GL Sciences

INSTRUCTION MANUAL
ETHYLENE OXIDE DETECTOR TUBE

No.122SA

★ 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 Sampling Time:	: Ethylene oxide	0.01 - 1.8 % (Printed scale), 1.0 - 4.0 %(50mL)
	: Isopropyl alcohol	0.05 - 2.5 %
	: Furan	0.01 - 0.9 % , 0.2 - 2.0 % (50mL)
	: Methyl isobutyl ketone	0.01 - 0.6 %
	: Methyl ethyl ketone	0.05 - 2.2 % , 1.0 - 5.0 % (50mL)
	:(1pump stroke, 1.5 minutes)	
	:(3pump strokes, 4.5 minutes Methyl isobutyl ketone, Only)	
Colour Change	: Orange → Dark brown	
Detectable Limit:	: 50 ppm Ethylene oxide, Methyl ethyl Ketone (1 pump stroke)	
	: 100 ppm Isopropuyl alcohol(1 pump stroke)	
	: 10 ppm Furan(1 pump stroke) , Methyl isobutyl Ketone(3 pump strokes)	
Operating temperature:	0 - 40 ℃ (32-104°F) (Temperature correction is necessary without Furan.)	
Aspirating Pump	: Model AP-20,AP-20S, 400B	

⚠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. 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 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 **ITEM 10. USER RESPONSIBILITY** CAREFULLY.
6. READ THE CONCENTRATION IMMEDIATELY AFTER DRAWING THE SAMPLE.

1. SAMPLING AND MEASUREMENT:

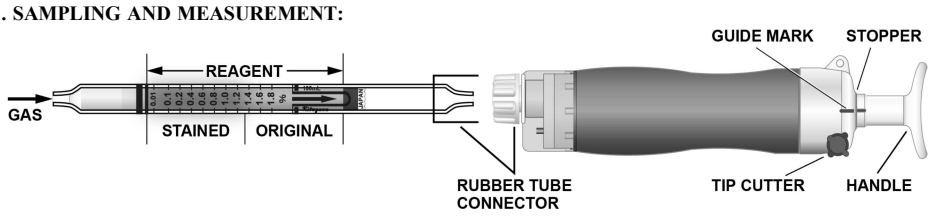


Fig.1

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 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 instructions manual of the pump.)
⑤ On completion of sampling, read the scale at the maximum point of the stained layer.
⑥ In case of 2 pump strokes, push the handle once more without removing the detector tube from the pump inlet, and air in the pump will be discharged perfectly.
⑦ In this case, actual concentration is half of the reading value.
⑧ If the discolouration is over the scale, change the tube and pull 1/2 strokes.
1) Insert the new tube to the pump inlet. Pull the handle at 1/2 strokes (to 50mL line), and it will be automatically locked. Leave it for 45 seconds.
2) Remove the detector tube from the pump and read the concentration.
3) Convret the reading value corrected by the temperature correction table, using the conversion scale.

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.

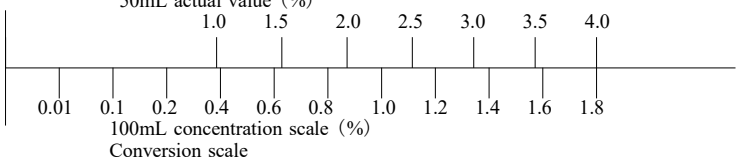
3. CORRECTION FOR AMBIENT CONDITIONS:

① Temperature; Correct the tube reading by following temperature correction table.
② Humidity; No corrections is necessary.

Temperature Correction Table					
Tube Readings (%)	Corrected Concentration (%)				
	0 ℃ (32°F)	10 ℃ (50°F)	20 ℃ (68°F)	30 ℃ (86°F)	40 ℃ (104°F)
1.8	-	2.00	1.80	1.70	1.64
1.6	2.06	1.78	1.60	1.50	1.46
1.4	1.84	1.58	1.40	1.35	1.28
1.2	1.60	1.34	1.20	1.14	1.09
1.0	1.31	1.12	1.00	0.93	0.88
0.8	1.08	0.91	0.80	0.73	0.68
0.6	0.86	0.70	0.60	0.54	0.49
0.4	0.63	0.49	0.40	0.34	0.30
0.2	0.36	0.26	0.20	0.16	0.13
0.1	0.20	0.14	0.10	0.08	0.06
0.01	0.05	0.02	0.01	0.01	0.01

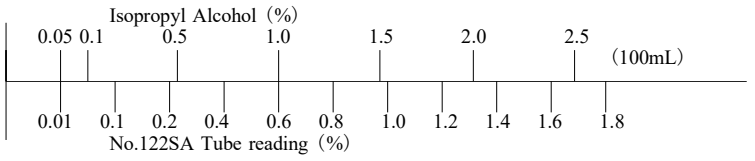
③ Atmospheric Pressure;

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



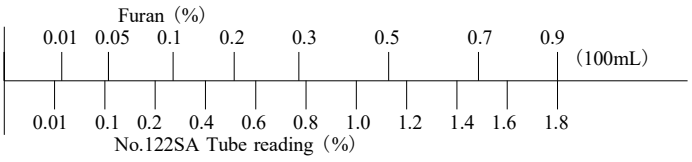
4. CONVERSION CHART AND TEMPERATURE CORRECTION TABLE

