CHROMAIR®

Operating Instructions
Ammonia Badge
(Part Number: 380003)

Introduction

Ammonia is a colorless gas with a sharp, irritating odor. It is a typical respiratory and eye irritant. Depending on the concentration, it may cause burning sensations, coughing, wheezing, headaches and conjunctivitis. High exposures cause caustic skin burns, eye swelling with possible loss of vision, shortness of breath and nausea. Ammonia causes chemical pneumonitis (deep lung inflammation) and pulmonary edema (abnormal fluid buildup in the lungs). OSHA PEL (permissible exposure limit) for general industry is 50 ppm (TWA). NIOSH REL (recommended exposure limit) for ammonia is 25 ppm (TWA).

Ammonia is a commonly used chemical. As a product of normal biodegradation of bio products, it is spread as a pollutant in poultry plants and animal farms. Ammonia is used in the production of nitric acid, ammonia salts, fertilizers, leather, cooling and freezing systems, cleaning liquids, etc.

Principle of Operation

The ChromAir passive monitor is a patented direct-read autogenic exposimeter. The device is constructed from six cells attached on one side to a flat indicator layer and on the other side to a series of different diffusive resistances. Ammonia gas diffuses to the cells through the different diffusive resistances and reacts with the indicator layer, producing color change from tan to beige to black. The color produced on the indicator layer is a direct measure of the exposure dose. Visual color comparison is achieved by observing the formation of the beige threshold color on the individual cell and reading the corresponding exposure dose.

Physical Specifications:

Dimensions	10.5 cm x 5.5 cm x 0.25 cm
Weight	11 g
Refrigerated shelf life	1 year
Color change	tan to black*

**Final color is humidity dependent. Low humidity final color is black, high humidity final color is green/black.*

Sampling Parameters:

Exposure Dose Range	4 - 300 ppm•hr
Maximum recommended sampling time	16 hours
Minimum recommended sampling time	5 minutes
Relative humidity range	15% - 90%
Face velocity range	10 - 168 cm/sec
Temperature range	10ºC - 40ºC (50ºF - 104ºF)
Light effect - UV (direct sunlight)	not recommended*
Light effect - visible	no effect
Known Interferences	aliphatic amines

*The back of the badge (viewing area) ***should not*** be exposed to direct sun light at any time.

Operating Instructions

1. Allow the badge to warm to room temperature prior to removing the badge from its protective pouch
3. Enter all pertinent information on the label before monitoring is started (i.e. name, location, date and start time).
4. For personnel monitoring, attach the badge near the user's breathing zone (i.e. collar) with the front side exposed to the surrounding atmosphere.
5. For area monitoring, attach the badge to a stand and mount in a centralized area with the front side exposed to the surrounding atmosphere.
6. Check the back side of the badge periodically to determine the exposure dose (ppm•hr).
7. To read the badge, locate the highest level cell with beige threshold color.
8. To obtain the average concentration (ppm) in the surrounding atmosphere, divide the exposure dose (ppm•hr) by the exposure time in hours.
   EXAMPLE: If the sampling time is 2 hours and the badge reads 4 ppm•hr, the average concentration is determined by:
   $\frac{4\ \text{ppm•hr}}{2\ \text{hr}}$ Therefore the average concentration is 2 ppm.

WARRANTY EXCLUSIONS AND LIMITATION OF LIABILITY

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Warning: Keep out of reach of children, if ingested seek medical attention immediately.

MORPHIX TECHNOLOGIES

www.morphtec.com

Publication Number: 03-380003A.14-0921
US Patent Number: 5,364,593

CHROMAIR®

Operating Instructions
Carbon Monoxide Badge
(Part Number: 380008)

Introduction

Carbon monoxide is a colorless, odorless gas. It is a commonly used industrial gas which is both highly toxic and odorless. Symptoms of exposure to carbon monoxide include headaches, palpitations, dizziness, weakness and nausea. Low levels of carbon monoxide in air, which is not immediately hazardous to life, may impair reaction time or sensory perception. Chronic exposure to low levels of carbon monoxide may adversely affect the cardiovascular system. Loss of consciousness and death may result from continued or more intense exposure. OSHA PEL (permissible exposure limit) for carbon monoxide is 50 ppm (TWA). NIOSH REL (recommended exposure limit) for carbon monoxide is 35 ppm (TWA).

