KITAGAWA
KOMYO RIKAGAKU KOGYO

INSTRUCTION MANUAL
METHYL BROMIDE DETECTOR TUBE
BROMOCHLOROMETHANE, ETHYL BROMIDE,
1,2-DICHLOROPROPANE, DIBROMOMETHANE,
1-BROMOPROPANE, 2-BROMOPROPANE
and BROMOFORM

No.157SB

★ 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 and Pump Stroke	: 2 - 80 ppm(*) : 1 pump stroke	1 - 25 ppm 2 pump strokes	0.4 - 10 ppm 4 pump strokes
(*)Graduations on the detector tube are based on 1 pump stroke.			
Sampling Time	: 1.5 minutes	3 minutes	6 minutes
Colour Change	: White → Yellow		
Detectable Limit	: 0.2 ppm (4 pump strokes)		
Operating Temperature	: 0 - 40 ℃ (32 - 104°F) (Temperature correction is necessary.)		
Operating Humidity	: 0 - 80 %R.H. at 30 ℃, (0 - 24.2 mg/L) (No 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
Bromochloromethane	2 - 80 ppm (Printed scale)	1 (100mL)	1.5 minutes
	20 - 400 ppm (Conversion chart)	1/2 (50mL)	1 minute
Ethyl bromide	2 - 80 ppm (Printed scale)	1 (100mL)	1.5 minutes
	20 - 400 ppm (Conversion chart)	1/2 (50mL)	1 minute
1,2-Dichloropropane	20 - 250 ppm (Conversion chart)	1 (100mL)	1.5 minutes
Dibromomethane	2.5 - 40 ppm (Conversion chart)	1 (100mL)	1.5 minutes
1-Bromopropane	5 - 80 ppm (Conversion chart)	1 (100mL)	1.5 minutes
2-Bromopropane	5 - 80 ppm (Conversion chart)	1 (100mL)	1.5 minutes
Bromoform	1 - 20 ppm (Conversion chart)	1 (100mL)	1.5 minutes
	0.5 - 9 ppm (Conversion chart)	2 (200mL)	3 minutes

Operating Temperature : 15 - 25 ℃ (59 - 77°F)
(Incorrect readings may be given in other temperature range of above-mentioned.)

⚠CAUTION
1. THE DETECTOR TUBE AND PRETREAT TUBE CONTAIN 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 REFRIGERATED PLACE (0-10 ℃/32-50°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:

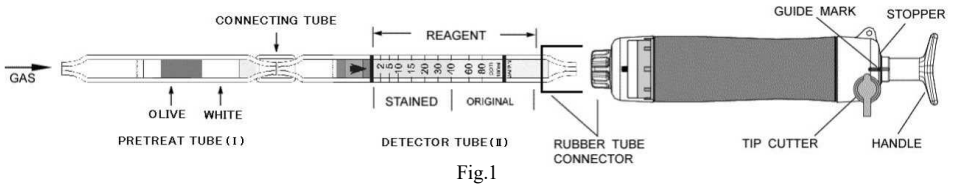


Fig.1

① Break both ends of the pretreat tube (Ⅰ) and detector tube (Ⅱ), and connect each end of the pretreat tube and detector tube with connecting tube as shown in Fig.1.

⚠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.

NOTE: If the reading value of Methyl bromide exceeds 25 ppm, do not forward to the following 2 pump strokes or 4 pump strokes.

⑥ In the case of 2 pump strokes, 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 the step ③ to ④ once more.
⑦ On completion of the sampling, read the scale at the maximum point of the stained layer and multiply the reading value after temperature correction undermentioned, by 1/2 for values up to 25 ppm.
⑧ In the case of 4 pump strokes, after the above ① to ④, 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 the step ③ to ④ three times more.
⑨ On completion of sampling, read the scale at the maximum point of the stained layer and multiply the reading value after temperature correction undermentioned, by 1/5 for values up to 10 ppm.
⑩ In the case of **Bromochloromethane** or **Ethyl bromide** measurement at a 1/2 pump stroke, after the above ① to ③, pull the handle at a 1/2 stroke (to 50mL line) until it locks and wait for 1 minute 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.)
⑪ On completion of sampling, read the scale at the maximum point of the stained layer and correct the reading value by using conversion chart.

SPECIAL NOTE: Ⅰ. The scale is calibrated at 20 ℃ (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; The scale is calibrated based on the temperature of 20 ℃ (68°F). Readings obtained in other temperature circumstances should be corrected with the following temperature correction table.

NOTE: No correction is necessary at less than 30ppm.

Temperature Correction Table						
Tube Readings (ppm)	Corrected Concentration (ppm)					
	0 ℃ (32°F)	5 ℃ (41°F)	10 ℃ (50°F)	20 ℃ (68°F)	30 ℃ (86°F)	40 ℃ (104°F)
80	-	140	98	80	75	73
60	145	76	67	60	57	56
40	44	43	42	40	40	40
30	30	30	30	30	30	30

Note: Temperature correction procedure

Example 1 : When the tube reading is 40 ppm at 5 ℃, the concentration is 43 ppm.

