KITAGAWA
KOMYO RIKAGAKU KOGYO

INSTRUCTION MANUAL
CARBON MONOXIDE DETECTOR TUBE

No.106C

★ 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	: 10 - 1,000ppm
Sampling Time	: 30 seconds - 5 min.
	※ This tube is calibrated based on the sampling time not related with number of pump strokes
Colour Change	: Pale yellow → Green → Blue
Detectable Limit	: 10 ppm (5.0 minutes)
Operating Temperature	: 0 - 40 ℃ (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 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 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 ℃/32-77°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:

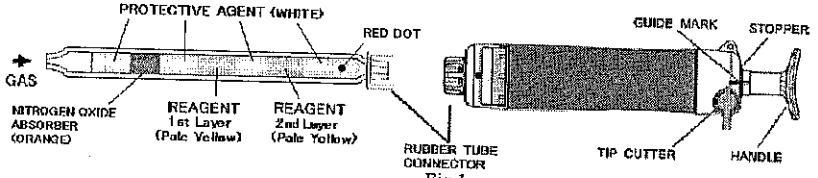

Fig.1

※ Reagent of 1st layer is for removing the coxistence gas such as Ethylene. 2nd layer is for reading the concentration.

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 end of the detector tube marked with red dot into the aspirating pump securely as shown in Fig.1.
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 30 secconds
⚠CAUTION THE SAMPLING TIME SHOULD BE COUNTED PRECISELY FROM THE TIME WHEN THE PUMP HANDLE WAS PULLED.
⑤ Remove the detector tube from the pump and wait for 2 minutes to change the colour of reagent at 15 ℃.
※ Waiting time depend on the temperature of detector tube and sampling time. **REFER TO TABLE OF WAITING TIME.**
⑥ Read a concentration to compare the colour stain of the 2nd layer reagent with a color standard chart.
⑦ When the concentration is below the 100ppm, sampling time of 1 ～ 5 minutes can be used to determine concentrations of 10 to 100 ppm. At this point, turn the handle right or left by 1/4 (90°), push back the handle without removing the detector tube from the pump and repeat the steps ③～④ for further sampling time.
⑧ On completion of sampling and waiting, correct the chart reading with the following equation to obtain a true concentration.

True concentration = Temperature corrected concentration × 0.5 / Sampling time (minute)

Table of waiting time (minute)

Temperature	0 - 5 ℃ (32 - 41°F)	10 ℃ (50°F)	15 ℃ (59°F)	20 ℃ (68°F)	25 ℃ (77°F)	30 - 40 ℃ (86 - 104°F)
Sampling time from 30 second or 1 minutes	5	3	2	2	1	1
Sampling time of 3 minutes	7	4	3	3	2	1
Sampling time of 5 minutes	10	7	5	4	2	1

SPECIAL NOTE: 1. The scale is calibrated at 15 ℃ (59°F), 50 %R.H. and 1013hPa. Readings obtained in other circumstances should be corrected (**REFER TO ITEM 3. CORRECTION FOR AMBIENT CONDITIONS**).

3. CORRECTION FOR AMBIENT CONDITIONS:

① Temperature; Correct the chart reading by following temperature correction table.

Chart Readings (ppm)	Temperature Correction Table: Corrected Concentration (ppm)								
	0 ℃ (32°F)	5 ℃ (41°F)	10 ℃ (50°F)	15 ℃ (59°F)	20 ℃ (68°F)	25 ℃ (77°F)	30 ℃ (86°F)	35 ℃ (95°F)	40 ℃ (104°F)
100	400	250	150	100	70	50	40	30	20
200	800	500	300	200	140	100	70	50	40
300	1,200	750	450	300	200	150	100	80	60
600	2,400	1,500	900	600	400	300	200	150	120
1,000	4,000	2,500	1,500	1,000	700	500	330	250	200

② Humidity; No correction is necessary.
③ Atmospheric Pressure; True concentration = Temperature corrected concentration × $\frac{1013}{\text{Atmospheric pressure (in hPa)}}$

4. INTERFERENCE:

Nitrogen dioxide of less than 300ppm does not affect the readings. Coexistence of more than 5 ppm of Ethylene or more than 1,000ppm of Hydrogen sulphide can not be removed in the reagent of 1st layer and produce blue or black stains and gives higher readings. Coexistence of more than 10% of Hydrogen at 40 ℃ (104°F) change the whole reagent to blue and gives higher readings.

5. CHEMICAL REACTION IN THE DETECTOR TUBE:

$CO + PdSO_4 + (NH_4)_2MoO_4 \rightarrow Mo_3O_8$

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 ～ 74.0%

◆ Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2008.

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.

Printed in Japan
IME1067