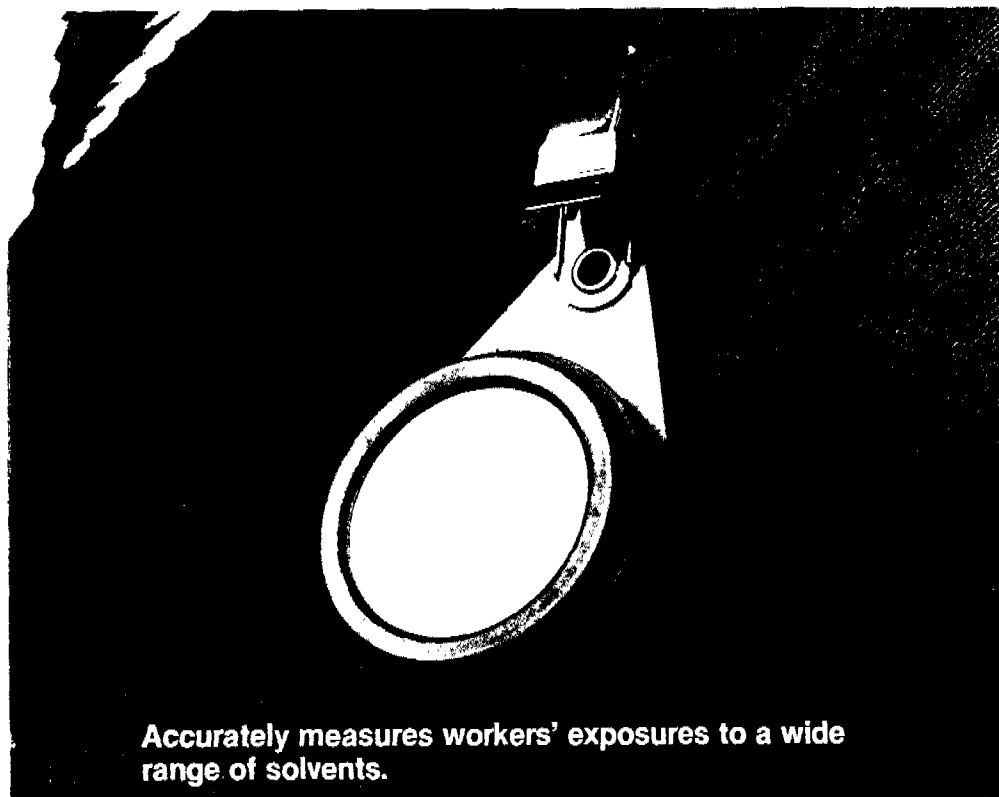


3M MASTER FILE COPY
Organic Vapor Monitors
#3500/3510
Instructions for Use
OBSOLETE



3M 103883

3M

Notice to User:

The air samplers described herein, if properly used according to the instructions, meet or exceed the accuracy requirements outlined in those applicable regulations now in effect under the Occupational Safety and Health Act of 1970 (29 U.S.C. 641-678). If you have any questions concerning the use of these products, Contact OH&SP Technical Service on (1-800-328-1300).

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3M Brand Organic Vapor Monitors #3500/3510

I. General Product Description

The 3M Brand Organic Vapor Monitor #3500 is a sampling badge to be worn near the breathing zone of personnel exposed to potentially hazardous organic vapor environments. It is designed to measure average concentrations over a measured time interval of 8 hours or less. The monitor requires no sampling pump. It is analyzed using techniques similar to those outlined in NIOSH Physical & Chemical Analytical Method 127 for

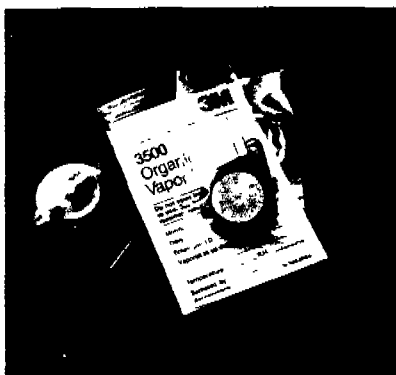
charcoal tubes. Analytical assay is correlated to environmental contaminant concentrations using data supplied by 3M Company.