Carbon monoxide is a widely spread air pollutant. It is a byproduct in the combustion of gasoline, diesel, kerosene and coal fuel; therefore, carbon monoxide may exist in different industries, residential areas and highways.

Principle of Operation

The ChromAir passive monitor is a patented direct-read autogenic exposimeter. The device is constructed from six cells attached on one side to a flat indicator layer and on the other side to a series of different diffusive resistances. Carbon monoxide gas diffuses to the cells through the different diffusive resistances and reacts with the indicator layer, producing color change from light brown to brown to black. The color produced on the indicator layer is a direct measure of the exposure dose. Visual color comparison is achieved by observing the formation of the brown threshold color on the individual cell and reading the corresponding exposure dose.

Physical Specifications:

Dimensions	10.5 cm x 5.5 cm x 0.25 cm
Weight	11 g
Shelf life – **Must be Stored <32ºF/0ºC**	1 year
Color change	light brown to dark
brown/black	

Sampling Parameters:

Exposure Dose Range	10 - 525 ppm•hr
Maximum recommended sampling time	48 hours
Minimum recommended sampling time	5 minutes
Relative humidity range	19% - 85%
Face velocity range	10 - 165 cm/sec
Temperature range	10ºC - 45ºC (50ºF - 113ºF)
Light effect - UV (direct sunlight)	no effect
Light effect - visible	no effect
Known Interferences	alkenes, hydrogen sulfide, and hydrogen

Operating Instructions

1. Allow the badge to warm to room temperature prior to removing the badge from its protective pouch.
2. Enter all pertinent information on the label before monitoring is started (i.e. name, location, date and start time).
3. Prior to exposure, remove the protective strip from the first cell on the front of the badge.
4. For personnel monitoring, attach the badge near the user's breathing zone (i.e. collar) with the front side exposed to the surrounding atmosphere.
5. For area monitoring, attach the badge to a stand and mount in a centralized area with the front side exposed to the surrounding atmosphere.
6. Check the back side of the badge periodically to determine the exposure dose (ppm•hr).
7. To read the badge, locate the highest level cell with brown threshold color.
8. To obtain the average concentration (ppm) in the surrounding atmosphere, divide the exposure dose (ppm•hr) by the exposure time in hours. EXAMPLE: If the sampling time is 2 hours and the badge reads 10 ppm•hr, the average concentration is determined by:

   $\frac{10 \text{ ppm•hr}}{2 \text{ hr}}$ Therefore the average concentration is 5 ppm.

WARRANTY EXCLUSIONS AND LIMITATION OF LIABILITY

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Warning: Keep out of reach of children, if ingested seek medical attention immediately.

MORPHIX TECHNOLOGIES

www.morphtec.com

Publication Number: 03-380008A.15-020224
US Patent Number: 5,364,593

CHROMAIR®

Operating Instructions
Chlorine Badge
(Part Number: 380004)

Introduction

Chlorine is a greenish-yellow gas with a pungent, irritating odor. Generally, chlorine is a potent respiratory system irritant. Mild exposures to chlorine cause burning of eyes, nose and mouth. Exposure to high concentrations (e.g. 1000 ppm) is likely to be fatal. The NIOSH REL (recommended exposure limit) for chlorine is 0.5 ppm (ceiling), whereas the OSHA PEL (permissible exposure limit) is 1ppm (ceiling).

Chlorine is an important chemical commodity widely used in the production of safe drinking water. It is also extensively used in the production of paper products, dyestuffs, textiles, petroleum products, chlorinated solvents, etc.

Principle of Operation

The ChromAir passive monitor is a patented direct-read autogenic exposimeter. The device is constructed from six cells attached on one side to a flat indicator layer and on the other side to a series of different diffusive resistances. Chlorine gas diffuses to the cells through the different diffusive resistances and reacts with the indicator layer, producing color change from yellow to orange. The color produced on the indicator layer is a direct measure of the exposure dose. Visual color comparison is achieved by observing the formation of the orange threshold color on the individual cell and reading the corresponding exposure dose.

