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Measuring New Fumigants with Dräger Tubes®

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Abstract: For more than 65 years, Dräger Safety is offering the well-known Dräger-Tubes®. The detection of gases and aerosols is the main focus with this system. Today, Dräger Safety offers more than 220 different tubes.

The Dräger Tubes® program works in an easy way, combining a precise pump with a glass tube filled with analytical chemicals. The measurement is made by drawing a defined volume of sample gas through the tube. Immediately after the measurement is finished, the concentration of the measured gas can be read on the detection layer of the tube. The chemical reaction inside the tube has left an easy-to-read stain.

A new application for our tubes is the testing of fumigated transport containers. There are strong regulations for the fumigation of containers in the worldwide shipping of goods in order to protect the importing countries from foreign insects. Harbour workers, truckers and customs people who have to open the containers for inspection may come into contact with significant concentrations of fumigants.

Dräger offers a lot of different tubes for the measurement of phosgene, methyl bromide, sulfuryl fluoride, chloropicrin, ethylformiate and MITC with different range of measurement. Also simultaneous measurements of different gases are possible.

Key words: Draeger tubes, gas detection

Introduction

Many containers are sprayed with different kinds of fumigants to protect them against pests or fungi. If such containers are not declared as fumigated, or are declared incorrectly, serious damage to health can result when the container is opened. The Dräger Safety fumigation kit is a quick and reliable means of detecting fumigants, allowing appropriate protective measures to be taken.

The Dräger Fumigation-Kit makes the inspection of containers for fumigation agents easy (figure 1). Even while the container is still sealed, the measurement can be performed quickly and safely-without the hazard of being exposed to the gases within the container. A measuring strategy, specially developed for this application, enables to determine the fumigant, even if the container has not been marked properly.

Portable and Fast

Based on the proven Dräger Tubes, the Dräger Fumigation-Kit contains all the essential equipment to find out whether a container has been fumigated. Within a few minutes, a statement can be made about the gas concentration within the container, and whether it has to be aerated. Even if the container has not been



Fig. 1 A worker during inspection of a container with Dräger Fumigation – Kit

marked, or the labeling is not legible, Dräger Safety has mapped out a fast and reliable measuring strategy as shown in figure 5. which enables to verify the fumigation agent, as shown in figure 2 and 3 and table 1, 2 and 3.

Easy to Use

For decades Dräger Tubes are renowned for their simplicity to use and their high accuracy. Without any training, the use of the Dräger Fumigation-Kit in combination with the especially for this application developed Dräger Tubes, leads to reliable results as shown in figure 2 and 3 and table 1, 2 and 3. Dräger Tubes are always on standby. All that is required are the suitable tubes, the hand-pump and the container-probe. Along with a color change within the tube, and the imprinted scaling, the actual concentration inside the container can be determined after a few strokes of the pump.

Large Number of Fumigants

Additionally to the top 3 fumigants (Formaldehyde, Methyl Bromide and Phosphine),

the Dräger Fumigation-Kit can be equipped with the newly developed Sulfuryl-Fluoride tube. The Dräger Fumigation-Kit makes the inspection of containers for fumigation agents easy. Even while the container is still sealed, the measurement can be performed quickly and safely-without the hazard of being exposed to the gases within the container. A measuring strategy, specially developed for this application, enables to determine the fumigant, even if the container has not been marked properly.

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Fig. 2 Simultaneous Tests Set Container Aeration I (81 03 380)

Table 1. detectable fumigants using Simultaneous Tests Set Container Aeration I (81 03 380)

Tube No	Substance	Sensitivity	Colour change
1	Formaldehyde	1 ppm	white à pink
2	Phosphine	0.3 ppm	yellow à red
3	Hydrocyanic Acid	10 ppm	yellow à red
4	Methyl Bromide	0.5 ppm	green à brown
5	Ethylenoxide	1 ppm	white à pink

Strokes;50/measurement time; approx. 4min

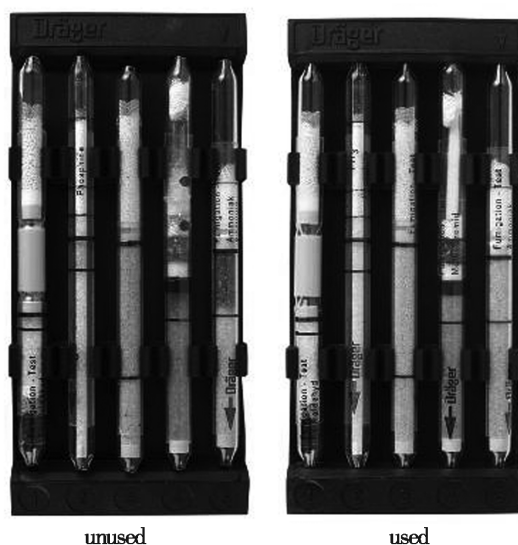


Fig. 3 Fumigation Tests Set I (81 03 410)

