

- ★ THIS DETECTOR TUBE IS USED WITH THE EXCLUSIVE USE MODEL S-20 SERIES AIR SAMPLER.
- ★ READ CAREFULLY THIS INSTRUCTION MANUAL AND THE INSTRUCTIONS OF THE SAMPLING PUMP PRIOR TO USING THIS PRODUCT.
- ★ DO NOT DISCARD THIS INSTRUCTION MANUAL UNTIL ALL THE TUBES IN THIS BOX ARE USED UP.

### 1. PERFORMANCE:

Gases to be measured	Acetic acid	Formic acid
Measuring Range	: 10 - 400 $\mu\text{g}/\text{m}^3$ (Printed scale) (2.5 $\times$ Temperature corrected value)	: 25 - 1000 $\mu\text{g}/\text{m}^3$ (2 $\times$ Temperature corrected value)
Sampling Volume	: 12L	: 12L
Sampling Time	: 200mL $\times$ 60 min.	: 200mL $\times$ 30 min.
Colour Change	: Pale Pink $\rightarrow$ Pale Yellow	
Detectable Limit	: 5 $\mu\text{g}/\text{m}^3$ (Acetic acid), 10 $\mu\text{g}/\text{m}^3$ (Formic acid) (at 60 min. sampling)	
Operating Temperature	: 5 - 35 $^{\circ}\text{C}$ (41 - 95 $^{\circ}\text{F}$ ) (Temperature correction is necessary.)	
Operating Humidity	: 20 - 80%R.H. (No correction is necessary.)	
Sampling Pump	: Model S-20 Series air sampler	

### ▲ CAUTION

1. THE DETECTOR TUBE CONTAINS CHEMICAL REAGENTS.
2. DO NOT TOUCH THESE REAGENTS DIRECTLY ONCE TUBES WERE BROKEN.
3. KEEP THE TUBES OUT OF THE REACH OF CHILDREN.

### NOTICE

1. AS THE SAMPLING AND MEASUREMENT PROCEDURE OF EACH SAMPLER IS DIFFERENT, READ THE INSTRUCTION MANUAL OF EACH SAMPLER CAREFULLY BEFORE USE AND THEN MAKE A MEASUREMENT.
2. DO NOT USE THIS TUBE OUTSIDE THE STATED OPERATING TEMPERATURE RANGE.
3. STORE TUBES IN A COOL AND DARK PLACE (0-25  $^{\circ}\text{C}$ /32-77 $^{\circ}\text{F}$ ), AND USE BEFORE EXPIRATION DATE PRINTED ON THE TOP OF THE BOX.
4. PRIOR TO USE, READ CAREFULLY ITEM 8. USER RESPONSIBILITY.
5. READ THE CONCENTRATION IMMEDIATELY AFTER MEASUREMENT.
6. THE COLOUR OF REMOVER MIGHT CHANGE FROM PALE GREEN TO DARK GREEN WHILE KEEPING, BUT IT DOES NOT AFFECT THE READINGS.
7. THE ORIGINAL COLOUR OF THE REAGENT WILL CHANGE TO PINK FROM PALE PINK BY THE HUMIDITY IN SAMPLING GAS AT THE TIME OF THE MEASUREMENT, BUT IT DOES NOT AFFECT THE READINGS.

### 2. SAMPLING AND MEASUREMENT:

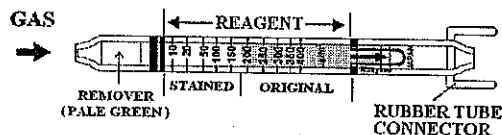


Fig.1

- ① Break both ends of the detector tube with attached ampule cutter.

**▲ CAUTION SAFETY GLASSES AND GLOVES SHOULD BE WORN TO PREVENT INJURY FROM SPLINTERING GLASS.**

- ② Connect the detector tube into the rubber tube connector of the Model S-20 series air sampler as shown in Fig. 1 (Arrow mark shall point to the sampler.), and fix it into the detector tube holder.
- ③ Turn ON power of the air sampler.
- ④ In accordance with instruction manual of each air sampler, preset the TIMER at 60 minutes and adjust the flow rate at 200mL/min.
- ⑤ After completion of sampling (60 minutes), remove the detector tube from the tube holder and read the scale at the maximum point of a stained layer. True concentration of Acetic acid and / or Formic acid can be obtained after temperature correction respectively.
- ⑥ When the concentrations are over the scale range (400  $\mu\text{g}/\text{m}^3$ ), 30 minutes sampling time can be used to determine these higher concentrations.  
In this case, the following equation is available to obtain a true concentration.  
30 minutes sampling for Acetic acid: True concentration = Temperature corrected concentration  $\times$  2.5
- ⑦ In case of measurement for Formic acid, multiply the temperature corrected value by 2. In this case, sampling time is 60 minutes.

