



INSTRUCTION MANUAL
ACETIC ACID DETECTOR TUBE
 FORMIC ACID, ACRYLIC ACID, ISOVALERIC ACID, ISOBUTYRIC ACID,
 n-VALERIC ACID, PROPIONIC ACID, ACETIC ANHYDRIDE,
 MALEIC ANHYDRIDE, METHACRYLIC ACID AND n-BUTYRIC ACID
 No.216S

★ READ THIS INSTRUCTION MANUAL AND THE INSTRUCTIONS OF THE ASPIRATING PUMP PRIOR TO USING THIS PRODUCT.
 ★ DO NOT DISCARD CAREFULLY THIS INSTRUCTION MANUAL UNTIL ALL THE TUBES IN THIS BOX ARE USED UP.

1. PERFORMANCE:

Measuring Range	: 1 - 50 ppm
and Pump Stroke	: 1 pump stroke
Sampling Time	: 1.5 minutes
Colour Change	: Pale pink → Yellow
Detectable Limit	: 0.2 ppm
Operating Temperature	: 0 - 40 °C (32-104°F) (Temperature correction is necessary.)
Aspirating Pump	: Model AP-20, AP-20S, 400B, AP-1, AP-1S or 400A

By using printed scale or conversion chart shown at ITEM 4. CONVERSION CHART, following gases can be detected.

Gases to be Detected	Measuring Range	Number of pump stroke	Sampling Time
Formic acid	1 - 50 ppm (Printed scale)	1 (100mL)	1.5 minutes
Acrylic acid	1 - 50 ppm (Conversion chart)	1 (100mL)	1.5 minutes
Isovaleric acid	3 - 50 ppm (Conversion chart)	1 (100mL)	1.5 minutes
Isobutyric acid	3 - 50 ppm (Conversion chart)	1 (100mL)	1.5 minutes
n-Valeric acid	3 - 70 ppm (Conversion chart)	1 (100mL)	1.5 minutes
Propionic acid	3 - 50 ppm (Conversion chart)	1 (100mL)	1.5 minutes
Acetic anhydride	1 - 15 ppm (Conversion chart)	1 (100mL)	1.5 minutes
Maleic anhydride	0.2 - 10 ppm (Tube reading × 0.2)	4 (400mL)	6 minutes
Methacrylic acid	1 - 50 ppm (Conversion chart)	1 (100mL)	1.5 minutes
n-Butyric acid	3 - 60 ppm (Conversion chart)	1 (100mL)	1.5 minutes

Operating Temperature Formic acid : 0 - 40 °C (32 - 104°F) (Temperature correction is necessary.)
 Other gases : 15 - 25 °C (59 - 77°F)

(Incorrect readings may be given in other temperature range of above-mentioned.)

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

2. SAMPLING AND MEASUREMENT:

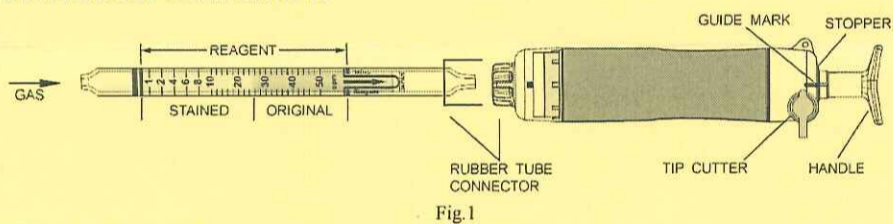


Fig.1

- ① Break both ends of the detector tube.

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

- ② Insert the detector tube into the 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 a full stroke until it locks and wait for 1.5 minutes or until the completion of sampling is confirmed with the flow indicator of the pump. (See descriptions about the flow indicator in the instruction manual of the pump.)
- ⑤ On completion of sampling, read the scale at the maximum point of the stained layer.
- ⑥ In the case of Maleic anhydride measurement, turn the handle right or left by 1/4 (90°), push it toward the pump without removing the detector tube from the pump and repeat step ③~④ three times more.

The following equation is available for true concentration.

$$\text{True concentration} = \text{Temperature corrected concentration} \times 0.2$$

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. CORRECTION FOR AMBIENT CONDITIONS.)

II. When the maximum point of the stained layer is unclear or oblique, 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.

In the case of Formic Acid, no temperature correction is necessary at less than 10ppm.

