

★READ THIS INSTRUCTION MANUAL AND THE INSTRUCTION MANUAL OF THE SAMPLER PRIOR TO USING THIS PRODUCT.

★DO NOT DISCARD CAREFULLY THIS INSTRUCTION MANUAL UNTIL ALL THE TUBES IN THIS BOX ARE USED UP.

## 1. PREFACE

Aldehydes and Ketones sampling tube (Silica gel treated with 2,4-Dinitrophenylhydrazine tube) is used to analyze Aldehydes and Ketones vapours in ambient air. i.e Formaldehyde, Acetaldehyde, Acetone. Aldehydes and Ketones vapours are absorbed and collected on silica-gel treated with DNPH section in passing through the tube. The desorption of the Aldehydes and Ketones are made by the solvent (Acetonitrile), and analyzed by high-performance liquid chromatography (HPLC). Quantity of the DNPH of the 1st section in the tube 811 is about 0.66mg.

### CAUTION

1. SAFETY GLASSES AND GLOVES SHOULD BE WORN TO PREVENT INJURY FROM SPLINTERING GLASS.
2. DO NOT TOUCH CHEMICAL REAGENTS DIRECTLY ONCE TUBES WERE BROKEN. IN CASE OF CONTACT WITH THE CONTENTS OF BROKEN TUBES, WASH OFF SKIN THOROUGHLY WITH WATER.
3. KEEP THE TUBES OUT OF THE REACH OF CHILDREN.

### NOTICE

1. USE THE AIR SAMPLER SUCH AS S-20 SERIES AIR SAMPLER.
2. STORE TUBES IN A DARK AND REFRIGERATED PLACE (0-10 °C/32-50°F), OR FREEZER (-18 °C/0°F). AND USE BEFORE EXPIRATION DATE PRINTED ON THE TOP OF THE BOX.
3. USE THE TUBE IMMEDIATELY AFTER CUTTING ENDS OF THE TUBE.
4. PRIOR TO USE, READ CAREFULLY ITEM 14. USER RESPONSIBILITY.
5. DO NOT USE THE TUBE 811 TO ANALYZE LIQUID SAMPLE.

## 2. SPECIFICATION

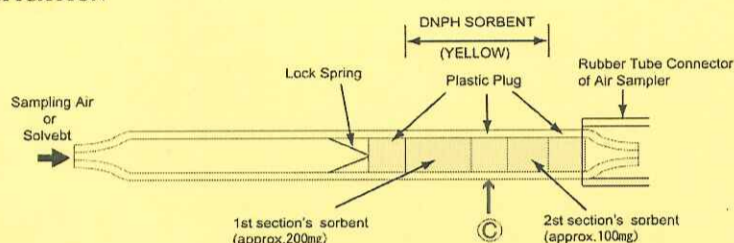


Fig. 1

## 3. BLANK VALUE OF DNPH DERIVATIVES IN TUBE

Blank value of DNPH derivatives in this tube is low (Refer to table.1).

Table.1 Blank value of DNPH derivatives in tube

	Formaldehyde	Acetaldehyde	Acetone
[ $\mu$ g / tube]	< 0.03	< 0.03	< 0.10

The volume of air passed through the tube must be large enough for the quantity of DNPH derivatives formed to be several times greater than the blank value (more than 10 times). The blank value of DNPH derivatives might increase slightly with time and temperature. Always compare samples to blank tube from same lot and store under same conditions.

## 4. CAPACITY

Capacity of the tube is 1.7  $\mu$  mol as a carbonyl compound (50  $\mu$  g in case of Formaldehyde). If several Aldehydes and/or Ketones exist, estimate maximum sampling volume from total concentration of all compounds to avoid the breakthrough. In case of an analysis of indoor air in normal home, 0.004ppm Formaldehyde can be analyzed at 10L sampling. Ozone degrades the DNPH derivatives. Connect the Ozone Scrubber (820) on the inlet side of sampling air of the Tube 811 in case of Ozone coexists.

## 5. STORING TUBE

Store the new tube in a refrigerated place (10 °C/32°F or lower) for up to six months. Unbroken tube may be stored at room temperature (20-25 °C/68-75°F) or freezer (-18 °C/0°F) for up to two weeks or one year respectively.

The blank value of DNPH derivatives might increase slightly with time and temperature. If the tube was exposed to high temperature or stored longer than recommended period before use, run a blank and confirm the blank value of DNPH derivatives.

After sampling, put caps of standard accessory on both ends of the tube and preserve it in a dark and refrigerated place or freezer until it is time to elute it. Elute the DNPH derivatives from the tube within two weeks.

## 6. ANALYSIS

0.004-3.5ppm Formaldehyde can be analyzed at a flow rate 1L/min for 10 minutes sampling.

- Performing HPLC analysis and working curb
- Example HPLC condition (Table.2).

Table.2 HPLC condition

Column :	ODS column (4.0mm I.D.×15cm) with pre-column filter or guard-column
Mobile phase :	CH <sub>3</sub> CN/H <sub>2</sub> O =50/50(for HPLC)
Flow rate :	1mL/min
Injection volume :	10 $\mu$ L
Column temperature :	40 °C
Detection :	Absorbance at 360nm

- ※ Condition in Table.2 is from us. In this case, Acetone and Acrolein does not separate from a complex mixture. In addition, there are other combinations having difficulty in separation.
- ※ Be careful of unintentional contamination of Aldehydes or Acetone while analysis.
- ※ Use the HPLC grade Acetonitrile. If your Acetonitrile is unacceptable, purge the Acetonitrile with Helium gas for further purification.
- ※ Blank value of DNPH derivatives might increase slightly with time and temperature. Always compare samples to blank tube from same lot and store under same conditions.