Physical Specifications:

Dimensions	10.5 cm x 5.5 cm x 0.25 cm
Weight	11 g
Refrigerated shelf life	1 year
Color change	yellow to orange

Sampling Parameters:

Exposure Dose Range	0.4 - >13 ppm•hr
Maximum recommended sampling time	2 days
Minimum recommended sampling time	15 minutes
Relative humidity range	35% - 85%
Face velocity range	5 - 150 cm/sec
Temperature range	10ºC - 35ºC (59ºF - 95ºF)
Light effect - UV (direct sunlight)	no effect
Light effect - visible	no effect
Known Interferences	bromine, iodine and hydrogen chloride

Operating Instructions

1. Allow the badge to warm to room temperature prior to removing the badge from its protective pouch.
2. Enter all pertinent information on the label before monitoring is started (i.e. name, location, date and start time).
3. For personnel monitoring, attach the badge near the user's breathing zone (i.e. collar) with the front side exposed to the surrounding atmosphere.
4. For area monitoring, attach the badge to a stand and mount in a centralized area with the front side exposed to the surrounding atmosphere.
5. Check the back side of the badge periodically to determine the exposure dose (ppm•hr).
6. To read the badge, locate the highest level cell with orange threshold color.
7. To obtain the average concentration (ppm) in the surrounding atmosphere, divide the exposure dose (ppm•hr) by the exposure time in hours. EXAMPLE: If the sampling time is 2 hours and the badge reads 4 ppm•hr, the average concentration is determined by:
   $\frac{4 \text{ ppm•hr}}{2 \text{ hr}}$ Therefore the average concentration is 2 ppm.

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Warning: Keep out of reach of children, if ingested seek medical attention immediately.

MORPHIX TECHNOLOGIES

www.morphtec.com

Publication Number: 03-380004A.15-0323
US Patent Number: 5,364,593

CHROMAIR®

Operating Instructions
Formaldehyde Badge
(Part Number: 380007)

Introduction

Formaldehyde is a colorless gas with a pungent, suffocating odor. It is a potent irritant to eyes, nose and throat. The most common effects of low level formaldehyde inhalation are eye, nose and upper respiratory irritation. Chronic symptoms of exposure are itching eyes, dry and sore throat, and possible difficulty in sleeping and unusual thirst after awakening. OSHA PEL (permissible exposure limit) for formaldehyde is 0.75 ppm (TWA). NIOSH REL (recommended exposure limit) is 0.016 ppm (TWA). NIOSH also recommends that formaldehyde be handled as a potential occupational carcinogen in the workplace.

Formaldehyde workplace exposure occurs because of its extensive use as an industrial chemical in the manufacturing of resins for adhesives, plastics, coatings and fabrics. Additional exposure to formaldehyde emissions comes from its use as a fumigant and sterilant. The major source of atmospheric discharge of formaldehyde is from combustion processes, specifically from the photo-oxidation of hydrocarbons in auto emissions.

Principle of Operation

The ChromAir passive monitor is a patented direct-read autogenic exposimeter. The device is constructed from six cells attached on one side to a flat indicator layer and on the other side to a series of different diffusive resistances. Formaldehyde gas diffuses to the cells through the different diffusive resistances and reacts with the indicator layer, producing color change from yellowish-brown to brown. The color produced on the indicator layer is a direct measure of the exposure dose. Visual color is achieved by observing the formation of the brown threshold color on the individual cell and reading the corresponding exposure dose.

Physical Specifications:

Dimensions	10.5 cm x 5.5 cm x 0.25 cm
Weight	11 g
Refrigerated shelf life	1 year
Color change	yellowish-brown to brown

Sampling Parameters:

Exposure Dose Range	0.3 - 12 ppm•hr
Maximum recommended sampling time	2 days
Minimum recommended sampling time	15 minutes
Relative humidity range	30% - 80%
Face velocity range	5 - 150 cm/sec
Temperature range	16ºC - 35ºC (61ºF - 95ºF)
Light effect - UV (direct sunlight)	no effect
Light effect – visible	no effect
Known Interferences	acrolein