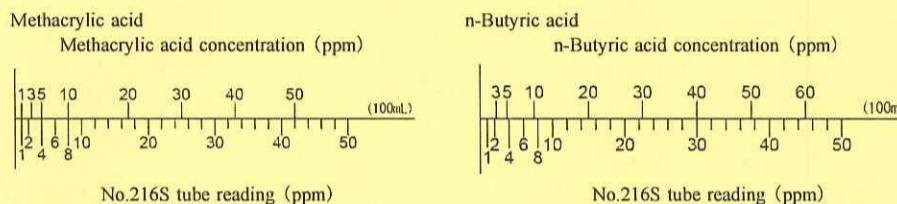
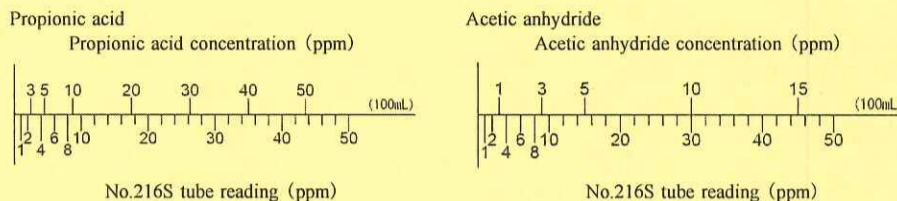
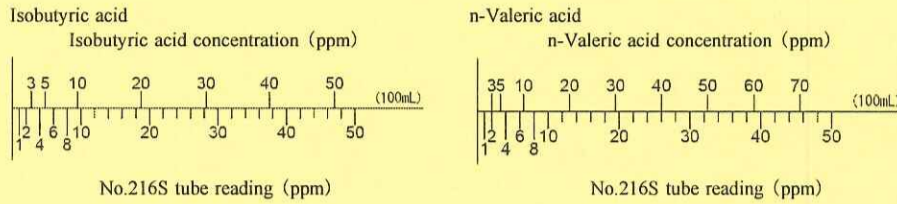
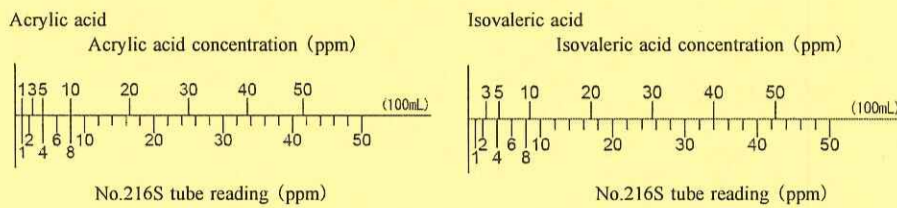
Tube Reading (ppm)	Corrected Concentration (ppm)				
	0 °C (32°F)	10 °C (50°F)	20 °C (68°F)	30 °C (86°F)	40 °C (104°F)
50	63	57	50	45	40
40	50	45	40	36	31
30	37	33	30	27	23
20	24	22	20	18	16
10	12	11	10	9	8
8	9.6	9	8	7.4	6.4
6	7.2	7	6	5.8	4.8
4	5	5	4	4	3
2	2.5	2.5	2	2	1.5
1	1	1	1	1	1

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 correction is necessary. Higher humidity change the colour of the whole reagent to pink, but the accuracy of the readings is not affected.

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

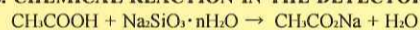
4. CONVERSION CHART:



5. INTERFERENCE:

Sulphur dioxide produces a similar stain and coexistence of more than 1/20 of Acetic acid concentration gives higher readings. More than 300ppm of Nitrogen dioxide produces a similar stain and coexistence of more than 10ppm produces an unclear stain. Hydrogen chloride produces a pink stain and coexistence of more than double concentration of Acetic acid gives higher readings. Chlorine produces a yellow stain and coexistence of more than 5ppm gives higher readings.

6. CHEMICAL REACTION IN THE DETECTOR TUBE:



7. DISPOSAL OF TUBES:

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

8. HAZARDOUS AND DANGEROUS PROPERTIES:

Gas	TLV-TWA	Explosion range in air
Acetic acid	◆: 10ppm	6.0-17%
Formic acid	◆: 5ppm	18-51%
Acrylic acid	◆: 2ppm	2.4-8%
Isovaleric acid	◆: — ppm	—
Isobutyric acid	◆: — ppm	2-9%
n-Valeric acid	◆: — ppm	1.6-7.6%
Propionic acid	◆: 10ppm	2.1-12%
Acetic anhydride	◆: 1ppm	2.7-10.3%
Maleic anhydride	◆: 0.01mg/m ³ (IFV)	1.4-7.1%
Methacrylic acid	◆: 20ppm	1.6-8.8%
n-Butyric acid	◆: — ppm	2-10%

◆ Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2013.

9. INSPECTION OF ASPIRATING PUMP:

- Checking for leaks;
- ① Insert a sealed, unbroken detector tube into the pump.
 - ② Align the guide marks on the shaft and stopper of the pump.
 - ③ Pull the handle to a full stroke and wait for 1 minute.
 - ④ Unlock the handle and allow it to return slowly into the pump by 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 procedures shown in the instruction manual of the pump to correct the leakage.

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 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.

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