## 7. WORKING CURVE

- ① Dissolve the standard sample (which means known concentration sample with DNPH derivative standards from reagent companies) into desorption solvent. This is standard solution.
- ② Dilute the standard solution step by step and make the working curve by means of injecting the diluted standard solution at each step into HPLC from the peak area and concentration of standard solution. Note: We recommend to prepare the 3 ~ 5 steps standard solution including the estimated concentration of sample.

## 8. ANALYSIS OF BLANK VALUE

### APPARATUS

- 5mL liquid syringe: Disposable syringe is possible.
- Connecting tube: No elution with Acetonitrile
- 5mL volumetric flask

Reagent: HPLC grade Acetonitrile.

※ The operation shall be done after the tube temperature is warmed up to room temperature.

- ① Cut the Tube 811 at the point C (Fig.1). Take off the lock spring and Plastic plugged on the 1st section's sorbent. Remove the 1st section's sorbent and put into a sample vial completely.
- ② Take off the Plastic plugged on the 2nd section's sorbent. Remove the 2nd section's sorbent and put it into another sample vial completely.
- ③ Pour the Acetonitrile as a desorption solvent into above both sample vials, put on the lid, shake them every 5 ~ 10 minutes for approx. 30minutes. Use HPLC grade Acetonitrile at a flow rate of 1mL/min. Analyze the blank value of tube from this solution by HPLC (n=3 ~ 5).

## 9. LIMIT OF DETECTION, QUANTITY AND SAMPLE VOLUME

The limit of detection and quantity are defined as 3 and 10 times the standard deviation (SD) of the analysis of the blank value respectively. In case of no blank value, use the SD of lowest DNPH derivative standard solution. The sample volume of air passed through the tube must be estimated from the blank value, expected concentration and limit of the quantity.

Note: The Japanese Ministry of Health, Labour and Welfare recommends that the level of the limit of the quantity should be at least one-tenth or less of guideline value (0.08ppm) for indoor air quality.

## 10. TO COLLECT THE SAMPLE

※ The operation shall be done after the tube temperature is warmed up to room temperature.

- ① Break both ends of a new 811 tube.
- ② Connect the tube end to the continuous drawing pump (such as S-20 series) which has stable sampling flow rate of 1L/min with connecting tube.

※ Ozone (usually present in urban air) degrades the DNPH derivatives.

Connect the Ozone Scrubber (820) on the inlet side of sampling air of the Tube 811 in case of Ozone coexists.

※ Record the mean temperature on the sampling site and sampling air volume.

※ The sampling volume is obtained by the following equation;

$$\text{Sampling Volume (L)} = \text{Reading value of gas meter after sampling} - \text{Reading value of gas meter before sampling}$$

- ③ After sampling, put caps of standard accessory on both ends of the tube and preserve it in a dark and refrigerated place or freezer until it is time to elute it.

※ Compare samples to travel blank tube from same lot and store under same conditions except for sampling (more than 3 tubes).

## 11. ELUTING

### APPARATUS

- 5mL liquid syringe: Disposable syringe is possible.
- Connecting tube: No elution with Acetonitrile
- 5mL volumetric flask

Reagent: HPLC grade Acetonitrile.

※ The operation shall be done after the tube temperature is warmed up to room temperature.

- ① Cut the Tube 811 at the point C (Fig.1). Take off the lock spring and Plastic plugged on the 1st section's sorbent. Remove the 1st section's sorbent and put into a sample vial completely.
- ② Take off the Plastic plugged on the 2nd section's sorbent. Remove the 2nd section's sorbent and put it into another sample vial completely.
- ③ Pour the Acetonitrile as a desorption solvent into above both sample vials, put on the lid, shake them every 5 ~ 10 minutes for approx. 30 minutes. Use HPLC grade Acetonitrile at a flow rate of 1mL/min. Analyze the blank value of tube from this solution by HPLC (n=3 ~ 5).

## 12. ANALYSIS

Analyze the concentration of each Aldehydes and Ketones in samples by HPLC from the working curve. Subtract the blank value from the sample value, and correct the temperature of sampling environment. The following equation is available to obtain a true concentration.

$$\text{Concentration of the sample (Aldehydes or Ketones vapour) [ppm]} = (S - B) \times 5 \times 22.4 \times \frac{(273 + t)}{(M \times 273 \times V)}$$

S : Average of sample value [ $\mu$  g/mL]

B : Average of blank value [ $\mu$  g/mL]

M : Molecular weight[g/mol]

t : Temperature of sampling environment(°C)

V : Sampling volume[L]

※ Analyze travel blank of the tube and confirm that it is not polluted during transportation.

## 13. DISPOSAL OF TUBES:

USED TUBES SHOULD BE DISPOSED CAREFULLY ACCORDING TO RELEVANT REGULATIONS, IF ANY.

## 14. USER RESPONSIBILITY:

It is the sole responsibility of the user of this equipment to ensure that the equipment is operated, maintained, and repaired in strict accordance with these instructions and the instructions provided with each sampler.

The Manufacturer and Manufacturer's Distributors shall not be otherwise liable for any incorrect measurement or any damages, whether damages result from negligence or otherwise.

※ Product specifications are subject to change without any prior notice.