Operating Instructions

1. Allow the badge to warm to room temperature prior to removing the badge from its protective pouch.
2. Enter all pertinent information on the label before monitoring is started (i.e. name, location, date and start time).
3. For personnel monitoring, attach the badge near the user's breathing zone (i.e. collar) with the front side exposed to the surrounding atmosphere.
4. For area monitoring, attach the badge to a stand and mount in a centralized area with the front side exposed to the surrounding atmosphere.
5. Check the back side of the badge periodically to determine the exposure dose (ppm•hr).
6. To read the badge, locate the highest level cell with brown threshold color.
7. To obtain the average concentration (ppm) in the surrounding atmosphere, divide the exposure dose (ppm•hr) by the exposure time in hours. EXAMPLE: If the sampling time is 2 hours and the badge reads 2 ppm•hr, the average concentration is determined by:

   $\frac{2 \text{ ppm•hr}}{2 \text{ hr.}}$ Therefore the average concentration is 1 ppm.

WARRANTY EXCLUSIONS AND LIMITATION OF LIABILITY

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Warning: Keep out of reach of children, if ingested seek medical attention immediately.

MORPHIX TECHNOLOGIES

www.morphtec.com

Publication Number: 03-380007A.15-0921
US Patent Number: 5,364,593

CHROMAIR®

Operating Instructions
Glutaraldehyde Badge
(Part Number: 380017)

Introduction

Glutaraldehyde is a colorless liquid with an irritating odor. It has an odor threshold in the ppb level. Glutaraldehyde may be fatal if inhaled, swallowed or absorbed through the skin. Symptoms of exposure may include burning sensations, headache, coughing, shortness of breath, nausea and vomiting. To the best of our knowledge, toxicological, chemical and physical properties have not been thoroughly studied. NIOSH STEL is 0.2 ppm.

Glutaraldehyde is used extensively in the medical field. It is used in hospitals for cold sterilization of medical supplies and instruments. Glutaraldehyde is also used as a disinfectant in urology, endoscopy and dental departments.

Principle of Operation

The ChromAir passive monitor is a patented direct-read autogenic exposimeter. The device is constructed from five cells attached on one side to a flat indicator layer and on the other side to a series of different diffusive resistances. Glutaraldehyde vapor diffuses to the cells through the different diffusive resistances and reacts with the indicator layer, producing color change from pink to violet. The color produced on the indicator layer is a direct measure of the concentration in ppm. Visual color comparison is achieved by observing the formation of the violet threshold color on the individual cell and reading the corresponding concentration.

Physical Specifications:

Dimensions	10.5 cm x 5.5 cm x 0.25 cm
Weight	11 g
Refrigerated shelf life	1 year
Store badges refrigerated at all times.	
Color change	pink to violet

Sampling Parameters:

Exposure Dose Range	0.04 - 0.95 ppm
Relative humidity range	25% - 85%
Face velocity range	10 - 165 cm/sec
Temperature range	15ºC - 35ºC (59ºF - 95ºF)
Light effect - UV (direct sunlight)	no effect
Light effect – visible	no effect
Known Interferences:	No interferences are known

Operating Instructions

1. Allow the badge to warm to room temperature prior to removing the badge from its protective pouch.
2. Enter all pertinent information on the I.D. label before monitoring is started (i.e. name, location, date and start time).
3. Remove the scavenger strip from the front of the badge.
4. For personnel monitoring, attach the badge near the user's breathing zone (i.e. collar) with the front side exposed to the surrounding atmosphere.
5. For area monitoring, attach the badge to a stand and mount in a centralized area with the front side exposed to the surrounding atmosphere.
6. Expose the badge 15 minutes.
7. At the end of the exposure period (15 minutes), ***return the badge to its original pouch and let stand for 45 minutes at room temperature to allow complete development of color. Read the badge no later than 3 hours after exposure.***

8.. At the end of the development period, locate the highest level cell with violet threshold color and read the corresponding average concentration from the scale.

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Warning: Keep out of reach of children, if ingested seek medical attention immediately.

