INSTRUCTION MANUAL

HYDROGEN CYANIDE DETECTOR TUBE

No.112SB

★ 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	: 2 - 100ppm(*)	0.5 - 25ppm
and Sampling Time	: 1 minute	4 minutes

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

Number of Pump Stroke	: 1(100mL) 4(400mL)
Colour Change	: Yellow → Red
Detectable Limit	: 0.2ppm (4 pump strokes)
Operating Temperature	: 0 - 40℃ (32-104°F) (No temperature correction is necessary.)
Operating Humidity	: 10 - 90%R.H. (Humidity 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 WERE 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 BEYOND 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 CAREFULLY **ITEM 9. USER RESPONSIBILITY**.
6. READ THE CONCENTRATION IMMEDIATELY AFTER MEASUREMENT.

2. SAMPLING AND MEASUREMENT:

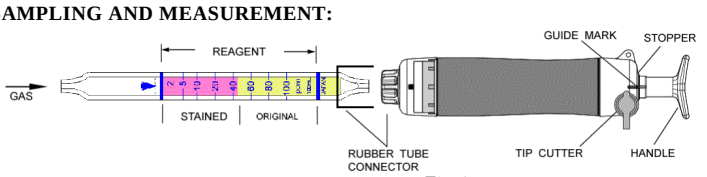

Fig.1

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 the 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 a full stroke 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 instructions of the pump.).

⑤ On completion of sampling, read the scale at the maximum point of the stained layer.

⑥ When the concentration is below the scale range, multiple pump strokes can be used to determine these lower concentrations. In case of 2, 3 or 4 pump strokes, then the following equation is available for true concentration after humidity correction undermentioned. (**REFER TO ITEM 3. CORRECTION FOR AMBIENT CONDITIONS.**)

$$\textbf{True concentration} = \textbf{Humidity corrected concentration} \times \frac{1}{\textbf{Number of strokes}}$$

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 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; No correction is necessary.

② Humidity; Correct the tube reading by following Humidity correction table.

Humidity Correction Table					
Tube Readings (ppm)	Corrected Concentration (ppm)				
	10%R.H.	30%R.H.	50%R.H.	70%R.H.	90%R.H.
100	91.0	95.0	100.0	105.0	111.0
80	73.0	76.0	80.0	84.0	88.5
60	54.5	57.0	60.0	63.0	66.0
40	36.0	38.0	40.0	42.0	44.5
20	18.0	19.0	20.0	21.0	22.5
10	8.4	9.2	10.0	10.8	11.6
5	4.2	4.6	5.0	5.4	5.8

Note: Humidity correction procedure

Example 1 : When the tube reading is 60 ppm at 30%R.H., the concentration is 57 ppm.

Humidity Correction Table					
Tube Readings (ppm)	Corrected Concentration (ppm)				
	10%R.H.	30%R.H.	50%R.H.	70%R.H.	90%R.H.
100	91.0	95.0	100.0	105.0	111.0
80	73.0	76.0	80.0	84.0	88.5
60	54.5	57.0	60.0	63.0	66.0
40	36.0	38.0	40.0	42.0	44.5
20	18.0	19.0	20.0	21.0	22.5
10	8.4	9.2	10.0	10.8	11.6
5	4.2	4.6	5.0	5.4	5.8

Example 2 : When the tube reading is 30ppm at 20%R.H., the true concentration is 27.8 ppm which is found by proportional allotment of each concentration and humidity as shown below.

Humidity Correction Table					
Tube Readings (ppm)	Corrected Concentration (ppm)				
	10%R.H.	30%R.H.	50%R.H.	70%R.H.	90%R.H.
100	91.0	95.0	100.0	105.0	111.0
80	73.0	76.0	80.0	84.0	88.5
60	54.5	57.0	60.0	63.0	66.0
40	36.0	38.0	40.0	42.0	44.5
20	18.0	19.0	20.0	21.0	22.5
10	8.4	9.2	10.0	10.8	11.6
5	4.2	4.6	5.0	5.4	5.8

(ppm)	10%R.H.	20%R.H.	30%R.H.
40	36.0	(37.0)	38.0
(30)	(27.0)	(27.8)	(28.5)
20	18.0	(18.5)	19.0

Numerals in parentheses are determined by proportional allotment.

③ Atmospheric Pressure;

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

4. INTERFERENCE:

Sulphur dioxide, Phosphine or Hydrogen sulphide produced a similar stain and coexistence of more than 1ppm, 1ppm, 3ppm, respectively with Hydrogen cyanide gives higher readings. Ammonia does not change the reagent by itself but coexistence of more than 5ppm with Hydrogen cyanide gives lower readings.

5. CHEMICAL REACTION IN THE DETECTOR TUBE:

$HCN + HgCl_2 \rightarrow HCl$

6. DISPOSAL OF TUBES:

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

7. HAZARDOUS AND DANGEROUS PROPERTIES OF HYDROGEN CYANIDE:

TLV-STEL◆ : 4.7ppm (Ceiling)

Explosion range in air : 5.6 - 46%

◆Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2010.

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 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.

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