* The 3500 monitor is designed to be analyzed by the user or by an independent laboratory. The 3510 is the same monitor but also includes a pre-paid analysis service from 3M for up to three compounds per monitor.

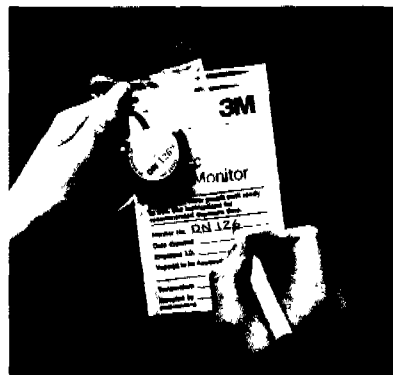
II. Principle of the Method

- 1 The contaminant enters the monitor by diffusion and is adsorbed by an active adsorbent medium (charcoal) inside the badge. The amount of contaminant adsorbed is determined by exposure time and contaminant concentration present in the sampled environment.
- 2 A measured volume of a suitable solvent is added to the monitor to desorb the collected organic vapors.
- 3 A portion of the desorbing solvent, containing the organic contaminants, is withdrawn from the monitor and analyzed by gas chromatography.
- 4 The weight of organic contaminant, determined by G.C. analysis, is converted to time weighted average exposure; using data supplied in the 3M Compound Guide and Calculation Guide. This product information may be obtained by completing the reply card found in each instruction guide.

III. Monitoring Instructions



1. The monitor and closure cap are packaged in a resealable bag. Shipping carton can be used to mail exposed monitors to the lab for analysis. Individual 3510 monitors can be sent to 3M in pre-paid mailers supplied.

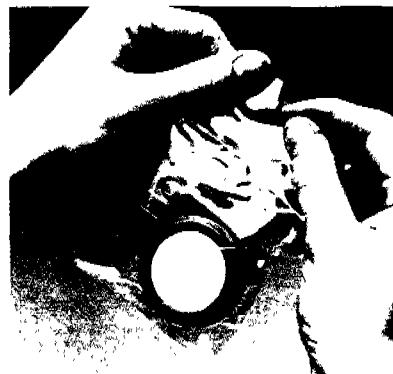


3. Before removal of monitor from clear pouch, record the following on resealable bag and your data log.

- a) Monitor code from monitor back label
- b) Date of sampling
- c) Employee or area code
- d) Compounds to be analyzed for
- e) Temperature and relative humidity



2. The monitor itself is contained in a clear plastic pouch. **DO NOT REMOVE MONITOR FROM CLEAR POUCH UNTIL READY TO START SAMPLING.**



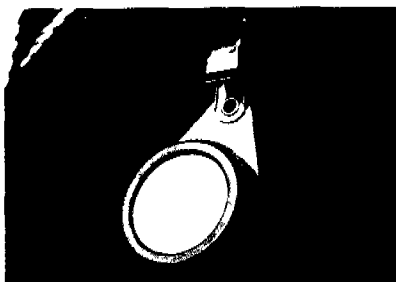
4. Remove monitor from clear pouch by tearing at notch above pouch seal.



