

# Gasmeter™ FTIR application note

## Container Fumigation

### KEY WORDS

- Container
- Fumigation
- Fourier Transform Infrared (FTIR)
- Methyl Bromide, Phosphine

### PRODUCTS

- [DX4040](#) Portable FTIR Gas Analyzer
- [Calcmeter 4040 Professional](#) Analytical software package

### OVERVIEW

Sea cargo containers and wooden packing materials are fumigated to control the spreading of pest animals and micro-organisms. Fumigant gases are toxic and measurements are carried out as a health and safety precaution.

Measurements are required by e.g. customs inspectors prior to opening containers, shipping companies are responsible for measurements. Products shipped in containers may release VOC's from e.g. solvents and glues used in manufacturing process and the concentration may be significant in the confined space of the container. Most containers originate in China and SE Asia, cargo container measurements take place in ports across the world - same gases are encountered in all ports

The battery powered backpack-size analyzer records infrared spectra at 10 scans/second and is capable of sub-ppm detection. The DX-4040 requires no span gas calibrations and only a short zero procedure. The analyzer is controlled by a standard laptop computer or a rugged Tablet PC. Calcmeter 4040 Professional software is used to control the analyser and display results.

The DX-4040 performs simultaneous analysis of 50 gases with compensation for cross-interference effects. The FTIR (Fourier Transform Infra-Red) measurement principle allows determination of both inorganic and organic substances regardless of their molecular weight. The 50 gas library is configured to include all common fumigants and a

wide range of substances released from the cargo for correction of cross-interference effects. The results produced by Calcmeter software can be traced back to the original infrared spectra of the substances.



This application note is meant to be an informative example of typical application where Gasmeter analyzers could be used. This is not a technical specification sheet. Information in this document is subject to change without prior notice. Optimal product configuration is application dependent, and exact application details such as detection limits, components included in the application, etc depend on process and/or measurement site details and may vary. Please, contact your local Gasmeter sales representative to get information specific to your needs.

## TYPICAL GASES WITH DETECTION LIMITS AND MEASURING RANGES FOR CONTAINER APPLICATIONS

Compound name	Range	Unit	Detection Limit	Compound name	Range	Unit	Detection Limit
Water	0 – 3	vol-%		α-Pinene <sup>2</sup>	0 – 50	ppm	0.04
Carbon Dioxide	0 – 2000	ppm		β-Pinene <sup>2</sup>	0 – 50	ppm	0.03
Carbon Monoxide <sup>1</sup>	0 – 200	ppm	0.25	3-Carene <sup>2</sup>	0 – 50	ppm	0.04
Nitrous Oxide	0 – 100	ppm	0.04	Formic Acid <sup>1</sup>	0 – 50	ppm	0.18
Nitrogen Monoxide	0 – 200	ppm	1.65	Acetic Acid <sup>1</sup>	0 – 50	ppm	0.07
Ammonia	0 – 50	ppm	0.13	Methyl Acetate <sup>6</sup>	0 – 50	ppm	0.01
Methane	0 – 100	ppm	0.11	Ethyl Acetate <sup>6</sup>	0 – 50	ppm	0.02
Ethane	0 – 50	ppm	1.06	2-Butoxyethyl Acetate <sup>6</sup>	0 – 50	ppm	0.02
Ethene	0 – 50	ppm	0.18	Acetaldehyde <sup>6</sup>	0 – 50	ppm	0.35
n-Propane	0 – 50	ppm	0.46	Acetone <sup>4</sup>	0 – 200	ppm	0.46
n-Butane	0 – 50	ppm	0.52	Methyl Ethyl Ketone <sup>6</sup>	0 – 50	ppm	0.14
Isopentane <sup>3</sup>	0 – 50	ppm	0.64	Methanol <sup>1</sup>	0 – 200	ppm	0.62
n-Hexane	0 – 50	ppm	0.49	Ethanol <sup>1</sup>	0 – 200	ppm	0.24
n-Octane	0 – 50	ppm	0.16	Isopropanol <sup>1</sup>	0 – 50	ppm	0.14
n-Propene	0 – 50	ppm	0.24	Dimethoxy Methane	0 – 50	ppm	0.05
Formaldehyde <sup>2</sup>	0 – 50	ppm	0.30	Ethylene Oxide <sup>7</sup>	0 – 50	ppm	0.40
Cyclohexane <sup>4</sup>	0 – 50	ppm	0.03	Carbon Disulfide <sup>8</sup>	0 – 200	ppm	0.80
Benzene <sup>4</sup>	0 – 50	ppm	0.60	Hydrogen Cyanide <sup>8</sup>	0 – 50	ppm	0.40
Toluene <sup>4</sup>	0 – 200	ppm	1.50	Methylene Chloride <sup>3</sup>	0 – 200	ppm	1.30
Styrene <sup>5</sup>	0 – 200	ppm	1.05	1,2-Dichloroethane <sup>3</sup>	0 – 200	ppm	0.80
Ethyl Benzene <sup>4</sup>	0 – 100	ppm	0.78	Chloropicrine <sup>8</sup>	0 – 20	ppm	0.50
m-Xylene <sup>4</sup>	0 – 200	ppm	0.90	<b>Methyl Bromide<sup>8</sup></b>	<b>0 – 200</b>	<b>ppm</b>	<b>0.90</b>
o-Xylene <sup>4</sup>	0 – 200	ppm	0.90	Ethylene Dibromide <sup>8</sup>	0 – 50	ppm	0.23
p-Xylene <sup>4</sup>	0 – 200	ppm	0.90	Sulfuryl Fluoride <sup>8</sup>	0 – 50	ppm	0.50
Limonene <sup>2</sup>	0 – 50	ppm	0.22	<b>Phosphine<sup>8</sup></b>	<b>0 – 50</b>	<b>ppm</b>	<b>1.00</b>

- 1) Foodstuff    2) Wood and plywood shipping materials    3) Refrigerant; kitchenware, A/C units    4) Solvents, plastic goods  
 5) Rubber shoes, tires    6) Inks, printed materials    7) Medical supplies    8) Fumigant

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