



INSTRUCTION MANUAL ACETIC ACID/FORMIC ACID DETECTOR TUBES

(FORMIC ACID, ACRYLIC ACID, ISOVALERIC ACID, ISOBUTYRIC ACID,
n-VALERIC ACID, PROPIONIC ACID, ACETIC ANHYDRIDE, MALEIC ANHYDRIDE,
METHACRYLIC ACID AND BUTYRIC ACID WITH CONVERSION CHART)

No.216S

- ★ READ CAREFULLY THIS INSTRUCTION MANUAL AND THE INSTRUCTIONS OF THE ASPIRATING 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, Acrylic acid, Isovaleric acid, Isobutyric acid, n-Valeric acid, Propionic acid, Acetic anhydride, Maleic anhydride, Methacrylic acid and Butyric acid

Measuring Range : Acetic acid	; 1-50ppm (Printed scale)
Formic acid	; 1-50ppm
Acrylic acid	; 1-50ppm
Isovaleric acid	; 3-50ppm
Isobutyric acid	; 3-50ppm
n-Valeric acid	; 3-70ppm
Propionic acid	; 3-50ppm
Acetic anhydride	; 1-15ppm
*Maleic anhydride	; 0.2-10ppm
Methacrylic acid	; 1-50ppm
Butyric acid	; 3-60ppm

Sampling Time : 1 pump stroke, 1.5 minutes
*4 pump strokes, 6 minutes (as for Maleic anhydride only)

Colour Change : Pale pink → Yellow

Detectable Limit: 0.2ppm (Acetic acid, Formic acid)

Operating temperature: Acetic acid and Formic acid; 0-40°C (32-104°F)
Other gases ; 15-25°C (59-77°F)

Temperature correction:

Acetic acid and Formic acid; Temperature correction is necessary.

Other gases ; **Incorrect readings may be given in other temperature range of above-mentioned.**

Aspirating Pump: Model AP-20, AP-20S, 400B, AP-1, AP-1S or 400A

CAUTION

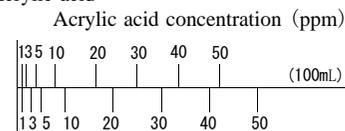
1. DETECTOR TUBE CONTAINS REAGENTS (SODIUM METASILICATE.).
2. DO NOT TOUCH THESE REAGENTS DIRECTLY ONCE TUBES ARE BROKEN.
3. KEEP THE TUBES OUT OF THE REACH OF CHILDREN.

NOTICE

1. USE ONLY PUMP MODELS AP-20, AP-20S, 400B, AP-1, AP-1S OR 400A. OTHERWISE, CONSIDERABLE ERROR IN INDICATION MAY OCCUR.
2. DO NOT USE FLOW CONTROL ORIFICE WITH THIS TUBE. (FOR MORE DETAIL, REFER TO THE INSTRUCTIONS OF THE ASPIRATING PUMP.)
3. BEFORE TESTING, CHECK THE ASPIRATING PUMP FOR LEAKS. (REFER TO ITEM 9). ANY PUMPS SHOWING SIGNS OF LEAKAGE SHOULD BE CORRECTED BEFORE USE.
4. DO NOT USE THIS TUBE OUTSIDE THE STATED OPERATING TEMPERATURE RANGE.
5. STORE TUBES IN A COOL AND DARK PLACE (0-25 °C/32-77°F), AND USE BEFORE EXPIRATION DATE PRINTED ON TOP OF THE BOX.
6. PRIOR TO USE, READ CAREFULLY ITEM 10 "USER RESPONSIBILITY".
7. READ THE CONCENTRATION IMMEDIATELY AFTER MEASUREMENT.

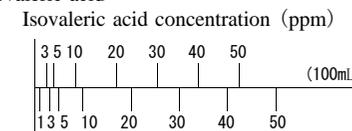
4. CONVERSION CHART:

Acrylic acid



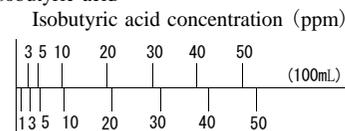
No.216S tube reading (ppm)

Isovaleric acid



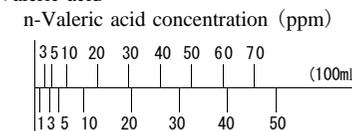
No.216S tube reading (ppm)

Isobutyric acid



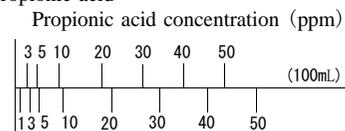
No.216S tube reading (ppm)

n-Valeric acid



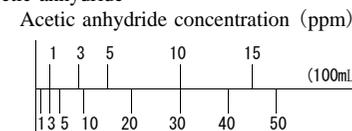
No.216S tube reading (ppm)

Propionic acid



No.216S tube reading (ppm)

Acetic anhydride

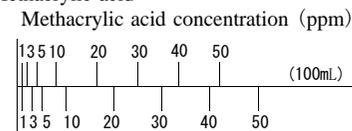


No.216S tube reading (ppm)

Maleic anhydride

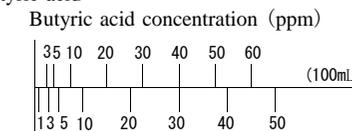
Draw sample gas by four (4) pump strokes and read gas concentration from the graduation printed on the tube, then multiply the tube reading by 0.2 (tube reading × 0.2).