5. Record start time on back label of the monitor. MOVE TO STEP 6 IMMEDIATELY.



8. Snap closure cap firmly onto monitor body. Be sure the two port plugs are firmly seated. SAMPLING IS NOW TERMINATED.



6. Attach monitor to employee as near to the breathing zone as possible. DO NOT REMOVE WHITE FILM AND PLASTIC RING.

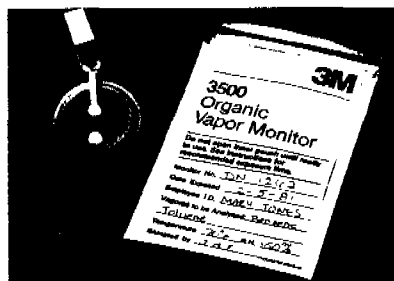


9. Record END TIME on back label of the monitor and on your data log.

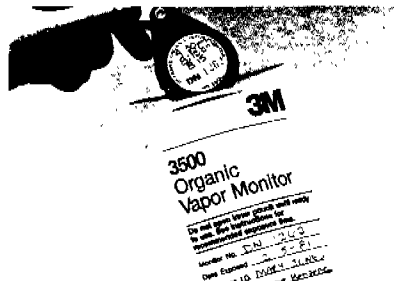


7. After sampling period is ended, remove plastic ring and white film. MOVE TO STEP 8 IMMEDIATELY.

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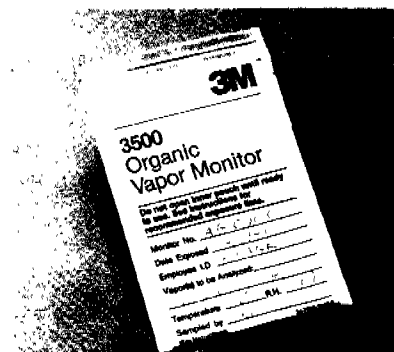


10. In spaces provided, record sampler number from back of sampler, date of sampling, employee I.D., Compound(s) to be analyzed, temperature & relative humidity, if extreme.



11. Return monitor to resealable bag with matching monitor code number. Return bags to mailers, seal and send to laboratory for analysis. **KEEP MONITORS IN AN AREA FREE OF ORGANICS.**

IV. Preparation of Blanks



1. A blank is a control sample monitor that tells the laboratory analyst if any background contamination is present due to the handling of the monitors in the actual work environment.

2. Prepare a blank for each separate set of exposed monitors as follows. Refer to Section III, Monitoring Instructions.

- At the monitoring site, remove a monitor from the clear pouch (Sec. III, Step 4).
- Immediately remove the white film and plastic ring and replace with closure cap (Sec. III, Steps 7 & 8).
- Return monitor to its resealable bag and label bag "Blank". Record monitor code numbers for which this monitor serves as the Blank.
- Submit the blank, along with exposed monitors, to the laboratory for analysis.

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V. List of Recommended Compounds for the #3500/3510 Organic Vapor Monitors

A list of compounds suitable for measurement by the monitor are found below. The complete compound guide notebook can be obtained by completing the card in each instruction booklet. For compounds not on this list, consult OH&SP Technical Service 612/733-6234.

Based on laboratory testing of over 70 organic vapors with the 3500 monitor, and based on the similar chemical nature of organic vapors and their adsorption on charcoal, OH&SP recommends the 3500 for use in monitoring the more than 135 organic vapors listed in the NIOSH/OSHA Pocket Guide to Chemical Hazards (DHEW publication No. 78-210).