Temperature Correction Table						
Tube Readings (ppm)	Corrected Concentration (ppm)					
	0 ℃ (32°F)	5 ℃ (41°F)	10 ℃ (50°F)	20 ℃ (68°F)	30 ℃ (86°F)	40 ℃ (104°F)
80	-	140	98	80	75	73
60	145	76	67	60	57	56
40	44	43	42	40	40	40
30	30	30	30	30	30	30

Example 2 : When the tube reading is 50ppm at 15 ℃, the true concentration is 52.3 ppm which is found by proportional allotment of each concentration and temperature as shown below.

Temperature Correction Table						
Tube Readings (ppm)	Corrected Concentration (ppm)					
	0 ℃ (32°F)	5 ℃ (41°F)	10 ℃ (50°F)	20 ℃ (68°F)	30 ℃ (86°F)	40 ℃ (104°F)
80	-	140	98	80	75	73
60	145	76	67	60	57	56
40	44	43	42	40	40	40
30	30	30	30	30	30	30

(ppm)	10 ℃	15 ℃	20 ℃
60	67	(63.5)	60
(50)	(54.5)	(52.3)	(50)
40	42	(41)	40

Numerals in parentheses are determined by proportional allotment.

② Humidity; No corrections is necessary.

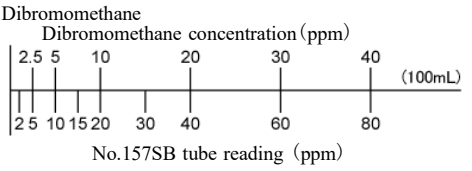
③ Atmospheric Pressure;

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

4. CONVERSION CHART:

Bromochloromethane, Ethyl bromide

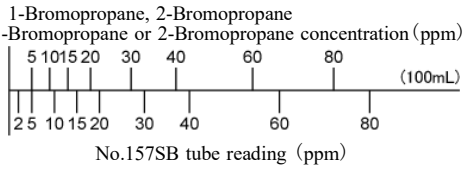
Bromochloromethane or Ethyl bromide concentration (ppm)



No.157SB tube reading (ppm)

1,2-Dichloropropane

1,2-Dichloropropane concentration (ppm)



No.157SB tube reading (ppm)

Dibromomethane

Dibromomethane concentration (ppm)

No.157SB tube reading (ppm)

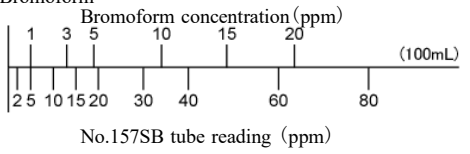
1-Bromopropane, 2-Bromopropane

1-Bromopropane or 2-Bromopropane concentration (ppm)

No.157SB tube reading (ppm)

Bromoform

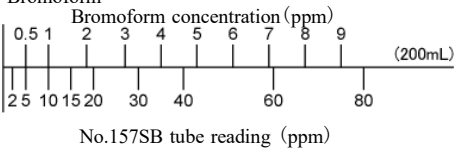
Bromoform concentration (ppm)



No.157SB tube reading (ppm)

Bromoform

Bromoform concentration (ppm)



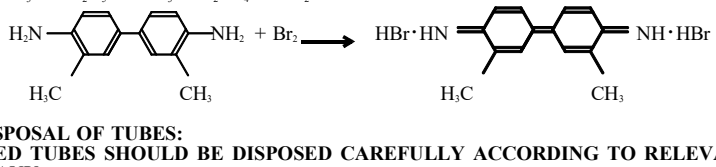
No.157SB tube reading (ppm)

5. INTERFERENCE:

Halogens or Halogenated hydrocarbons produce a similar stain and coexistence of them give higher readings.
Hexane does not affect by itself and coexistence of more than 200 ppm gives lower readings.

6. CHEMICAL REACTION IN THE DETECTOR TUBE:

$CH_3Br + I_2O_5 + CrO_3 + H_2SO_4 \rightarrow Br_2$



7. DISPOSAL OF TUBES:

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

8. HAZARDOUS AND DANGEROUS PROPERTIES:

Methyl bromide	TLV-TWA ◆: 1 ppm	Explosion range in air : 10 - 16 %
Bromochloromethane	TLV-TWA ◆: 200 ppm	Explosion range in air : —
Ethyl bromide	TLV-TWA ◆: 5 ppm	Explosion range in air : 6.8 - 11 %
1,2-Dichloropropane	TLV-TWA ◆: 10 ppm	Explosion range in air : 3.4 - 14.5 %
Dibromomethane	TLV-TWA ◆: 50 ppm	Explosion range in air : —
1-Bromopropane	TLV-TWA ◆: 10 ppm	Explosion range in air : —
2-Bromopropane	TLV-TWA ◆: — ppm	Explosion range in air : —
Bromoform	TLV-TWA ◆: 0.5 ppm	Explosion range in air : —

◆ Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2012.

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 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 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.

IME1571/4

Printed in Japan