Methacrylic acid



No.216S tube reading (ppm)

Butyric acid

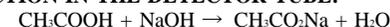


No.216S tube reading (ppm)

5. INTERFERENCE:

Sulphur dioxide produces similar stains and coexistence of more than 1/20 of Acetic acid or Formic acid concentration gives higher readings. More than 300ppm of Nitrogen dioxide produces similar stains and the coexistence of more than 10ppm produces unclear stains. Hydrogen chloride produces Pink stains and the coexistence of more than double concentration of Acetic acid or Formic acid concentration gives higher readings. Chlorine produces Yellow stains and the coexistence of more than 5ppm gives higher readings.

6. CHEMICAL REACTION IN THE DETECTOR TUBE:



7. DISPOSAL OF TUBE:

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

2. SAMPLING AND MEASUREMENT:

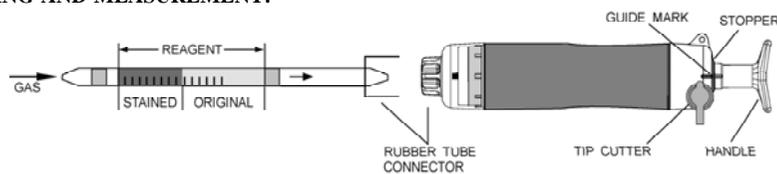


Fig.1

- ① Break both ends of detector tube.

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

- ② Insert the detector tube into aspirating pump securely as shown in Fig.1. (Arrow mark shall point to the pump.)
- ③ Align the guide marks on the handle and stopper of the aspirating pump.
- ④ Pull the pump handle at full stroke (100mL) until it locks and wait for 1.5 minutes as it is or until the sampling is confirmed as to be completed. (See descriptions of the flow indicator in the pump instruction manual).
- ⑤ After the sampling is completed, read the scale at the top of the stained layer. True concentration of **Acetic acid** and/or **Formic acid** can be obtained after temperature correction respectively.
- ⑥ In case of **Acrylic acid, Isovaleric acid, Isobutyric acid, n-Valeric acid, Propionic acid, Acetic anhydride, Methacrylic acid and/or Butyric acid** measurement, convert the reading value by using the respective conversion chart undermentioned.
- ⑦ In case of **Maleic anhydride** measurement, repeat above ③ to ④ procedures three (3) times more. After the sampling is completed, read the scale at the maximum of the stained layer and multiply the reading value by 0.2.

SPECIAL NOTE: I. The scale is calibrated at 20 °C (68°F), 50 %R.H. and 1013hPa. Readings obtained in other circumstances should be corrected (**REFER TO ITEM 3**).

II. When the maximum point of the stained layer is unclear or obliquely, read the scale at the centre between the longest and shortest points.

3. CORRECTION FOR AMBIENT CONDITIONS:

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

Tube Reading (ppm)	Corrected Concentration (ppm)				
	0 °C (32°F)	10 °C (50°F)	20 °C (68°F)	30 °C (86°F)	40 °C (104°F)
50	63	57	50	45	40
40	50	45	40	36	31
30	37	33	30	27	23
20	24	22	20	18	16
10	12	11	10	9	8
5	6	6	5	5	4
3	4	4	3	3	2
1	1	1	1	1	1

Tube Reading (ppm)	Corrected Concentration (ppm)		
	0 °C (32°F)	10 °C (50°F)	20 °C – 40 °C (68°F – 104°F)
50	82	60	50
40	57	45	40
30	36	32	30
20	22	21	20
10	10	10	10

- ② Humidity; No corrections are necessary.
- ③ Atmospheric Pressure;

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

8. HAZARDOUS AND DANGEROUS PROPERTIES:

TLV-TWA ◆: Acetic acid; 10ppm Formic acid; 5ppm Acrylic acid; 2ppm
 Propionic acid; 10ppm Acetic anhydride; 5ppm Maleic anhydride; 0.25ppm
 Methacrylic acid; 20ppm

Explosive range in air: Acetic acid; 4.0-19.9% Formic acid; 18-57%

- ◆ Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2004.

9. INSPECTION OF ASPIRATING PUMP:

Checking for leaks;

- ① Insert sealed, unbroken detector tube into the pump.
- ② Align the guide marks on the shaft and stopper of the pump.
- ③ Pull the handle at full stroke (100mL) and wait for 1 minute as it is.
- ④ Unlock the handle and allow it to return slowly into the pump with holding the cylinder and handle securely.

CAUTION HANDLE WILL TEND TO SNAP BACK INTO THE PUMP QUICKLY.

- ⑤ If the handle returns completely to the original position, the performance is satisfactory. Otherwise, refer to maintenance procedure in the pump instructions to correct the fault.

10. 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 AP-20, AP-20S, 400B, AP-1, AP-1S or 400A aspirating pump, 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 specifications.

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.

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