* Acetone	Diethyl Phthalate	Mesitylene
Acetonitrile	Diglycidyl Ether	* Methyl Acetate
Acrylonitrile	Diisobutyl Ketone (DIBK)	Methyl Acrylate
Allyl Alcohol	Dimethyl Formamide (DMF)	* Methylal (Dimethoxy Methane)
Allyl Chloride	Dioxane	Methyl Butyl Ketone (MBK)
Amyl Acetate	Dipropylene Glycol Methyl Ether	Methyl Cellosolve
iso - Amyl Acetate	Enflurane (2-Chloro-1,2,2-	Methyl Cellosolve Acetate
n - Amyl Alcohol	Trifluoroethyl Difluoromethyl	* Methyl Chloroform
iso - Amyl Alcohol	Ether)	(1,1,1-Trichloroethane)
sec - Amyl Alcohol	Epichlorohydrin	Methyl Cyclohexane
Benzene	* Ethyl Acetate	Methyl Cyclohexanone
Benzyl Chloride	Ethyl Acrylate	Methyl Cyclohexanol
Bromoform	* Ethyl Alcohol	Methyl (n-amy) Ketone
* Butadiene	Ethyl (sec-Amyl) Ketone	Methyl Ethyl Ketone (MEK)
Butyl Acetate	Ethyl Benzene	Methyl Isobutylcarbinol
iso - Butyl Acetate	* Ethyl Bromide	Methyl Isobutyl Ketone (MIBK)
sec - Butyl Acetate	Ethyl Butyl Ketone	Methyl Methacrylate
tert - Butyl Acetate	(3-Heptanone)	Methyl Propyl Ketone
Butyl Alcohol	* Ethyl Chloride	alpha - Methyl Styrene
iso - Butyl Alcohol	Ethylene Chlorohydrin	Naphthalene
sec - Butyl Alcohol	* Ethylene Dibromide	n - Octane
tert - Butyl Alcohol	(1,2-Dibromoethane)	* Pentane
Butyl Cellosolve	* Ethylene Dichloride	Perchloroethylene
Butyl Glycidyl Ether	(1,2-Dichloroethane)	Phenyl Ether
p - tert - Butyl Toluene	* Ethyl Ether	Phenyl Glycidyl Ether
Camphor	* Ethyl Formate	Propyl Acetate
Carbon Tetrachloride	* Freon 112	Propyl Alcohol
Cellosolve	* Freon 113	* Isopropyl Acetate
Cellosolve Acetate	* Freon 114	Isopropyl Alcohol
Chlorobenzene	* Freon 115	Isopropyl Ether
o - Chlorostyrene	* Freon 116	Isopropyl Glycidyl Ether
o - Chlorotoluene	* Freon 12B2	Propylene Dichloride
* Chlorobromomethane	* Freon 13B1	n - Propylnitrate
Chloroform	Furfural	Stoddard Solvent
1 - Chloro - 1 - Nitro Propane	Furfuryl Alcohol	Styrene
Chloroprene	Glycidol	1,1,2,2-Tetrachloroethane
Cumene	Halothane (2-Bromo-2-Chloro-	Tetrahydrofuran (THF)
Cyclohexane	-1,1,1-Trifluoroethane)	1,2,4-Trichlorobenzene
Cyclohexanol	Heptane	Toluene
Cyclohexanone	Hexane	1,1,2-Trichloroethane
Cyclohexene	Hexachloroethane	Trichloroethylene
Cyclopentadiene	Isophorone	1,2,3-Trichloropropane
Diacetone Alcohol	* Isopropyl Acetate	* Vinyl Chloride
o - Dichlorobenzene	Isopropyl Alcohol	* Vinylidene Chloride
p - Dichlorobenzene	* Isopropyl Ether	Vinyl Toluene
Dichloroethyl Ether	Isopropyl Glycidyl Ether	Xylene
Dichloromethane	Mesityl Oxide	
(Methylene Chloride)		

* Because of their high vapor pressures (low boiling points), the starred (*) compounds are best sampled initially with the 3M #3520 Monitor (with Backup Section). Subsequent sampling may be done with the 3M 3500/3510 Monitor if determined, by #3520 results, that contaminant concentrations are within the 3500/3510 capacity limits.

VIII. Calculation Procedures

1. Using gas chromatography analysis methods, determine the weight of each contaminant present on the monitor in milligrams.
2. Correct the weight by subtracting out the number of milligrams, if any, found in the blank sample for each individual contaminant.
3. Determine the recovery efficiency for each contaminant. The procedure found in the #3500 Compound Guide Notebook titled, "Recommended Procedure for Determination of Recovery Coefficients" should be utilized. To obtain this information, please send the reply card found on the back page of Instruction Booklet
4. Using the Organic Vapor Monitor #3500 Compound Guide, determine the sampling rate for each contaminant.
5. Determine the sampling time in minutes for the contaminants from the back label of the exposed monitor.
6. Calculate the contaminant concentration using the following equations:

$$\frac{\text{mg}}{\text{m}^3} = \frac{(W) (10^6 \text{ cm}^3/\text{m}^3)}{(r) (K_0) (t)}$$

Where:

W = Corrected weight in milligrams
 r = Recovery (Desorption) efficiency
 K₀ = Monitor Sampling rate, cm³/min.
 t = Sampling time, minutes

