air filtration:</b>	3-stage filter unit
<b>Nitrogen generator:</b>	Capacity 99 % N <sub>2</sub> , 8 l/min, 5-6 bars, efficiency ratio 20 %
<b>Calibration gas drying:</b>	Absorption dryer, capacity -30 °C
<b>Mercury scrubber:</b>	Absorption scrubber
<b>Vacuum pump:</b>	WOB-L piston twin headed

### Alarm outputs

<b>System alarm:</b>	Gasmet CVAf mercury analyzer and application software
<b>Service request:</b>	Gasmet CVAf mercury analyzer and application software
<b>Maintenance status:</b>	Gasmet CVAf mercury analyzer and application software
<b>Result valid:</b>	Gasmet CVAf mercury analyzer and application software
<b>Concentration alarm:</b>	Gasmet CVAf mercury analyzer and application software

### Air conditioning

<b>Cooling capacity:</b>	A35 °C / A35 °C 1500 W
<b>Internal circulation:</b>	500 m <sup>3</sup> /h

### Dilution probe

<b>Operating principle:</b>	Ejector with critical orifice
<b>Material:</b>	SS 316, glass coated sample wetted parts
<b>Operating temperature:</b>	Maximum 250 °C (filter housing temperature)
<b>Filter element:</b>	Glass coated SS 316, 2 µm
<b>Dust load:</b>	< 2 g/m <sup>3</sup>
<b>Flow alarm:</b>	Yes
<b>Sample gas pressure:</b>	0.9 - 1.2 bars (in stack)
<b>Sample gas temperature:</b>	400 °C (max., in stack)
<b>Probe installation location temperature:</b>	-20 - 50 °C

### Heated probe tube

<b>Material:</b>	SS 316, glass coated sample wetted parts
<b>Temperature:</b>	Maximum setting 250 °C
<b>Length:</b>	122 cm
<b>Mounting flange:</b>	DN100PN16
Other materials, lengths, and temperatures are available on request.	

### Heated line

<b>Tube size:</b>	2 * 6/8 mm
<b>Core material:</b>	PFA Teflon core
<b>Temperature:</b>	Maximum 200 °C
<b>Fittings:</b>	8 mm Swagelok
<b>Power supply:</b>	230 VAC or 115 VAC
<b>Power density:</b>	200 watts/meter
<b>Dilution and flowback air:</b>	Unheated 2*4/6 mm Teflon core, 6 mm Swagelok

The maximum length for the heated line is 30 m with 230 VAC and 15 m with 115 VAC power supply. Analyzer and calibrator are connected to dilution probe with combined heated line which divides into two parts on both ends.

### Electrical connections

<b>Main supply:</b>	3 * 16 A (up to 15 m sample line) 3 * 32 A (15 - 28 m sample line)
<b>Power consumption:</b>	~ 8 kW (the full CMM with heated lines, 30 m)

### Measuring data outputs

The CMM system is equipped with four analog outputs representing the result total Hg concentration with different ranges

<b>Analog output range:</b>	4 – 20 mA. Active, load 350 Ω max.
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### Enclosure

<b>Material:</b>	Bake painted steel
<b>Dimensions (cm):</b>	212 * 61 * 70 (cooling unit on top)
<b>Weight:</b>	230 kg (full CMM cabinet) 27 kg (dilution probe + probe tube)
<b>Protection:</b>	IP 54