Table 2. detectable fumigants using Fumigation Tests Set I (81 03 410)

Tube No	Substance	Sensitivity	Colour change
1	Formaldehyde	1 ppm	white à pink
2	Phosphine	0.1 ppm	yellow à red
3	Hydrocyanic Acid	10 ppm	yellow à red
4	Methylbromide	5 ppm	green à brown
5	Ammonia	50 ppm	yellow à blue

Strokes;50/measurement time; approx. 3 min

Example for Single Gas Tubes

Dräger Tube Sufuryl Fluoride 1/a (81 03 471)

- Lowest detection range 0.8 ppm
- Scale from 1 to 5 ppm
- No cross sensitivities to other fumigants
- The only tube for Sulfuryl Fluoride in the market
- Unique technique with a hot layer in the pre tube



Draeger Tube Methyl Bromide 0,2/a (81 03391)

- Lowest detection range in the market
- No cross sensitivity to other fumigants, except Ethylen Dibromide
- Detection range is required by European countries (Netherlands)



Draeger Tube Chloropicrin 0.1/a (81 03421)

Lowest detection range in the market
No cross sensitivity to other fumigants, except Ethylen Dibromide Detection range is required by European countries(Netherlands)



Draeger Tube Methylisothiocyanate 0.1/a (81 03485)

Field of application is the replacement of Methyl Bromide used in the ground fumigation for pest control



Draeger Tube Ethyl Formate 20/a (81 03541)

The first ethyl formate tube in the market
No cross sensitivity to 500 ppm CO₂ and 10 ppm CO



Summary

All important fumigants and TIC can be detected by Draeger Tubes. This is the simplest and easiest way of detection. Table 3 gives an overview about the possibilities for single gas measurement.

Table 3

Fumigant	Range of Draeger Tubes
Ammonia (NH ₃)	0.25 ppm – 10 Vol %
Benzene (C ₆ H ₆)	0.5 – 60 ppm
Carbon Dioxide (CO ₂)	100ppm – 60 Vol%
Carbon Monoxide (CO)	2 ppm – 7 Vol %
Chloropicrin (CCL ₃ NO ₂)	0.1 – 2 ppm
1,2 Dichloroethane (C ₂ H ₄ Cl ₂)	2 – 10 ppm *

Fumigant	Range of Draeger Tubes
1,3 Dichlorpropene (C ₃ H ₄ Cl ₂)	0.1 – 10 ppm
Ethylene Oxide (C ₂ H ₄ O)	1 – 500 ppm
Ethyl Formate (HCOOC ₂ H ₅)	20 – 500 ppm
Formaldehyde (HCHO)	0.04 – 40 ppm
Hydrocyanic Acid (HCN)	2.5 – 150 ppm
Methylbromide (CH ₃ Br)	0.2 – 50 ppm
Methylisothiocyanate (CH ₃ NCS)	0.1 – 6 ppm
Phosphine (PH ₃)	0.01 – 10 000 ppm
Sulfuryl Fluoride (SO ₂ F ₂)	1 – 5 ppm

* tube Methylbromide 0.2/a

Fig. 4

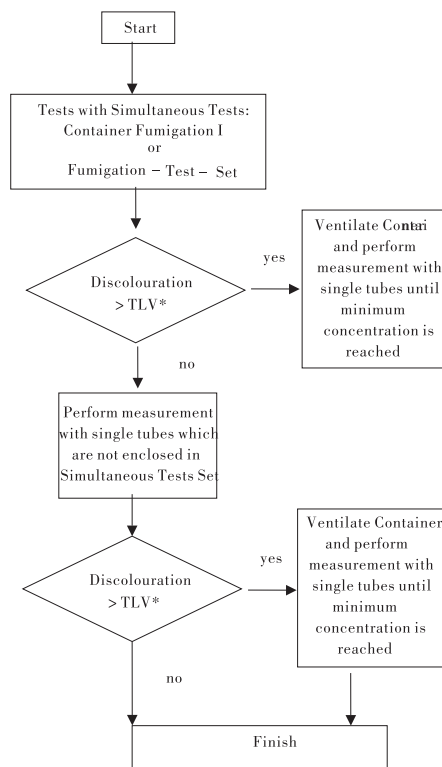


Fig. 5 Measurement strategy to detect unknown fumigants; * TLV = Threshold Limit Values