7. To calculate concentration in ppm at reference conditions of 298°K and 760 mm.Hg. use the following equation:

$$\text{ppm} = \frac{\text{mg}}{\text{m}^3} \times \frac{24.45}{\text{MW}}$$

Where:

MW = Molecular weight, g./mole

The above equations calculate concentrations that can be strictly compared to OSHA standards only if the temperature during sampling was

298°K (25°C or 77°F). If sampling temperature is significantly different than 298°K, then a correction can be applied as follows:

Temperature corrected concentration C₀

$$C_0 = \frac{\text{mg}}{\text{m}^3} \times \left(\frac{298^\circ\text{K}}{T_s} \right)^{1/2}$$

$$C_0 = \text{ppm} \times \left(\frac{298^\circ\text{K}}{T_s} \right)^{1/2}$$

Where:

T_s = Temperature at Sample Site in °K.

This correction eliminates an error of approximately 1% for every 10°F (5.6°C) increment above or below 77°F (25°C).

See the 3M Brand Organic Vapor Monitor #3500 Calculation Guide for complete details and example calculations.

8. #3500 CALCULATION GUIDE

The #3500 Calculation Guide is designed for the customer involved in the analysis of the #3500 by the gas chromatograph. The #3500 Calculation Guide describes in detail the steps involved in calculating parts per million (ppm) or milligrams per cubic meter (mg/m³), when analysis and result tabulation are performed by the customer. The Guide also includes a discussion on diffusion theory and a derivation of the equations in the calculation procedures.

The #3500 CALCULATION GUIDE is part of Section Three of the #3500 COMPOUND GUIDE NOTEBOOK -LABORATORY PROCEDURES.

Notice:

3M disclaims responsibility for any comparison of test data to any existing or future health and safety standard regulating exposures to organic vapor as to whether such standards are or are not adequate to insure the safety of persons or property. 3M warrants only the accuracy of the sampling/analytical methods and the data obtained thereby.

IX. Organic Vapor Monitor #3500 Compound Guide Notebook

The 3M Brand Organic Vapor Monitor #3500 is analyzed using techniques similar to those outlined in NIOSH Physical and Chemical Analytical Method 127 for charcoal tubes.

To save time and help assure analysis accuracy, the 3M Laboratory provides the data required to accurately determine the Time Weighted Average concentration. The monitor is designed to measure TWA concentrations over a sampling period of 8 hours or less.

The constant sampling rate (cc/min.), the recovery coefficient, and other important analysis factors are provided in the Compound Guide Notebook.

Please complete information below, remove card and send to 3M in order to receive your copy of the 3500 Compound Guide Notebook.

Please register me for an Organic Vapor Monitor #3500 Compound Guide Notebook, as well as all future data sheets.

CHECK ONE:

☐ Send the data binder to me.

☐ Instead, send the binder directly to the laboratory named below.

Your Name _____
Title _____ Phone _____
Company Name _____
Address _____
City _____ State _____ Zip _____
Other compounds you wish to monitor. _____

Name of Laboratory
to Receive Binder _____
Name of Person _____
Address _____
City _____ State _____ Zip _____

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Important Notice

WARRANTY: In the event any 3M OH&SP product is found to be defective in material, workmanship, or not in conformance with any express warranty for a specific purpose, 3M's only obligation and your exclusive remedy shall be to repair, replace, or refund the purchase price of such parts or products upon timely notification thereof and substantiation that the product has been stored, maintained and used in accordance with 3M's written instructions.

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FOR MORE INFORMATION and assistance on 3M Brand Health and Safety Products, contact your local 3M representative or call OH&SP Technical Service Toll Free, 1-800-328-1300. In Minnesota call (612)733-6234. In Canada, contact 3M Canada Inc., P.O. Box 5757, Terminal A, London, Ontario, Canada N6A4T1 (519)451-2500.

R-3500/3510 U14-P (445)C/NC

Litho in U.S.A.

Occupational Health & Safety Products Division/3M

220-7W, 3M Center, St. Paul, MN 55144

Monitor Analysis Service (#3510, USA only)

230-B, 3M Center, St. Paul, MN 55144

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