

- ★ 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	: 40 - 2000 ppm	20 - 1000 ppm (*)	5 - 50 ppm
and Pump Stroke	: 1/2 pump stroke	1 pump stroke	4 pump strokes
	(*) Graduations on the detector tube are based on 1 pump stroke.		
Sampling Time	: 1.5 minutes	3 minutes	12 minutes
Colour Change	: Yellow → Dark brown		
Detectable Limit	: 2 ppm (4 pump strokes)		
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		

⚠ CAUTION

1. THE DETECTOR TUBE CONTAINS CHEMICAL REAGENTS.
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 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 8 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 9. USER RESPONSIBILITY CAREFULLY.
6. READ THE CONCENTRATION IMMEDIATELY AFTER DRAWING THE SAMPLE.

2. SAMPLING AND MEASUREMENT:

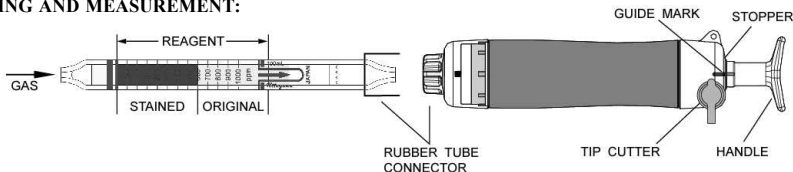


Fig.1

- 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 3 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 Carbon monoxide exceeds 50 ppm, do not forward to the following 4 pump strokes.

- ⑥ When the concentrations are below the scale range, 4 pump strokes can be used to determine concentrations of 5 to 50 ppm. At this point, 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 3 times 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 0.25 for values up to 50 ppm.
- ⑧ When the concentrations are over the scale range, a 1/2 pump stroke can be used to determine concentrations of 40 to 2000.
 - 1) Remove the detector tube from the pump.
 - 2) Turn the handle right or left by 1/4 (90°), push back it toward to the pump.
 - 3) Insert the new tube into the aspirating pump.
 - 4) Pull the handle at a 1/2 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.
 - 5) 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 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.

No temperature correction is necessary at less than 50 ppm of tube readings.

Tube Readings (ppm)	Temperature Correction Table				
	Corrected Concentration (ppm)				
	0 °C (32°F)	10 °C (50°F)	20 °C (68°F)	30 °C (86°F)	40 °C (104°F)
1000	870	930	1000	1030	1060
900	780	840	900	930	960
800	690	750	800	830	850
700	610	660	700	720	740
600	520	560	600	620	640
500	430	470	500	520	540
400	350	370	400	410	430
300	260	280	300	310	320
200	180	190	200	210	220
100	90	100	100	100	110
50	50	50	50	50	50

② Humidity; No corrections is necessary.

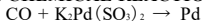
③ Atmospheric Pressure;

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

4. INTERFERENCE:

More than 5000ppm of Ethylene produces a pale grey stain and coexistence of more than 5000ppm of Ethylene produces an unclear stain at the top of the discoloured layer and gives higher readings. More than 5000ppm of Hydrogen changes the colour of the whole reagent to greyish yellow and coexistence of more than 5000ppm of Hydrogen produces an unclear stain at the top of discoloured layer. More than 1.5ppm of Acetylene produces a dark green stain and coexistence of more than 1/5 of Carbon monoxide gives higher readings. More than 100ppm of Sulphur dioxide fades the original colour and coexistence of more than 1/5 of Carbon monoxide gives higher readings. Nitrogen dioxide does not affect the accuracy of the readings by itself but coexistence of more than 1/5 of Carbon monoxide gives higher readings.

5. CHEMICAL REACTION IN THE DETECTOR TUBE:



6. DISPOSAL OF TUBES:

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

7. HAZARDOUS AND DANGEROUS PROPERTIES OF CARBON MONOXIDE:

TLV-TWA ◆ : 25 ppm

Explosion range in air : 12.5 - 74%

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

8. 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.

9. 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 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.