- SPECIAL NOTE:**
- I. The scale is calibrated at 20  $^{\circ}\text{C}$  (68 $^{\circ}\text{F}$ ), 50 %R.H. and 1013hPa. Readings obtained in other circumstances should be corrected (REFER TO ITEM 3. CORRECTION FOR AMBIENT CONDITIONS).
  - II. When the maximum point of the stained layer is unclear, read the scale at the longest point of the stained layer. When the end of the stained layer is slanted, read the scale at the centre between the longest and shortest points.
  - III. It is desirable to read the concentration immediately after measurement because the stained layer becomes longer gradually.

### 3. CORRECTION FOR AMBIENT CONDITIONS:

- ① Temperature; Correct the tube reading by following temperature correction table.

Tube Reading ( $\mu\text{g}/\text{m}^3$ )	Temperature Correction Table for Acetic Acid						
	Corrected Concentration ( $\mu\text{g}/\text{m}^3$ )						
	5 $^{\circ}\text{C}$ (41 $^{\circ}\text{F}$ )	10 $^{\circ}\text{C}$ (50 $^{\circ}\text{F}$ )	15 $^{\circ}\text{C}$ (59 $^{\circ}\text{F}$ )	20 $^{\circ}\text{C}$ (68 $^{\circ}\text{F}$ )	25 $^{\circ}\text{C}$ (77 $^{\circ}\text{F}$ )	30 $^{\circ}\text{C}$ (86 $^{\circ}\text{F}$ )	35 $^{\circ}\text{C}$ (95 $^{\circ}\text{F}$ )
400	830	650	530	400	365	310	235
350	750	585	470	350	320	270	205
300	660	505	405	300	275	230	175
250	550	430	340	250	225	190	145
200	450	345	275	200	180	150	115
150	340	255	205	150	135	110	85
100	230	175	140	100	90	70	50
50	120	95	70	50	45	35	30
20	40	35	30	20	20	15	10
10	20	15	10	10	10	10	5

Tube Reading ( $\mu\text{g}/\text{m}^3$ )	Temperature Correction Table for Formic Acid						
	Corrected Concentration ( $\mu\text{g}/\text{m}^3$ )						
	5 $^{\circ}\text{C}$ (41 $^{\circ}\text{F}$ )	10 $^{\circ}\text{C}$ (50 $^{\circ}\text{F}$ )	15 $^{\circ}\text{C}$ (59 $^{\circ}\text{F}$ )	20 $^{\circ}\text{C}$ (68 $^{\circ}\text{F}$ )	25 $^{\circ}\text{C}$ (77 $^{\circ}\text{F}$ )	30 $^{\circ}\text{C}$ (86 $^{\circ}\text{F}$ )	35 $^{\circ}\text{C}$ (95 $^{\circ}\text{F}$ )
400	475	445	425	400	375	340	300
350	415	395	370	350	335	300	265
300	355	335	320	300	280	260	230
250	300	285	265	250	235	220	195
200	250	235	215	200	190	175	160
150	195	180	165	150	145	135	120
100	140	125	110	100	95	90	85
50	80	70	60	50	50	45	43
20	35	30	25	20	20	20	18
10	20	15	10	10	10	10	8

- ② Humidity; No correction is necessary.

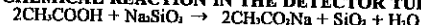
- ③ Atmospheric Pressure;

$$\text{True concentration} = \frac{\text{Temperature corrected concentration} \times 1013}{\text{Atmospheric pressure (in hPa)}}$$

### 4. INTERFERENCE:

Each coexistence of Ammonia, Ozone, Formaldehyde, Acetaldehyde, Toluene, Xylene, Ethyl benzene and Ethyl acetate with Organic acid do not affect the readings. More than 10 ppb of Sulphur dioxide produces a similar stain and gives higher readings. More than 60 ppb of Nitrogen dioxide produces a pale orange stain and gives higher readings.

### 5. CHEMICAL REACTION IN THE DETECTOR TUBE:



### 6. DISPOSAL OF TUBES

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

### 7. HAZARDOUS AND DANGEROUS PROPERTIES OF ACETIC ACID AND FORMIC ACID:

TLV-TWA  $\blacklozenge$  : Acetic acid; 10ppm      Formic acid; 5ppm  
 Explosion range in air : Acetic acid; 5.4-16.0%      Formic acid; 18-51%  
 $\blacklozenge$  Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2008.

### 8. 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 Model S-20 series air sampler, and that detector tubes are not used which are either beyond their expiration date or have a colour change different to that stated in the Performance.  
 The Manufacturer and Manufacturer's Distributor shall not be otherwise liable for any incorrect measurement or any damages, whether damages result from negligence or otherwise.