



INSTRUCTION MANUAL CARBON MONOXIDE DETECTOR TUBES

No.106SA

- ★ 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:

Measuring Range	20 - 1000 ppm (*)	5 - 50 ppm	40 - 2000 ppm
and Sampling Time	:3 minutes	12 minutes	1.5 minutes

(*) Graduations on the detector tube are based on 1 pump stroke.

Number of pump strokes	:1 (100mL)	4 (400mL)	1/2 (50mL)
Colour Change	:Yellow → Dark brown		
Detectable Limit	:1 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. DETECTOR TUBE CONTAINS 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 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 TOP OF THE BOX.
5. PRIOR TO USE, READ CAREFULLY ITEM 9. USER RESPONSIBILITY.
6. READ THE CONCENTRATION IMMEDIATELY AFTER MEASUREMENT.

2. SAMPLING AND MEASUREMENT:

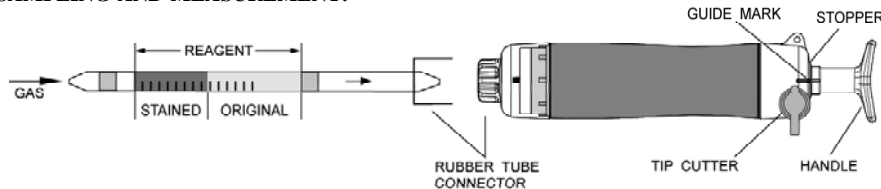


Fig.1

- 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 aspirating pump securely as shown in Fig.1. (Arrow mark shall point to the pump.)
- ③ Align the guide marks on the shaft and stopper of the aspirating pump.
- ④ Pull the pump handle at full stroke locked position 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.
- ⑥ In case of 4 pump strokes: After the above step ④, turn the pump handle right or left by 1/4 (90°), push the handle without removing the detector tube from the pump inlet, turn it right or left by 1/4 (90°) and repeat the step ④ and these turning-pushing procedures another 3 times.
- ⑦ On completion of 4 pump strokes sampling, read the scale at the maximum point of the stained layer and then multiply the reading value by 1/4.
- ⑧ If the discolouration is over the scale, change the tube and carry out the following 1/2 pump strokes.
 - 1) Turn the pump handle right or left by 1/4 (90°) and push it toward to the pump.
 - 2) Insert the new tube to the pump inlet.
 - 3) Pull the handle at 1/2 pump strokes locked position (to 50 mL line) and leave it for 1.5 minutes as it is.
 - 4) Remove the detector tube from the pump and read the concentration at the maximum point of the stained layer.
 - 5) Then multiply the reading value 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 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 Readings (ppm)	Temperature Correction Table				
	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

- ② Humidity; No corrections is necessary.

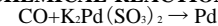
- ③ Atmospheric Pressure;

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

4. INTERFERENCE:

Coexistence of more than 5000ppm of Ethylene will give higher reading.
 Coexistence of Sulphur dioxide of more than 1/5 of Carbon monoxide will give higher reading.
 Coexistence of Nitrogen dioxide of more than 1/5 of Carbon monoxide will give higher reading.
 Coexistence of Acetylene of more than 1/5 of Carbon monoxide will give higher reading.
 Coexistence of more than 5000ppm of Hydrogen produces a whole reagent to Yellowish grey.

5. CHEMICAL REACTION IN THE DETECTOR TUBE:



6. DISPOSAL OF TUBE:

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

7. HAZARDOUS AND DANGEROUS PROPERTIES OF CARBON MONOXIDE:

TLV-TWA ◆ : 25 ppm
 Explosive range in air : 12.5 - 74%
 ◆ Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2004.

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 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 procedure in the instruction manual 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 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.