Gasmet™ Engine Emissions Monitoring System EEMS

The Gasmet engine emissions monitoring system EEMS has been designed engine emissions monitoring which require for fast response time. A typical application for Gasmet EEMS consists of H_2O, CO_2, CO, N_2O, NO, NO_2, SO_2, HCl, HF, NH_3, CH_4, C_2H_6, C_3H_8, and C_2H_4, but it can be easily configured for a new set of compounds and/or calibration ranges.

Gasmet EEMS has a liquid nitrogen cooled CR2000 analyzer, a fast data transfer using RS422 protocol, and a powerful pump inside the sampling system. These factors contribute to a fast response time. In Figure 1, the response time of Gasmet EEMS is depicted.

The Gasmet EEMS is used for on-line measurements. It is an ideal tool to use for measuring trace concentrations of pollutants in wet, corrosive gas streams. All parts of the Gasmet EEMS are be heated up to 180 ºC. It can be used for undiluted gases and the sample gases do not need drying beforehand.

The Gasmet EEMS consists of Gasmet CR2000 FTIR gas analyzer, Gasmet industrial PC, and Gasmet sampling system. As an option, the system can be equipped with Gasmet oxygen analyzer and/or with total hydrocarbon analyzer (FID). All parts of the system are 19" rack mounted and are installed on the pull-out shelves. The Gasmet EEMS includes all power connections and temperature controllers for heated lines and heated sample probe. The operation of the system is fully automatic and controlled by the Calcmet software. Additionally, all functions of the Gasmet EEMS can also be used manually.

The Gasmet industrial PC and Calcmet application software controls EEMS. The measuring data can be transferred from the industrial PC to the control room with digital outputs (ModBus) or with analog outputs 4 - 20 mA. The alarms are transferred with relay contact. The Gasmet EEMS provides different alarm functions such as *Function alarm*, *Service alarm*, and *System alarm*. Function and service alarms are associated with the Gasmet FTIR gas analyzer and with the Calcmet analysis software. System alarm comes from Gasmet sampling system and it includes temperature alarms (from sample probe, heated lines, and sampling unit), flow alarm, and pressure alarm for zero gas. If any of the critical alarms is activated, instrument air starts to flow automatically into the system to prevent condensation. Standard EEMS is also equipped with a one span gas valve to allow automated span checks.

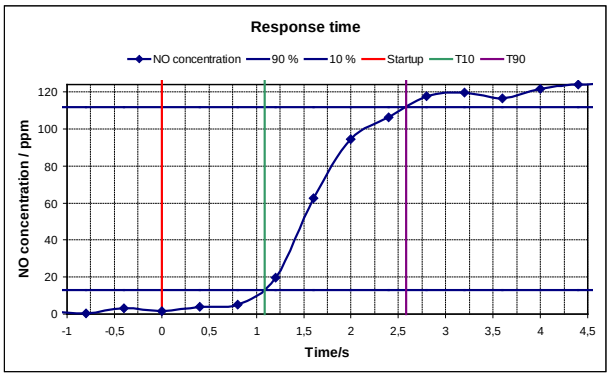

Figure 1. The Gasmet EEMS response time with a five meter heated line (T = 180 °C) and a PSP4000H sample probe.

The Gasmet EEMS has been installed in a transportable cabin with 4 inch wheels underneath (Figure 2).

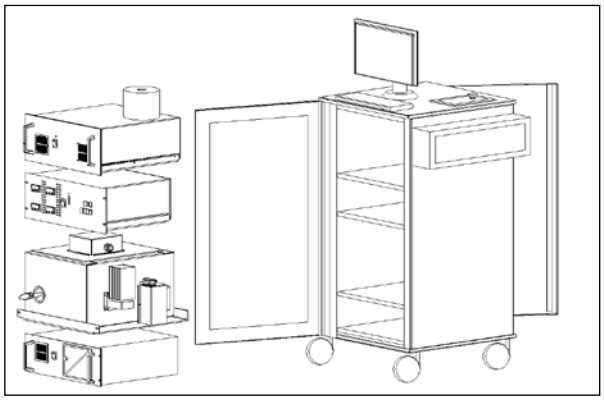

Figure 2. The Gasmet EEMS components and cabin.

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General parameters

Gas analyzer:	Gasmet CR2000
Measuring principle:	FTIR (Fourier Transform Infrared)
Performance:	Simultaneous analysis of up to 50 gas components
Operating temperature:	20 ± 20 °C, non-condensing, dust free ambient air.
Storage temperature:	-20 - +60 °C
Response time, T_{90}:	< 2.5 s
Response time, T_{10-90}:	< 1.5 s
Result update time:	< 0.4 s
Gas cell temperature:	50 - 180 °C
Sample gas:	Non-condensing, particle free
Flow rate:	~ 12 liters per minute
Sample gas pressure:	Ambient

Measuring parameters

Zero point calibration:	Before each test period or 24 hours, calibration with nitrogen (5.0 or higher N_2 recommended)
Zero point drift:	**<** 2 % of measuring range per zero point calibration interval
Sensitivity drift:	None
Linearity deviation:	< 2 % of measuring range
Temperature drifts:	< 2 % of measuring range per 10 K temperature change
Pressure influence:	1 % change of measuring value for 1 % sample pressure change. Ambient pressure changes measured and compensated

Alarm outputs

Function alarm:	Gasmet FTIR gas analyzer and Calcmet application software.
Service alarm:	Gasmet FTIR gas analyzer and Calcmet application software.
System alarm:	Probe temperature low/high Heated module temp. low/high Line 1 temperature low/high Line 2 temperature low/high Line 3 temperature low/high Zero gas pressure low
Concentration alarm:	Measured values low/high
Cooling alarm:	Cabinet temperature high

Measuring data outputs

Gasmet measuring system is equipped with analog or digital outputs. Gasmet industrial PC controls the measuring outputs.

Digital output: ModBus, ASCII, COMLI, DDE link. Other protocols on request.

Analog output:

- **Output range:** 4 - 20 mA, isolated
- **Channels**: 8 or 16

Air conditioning

Cooling principle:	Ventilation
Circulation:	500 m^3/h

Heated lines

Tube size:	4/6 mm
Core material:	Teflon core
Operating pressure:	Maximum 400 kPa
Temperature:	Maximum 200 ºC
Fittings:	6 mm Swagelok
Power supply:	230 VAC or 115 VAC
Power density:	120 watts per meter

Electrical connections

Main supply:	3 x 16 A; 3 x L+N+PE (TN-S)
Power consumption:	~7,5 kW {the full Gasmet EEMS including Gasmet CR-2000 FTIR gas analyzer, Gasmet industrial PC, Gasmet sampling unit, sample probe, and heated lines (21 m)}.

Optional sample probe

Sample probe: PSP4000H

- **Power density:** 320 watts
- **Operating temperature:** 0 – 180 ºC
- **Filter element:** Ceramic, 2 µm
- **Dust loadings:** < 2 g/m^3

Probe tube material: SS 316

- **Probe length:** 1 meter
- **Sample temperature:** 600 ºC maximum
- **Sample pressure:** 1 bar maximum

Other probes for high temperatures and for high dust loadings

Enclosure

Material:	Bake painted steel
Dimensions (mm):	1200 * 600 * 600 mm
Weight:	~ 250 kg (full system)
Protection:	IP 50

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