MORPHIX TECHNOLOGIES

www.morphtec.com

Publication Number: 03-380017A.15-0921
US Patent Number: 5,364,593

CHROMAIR®

Operating Instructions
Mercury Badge
(Part Number: 380018)

Introduction

Mercury is a silver-white, heavy, mobile, liquid metal with no specific odor. It is readily absorbed through the skin, the gastrointestinal tract and the respiratory tract. Chronic exposure may cause inflammation of the mouth and gums, kidney damage, muscle tremors, depression and nervousness. Mercury spills and heated mercury are particularly hazardous. OSHA PEL (permissible exposure limit) in the general industry for mercury is .1 mg/10 m^3(TWA). NIOSH REL (recommended exposure limit) for mercury is 0.05 mg/m^3 (TWA).

Mercury is used in barometers, thermometers, hydrometers, pyrometers, and in mercury arc lamps producing ultraviolet rays. It is also used in pharmaceuticals, agricultural chemicals and antifouling paints.

Principle of Operation

The ChromAir badge is a patented direct-read colorimetric device to indicate the presence of mercury at relevant exposure doses. The badge is constructed from five cells attached on one side to a colorimetric sensor and on the other side to a series of different diffusive resistances. Mercury vapor diffuses through the different diffusive resistances and reacts with the sensor, producing color change from white to purple. The color produced on the sensor is a direct measure of the exposure dose. Observe the formation of the threshold color on the individual cell and read the corresponding exposure dose.

Physical Specifications:

Dimensions	10.5 cm x 5.5 cm x 0.25 cm
Weight	11 g
Shelf life (<45ºF/7ºC)	1 year
Color change	white to purple

Sampling Parameters:

Exposure dose range	0.125 – 1.6 mg/m^3•hr
Maximum recommended sampling time	12 hours
Minimum recommended sampling time	15 minutes
Relative humidity range	10% - 85%
Face velocity range	5 - 150 cm/sec
Temperature range	12ºC - 39ºC (54ºF-102ºF)
Light effect - UV (direct sunlight)	not recommended
Light effect - visible	no effect
Known Interferences:	arsine, phosphine (hydrides)

Operating Instructions

1. Allow the badge to warm to room temperature prior to removing the badge from its protective pouch.
2. Enter all pertinent information on the label before monitoring is started (i.e. name, location, date and start time).
3. For personnel monitoring, attach the badge near the user's breathing zone (i.e. collar) with the front side exposed to the surrounding atmosphere.
4. For area monitoring, attach the badge to a stand and mount in a centralized area with the front side exposed to the surrounding atmosphere.
5. Check the back side of the badge periodically to determine the exposure dose (mg/m^3•hr).
6. To read the monitor, locate the highest level cell with threshold color.
7. To obtain the average concentration (mg/m3), divide the exposure dose (mg/m3•hr) by the exposure time in hours. Example: If the sampling time is 2 hours and the badge reads 0.5 mg/m3•hr, the average concentration is determined by:

$$\frac{0.5 \text{ mg/ m}^3\text{•hr}}{2\text{hr}}$$

Therefore the average concentration is 0.25 mg/m^3.

WARRANTY EXCLUSIONS AND LIMITATION OF LIABILITY

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Warning: Keep out of reach of children, if ingested seek medical attention immediately.

MORPHIX TECHNOLOGIES

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US Patent Number: 5,364,593

CHROMAIR®

Operating Instructions
Ozone Monitor
(Part Number: 380010)

Introduction

Ozone is a bluish gas with a pleasant, characteristic odor in concentrations of less than 2 ppm. In higher concentrations, the odor is pungent and irritating. Ozone is a severe irritant to the eyes and the mucous membranes. Long-term exposures will cause pulmonary edema (abnormal fluid buildup in the lungs) and chronic respiratory disease. OSHA and NIOSH exposure limit for ozone is 0.1 ppm (TWA).

Ozone is used as a disinfectant for air and water. It is also used to bleach waxes, textiles and oils.

Principle of Operation

The ChromAir passive monitor is a patented direct-read autogenic exposimeter. The device is constructed from six cells attached on one side to a flat indicator layer and on the other side to a series of different diffusive resistances. Ozone gas diffuses to the cells through the different diffusive resistances and reacts with the indicator layer, producing color change from blue to light blue and finally to white upon high exposure. The color produced on the indicator layer is a direct measure of the exposure dose. Visual color comparison is achieved by observing the formation of the light blue threshold color on the cell and reading the corresponding exposure dose.