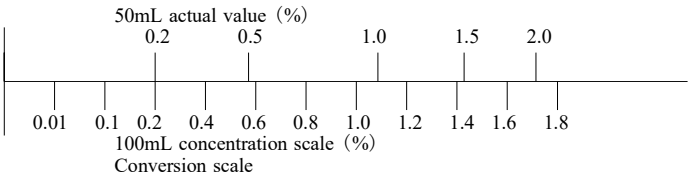
ISOPROPYL ALCOHOL



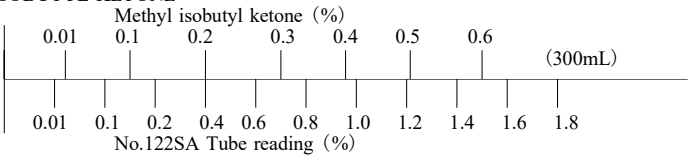
Temperature Correction Table for Isopropyl Alcohol					
Conversion value (%)	Corrected Concentration (%)				
	0 ℃ (32°F)	10 ℃ (50°F)	20 ℃ (68°F)	30 ℃ (86°F)	40 ℃ (104°F)
2.5	-	-	2.50	2.10	2.00
2.0	-	-	2.00	1.70	1.62
1.5	-	-	1.50	1.28	1.21
1.0	-	1.43	1.00	0.85	0.80
0.5	1.00	0.62	0.50	0.42	0.38
0.1	0.16	0.14	0.10	0.09	0.08
0.05	0.09	0.06	0.05	0.04	0.03

FURAN



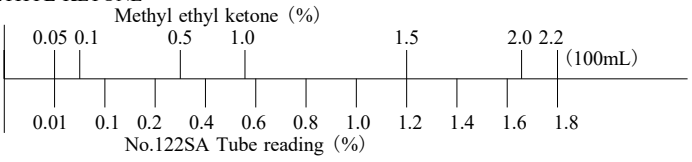


METHYL ISOBUTYL KETONE

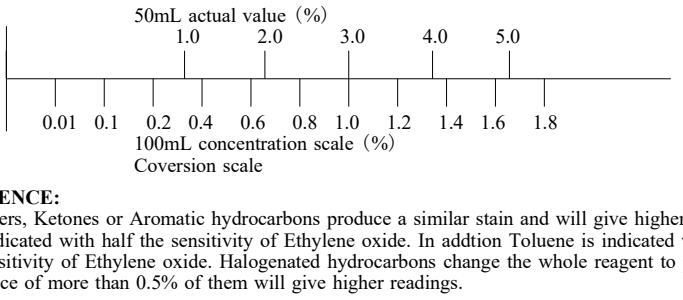


Temperature Correction Table for Methyl Isobutyl Ketone					
Conversion value (%)	Corrected Concentration (%)				
	0 ℃ (32°F)	10 ℃ (50°F)	20 ℃ (68°F)	30 ℃ (86°F)	40 ℃ (104°F)
0.6	-	-	0.60	0.55	0.52
0.5	-	-	0.50	0.46	0.43
0.4	-	-	0.40	0.37	0.35
0.3	-	-	0.30	0.28	0.27
0.2	-	0.23	0.20	0.19	0.18
0.1	0.16	0.11	0.10	0.10	0.10
0.01	0.01	0.01	0.01	0.01	0.01

METHYL ETHYL KETONE



Temperature Correction Table for Methyl Ethyl Ketone					
Conversion value (%)	Corrected Concentration (%)				
	0 ℃ (32°F)	10 ℃ (50°F)	20 ℃ (68°F)	30 ℃ (86°F)	40 ℃ (104°F)
2.2	-	2.53	2.20	2.04	1.96
2.0	2.70	2.30	2.00	1.84	1.76
1.5	2.36	1.74	1.50	1.35	1.26
1.0	1.52	1.16	1.00	0.88	0.80
0.5	0.70	0.58	0.50	0.42	0.38
0.1	0.14	0.12	0.10	0.08	0.06
0.05	0.07	0.05	0.05	0.03	0.03



5.INTERFERENCE:

Alcohols, Esters, Ketones or Aromatic hydrocarbons produce a similar stain and will give higher readings. Ethanol is indicated with half the sensitivity of Ethylene oxide. In addtion Toluene is indicated with 7 times the sensitivity of Ethylene oxide. Halogenated hydrocarbons change the whole reagent to pale brown and coexistence of more than 0.5% of them will give higher readings.

6. CHEMICAL REACTION IN THE DETECTOR TUBE:

Ethylene oxide	CH_2CH_2O	$+Cr^{6+}+H_2SO_4 \rightarrow Cr^{3+}$
Isopropyl alcohol	$CH_3CH(OH)CH_3$	$+Cr^{6+}+H_2SO_4 \rightarrow Cr^{3+}$
Furan	C_4H_4O	$+Cr^{6+}+H_2SO_4 \rightarrow Cr^{3+}$
Methyl isobutyl ketone	$(CH_3)_2CHCH_2COCH_3$	$+Cr^{6+}+H_2SO_4 \rightarrow Cr^{3+}$
Methyl ethyl ketone	$CH_3COC_2H_5$	$+Cr^{6+}+H_2SO_4 \rightarrow Cr^{3+}$

7. DISPOSAL OF TUBE:

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

8. HAZARDOUS AND DANGEROUS PROPERTIES OF:

Ethylene oxide	TLV-TWA ◆: 1 ppm	Explosion range in air: 3.0 - 100 %
Isopropyl alcohol	TLV-TWA ◆: 200 ppm	Explosion range in air: 2.0 - 12.0 %
Furan	TLV-TWA.◆:	Explosion range in air: 2.3 - 14.3 %
Methyl isobutyl ketone	TLV-TWA ◆: 20 ppm	Explosion range in air: 1.4 - 7.5 %
Methyl ethyl ketone	TLV-TWA ◆: 200 ppm	Explosion range in air: 1.7 - 11.5 %

◆ Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2019.

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 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.

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