Physical Specifications:

Dimensions	10.5 cm x 5.5 cm x 0.25 cm
Weight	11 g
Refrigerated shelf life	1 year
Color change	blue to white

Sampling Parameters:

Exposure Dose Range	0.08 – 1.6 ppm•hr
Maximum recommended sampling time	10 hours
Minimum recommended sampling time	5 minutes
Relative humidity range	20% - 90%
Face velocity range	10 - 165 cm/sec
Temperature range	16ºC - 30ºC (61ºF - 86ºF)
Light effect - UV (direct sunlight)	not recommended*
Light effect - visible	no effect
Known Interferences	hydrogen peroxide, and nitrogen dioxide up to 1 ppm

*The back of the badge (viewing area) ***should not*** be exposed to direct sunlight at any time.

Operating Instructions

1. Allow the badge to warm to room temperature prior to removing the badge from its protective pouch.
2. Enter all pertinent information on the I.D. label before monitoring is started (i.e. name, location, date and start time)
3. For personnel monitoring, attach the badge near the user's breathing zone (i.e. collar) with the front side exposed to the surrounding atmosphere.
4. For area monitoring, attach the badge to a stand and mount in a centralized area with the front side exposed to the surrounding atmosphere and the back side protected from exposure to direct sunlight.
5. Check the back side of the badge periodically to determine the exposure dose (ppm•hr).
6. To read the badge, locate the highest level cell with light blue threshold color.
7. To obtain the average concentration (ppm) in the surrounding atmosphere, divide the exposure dose (ppm•hr) by the exposure time in hours. EXAMPLE: If the sampling time is 2 hours and the badge reads 0.08 ppm•hr, the average concentration is determined by:

   $\frac{0.08 \text{ ppm•hr}}{2 \text{ hr.}}$ Therefore the average concentration is 0.04 ppm.

WARRANTY EXCLUSIONS AND LIMITATION OF LIABILITY

IF THE USER DOES NOT ACCEPT THE FOLLOWING TERMS, THE USER SHOULD NOT USE THE CHROMAIR BADGES.

Seller warrants that, for the lesser of one (1) year or the shelf-life provided on the Seller's product, its packaging or its literature, its products shall conform to the description of such products as provided on the Seller's product, its packaging or its literature. THIS WARRANTY IS EXCLUSIVE AND SELLER MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. Seller's warranties made in connection with this sale shall not be effective if Seller has determined, in its sole discretion, that Buyer has misused the products in any manner, has failed to use the products in accordance with safe industry standards and practices, or has failed to use the products in accordance with Seller's written operating instructions, or other instructions furnished by Seller to Buyer.

Seller's sole and exclusive liability and Buyer's exclusive remedy with respect to products to Seller's satisfaction to be defective or nonconforming shall be replacement of such products without charge or refund of the purchase price, in Seller's sole discretion, upon the return of such products in accordance with Seller's instructions. All claims must be brought within one (1) year of shipment, regardless of their nature.

SELLER SHALL NOT IN ANY EVENT BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND RESULTING FROM ANY USE OR FAILURE OF THE PRODUCTS, EVEN IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE INCLUDING, WITHOUT LIMITATION, LIABILITY FOR LOSS OF USE, LOSS OF WORK IN PROGRESS, DOWN TIME, LOSS OF REVENUE OR PROFITS, FAILURE TO REALIZE SAVINGS, LOSS OF PRODUCTS OF BUYER OR OTHER USE OF ANY LIABILITY OF BUYER TO A THIRD PARTY ON ACCOUNT OF SUCH LOSS, OR FOR ANY LABOR OR ANY OTHER EXPENSE, DAMAGE OR LOSS OCCASIONED BY SUCH PRODUCT INCLUDING PERSONAL INJURY OR PROPERTY DAMAGE UNLESS SUCH PERSONAL INJURY OR PROPERTY DAMAGE IS CAUSED BY SELLER'S GROSS NEGLIGENCE.

Warning: Keep out of reach of children, if ingested seek medical attention immediately.

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